International Conference on Multidisciplinary Approaches - 2015

PROCEEDINGS

11th - 12th September 2015

Faculty of Graduate Studies
University of Sri Jayewardenepura
International Conference on Multidisciplinary Approaches 2015

“Redefining Diversity for a New Direction”

Conference Proceedings

11th and 12th September 2015

Faculty of Graduate Studies
University of Sri Jayewardenepura
10280 Nugegoda, Sri Lanka
Disclaimer

The responsibility for opinions expressed, in articles, studies and other contributions in this publication rest solely with their authors, and this publication does not constitute an endorsement by the ICMA-2015 of the opinions so expressed in them.

Official website of the Conference

http://www.fgs.sjp.ac.lk/icma
Editorial Board

Senior Professor Swarna Piyasiri
Professor Preeni Fernando
Professor Sagarika Ekanayake
Professor Saman Chandra Ranasinghe
Professor Kennedy Gunawardene
Professor Sandun Senarath
Professor Laleen Karunanayake
Professor Mayura Samarakoon
Dr. Prasad Jayaweera
Dr. Charmalie Nahallage

Editorial Assistance

Ms. Pabasara Weerarathne
Mr. Mohomed Atheeq
Ms. Vidyani Lakshika
Message from the Vice Chancellor

It is indeed a pleasure to send this message on the occasion of the 2nd International Conference on Multidisciplinary Approaches (iCMA 2015) organized by the Faculty of Graduate Studies, University of Sri Jayewardenepura.

As reflected in its theme, redefining diversity for a new direction, this conference offers a multidisciplinary forum for scholars and professionals from all over the world to re-examine and re-define diversity to achieve new goals and set new standards. This will indeed be a challenging task for both organizers and participants as expectations of all stakeholders on this kind of scholarly endeavor will be quite high. Yet, I am sure that the national and international scholars presenting their research findings will come out with new insights for the diverse issues addressed in the conference.

With a blend of six disciplines and thus becoming truly multidisciplinary, this event will be an excellent window for researchers from Health Sciences, Natural Sciences, Management & Finance, Humanities, Social Sciences, and Modern Technology & Applications to showcase their capabilities and contribute to the advancement of knowledge in these respective study fields. I congratulate all of them for their success and also express my sincere thanks to the organizers for their untiring efforts to host this event.

Prof. Sampath Amaratunge
The Vice-Chancellor
University of Sri Jayewardenepura
Nugegoda
Sri Lanka
Message from the Conference Chair

As the Conference Chair and the Dean of the Faculty of Graduate Studies (FGS), I am very happy & proud to send this message on the occasion of the 2nd International Conference on Multidisciplinary Approaches (iCMA 2015) which will be held on 11th & 12th September 2015. This follows iCMA 2014 which achieved a huge success. The theme of this year’s iCMA is “Redefining Diversity for a new Direction.” Two scholars of international acclaim, Emeritus Professor Fritz Schiemer form University of Vienna, Austria and Professor Athula Ginige from University of Western Sydney, Australia will be the keynote speakers of iCMA 2015.

iCMA is an annual multidisciplinary forum for academics, researchers and professionals to share their knowledge, experiences, and research in a range of disciplines. The goal is to create a platform for the dissemination of knowledge and to enable mutual critical discussion of research in these areas. To achieve this goal, researchers from local and international universities, professional bodies and from research institutes are invited.

The iCMA 2015 focuses on a range of disciplines including Health Sciences, Natural Sciences, Management & Finance, Humanities, Social Sciences, and Modern Technology & Applications. There will be a special plenary session titled “Glory of Nature and Beauty of Science” which will attempt to harmonize natural glory with scientific ingenuity.

Abstracts will be published in the conference proceedings while some selected full papers will be published in the International Journal of Multidisciplinary Studies published by the Faculty of Graduate Studies, University of Sri Jayewardenepura. The best oral and poster presentations under separate sub-themes will receive awards.

I greatly appreciate the strong team effort extended by the co-chairs, all the members of the conference organizing committee, review panel, the editorial board members, all the academic staff members and the non-academic staff members of the Faculty who extended their strong support to make this event a success.

I congratulate all the participants for their enthusiasm and hope iCMA 2015 will be an excellent forum for them to enrich their research, technologies and find new insights along a truly multidisciplinary approach.

Professor Swarna Piyasiri
Conference Chair
Senior Professor
Dean, Faculty of Graduate Studies
University of Sri Jayewardenepura
Contents

MULTIDISCIPLINARY APPROACHES ................................................................................................................1
THE ROAD TO TRANSDISCIPLINARITY ...........................................................................................................2
DIGITAL KNOWLEDGE ECOSYSTEMS: NATURE INSPIRED COMPUTING FOR THE KNOWLEDGE ECONOMY ....4
MIXING DIVERSITY FOR CREATIVITY LED GROWTH ..................................................................................6
HEALING POWER OF MUSIC: MUSIC THERAPY ............................................................................................7
GLORY OF NATURE AND BEAUTY OF SCIENCE: AN ECONOMISTS’ PERSPECTIVE .....................................8
CREATION OF THE 21ST CENTURY SRI LANKAN SITAR ..............................................................................9

HEALTH SCIENCES
A BIOWAIVER STUDY TO DETERMINE THE QUALITY AND THE IN VITRO EQUIVALENCE OF THE MOST
WIDELY AVAILABLE METRONIDAZOLE PRODUCT IN COLOMBO, SRI LANKA ..........................................11
ASSESSMENT OF QUALITY OF LIFE OF PATIENTS WITH DIABETIC ULCERS BY CARDIFF WOUND IMPACT
SCHEDULE (CWIS) ..........................................................................................................................................12
THE ACCESS OF ESSENTIAL MEDICINES FOR NON COMMUNICABLE DISEASES IN PRIVATE SECTOR OF
SRI LANKA ....................................................................................................................................................13
CONCERNS OF PHYSICIANS AND NUTRITIONISTS ON SELF-MANAGEMENT OF DIABETES MELLITUS AMONG THE
TAMILS LIVING IN THE BATTICALOA DISTRICT: A QUALITATIVE STUDY ..................................................14
ASSOCIATION OF SERUM CORTISOL WITH SEVERITY OF CORONARY ARTERY DISEASE AMONG PATIENTS
ADMITTED TO THE CARDIO-THORACIC UNIT OF SRI JAYEWARDENEPURA GENERAL HOSPITAL ............15
USE AND APPROPRIATENESS OF ANTIBIOTICS IN GENERAL MEDICAL UNITS OF A TERTIARY CARE INSTITUTION .....16
IN VITRO ANTIBACTERIAL ACTIVITY OF CRUDE EXTRACTS OF HIBISCUS HISPIDISSIMUS.GRIFF (NAPIRITTA) ....17
LACTOBACILLUS FERMENTUM: POTENTIAL PROBIOTIC ISOLATED FROM FERMENTED SRI LANKAN FINGER
MILLET (ELUCINE CORACANA) .....................................................................................................................18
ESSENTIAL OILS OF ALPITNIA CALCARATA ROSC. INHIBITS THE IN VITRO GENERATION OF REACTIVE OXYGEN
SPECIES IN MOUSE MACROPHAGES ........................................................................................................19
A SURVEY ON ANIMAL ORIGIN MATERIALS USED IN INDIGENOUS MEDICINE IN SRI LANKA WITH SPECIAL
REFERENCE TO TALPATE PILIYAM ..............................................................................................................20
ANTIBACTERIAL ACTIVITY OF DISTILLATION OF LEAVES OF Atalantia ceylanica (YAKINARAN) ..................21
WOUND HEALING ACTIVITY OF ETHANOLIC EXTRACT OF BARK OF PLUMBAGO ZEYLANICA ................22
USE OF A MULTIPLEX PCR TO IDENTIFY CANDIDA SPECIES IN CONCENTRATED ORAL RINSE SAMPLES OF PATIENTS
WITH DIABETES .........................................................................................................................................23
STANDARD PRECAUTIONS DURING PHLEBOTOMY: DO HEALTHCARE WORKERS PAY HEED? ...................24
PSYCHOSOCIAL PROBLEMS FACED BY PERSONS WITH SPINAL CORD INJURY: A REHABILITATION HOSPITAL
BASED QUALITATIVE STUDY ......................................................................................................................25
MEDICATION SAFETY AMONG IN-PATIENTS – A WARD BASED STUDY ..................................................26
ANTIBIOTIC SELF MEDICATION (ASM) AMONG SCHOOL TEACHERS IN KEGALLE EDUCATIONAL DIVISION ....27
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBV AND HIV SEROPOSITIVITY, KNOWLEDGE, ATTITUDES, PRACTICES ON DISEASE TRANSMISSION AMONG FUNERAL INDUSTRY WORKERS IN SELECTED DISTRICTS OF SRI LANKA</td>
<td>50</td>
</tr>
<tr>
<td>HUMANITIES</td>
<td></td>
</tr>
<tr>
<td>A STUDY OF FACEBOOK ADDICTION LEVEL AMONG TEENAGE SCHOOL STUDENTS IN SRI LANKA</td>
<td>52</td>
</tr>
<tr>
<td>(In Negombo Educational Zone)</td>
<td></td>
</tr>
<tr>
<td>USAGE OF SOCIAL MEDIA AND RELATED PROBLEMS: A STUDY BASED ON INTERNATIONAL STUDENTS IN THE WUHAN UNIVERSITY IN CHINA</td>
<td>53</td>
</tr>
<tr>
<td>CRITICAL ANALYSIS OF BUSINESS INTERVENTION AND ECONOMIC INTERFERENCE TO SRI LANKAN NEW MEDIA INDUSTRY (SPECIAL REFERENCE TO MOBILE PHONE AND FACEBOOK)</td>
<td>54</td>
</tr>
<tr>
<td>EXTREME BEAUTY: EXTRAVAGANT ELEGANCE OF THE COSTUME OF THE KANDYAN ELITE</td>
<td>55</td>
</tr>
<tr>
<td>THE POLITICAL COMMUNICATION AND THE PEDIGREE OF POLITICAL CANDIDATES (A RESEARCH ON 02 PRESIDENTIAL ELECTIONS OF SRI LANKA)</td>
<td>56</td>
</tr>
<tr>
<td>EXPRESSION OF SENSUALITY: BEAUTY OF FABRIC FOLDING METHODS OF DANCE COSTUMES</td>
<td>57</td>
</tr>
<tr>
<td>‘TRANSLATING THE UNTRANSLATABLE’: AN ANALYSIS ON TRANSLATING CULTURE SPECIFIC REFERENCES IN TRANSLATING A SCRIPT FOR DUBBING PURPOSE</td>
<td>58</td>
</tr>
<tr>
<td>RELEVANCE OF KABIR’S POETRIES OF SOCIAL CRITICISM TO MODERN INDIAN SOCIETY</td>
<td>59</td>
</tr>
<tr>
<td>TRANSLATING KINSHIP TERMINOLOGY</td>
<td>60</td>
</tr>
<tr>
<td>A DISCUSSION ABOUT THE DRAMATIC IRONY CONCEPT</td>
<td>61</td>
</tr>
<tr>
<td>EMPLOYMENT OF MUSIC IN INDIAN CHHAI THEATRE</td>
<td>62</td>
</tr>
<tr>
<td>A STUDY ABOUT THE PARALLEL CONCEPTS OF SANSKRIT RHETORIC AND SPOKEN SINHALA</td>
<td>63</td>
</tr>
<tr>
<td>LEXICAL DIFFERENCES BETWEEN SRILANKAN TAMIL AND MUSLIM DIALECTS</td>
<td>64</td>
</tr>
<tr>
<td>ŚUKASAPTATI; A SANSKRIT DIDACTIC WORK WITH EROTISM</td>
<td>65</td>
</tr>
<tr>
<td>A STUDY ON THE ENGLISH AND SINHALA TRANSLATIONS OF SONGS IN BERTOLT BRECHT’S ‘DER KAU KASCHE KREIDEKREIS’ IN RELATION TO JOHN DRYDEN'S THEORY OF TRANSLATION</td>
<td>66</td>
</tr>
<tr>
<td>CANONS IN THE COMMENTARY: AN INVESTIGATION ON A DISCOURSE APPEARS IN THE AṆGUṬTARANIKĀYA ĀṬṬHAKATĀ</td>
<td>67</td>
</tr>
<tr>
<td>WERE THE VERSE-DRAMA DISREPUTABLE ONLY FOR BHIKKUS?</td>
<td>68</td>
</tr>
<tr>
<td>SENSUAL PLEASURE (PAṆCAKĀMA) REFLECTED IN GUHYASAMĀJATANTRA AND ITS PROFOUND CLARIFICATION</td>
<td>69</td>
</tr>
<tr>
<td>A COMPARATIVE STUDY ON THE UTILITY OF TEN- COMMANDMENTS AND THE EIGHT NOBLE PATH TO STRENGTHEN THE SOCIAL HARMONY</td>
<td>70</td>
</tr>
<tr>
<td></td>
<td>71</td>
</tr>
<tr>
<td></td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>73</td>
</tr>
<tr>
<td></td>
<td>74</td>
</tr>
<tr>
<td></td>
<td>75</td>
</tr>
<tr>
<td>Title</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>EXISTENTIALIST QUEST OF BUDDHISM AND SARTRISM – A PHILOSOPHICAL ANALYSIS</td>
<td>76</td>
</tr>
<tr>
<td>MOTIVATIONAL STRATEGIES USED BY THE BUDDHA AND THEIR APPLICABILITY FOR TEACHING ENGLISH AS A SECOND LANGUAGE</td>
<td>77</td>
</tr>
<tr>
<td>THE TRUTH-VALUE OF BUDDHIST LOGIC: IN THE FLOW OF QUADRILEMMA, DIALETHEISM, LEM AND BIVALENCE</td>
<td>78</td>
</tr>
<tr>
<td>The most affective factor to existence of the Job Stress</td>
<td>79</td>
</tr>
<tr>
<td>USE OF TEXTBOOKS IN DEVELOPING READING SKILLS IN ENGLISH AS A SECOND LANGUAGE</td>
<td>80</td>
</tr>
<tr>
<td>THE VALUE OF HUMOR IN ENGLISH AS A SECOND LANGUAGE CLASSROOM</td>
<td>81</td>
</tr>
<tr>
<td>EFFECTIVENESS AND SUSTAINABILITY OF THE UNIVERSITY TEST OF ENGLISH LANGUAGE (UTEL)</td>
<td>82</td>
</tr>
<tr>
<td>KNOWLEDGE MANAGEMENT AT HIGHER EDUCATION INSTITUTIONS</td>
<td>83</td>
</tr>
<tr>
<td>A STUDY BASED ON THE INDIGENOUS KNOWLEDGE IN MEERIGAMA DIVISIONAL SECRETARIAT DIVISION OF GAMPAHA DISTRICT</td>
<td>84</td>
</tr>
<tr>
<td>EDUCATIONAL ISSUES RELATED TO MENTAL ILLNESSES OF UNDERGRADUATES</td>
<td>85</td>
</tr>
<tr>
<td>PRESCHOOL TEACHERS’ USE OF PLAY BASED TEACHING STRATEGIES IN THE TEACHING LEARNING PROCESS</td>
<td>86</td>
</tr>
<tr>
<td>POSITIVE ENERGY AND LANGUAGE LEARNING</td>
<td>87</td>
</tr>
<tr>
<td>DOMESTICATING AN AVADĀNA: A CASE STUDY IN NEWAR BUDDHISM</td>
<td>88</td>
</tr>
<tr>
<td>A STUDY ON THE ENGLISH AND SINHALA TRANSLATIONS OF SONGS IN BERTOLT BRECHT’S ‘DER KAUKASICHE KREIDEKREIS’ IN RELATION TO JOHN DRYDEN'S THEORY OF TRANSLATION</td>
<td>89</td>
</tr>
<tr>
<td>EFFECTIVENESS OF MULTIMEDIA PACKAGES ON LEARNING BIOLOGICAL CONCEPTS AMONG STUDENT TEACHERS OF DIPLOMA IN ELEMENTARY EDUCATION</td>
<td>90</td>
</tr>
<tr>
<td>MEDIA INFLUENCE AND POLITICAL OPINION ( RELEVANCE TO GAMPAHA ELECTORATE )</td>
<td>91</td>
</tr>
<tr>
<td>CROSS CULTURAL PROBLEMS OF ADVERTISING (AN ANALYSIS CONDUCTED IN 2012 BASED ON THE HIV AIDS PRINT ADVERTISEMENTS OF SELECTED COUNTRIES (SRI LANKA, INDIA AND AMERICA))</td>
<td>92</td>
</tr>
<tr>
<td>Buddha’s Utterances in the Commentary: An Examination of the Excluded Sutta-excerpt in Atthasālinī</td>
<td>93</td>
</tr>
<tr>
<td>WHAT IS THE BHAVANGA CITTA, REPRESENTED IN THERĀVĀDA ABHIDHAMMA?</td>
<td>94</td>
</tr>
<tr>
<td>HOW TO PRESERVE INDIGENOUS KNOWLEDGE IN SRI LANKA: A STUDY</td>
<td>95</td>
</tr>
<tr>
<td>A STUDY ABOUT READING HABIT AMONG UNIVERSITY STUDENTS: WITH SPECIAL REFERENCE TO MAIN LIBRARY, UNIVERSITY OF KELANIYA</td>
<td>96</td>
</tr>
</tbody>
</table>
KING LEAR AND LADY MACBETH: VICTIMS OF ‘EVEN-HANDED JUSTICE’ OR CAUSE AND EFFECT? – A BUDDHIST OUTLOOK TO THE PSYCHOLOGICAL CONVERSIONS OF THEIR CHARACTERS .........................................................103

AN ANALYSIS ON ‘THE DESTINY OF WOMAN WITHIN THE REPRESSED SOCIAL REALM’ BASED ON THE SELECTED VITAL FEMININE PORTRAYALS IN LITERATURE ..................................................................................................................104

A STUDY OF HUMANITY OF WOMEN AS DEPICTED IN HENRIK IBSEN’S PLAY, ‘A DOLL’S HOUSE’ .................................................109

EURIPIDES’ PORTRAYAL OF MEDEA: ‘THE OTHER’ OF THE GREEK SOIL ........................................................................................................110

LEGAL KNOWLEDGE MANAGEMENT FOR LEGAL TRANSACTIONS ..................................................................................................113

A STUDY ON HEALTH WORKFORCE IN SRI LANKAN GOVERNMENT SECTOR ALLOPATHIC HEALTH SYSTEM ........114

INVESTIGATION OF FACTORS AFFECTING THE REVERSE LOGISTICS IN AUTOMOBILE INDUSTRY: A CASE STUDY IN COLOMBO REGION ..................................................................................................................115

COMPARATIVE ANALYSIS OF OFFICE RENT DETERMINANTS IN NUHEGODA AND BATTARAMULLA URBAN AREAS IN COLOMBO ........................................................................................................116

A CRITICAL EVALUATION OF ASSESSOR’S POWERS IN RESPECT OF TAX ASSESSMENT IN SRI LANKAN CONTEXT: WITH SPECIAL REFERENCE TO TAX PAYER’S PROCEDURAL DUE PROCESS RIGHTS ....................................................117

PREDICTING DECISIONS ON LOAN PERFORMANCE USING BUSINESS INTELLIGENCE TOOL ........................................................................118

THE INFLUENCE OF BUSINESS STRATEGY ON OUTSOURCING HUMAN RESOURCE FUNCTIONS: A STUDY OF THE MANUFACTURING SECTOR IN SRI LANKA ....................................................................................................................................119

EUTHANASIA: THE RIGHT TO DIE WITH DIGNITY AND THE LEGAL DILEMMA ..................................................................................120

FOURIER ANALYSIS ON MODELING SECTOR RETURNS OF SRI LANKAN SHARE MARKET ..................................................................................121

BEHAVIORAL STOCK MARKET MODEL TO REFLECT THE INFLUENCE OF GREED AND FEAR OF TRADERS IN COLOMBO STOCK EXCHANGE ........................................................................................................122

INTELLECTUAL CAPITAL AND FINANCIAL PERFORMANCE IN SRI LANKAN BANKS ..............................................................123

CAPITAL STRUCTURE, LIQUIDITY MANAGEMENT AND THEIR IMPACT ON PROFITABILITY: A COMPARATIVE STUDY OF BEVERAGE FOOD AND TOBACCO FIRMS AND MANUFACTURING FIRMS IN COLOMBO STOCK EXCHANGE (CSE) IN SRI LANKA ..................................................................................................................124

IMPACT OF BOARD CHARACTERISTICS ON DIVIDEND POLICY: A STUDY OF LISTED COMPANIES IN SRILANKA ....125

FIRM SIZE ON PROFITABILITY: A COMPARATIVE STUDY OF STATE AND PRIVATE COMMERCIAL BANKS IN SRI LANKA ..................................................................................................................126

COMMONSENSE KNOWLEDGE SYSTEMS IN MANAS PRAKRTI: HOLISTIC APPROACH FOR STRATEGIC HUMAN RESOURCE MANAGEMENT ................................................................................................................127
A CRITICAL ANALYSIS ON ELECTRONIC COMMERCE ADAPTATION BY SRI LANKAN HOSPITALITY INDUSTRY ........128
EMPLOYEE MOTIVATION AND JOB PERFORMANCE; CASE STUDY ON PRIVATE SECTOR COMPANY ..................129
ANALYSIS OF THE REDEVELOPMENT STAGE OF A REAL ESTATE: A CASE IN THE CITY OF COLOMBO ..................130
ESTIMATING THE BEST TIME FOR REDEVELOPMENT OF A REAL ESTATE: A CASE STUDY IN BAMBALAPITIYA ..........131
A STUDY ON THE IMPACT OF WORKPLACE ENVIRONMENT ON THE EMPLOYEE’S PERFORMANCE ..................132

**MODERN TECHNOLOGY AND APPLICATIONS**

EVALUATION OF THE BEACH NOURISHMENT PROJECT AT PALLIYAWATTA-USWETAKEIYAWA SRI LANKA........134
ENERGY DEMAND FORECASTING FOR SELECTED SECTORS IN SRI LANKA.................................................135
LOW-COST REAL TIME STereo VISION BASED AUTONOMOUS ROBOT NAVIGATION SYSTEM ..................136
SRI LANKA AS A POTENTIAL HUB FOR IT/BPO SERVICES ........................................................................137
ABSTRACT ON GLOBAL KNOWLEDGE SHARING FOR IMPLEMENTING A DIGITAL MANUFACTURING
LAB (FABLAB) FOR RURAL DEVELOPMENT IN SRI LANKA ................................................................138
ENERGY CHALLENGES IN THE KNOWLEDGE ECONOMY: SPATIAL MODEL FOR ELECTRIC TRANSMISSION
LINE ROUTING........................................................................................................................................139
NONLINEAR DYNAMICS OF THE DENGUE MOSQUITO PROPAGATION WITH RESPECT TO CLIMATE FORCES: A
DISCRETE TIME DENSITY DEPENDENT FUZZY MODEL ...........................................................................140
AN EMPIRICAL STUDY OF SITUATIONAL, LEADER AND TEAM MEMBER CHARACTERISTICS ON COACH
LEADERSHIP BEHAVIOR STYLES EXHIBITED BY THE COACHES OF STATE UNIVERSITIES IN WESTERN PROVINCE ....141
LOW COST TEACHING TOOL WITH MULTIMEDIA SUPPORT .........................................................................142
THREE TIER DESIGN FOR HEALTHCARE SERVICE SOLUTIONS ..............................................................143
COLLABORATION MODELLING FRAMEWORK FOR LEGAL WORKFLOW MANAGEMENT .........................144
IMPROVED AUTOMATED NUMBER PLATE RECOGNITION SYSTEM WITH HISTOGRAM AND TEMPLATE
MATCHING................................................................................................................................................145
INTEGRATION OF MODERN APPLICATION FOR MEDICAL CODING SYSTEMS AND ELECTRONIC PATIENT
RECORDS..................................................................................................................................................146
USING DATA MINING TECHNIQUES TO ANALYZE CRIME PATTERNS OF NATIONAL CRIME DATA ...............147
WEB BASED GIS APPROACH FOR GEOMORPHOLOGIC CHANGE DETECTION ON THE MOUTH OF RIVER
"KALU", SRI LANKA................................................................................................................................148
IDENTIFICATION OF FACTORS AFFECTING MISSING VALUES IN SURVEY DATA AND COMPARISON OF
IMPUTATION METHODS ..........................................................................................................................149
FORECASTING INTERNATIONAL TOURISM INCOME IN SRI LANKA: POST-WAR PERIOD ......................150
MODELING AND FORECASTING OF CRUDE OIl PRICE ...............................................................................151
FORECASTING GROSS DOMESTIC PRODUCT (GDP) IN SRI LANKA USING TIME SERIES ANALYSIS ..........152
EASY AND EFFECTIVE RE-SCHEDULING OF TRAIN TIMETABLE FOR SRI LANKA RAILWAYS IN THE EVENT
OF DELAY IN ONE OR MORE TRAINS .....................................................................................................153
DESCRIPTING ROTATIONS OF THREE DIMENSIONAL OBJECTS USING QUATERNIONS ..............................154
OPTIMAL ONE DAY INTERNATIONAL CRICKET SQUAD SELECTION BY GENETIC ALGORITHM .............................................. 155
ANALYSIS OF STOCK PRICES USING MARKOV CHAIN .......................................................................................... 156
EFFECT OF PROCESS PARAMETERS ON WASTE PLASTIC PYROLYSIS IN A SEMI BATCH REACTOR .................. 157
EXTRACTION AND USAGE OF NATURAL POLYMER MATERIALS FROM SUGARCANE WASTE TO DEVELOP DEGRADABLE COMPOSITE MATERIAL FOR PACKAGING APPLICATIONS ............................................................. 158
SYNTHESIS OF LOW DENSITY POLYETHYLENE BASED PHOTODEGRADABLE POLYMER COMPOSITE USING CINNAMON LEAF OIL ............................................................................................................................... 159
INVESTIGATION OF THE TECHNICAL PROPERTIES OF THE TYRE RETREADING COMPOUND FORMULATED WITH RSS/SCRAP RUBBER BLENDS .............................................................................................................. 160
SYNTHESIS OF SPIRONAPHTHOXAZINE DERIVATIVE TO BE DEVELOPED AS A NOVEL SMART MATERIAL .......... 161
Spectrophotometric determinations of Copper with 3-hydroxy-3-methyl-1-p-methoxy phenyl triazene ......................... 162
Sentimental Analysis Based on Sinhala Language Social Media Updates .................................................................... 163
A STATISTICAL STUDY ON G.C.E. (O/L) RESULTS IN JAFFNA AND VALIKAMAM EDUCATIONAL ZONES ............ 164
FORECASTING TOURIST ARRIVALS TO SRI LANKA USING ARIMA AND ARFIMA APPROACH ................................. 165
IRON DETERMINATION WITH 3-HYDOXY-3-METHYL-1-P-METHOXY PHENYL TRIAZENE ........................................ 166

NATURAL SCIENCES
FORMULATION OF INSTANT JELLY MIX USING NATURAL COLOURANT AND ITS PRODUCT QUALITY EVALUATION .................................................................................................................................................. 168
CHARACTERIZATION OF SOME FINGER MILLET (ELEUSINE CORACANA L.) GERMPLASM ACCESSIONS AVAILABLE IN SRI LANKA USING MORPHOLOGICAL MARKERS ...................................................................................... 169
FATTY ACID COMPOSITION OF KADAL PRAWN (Metapenaeus dobsoni, MIERS, 1878) .............................................. 170
POTASSIUM ENHANCED GROWTH, FRUIT QUALITY IMPROVEMENTS AND RESISTANCE TO ANTHRACNOSE IN FIELD GROWN CAPSICUM (CAPSICUM ANNUN L. CV. ‘HUNGARIAN YELLOW WAX’) .............................................................................................................. 171
PRELIMINARY YIELD PERFORMANCE AND LATEX PHYSIOLOGICAL PARAMETERS OF RUBBER (HEVEA BRASILIENSIS) PLANTED IN INTERMEDIATE ZONE OF SRI LANKA ...................................................................................... 172
IN VITRO SEED GERMINATION AND CALLUS INDUCTION OF TYRINOPSIS WALLA GAERTN ....................................... 173
REMOVAL OF Cu\(^{2+}\) AND Zn\(^{2+}\) USING UNMODIFIED COCONUT COIR DUST ......................................................... 174
CADMIUM, ARSENIC AND FLUORIDE IN GROUNDWATER AT GIRANDURUKOTTE AND NAGADEEPA, BADULLA DISTRICT, Sri Lanka .............................................................................................................................. 175
SPECIES DIVERSITY, SPECIES RICHNESS AND ABUNDANCE OF REPTILES AT THE YAGIRALA FOREST RESERVE OF SRI LANKA ......................................................................................................................... 176
SEASONAL VARIATION IN FAT CONTENT OF Sardinella longiceps BY MATURITY STAGE ............................................. 177
POTENTIAL USE OF NS1 AG STRIPS TO DETECT DENV INFECTION IN FIELD COLLECTED FEMALE AEDES AEGYPTI MOSQUITOES FROM DENGUE HIGH RISK AREAS IN COLOMBO DISTRICT ................................................................. 178
STUDY ON THE OCCURRENCE OF ANTIBIOTIC CONTAMINATIONS IN THE AQUATIC ENVIRONMENT, SRI LANKA ...................................................................................................................................................... 179
ASESSMENT OF NI, CD AND CU IN SOIL, IRRIGATION WATER AND GREEN LEAFY VEGETABLES CULTIVATED IN AND AROUND COLOMBO DISTRICT, SRI LANKA ................................................................. 180

ASESSMENT ON WATER PURIFICATION CAPABILITIES OF ACTIVATED CHARCOAL PREPARED FROM PALMYRAH (BORASSUS FLABELLIFER) KERNEL SHELL BY DIFFERENT CARBONIZATION AND CHEMICAL ACTIVATION PROCESSES ............................................................................................................. 181

SEASONAL DISPERSAL PATTERNS OF ADENOMUS KELAARTII (AMPHIBIA: BUFONIDAE) IN AND AROUND THOTAHAYA OYA, YAGIRALA FOREST RESERVE, SRI LANKA ................................................................. 182

ECO-FRIENDLY ALTERNATIVES FOR STORAGE PEST MANAGEMENT: LEAVES OF RUTA GRAVEOLENS (ARUDA) AS A REPELLENT AGAINST THE RICE WEEVIL, SITOPHILUS ORYZAE L. (COLEOPTERA: CURCULIONIDAE) ................. 183

MICROBIAL DIVERSITY IN NITROGEN FIXING NODULES OF CASUARINA EQUISETIFOLIA AND ITS IMPACT ON PLANT GROWTH AND SOIL QUALITY .......................................................................................................................... 184

ISOLATION OF ANTIBIOTIC PRODUCING BACTERIA FROM SOIL AND STUDYING THE IMPACT OF CARBON SOURCE ON ANTIBIOTIC YIELD .......................................................................................................................... 185

CHARACTERIZATION OF EFFICIENT ROCK PHOSPHATE SOLUBILIZING BACTERIA FOR USE AS BIOINOCULANTS FOR RICE .................................................................................................................. 187

SIGNIFICANCE OF LACCASE BY RIGIDOPORUS MICROPORUS, THE CAUSE OF WHITE ROOT DISEASE OF RUBBER ................................................................. 188

CHARACTERIZATION OF RALSTONIA SOLANACEARUM WHICH CAUSES BACTERIAL WILT OF POTATO .................................................................................................................. 189

CLEANER PRODUCTION ASSESSMENT: IMPROVING RESOURCE EFFICIENCY IN REBUILD AND DAG TIRE INDUSTRY, .......................................................................................................................... 190

SCREENING OF SELECTED DRINKING WATER BODIES IN SRI LANKA FOR THE DETECTION OF THEIR POTENTIAL FOR PRODUCTION OF CYANOTOXIN, MICROCYSTIN USING PCR .................................................................................................................. 191

EVIDENCE OF RESTRICTED MATERNAL GENE FLOW OF PURANA (OLD) POPULATION IN THE SUBURBS OF SIGIRIYA, SRI LANKA .................................................................................................................. 192

EXPOSURE OF MALE WISTAR RATS TO COMMERCIALLY AVAILABLE ETHREL: SHORT TERM, LONG TERM EFFECTS AND RECOVERY .................................................................................................................. 193

THE VARIATION OF FRUIT COMPONENTS IN CONSERVED COCONUT GERmplasm AT POTTUKULAMA FIELD GENEANK IN SRI LANKA .................................................................................................................. 194

SCREENING OF HEVEA CLONES AGAINST CORYNESPORA LEAF FALL DISEASE: THE MOST DESTRUCTIVE FOLIAR DISEASE OF RUBBER .................................................................................................................. 195

COMPILATION OF AN INFORMATIVE SSR MARKER SET FOR MOLECULAR CHARACTERIZATION OF FINGER MILLET (ELEUSINE CORACANA L.) GERmplasm ACCESSIONS OF SRI LANKA .................................................................................................................. 196

ETHYL METHYL SULFONATE (EMS) INDUCED HERBICIDE RESISTANCE IN SRI LANKAN RICE (ORYZA SATIVA) VARIETIES .................................................................................................................. 197

QUANTIFICATION AND CHEMICAL ANALYSIS OF WASTE GENERATED DURING THE PROCESSING OF CASSAVA CROCKET .................................................................................................................. 198

IMPACT OF GEOGRAPHICAL LOCALIZATION ON SEED MORPHOLOGY, OIL CONTENT AND FATTY ACID COMPOSITION OF MADHUCA LONGIFOLIA GROWN IN SRI LANKA .................................................................................................................. 199

ARTIFICIAL ASEXUAL PROPAGATION OF SEA ANEMONE (ENTACMAEA QUADRICOLOR) USING ARTIFICIAL PROPAGATION METHOD .................................................................................................................. 200
INDUCED BREEDING OF STRIPED CAT FISH (PANGASIANODON HYPOPHTHALMUS) USING OVAPRIM AT NATIAL ZOOLOGICAL GARDENS SRI LANKA .................................................................................................................. 201
CAPTIVE BREEDING OF DAWKINSIA SRILANKENSIS (DANKDU PETHIYA) ............................................................................................................................ 202
SCREENING OF ANTIFUNGAL ACTIVITY OF SELECTED SPICES AGAINST CANDIDA SPECIES .................................................................................... 203
NATURAL GRAIN PROTECTANTS: GROWTH REGULATORY EFFECTS OF NEEM (AZADIRACHTA INDICA) SEED OIL ON THE RICE MOTH, CORCYRA CEPHALONICA (STAINTON) ................................................................. 204
PROXIMATE COMPOSITION AND ANTIOXIDANT ACTIVITY OF FOUR PENAEID PRAWN SPECIES ........................................................................... 205
DETERMINATION OF NUTRITIONAL FACTS OF PALMYRAH (BORASSUS FLABELLIFER) SAP BASED PRODUCTS EXISTING IN THE MARKET OF JAFFNA PENINSULA .................................................................................................................. 206
EFFECT OF STORAGE ON NUTRITIONAL AND SENSORY QUALITIES OF YOGHURT MADE FROM COW MILK ........ 207
EFFECT OF INCORPORATION OF FUNGICIDES INTO TISSUE CULTURE MEDIUM ON FUNGAL CONTAMINANTS OF IN VITRO GROWN KAEMPFERIA GALANGA ...................................................................................................................... 208
ALPHA AMYLASE AND ALPHA GLUCOSIDASE INHIBITORY ACTIVITY OF SELECTED PLANT EXTRACTS .................................................................... 209
A PRELIMINARY STUDY TO ANALYZE Aedes aegypti DIVERSITY IN SRI LANKA USING MITOCHONDRIAL DNA VARIATIONS ............................................................................................................................................... 210
ROLE OF STENOTROPHOMONAS MALTOPHILIA IN THE DEGRADATION OF ANTIBIOTICS AND HYDROCARBONS .............................. 211
CULTIVATION OF MICROALGAE; CHAETOCEROS CALCITRANS FOR BIODIESEL PRODUCTION AS AFFECTED BY DIFFERENT NITRATE CONCENTRATIONS AND SALINITY LEVELS ........................................................................................................... 212
ASSESSMENT OF SEASONAL VARIATION IN GROUNDWATER QUALITY OF KELANI RIVER BASIN BY MULTIVARIATE ANALYSIS ........................................................................................................................................... 213
THE PRESENT STATUS OF DIVERSITY OF POTENTIAL MEDICINAL PLANTS OF VELLAIBMALAI FOREST IN MULLAITIVU DISTRICT .................................................................................................................... 214
DEVELOPMENT OF READY TO EAT CASHEW APPLE SNACK WITH IMPROVED CONSUMER ACCEPTABILITY AND LONG SHELF LIFE ........................................................................................................................................ 215
PRODUCTION OF EXTRACELLULAR AMYLASE BY ASPERGILLUS NIGER UNDER LIQUID SUBMERGED FERMENTATION USING JACK FRUIT RAG AS THE CARBON SOURCE ...................................................................................... 216
EXPOSURE ANALYSIS OF DRINKING AND DIETARY CONTAMINANTS IN A SELECTED POPULATION, PADAVIYA, ANURADHAPURA .................................................................................................................... 217
DETERMINATION OF IRON CONTENT IN SELECTED EDIBLE VEGETABLES BY USING SIMPLE COLORIMETRIC METHOD IN TWO LOCATIONS OF BATTICALOA DISTRICT ........................................................................................................ 218
GROWTH CYCLE CHARACTERISTICS OF SELECTED WILD PLANTS TO ENHANCE BIODIVERSITY ................................................................... 219
NUTRITIONAL AND SENSORY QUALITIES OF SWEET ORANGE BLEND STAR FRUIT CORDIAL ................................................................................ 220
COMPARISON OF FLUORIDE AND HARDNESS LEVELS IN GROUNDWATER RESOURCES OF CKDU PREVALENT MEDAWACHCHIYA AREA & CKDU NON PREVALENT HURULUWEWA AREA .................................................................................. 221
A STUDY ON FACTORS AFFECTING THE GROWTH PERFORMANCE OF CALVES IN THREE VETERINARY RANGES IN GALLE DISTRICT, SRI LANKA ........................................................................................................... 222
DEMOGRAPHIC STABILITY OF ANOPHELES CULICIFACES SIBLING SPECIES E (DIPTERA: CULICIDAE) IN SRI LANKA ........................................................................................................................................ 223
CRYOPRESERVATION OF COCONUT (Cocos nucifera L.) EMBRYOGENIC CALLUS FROM UNFERTILIZED OVARIES BY ENCAPSULATION-DEHYDRATION; A PRELIMINARY STUDY ................................................................. 224

COMPENSATORY BASE CHANGES DIFFERENTIATE THE ANOPHELES SUBPICTUS (DIPTERA: CULICIDAE) SPECIES COMPLEX IN SRI LANKA ........................................................................................................... 225

DEVELOPMENT OF A HPLC METHOD WITH UV DETECTION TO DETERMINE VITAMIN A PALMITATE CONTENT IN MULTIVITAMIN SYRUPS THROUGH THE DIRECT EXTRACTION OF THE ANALYTE .............................................................. 226

PRELIMINARY INVESTIGATIONS ON THE CHANGES OF SOME PHYSIOLOGICAL PARAMETERS OF FIELD GROWN RUBBER PLANTS FOR THE DRY PERIOD IN THE DRY ZONE OF SRI LANKA ....................................................................................................................... 227

SOCIAL SCIENCES

AN ANALYTICAL STUDY ABOUT THE ILLEGAL MIGRATIONS IN POST WAR SRI LANKA (WITH SPECIAL REFERENCE TO AUSTRALIA) .......................................................................................................................................................... 229

THE COMMON LAW APPROACH TOWARDS THE DISSOLUTION OF MARRIAGES; THE SRI LANKAN PERSPECTIVE ... 230

DISCRIMINATORY PROPERTY INHERITANCE AND ILLEGITIMATE HARM FOR NON-MARITAL CHILDREN IN SRI LANKA: A CRITICAL ANALYSIS OF SRI LANKAN LAWS IN THE LIGHT OF CONVENTION ON THE RIGHTS OF THE CHILD ..................................................................................................................................... 231

FACTORS LEADING URBAN YOUTH TO JOIN GANG IN COLOMBO CITY OF SRI LANKA .......................................................... 232

ON POVERTY AND ENVIRONMENTAL DEGRADATION: BASED ON RAMMALE KANDA RESERVE IN A PASSGODA DS AREA ..................................................................................................................................... 233

COMMUNITY EMPOWERMENT AS A HOSTAGE OF THE CONFLICT BETWEEN DEVELOPMENT GOALS AND POLITICAL GOALS ....................................................................................................................... 234

DOES EXPORT GROWTH EXPLAIN LONG-RUN GDP GROWTH IN INDIA AND SRI LANKA?: EVIDENCE FROM THIRLWALL’S LAW ........................................................................................................................................... 235

FUTURE NATIONAL SECURITY CONCERNS OF SRI LANKA: WITH REFERENCE TO TERRORISM ............................................. 236

IDENTIFYING THE INFLUENTIAL FACTORS FOR ECONOMICALLY EMPOWERMENT OF DISABLED PERSONS: A CASE STUDY FROM ALAIYADIVEMBU D.S, AKKARAIPATTU ...................................................................................... 237

THE INFLUENCE OF SOCIAL CAPITAL IN RURAL DEVELOPMENT IN SRI LANKA .................................................................................. 238

THE ROLE OF INTELLECTUAL PROPERTY RIGHTS IN FACILITATING THE ‘KNOWLEDGE ECONOMY’ OF A DEVELOPING COUNTRY .............................................................................................................................. 239

EXPORT LED GROWTH HYPOTHESIS AND ITS VALIDITY FOR SRI LANKA ......................................................................................... 240

ECONOMIC LIBERALIZATION AND ITS IMPACTS ON THE MANUFACTURING SUB SECTOR IN SRI LANKA ...................................................................................................................................................... 241

STRUCTURAL CHANGES IN ECONOMIC DEVELOPMENT IN SRI LANKA AFTER 1977 .................................................................................. 242

STATE SOVEREIGNTY AND UNNECESSARY INTERNATIONAL INTERFERENCE ......................................................................................... 243

COUNTENANCE OF CURRENT AUTOCRACY IN THE ESTATE LABOUR AND STATE LABOUR POLITICS .............................................. 244

INFLUENCING FACTORS OF SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS ON URBAN FEMALE MIGRANTS SRI LANKA ................................................................................................. 245

AN ANALYSIS OF ENVIRONMENTAL FACTORS THAT INFLUENCED HOMO SAPIENS IN ESTABLISHING HUMAN SETTLEMENTS AT BATADOMBALENA ......................................................................................................................................... 246
CHARACTERISTICS OF MULTICULTURAL NATURE THROUGH THE MULTIDISCIPLINARY RESEARCH OF THE JETAVANARAMA ARCHAEOLOGICAL SITE IN ANURADHAPURA, SRI LANKA ................................................................. 247
MONEY USAGE IN THE ANCIENT PERIOD OF ANURADHAPURA ................................................................. 248
LAND-USE FACTOR ON FLOOD OCCURRENCE IN ILORIN, NIGERIA ................................................................. 249
MOTORCYCLE AS ALTERNATIVE MEANS OF PUBLIC TRANSPORT: A LESSON FROM A NIGERIAN CITY ......... 250
A GIS MODEL FOR Site Selection OF INDUSTRIAL ZONES IN SRI LANKA ................................................................. 251
CAUSALITY RELATIONSHIP BETWEEN TOURIST ARRIVALS AND EXPORT: ENPERICAL EVIDENCE FROM SRI LANKA .... 252
AN ETHNOGRAPHICAL STUDY ON RIVER GEM MINING IN RATHNAPURA DISTRICT SRI LANKA .................. 253
A STUDY ON THE BUDDHIST STRATEGIES ADOPTED FOR COPING WITH STRESS .......................................... 254
BUDDHIST STANDPOINTS ON NATURAL DISASTERS ....................................................................................... 255
IMPACT OF ALCOHOL CONSUMPTION AMONG YOUTH TOWARDS THEIR SATISFACTION: A PROBLEM OF PERSONALITY DEVELOPMENT OR A SOLUTION FOR STRESS RELEASER ................................................................. 256
INFLUENCE OF HAPPINESS TO QUALITY OF LIFE .......................................................................................... 257
A STUDY ON THE SOCIAL IMPACT OF ILLEGAL ABORTION: SPECIAL REFERENCE TO POLONNARUWA DISTRICT ...... 258
IMPACT OF MIXED MARRIAGE ON SOCIETY .................................................................................................. 259
REDEFINING DIVERSITY OF GENDER AND SEXUALITY AS HUMAN NATURE .................................................. 260
AN ANALYSIS ON FLOOD MAPPING AND MITIGATION FOR AKKARAIPATTU MUNICIPAL COUNCIL AREA ........ 261
SOCIAL IMPACT, ATTITUDES AND BEHAVIOURAL PATTERN OF BUSY LIFE STYLES DUE TO MICRO-SLEEPINESS SRI LANKA .................................................................................................................. 262
EFFECT OF WOMEN’S MIGRATION ON FAMILY INVESTMENT BEHAVIOR .......................................................... 263
A STUDY OF HOUSEHOLD BORROWING BEHAVIORS IN SRI LANKA .............................................................. 264

xvi | P a g e
MULTIDISCIPLINARY APPROACHES

J.B. Disanayaka

Professor Emeritus, University of Colombo

The aim of these annual conferences is to find out how we could improve the quality of what we are doing. As members of the University community, what are we expected to do? We are expected to add to the world of knowledge by creating new knowledge. However, we are not the only ones who create. All beings, whether man or beast, have the power to create, to create new beings, and we call it procreation. Human beings have two other kinds of creation: to create works of art and create new knowledge.

Artists create works of art, by blending things that are already there into new combinations: musicians blend sounds into new compositions, dancers blend gestures into new movements, painters blend colours into new pictures, and fiction writers including poets place the best words in the best order to create works of literary art. The test of a good work of art is its originality in creating pleasure in the minds of the connoisseur.

University researchers create new knowledge and expand its horizons. To create new knowledge, we follow a set of methods that is generally known as the ‘scientific method’, a methodology accepted not only by those in the exact sciences but even by those in the social sciences and the humanities. We collect data, as much as possible; we sort the data to find out what is more relevant; we make hypotheses to accommodate all relevant data; we modify the hypotheses, wherever necessary, and finally arrive at a conclusion that adds new information to the already existing body of knowledge.

In spite of the differences in our fields of study, we need to share information for the benefit of the entire university community. Let me give a few examples from my own area of study, linguistics. Today many speak of ‘paradigms’, old ones and new ones. The original concept comes from grammar where it refers a word showing all its grammatical forms. Linguists today speak of ‘morphology’ – the study of the meaningful units of a language, and the way in which they are put together to form words – and this is a term we have borrowed from Biology, where it refers to forms and structures of living organisms. Multidisciplinary approaches to knowledge have always borne better results.
THE ROAD TO TRANSDISCIPLINARITY

Fritz Schiemer

Department of Limnology and Bio-Oceanography, Faculty of Life Sciences
University Vienna, Austria

Transdisciplinary science is a rapidly developing field, necessary to explore ways for sustainable management. It involves social, economic and environmental aspects in view of manifold and controversial stakeholder interests. There are constraints in crossing interdisciplinary boundaries. By tradition scientists are usually confined to specialized niches of knowledge and not easily prepared to embark in interdisciplinary endeavours. Interdisciplinarity even among natural sciences require new research approaches and new ways of thinking. The challenges become even more formidable when bridging natural and social sciences e.g. connecting abiotic framework conditions with environmental processes and social and socio-economic aspects.

Transdisciplinary research - orientated to define ways to communicate with practitioners and introduce research findings into political decisions - requires new and diverse formats of education, training and networking.

I will use two examples of personal engagement in water issues over the last 30 years to outline the challenges in getting involved in applied research and science-policy interactions.

The first example refers to the management of the riverine landscape of the Danube in Austria. Large rivers with their extensive wetlands and floodplains are offering a wide variety of ecological services e.g. flood retention, drinking water supply, fisheries and conservation. Other human uses are hydropower production and navigation. They represent partially controversial stakeholder interests of different political power. Human impacts over the past 150 years by river regulation, damming and pollution have reduced some of the service capacities and call for rehabilitation measures.

In 1983/84 I became engaged in a major public discussion over a projected hydropower dam at Hainburg, downstream of Vienna. The project was stopped because of the warnings by scientists and public interventions. As a result of our critical position we were invited by the government to take part in a commission of practitioners, planners and scientists to develop long-term management and restoration concepts. The panel was requested to find science–based compromises for controversial stakeholder interests. This engagement forced scientists of various disciplines - ecologists, hydrologists and geo-morphologists - to develop a common understanding of the vulnerability of river-floodplain systems to human interventions. Over the past thirty years, scientists played a significant role in this discussion process in defining environmental targets and developing benchmarking and assessment criteria for management options. The involvement was also a school of learning on interaction with stakeholders and decision makers.

The second set of experiences results from a long-term engagement on resource-management in SE-Asian reservoirs and lakes. Following an early ecosystem orientated study on the Parakrama Samudra reservoir in Sri Lanka (1979-1982) a multidisciplinary EU-programme was launched under the long-winded title “Strategies for partitioning the productivity of Asian reservoirs and lakes between capture fisheries and aquaculture for social benefit and local market without negative environmental impacts“.

The international project carried out by a consortium Asian and European scientists provided a large amount of factual information (Schiemer et al. 2008) and a wealth of experience on challenges to formulate a system-orientated
approach comprising environmental and socio-economic aspects and transferring the scientific knowledge into real-world politics.

In combining these experiences the paper will address

- the stimulation of science by sustainable management issues,
- approaches to achieve protocols for interdisciplinarity by defining joint research hypothesis,
- the challenge of formulating holistic ecological-sociological approaches,
- the scope of transdisciplinary science and the necessity of long-term involvement in adaptive management programmes,
- the challenge to get involved in decision processes in order to harmonize stakeholder interest and define sustainable solutions,
- the necessity to strengthen institutional and legal frameworks which guarantee holistic planning and transparent decision processes.
We are now in a phase of human history characterised by having unprecedented level of connectivity to exchange information digitally. This has enabled us to rethink and modify various business as well as livelihood processes.

To better understand how this connectivity can be effectively used to enhance livelihood activities we embarked on a project to develop a mobile based information system for Sri Lankan farmers. This system has now evolved into a Digital Knowledge Ecosystem mimicking energy flow patterns in biological ecosystems replaced by information flow patterns. We are now starting to see emergence of digital ecology patterns as well similar to what can be observed in biological ecosystems.

The insights gained from the Sri Lankan farmer project is now being applied to develop large complex Digital Knowledge Ecosystems for agriculture in India and health and wellbeing management systems in some of the EU countries and Australia. Further this model has been used in a project to stimulate innovation and competitiveness among Small Business and to reorganise a large engineering knowledgebase in Australia.

The ability to develop sustainable information flow models for divers domains define a new direction where due to enhance flow of information and knowledge people can be empowered to achieve better social, economic and health outcomes creating a new knowledge economy.
බියර් ව්‍යාපාරේ මුද්‍රා වල න්‍යාර්ථසාහය

ඉංග්‍රීසියේ මෙරට පිළිතුරුයන්, එක්සත්

බියර් ව්‍යාපාරේ මුද්‍රා වල ta weiqśka w;aú|sk ,o fidnd oyfí iqkaor;ajh" wo jk úg mj;akd udc mūirh
yd ii|d n,ňka ta fjki y-kajd foňka"

—lkafoa ,kafoa .Ő=,e,af,a fmaekd f;la udfk” - hkqfjka” uf.a u mo rpkahka yd ix.S;fhkaa
ks%udKha jQ .S;h o"

merKs .fi .e,a lrejka .ňka .ug fjf<|dfuys hk w;r w~yer mdňka” .uka iSmo .hňka Tjqkaf.a
.uka u. osf.a ýgq fidnd oyfí filkao3hd;aul mūirh úia;r Irňka .sh wkaou"

—ii| ili| osh m,af,a ;sfnhs w,“’” hkqfjka mgka f.k .ehQ lí mka;sh weiqśka .S;hla ks%udKh
fldg foaYSh yd cd:Hka;r jYfhka ckms%sh;ajh oskd .ekSug iu;ajQ” .S; rpkfhyse wka;¾.; jk
oyi lreKq úia;r Irňka“tu .S;ho"

foudmšhíf.ka fjkàu Ŷre rg f.dia tys /|S isák" ;u tlu mq=" fuod wjqreoaogj; a f.or tafoda hk
is;=ú,af,ka :efjk" .fì tla;rd udmsh fofokl=f.a is;a ika;dmh oelajk ufkda úoHzd;aul miqiu
fy<sorjq flfrňka” Tyqf.a mshd fj,a kshf¾ b|f.k .hk"

—filal= f.or ux.,sld oS. .sfh;a KE ;ju; - ux ys;kafk WU tklx n,d bkakjd"

hkqfjka t jka foudmshkaf.a wfmalaIdj lshdmdk .S;ho we;=¿" foaYkfhska yd ck .S weiqśka
ks%udKh jQ .S; .dhkfhka iukaú; jefvígyk"

—iajNdj O¾ufha f;aci yd úoHdfő w,xdlrh” kňka 2015$09$11 osk Y%S chj¾Okmqr
úYajúoHd,haoS meje;afjk cd;Hka;r iuqëföoS bosßm;a flf¾'
Reflecting back one should be able to visualize the impetus given to global development by science. One can also indicate that some of the developments almost led to the demise of the world demonstrating the double edge nature of science. Fortunately due to the string perseverance of scientists the world was able to arrest such disruptive pathways propagating further. However still we are aware of directions taken by the global community which technically places us in danger. Our actions irrespective of climate change are an example where we display behavior at times quite creatively in spite of strong evidence. How can one organize communities to shift direction through consensus is a question of our times.

With the passage of time some sections of us have come to understand and value pathways that try to understand and mimic nature rather than looking at continuous conquest of nature as an ultimate objective.

The presentation will reflect on these developments, the pioneering efforts of scientists such as Lovelace, Rowland, Mowlina and the evolving field of biomimetics etc. With the abilities to explore the extremes with confidence people have started turning such abilities to interesting developments which are beginning have marked impact on economy. Today the beauty of nature and the glory of science are coming together rather than one working against each other. Thus in Sri Lanka seeking development at a later stage we have a different direction to take. Korean strategy for the advancement of science for a creative economy had been through the strategy of science + creativity = answer + advancement. In Sri Lanka at present the understanding of advancement link to science is almost absence. This is a lesson that we have to take on board learning from many a successful example elsewhere. It is equally important to keep the value system in check as unleashing creativity towards a better world is only supported by the value system.
HEALING POWER OF MUSIC: MUSIC THERAPY

Samitha Siritunga

Non-Communicable Disease Unit
Ministry of Health, Sri Lanka

Since last few decades, it has been observed that there is an increase in morbidity as well as mortality due to non-communicable diseases (NCD) such as heart diseases, diabetes, stroke, hypertension, malignancies and also mental illnesses in the world as well as in Sri Lanka. In Sri Lanka, the number one killer in hospitalized patients is heart disease. It has been predicted that the morbidities and mortalities due to NCDs will increase gradually in next few decades. It is well evident that NCDs will affect not only the physical health of the individual, but will also adversely affect the mental, spiritual, social wellbeing of the patient. Moreover, it will associate with a number of socio-economic and other problems too.

Mental stress and poor mental well-being is considered as one of the major risk factor for development of NCDs. Therefore, if it could be addressed and managed effectively through mental relaxation, enormous results can be obtained. Hence, mental relaxation helps to reduce the morbidity and mortality due to NCDs by controlling the disease, and sometimes by curing the specific illnesses. As a result of all these, it would help to increase the individual’s quality of life, physical, mental, spiritual and social well-being and hence the quality of life of the patient as well as the society. Among many relaxation techniques relaxing music has also been considered.

Music therapy deals with controlled use of music and used as a complementary therapy that is used along with other treatments to help patients cope mentally and physically with their condition. It is also helps to change the behaviour and the emotions of an individual.

For centuries, Music both Hindustani classical music and Western classical music have been used in the management of different types of diseases affecting each system in the human body and this alarming effect of music has been thought to be due to complex neurophysiological phenomenon. Not only the Music but also different noises that are naturally found in the nature are being used and recommended by scientists in the management of diseases.
GLORY OF NATURE AND BEAUTY OF SCIENCE: AN ECONOMISTS’ PERSPECTIVE

P. Nandalal Weerasinghe
Former Deputy Governor, Central Bank of Sri Lanka

According to Merriam-Webster’s definition, science is a study of the natural world based on facts learned through experiments and observations. It is debatable whether economics is also a science. When we consider nature and science together we derive ‘natural science’ which is defined as a branch of science concerned with the description, prediction, and understanding of natural phenomena, based on observational and empirical evidence. Though, empirical studies are very much in the core of economics, the conclusions derive is strictly time-bound compared to natural sciences. Theoretically, economics form a major part of social science which is defined as a science that is concerned with society and the relationships among individuals within a society. Economists are involved in predicting future behavior like many natural scientists but the basis under which these phenomenon are made is perhaps the most variable factor among all, the ‘human behavior’ quite in contrast to the basis used in natural sciences. Whether economics is a science or not, what is absolutely important is to know the impact of science on economic growth.

Natural science would thrive only in an environment of economic progress. Ancient innovations had been made in developed civilizations or on an instance where some important directional changes have been made for economic progress such as the industrial revolution. As such, science and innovations play an integral role in economic progress. No economy would thrive and sustain the growth unless science and innovation is in place. One of the important phenomenon of growth is improvement in productivity which can be achieved through innovative science and technological advancements. Scientific progress would endure and innovations could survive only if the product is economically feasible. There are many innovations innovated almost every day though only few become commercial success. Therefore, economic and financial feasibility is absolutely essential for any scientific endeavor. This paper makes an attempt to examine efficient usage of scientific research and innovation for enhancement of economic well-being.
CREATION OF THE 21ST CENTURY SRI LANKAN SITAR

Sangeethpathi Pradeep Rathnayake
Department of Languages & Cultural Studies
University of Sri Jayewardenepura

This paper will look at the origin and evolution of the sitar from the 13th Century and discuss the changes in playing styles – gharanas – that has been happening throughout the ages. It will be accompanied by demonstrations on the sitar and video clips.

Special focus will be given to the two main gharanas – Maihar Gharana and Imdad Khani Gharana. The adaptation of the sitar to the modern age, where, with globalization, the traditions associated with learning went into decline and even music traditions came together. The work of Ravi Shankar will be discussed here, where I will show how he took the instrument and its music system to the West through collaborations with pop groups such as The Beatles and Western classical musicians like Yehudi Menuhin. I will show, however, that even while Shankar mixed traditions, he kept the ragadhari system firmly as his base.

The paper will then draw attention to what has happened to the sitar style after Ravi Shankar. There were composers after him, who fused with the Western music system more completely than Ravi Shanker did. Two examples here are Lalanath de Silva’s Sitar Concerto composed in 1998 and my own Kuveni Concerto for the sitar and the cello, composed in 2010. In both, I played the sitar as soloist.

While de Silva used the raga system as his base for melodies while having a structure that was symphonic, in my Kuveni Concerto I left the Hindustani system altogether and used a Sri Lankan, Sinhala folk or dance melody – the Kuveni asna - as the base for my work. Therefore, that is an instance where the sitar has been adapted to a western mode without any connection with Indian ragadhari music.

This is a part of my effort in creating a Sri Lankan identity for the sitar. How are identities made? My contention is that most identities can be formed by having a special technique of playing that gives an instrument a special flavour.

The way I have taken the sitar beyond the limit set by Ravi Shankar is by changing the technique in the way the sitar is played. Technique is very important in giving a particular identity to an instrument. For example, the violin, which originated in the West as an instrument, now has an Indian identity by the Indians giving them different playing styles. The way of holding the violin and its playing is vastly different between the Western and Eastern styles. Likewise, I have used the concept of harmony, chords, musical embellishments and plucking styles to give the sitar a more Sri Lankan identity. In addition, the traditional accompaniment of tabla has been replaced by Sri Lankan percussion instruments. Sri Lankan folk melodies – and not the Indian ragadhari system, has been used for my compositions. In keeping with the Sri Lankan folk music notes, I have used the perfect fourth and the fifth interval to play double notes on sitar strings, giving the sound a particularly Sri Lankan feel.

I have also given a more global identity to this instrument by taking elements from world music traditions like the blues and jazz. By using them, I am trying to give popularity to the sitar both in my country, the East and the West.
HEALTH SCIENCES
A BIOWAIVER STUDY TO DETERMINE THE QUALITY AND THE IN VITRO EQUIVALENCE OF THE MOST WIDELY AVAILABLE METRONIDAZOLE PRODUCT IN COLOMBO, SRI LANKA

S.W.A.J. Fernando1,2, Dhanushathambawita1, Priyadasrshani Galappatthy1, Kusium De Abrew and Raveendra Jayakody1

1Department of Pharmacology and Pharmacy, Faculty of Medicine, University of Colombo,  
2 Department of Chemistry, Faculty of Science, University of Colombo  

Bioequivalence studies conducted in healthy volunteers are the usually accepted method to determine the therapeutic equivalence of two drug products. As these in vivo bioequivalence studies are time consuming and expensive to conduct, major regulatory authorities now accept biowaiver studies, using in vitro dissolution testing, for selected drugs belonging to Biopharmaceuticals Classification System (BCS) class 1 and III drugs as they correlate with in vivo equivalence results. We conducted a biowaiver study for a product of metronidazole, a BCS I antibiotic. A market survey was performed in 20 private pharmacies in Colombo and the National Hospital Sri Lanka (NHSL), to identify the most commonly used metronidazole products and to select products for the in vitro study. Quality testing was done according to the British Pharmacopeia 2012 and United State Pharmacopeia 2011 to determine pharmaceutical equivalence. In vitro equivalence was determined using the biowaiver testing procedure recommended by the World Health Organization. Dissolution profiles were generated at pH 1.2, 4.5 and 6.8 using validated spectrophotometric method at 278 nm. According to the market survey, only ten products were available, although there were 32 registered oral dosage forms. Metrogyl was used in NHSL and was also the most widely available metronidazole brand in the private sector. Therefore “metrogyl” was used as the test product. The innovator product and reference listed drug in the Orange Book of United States, “flagyl” was used as the reference product, which was also the second most commonly available metronidazole brand in the market. The two metronidazole products, complied with all the pharmacopoeial quality requirements making them pharmaceutically equivalent. Both products showed more than 85% dissolution in less than fifteen minutes making similarity factor (f2) calculation unnecessary as they can be categorized as very rapidly dissolving drugs. We conclude that ‘metrogyl’ was bioequivalent to the reference product using in vitro methodology and the two products could be interchangeable during clinical use, provided that metrogyl complies with the excipient requirements given in the metronidazole biowaiver monograph published by International Pharmaceutical Federation (FIP). This study shows that in vivo bioequivalence requirement can be waived using the in vitro method for selected pharmaceuticals for which biowaiver monographs are available by FIP.

Keywords: Metronidazole, Biowaivers, Dissolution profiles, BCS.
ASSESSMENT OF QUALITY OF LIFE OF PATIENTS WITH DIABETIC ULCERS BY CARDIFF WOUND IMPACT SCHEDULE (CWIS)

A Sriyani Kumarasinghe 1, Nalika Gunawardena2, Sudharshani Wasalathanthri3, Priyadarshika Hettiarachchi4

1Department of Health Sciences, The Open University of Sri Lanka, Sri Lanka
2Department of Community Medicine, University of Colombo, Sri Lanka
3Department of Physiology, University of Colombo, Sri Lanka
4Department of Physiology, University of Sri Jayewardenepura, Sri Lanka

Diabetic ulcers have a negative impact on quality of life (QoL). The purpose of the study was to assess QoL of patients with diabetic ulcers. This was a cross-sectional study of diabetic leg and foot ulcer patients (n=301) admitted to the National Hospital of Sri Lanka. QoL was assessed using condition specific Cardiff Wound Impact Schedule (CWIS) validated for Sri Lanka. CWIS comprises of three subscales; social life (SL), well-being (WB) and physical symptoms and daily living (PSDL). Scores are calculated for each domain (0-100) and scores of subscales are summed up as total QoL. High score in CWIS denotes high QoL.

Mean age of patients was 59.26 (SD±9.4) years. 56% (n=169) of patients were females. Mean scores of total QoL (162.22/300), and all sub scales, SL (58.45/100), WB (43.29/100), and PSDL (60.0/100) of the study population were low. QoL (mean) of women was lower than men in total QoL (157.04 vs. 168.85, p=0.028) and subscale of WB (40.99 vs. 46.23, p=0.011). Total QoL among three groups; retired, presently employed and unemployed were significantly different (p=0.008) with lowest scores among those unemployed. Scores of total QoL (p=0.004), subscales of SL (p=0.004) and WB (p=0.013) were significantly lower in those depending on others than those living on their own. QoL was low in those with ulcer experience of <6 weeks duration, in total QoL (p=0.019), subscales of PSDL (p=0.043), and WB (p=0.005). No significant differences were observed with patients’ age, educational level and the site of ulcer.

QoL measured using CWIS is low in patients with diabetic leg and foot ulcers. Better QoL was found in men than women. QoL is lowest in the unemployed group. Patients living on their own have better QoL than those who depend on others. QoL was not affected by the site of the ulcer. Initial stages of ulcer experience were associated with lower QoL than having an ulcer for a long duration.

This study showed that female gender, unemployment, dependence to others and the initial stages of ulcer were associated with poor QoL. These factors should be considered when managing patients with diabetic ulcers.

Keywords: Quality of life, diabetic leg and foot ulcers, CWIS
THE ACCESS OF ESSENTIAL MEDICINES FOR NON COMMUNICABLE DISEASES IN PRIVATE SECTOR OF SRI LANKA

P.R.L. Dabare 1, C.A. Wanigatunge 2, B.V.S.H. Beneragama 3

1Department of Allied Health Sciences, Faculty of Medical Sciences, University of Sri Jayewardenepura.
2Department of Pharmacology, Faculty of Medical Sciences, University of Sri Jayewardenepura.
3Family Health Bureau, Ministry of Health and Indigenous Medicines, Sri Lanka

Non communicable diseases (NCDs) are major health challenges for low and middle income countries. There were 38 million deaths (68%) from world population due to NCDs. Access to medicines is a universal human right where availability and affordability of medicines are preconditions. Both public and private sectors contribute to the healthcare of the people of Sri Lanka. The objective of the present study was to determine the availability and affordability of essential medicines (EM) prescribed to treat selected common NCDs in private health sector of Sri Lanka.

Methodology was based on 2nd edition of WHO/HAI manual. Data were collected from a representative sample involving all 9 provinces and consisted of Rajya Osusalas, private pharmacies and private hospital pharmacies. Availability and prices of EMs commonly prescribed for hypertension, acute coronary syndrome, asthma and diabetes were collected. Percentage availability, median price of originator brand (OB) and lowest priced generic (LPG), median price ratio (MPR) to the International Reference Price (IRP) and median price ratio of OB to LPG were calculated. Affordability was determined using the daily income of the lowest -paid unskilled government worker and calculated according to basket method.

Availability of assessed EMs was >50% as lowest priced generics in private pharmacies. However availability of OB in private sector was less than 50%. Price of one unit dosage form of all the LPG medicines surveyed was less than ten rupees. Price of unit dosage form of 50% of OB medicines surveyed was >50 rupees. Price of seven originator brands was five times higher than International Reference Price. Price of all originator brands of medicines was always higher than that of lowest priced generic. Single and multiple medicines for hypertension and oral medicines for diabetes were affordable if LPGs are purchased. Inhalers for asthma were not affordable to the lowest paid government worker. Medicines from OB for treatment of hypertension, asthma and diabetes for a month were not affordable to the lowest paid government worker.

The EMs in lowest priced generics are available in Sri Lanka. The medicines for hypertension and diabetes are affordable to most if LPGs are purchased.

Keywords: Essential medicines, non communicable diseases, Sri Lanka, private sector, access
CONCERNS OF PHYSICIANS AND NUTRITIONISTS ON SELF-
MANAGEMENT OF DIABETES MELLITUS AMONG THE TAMILS
LIVING IN THE BATTICALOissor DISTRICT: A QUALITATIVE STUDY

G. Kisokanth 1, S. Prathapan 2, J. Indrakumar 3, J. Joseph 4

1, 4 Department of Supplementary Health Sciences, Faculty of Health-Care Sciences, Eastern University, Sri Lanka
2 Department of Community Medicine, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.
3 Department of Medicine, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka.

kiso.1983@yahoo.com

Plausible reasons for the steady increase in the prevalence of Diabetes Mellitus (DM) in Asian countries may include poor lifestyle, rapid urbanization, lack of knowledge and unsatisfactory attitude and practices towards disease among patients with DM. The purpose of this study was to explore the lived experiences of physicians and nutritionists treating Tamils with DM living in Batticaloa District Sri Lanka, with regards to their attitudes and to understand their culturally acceptable practices in self-management of DM. Two consultant physicians and two nutritionists who treat Tamil patients with DM were recruited voluntarily. Descriptive qualitative methodology was used to explore the lived experiences of physicians and nutritionists. The data were collected by in-depth interview by using audio recording and verbatim transcripts were analyzed on the basis of content analysis. The results show that Tamil patients with DM have poor diabetic self-management practices mainly due to ignorance of diet habits, ignoring dietary advice, changing of lifestyle, reduced physical activity, reduced relaxation, non-compliance, delay in seeking treatment and ignorance of self-care. The analysis also revealed that healthy eating, being physically active and risk reducing behaviors of patients would facilitate better self-management of DM among Tamils. The findings of current study indicate that self-management of DM among Tamils largely depends on their attitudinal changes. All the interviews of physicians and nutritionists revealed that controlling DM is not easy unless sincere commitment of time and effort is taken by patients. Ignorance, poor dietary habits and lifestyles have impacts on Tamil patients with DM. The finding would contribute to better self-management of the disease among Tamils if they adhere to the acceptable practices by modifying lifestyles and changing the attitudes and practices which will enable health care workers to assist diabetics for better self-management.

Keywords – Diabetes Mellitus, Self-management, Nutritionist, Physician, qualitative study
ASSOCIATION OF SERUM CORTISOL WITH SEVERITY OF CORONARY ARTERY DISEASE AMONG PATIENTS ADMITTED TO THE CARDIO-THORACIC UNIT OF SRI JAYEWARDENEPURA GENERAL HOSPITAL

E.M.S. Bandara¹, S.Ekanayake¹, A.D. Kapuruge², C.A. Wanigatunge³

¹Department of Biochemistry, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka.
²Cardio-thoracic Unit, Sri Jayewardenepura General Hospital, Nugegoda, Sri Lanka.
³Department of Pharmacology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

Cortisol is the most biologically active of the glucocorticoids and enables organs to respond to physical and emotional stress by maintaining homeostasis. Cortisol secretion shows a circadian rhythm with the highest secretion seen early morning. Hyperactivity of hypothalamic pituitary adrenal axis combined with tissue hypersensitivity to glucocorticoids may contribute to more severe atherosclerosis and CAD. The salivary cortisol is identified as being independently associated with atherosclerosis of carotid arteries. Since the prevalence of coronary artery disease is high among Sri Lankans, the study was conducted to assess the association of serum cortisol concentration with severity of coronary artery disease of patients who awaiting Coronary Artery Bypass Graft surgery. A cross sectional descriptive study was carried out at the Cardio-thoracic Unit of Sri Jayewardenepura General Hospital and University of Sri Jayewardenepura. Study sample consisted of 102 patients (67-male (57±10 years) and 35-females (58±7 years)). The morning serum cortisol was measured by enzyme immune assay method of mini Vidasimmune analyzer. Severity of coronary artery disease was evaluated by Gensini score using the coronary angiogram which assigns a severity score according to the degree of luminal narrowing and geographical importance of each coronary stenosis. Patients were divided into three groups depending on 1st (cortisol <81 ng/mL), 2nd (81-141 ng/mL) and 3rd (>141 ng/mL) quartile. The Pearson correlation and independent t test (p< 0.05) was used (SPSS 16.0 version). The serum cortisol ranged from 4–245 ng/mL. The Genisini score ranged from 4-128. A significant positive correlation was observed between cortisol and Gensini score (r=0.3, p=0.005). More severe coronary artery disease (Gensini score) was observed in patients those who had serum cortisol >141 ng/mL compared to patients who had cortisol concentrations < 41ng/mL. According to the correlation the severity of coronary artery disease (as evaluated by Gensini score) was higher when serum cortisol was high irrespective of gender.

Keywords: Coronary artery disease, cortisol, Gensini score
Antibiotics are widely used worldwide and their inappropriate prescription leads to emergence of multi-drug resistant organisms, increased morbidity and mortality. Rational use of antibiotics is the key to reducing the development of resistant organisms. Thus the objective of this study was to ascertain the use and appropriateness of antibiotics used in medical wards at a selected tertiary care institution using available national guidelines.

A descriptive cross sectional study was carried out on the patients prescribed antibiotics in three general medical units. A random sample of patient records (n=543) over a period of 4 months was analyzed. The regimes were assessed for concordance with the guidelines of Sri Lanka Medical Association (SLMA) and the Health Sector Development Programme (HSDP).

The commonest indications to prescribe antibiotics were lower respiratory tract infections (LRTI) (n=235, 43%), urinary tract infections (UTI) (n=60, 11%) and infective exacerbation of bronchial asthma (n=45, 8.3%). The commonest first antibiotic prescribed for LRTI was co-amoxiclav (n=98, 41.7%) which was given in combination in 18/98 (18.36%) of episodes, while ciprofloxacin was the first choice in 46.6% of UTIs. For LRTIs the prescribed antibiotics showed a greater concordance with HSDP guidelines (n=157, 66.8%) compared to SLMA guidelines (n=99, 42.1%). The concordance with SLMA guidelines for lower UTIs was only 11.8% (n=4) while that for pyelonephritis was 38.5% (n=10). Co-amoxiclav was the first antibiotic prescribed for infective exacerbation of bronchial asthma in 48.9% (n=22) for which there were no separate guideline in either the SLMA or HSDP. The antibiotic use in LRTI was incorrect due to inappropriate dose and route of the drug (n=20, 8.5%), wrong choice of the drug (n=13, 5.5%) and wrong combination of drugs (n=13, 5.5%) according to the HSDP guidelines. No statistically significant difference was found between individual unit practices.

Antibiotic prescriptions need to be improved to optimize use and reduce development of resistance. Development and effective implementation of a National Antibiotic Policy would be a major step in ensuring appropriate use of antibiotics.

**Keywords:** Antibiotics, prescription, tertiary care,
IN VITRO ANTIBACTERIAL ACTIVITY OF CRUDE EXTRACTS OF
HIBISCUS HISPIDISSIMUS.GRIFF (NAPIRITTA)

P.T.N. Pathirana, M.T.A. Dayarathna, WJ Wickramarachchi

Department of Cikitsa, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya

nisansalapatirana@gmail.com

"Hibiscus hispidissimus" (Malvaceae) has widely been used as a remedy in traditional medicine specially for various kinds of infectious skin diseases. The present study was aimed at observing the antibacterial activity of crude extracts of different parts of the plant (leaves, flowers, fruits and roots) against four bacterial strains by agar well diffusion method (50µl) in comparison with standard antibiotics, Amoxicillin (10mg/ml) and Tetracycline (10mg/ml). The antibacterial activity of the each extract was studied against Gram negative ("Pseudomonas aeruginosa" – ATCC27853), Gram positive ("Staphylococcus aureus" – ATCC25923 and "Streptococcus agalactiae" – ATCC12386) and Methicillin resistant "Staphylococcus aureus" (MRSA – ATCC43300). Data were statistically analyzed using Independent T-test in SPSS 22 software and statistical significance was determined at 0.05. Although the plant extracts have displayed inhibitory zones against both Gram negative and Gram positive organisms, Levene’s test revealed that extracts of leaves, fruits and roots to have significant antibacterial activity (p>0.05) against all the respective microorganisms tested. But, flower extracts were not recorded as having antibacterial activity (p<0.05) against "P. aeruginosa", "S. aureus" and "S. agalactiae" except MRSA (p>0.05). The study concludes that crude extracts of "H. hispidissimus" plant possess antibacterial activity against MRSA. Moreover, crude extracts of leaves, fruits and roots exhibited antibacterial activity while the flowers showed no activity against the rest of the bacterial species studied.

Key words: Hibiscus hispidissimus, Antibacterial activity, Methicillin resistant Staphylococcus aureus, Agar well diffusion method, Positive control
**LACTOBACILLUS FERMENTUM: POTENTIAL PROBIOTIC ISOLATED FROM FERMENTED SRI LANKAN FINGER MILLET**
(ELUCINE CORACANA)

D.M.W.D.Divisekera¹, J.K.R.R.Samarasekera¹, C.Hettiarchachi², J.Gooneratne¹, S. Gopalakrishnan³

¹Industrial Technology Institute, 363, Bauddhaloka Mawatha, Colombo 07, Sri Lanka
²Department of Chemistry, Faculty of Science, University of Colombo, Sri Lanka
³International Crops Research Institute for Semi-Arid Tropics, Telemana, India

Finger millet (*Eleusine coracana*) is one of the ancient millet, that is rich in dietary fiber, minerals, and sulfur containing amino acids compared to white rice, the current major staple in South Asia. Due to the presence of water-soluble fibers, oligosaccharides and resistant starch, it fulfills the prebiotic effects and can stimulate the growth of probiotic bacteria. This study was focused to isolate, characterize and identify probiotic bacteria associated with Sri Lankan finger millet. Seeds were collected from germplasm of Seed and Planting Material Centre, Pelwehera. Seeds were milled, sieved, fermented at 30 °C, 16h. Aliquots were prepared from fermented sample, isolation of probiotics were carried out on de Man Rogosa and Sharpe Agar (Hi-Media, India), incubated at 37 °C, 24 h. The colony morphology of the isolate was noted. Isolate was further characterized phenotypically (Gram, endospore staining, motility), biochemically (indole, methyl red, vogues prosker, citrate, gelatin liquefaction, H₂S production, starch hydrolysis, urease and Catalase). Sugar utilization pattern (maltose, lactose, glucose, sorbitol, arabinose, mannitol, dextrose, salicin, ribose, melezitose, cellobiose and melebiose) was examined. Tolerance to Acid, sodium chloride and temperature was investigated. To assess the safety of isolate, hemolysis was conducted. The 16S rRNA sequencing was carried out by extracting genomic DNA using an in-house optimized SDS proteinaseK DNA extraction method. For PCR, primers 1492R, 27F and for sequencing, primers 518F and 800R were used. Sequence alignment was carried out by Basic Local Alignment Search Tool. The result revealed that the isolate was Gram positive, non spore forming, non motile rod shaped bacteria, which fermented sugars except salicin, ribose, melezitose, cellobiose and melebiose. Isolate was positive for MR and negative for other biochemical tests performed. Isolate could tolerate high acidic conditions (pH 2, 3, 4), temperature of 30 °C - 37 °C and sodium chloride concentrations of 5.5%, 6.5%. 16S rRNA sequencing analysis of the amplified gene identified the isolate as *Lactobacillus fermentum*. This is the first report of the isolation and characterization of *L. fermentum* from Sri Lankan fermented finger millet. Prior to commercialization of the isolate, the toxicity will be investigated and the efficacy of the isolate will be determined.

**Keyword:** *Lactobacillus fermentum*, probiotic, prebiotic, finger millet,
ESSENTIAL OILS OF *ALPINIA CALCARATA* ROSC. INHIBITS THE *IN VITRO* GENERATION OF REACTIVE OXYGEN SPECIES IN MOUSE MACROPHAGES

M. Chandhrakanthana, S. Kathirgamanatharb, S.M. Handunnettic, G.A.S. Premakumara\(^d\)

\(^a\)Industrial Technology Institute, Sri Lanka
\(^b\)Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo, Sri Lanka

Phagocytic cells, like macrophages, are known to be activated under oxidative conditions. The stimulated production of reactive oxygen species (ROS) by these phagocytic cells due to the increased consumption of oxygen results in the oxidative burst which causes tissue injury in chronic inflammatory conditions like rheumatoid arthritis (RA). Rhizomes of *Alpinia calcarata*, commonly known as *heen araththa* in Sinhala and *chiththaraththa* in Tamil, are popularly used in herbal medicine for its reputed analgesic, antimicrobial, anti-inflammatory and anti-tumour properties. The herbal formulation, *Maha Rasnadhi Quathar* (MRQ), used by Sri Lankan ayurvedic practitioners in treating RA contains rhizomes of *A. calcarata* as a major ingredient. The present study, aimed to investigate the *in vitro* anti-inflammatory activity of essential oils (EO) of *A. calcarata* rhizome, leaf and stem sheath by a chemiluminescence based phagocytosis kinetic assay. Whole plants of *A. calcarata* were collected from Western province of Sri Lanka and the hydro-distillation using Clevenger apparatus yielded essential oils from rhizome, leaf and stem sheath. Gas chromatography-Mass Spectrometric (GC-MS) analysis was done to identify the components of the EO’s. Murine macrophage RAW 264.7 cells were cultured in RPMI-1640 media supplemented with 5% Fetal bovine serum were activated by serum opsonized zymosan-A and changes in ROS production was determined by luminol based chemiluminescence. The cytotoxicity of EO’s was determined by Tryphan blue exclusion assay (40, 20, 10, 5, 2.5 and, 1.25 µg/mL). The inhibitory effects on intracellular generation of ROS by essential oils of *A. calcarata* were studied. Results obtained showed that all essential oils at 40 µg/mL decreased ROS production and possess strong inhibitory activity in the range of 79.23±0.67, 80.45±0.63 and 79.45±0.34% for rhizome, leaf and stem sheath respectively. Aspirin (40 µg/mL) was used as a standard drug and it showed inhibition of 80.65±0.64%. A dose response relationship was observed in the inhibition of all EO’s and the IC\(_{50}\) was found to be 21.97±0.84, 21.59±0.22, 23.27±1.58 µg/mL respectively. None of the EO’s affected macrophage viability (90-95%) upon 1 h incubation. Some of the major components by GC-MS analysis of EO’s were 1,8-cineole, α-pinene, β-pinene, fenchyl acetate, borneol, camphor, carotol and, α-phellandrene. The emerging evidence in the use of EO’s, which are commonly complex mixtures of volatile terpenes, as alternative medicine indicates the need of research and validation of the numerous health and wellness benefits of therapeutic grade EO’s. The present study is the first report on intracellular ROS production inhibition by *A. calcarata* in murine macrophages by a novel cell based chemiluminescence assay. In conclusion, essential oils of *A. calcarata* rhizome, leaf and stem sheath showed a significant inhibition of ROS production *in vitro* and could have a potential therapeutic effect on arthritis disease by inhibiting production of superoxide anions thus by preventing oxidative burst of macrophages.

**Keywords:** *Alpinia calcarata*, ROS, Luminol, Zymosan, Anti-inflammatory.
A SURVEY ON ANIMAL ORIGIN MATERIALS USED IN INDIGENOUS MEDICINE IN SRI LANKA WITH SPECIAL REFERENCE TO TALPATE PILIYAM

H.P.I.J. Kaldera, S.L. Wewalwala

Department of Ayurveda Basic Principles, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya inoka.jayamali@gmail.com

Sri Lanka claims a profound and valuable culture dated up to thousands of years in which the indigenous medicine with its precious and unrevealed treasures has been playing a significant role. In the system not only herbals but also minerals and animal origin materials have been used.

Aim of this study was to identify the animal origin materials and their applications used in indigenous system of medicine in Sri Lanka. Talpathe piliyam is a series of printed books consisted of several volumes which have copied from the ancient ola manuscripts and published by the department of Ayurveda. They were thoroughly studied and categorized under following topics viz. animal phylum and sub phylum, part of the body used, diseases which they used the method of application and preparation.

According to the results obtained, parts of mammals and quadrupeds, reptiles, birds, fish, insects, arachnids, annelids, crustaceans and several animal parts which belong to phylum mollusca also have been used. Meat, bones, teeth, horns, urine, feces, skin, milk and other dairy products such as ghee and cheese have been used as major materials. Fur, hair, shells, egg shells, bile, feathers, exo-skeletons, fat, quills, secretions and dead skin of cobra also have been used exceptionally for drug preparation.

These animal materials have been used for several purposes such as both internal and external applications, supportive materials for drug production and as materials for drug storage. External applications were balms, oils and medicated smokes while decoctions, pills and pastes have been used as internal applications.

There is a vast knowledge about using animal origin materials in indigenous medicine. It can be concluded that their application and method of preparation have dispersed in a broad spectrum and further studies could be carried out in searching unrevealed valuable materials for the production of novel medicines.

**Keywords:** Indigenous medicine, animal origin materials
ANTIBACTERIAL ACTIVITY OF DISTILATION OF LEAVES OF
ATALANTIA CEYLANICA (YAKINARAN)

D. A. L. Munasinghe, E. D. C. Karunarathna, A. D. H. Sudesh

Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Sri Lanka
munasinghe74@yahoo.com

The steam of boiled leaves and extract of Atalantia ceylanica are used by certain villagers as a traditional treatment for healing respiratory ailments such as influenza. Thus the study was aimed to investigate the antibacterial effect of Atlanta leaves. Antibacterial activity of leaves of was tested qualitatively against 05 bacterial strains with the modified plate method at Gampaha Wickramarachchi Ayurveda Institute in April 2015. The plates, prepared with the distillation of leaves which comprised of neat concentration of raw leaf materials and Mueller-Hinton agar were inoculated with laboratory stored standard bacterial strains such as Pseudomonas aeruginosa, Streptococcus pneumonia, Escherichia coli, Staphylococcus aureus and Methicillin resistant Staphylococcus aureus separately. These can cause respiratory as well as gastro intestinal symptoms. For the control test distilled water was used to make plates instead of leaf extract. Even after the duplicated experiment no strain was found to be inhibited by the leaf materials, which indicated that the neat concentration of raw chemical compound of particular leaves have no inhibitory action on tested strains. As the respiratory infection is not only caused by bacteria but also viruses, perhaps phytochemicals might have possessed antiviral as well as antibacterial features other than the tested strains. Occasionally the chemical of particular plant leaves might have possessed certain ant-inflammatory feature to control respiratory symptoms. Finally it was clear that the chemical compounds of the distillation of leaves of Atalantia ceylanica has no significant inhibitory effect on the growth of tested strains.

Keywords: Atalantia ceylanica, traditional usage, distillation, antibacterial effect, anti-inflammatory effect
In tribal areas, different crude drug extracts are used to treat various skin disorders including wounds. Wound healing process involves several steps, which involves coagulation, formation of granulation tissue, collagenation and acquisition of wound strength. During the formation of new tissue, endothelial cells proliferate and form new blood vessels. The present study was undertaken to evaluate the wound healing activity of ethanolic extract of *Plumbago zeylanica* bark. The influence of bark of *Plumbago zeylanica* was studied for its wound healing activity at a dose of 250mg/kg body weight, using excision and dead space wound models in rats. The animals were divided into three groups in excision wound model the controls were treated with 0.25% carboxy methyl cellulose (CMC), reference standard group rats were treated with sulphathiazole ointment and the experimental were treated with extract of *Plumbago zeylanica* bark till complete epithelialization. Each group comprised of six rats. The animals in dead space wound models were divided into two groups and controls were given plain drinking water and the experimental animals were administered with extract orally for 10 days. Ethical clearance was taken before performing experiments and all experiments were conducted in accordance with Institutional Animal Care and Use Committee (IACUC) guidelines. The extract treated wound was found to epithelize faster as compared to controls. Extract treated rats exhibited 66% reduction in the wound area when compared to control (55%). The wet and dry granulation tissue weight and hydroxyproline contents in a dead space wound model increased significantly (P≤ 0.001) when compared to controls. Histological studies of the tissue obtained on day 10 from the extract-treated group showed increased well organized bands of collagen, more fibroblasts and few inflammatory cells when compared to controls which showed inflammatory cells, scanty collagen fibers and fibroblasts. The demonstration of increased rate of wound contraction together with the biochemical and histological findings suggest the use of *Plumbago zeylanica* bark extract in the management of wound healing.

**Keywords**- Ethanolic extract, Hydroxyprolin, Plumbago zeylanica, Sulphathiazole, Wound healing.
USE OF A MULTIPLEX PCR TO IDENTIFY CANDIDA SPECIES IN CONCENTRATED ORAL RINSE SAMPLES OF PATIENTS WITH DIABETES

M.K.A. Sampath1, T.D.C.P. Gunasekera1, J. Kottahachchi1, K.A.A.Dilhari1, U.Bulugahapitiya2, S.S.N. Fernando1, M. M. Weerasekera1

1 Department of Microbiology, Faculty of Medical Sciences, University of Sri Jayewardenepura
2 Endocrinology unit, Colombo South Teaching Hospital.

Oral candida infections are most frequently observed in patients with diabetes. As diabetes has become the number one non communicable disease in Sri Lanka, oral candida infections are an emerging problem. Although Candida albicans is the predominant pathogen in oral candidiasis multiple Candida species involvement is common. Hence it is important to develop rapid, sensitive and specific molecular based methods to identify multiple Candida species in clinical specimens.

The aims of this study were to optimize and apply a multiplex PCR to identify four important Candida species, namely C.albicans, C.parapsilosis, C.glabrata and C.tropicalis in concentrated oral rinse samples of patients with type 1 diabetes. The performance of multiplex PCR was compared with phenotypic identification.

A multiplex PCR was optimized to identify C.albicans, C.parapsilosis, C.glabrata and C.tropicalis in concentrated oral rinse samples of patients with diabetes, attending the Endocrinology clinic at Colombo South Teaching hospital. Multiplex PCR was optimized using a common reverse primer, ITS4 and four species specific primers targeting ITS 1 and ITS2 regions of yeast genome (primer CA, CT, CP, and CGL respectively). Optimized multiplex PCR was applied to identify four different candida species in 20 clinical samples and the results were compared with results of phenotypic identification for Candida ie; colony characteristics, germ tube test, sugar assimilation and clamydospore formation. Further antifungal susceptibility test was performed using disk diffusion method (NCCLS guideline M 44) for colonized patients.

Out of the 20 oral rinse samples, 10 were culture positive. However, only 8 samples were colonized (> 600 CFU/ml) with Candida species. Out of these 8 patients, multiple Candida species were identified in 5 patients, where all of them had C. albicans alone with either C. Parapsilosis or C. tropicalis. Three patients had only Candida albicans. The 20 samples tested with multiplex PCR, 14 were positive for Candida spp. All 14 contained C. albicans with 12 being positive for multiple Candida spp. including C. parapsilosis (10/20), C. tropicalis (4/20) and C. glabrata (4/20).

Established multiplex PCR is found to be rapid, sensitive and more specific than conventional culture method in identifying multiple candida species in oral rinse samples.
STANDARD PRECAUTIONS DURING PHLEBOTOMY: DO HEALTHCARE WORKERS PAY HEED?

Kamani Gunasekera

Department of Microbiology, Faculty of Medical Sciences, University Of Sri Jayewardenepura
kamani.lk@gmail.com

In healthcare settings contaminated fomites are potential vectors for cross-transmission of nosocomial pathogens when equipment is shared between patients. The primary mechanism of transmission from one patient to another is via healthcare workers’ (HCWs) hands. The risk of transmission of nosocomial infections can be kept low through standard precautions such as good hand hygiene and proper glove utilization. The aim of this study was to assess standard precautions during phlebotomy in a tertiary care hospital in Sri Lanka.

Observations of HCWs during venepuncture for routine blood investigations were made on 96 occasions in 24 general wards of the Colombo South Teaching Hospital, Kalubowila. Four observations were made at random in each ward. The HCWs were unaware of the audit and observations were made during collection of specimens for another part of this study.

Only 7 of 96 (7.3%) HCWs washed hands before wearing gloves or performing phlebotomy without gloves. More than two thirds of HCWs (68.8%) did not use gloves for phlebotomy. None of the HCWs who wore gloves changed gloves in between patients. Only 19 of 96 (19.8%) HCWs washed their hands after removing gloves or performing phlebotomy without gloves. Only one of the HCWs washed hands both before and after handling the patient. Jewellery was worn on hands by 19 of 96 (19.8%) HCWs and none of them removed these before the procedure. Most of the time tourniquets were improperly stored and were seen tied to the trolley. No attempt was taken by HCWs to clean the tourniquets in between patients.

HCWs pay poor attention to standard precautions during routine phlebotomy procedures. Precautions for personal safety are disregarded by most as they do not use gloves. HCWs need to be educated that the spread of nosocomial pathogens to patients, instruments and environment is primarily through hands of workers and that it is important to follow standard precautions at all times.

Keywords: Gloves, healthcare worker, tourniquet, phlebotomy, standard precautions
PSYCHOSOCIAL PROBLEMS FACED BY PERSONS WITH SPINAL CORD INJURY: A REHABILITATION HOSPITAL BASED QUALITATIVE STUDY

P.W.G.D.P. Samarasekara¹, S.M.K.S. Seneviratne², D. Munidasa³, S.S. Williams⁴

¹ Department of Health Sciences, Faculty of Natural Sciences, The Open University of Sri Lanka, Nawala, Sri Lanka
² Department of Allied Health Sciences, Faculty of Medical Sciences, University of Sri Jayewardenepura, Gangodawila, Sri Lanka
³ Rheumatology and Rehabilitation Hospital, Ragama, Sri Lanka
⁴ Department of Psychiatry, Faculty of Medicine, University of Kelaniya, Sri Lanka

Spinal cord injury (SCI) is a major trauma that impacts many aspects of a person’s life. The experience of a life altering incident, acute hospital care and prolonged hospitalization for rehabilitation creates a severe disruption to a spinal cord injured person’s life. The purpose of this study was to describe psychosocial problems faced by persons with SCI.

A qualitative study was conducted among persons with SCI, undergoing rehabilitation at the Rheumatology and Rehabilitation Hospitals, Ragama and Digana Sri Lanka. Ten participants were selected purposively to represent both males and females, with cervical, thoracic or lumbar levels of injuries due to traumatic and non-traumatic causes as well as from different socioeconomic backgrounds.

In-depth interviews were conducted after informed consent using an interview guide with probes. Interviews were audio taped and transcribed verbatim. Qualitative content analysis was conducted. Ethical approval for this study was obtained from the Ethics Review Committee, Faculty of Medicine, University of Kelaniya.

The following themes were identified in the content analysis: Physical dependency, financial difficulty, burden on the family, uncontrollable sensations, uncertainty of marital relationships and lack of concern from associates. Physical dependency was perceived in relation to their limited mobility. They perceived financial difficulties in relation to their inability to return to work. They felt that they would hitherto be a burden on their families financially. Uncontrollable sensations were due to spasticity and frequent spasms. Fears and doubts about “partner satisfaction” in their marriage due to their physical disabilities was expressed. They also expressed concern about the insensitive over reaction from relatives and friends that made them miserable angry.

The findings reinforce the needs of persons with SCI. Care teams should endeavor to address them in the rehabilitation process. The role of the social services too should be strengthened to complement the medical role in ensuring psychosocial wellbeing.

Keywords: Spinal cord injury, physical disability, dependency, psychosocial problems, rehabilitation
MEDICATION SAFETY AMONG IN-PATIENTS – A WARD BASED STUDY

M.I. Thirumaga¹, M.A.R. Ahamedbari¹, N.R. Samaranayake¹, C.A. Wanigatunge²

¹Department of Allied Health Sciences, Faculty of Medical Sciences, University of Sri Jayewardenepura
²Department of Pharmacology, Faculty of Medical Sciences, University of Sri Jayewardenepura

Medication safety is important to ensure patient safety. Medication errors happen when prescribing, transcribing, dispensing and administrating of drugs. This study was carried out to assess the occurrence of prescribing and some selected drug administration errors among in-ward patients.

A descriptive cross sectional study was conducted among in-ward patients at a selected base hospital in Sri Lanka. Participants were selected randomly from two medical wards. Data was collected from the latest inward prescription. Medication history and clinic records were other sources of information. Additionally, drug charts were matched with the prescription to assess if drugs were administered as instructed by prescribers. The total number of prescriptions was used as the denominator for calculating percentages.

Four hundred prescriptions which included 2182 drugs were analyzed. There were 237 men and 163 patients women. The mean (standard deviation) number of drugs per prescription was 5.5 (3.0). One or more errors were observed in 146 (36.5%) prescriptions. There were 134 (33.5%) prescribing errors and 12 (3%) drug administration errors. Most of the prescribing errors were related to wrong frequency 41 (10.2%), duplication of drugs 40 (10%), drug omissions 17 (4.2%) and unacceptable drug combinations 24 (6%). The 12 drug administration errors mostly included wrong frequency errors 7 (1.7%).

Prescribing and drug administration errors happen in hospitals and this may affect patient safety. Healthcare professionals should be made aware of this danger and the healthcare system should be improved to minimize these medication errors.
ANTIBIOTIC SELF MEDICATION (ASM) AMONG SCHOOL TEACHERS IN KEGALLE EDUCATIONAL DIVISION

D. I. Lakmali, Pradeepa Jayawardane

Faculty of Medical Sciences, University of Sri Jayewardenepura

Self medication with antibiotics is a major health problem and has not much been assessed in Sri Lanka. The objectives of study were to describe patterns of self-medication with antibiotics and its associating factors and to assess the knowledge on antibiotics among school teachers.

This study was conducted as a descriptive cross sectional study among 384 teachers in 8 selected schools in Kegalle education division using a validated self administered questionnaire. Data were analyzed using SPSS, version 16 and results are presented as frequencies and percentages. Correlations were assessed using Chi-square test at a significance level of P<0.05.

Of the 384 questionnaires distributed 374 (97%) were completed and returned. 74.8% (n=279) of the study sample was females. Mean age of the sample was 43±9 years (±SD). The knowledge on antibiotics, was poor in 56% (n=209). Only 24.9% knew that antibiotics were useful only in bacterial infections. 67.7% of the study sample self-medicated with antibiotics. 27.3 % has self-medicated at least once over the past 12 months. Being above the age of 40 years and living near the city significantly associated with ASM. Of those who have self-medicated with antibiotics 169 (75.1%) have used amoxicillin, 25 (11.1%) have used ampicillin, 6 (2.7%) used erythromycin and 4 (1.8%) used co-amoxiclav. Illnesses they self medicated with antibiotics were common cold 141 (62.7%), sore throat 101 (44.9%), cough 55 (24.4%), physical injuries 55 (24.4%), fever 27 (12%) and dental problems 26 (11.6%). The main source of information and the place they acquired antibiotics was community pharmacies 150 (66.7%). Most had stopped the antibiotic course when the symptoms disappeared 164 (72.9%). 173 (76.9%) who self medicated knew that it is not safe. ASM is high among the sample tested. Knowledge on antibiotics was poor. They had inappropriate and harmful practices. Age above 40 years and living near the city associated with antibiotic self-medication. ASM is a problem and the general public should be educated regarding the hazards of ASM.
Sri Lanka is a country which provides a free and high quality health care service to its citizens. However, the service delivery standards need to be improved as the longer waiting time compromises the quality of care provided. The objective of this study was to introduce an affordable solution to improve the waiting time at OPD which benefits both the patients and hospital staff as an extension to “eHospital – Dompe” project. “mChannelling” is a fully automated, IVR (Interactive Voice Response) based, free appointment system from government hospitals to general public. The hot line (0711-370370) is open for any telecommunication network and any time of the day. The automated IVR enables the patients to select a convenient time slot for OPD consultation from “mChannelling” enabled hospitals, launched at District Hospital-Dompe. The “mChannelling” solution prompts the caller to select the hospital at the beginning. Then it is redirected to the selection of the date and then to the consultation time slot. Once the appointment is confirmed, a confirmation SMS is sent to the caller indicating the date and time of the appointment. Upon presenting the conformation SMS, the hospital reception will check the validity and send patient to the doctor and dedicated counter to collect drugs. Only standard call charges are applicable for this solution. The appointment schedule is updated by the hospital administration using web based hospital admin portal. “mChannelling” enables patients to obtain appointments for next seven days and the overall waiting time is minimized to 30 minutes. The patients are benefited with hassle free service with patient friendly environment at “eHospital”-Dompe. The authority of scheduling appointments is with the hospital authority and Mobitel is hosting the solution. The Ministry of Health (WP) has identified “mChannelling” to deploy in all “eHospitals” in the province.

**Keywords:** mChannelling, Appointment system, IVR
ANALYSIS OF SEVERITY AND DISTRIBUTION OF DIABETIC FOOT ULCERS. A SINGLE UNIT EXPERIENCE

A. L. A. M. C. Ambegoda ¹, J. R. Wijesekera ², K. I. Panditharathne ¹, R. T. Gamage¹, O. M. D. C. S. Mudalige ¹, M. D. R. M. Piyasiri ²

¹ Colombo North Teaching Hospital, Ragama, Sri Lanka  
² Base Hospital, Dambadeniya, Sri Lanka  
mcambegoda@yahoo.co.uk

Diabetes is the commonest cause of foot ulceration in developing countries leading to severe morbidity and mortality.

The main aim of the study was to assess anatomical distribution of diabetic foot lesions, categorize it according to Wagner wound grading, find the association between smoking packs years and the severity of the foot lesions and to assess the relationship between the bony deformities and anatomical location of the ulcer.

This was a cross sectional descriptive study conducted at a casualty surgical unit in a tertiary care teaching hospital for a period of 4 months. 91 diabetic patients with a diabetes related foot lesion were enrolled after simple randomization. Pretested interviewer administered questionnaire was used to gather data. Variety of soft tissue and bony changes of diabetic foot were assessed along with demographic data. Lesions were classified according to Wagner classification. Data was analysed using Epidata software.

Out of the 91 participants, 55 (61.1%) were males and 36 (38.9%) females. Mean age was 60.12 ± 10.19 years. Median diabetes duration was 10 years (IQR = 4.25 – 16.75). Wagner grade 1, 2, 3, 4 and 5 were 17.7%, 40.65%, 28.8%, 13.3% and 0% respectively. Claw toe was the commonest bony deformity with 30.76%. Commonest ulcer location was margins of foot (31.87%). There was no statistically significant association between the pack years of cigarette smoking males and severity of foot lesions (Spearman’s rank correlation coefficient = - 0.037, p = 0.82). Patients with claw and hammer toe deformities had their ulcers located in fingertips and toes (p< 0.05). There was no statistically significant association with flat foot deformity and ulcer location on any particular anatomical area (p>0.05)

Significant association between toe deformities and ulcer occurrence in finger tips can be utilized to manufacture footwear for these patients to prevent ulcer formation.
FACTORS INFLUENCING THE PHYSICAL INACTIVITY AMONG THE HIGH SCHOOL STUDENTS IN THE DISTRICT OF JAFFNA, SRI LANKA

S. Thiruvarangan¹, C. A. Gnanathasan², A. H Wettasinghe³

¹ Allied Health Sciences Unit, Faculty of Medicine, University of Colombo
² Department of Clinical Medicine, Faculty of Medicine, University of Colombo
³ Allied Health Sciences Unit, Faculty of Medicine, University of Colombo

Regular physical activity remains an important behavior for preventing Non Communicable Diseases (NCDs). The period of adolescence represents the transition from childhood to adulthood and lifetime habits such as regular physical activity are normally begun at this time. But unfortunately research indicates that physical activity rates decline consistently during the adolescent years. This study was aimed to assess Sri Lanka adolescents’ physical activity level and their perceived barriers to physical activity. Random sampling method was used to select the five schools from Valikamam division in Jaffna district followed by convenient sampling method to select 182 adolescent’s student between 16-18 years. Current physical activity level and perceived barriers to physical activity were assessed in the sample. Physical activity level was estimated by IPAQ short versions (International Physical Activity Questionnaire) where participants responded to the instrument with 21 items representing 07 barriers to physical activity using a Likert Type scale. Sum scores were computed. The main barriers to perform the physical activity were lack of time (85.2%, n=155), social influence (78.6%, n=143), lack of will power (73.3%, n=134) and fear to injury (59.3%, n=108). Physical inactivity had a significant relationship with lack of time (p=0.021) and social influence (p=0.041) whereas it had no significant relationship (p>0.05) with other factors such as lack of will power, lack of energy, fear to injury, lack of skill and lack of resources. There is a need for future research, which needs to be carried out with larger sample group to develop national standardized instrument. It will be helpful for accurately identify perceived barriers and then recommend changes to enhance physical activity among adolescents.

Keywords: Physical inactivity, Perceived barriers, Adolescents
QUALITATIVE STUDY ON PERCEPTION OF MOTHERS REGARDING
DIETARY PRACTICES DURING THE POSTPARTUM PERIOD

T. Sundarapperuma¹, P. Hettiarachchi ², S. Wasalathanthri ³, S. Sivayogan ⁴

¹Allied Health Science Degree Programme, Faculty of Medicine, University of Ruhuna
²Department of Physiology, Faculty of Medical Sciences, University of Sri Jayewadenepeura
³ Department of Physiology, Faculty of Medicine, University of Colombo
⁴ Department of Community Medicine, Faculty of Medical Sciences, University of Jayewadenepeura

Women with a history of gestational diabetes mellitus (GDM) have a significant risk of developing type two diabetes mellitus (T2DM) in later life. Dietary interventions after delivery are known to attenuate the trajectory to T2DM. The aim of this study was to explore the perception of mothers on traditions, myths and barriers regarding healthy dietary practices during the postpartum period.

Thirty volunteering antenatal mothers with a diagnosis of GDM who also have a past history of GDM were invited for this study. Focus group discussions were used to collect data. Ten mothers were invited to form one focus group and 3 such groups were taken from 3 selected districts, Colombo, Gampaha and Galle. Focus group discussions were conducted with each group till the saturation point was achieved. Discussions were audio recorded and transcribed. Transcripts were independently reviewed by the researchers and themes were identified and coded using a content analysis approach.

Five key themes were emerged from the data (1) Myths and traditions of food and food habits specific to postpartum period, (2) lack of motivation to practice, (3) Time pressure, (4) negligence and (5) financial barriers. In addition, lack of awareness, social pressure and lack of family support were identified as important barriers especially among women residing in rural areas.

This study provides an insight into the traditions, myths and barriers regarding dietary practices of GDM mothers. Postpartum period has unique problems. Therefore, identifying these is important in planning dietary interventions for these mothers in order to prevent or reduce the future risk of developing diabetes mellitus.

The dietary interventions planned should be culturally acceptable. Dietary counseling and motivation should be targeted not only for mothers but for their family members to improve adherence to management plans designed for these women.

Keywords: Gestational diabetes mellitus, Qualitative study, Dietary interventions, Focus group discussion, Myths and barriers.
PUBLIC HEALTH MIDWIVES’ HEALTH EDUCATION ACTIVITIES RELATED TO COMMON GYNAECOLOGICAL COMPLAINTS

I. M. P. S. Ilankoon\textsuperscript{1}, P. P. R. Perera\textsuperscript{2}, C. S. E. Goonewardena\textsuperscript{3}, R.C. Fernandopulle\textsuperscript{4}

\textsuperscript{1}Department of Allied Health Sciences, \textsuperscript{2}Department of Biochemistry, \textsuperscript{3}Department of Community Medicine, \textsuperscript{4}Department of Obstetrics and Gynaecology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka. 

prasanthi@sjp.ac.lk

Public Health Midwife (PHM) mainly works in the field, providing domiciliary care by residing in the community. They work in urban, rural and estate areas and indulge in maternal and child care services. PHMs can build rapport with women, discuss health issues and guide them for necessary health care facilities and provide health education.

This descriptive cross sectional study was carried out in Colombo Municipal Council area to assess health education activities of the PHMs related to common vaginal complaints such as vaginal discharges, pruritis and itchiness. All PHMs who have worked as a PHM in CMC area for at least 6 months were selected. Data were collected using a self-administered questionnaire which consisted of demographic characteristics and health education activities. Ethical clearance was obtained from the Ethics Review Committee of the Faculty of Medical Sciences, University of Sri Jayewardenepura. SPSS software version 16 was used for descriptive statistics to obtain percentages and means.

A total of 56 PHMs participated in the study with a response rate of 82%. Mean age of the study participants was 36.57 years (SD\(\pm\)10.10). Majority were more than 30 years old (62.5\%, \(n=35\)) and have worked as a PHM for less than 10 years (67.7\%, \(n=38\)). Mean years of working as a PHM was 9.05 (SD\(\pm\)9.07). Majority of the participants (\(n=29, 91.1\%\)) agreed that they discuss women’s health issues and identify females at risk for reproductive health matters and educate for prevention of disease (\(n=52, 92.9\%\)). Main challenges for health education during field and clinic were identified as lack of available time (\(n=46, 82.1\%\)), lack of teaching materials (\(n=44, 78.6\%\)), lack of a good educational environment in community/clinic (\(n=45, 80.4\%\)) and lack of knowledge (\(n=38, 67.9\%\)) and women’s lack of interest in learning (\(n=46, 82.1\%\)). Seventy eight percent of PHMs agreed to receive continuing education to improve confidence in ability to change women’s health/lifestyle behaviors (\(n=44\)).

Majority of PHMs displayed the need of continuing education in order to improve confidence in health education for women’s health issues and identify females at risk for reproductive health matters. An educational programme on common gynaecological complaints including teaching methods and communication skills for PHMs will help to render better services to the community.

Keywords: Public Health Midwife; Women’s health issues; Health education
PEOPLES’ VIEWS ABOUT A MULTIDISCIPLINARY MEDICAL EDUCATION PROGRAMME AIMED AT PROMOTING POPULATION HEALTH

S.S.W. Fernando, T.K. Athukorala, N.P. Jayasekara, T Hemajith, T Ponnamperuma

Department of Community Medicine, Faculty of Medicine, University of Ruhuna, Galle, Sri Lanka
srimalief@gmail.com

A community-based multidisciplinary medical education programme called Community Attachment Programme (CAP) has been a part of the medical curriculum in a university in Southern Sri Lanka since early 90s. This programme, which runs over a period of 2 years, trains the undergraduates to identify determinants of health, make community diagnosis and manage health problems in the community context by multidisciplinary teamwork. A study was done to evaluate the effectiveness of CAP in making people aware of the multidimensional nature of health.

A cross sectional survey was conducted among 151 conveniently selected individuals in the community, from a total of 300 who participated in the CAP in 2014, using a self-administered questionnaire.

The sample consisted of Muslims (66%) and Sinhalese. Mean family size was 5.32 (SD±1.97) and majority of the respondents belonged to middle income group. On average, undergraduates made 5 visits per household. About 94% of the participants were on the opinion that the multidisciplinary nature of the CAP assisted to enhance their health, by empowering them to take correct decisions on health issues in individuals and their environment. About 65% of those individuals who participated in health promotion activities in the community with multi-stakeholders, expressed their willingness to continue such community development work even after the conclusion of CAP. We noted that respondents from the low income category had the highest mean satisfaction score compared to those in the middle and upper income categories (ANOVA;F(2,112)=7.59912,p<.01). Number of visits by undergraduates was positively correlated with satisfaction score (r=0.2,p<.05). However, about half of the respondents reported that social and behavioral health issues of their families were not adequately addressed by the programme.

The CAP has been perceived as a productive population health programme by the participants, and the low income group seems to have benefited the most from the programme. Undergraduates’ knowledge, attitudes and skills in addressing social and behavioral health issues in the community were not satisfactory. CAP should be improved to address all factors impacting on health with equal importance, in order to implement community-oriented sustainable programmes to promote population health.

Keywords: Community Attachment Programme, Population health, Community, Undergraduates
PEOPLE'S PERCEPTIONS ON PUBLIC SECTOR HEALTH CARE DELIVERY SYSTEM OF SRI LANKA: A REFLECTION FROM A SUBURB OF WESTERN PROVINCE

K.A.S. Keeragala, M.A.S.C.Samarakoon, A.I. Jagoda

Ministry of Health, Sri Lanka

The study addresses an important research question on how best the health care system in Sri Lanka can be reformed with reference to the actual need of the general public of the country. Main objective of the study was to identify public perception of health care they received by the government system.

A survey instrument on service seekers along with a focus group discussion with policy makers were utilized for collecting data. The questionnaire survey sample employed for data collection and the study location is identified as Piliyandala (Kesbewa) Divisional secretariat division in Colombo District in the Western Province.

The sample selection method was based on multi stage random sampling method. The survey was carried out among 73 Grama Niladhari areas in the Piliyandala Divisional Secretariat Division including a total sample of 438 households. From each Grama Niladhari area, six households were selected by random sampling. The age of the study sample was 18 – 60 years and both males and females participated in the study. The education level varied from ordinary level to postgraduate level.

Majority of the patients choose Government Hospitals for medical treatment mainly due to the ability to choose a doctor and the ability to get treatment at any time. Patients prefer Government Hospitals than Private Sector Hospitals due to the ability to obtain drugs, polite service of the staff and maintenance of confidentiality.

According to the responses received, service seekers believe that the main issue with the government health institutions is that they are overcrowded. Whereas non-availability of drugs is the second major issue, quality issues, safety issues and non availability of investigation also matters in a considerable percentage.

Nearly 75% of the people prefer to have a health insurance scheme. Very few agreed to charging the full cost while one third agreed for charging the cost partially from the patient. The study results reported fairly high level of trust in their Health Care Provider, hospitals. It confirms that there is a considerable amount of public confidence regarding Sri Lankan health care.

Trust is crucial in medical settings. The study report describes an increase in trust in Public Health Care System in Sri Lanka. In addition, health care improvement via public private partnership and introduction of a user fee for health care should be considered.
HEALTH CARE RELATED BEHAVIOR AMONG RESIDENTS OF A SELECTED MEDICAL OFFICER OF HEALTH AREA

Piyumi Senanayake, Bhagya De Silva, Ayesha Madumanthi, Nadeeka Madushani, Kokilaa Wijerathne, S Sivayogan, Chandanie Wanigatunge

Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda
shivym@yahoo.com

There is limited understanding of the factors that influence decisions with regard to health care related behaviours in the Sri Lankan context. The aim of this study is to explore the effect of socio-demographic and other relevant factors on the health care related behaviour of the residents of a selected semi-urban Medical Officer of Health area.

A descriptive cross sectional study design was used and 422 respondents from an MOH area were selected using a multi-stage sampling technique. Interviewer administered questionnaires were used to collect data and data was analysed using SPSS version 15. Descriptive data was presented as numbers and percentages, whereas associations between categories were analysed with chi square tests.

Majority of respondents were chief occupant (51.2%), males (50.7%), Sinhalese (97.6%) and Buddhists (87%), aged between 41 years to 50 years (21.1%), earning Rs.30,000 – Rs.44,999 monthly (25.4%) and educated up to GCE A/L (35.8%). Statistically significant associations existed between the sex (p=0.027), age (p=0.000), education level of the respondents (p=0.000) and their perception of health. Majority sought treatment after failure of self-medication (57.3%) and when daily activities were affected (60.2%). Statistically significant associations between age of the (p=0.000), education level (p=0.000), monthly income of the respondents (p=0.000) and the preferred health care system were identified. The preferred health care system differed according to illnesses. Most sought ayurvedic health care (47.6%) for fractures, whilst allopathic medicine was preferred for other illnesses. Affordability (72.7%), availability (79.8%), accessibility (71.3%) and waiting time (54.97%) were main factors affecting the selection of health care provider. Majority used their medicine as prescribed and there were no statistically significant association between sex and methods of medicine use (p=0.139).

Health care related behavior is a collection of decision making processes that are dominated by an array of factors ranging from the socio-demographic characteristics of a person to the social norms and attributes of the health care systems and providers.

Keywords: Health care seeking behaviour, factors, decisions
The decisional needs of the people cannot be assessed by the level of coverage of the vaccine. The target of aTd vaccine is to prevent outbreak of diphtheria among adolescents and booster their immunity towards tetanus. There was no developed Decision Aid for the aTd vaccine. The purpose of the study was to develop a Decision Aid for the aTd vaccine.

Decision Aid was developed according to the standard procedure recommended by the International Patient Decision Aid Standards (IPDAS). The systematic development process had five steps and those were assessing decisional needs, formation of groups to develop and review patient decision aid, drafting, reviewing, and revising the Decision Aid, external peer review and field testing. The decisional needs and information needs of the parents/guardians of children residing in the District of Kalutara had been described by cross sectional study. There were three review groups. First group consisted of epidemiologist, community physician, pediatrician, psychologist, and communication specialist. The second group consisted of health care workers of relevant field and include MOH, PHNS, PHM and PHI. The third group was the parents of the children born in 1996. The drafted Decision Aid was reviewed, and revised by the review groups. Decision Aid had four main domains and those were providing information about the condition/ options, presenting probabilities of outcome, clarifying and expressing patients’ values and structured guidance in deliberation and communication. The external peer review group consisted of community physician, epidemiologist, pediatrician and communication specialist, who had not been involved in the development of the decision aid. The developed decision aid was field tested among the forty parents of children schooling in grade seven in Gampaha District.

The decision Aid for the aTd vaccine was developed. Domains of the Decision Aid was developed to address the decisional needs of the parents/guardians with regard to decision of vaccinating their children with aTd vaccine.
EVALUATION OF ANTI-TUSSIVE ACTIVITY OF *PHYLLANTHUS NIRURI* FRUIT EXTRACT ON COUGH REFLEX INDUCED BY SULPHUR DIOXIDE IN MICE

Gajendra P. Choudhary

Division of Pharmacognosy, School of Pharmacy, Devi Ahilya University, Indore, India
choudharygp@rediffmail.com

*Phyllanthus niruri* which is commonly known as “Bhuiamla is a well known plant used in traditional medicine in India”. Extracts of this herb have been proven to have therapeutic effects in many clinical studies. The active phytochemicals such as flavonoids, alkaloids, terpenoids, lignans, polyphenols, tannins, coumarins and saponins, have been identified from various parts of *P. niruri*. The fruits of *P. niruri* is used in folklore medicine for cough. The present study was conducted to study the anti-tussive activity of the fruit extract on cough reflex induced by sulphur dioxide in mice

The fruits of *Phyllanthus niruri* were collected from plantation in medicinal garden, School of Pharmacy, Devi Ahilya University, Indore. The coarse powder of fruits was extracted with methanol (90%v/v) using a soxhlet apparatus. The extract was evaporated under reduced pressure until all the solvent had been removed to give an extract sample with a yield of 8.6%w/w. Swiss albino mice of either sex weighing between 35-45 gm were used for these experiments. The animals were used for the experiment after an acclimatization period of one week. Ethical clearance was taken before performing experiments and all experiments were conducted in accordance with Institutional Animal Care and Use Committee (IACUC) guidelines. Anti-tussive effect against sulphur dioxide (SO$_2$)-induced cough was evaluated by the standard protocol. Animals were divided into four groups, containing six mice in each group. One served as control group, two groups for methanol extract of fruits *Phyllanthus niruri* (200 and 400 mg/kg, p.o.) and the remaining group was used for standard drug codeine phosphate (10 mg/kg, p.o.). The control groups of animals were treated in the similar manner, which received only normal 2 % Tween 80 solution (10 ml/kg, p.o.). The experimental results have been expressed as the mean±SEM. Significance was evaluated using the students “t” test.

Both in the case of codeine phosphate and extract of *Phyllanthus niruri*, the maximum inhibition of cough reflex was observed at 90 minutes after drug administration. The highest inhibition of cough (58.76 %) was produced by the extract at the dose of 400 mg/kg (p.o.) at 90 minutes of the experiment, whereas codeine phosphate (10mg/kg) showed maximum 63.35% inhibition at 90 minutes of the experiment. The result obtained with 200 and 400 mg/kg dose of extract were statistically significant (p< 0.001) throughout the time span of experiment. In conclusion the results of the present study provide experimental evidence in support of folklore claim of *Phyllanthus niruri* fruit as an anti-tussive agent.

**Keywords:** Anti-tussive, Fruit, Codeine phosphate, *Phyllanthus niruri*
Fistula in ano is a surgical disease. According to the modern medicine, it is an inflammation of the anal glands. Ayurveda texts mention the main cause for fistula in ano is improper dietary habits (su/chi/8 and su/ni/4 especially cha/chi/2, 17). Advising people regarding the dietary habits which they should follow for preventing the disease is vital. Therefore, the present cross sectional study was conducted to find the association between the fistula in ano and the dietary habits. A survey was carried out with the outdoor patients of Gampaha Wickramarachchi Ayurveda Teaching Hospital. Fifty patients clinically diagnosed as fistula in ano in shalya (surgery) were selected randomly as the study group, while another 50 patients attending the same clinic but who do not suffer from fistula in ano and do not have a history of fistula in ano were selected as the control group. Patients who suffer from fistula caused due to other diseases were excluded from the survey. The patients were interviewed personally and data collected based on a questionnaire which was designed relating to the improper dietary habits mentioned in Ayurveda texts. The time of diet and consumption of selected food items for more than 3 days per week were confirmed. Data were analyzed, using SAS software (9.1) version. Results indicated, odds ratios for fish, instant foods like noodles or tinned food, starchy foods, red rice, samba rice, basmati rice, prawns, cuttle fish, pineapple, kottu as 2.15, 23.1, 2.10, 0.46, 1.89, 4.26, 16.0, 30.0, 23.1, and 3.27 respectively. Odds ratios for sweet foods, chilly food, salt food and warm food were 0.68, 1.71, 5.1 and 4.5 respectively. When considering beverages odds ratios for tea, alcohol and any type of cool drink were 5.78, 27.56, and 4.93 respectively.

In conclusion it can be said that having fish, starch, cuttle fish, prawns, instant foods such as noodles or tinned food, kottu, basmati rice, pineapple, salt food, warm foods, alcohol, excessive tea and cool drinks, more than 3 days per week was responsible for the fistula in ano in patients in the study group.

**Keywords:** Fistula in ano, Ayurveda, surgery, anal glands, inflammation
PRELIMINARY CADAVERIC STUDY OF BRANCHING PATTERN OF THE COELIAC TRUNK IN A SELECTED SRI LANKAN POPULATION

E.A.S.T. Edirisinghe, H.F.D.G. De Fonseka, M.H.P. Dissanayake, S.G. Yasawardene

Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura
steusjp@gmail.com

Coeliac trunk is the first central branch from abdominal aorta giving rise to its 3 main branches; Left Gastric(LGA), splenic(SA) and Common hepatic(CHA) artery. Sri Lankan studies on celiac trunk anatomical variations are scarce. Morphology of coeliac trunk and its branches are important in development of techniques for liver transplantation and gall bladder surgeries. The objective of the present study was to describe the morphology of coeliac trunk and main branches in a selected Sri Lankan population.

Eleven formalin fixed adult cadavers were dissected and measurements were taken by using electronic digital caliper. Majority[54.5%(6/11)] of the coeliac trunks originating closer to the upper border of 1st lumbar vertebral body. Percentage72.7(8/11) of coeliac trunks divides in to normal 3 main branches while 27.3%(3/11) had additional left and right inferior phrenic arteries as the first branches. Majority[45.5%(5/11)] LGA originated within 0.5cm from the origin of the trunk. Majority of right gastric artery[45.5%(5/11)] arises from the gastro duodenal artery while in18.5%(2/11) had it from the hepatic artery proper. In majority[36.4%(4/11)] all 3 branches were given as terminal branches while 27.3%(3/11) gave SA and CHA as terminal branches 0.5cm distal to the origin of LGA. All the proper hepatic arteries were raised from CHA while 40%(4/11) were located anterior and 40%(4/11) were medial to the common bile duct. Presentage81.8 %(9/11) had cystic artery originating from the right hepatic artery with gender distribution of 1.2 of male:Female respectively, while 18.2%(2/11) gave it from the gastro-duodenal artery with equal gender distribution. Percentage54.5(6/11) cystic arteries have passed anterior to the cystic duct.

Branching pattern of the coeliac trunk was similar to western studies with anatomical variations. More cadaveric studies are needed to develop Sri Lankan data base.

**Keywords:** Morphology, Coeliac trunk, Sri Lankan population
EFFICACY OF COMBINATION OF HERBAL MEDICINES
(SYRUP VASAKA, SUWASAKUDORI PILL AND PEENISA OIL) IN THE
MANAGEMENT OF COLD WEATHER PROVOKED RESPIRATORY
SYMPTOMS

Ananthajothy Vijayakumar¹, Sri Ranjani Sivapalan²

¹ Rural Ayurvedic Hospital, Kodikamam, Jaffna, Sri Lanka
² Unit of Siddha Medicine, University of Jaffna, Sri Lanka
ananthyvijay@gmail.com

The weather changes and subsequent cold provoked respiratory symptoms are incorporated with the type of Non Allergic Rhinitis. It is one of the global issues related to the respiratory system. The periodical monsoons make changes in the climate of Sri Lanka. The climate of Jaffna in Northern Sri Lanka also experiences the seasonal rhythm of rainfalls. The cold climate affects the human beings and respiratory symptoms arise. A preliminary survey conducted with indigenous medical practitioners in 4 MOH areas in Jaffna District, showed that a combination of herbal medicines - Syrup Vasaka, Suwasakudori pill and Peenisa oil are prescribed by the practitioners for this condition. This research was thus aimed to study the efficacy of the combination of the above in this condition. It was a clinical trial done in Rural Ayurvedic Hospital, Kodikamam, Jaffna, Sri Lanka. Ethical clearance was obtained from Ethical Review Committee, University of Colombo. Seventy five subjects were included in this study according to the inclusion and exclusion criteria (Subjects above 12 years of age, both sex with respiratory symptoms, provoked by cold weather were included and subjects with diabetic mellitus, tuberculosis and bronchial asthma were excluded). Data were collected through interviewer administered questionnaire and symptoms (mainly sneezing, running nose, cough, expel out sputum, itching in eyes, pain in throat, nasal irritation and nasal block), signs and examinations at base line were recorded in case record. Severity of the signs and symptoms was recorded by using score system. Syrup Vasaka was given three times a day, 10 ml for 13 – 20 years old and 15 ml for above 20 years old subjects. Suwasakudori pill was given two times a day, one tablet for 13 - 15 years old and two tablets for above 15 years old with betel juice. Peenisa oil was given to apply on head every other day in quantity sufficient. Subjects were treated for a period of 15 days and all of them were put under observation for one month follow – up period without treatment. Changes in the severity of each symptoms and signs were recorded according to the score system once in 5 days during the treatment period and once in 10 days in the follow up period. Analysis was done using SPSS. Improvement of the symptoms and signs were analyzed through Paired samples – T test by assessing the mean difference between the scores of each sign and symptom at base line and end of the treatment; base line and end of follow up. Highly significant differences (p = 0.00) in the improvements of the symptoms were observed at the level of assessments. Hence the combination of Syrup Vasaka, Suwasakudori pill and Peenisa oil showed improvement in the disease condition and it prevented the relapsing of disease in the period of follow up. Thus it could be concluded that the combination was effective in cold provoked respiratory symptoms.

Keywords: Efficacy, herbal, cold weather, management, respiratory
APPLICABILITY OF BUDDHIST COUNSELING AND MEDITATION IN THE MINIMIZATION OF MENTAL DIFFICULTIES OF THE PATIENTS AFFECTED BY CHRONIC DISEASES

U.P. Ubayasekera

Post Graduate Institute of Pali and Buddhist Studies, University of Kelaniya
udanipriyanka2011@gmail.com

Chronic diseases are conditions of long term illnesses with multiple morbidities, combined ailments, disabilities and serious complications which significantly reduce the quality of life of the patient. Most of these diseases are psychosomatic and mentality of the patient is affected by grief, suffering and sorrow. It has been suggested to have an association between depression and major chronic diseases such as asthma, arthritis, cardiovascular disease, cancer, diabetes and obesity. The mental difficulties have an impact on aggravating the symptoms of physical disease and it will in turn, further deteriorate the mental threshold of the patient turning on a vicious circle. This phenomenon is long underestimated due to the lack of understanding of the link between negative mental outcomes and physical disease. The objective of this study is to demonstrate the possibility of applying Buddhist counseling and meditation to minimize the mental difficulties of the patients caused by chronic conditions. The methodology of the study is based on primary data sources of Buddhist chronicles such as dhōvanasutta, thikicchakasutta, vamanasutta of samanasagnavagga of tatiyapannasaka of anguttaranikaya, and cittavagga of dhammapada and a short-term field experiment with 34 patients who attended a clinic held at Polonnaruwa District in 2014. Based on Buddhist counseling techniques, those patients were advised to be mindful of their condition and engage in Anapanasati meditation practices daily. The study revealed that some important concepts derived from Buddhist chronicles such as Ariyadhōvana, Ariyavirecana, and Ariyavamana can be used for mental purification of patients suffering from chronic conditions. Accordingly, mental difficulties of the patients can be determined as mental expressions of sōka, paridēva, dukkha, dōmanassa, upāyāsa as explained in chronicles; dhōvanasutta, thikicchakasutta, vamanasutta. Over a period of three months experiment results flagged that, the mental difficulties of the patient can decreased and improved the prognosis of physical illness by applying the Buddhist counseling methods and meditation. It is concluded that sustainable outcomes can be achieved by combining Buddhist counseling techniques with meditation based on reality of life and physical body. Once the patient is trained to meditate on impermanence principle of the life, the reality of suffering can be understood systematically. However, extensive study on the subject is essential in formulating proper counseling methods to overcome the mental difficulties of the patients suffering from chronic diseases.

Keywords: Buddhist philosophy, counseling, mental difficulties, chronic conditions
ASSESSMENT OF FOOD BELIEFS IN PREGNANT MOTHERS IN A RURAL AREA OF SRI LANKA

Amnt Adikari1, 2, R. Sivakanesan 2, 3, C. Liyanage 4, D.G.N.G. Wijesinghe2, 5

1Department of Applied Nutrition, Faculty of Livestock, Fisheries and Nutrition, Wayamba University of Sri Lanka, Makandura, Gonawila (NWP), Sri Lanka
2Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka
3Department of Biochemistry, Faculty of Medicine, University of Peradeniya, Sri Lanka
4Department of Community Medicine, Faculty of Medicine, University of Ruhuna, Sri Lanka.
5Department of Food Science & Technology, Faculty of Agriculture, University of Peradeniya, Sri Lanka

thakshila.adikari@yahoo.com

Maternal diet is an important determinant of healthy pregnancy and outcomes of pregnancy. In Sri Lanka, the prevalence of low birth weight, maternal underweight and iron deficiency anaemia were 17%, 13.4 % and 34% respectively. Since the mother’s diet is affected by socio-cultural influences such as food beliefs, this study aims to investigate the existing beliefs regarding food during pregnancy.

A cross-sectional survey was conducted at Maternal and Child Health (MCH) clinics in Pannala MOH division, located in Kurunegala district. Pregnant women, who came to the MCH clinics during data collection period, were interviewed after taking verbal consent. A pre-tested interviewer administrated questionnaire was used to gather information. Simple descriptive analysis was used.

One hundred seventy-six pregnant women were interviewed and out of them 114 (65%) believed in restricting some food item during pregnancy. The age of pregnant mothers ranged from 19 to 40 years with a mean age of 27.3 ± 4.59 years. The entire sample was literate and 55% completed secondary education. Results revealed that sixty-eight percent (78) of the sample believed eating plenty of green-leafy vegetables during pregnancy is important as it helps with proper growth of child’s hair. Seventy percent of participants restricted unripe pineapple and papaya in early pregnancy with a fear of abortion. Sixty-five percent (74) of respondents believed sardin, crab, prawns, cuttlefish, tomato, and bread fruit are "hot-natured" food that can cause miscarriage in pregnancy. Fifty-nine percent (68) of pregnant women believed that food viewed as "cold" such as spinach, mung-bean, ash pumpkin, should be avoided during pregnancy as they can cause diarrhoea in mother, body swelling, stomach discomfort, aches and pains and cough. Eighteen (15.8%) pregnant mothers avoided pork as they believed it could have ill effects and 42% restricted “fresh cow milk” with a fear of having phlegm for them.

This study concluded that a large proportion of the study population had unscientific food beliefs in pregnancy. There is a need for nutrition education and awareness regarding traditional unscientific food beliefs at school and clinics levels.

Keywords: Food beliefs, maternal diet, pregnant mothers, pregnancy
CHEMICAL COMPOSITION OF KSHARASUTRA (MEDICATED SETON) USED IN AYURVEDIC PARASURGICAL MANAGEMENT FOR FISTULA-IN-ANO

A.A.J.P.Kumara¹, J.A Liyanage², D.L.Jayaratne³

¹Department of Shalaya Shalakya, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Yakkala
²Faculty of Science, University of Kelaniya
³Department of Microbiology, Faculty of Science, University of Kelaniya
mrsnhkumara@gmail.com

In this study an attempt was made to evaluate the natural compounds present in the individual Ayurvedic plant ingredients used for the preparation of the medicated thread (ksharasutra) used in parasurgical management for fistula-in-ano. It is postulated that a number of chemicals present in the ksharasutra have anti inflammatory, antibacterial and antifungal activities. Main objective of this study is to identify the chemical compounds that are responsible for the clinical success of the ksharasutra treatment.

The standard kshara sutra is prepared by repeated coatings of alcohol extract of guggul (Comiphoramukul), apamargakshara (ash of Achyranthusaspera) and haridra (Curcuma longa) powder over a surgical barbour linen thread no.20. This thread is spread out length wise in hangers. Each thread on the hanger is then smeared with extract of guggul with the help of gauze piece soaked in the guggul gum resin. This wet hanger is transferred in kshara sutra cabinet. On the next day the dried threads are again smeared with guggul, this process is repeated for 11 days. On the 12th day the thread is again smeared with guggul and then in the wet condition, thread is spread over the Apamargakshara powder. The thread is now allowed to dry in cabinet & the same procedure is repeated for seven times in seven days continuously. Dried thread is smeared again with guggul and in wet condition, haridra powder it to be coated over the thread & is repeated for three consecutive days. In this way, a thread has total 21 coatings of guggul, 7 coatings of Apamargakshara and 3 coatings of Haridra powder. After completion of 21 coatings each thread about should cut away from the hangers and sealed in glass tube.

The kshara sutra extracts were subjected to phytochemical analysis to detect the presence of following biomolecules using the standard qualitative procedures as described by Trease and Evans (1989). Acetone extract were tested using TLC for the presence of three curcuminoids. The TLC pre-coated silica gel (Merk-60 F254,0.25mm thick) plate were developed using a Camag twin trough glass tank which was pre-saturated with the mobile phase for 1 hour and each plate was developed to a height of about 10cm. The composition of mobile phase was optimized by using different mobile solvents of varying polarity. After development plates were removed and dried and spots were visualized in UV light. The results revealed that ksharasutra contains alkaloids, flavonoids, tannins, saponins, guggulsterone (anti-inflammatory) and curcumin (antibacterial). Its anti-inflammatory and antibacterial activities are due to the presence of these active constituents.

Keywords: kshara sutra, Apamargakshara, chemical analysis
THE EFFECT OF SCHOOL ENVIRONMENT AND PEER RELATIONSHIP ON EXECUTIVE FUNCTIONS IN A SAMPLE OF ADOLESCENTS - A PRELIMINARY STUDY

K.A.T. Nayanapriya*, P.T.M.A. Nanayakkara*, M.I.S. Silva*, B.C. Guruge1, Chandana Hewage*

* Department of physiology, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda
1National Hospital of Sri Lanka

Executive functions (EFs) are prefrontal cortex (PFC) mediated higher cognitive functions essential for maturation of cognition and appropriate behavior. The PFC can be affected by various adverse environmental and stress situations faced by adolescents leading to various behavioral and cognitive abnormalities. Preparation for Advanced Level examination is considered to be such a situation where conflict of interest can occur between teacher’s demand and child’s expectation.

This was a part of an ongoing study conducted to assess how demands in school and peers can affect the performances of executive function tasks (computerized visuo-spatial working memory (VSWM) and verbal working memory (VBWM) tasks) in a sample of adolescents who sat for the A/L examination in 2014 for the first time. The school and peer effects were assessed through a self-administered questionnaire with higher scores reflecting more supportive environment for the adolescents. Items that assessed in the school environment includes emotional support, enriched environment etc. Correlation was assessed through spearman correlation coefficient(r) and significant level was kept at p < 0.05.

Study sample was comprised of 35 children within Maharagama educational zone with a mean age of 19.5 years (+0.51) and 48.6 % of them were girls. Correlation between school environment and WM tasks were statistically non-significant (r=0.02, p=0.93 and r=0.11, p=0.55). Correlation between peer relationship and WM tasks were 0.35 (p=0.04) and 0.16 (p=0.36) respectively. Correlation between GCE A/L Z-score and visuo-spatial and verbal WM tasks were 0.15 (p=0.41) and 0.08 (p=0.66). All were positively correlated. Only the correlation between peer relationship and VSWM was statistically significant. This may be due to the smaller sample size.

Keywords: School environment, Peer relationship, Executive functions, Working memory, GCE A/L Z-score.
EFFECTIVENESS OF SODIUM FLUORIDE AND ACIDIFYING BLOOD SAMPLES IN THE \textit{IN VITRO} PRESERVATION OF BLOOD GLUCOSE AND DIABETIC DIAGNOSIS

Inoka Uluwaduge, Kobika Thillainathan, Janani Jeyachandran, S.S.P. Gamage

Medical Laboratory Sciences Degree Program, Department of Allied Health Sciences, Faculty of Medical Sciences, University of Sri Jayewardenepura, Nugegoda

kosthima@gmail.com

This study was carried out to validate the use of sodium fluoride in the \textit{in vitro} preservation of blood glucose and diagnosis of diabetes and to decide on a simple and more reliable alternative in the place of NaF to preserve blood glucose concentration more effectively.

A total number of 103 volunteer individuals including 20 diabetes patients (to ensure obtaining higher values) participated in this study. Fasting or random blood samples (3 ml) were obtained from each participant and aliquot into three different containers; the plain tube, NaF containing bottles and citric acid containing bottles. Blood in plain tubes were processed immediately and the values obtained from the tubes were taken as the baseline glucose concentration. Blood samples preserved with NaF (1mg NaF /3mg K$_2$C$_2$O$_4$ /1mL blood) and citric acid (5mg citric acid /2mg EDTA-2Na /1mL blood) were analysed for glucose (Glucose oxidase enzymatic kit, BiaSys) after 1 hour and 2 hours of collection and the values obtained were compared against control value from plain tube.

The mean baseline blood glucose concentration obtained was 106.5 mg/dL. A significant reduction in the mean glucose concentration was seen [8.9 mg/dL or 8.8% at 1 hour and 12.2 mg/dL or 11.9% at 2 hour; \( p < 0.05 \)] when blood was drawn into tubes containing NaF /K$_2$C$_2$O$_4$. In contrast, the reduction in the mean glucose concentration was comparatively less [2.3 mg/dL or 2.2% at 1 hour and 4.4 mg/dL or 4.1% at 2 hour] when blood was drawn into tubes containing citric acid / EDTA-2Na. The test sensitivity of citric acid treated samples was higher than the NaF treated samples. Especially among the cases having glucose concentration within IFG range (based on baseline glucose findings), the test sensitivity of citric acid treated samples (61.5% at 1 hour and 30.8% at 2 hour) was superior in comparison to the NaF treated samples (7.7% at 1 hour and 0.0% at 2 hour).

Based on findings, the citric acid containing tubes are superior to the NaF containing tubes in the preservation of blood glucose. Treating blood samples with citric acid (acidifying blood samples) minimizes the risk of misdiagnosis of diabetes and prediabetes. Therefore, citric acid would be a simple and more reliable alternative for NaF in the \textit{in vitro} preservation of blood glucose.

**Keywords:** sodium fluoride, acidifying samples, blood glucose, diabetic diagnosis, \textit{in vitro} preservation
CURRENT STATUS OF PROVINCIAL AYURVEDA PHARMACEUTICAL INDUSTRY IN SRI LANKA


Department of Dravyaguna Vignana, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Yakkala, Sri Lanka

nirasha1982@yahoo.com

Ayurveda pharmaceuticals are an important component in Ayurveda system of medicine. As a result of urbanization, industrialization and globalization, preparation of Ayurveda pharmaceuticals has evolved as a commercial industry. Due to expansion of the industry, quality, safety and efficacy of products and the manufacturing standards are widely considered as important by the consumers. Therefore evaluation of standards of pharmaceutical industry in Sri Lanka is significant. The objective of this study was to assess the criteria applied in standard Ayurveda pharmaceutical manufacturing process.

This study was conducted as a questionnaire based field survey with consenting twenty (20) Ayurveda pharmaceutical manufacturers randomly selected from Uva, Sabaragamuwa, Western and Southern provinces. Prepared questionnaires were distributed to the manufacturers and data were collected. Data were analyzed using descriptive statistic in SPSS 22 statistical package.

It is revealed that 50% of manufacturers were large scale and others were related to small and medium scale. 70% of industrial places were under the supervision of registered Ayurveda medical officers, classical formulas and herbal cosmetics are been produced by the 45% of manufacturers, 95% of employees were skillful with the experience. Plant, mineral and animal materials are been used by 100% of manufacturers, 55% of manufacturers are dependent for raw materials on traders, cultivators, collectors from natural habitat and importers. Eighty five percent of manufacturers highlighted that non-availability of required quantities of raw materials. Dissatisfaction of quality of raw material was 60% and 65% of manufacturers were not satisfied with the supply chain of the raw materials. 55% of manufacturers used traditional and modern technology and equipment in manufacturing processes, 65% of manufacturers did not apply traditional and modern standards to upgrade the quality of final product of the medicine. Further to that 55% of manufacturers have not applied Good Manufacturing Practices (GMP) and ISO standards in the process of Ayurveda pharmaceutical preparations.

Conducting awareness on standardization of raw materials, manufacturing processes and finished products will lead to the development of Ayurveda pharmaceutical industry according to global expectancies.

Keywords: Ayurveda, Pharmaceuticals, Industry, Status
FACTORS AFFECTING BLOOD PARAMETERS OF ADULT DENGUE PATIENTS INCLUDING INTAKE OF PAPAYA LEAF EXTRACT


Faculty of Medical Sciences, University of Sri Jayewardenepura, Sri Lanka
nickydemel@gmail.com

Dengue is the most important mosquito borne viral infections found in Sri Lanka. Systematic IV fluid therapy is the recommended treatment according to guidelines released by the Ministry of Health. Thrombocytopenia is an important feature which aids in the initial diagnosis of dengue. A study to describe the effectiveness of papaya leaf extract, patient and health care based factors on platelet counts of adult dengue patients was attempted here.

An interviewer administered questionnaire was filled for each of the 200, serologically/clinically diagnosed dengue patients (both dengue and dengue haemorrhagic fever) at Colombo South Teaching Hospital of which 52 had ingested papaya leaf extract. The 52 patients had taken a minimum volume of 10 mL (single dose) of concentrated papaya leaf extract of which the number of doses varied between 1 and 9. The platelet count on day 3 of admission was taken into consideration. Participants were selected from the study setting entirely on voluntary basis after obtaining written informed witnessed consent. The variables were recorded and analyzed on SPSS software using Chi square test, Independent-Samples T test, Paired-Samples T test where applicable.

The findings of this study showed a significant (p=0.005) association with platelet count on day 3 and intake of papaya leaf extract. When papaya leaf extract was ingested, the mean platelet count on day 3 was 24210 higher than when it was not taken. The platelet count on day 3 showed a significant (p=0.005) association with the number of doses of papaya leaf extract (higher platelet counts were seen when increased papaya leaf extraction doses were given). Association between sex and platelet count was significant (p=0.019) in the group which had taken papaya leaf extract where the females had a higher platelet count. This association was not observed in the group which had not taken papaya leaf extract. The patients age, past episodes of dengue, smoking habits, alcohol intake, type of meal, presence of chronic illnesses and usage of ayurvedic home medications prior to admission were not significantly associated with the platelet count irrespective of whether papaya leaf extract was taken or not. The study shows that papaya leaf extract causes a significant increase in the platelet count. Due to time constrains, the cases encountered was inadequate to analyze the effect of papaya leaf extract extensively by dividing it as dengue fever and dengue haemorrhagic fever for which further research is recommended.

Keywords: dengue, platelet count, papaya leaf extraction
DEMOGRAPHICAL CHARACTERIZATION OF DENGUE INFECTED PATIENTS IN AKURANA MEDICAL OFFICER OF HEALTH AREA, CENTRAL PROVINCE OF SRI LANKA


1Molecular Medicine Unit, Faculty of Medicine, University of Kelaniya, Ragama, Sri Lanka
2Biotechnology Unit, Industrial Technology Institute, Colombo 7, Sri Lanka
3Institute of Fundamental Studies, Kandy
4Anti Malaria Campaign-Regional Office-Kandy
5Department of Zoology, Faculty of Science, University of Kelaniya, Kelaniya, Sri Lanka

hasnayana@yahoo.com

Dengue has been recognized to be one of the major threats on the public health of many tropical countries including Sri Lanka. The controlling of the high rate of mortality caused by dengue, that remains without being altered regardless of the immense efforts and control strategies of the relevant authorities, has remained as a major challenge in the Sri Lankan health sector. Vulnerability assessment of communities to dengue infection is of higher importance in drafting and implementation of management plans to ensure effective management and controlling of dengue epidemics at the regional scale. Therefore, a statistic based analysis of the dengue patient characteristics was carried out to determine the susceptibility of population to dengue infection in Akurana Medical Officer of Health (MOH) area. Monthly records of reported dengue cases from 2010 to 2014 of the Akurana MOH division were collected. Normal Chi square test coupled with Paired-Chi square test was devised to investigate the impact of sex and age on the infection. MINITAB (version 14.12.0) software package was used for statistical analysis. In accordance with the results of the normal Chi square, the percentage Infected Male: Female Ratio (PIMFR) remains significantly altered throughout the period of study (p=0.001<0.05 at 95% of significance). Males tend to indicate relatively high susceptibility for dengue infection than females (with 61.19: 38.81 of average PIMFER). The vulnerability of age groups for dengue infection was analyzed among different age groups as year 0 - 5 (8.18 %), 6 - 10 (18.89 %), 11 - 20 (33.85 %), 21 - 30 (17.19 %), 31 - 40 (7.98 %), 41 - 50 (9.59 %), 51 - 60 (2.48 %), and > 61 (1.84%). However, according to the Paired-Chi square test, the vulnerability of age groups tend to shift significantly throughout the study period [>X2 (7, 0.95) = 14.067]. In conclusion males tend to indicate relatively high susceptibility to dengue. Age groups of 6 - 10, 11 - 20 and 21 - 30 could be recognized as highly vulnerable age groups in the community for dengue, while age group of > 61 emerge as least vulnerable group for the infection of dengue in the Akurana MOH.

Keywords: Dengue, Akurana, Infection.
OBESITY INCREASES THE RISK OF DEVELOPING INSULIN RESISTANCE AND PROMOTE METABOLIC SYNDROME: A STUDY AMONG OBESE AND NON-OBESE NON-DIABETIC SUBJECTS

N Ranadeva, L Athiththan, U Hettiaratchi

Department of Biochemistry, University of Sri Jayewardenepura, Nugegoda
nadeekadimu@gmail.com

International Diabetes Federation defines, central obesity indicated by increased waist circumference (WC) as the primary criteria of metabolic syndrome. In addition, insulin resistance (IR), impaired fasting serum glucose, hypertension and dyslipidemia are considered as other criteria for assessing metabolic syndrome. Hence the aim of this study was to identify the potential risk factors for the development of metabolic syndrome in obese subjects. This study was conducted at Faculty of Medical Sciences, University of Sri Jayewardenepura as a case control study, in subjects who were not diagnosed as diabetics and had fasting serum glucose level < 100 mg/dL (n = 100), aged 20-40 years, consisting obese as the case group (Body Mass Index ≥ 25 kgm⁻², n = 50) and non-obese as the control group (Body Mass Index < 25 kgm⁻², n = 50). WC > 80 cm in females and WC > 90 cm in males were considered as cut-off values for central obesity. Venous blood sample (4 mL), was obtained. Fasting serum glucose (GOD/POD kit method), fasting serum insulin (ELISA method) were assessed. Insulin resistance was calculated using the homeostasis model assessment-estimated insulin resistance (HOMA-IR).

\[
\text{HOMA-IR} = \frac{\text{Fasting insulin (\muIU/mL)} \times \text{fasting glucose (mmol/l)}}{22.5}
\]

HOMA-IR ≥ 2.6 was considered as insulin resistant. Data were analyzed using SPSS and Microsoft Excel 2010. Among the obese group, 38% of the subjects had HOMA-IR ≥ 2.6 (4.37 ± 2.22 µIU/mL), whereas in non-obese group only 8% had HOMA-IR ≥ 2.6 (4.30 ± 2.49 µIU/mL). In obese group 82% had central obesity (males = 96.7 ± 5.1 cm, females = 89.4 ± 8.5 cm) while in non-obese group there were only 14% with central obesity (males = 92.8 ± 3.1 cm, females = 84.2 ± 2.3 cm). Among the obese group, 34% had both high HOMA-IR and central obesity, but in non-obese group only 2% had both insulin resistance and central obesity. Apart from this, the obese subjects had significantly higher (p value < 0.05) mean insulin resistance value (2.82 ± 1.86) compared to the mean IR value (1.91 ± 0.99) of non-obese subjects.

Even in apparently normal non-diabetic subjects, high percentage of obese subjects had increased WC. Further, a good percentage of these obese subjects also had increased HOMA –IR indicating obesity alone could give rise to insulin resistance and promote the risk of developing metabolic syndrome.

Keywords: Insulin resistance, Waist circumference, central obesity, obesity, HOMA-IR
HBV AND HIV SEROPOSITIVITY, KNOWLEDGE, ATTITUDES, PRACTICES ON DISEASE TRANSMISSION AMONG FUNERAL INDUSTRY WORKERS IN SELECTED DISTRICTS OF SRI LANKA


Department of Microbiology, Faculty of Medical sciences, University of Sri Jayewardenepura

Exposure to body fluids and other clinical material pose a clear risk of infection for those involved in the process of embalming and cadaver handling

A descriptive cross sectional study was carried out among funeral industry workers in Colombo, Gampaha and Matara districts in 2014. A 5 ml blood sample was collected from each participant and tested for the presence of Hepatitis B surface antibody (Anti HBs) and Anti HIV antibodies using enzyme linked immunosorbant assay and rapid immunochromatography assay respectively. Data was collected using an interviewer administered questionnaire. Knowledge, attitudes and practices on prevention of disease transmission while cadaver handling and knowledge and attitudes on funeral industry related infectious hazards were assessed using 57 and 29 questions respectively. A score of 1 was given for each correct response, attitude or practice. A total score of more than 75% was considered good, 50-74% moderate and less than 50% poor for each category

The study included 70 participants employed as embalmers (n=41, 59%) and helpers (n=29, 41%). Majority of the participants (n=47, 67%) had been employed for >10 years of the 70 participants, 5 (7.1%) individuals with no history of vaccination were positive for antibody against Hepatitis B surface antigen indicating that they were exposed to the infection. None were positive for antibody against HIV. The participants had an overall moderate knowledge (52%), poor attitudes (42%), and moderate practices (53%) with regard to disease transmission during embalming and cadaver handling. Sixteen (23%) and 37 (53%) knew that infected cadavers could transmit HBV and HIV respectively. Only 15 (21%) and 7(10%) identified that HIV and HBV infected bodies should not be embalmed. While 66 (94%) were unaware of the HBV vaccine, 21% of the respondents were of the attitude that it is important. The use of personal protective equipment was poor, but 84% claimed to use gloves during embalming. None had received formal training in cadaver handling and infection control. However all respondents wanted to obtain professional training in this regard.

Majority of the funeral industry workers are at risk of occupational exposure to HBV and HIV. Formal training programs and guidelines are needed to improve the embalming practices and reduce the possibility of occupational infections in this group.

Keywords: HBV, HIV, funeral industry, embalmers and infection control
HUMANITIES
A STUDY OF FACEBOOK ADDICTION LEVEL AMONG TEENAGE SCHOOL STUDENTS IN SRI LANKA (IN NEGOMBO EDUCATIONAL ZONE)

K. D. Nathalia Fernando

Department of Philosophy, University of Kelaniya, Sri Lanka.

Nowadays, Social Networking Sites (SNSs) are major communication system in all societies. Among them Facebook is the most popular social networking site with more than 2 billion users all over the world, especially, young users. Facebook is a useful social sharing network especially for young people in case it is consciously used. However, overuse and unconsciously using Facebook has brought the discussions about a habit such as Facebook addiction into agenda. ‘addiction’ to social networks on the Internet may be a potential mental health problem for some users. Facebook Addiction has also been conceptualized under Internet Spectrum Addiction Disorder. In Sri Lanka Facebook is a social sharing network which is mostly used among the teenage school students in order to communicate with friends, entertain and relax, upload/download photos. Facebook Addiction also makes Sri Lankan teenagers experience problems and erosions in their social life and relations. Therefore Objectives of this research were, to identify the level of facebook addiction among teenage school students in Sri Lanka. Selected sample was 400 teenage students in Negombo educational zone as respondents. To collect the data questionnaire was used. Data were analyzed by using simple percentages, t-test to investigate the facebook addiction level. Findings show, ‘Facebook chat’, ‘Wall post’, and ‘Picture uploading’ were features used most. According to this when the Facebook usage period increases Facebook addiction levels also increase. Facebook addiction levels of females are higher than males’. Those who are connected to Facebook through both computers and cell phones have higher level of Facebook addiction than those who are connected only computers or cell phones. Finally, the more Facebook using experiences of teenage school students increase the more their levels of Facebook addiction increase and the decrease in real life social community participation and academic achievement, as well as relationship problems.

**Keywords:** Facebook addiction, Social Networking Sites (SNSs), Teenagers, teenage school students, Internet Spectrum Addiction Disorder
Consequent to the rapid development of Chinese education many of international student’s enrollments of higher education have increased. The rapid development of social media has fundamentally reshaped the world education system. CNNIC (2009) Statistical survey report on the Internet development in China mentioned that China dominates the blogosphere worldwide, with 162 million Chinese bloggers (CNNIC, 2009). According to Walsh (2008), blogging in China is not just a pastime for opinion leaders but a form of collective behavior emphasizing the cultural need for togetherness in the Chinese society (Walsh 2008). This paper examines Usage of social media and related problems of international students in the Wuhan University in China.

A survey method was used to collect data and sample is selected among international students who are studying in Wuhan University in china. A questionnaire is used as research instrument to collect primary data. Despite the distribution of 250 questionnaires to international students, only 216 (86.4%) were received from them.

The research finds that legal risk, privacy, credibility, convenience, copyright, cost, time and permanency are influenced to use of social media and related problems. A “content of social media” is predominantly used by international students in the Wuhan University. These media sites are used by post graduate students to achieve their educational and entertainment purposes. When consider major study area variation of using social media can be observed even among the student in the same major subjects. The usage of social media would be determined by the individual expectoration of the international students. Although social media like face book, Twitter, LinkedIn, blogs, wikis, and other virtual communities help create new opportunities to build up diverse relationships with each other, there are many inherent legal risks that everyone has to face unenthusiastically. This research finds that when the university students are more concerned about legal risk, the frequency with which they use for social media sites decreases. The current research discovers that convenience of use of social media directly affect the highest usage of the social media. Unique characteristic feature of media usage in China is applying restriction for popular media sites and introduced alternative Chinese popular native social media sited instead. Therefore learning native language will benefited approaching to social media. Hence, it can be concluded that, native social media usage in China is positively affected by Chinese language proficiency.

**Keywords:** Social Media, International Students, Legal Risk, Privacy, Individual Expectation
The media has transformed itself into an influential factor within the contemporary world. It has embraced the entire society rather than remaining as a specific sector within the social fabric. Human thought processes as well as human behavior patterns have been dominated by the modern media culture. Commercialization of media has widely been studied and analyzed by the various trends of media studies during the last few decades. But, the commercial use of social media remains as an unexplored area within the Sri Lankan media studies research. This paper contributes to fill that gap. Using Facebook and mobile phones for promoting commercial industries is an emerging trend in the country. This study mainly focuses on the way in which that new media functions as an important tool in promoting business purposes. It evaluates the efficiency of mobile communication and social media in terms of functioning across boundaries of space and time. This study is conducted through qualitative research methodology. The descriptive survey method also is employed, since the research aims to inquire about business interventions in small scale organizations as well. The study limits to the mobile marketing and social media within Sri Lankan context only. The sample contains the owners of small scale businesses and Facebook consumers. The prevailing condition is to be analyzed by interviewing the owners of the business organizations and consumers. These interviews are to be conducted in two sections with 07 key questions as a web-based survey. The SPSS data package is to be used as the main analytical tool to analyze the data. The analysis reveals as to what extent the businesses gains benefits of using Facebook and mobile marketing.

**Keywords:** New Media, Business, Facebook, Mobile phone
EXTREME BEAUTY: EXTRAVAGANT ELEGANCE OF THE COSTUME OF THE KANDYAN ELITE

G.M. Ranathunga

Fashion Design and Product Development, Department of Textile and Clothing Technology, Faculty of Engineering, University of Moratuwa, Sri Lanka.
gayathrir@uom.lk

Objective of the research is based on a dedicated dress fashion which was very much vogue among elite male of the Kandyan Kingdom of Sri Lanka during the 18th century. It is aimed to incubate fashion concepts and introduce fashionable sartorial elements to the field of fashion, inspiring the costume. The Kandyan era was a transitional era (from 16th century to 1815) of the traditional dress which conveyed new meanings through dress, due to many foreign influences spread over the Kingdom.

Kandyan elites were powerful distinguished group who were consisted of high rank officers, drawn from a few families of high caste at the Kings service. Their extensive luxurious costume signified dignity, power and high social standard.

The analysis was explored through historical records, murals of the period and reviewing literature. The analysis was surveyed through socio-cultural, administrative, religious and economic factors of the era. These factors were again analyzed with foreign influences to understand the theoretical base on influence fashion. This has resulted in developing several psychological, social and economic theories to explain how such statuses were instrumental in bringing about in influence in fashion.

The Kandyan costume was hybrid formation of Eastern and Western sartorial elements. The dress has an extravagant body silhouette. The dress was arranged by making knots, pleats, folds and frills wrapping around the body rather than tucking pins or sewing. Foreign costume had been considered by elites as a symbol of displaying their high social status to the society. Exquisite dresses were coupled psychologically with good social status. As well as, it was revealed that live or symbolic model influenced the elites. Elites learnt fashion by observing foreigners and the King. Moreover, peer pressure of their group was very much influential in exerting foreign fashions to their costume. Besides all, the task of the dress was more highlighted than the beauty of the dress. These theories cut across time factors and introduce basic theoretical approaches to the present.

Keywords: Kandyan elite, Extreme beauty, Extravagant dress silhouette, Traditional elegance
The Human history and the Political Communication are widely accepted as originated simultaneously. Upon the growth of the Democracy and the political party concept the Political Communication too grew into a more deliberate level. Politian now use political communication beyond mere campaign to address the public conscious intensely. Using the dignity of candidate’s pedigree as a strategy to manipulate the voters’ favor might have been first initiated in this background. A close analysis on the Presidential elections of Sri Lanka will strongly prove this.

Following research was conducted to analyze the pedigree of the major candidates contested in 1994 and 1999 Presidential elections. These 02 elections were selected specifically on the grounds of the main candidates and their pedigree. Selecting 02 elections which had 02 main candidates with equally notable pedigree was important for a better comparison. Thus, each of the election campaigns were closely analyzed by scrutinizing all national week days and weekend newspapers published during the relevant election campaign times. Reviews from 10 academics/experts including senior professors and journalists is also included. This was done in order to confirm the research findings and tally those facts in to the theories of political communication. A survey was used to evaluate the impact caused on the voters by the pedigree of the presidential candidates. The survey was distributed to a sample of 100 voters chosen over the population of each district of the country. Voters’ responses to the survey were further analyzed by using IBM SPSS software package.

The assumption adopted for the aforesaid research was undeniably asserted by the research. Usage of the dignity of presidential candidate’ pedigree as a campaign strategy was factual. The research also implicated the allurement of certain voters towards the candidates of comparatively prominent pedigrees. Also, the negativity implied from the pedigree of a candidate was strategically capitalized by opposing candidates.

**Keywords:** Pedigree, Candidates, Voters, Political Campaign,
ස්කාපාල ගැපවතේ සම්බන්ධ කරන වේ මෙය ඉන්දියා ප්‍රජාතන්ත්‍රව සම්බන්ධ
වේදීම් පැරණිත්‍ර පැරණිත්‍ර පැරණිත්‍ර

sankhapala1984@gmail.com

ස්කාපාල සතුන්ගේ මඟින් මමට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා චාරාජීවිත පිළිතුරු විස්තරක් හා මුදුන අනුව මමට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය.

කොළඹ මහවැලල්කාරීන් මත දත්ව මමට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා චාරාජීවිත පිළිතුරු විස්තරක් හා මුදුන අනුව මමට ඉදිරිපත්‍ර පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය. මෙයේට ඉදිරිපත්‍ර පිළිතුරු විස්තරක් හා මුදුන අනුව පිළිතුරුදෙනාගැනීමක් බෙදෙය.

57 | Page
EXPRESSION OF SENSUALITY: BEAUTY OF FABRIC FOLDING METHODS OF DANCE COSTUMES

Priyanka Virajini Medagedara Karunaratne

Fashion Design and Product Development, Department of Textile and Clothing Technology, Faculty of Engineering, University of Moratuwa, Sri Lanka

virajini@uom.lk

Depicting sensuality in costume by draping wads of fabrics in historical times reveals curious, tantalizing cultural phenomena which signify their complex origins. A costume worn in dance has in it the quality of Rhythm. Even each costume has its own rhythm. However these rhythmic characteristics arise from the culture from which they originate. Every costume comes alive when it is worn on the human body. Skillfully choreographed movements of the human body can be enhanced by the delicate folds and draperies of transparent textiles. However textiles that are two dimensional when worn on the bodies as costumes become three dimensional.

The objective of this paper is to explore in what ways the expression of sensuality in feminine beauty depicted by using fabric folding methods in dance costumes shown in many visual and literal historical formats during the 15th – 17th Centuries in Sri Lanka. The Kotte era was selected as the study setting and signifies ample expressions of sensuality of female dancers.

A qualitative research method was adopted for the research and the analysis of data is explored through in-depth observational studies with many temple murals comparing with original literal texts and poetry pertaining to the era. The process of the research is inductive; the researcher builds abstractions, concepts and theories from details. By triangulating visual and literal data the validation was much confirmed.

The study reveals that there was a unique methodology of arranging the long fold to the lower cloth without any single stitching or tucking by emphasizing subtle body curves by expressing sensual beauty of female. Folds depicted in the dance dresses show how it manipulates the fabric to express creative forms within the fabric. Fold constitutes a move from effective to affective spaces; folding is a description of activity, intended to flow smoothly and continually with no evidence of ambiguity of interruption.

**Keywords:** Folds, Sensuality, Rhythm, Dance costume, Body curves.
The field of translation is becoming exceedingly popular with the advancement of technology. In the Sri Lankan context, the field of audio visual translations, specifically dubbing and subtitling was first practiced in early 1980s. However, compared to the practices in the field of audio visual translation in the other parts of the world, the advancement of the field in Sri Lanka was comparatively slow. Nevertheless, dubbed dramas, movies, etc. from various continents of the world are dubbed in Sinhala and Tamil and telecasted in Sri Lanka. Translating a script for dubbing purpose is challenging since the translator has to focus on the linguistic factors as well as socio-cultural factors related to both the source language and the target language. The purpose of the study was to analyze strategies in translating culture specific expressions in translating a script for dubbing purpose. As the methodology, culture specific references of a Korean drama which consist of 50 episodes of 60 minutes each, which was translated and telecasted in Sinhala was analyzed. The analysis was done from the word level and above word level considering the linguistic factors as well as socio-cultural factors of both source language and the target language. Thus, the findings show that apart from strategies of translating the other conventional media, polysemiotic nature in audio visual translations, had driven the translator towards paraphrasing, addition, omission, adaptation and direct transfer to a greater extent. Furthermore, an audio visual translator has to use several interventional strategies in translating culture specific expressions within the cultural, linguistic, technical and contextual considerations in translating a script for dubbing purpose.

Keywords: Audio visual translations, Dubbing, culture specific references, translation strategies, source language and target language
RELEVANCE OF KABIR'S POETRIES OF SOCIAL CRITICISM TO MODERN INDIAN SOCIETY

Chathurini Fernando¹, Lakshman Senevirathna²

¹Department of Basic Principles, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya, Sri Lanka
²Department of Hindi, Faculty of Humanities, University of Kelaniya, Sri Lanka

Kabirdas was the well-known poet of Bhakti Period which means the medieval period of Hindi Literature. His vision of life is centered on the elimination of social discrimination resulting from caste and religious discrepancies and setting up of an ideal society where individuals entertain equal rights and privileges. The initial setup of the accomplishment of his vision was to bring about changes in personal attitudes of individual for a moral development. He used the poem as the primary medium for social enhancement through individual development. His poetry was directed towards this adviser vole and attempted at a social revolution. According to him, all human beings are created by the same root of blood and therefore everyone in the society should entertain equal rights. Thus the objective of this study was to identify the relevance of Kabir’s Poetries of social criticism to the modern Indian society. Primary data collective method was used for the study and data were taken from the relevant classical Indian books, magazines and other supportive books which are related to Kabir's Poetries. Overall finding reveals that his guidance enabled many people towards to realize good and correct attitudes and to give up certain faiths and myths they followed blindly. Further, Kabir’s religious philosophy, humanism and his language are mostly relevant to the present society. According to the analyzed results it can be concluded that Kabir's advices and his social philosophy is highly relevant and they have made a great impact on the modern Indian society.

Keywords: Kabir's Poetry, Medieval Period Hindi Literature
Terms which are related in addressing the relatives or relations are called as kinship terminology and this can be considered as another important phenomenon which can be found in socio linguistics, which studies the relationship between language and society. Kinship terminology plays a vital role in translation, especially in literary translation, since all most all the literary pieces of work utilize kinship terminology. According to Wardhaugh R (1986) “There is a considerable literature on kinship terminology, describing how people in various parts of the world refer to relatives by blood (or descent) and marriage. Kinship systems are a universal feature of languages, because kinship is so important in social organization. Some systems are much richer than others, but all make use of such factors as gender, age, generation, blood, and marriage in their organization”. This study will utilize the novel Giraya written by Punyakante Wijenaike and its translation by Cyril C. Perera in extracting the necessary instances and examples in assessing the kinship terminology which indicates a close relationship with the society. The novel Giraya (1971), originally written in English by Punyakante Wijenaike is translated into Sinhalese by the well-known translator Cyril C. Perera in the year 1992. Since kinship terminology might vary from one language to another, it is important for the translator to pursue a clear cut understanding of the usage of correct kinship terminology. Similarly it is quite evident that when a translator deals with two different languages, she/he is always dealing with two different cultures and in that sense it is very important for a translator to be knowledgeable about the terms which are being used by the respective communities.

Keywords: Translation, Kinship Terminology, Problems
A DISCUSSION ABOUT THE DRAMATIC IRONY CONCEPT

H. W. B. I. Sampath

University of Kelaniya, Kelaniya
bihesh@gmail.com

Irony is the reciprocity of poetic experience. Some critics have explained it as a deference of two knowledge levels. Irony is a western literally concept. There are many kinds and usages of irony, Verbal irony, Structural irony, Stable irony, Unstable irony, Socratic irony, Dramatic irony, Tragic irony, Cosmic irony, Romantic irony, Classical irony, Situational irony etc. The dramatic irony what the cognizance of audience, unknown something of dramatis personae is a main kind of irony. In Oedipus drama, audience know about the augury of gods, Jocasta and others who are the dramatis personae known it the end of the drama. The Mark Antony’s speech of Julius Caesar, written by William Shakespeare is an ironical act. Mark Antony want damaged the personality of killers of Julius Caesar. However, he compliment by soft words to killers. He calls as 'honorable Brutes', who is the main killer of Julius Caesar. The citizens can able to understand the ironical meanings of this speech and after they killed Brutes and his party. The twin menaechmi, written by Plautus is another western example about dramatic irony. The eastern drama writers have used dramatic irony concept also, to increase the meanings and Rasa of their dramas. Rathnawali, written by Sri Harshadewa and Abhignana Sakunthala, written Kalidasa kavi are examples. The audiences know what the identity of Sagarika is. They know her as the princes Rathnawali who is the daughter of king Wickramabhahu of Sri Lanka. However, the dramatis personae known it the end of the drama. King Dushshanta of Abhignana Sakunthala lulls an unknown child in the ending episode. Finally, king knows him as his own son. In Sinhalese stage, lot of dramas has produced with dramatic irony. Tharavo Igilethi written by Lushan Bulathsinhala, Wessanthara written by Ediriweera Sarachchandra, Suba saha Yasa written by Saiman Nawagaththegama, Charandas directed by Parakrama Niriella are examples. The writers and producers of those dramas have used irony concept to increase the rasa of their dramas. The objective of this research is discussion about the irony concept of foreign and Sri Lankan dramas. This research based on primary and secondary sources. Dramas and basic literary criticism books study as the primary sources and ideas of modern critics study as the secondary sources. Dramatic irony is a very important part of dramas, which related with all traditions of world.

Keywords: Drama, Irony, dramatis personae, audience
EMPLOYMENT OF MUSIC IN INDIAN CHHAU THEATRE

W. B. A Vitharana

Dept of Languages, Cultural Studies and Performing Arts
University of Sri Jayewardenepura, Nugegoda, Sri Lanka
Wijayassri@gmail.com

Chhau is a form of folk theatre tradition created by the Indian folk artists. The special feature of the Chhau theatre is the use of the mask like Kolam theatre in Sri Lanka. Chhau is prevalent in West Bengal, Jarkand and Orissa states in India. The Chhau theatre consists of three traditions known as Purulia Chhau in the Purulia district in West Bengal, as Seraikela Chhau in the Seraikela district in Jarkand and as Mayurbanj Chhau in the Mayurbanj district in Orissa. Chhau theatre has been created for the entertainment of the village folk. The music employed in Chhau is of classical nature. It has been developed by the Hindustani classical music and some indigenes music forms and folk tunes of Oriya.

The aim of this study is to inquire into the employment of music in Indian Chhau theatre. From this study, it would be clear that there are some special characteristics and common features among the Purulia, Seraikella and Mayurbhanj traditions of Chhau. The common features of all traditions are: In Chhau plays prominence is given to instrumental music and singing is of little importance, the musical party or the orchestra consists of two tribal drums known as Dhamsa (large kettle shape drum), and the two cylindrical drums known as Dholot Dholak and one wind instrument known as Sehnai. Use classical music and some indigenes music forms and folk tunes for the Chhau theatre. All the compositions have three distinct stages of increasing intensity in their tempo: low (Vilambit), medium (madhyalay), and high (drut), are special characteristic of musical features in Seraikella Chhau. The music of Mayurbhanj Chhau is generally classified into four phases: Vilambit, Madhyalaya, Drutalaya and Nataki. For this study, practical observations and interviews were used as the main research instruments.

Keywords: Chhau, Folk, Theatre, Music.
A STUDY ABOUT THE PARALLEL CONCEPTS OF SANSKRIT RHETORIC AND SPOKEN SINHALA

H. W. B. I. Sampath

University of Kelaniya, Kelaniya
bihesh@gmail.com

In poetics, rhetoric is useful to increase the beauty of poems. Sanskrit critics have analyzed a lot of rhetoric kinds. There are two main kinds of Alankara, Arthalankara(rhetoric) and Shabdalankara(Sound devices). Rhetoric principals have a very long history. It starts from Vedic era. Natyashastra, written by Bharathamuni (3rd century A.D.) has been very earliest analyzed rhetoric principles. He explains three rhetoric kinds (Upama-simile, Rupaka-metaphor, Deepaka-illuminator) and one sound device (Yamaka-of an artificial poem). This study is limited to rhetoric. After Bharatha, Bhamaha(36 rhetoric kinds), Dandeen(35 rhetoric kinds), Vishvanatha(70 rhetoric kinds), Jayadeva(100 rhetoric kinds), Apayaadeekshitha(125 rhetoric kinds) and other critics have been analyzed a lot of rhetoric kinds. The earliest critics identified and analyzed the rhetoric kinds following by the usages in oldest literary books. The critics of middle era followed the both way, literary and rhetorical books. The earliest poets had not a rhetoric explanation. They may be got poetic sayings by spoken languages. In this way, scholars can identify parallel concepts of rhetoric in spoken languages. Sinhala language has two different paths, Spoken and writing Sinhala. This research is limited to spoken Sinhala. The objective of this research is discuss about the equality of Upama(Simile), Rupaka(Metaphor), Swabhavokti(Description of nature), Akshepa(Hint), Arthantharanyasa(The Transition), Samasas(Condensed Metaphor), Athishayokthi(Hyperbole), Hethu(The Cause), Sukshma(The Subtle), Lava, Preyas, Urjasvi, Samahitha, Visheshokthi(Peculiar Allegation), Aprasthuthaprasansa(Indirect Description), Nidarshana(Illustration), Ashikh, Smarana(Reminiscence), Vyajokthi(The Dissembler), Gudhokthi(The Secrecy), Vivruthokthi(Open Speech), Lokokthi(Popular Saying), Chekokthi(The Skilful Speech), Prathisheda(Prohibition) and other main rhetoric kinds and spoken Sinhala. In “Aliyek vage Minihek”(The man as big as likes an elephant), “Mage puthamatamenikak”(My son is a gem to me) sentences speaker uses very simple rhetoric kinds, Simile and metaphor. Other complex rhetoric kinds also can find in spoken Sinhala like, “Eya nugath duppath kellak unath mata kumarikavak”(She is an uneducated and poor girl But She is an angle to me-Visheshokthi(Peculiar Allegation), “Para aine amma appa nethiva inna lamayith mage unta vada Hondata jeevath venava”(The poor children, who live in streets, live better than my sons-Aprasthuthaprasansa(Indirect Description), “Mila mudal ethi venava, nethi venava. Sunamiyen minissunta koi tharam de ahimivuna da”(Properties are not with people always. As a result of tsunami disaster, how many things forfeiture to people?-Arthantharanyasa(The Transition) etc. This research based on primary data, which is rhetorical books of Sanskrit and selected usages of spoken Sinhala. At the end of this research could realize the similarities of Sanskrit rhetoric and the usages of spoken Sinhala language.

Keywords: Sanskrit, Rhetoric, Critics, Sinhala, Parallel
This study is conducted to identify the lexical difference between Srilankan Tamil dialect and Muslim Tamil dialect. Tamil language which is spoken by Tamils and Muslims vary a considerable extent. Therefore speakers of Tamil on both sides experience difficulty in understanding each other’s speech easily. It could be identified several phonological morphological and syntactic differences in both these dialects. To collect data for this study; both deductive and inductive methods will be used.

However this study explores only on lexical differences specially on noun and verb classes. This lexical differences occur specially from the point of their socio cultural significance. Differences in occupational process, food habits, style of dressing, religious rituals etc; have influenced for exclusive words for both dialects.

Tamil speaking muslims use a large number of words from Arabic language. Moreover kinship terms from both these dialects are quite different.

For instance,
Father - Appa (Tamils) , Vaappa (Muslims)
Elder brother – Anna (Tamils) , Naana (Muslims)

A number of lexical items shared by both these dialects vary in their contextual use.
Gravy - Kulambu (Tamils) , Aanam (Muslims)
Beautiful – Vadivu (Tamils) , Pasunthu (Muslims)

This comparative study hopes to offer new insights into both these communities which could lead to communicate with ease and comfort; moreover this research will be useful to the Sinhala native speakers who learn Tamil as a second language; to understand the respective language without any confusion.

**Keywords:** Lexical differences, Dialectal variations, Socio cultural significances
**ŚUKASAPTATI; A SANSKRIT DIDACTIC WORK WITH EROTICISM**

Ven. Welipitiye Indananda  
Department of Languages, Bhikshu University of Sri Lanka, Anuradhapura  
Welpitiyeindananda@yahoo.com

Telling stories is a unique feature in Sanskrit literature. After the compilation of the two great epics, *Mahābārata* and *Rāmāyaṇa* Sanskrit stories were considered to be fine expressions of many human thoughts. Therefore, many Sanskrit literates decided to use stories in different shapes. Out of them, *Pancatantra* and *Hitopadeśa* are well known Sanskrit story collections. However, much attention should be paid to the set of Sanskrit story collection named *Śukasaptati* or seventy tales of parrot. These seventy stories are told by a certain parrot. The objective of writing this kind of book is to stop a wife whose husband had gone abroad from an undue sexual union. According to the theme of *Śukasaptati*, all research, done by western scholars during the past few decades, describe this work as a merely erotic writing. At the very beginning of each story in *Śukasaptati* the particular wife tries to unite with a paramour. But, the parrot always prevents her from that misconduct. In order to accomplish the aim the parrot uses three tricks. They are as follows:

1. Giving a challenge to the wife  
2. Using gumption at the appropriate occasion  
3. Emphasizing didactic saying

Someone who reads *Śukasaptati* with the mind of afore mentioned three aspects, he or she realizes the didactic importance of this work besides the erotic concepts. Sanskrit didactic stories mainly focus on four great values as *dharma*, *artha*, *kāma* and *mokṣa*. Didactic concepts which relate to these four great values are included in *Śukasaptati*. In this research paper, the researcher tries to discuss *Śukasaptati* as a Sanskrit didactic work through afore stated three aspects. Since the research is a fully literary based research, books, research articles and other writings on *Śukasaptati* are to be used here. Only a few stories of *Śukasaptati* will be used for the convenience of the research. As the conclusion of this research, the researcher hopes to highlight the hidden didactic values in Sanskrit literature, especially in *Śukasaptati*.

**Keywords:** Sanskrit Didactic Literature, Eroticism, *Śukasaptati*, Didactic Concepts in *Śukasaptati*, Four Great Values
Translation is the process of converting words or text from one language to another. The translation process does not always imply the creation of a complete replica of the source work in the target language. Translations differ from their source work due to various factors. John Dryden, the first major English theorist of translation, points out three types of translations in the preface to "Ovid's Epistles". They are metaphrase, paraphrase and imitation. This paper is an attempt to find out which of these types have come to effect in the translation of songs in Bertolt Brecht's "Der Kaukasische Kreidekreis" into English and Sinhala. The English translation of the play "The Caucasian Chalk Circle" by Eric Bentley is based on the original German play by Brecht, whereas the Sinhala translation "Hunuwataye Kathawa" by Henry Jayasena is based on the English translation. In this study, the songs in each translation have been compared with the songs in the original plays. In the English translation, no major changes can be seen whereas various words, ideas...etc in the original play have been altered in the Sinhala translation. This brings us the conclusion that metaphrase and imitation have been utilized as the translation methods in translating songs into English and Sinhala respectively. It is apparent that making changes has been essential because of the cultural differences between the audiences of source and target work. Another reason for making changes has been the necessity of maintaining the rhythm of the songs.
CANONS IN THE COMMENTARY:
AN INVESTIGATION ON A DISCOURSE APPEARS IN THE
AṆGUTTARANIKĀYA AṬṬHAKATHĀ

Aruna K. Gamage

Department of Pali and Buddhist Studies, Faculty of Humanities,
University of Kelaniya, Sri Lanka

As in many religions, the term ‘canon’ here refers to tipiṭaka, which is the primary source of the Theravada Buddhism, preserved in Pāli language while the term ‘commentary’ stands for aṭṭhakathās, the works belong to the exegetical or hermeneutical literature that are composed in the same Indic language for the canon.

The aim of this paper is to examine nature, historicity and substantiality of three Pāli verses occur in Manotathapūraṇī [I 93], the commentary of Aṅguttara-nikāya, which is the fourth text of the ‘discourses of collection’ (sutta-pitaka) in the canon. As this commentary clearly remarks this is a complete discourse (sutta) even though it is concise. The conciseness is not, in any way, conducive to diminish a doctrinal or historical importance of a discourse since we possess constant references for number of smaller discourses of those contents limited only with for two verses and some time for a single verse.

However, arguably, this sutta, which emphasizes the indispensable efficacy of the canonical scriptures for the persistence of the Buddhism and attainability for the spiritual states such as complete emancipation, cannot be found in anywhere in the canon. Furthermore, no correspondent or parallel discourse is traceable in the canon that we currently possess. When considering the exactness of painstaking dedication, as illustrated in the commentaries and Pāli chronicles, done by the Sri Lankan Pali oral tradition in order to preserve the sacred teachings of the canon, it is hard to believe on a careless exclusion of this type of discourse from the Tipiṭaka, which is of worth significance to realize the mutual combination between canonical texts and the spiritual progress. On the other hand, the form of the phraseology of these three verses leads us to believe that it is a later composition of the commentator. The uncertainty of this sutta is reinforced since, as the commentary of Aṅguttara-nikāya records, it is presented by the members of dhamma-preachers in a doctrinal controversy to convince the inevitability of the scriptures to attain to the emancipation rather than fulfilling a virtuous conduct. Therefore, one may tend to believe this as an apocryphal discourse or an improvisation.

Although Buddhist scholarship has paid attention to these verses, no careful scrutiny is available, which scrupulously evaluate the nature of them. Thus, this study is intended to fill that deficiency.

Keywords: canon, commentary, phraseology, Mahāvihāra, commentator
මම තෙක්ව දෙසාවක් ලෙස දෙක්ව කොහෝම් දෙසාවක් ලෙසින්

දෙවි ම. දෙසාව

මම තෙක්ව දෙසාවක් ලෙස දෙක්ව කොහෝම් දෙසාවක් ලෙසින්.
WERE THE VERSE-DRAMA DISREPUTABLE ONLY FOR BHIKKUS?

Neil Pushpakumara
Lecturer, Department Of Sinhala, Faculty Of Humanities, University Of Kelaniya
emnpkumara@gmail.com

When defining verse-drama considering verse and drama as two different terms, they are defined separately in two meanings. When verse-drama is considered as one single word exclusively, the second definition could be accepted as correct. Verse-drama is considered as profane in terms of Buddhist teachings and ecclesiastical codes such as Dambadeni Kathikāvatha code and other laws. According to Dambadeni Kathikāvatha and Karmavibhāgaya, verse-drama categorically refers to a classification of drama as ‘Kavnalu’ or ‘Kavinalu’. This position is confirmed by poetic texts composed by Sri Lankan Buddhist Bhikkus in different languages namely, Pali, Sanskrit and Sinhala. Further, it is assumed that the laws imposed meaningfully according to above sources in respect of verse-drama should not be considered as obligatory. However, verse-drama and music are a taboo for Buddhist Bhikkus according to Buddhism. But, it could be implied by the factors introduced by the sources such as Mahāvansaya and other chronicles that Buddhist Bhikkus have been accustomed within the usage of poems and drama exercising as literary compositions. It is a multitude probability that verse-drama or kavnaluwa / kavinaluwa which were prohibited for Buddhist Bhikkus, were not forbidden for laities. But certain factors have been found in contrast with the above perception. Therefore, the objective of this Research is to ascertain as to whether verse-drama were considered as disreputable only for Buddhist Bhikkus. This research is based on the text titled as, Karmavibhāgaya, said to have been composed during the Polonnaruwa era. Further, in examining verse-drama, a major part of this study, texts such as Abhidarma Atuwāwa, Dambadeni Kathikāvatha, Sandesha poetic compositions and Budugunālankāraya were employed. In addition to these texts, Mahāvansaya and other literary works composed by erudites regarding the above topic were considered at certain phases. Accordingly, this research was conducted based on primary, secondary and tertiary sources, fundamentally.

As such, it could be concluded that verse-drama referred to as Kavnaluwa / Kavinaluwa were set apart for laities and Bhikkus as irreligious to follow during the time of Karmavibhāgaya was composed.

Keywords: Verse-drama, disreputable, Karmavibhāgaya, Bhikkus, laities
蒲錸 බැගුම් ඔබගේ කටයුතුව

උපාධිකරණ ආභය එක

දන් සහ විදේශය කැමින්කරණය, ආභක් විදේශය කිරීමදය.

dhammasiri85@gmail.com

මැතකින් නොකේන්, දත්ත පිළිති දියමකු විස්තර කල අතර පදකාන්තය ඇතිනච්ච තෙකෙස් තුළින් අතර විශේෂයක් කාමක් දියමකු දියයමකුගේ පිළිතින නොකේන්. ඒවා රැතියක් මෙහෙය විස්තර කළ අතර විශේෂයකාගේ පිළිතිය ඇතිකරන්නේ පිළිතියක් දියමකු තෙකෙස් නොකේන්. ඒවා යක්තියක් මෙහෙය විස්තර කළ අතර විශේෂයකාගේ පිළිතිය ඇතිකරන්නේ පිළිතියක් දියමකු තෙකෙස් නොකේන්. ඒවා රැතියක් මෙහෙය විස්තර කළ අතර විශේෂයකාගේ පිළිතිය ඇතිකරන්නේ පිළිතියක් දියමකු පිළිති තෙකෙස් නොකේන්.

රෝපයන් පමණක් පැතේයින් පිළිතිය සිදුවන විස්තර කළ අතර විශේෂයකාගේ පිළිතිය ඇතිකරන්නේ මෙහෙය ඇතිකරන්නේ පිළිතියක් දියමකු තෙකෙස් නොකේන්.

රෝපයන් පමණක් පැතේයින් පිළිතිය සිදු මෙහෙය ඇතිකරන්නේ පිළිතියක් දියමකු තෙකෙස් නොකේන්.

රෝපයන් පමණක් පැතේයින් පිළිතිය සිදු මෙහෙය ඇතිකරන්නේ පිළිතියක් දියමකු තෙකෙස් නොකේන්.
SENSUAL PLEASURE (PAÑCAKĀMA) REFLECTED IN GUHYASAMĀJATANTRA AND ITS PROFOUND CLARIFICATION

Ven. Yakkaduwe Sugunaseela¹, Ven. Niwandama Dhammissara²

¹ Sri Sumangala Pirivena, Wariyapola, Kurunegala, Sri Lanka
² Vidyalankara Pirivena, Peliyagoda, Sri Lanka
suguna2012@gmail.com

Guhyasamājatantra is a foremost text of Tantrayāna Buddhist tradition and it was a major cause for the development of Tantrayāna. It should be noted that the superficial nature of the teachings of Guhyasamājatantra is not matching with early Buddhism. Nevertheless, an in-depth examination draws conclusion that this teaching has taken a new method to obtain the supreme attainments reflected in early Buddhism. The record on Sensual Pleasure (pañcakāma) exposed in Guhyasamājatantra can be recognized in the same manner as mentioned above.

Pleasing sensual organs related to the worldly life, is a specific fact of this tantra. Furthermore, it emphasizes that engaging in pancakāma is the best way to liberation and an individual should associate it to obtain Nirvāṇa. This practice advocates killing as one’s own will, telling lies, stealing other’s property, engaging in sexual misconduct, etc. In this text and engagement in sensual pleasure is accepted as a good conduct and on the other hand it is considered as an honour to the Buddha. Then, he attain Buddhahood immediately. Moreover, it approves that eating human- flesh, elephant- flesh, horse- flesh, dog- horse, etc. for the obtaining of Tivajra and Pancābhīnna and it is a qualification to become a vidyādhara. Therefore, the prime endeavor of this paper is to examine the exact purpose of Guhyasamājatantra and its objectives which represent symbolically with reference to the concept of Pañcakāma and also to reveal any hidden message to refrain from unwholesome deeds as reflected in early Buddhism.

Finally it can come to a conclusion, this research answers to the dilemma that “engaging in sensual pleasure (pañcakāma) is the best way to liberation, and is this really implied in Guhyasamājatantra?”. On the other hand, although a conclusion can be drawn according to this text that all the persons in the world who are engaged in unwholesome sensual misconducts are qualified to enter the path of liberation, it should be noted here that ‘the true hidden meaning of this doctrine lies as an absolute secret.’

Keywords: Guhyasamājatantra, Sensual pleasure, Early Buddhism, Superficial meaning, Hidden meaning
සාමාන්‍ය අවශ්‍ය කාර්යකම් චිත්‍ර කාර්යාලයේ මණ්ඩලයන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

මොත්තොයි ගොඩභාටයෙන්

ත්‍රේශ්‍රයි බූකාංකය, පායික්‍රමය, ආරක්ෂාව සහිත, පැරණිවාකාර, මොත්තොයි
This paper draws attention about the moral value of the comparative study on the ten-commandments and eight noble path and their influence for the social harmony. The social harmony is one of the most discussed theme in the present society.

The eight noble path, one of the key concept of Buddhism, deals with three main aspects which are known as Sila (morality), Samādhi (Mental culture), Paññā (wisdom). At the same time in Christianity ten-commandments force to society with mutual understating and harmony. Though there are some fluctuation of ethical background, in its utmost sense two of these principles lead people to harmonized society.

With commercialization and modernization people lives have become more complex and instead being moralistic, people have become narrow minded selfish, they have forgotten the value of the human relationship and they breakdown the social harmony. To fill the vacuum of between modernization commercialization and the comprehensive development of individual. Moral education is the best to fill the particular vacuum and lead people to harmonized society.

In this research eight noble path and Ten Commandments and their influence for the social harmony will be examined on a comparative basis with special reference to Pali Buddhist canon and the Bible.

**Keywords:** Ten-commandments, Eight Noble Path, harmony, society, Pāli Buddhist canon, Bible.
උෝපත මාධ්‍ය මීටරමේ මාර්ගය යොදාගන්නේ

මහින්ද සහිතාන්ත්‍රිතයේ

mahelepolat@yahoo.com

කොළඹ ශිෂ්‍යන්ගේ පුළුත් විශේෂ ආදායම් විසින් පිළිතුරු කිරීමට ඉතිහාසික කලාව සහ ඒවා නැමුතින් ඉදිරිපත්‍ර විශේෂ කලාව මෙය. කොළඹ ශිෂ්‍යන්ගේ කොළඹ සහිතාන්ත්‍රිතයේ ස්තූපාත්‍ය පුරාණය ආරාම්භ කිරීමට ඉතිහාසික කලාව සහ ඒවා නැමුතින් ඉදිරිපත්‍ර විශේෂ කලාව මෙය. කොළඹ ශිෂ්‍යන්ගේ කොළඹ සහිතාන්ත්‍රිතයේ ස්තූපාත්‍ය පුරාණය ආරාම්භ කිරීමට ඉතිහාසික කලාව සහ ඒවා නැමුතින් ඉදිරිපත්‍ර විශේෂ කලාව මෙය.

මහින්ද සහිතාන්ත්‍රිතයේ මාර්ගය යොදාගන්නේ

Guidance (G) ආදායම් ඉදිරිපත්‍ර, Practice (P) ආදායම්, Conduct (C) ආදායම්, Practice (P) ආදායම්, Conduct (C) ආදායම්, Practice (P) ආදායම්, Conduct (C) ආදායම්, Practice (P) ආදායම්, Conduct (C) ආදායම්

මාර්ගය ගෙනුන්නේ

75 | P a g e
EXISTENTIALIST QUEST OF BUDDHISM AND SARTRISM – A PHILOSOPHICAL ANALYSIS

R. Premkumar

State Ministry of Cultural Affairs, 8th Floor, Sethsiripaya, Battaramulla
Premkumar.phd@gmail.com

Buddhism founded by the Buddha comprises of fundamental aspects of modern existentialism of the west: committed to the truth, removal of suffering, nausea for meaningless world, death consciousness, etc. The Buddhism and Sartrism (philosophy of Jean Paul Sartre) severely criticize existence of God and place an individual in the centre of the world. As far as the two isms are concerned, the subject (thing for itself) gains currency. From single individual both the thoughts and views emerge and all dimensions of human experience are valued equally. The Buddha and Sartre consider that freedom is the significant element in human beings. Freedom from sufferings is the goal of the Buddha and freedom of choice in action is the goal of Sartre. Both the philosophers lay emphasis on ‘death-consciousness’ in our life journey. Buddhism and Sartrism regard that truth is not equal to knowledge. Infact, knowledge is one of the aspects of the truth that embodies all kinds of experiences of human beings. i.e., common man or Individual’s experiences. The concept of ‘being –for–itself’ is conceived as the influence of Buddhism on Sartrism by thoughts of Arthur Schopenhauer, a German philosopher. This paper analyses similarities and dissimilarities between the two ‘isms’ through the works of the philosophies. This paper also tries to analyze problems and solutions associated with the two philosophies that flourished different period of time and to enlighten humanity with new outlook of the knowledge provided by thoughts of the east and the west.

Keywords: Existentialism, freedom, death-consciousness, Buddhism, Being –for-itself
මෙහෙන් මගින් එකම් අතර මාර්ගාස්ථිතයේ ලෝකයට වන අතරින්
මැතිකුණාකර්යා කිහිපයක් වේ මාර්ගාස්ථිතාවක්

යිති ගැටලුකාව

මෙහෙන් මගින් පොදුකරන්න, මාර්ගාස්ථිතය
mpranjanee@gmail.com

මෙහෙන් 175018 දින ජනවරිව අළුත් 8 මූර්ති මාසයේ අයිතිව බොහෝ ප්‍රදේශවල පැවති වන අතරින් මාර්ගාස්ථිතාවක් ලක් විය. ඉන්හි, මාර්ගාස්ථිතාවට විනායක විය මෙහෙන් පැවති මෙහෙන් පිලිබඳවා වන්නේ, ඉන්හි මාර්ගාස්ථිතාවට මෑක්කරමේ මාසයේ බෝධ ක්‍රමයට විශේෂීමෙන් පැවතී. 150 මෙසෙක් මීටර් පත්කාමෙන් මෙහෙන් පූර්ව ක්‍රමයට විශේෂීමෙන් පැවතී. 8 ක්‍රියාකාර ක්‍රමය මෙහෙන් පැවති මාසයේ පැරණිමයේ පැවති විශේෂීමේ පැවති. ඉන්හියන් මාර්ගාස්ථිතාවට මාර්ගාස්ථිතාව විශේෂීමන්දේ මුළු විස්තර කරන්නේ මාර්ගාස්ථිතාවක් ලක් විය. ඉන්හි මාර්ගාස්ථිතාව මාර්ගාස්ථිතාවට විශේෂීමෙන් පැවති මාර්ගාස්ථිතාවක් ලක් විය.

1. මෙහෙන් විමාන බොහෝ කරන්නේ මෙහෙන් පැවති පුරාම විශේෂීමේ මිලියන්ත්රයන්
2. මෙහෙන් පුද්ගල පිළිතුරු කරන්නේ පිළිතුරුන්
3. මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
4. මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
5. මෙහෙන් විය විකාශීය පිළිතුරු කරන්නේ පිළිතුරුන්
6. මෙහෙන් විය විකාශීය පිළිතුරු කරන්නේ පිළිතුරුන්

මෙහෙන් විය මාර්ගාස්ථිතාවට විශේෂීමක් ලක් විය, ඉන්හි විත්සයන්ම පැවති මාර්ගාස්ථිතාවක් ලක් විය මාර්ගාස්ථිතාවක් ලක් විය මාර්ගාස්ථිතාවක් ලක් විය මාර්ගාස්ථිතාවක් ලක් විය.

- මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
- මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
- මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
- මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
- මෙහෙන් පුද්ගලික පිළිතුරු කරන්නේ පිළිතුරුන්
MOTIVATIONAL STRATEGIES USED BY THE BUDDHA AND THEIR APPLICABILITY FOR TEACHING ENGLISH AS A SECOND LANGUAGE

M. N. S. Dilani

Department of English, Buddhist and Pali University of Sri Lanka
nipunikamadugodage@yahoo.com

Motivation is a principal factor that directly affects the second language learning. The vital importance of motivation in second language learning is explicit from the very fact of the high number of research conducted on the theme continuously in diverse contexts. The same fact evidences the room for further research vacuity to be filled in terms of motivating learners to learn a second language. In Sri Lankan context learning English has been referred to have a paradoxical relationship in terms of its difficulty of mastering the language to a native like standard despite the fact it is being learnt from childhood. Various motivational strategies have been successfully tested by the English teachers in Sri Lanka in diverse teaching contexts and yet the low English competence of the students in spite of the great enhancement of external factors, has been attributed to the psychological factors like motivation to a great extent.

The Buddha undoubtedly being the greatest teacher ever has used various motivational strategies to inspire people who were absolutely blind and ignorant of spirituality by being fully coveted to the worldly pleasures for spiritual and worldly development. Definitely, it is greatly the Buddha’s motivation that progressed in teaching spirituality to the completely sluggish ignorant.

Accordingly, the current study examines the motivational strategies used by the Buddha and studies the possibility of applying them in teaching English. In spite of the contradictory objectives two disciplines have motivation being a psychological factor can be commonly applied in any context.

Keywords: Motivation, Motivational strategies, the Buddha, teaching English
කෑම තනි අතර පැවතිම් පිලිගණනකාරී විධාන පැවතියක් එකින් රැකෙලන පදනම්

මතරිය මත දෙයි

කැරපික්කාදාසීඛාතිහා @gmail.com

පුස්තකයේ යුතුවන්නේ මුලින් නිදසුන් සරල අනුවර්තනය ලබා ගැනීමට ඔබට විශේෂ පැහැදිලිය ගැනීමට මෙම පිටිපත ගනිමි. ඔබට මෙම නිදසුන් සරල අනුවර්තනය කරගැනීමට යොතක්ද මෙම පිටිපත සොන්යේදී ඔබට තිබුණිය. ඔබට මෙම නිදසුන් සරල අනුවර්තනය කරගැනීමට පැහැදිලිය ගැනීමට ගැනීමට මෙම පිටිපත සොන්යේදී පිටිපත සොන්යේදී ඔබට තිබුණිය. ඔබට මෙම නිදසුන් සරල අනුවර්තනය කරගැනීමට ගැනීමට මෙම පිටිපත සොන්යේදී ඔබට තිබුණිය. ඔබට මෙම නිදසුන් සරල අනුවර්තනය කරගැනීමට ගැනීමට මෙම පිටිපත සොන්යේදී ඔබට තිබුණිය. ඔබට මෙම නිදසුන් සරල අනුවර්තනය කරගැනීමට ගැනීමට මෙම පිටිපත සොන්යේදී ඔබට තිබුණිය. ඔබට මෙම නිදසුන් සරල අනුවර්තනය කරගැනීමට ගැනීමට මෙම පිටිපත සොන්යේදී ඔබට තිබුණිය.
It is dogmatic to hold that quadrilemma (catuṣkoṭi) is the logical position of Buddhism regarding truth-value. Some further state that the Buddha rejects even quadrilemma and holds no logical position, which is also not tenable referring to some canonical evidences. In fact, in early Buddhism quadrilemma appears to be an examination of four possibilities in a given statement rather than a ‘logical analysis’ as some would suggest. Nāgarjuna in effect advocates certain variety of quadrilemma with four logical forms as $A, \neg A, A \land \neg A, \neg (A \lor \neg A)$. Further analysis in the same line shows the dialetheism in the Buddhist philosophy of śūnyatā with respect to contradiction of truth-values, particularly in third and fourth alternatives of quadrilemma. However, when we come to Buddhist logic of Dignāga and Dharmakīrti, bivalence is enjoyed in terms of logical position of truth-values in Buddhism with indirect reference to LEM (law of excluded middle). This position can also be fortified with canonical explanations of early Buddhism. Since all of these positions come in the same flow of Buddhism, apparently many-valued position of quadrilemma seems to be refuted in Buddhist logic, which shows inconsistency in interpreting Buddhist philosophical position regarding truth-value. This paper attempts to resolve this apparent inconsistency and find possible position in line with Buddhist logic.

**Keywords:** truth-value, quadrilemma, dialetheism, LEM, bivalence, contradiction, inconsistency
වෙනස්වාදේන් ගානාගත් මහතා රාජීය අධිකාරීන්
හැඩි දේශියේ පාලනය

රාජ්‍ය මහනිලහි මෙහෙවත්
nandarathanaw@yahoo.com

මුනිදිගත් බොහෝවන් මෙහෙවත්

නොදකුන්තකින් අදහස්  සන්නිෂ්ඨව දැක්වා ඇති අත්නියනත් කොටස හැඩි සන්ධානය යනුගෙන් වෙනස්වාදේන් මෙහෙවත් බොහෝවන් මෙහෙවත්

වෙනස්වාදේන් මෙහෙවත් මෙහෙවත෉යේ

නොදකුන්ෂ්ඨව මෙහෙවත්

නොදකුන්ෂ්ඨව මෙහෙවත්

නොදකුන්ෂ්ඨව මෙහෙවත්

නොදකුන්ෂ්ඨව මෙහෙවත්

නොදකුන්ෂ්ඨව මෙහෙවත්

නොදකුන්ෂ්ඨව මෙහෙවත්

නොදකුන්ෂ්ඨව මෙහෙවත්

(filters, moderators, administrators, editors, reviewers, editors, editors, editors, editors, editors).
THE MOST AFFECTIVE FACTOR TO EXISTENCE OF THE JOB STRESS

Withanage Udari Nisansala, Withanage Madara Seuwandi, Kavindu Lakshan Rodrigo

Department of Languages, Cultural Studies and Performing Art
University of Sri Jayawardanapura, Sri Lanka
withanagemadara@gmail.com

When a person is facing something new or the same thing again and again that person feeling bad and frighten for that situation. Simply it is called Stress. Stress can affect both our body and our mind. People under large amounts of stress can become tired, sick, and unable to concentrate or think clearly and even suffer mental breakdowns. Some of the most common sources of stress are: Survival Stress, Internal Stress, and Environmental Stress, Job Stress. Here Job Stress is kind of stress builds up over a long time and short time in our body which a person expecting a job and on the job. It can be caused by working too much or too hard at our job(s). It can also be caused by not knowing how to manage the job, time well or how to take time out for rest and relaxation. This can be one of the hardest kinds of stress to avoid because many people feel this is out of their control. Job Stress affects the mind, body, and behavior in many ways, and everyone experiences stress differently. Not only can overwhelming stress lead to serious mental and physical health problems, it can also take a toll on relationships at home, work.

Researchers have been doing many researches about the Job Stress. Many studies regarding their Poor Time Management, Lack of Knowledge about the world of work, Lack of communication, Lack of job satisfaction and performance are obtained however the key factors in Job Stress is not discussed further. In this research, we have discussed about special key factors are such as Poor Self Concept (Self Esteem and Self Actualization) Lack of Confident and lack of life achievements with target to find the most affective factor for the Job Stress. Here we used secondary data sets which are represented information about the above mentioned factors. Also randomly selected various parties such as university students, working people of Government and Private sector were involved through interviews and group discussions. Finally, the result is concluded that the “Poor Self Concept” (Self Esteem and Self -Actualization) is the most affective factor to existence of the Job Stress.

Keywords: Job Stress, Time, Body, Self, Again
රිදුම් ප්‍රතිපාදිත උදාහරණය අතීත ස්කීත්‍රිය විද්‍යාවේ
මාධාරිණියමක් ක්‍රියාමයන්
(මාජින් ස්කීත්‍රිය මාධාරිණිය මාධාරිණිය හදුනින්)

ප්‍රධාන සැකසින්

මෙම මාජින් ස්කීත්‍රිය විද්‍යාවේ පිටිය ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

මෙම මාජින් ස්කීත්‍රිය විද්‍යාවේ පිටිය ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

කින්දු කයින් අමත්තම මෙගෝස් මෙම මාජින් ස්කීත්‍රිය විද්‍යාවේ පිටිය ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

මෙම මාජින් ස්කීත්‍රිය විද්‍යාවේ පිටිය ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

මෙය මාජින් ස්කීත්‍රිය විද්‍රේෂණයන්

ථිවන්නේ මාජින් ස්කීත්‍රීය විද්‍යාවේ පිටිය ක්‍රියාපදයෙක් ස්කීත්‍රීය විද්‍යාවේ පිටිය ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.

ක්‍රියාපදයෙක් විස්තර කෝටස් කරන්නේ ඉංගිරින් මෙක්.
Teaching English as a Second Language (ESL) is considerably impacted by the development of science and technology. ESL is taught through online and distant modes. Therefore the face to face mode of teaching needs to incorporate teaching aids which would motivate learners to obtain proficiency in reading skills. Today each school, department, institution or university has a computer laboratory. Majority of the universities provide ESL teaching and facilitate learning via computer networked laboratories. Yet the ESL learners’ performances do not show remarkable proficiency in reading skills. This study explores whether the use of textbooks for ESL reading would promote reading skill proficiency among tertiary level learners. The study adopted both qualitative and quantitative methods. Forty students from 3rd year Faculty of Arts were selected randomly. A pre test was held for all the participants on reading skills. Twenty students with less proficiency in reading skills were selected from the marks they scored in the pre test. They were considered as experimental group(group A). They were taught reading skills by using a text book. After following the text book based ESL reading lessons for a month, group A was tested. The control group(group B) consisting twenty participants were given handouts as reading material for a month. A post test was conducted for both groups A and B. The performances on reading skills at the pre and post tests were analyzed. The findings reveal the fact that the reading skill proficiency of the experimental group increased after using the reading text books. The study has an implication of utilizing text books to improve ESL learners’ proficiency in reading skills at the tertiary level. The study has an implication of utilizing text books to increase proficiency in reading skills in the ESL at tertiary level.

**Keywords:** reading skills proficiency, performance, text books, and tertiary level learners.
Humor is a powerful instructional resource in a language classroom. According to Ronald Berk “the psychological and physiological benefits of laughter can have a direct impact on teaching and learning, especially in five significant areas: teacher-student rapport, classroom atmosphere, student responsiveness, test performance, and student attendance” (2000, 152). Humor can hold the attention of the learners and create a learner-centered classroom atmosphere which helps to understand the individual differences of the learner within the classroom social milieu. It increases retention of what is learnt in the classroom through a catalytic form of laughter-oriented humorous material and cultivate constructive attitudes towards errors and mistakes while arousing learner interest and attention. The learners become tension-free and they can get rid of language anxiety in a joyous atmosphere created by laughter. Hence, this study investigated how humor helps to teach and learn English as a second language in the Faculty of Agriculture at the University of Ruhuna. The sample comprised 60 1st year students who were following the course of BSc Agricultural Resource Management & Technology in 2014. Questionnaire surveys and interviews were conducted with the students to gain in-depth insights into the humor used in the classroom. In addition the researcher conducted the class for one semester, 30 hours and experienced how humor impacted on language teaching and learning. Descriptive statistics was used to analyze the data. The findings of the study depicted that humor in the language classroom has a direct positive impact on teaching and learning language. Thus the findings are significant in preparing curricula or lesson materials to teach English language effectively for the educational, professional and socio-economic benefits of the students.

Keywords: Humor, language, teaching, learning, classroom
EFFECTIVENESS AND SUSTAINABILITY OF THE UNIVERSITY TEST OF ENGLISH LANGUAGE (UTEL)

Rohan Abeywckrama¹, Ishara Ranathunga²

¹Department of Languages, Faculty of Social Sciences and Languages
Sabaragamuwa University of Sri Lanka
ELTU², Faculty of Geomatics, Sabaragamuwa University of Sri Lanka
rohan.abe@gmail.com

The UTEL is a standardized examination which measures the general English language proficiency of the undergraduates in Sri Lankan universities. It provides opportunities for the university students to obtain a certificate for their English language skills. The test is considered as a secure, global, authentic and customer-focused test which measures true to life ability to communicate in English. The main purpose of this research is to identify the effectiveness and sustainability of the University Test of English Language (UTEL) introduced by the Ministry of Higher Education (MOH) in collaboration with the Higher Education for the 21st Century Project (HETC), which is funded by the World Bank. This study is important for university academics since the findings of the research may provide a better prospect for them to align their ELT courses, materials as per the requirements of the UTEL. For the study a random sample from two state universities were selected and the sample includes those who have obtained average band score 3 and above 3. Apart from the questionnaire, interviews were also conducted to obtain data so as to increase and cross-validate the students’ responses to the questionnaire. The findings of this investigation indicate that establishing national standards for proficiency in English language skills has facilitated the graduates to assess themselves to identify the improvements they need and obtain the recognition for their skills. Even though the percentage of the undergraduates who sit for test is insignificant, such standards and certification further enable graduates to access the best employments. The results and findings will enable the test administrators, educationists etc. in the field to comprehend students’ attitudes towards the test and use the recommendations of the researcher to make the test more reliable and consistent.

Keywords: UTEL, standard, sustainability, undergraduates, employability, test
KNOWLEDGE MANAGEMENT AT HIGHER EDUCATION INSTITUTIONS

Manojkumar S. Chhangani

Government Meera Girls’ College, Udaipur-(Rajasthan) India
dr.mksc@gmail.com

Higher education institutions (HEIs) are organizations with highly qualified and expert’s staff in all sorts of fields who contribute their expertise and experience put forward to producing and preserving knowledge. The modernization of higher education (HE) has forced the institutions to store, manage and use existing information and knowledge stores in a better way in order to meet new accountability, effectiveness and efficiency requirements. In this paper, an attempt has been made to discuss some strategic applications of information management at HEIs in addition to proposing a basic structure for IT-services.

**Keywords:** Information management, knowledge management, higher education
A STUDY BASED ON THE INDIGENOUS KNOWLEDGE IN MEERIGAMA DIVISIONAL SECRETARIAT DIVISION OF GAMPAHA DISTRICT

M.C.N Jayawardana

Department of Library and Information Science, University of Kelaniya
Chathurika.navodani@yahoo.com

There are several terms used for indigenous knowledge, traditional or conventional or local knowledge. The indigenous knowledge is a unique, prototype traditionally sustained and practical knowledge confined to particular community, people or culture. It is the conventionally accumulated knowhow, belief system, norms, ethic system, and practices involving tools, techniques and activities aiming at solving problems in human life cycle of a culture or community.

Sri Lankan indigenous knowledge is acutely vivid and productive. The principal objective of this paper was to investigate the traditional agricultural knowledge and practices and its situation in Meerigama Divisional Secretarial Division. Other objectives were to explore the traditional cultivation methods, and to study religious practices involving traditional agriculture.

The method of research was the ethnographic hence survey design was applied. As a sample, two Gramasewa Divisions, Borlana and Muruthawala were used. Primary data was collected conducting interviews among farming community. In addition to that participatory observation was applied for collecting further primary data. For collecting secondary data encyclopaedias and other reference sources and internet were used.

Findings are that still farmers use traditional norms and belief systems in their cultivation. Certain religious practices and observances apply for their agricultural work.

The indigenous knowledge used by this farming community has to be recorded and preserved for future generation use. Oral communication tradition is still prevailed hence it is very essential to record and preserve this knowledge as intangible cultivation heritage.

Keywords: Traditional Knowledge, intangible cultural heritage, indigenous knowledge, Agriculture, Oral communication tradition
EDUCATIONAL ISSUES RELATED TO MENTAL ILLNESSES OF UNDERGRADUATES  
(With Reference to University of Kelaniya)

Harini Navoda de Zoysa
Assistant Lecturer, Department of Philosophy, University of Kelaniya, Sri Lanka  
harini.navo33@gmail.com

Education is one of basic needs and a right of all human beings. Even though universities are considered as highest educational institutions, some undergraduates fail to achieve its full benefits due to mental illnesses. Mental illnesses are considered as significant public health issue worldwide. They refer to a wide range of mental health conditions and disorders that affect their mood, thinking and behavior. It can make them miserable and can cause problems in their daily life especially in education or relationships. The objective of this research is to identify the issues with regard to psychological problems of undergraduates in their education. The survey sample consisted of 50 undergraduates from faculty of Social Sciences in university of Kelaniya. Methods such as questionnaires were used to collect primary data and journal articles, books were used as secondary data. Data analysis has been done by using descriptive method. Psychological problems with regard to education are identified as Exam Stress, loss of sleep, loss of appetite and gastric burning. Those who do experience psychological problems cite assignment deadlines and exams as triggers of distress. The findings of this research indicate that most of students say they experience psychological problems in their educational life but they do not seek medical treatment because, they do not consider themselves as suffering from mental illnesses which require treatment at the beginning. Only few students they obtain the services of counsellors. Therefore it can be concluded that identifying such illnesses are very essential in preventing bad effects of such illnesses and thereby ensuring better education for undergraduates.

Keywords: Mental Illnesses, Education, Psychological Problems, Stress
Theories of Piaget and Vygotsky on learning through play highlight the significance of during early years. Play is important for the development of concepts and skills in preschool children needed for their academic skills in later life. Studies have shown that the mushrooming of preschools and increasing demand of desk work have threatened the important of using play for learning in the current context of Early Childhood Education in Sri Lanka. This leads to a problematic situation to investigate to what extent the play based teaching is used in the current context. The study attempted to investigate to what extent the preschool teachers use play based teaching strategies in the teaching learning process, teacher’s perception of using play based strategies and children's participation in those activities. The study employed both qualitative and quantitative methods of research. A questionnaire was administered to a sample of 30 preschool teachers registered in the Certificate in Preschool Education (CPE) Programme offered by the Open University of Sri Lanka (OUSL) in 2014/2015. The observations and interviews were carried out with randomly selected 12 teachers from the sample. The quantitative data was analysed using charts and tables and qualitative data was descriptively analysed. The data revealed that nearly 50% teachers from the sample used play based teaching strategies to a certain extent while the other half used more activities similar to desk work due to institutional and parents requirements. It showed that though teachers perceive the importance of using play based teaching, they were not aware of how to incorporate play properly into the activities. Use of play based teaching strategies was helpful for teachers to control the classroom and maintain children’s attention throughout the lesson. Further it helped to obtain a significant participation of children particularly towards the outdoor play activities and dramatic play regardless of their gender and age. However, longer play sessions didn’t increase the children’s participation throughout the activity. Thus the study concluded play based teaching strategies were used in the teaching learning process to certain extent and children were very much interested in those activities. Further the study recommends making aware of preschool teachers on how to incorporate play into teaching learning process through teacher training programmes.

Keywords: Early Childhood Education, Play based Teaching Strategies, Teaching Learning Process, Teacher Perception
One’s mind and its energy is the projection of the reality. It is through this energy that humans achieve success. Nothing can be successfully achieved without positive energy. It is said that our mind is like a magnet; positive attracts positive and negative attracts negative. Human mind is also like a recorder. Every knowledge that humans want to acquire is recorded in the human mind and lies deep within. By making use of one’s positive energy, one can unleash this knowledge recorder. This theory can be applied for the language acquisition.

The focus of this study is to bring out the inseparable connection between positive energy and language learning. This study examines how does the teacher’s positive attitude towards the students’ capabilities and, in return the students’ positive attitude towards the language acquisition play an immense role in language learning. Using qualitative methodology, data was gathered through in-depth interviews and discussions with the lecturers in English and undergraduates of the Faculty of Management Studies and Commerce, University of Sri Jayewardenepura. The findings show that a key factor in language acquisition is the positive energy. Maintaining a positive attitude towards the language that one wants to achieve proficiency in, certainly gives out the desired outcome. Moreover, the positive energy of the language teacher undoubtedly creates a stress-free environment for the students, and when the students feel free in the class environment, it is proved that there is a significant increase in the language absorbent capacity of the students. Thus it is concluded that it is mainly through the intercommunication of positive vibrations of the teacher and the student, that the language learning process becomes successful. This research provides insightful information for the language teachers who are involved in experimenting new methodologies to enhance the language absorbent capacity of the language learners as well as for the students who are involved in the process of language acquisition.

**Keywords:** Positive Energy, Mind, Attitude, Language Acquisition
DOMESTICATING AN AVADĀNA: A CASE STUDY IN NEWAR BUDDHISM

Ven. Gangodawila Chandima

Faculty of Graduate Studies, University of Sri Jayewardenepura, Sri Lanka

The avadānas are teaching stories that illustrate the qualities of a pious and spiritual life. There is a long tradition of using them to engage audiences of the laity in an effort to pass on the deeper spiritual truth of Buddhism. However, when a small handful of such stories, out of the hundreds that exist, achieve a distinctive prominence within a particular community, the reasons for this are likely to be less found in the universal truths of the avadāna stories than in the ways those stories have been adapted to the unique conditions and needs of that community. Understanding this process requires an approach that addresses the role of domestication: including redacting and editing to effectively localize the stories. Domestication in the context of avadāna stories simply means how such a number of distinctive stories can be better redacted and edited for the sake of both scriptural and spiritual significance.

Todd Lewis has observed that Buddhist scholarship has tended to err either on the side of an anthropology that takes inadequate account of the nuances of the spiritual tradition or a textual reading that is blind to the context of traditional avadāna narratives and rituals. This research paper investigates Lewis’ path, striking a balance that leverages the strength of each approach to offset their respective weaknesses. The sources which will be consulted as the methodology for the research will be of Lewis' books and journals written on the subject.

Of the hundreds of Buddhist spiritual teaching stories that can be found in the Buddhist canon, why did these avadāna stories gain such widespread repetition and emphasis within Newar Buddhism? Answering that question requires understanding the kind of domestication process explained in this paper. As with much of the tone in Buddhism, the Newar found in this avadāna a particular concern for problems unique to the kind of trading life that they knew so intimately. That could be reason enough for its popularity. However, its exceptional popularity, within the ritual and festive context of their Buddhist practice suggests something more than just a valorization of their economic way of life. That is the kind of domestication explicated in this research paper.

**Keywords:** avadāna, Todd Lewis, anthropology, Newar Buddhism, domestication
Translation is the process of converting words or text from one language to another. The translation process does not always imply the creation of a complete replica of the source work in the target language. Translations differ from their source work due to various factors. John Dryden, the first major English theorist of translation, points out three types of translations in the preface to "Ovid's Epistles". They are metaphrase, paraphrase and imitation. This paper is an attempt to find out which of these types have come to effect in the translation of songs in Bertolt Brecht's "Der Kaukasische Kreidekreis" into English and Sinhala. The English translation of the play "The Caucasian Chalk Circle" by Eric Bentley is based on the original German play by Brecht, whereas the Sinhala translation "Hunuwataye Kathawa" by Henry Jayasena is based on the English translation. In this study, the songs in each translation have been compared with the songs in the original plays. In the English translation, no major changes can be seen whereas various words, ideas...etc in the original play have been altered in the Sinhala translation. This brings us the conclusion that metaphrase and imitation have been utilized as the translation methods in translating songs into English and Sinhala respectively. It is apparent that making changes has been essential because of the cultural differences between the audiences of source and target work. Another reason for making changes has been the necessity of maintaining the rhythm of the songs.
EFFECTIVENESS OF MULTIMEDIA PACKAGES ON LEARNING BIOLOGICAL CONCEPTS AMONG STUDENT TEACHERS OF DIPLOMA IN ELEMENTARY EDUCATION

1 K.Krishnamoorthy, 2 R.Bagdha Vatchala Perumal

1 Department of Education, DDE, Alagappa University, Karaikudi – 630 003, Tamilnadu, India
2 District Institute of Education and Training, Uthamapalayam - 625 523, Tamilnadu, India
ksmoorthy@gmail.com

Science Education is the foundation for sustainable national development. The teaching of biology is the basis for medicine, bio-chemistry, micro-biology, zoology, botany and even environmental sciences. Biology education is meant to expose the learners to biological nature (facts, principles and concepts), processes and attitudes and then equip them with skills of a professional biology teacher. Incidentally, the learners have their peculiar characteristics which may manifest special learning needs (Elliot, Kratochiwill, Cook and Travers, 2001). Learners expect that the materials and method of instruction should be easily transferable to the real world. Thus, the task of the teacher is to provide the materials and experiences to aid learning and meet the learner’s expectations (Ogwo, 2004). The investigator during his classroom transactions found that many student teachers especially with Arts and Commerce background struggle while learning biology. Further investigation revealed that the root cause of the problem is the conceptual understanding of biology. Hence the investigator opted to deal with the problem by preparing suitable multimedia packages for strengthening the conceptual understanding in the said area. Here the investigator made an attempt to develop a standardized student-specific multimedia package on Biology for the student teachers of D.El.Ed with Tamil as the medium of instruction. Through the study the heterogeneous group of student teachers could have the conceptual understanding on basic biological concepts and also gain an exposure about how to use multimedia resources in teaching – learning process. The study proved that the multimedia packages are found to be more effective for learning biological concepts among student teachers of diploma in elementary education in terms of gain ratio.
MEDIA INFLUENCE AND POLITICAL OPINION ( RELEVANCE TO GAMPAHA ELECTORATE )

K.M.D.C. Prasadi

Department of Economics, University of Kelaniya, Sri Lanka

prasahas@gmail.com

There is a mutual relationship between politics and mass media in Sri Lanka. Therefore this study is focused to identify whether there is an impact on political opinion of people by mass media, which is the main objective. In addition to the main objective, the sub objective of the study is to identify out of the media units, the printed media, electronic media and e-communication, which type of media unit had influenced the political opinion of people in the election held during the period of February 2010 to February 2015. Primary data had been collected from 150 individuals of Gampaha electorate between the ages 20-60 years representing different levels of education. The primary data had been collected using a questionnaires and the secondary data had been collected from related articles, of printed media, websites, and books. The data obtained were analyzed quantitatively. According to the study, it was concluded that the mass media had an impact on political opinion of people, which resulted in changing their opinion in recent elections. As the most effective media unit which succeeded to change the political opinion of people had been identified as printed media, followed by Face Book network.

Keywords: Mass Media, Political opinion, Influence, voting areas, People
Communication Features of the Mutti Mangallya in Nuwarakalaviya

Keywords: Nuwarakalaviya, Tank, Mutti Mangallya, Communication Features
CROSS CULTURAL PROBLEMS OF ADVERTISING
(AN ANALYSIS CONDUCTED IN 2012 BASED ON THE HIV AIDS PRINT
ADVERTISEMENTS OF SELECTED COUNTRIES (SRI LANKA, INDIA
AND AMERICA))

Dineesha Liyanage

dldenuwan@gmail.com

Advertising is a very powerful communication tool in the commercial world today. So many advertisements adapted to new behaviors in consumers. All the advertisements are cultural values reconstruction to consumers in other hand. Cross cultural communication solutions are also critical to effective cross cultural advertising. Focusing areas of this research are cross cultural differences in advertising colors, numbers, images, language, communication style, and cultural values in cross cultural advertising. Therefore we draw our attention towards the cross cultural problems of advertising. And also here we study what are the cross-cultural advertising. What are the cultural values of advertising.

We used the method of content analysis in this study. We based on 8 selected print advertisements from HIV aids in our analysis used in three countries such as Sri Lanka, India and America Year of 2012. The main method of data analysis of content analysis. The analysis was based on quantitative and qualitative methods.

Keywords: Advertising, HIV AIDS, Cross Culture, Communication, Problems
BUDDHA’S UTTERANCES IN THE COMMENTARY:  
AN EXAMINATION OF THE EXCLUDED SUTTA-EXCERPT IN  
 ATTHASĀLINĪ 

Aruna K. Gamage  

Department of Pali & Buddhist Studies, Faculty of Humanities, University of Kelaniya  
arunak.gamage@yahoo.com

Atthasālinī, the commentary to Dhammasaṅgaṇī (henceforth: DhsA 65-6), the first book in the Abhidhamma-piṭaka of the Theravada canon, quotes prose, from a discourse, which is not included in the present tipiṭaka. Subsequently, two verses that are interrupted by a single canonical verse are also quoted in the same context. Two factors: the resemblance of the phraseology between the prose passage and these two verses as well as the unavailability of them in the canon, lead us to believe that they also most likely belong to the same prose passage. 

To the best of my present knowledge, apart from the ‘the Expositor, (Maung Tin: 1920, PTS, London, pp. 87-8)’ the English translation of DhsA, no considerable remark available in English for this valuable passage. Accordingly, this paper attempts to fill that lacuna paying special attention to all the available canonical, commentarial and corresponding Sanskrit passages related to Buddhism. In addition, relevant lexicographical works will also be consulted so as to reach more sophisticated conclusions.

This passage seems, as its diction suggests, is of not to be a later composition. The commentator of DhsA adducing this passage in order to illustrate the multifarious consequences of karmic results that he is quoting it from a discourse, which is not rehearsed at the joint-recitations (saṅgīti). The remarkable expression is that the sutta that this passage is consists of is not mentioned as rejected from the saṅgītas but ‘not rehearsed’ (saṅgīti-an’ārūḥha) therein. Even though he does not flatly state that this is a Buddha’s preaching, the wording that he collocates with the quotation implies that there was no doubt and objection regarding it’s the substantiability among the members of Mahāvihāra confraternity.

Apart from the critical evaluation to this excerpt that pays the attention to the all canonical parallels and commentarial exegeses, the reasons that led for the exclusion of this remarkable canon will also conjectured.

Keywords: Pāli canon, saṅgītas, Mahāvihāra tradition, commentaries, excluded texts
නිදහස් දරිණීය පුළුම්පතිතාමා මුණුමේ කරගැනීම

මාතිවර්තන කරගැනීම ලිපි

මාතැමුණ්ඩු ඩෙවර්කා ප්‍රමාණය යනු ප්‍රමාණය, ඔබ ප්‍රමාණය පිළිතුරුයේ දී. nandarathanaw@yahoo.com

WHAT IS THE BHAVANGA CITTA, REPRESENTED IN THERAVĀDA ABHIDHAMMA?

Ven. Suriyawewa Wijayawimala

University of Kelaniya, Kelaniya
rev.wijayawimala833@gmail.com

It is an apparent fact that among the concepts of Theravāda Abhidhamma, Bhavānga citta (becoming existence citta), is a particular and specific concept and on the other hand it can be identified as a remarkable achievement of the Theravāda tradition. The fact which should be noted here is that ‘at the very beginning, the Bhavānga citta was not included in Abhidhamma.’

This teaching is represented as a result of solving and elucidating the nature of sansāric existence (bhavagāmitvaya) of the individual which caused to arise many contradictions and ambiguities among the manifold Buddhist traditions. It is noteworthy to mention here that, this concept has been formed or introduced in accordance with the fundamental Buddhist teachings and it doesn’t go beyond the basic Buddhist essence.

The aim of this overview is to perform a substantial examination on the concept of Bhavanga citta which is discussed deeply in Theravāda Abhidhamma.
Indigenous knowledge is one’s own knowledge and heritage which belongs to one regional people or one country. It is called local knowledge, folk knowledge, and traditional wisdom. This knowledge is generated and transmitted by society. It is not legitimized, scientific and not written. Indigenous knowledge is included in agriculture, rituals, medicine, education, architecture, irrigation, witchcraft and folklore in Sri Lanka. Indigenous knowledge is passed generation to generation. Sri Lanka’s local knowledge has been transferred time to time. This knowledge is being destroyed and challenged by the directions of misconceptions. What are they? They are legitimizing, lack of scientific basis, lack of immediate results, require more efforts, lack of economic value, not tallying with current methodology rural attribution and mysterious nature etc. Sri Lankans are underestimating their own heritage. Ex: goda veda and goda vedakama

We must make a decision on conservation and preservation of Sri Lankan cultural heritage with regard to indigenous knowledge. For example: Old farmers in Sri Lanka used “kema” to destroy the insects that damage to cultivation but today they use Pesticides for it. Therefore kidney diseases are spreading rapidly in Anuradapura and the related areas strongly. It is a tragedy of modern scientific development.

Sri Lankans can do conservation and preservation of ancient value of local knowledge and strategic sources. For the preservation of the indigenous knowledge, the following methods can be used. What are they? Documenting knowledge (example: witchcrafts and folklores), searching knowledge that has been eliminated by modern methods (Archaeological excavation), conducting tests on local knowledge (for example; using of kohoba spirits to destroy insects), conserving knowledge that comes through orally over generations using CD, DVD, recorders and books, digitalization of old Ola books. These may conserve our heritage and culture for future.

**Keywords:** Indigenous knowledge, Local knowledge, Traditional wisdom
A STUDY ABOUT READING HABIT AMONG UNIVERSITY STUDENTS: WITH SPECIAL REFERENCE TO MAIN LIBRARY, UNIVERSITY OF KELANIYA

Sakunthala Herath

University of Kelaniya, Kelaniya
dissanayakasaku@gmail.com

Reading is considered very important and essential for the overall development of a human being. However, with the advent of modern digital technologies, especially the growing popularity of social networking on the web, mobile phones, televisions, e-journals and other means of entertainment, the reading habit of the general public, especially the younger generation, is undergoing a decline. This is an exploratory study to investigate the reading habit of the students of Social Science and Humanities at the University of Kelaniya, Sri Lanka with the following objectives: To identify reading interest and habits of students in the Faculty of Social Sciences and the Faculty of Humanities at the University of Kelaniya. To trace the major trends in the reading habits of those students. To assess the influence of the Internet, radio, television, and other mass media on the reading habits of those students. To put forward recommendations for the improvement of the reading habit of those students in particular and other people in general.

A structured questionnaire has been designed to collect data from the students. Due to time and other constraints it was necessary to limit the sample for 50 students in above two faculties. Students in the Faculty of Social Sciences and the Faculty of humanities are selected as the population of the study. The major findings of the survey summarized as follows:

The students read books and other materials with a sense of purpose and with specific targets, not aimlessly or for fun. Most students feel that they need to read because reading gives them a way to develop their life and to keep abreast of the changing times. This is indeed quite encouraging.

Reading materials, especially books, should be constant companions to all people, especially students. The majority of the students read books only for two to four hours a day. Most students surveyed have indicated that textbooks are the books of their choice, although a substantial number of students also like to read fictions and non-fictions.

Reading of newspapers requires less time. And newspapers give news and information on current affairs. That is why a large majority of the respondents read newspapers regularly. The World Wide Web has grown in popularity and use in recent years. The respondents of this survey, like other young people, are regular users of the web. It is an encouraging sign that the majority of them browse the web for reading purposes.

Keywords: Reading, Reading Habit, Literacy, Library, reading interest
KING LEAR AND LADY MACBETH: VICTIMS OF ‘EVEN-HANDED JUSTICE’ OR CAUSE AND EFFECT? – A BUDDHIST OUTLOOK TO THE PSYCHOLOGICAL CONVERSIONS OF THEIR CHARACTERS.

Waruni Tennakoon

Department of English, Buddhist and Pali University of Sri Lanka
varunitix@gmail.com

William Shakespeare has gifted us with a plethora of complex characters in his dramas which have been subjected to a number of psychological analyses. The two characters, King Lear and Lady Macbeth in ‘King Lear’ and ‘Macbeth’ respectively, undergo serious psychological transformations within the course of each drama. The increasing mental instability of Lady Macbeth is the major cause for her ultimate physical downfall whereas King Lear gradually gains insight following his mental instability. Even if these psychological conversions have been widely analyzed in a western psychological perspective, research to analyze their complex conditions of mind in a Buddhist point of view is scarce, and thus the current research aims to fill this gap in interpreting these psychological complexities in a Buddhist light. In ‘Macbeth’ Shakespeare states the tormented mentalities to be caused by the ‘even handed justice’ and in ‘King Lear’, he sees Lear is ‘tasting his own folly’. Buddhism provides an enlightening explanation to such complex mentalities when the Buddha recurrently points out the theory of cause and effect and how one has to reap what he sow. Thus, the present study analyses the psychological conversion of these two characters with reference to Buddhist teachings on human mind connecting them to the theory of cause and effect. The main objectives of the research are to open the doors for the Buddhist scholars to Western literature, especially to Shakespearean dramas and present a novel Buddhist psychological analysis to the aforesaid characters. An extensive study of the dramas under concern and related literature was carried out as the methodology of the present book research to collect data.

Keywords: justice, cause and effect, psychology, Buddhism
AN ANALYSIS ON ‘THE DESTINY OF WOMAN WITHIN THE REPPRESSED SOCIAL REALM’ BASED ON THE SELECTED VITAL FEMININE PORTRAYALS IN LITERATURE

D.N.P Amarasooriya

University of Sri Jayawardenepura
nimeshaprsd061@gmail.com

The images of the ‘feminine figures’ which are reflected through the diverse socially and culturally created dimensions appear as fragmented bodies thus allowing the feminine self to be surrounded by the awareness of her nonexistence, the sense of lack of belonging and repressed individuality. The literary portrayals of women figures representing the social reality which is assigned to the feminine sphere address the unsolvable fictitious mystery which wraps her.

Thus, ‘Nora Helmer’ in the play ‘The Dolls House’ by Henric Ibsen, ‘Adela’ in ‘The House of Bernarda Alba’ by Federico Garcia Lorca and ‘Emma Bovary’ in ‘Madame Bovary’ by Gustave Flaubert, ‘Maggie Tulliver’ in The Mill On the Floss by George Eliot and ‘Kattrin’ in Mother courage and Her children by Bertolt Brecht as the feminine characters whose individuality and instinctual essence are repressed, bring to the surface the socially determined fatal end and the imagined symbolic disappearance of the feminine figure.

In analyzing and elaborating the perspectives which are discussed within the research paper the theoretical perspectives of Simon de Beauvoir (The text ‘The second sex’), Sigmund Freud, (The text ‘Civilization and its Discontents‘,) and Slavoj Zizek, (The text ‘Looking Awry’) are referred with a thorough consideration.

Consequently the woman figure whose identity is negated and given less vitality is identified as an inferior and vulnerable social figure within the existing social order and thus the literary characters like Adela, Nora, Emma, and Maggie Tulliver portray the antagonism between the social principle of ‘Repression’ and the feminine ‘Liberation’. In contrast to the characters such as Adela, Emma and Nora who negate the social other in pursuing their determined routes towards the self satisfaction, the feminine portrayals like Kattrin and Maggie Tulliver adopt the self denial and renunciation of desires for the betterment of the other. Thus the characters like Nora, Emma and Adela become capable of gratifying their intense abomination towards the social order while Kattrin and Maggie Tulliver with their self-sacrifice and altruistic motives achieve a serene satisfaction. In that sense it can be identified that their self annihilation leaves behind something rather than nothing implying a more psychological vitality without being just a physical deterioration.

Keywords: Feminine figure, Repression, Liberation, Individuality, Self annihilation


01. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
02. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
03. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
04. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
05. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.

මුළු අතින්ගෙනී 01. කීරුක විශේෂයන්
02. කීරුක විශේෂයන්
03. ක්‍රමවාදයන් කීරුක විශේෂයන්
04. ක්‍රමවාදයන් කීරුක විශේෂයන්
05. ක්‍රමවාදයන් කීරුක විශේෂයන්

නිර්මාණ අතින්ගෙනී කීරුක විශේෂයන්

01. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
02. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
03. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
04. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
05. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.

නිර්මාණ අතින්ගෙනී 01. කීරුක විශේෂයන්
02. කීරුක විශේෂයන්
03. ක්‍රමවාදයන් කීරුක විශේෂයන්
04. ක්‍රමවාදයන් කීරුක විශේෂයන්
05. ක්‍රමවාදයන් කීරුක විශේෂයන්

නිර්මාණ අතින්ගෙනී කීරුක විශේෂයන්

01. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
02. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
03. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
04. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
05. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.

නිර්මාණ අතින්ගෙනී 01. කීරුක විශේෂයන්
02. කීරුක විශේෂයන්
03. ක්‍රමවාදයන් කීරුක විශේෂයන්
04. ක්‍රමවාදයන් කීරුක විශේෂයන්
05. ක්‍රමවාදයන් කීරුක විශේෂයන්

නිර්මාණ අතින්ගෙනී කීරුක විශේෂයන්

01. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
02. මුළු අතින්ගෙනී - කීරුක විශේෂයන්.
03. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
04. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.
05. ක්‍රමවාදයන් අතින්ගෙනී - කීරුක විශේෂයන්.

නිර්මාණ අතින්ගෙනී 01. කීරුක විශේෂයන්
02. කීරුක විශේෂයන්
03. ක්‍රමවාදයන් කීරුක විශේෂයන්
04. ක්‍රමවාදයන් කීරුක විශේෂයන්
05. ක්‍රමවාදයන් කීරුක විශේෂයන්.

නිර්මාණ අතින්ගෙනී කීරුක විශේෂයන්


colomboとsinhaleseの訳文


colomboとsinhaleseの訳文


colomboとsinhaleseの訳文


colomboとsinhaleseの訳文


colomboとsinhaleseの訳文


colomboとsinhaleseの訳文
A COMPARATIVE STUDY ABOUT
ATHYANTHATHIRASKRUTHAVACHYADVANI, SAMADHIGUNA AND
RUPAKARTHA

H. W. B. I. Sampath

University of Kelaniya, Kelaniya
bihesh@gmail.com

Athyanthathiraskruthavachyadvani, Samadhiguna and Rupakartha is three different concepts related with Dvanivada, Gunareethiwada and Alankarawada. Dhvani is the verbal meaning prevail over by the implicit meaning of poems. According to Anandawardena, the author of Dhvanyaloka, in athyanthathiraskruthavachyadvani is covered the verbal meaning and is imbued the other meaning. “The moon is not shining like a blind mirror as a result of sigh.” is the Dhvanyaloka example. Blind is a nature of the eye, But in this situation poet is covered that meaning and implicated another meaning. Guna (Prana) are the compulsory elements of poems. Bharatha and lot of afterwards Sanskrit critics have analyzed Samadhiguna. According to Sanskrit critics, Samadhiguna is the cognition of one attitude, in another attitude, without against with the world truths. “Lily sleeping”, “Lotus walking-up” are examples. Sleeping and walking-up are behaviors of human, but in this examples connoisseur can see those ideologies in flowers. According to Kunthaka, the writer of Wackrokhijeewitha, this concept includes with Upacharawackratha of Padapurwarda Wackratha. Western poets and traditional eastern poets have used the language principal of Rupakartha (metaphorical meanings). Rupakartha is not rupakalankara (metaphor). If say her face is a moon, it is a metaphor (Rupakalankara). Rupakalankara is a simple rhetoric kind, such as simile (Upama). But Rupakartha is a complex language pattern. In Latin language “Transferred Epithet” and in English language “Metaphorical meaning” are similar that. Rupakartha (metaphorical meanings) are the combination of different attitudes. The word metaphorical to indicate not using words with their ordinary meaning, but are describing something by means of an image or symbol. For an example, “People are sleeping, the sea is silent.” is a general statement. But, “the sea is sleeping” is a metaphorical meaning. The objective of this research is discussed about the similarity of Athyanthathiraskruthavachyadvani, Samadhiguna and Rupakartha, and this is limited to those main three concepts. This research based on primary literary sources, such as Dhvanyaloka, Wackrokhijeewitha and Kavyadarsha. Any critic has not explained about the equality of those three concepts, But at the end of this research could realize the equality of Athyanthathiraskruthavachyadvani, Samadhiguna and Rupakartha.

Keywords: Athyanthahtiraskruthavachyadvani, Samadhiguna, Upacharawackratha, metaphorical meanings, poems
සම විදාහාරයක් දෙනු ලැබේ තුළත්වයක් දකුණුමන්ය ගුරුවරයේ

සංවිධානය කියාව

විදුහලේ ආශානාගතව, දෝශනයකින්
wirathana89@gmail.com

උපාංගයන් අන්නාවන් විශේෂීන්ගතියන් දිගුවෙන් ගනී. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. උපාංගයන් අන්නාවන් විශේෂීන්ගතියන් එක් හා එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. උපාංගයන් අන්නාවන් විශේෂීන්ගතියන් එක් හා එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු.

මාය ආශානාකෝ දෙනුමන් විශේෂීන්ගතියන් දිගුවෙන් ගුරුවරයේ විය ය. එක් එක් කොටස එකාකාකෝ ය. උපාංගයන් අන්නාවන් විශේෂීන්ගතියන් එක් හා එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු.

උපාංගයන් අන්නාවන් විශේෂීන්ගතියන් එක් හා එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එක් හා එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු.

උපාංගයන් අන්නාවන් විශේෂීන්ගතියන් එක් හා එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු. එමින් එක් හා එමින් එක් විරාසම්කෝවන් මමිගම් කොටස කුරුණු කරමු.
A STUDY OF HUMANITY OF WOMEN AS DEPICTED IN HENRIK IBSEN'S PLAY, 'A DOLL'S HOUSE'

M. D. Kumudini

kumudimaddumage@gmail.com

By showing the gap between male and female social roles, through this play, Ibsen's objective was to see the problems of women as part of common humanity. It is through the central character Nora, that Ibsen brings into discourse, the experience gained by actively contributing to the struggle for "Women's freedom" that was being socialized then.

The main source used for this study is the text of the play. Written sources about women, human feelings of women and problems and challenges faced by women, along with a sample of a few family units directed to family counselling are also used as additional sources.

Nora's family seemingly well-established at the beginning of the play, is ironically destroyed by the efforts of Nora to protect the status of the family being well-established. The central conflate of the play rises from the secret loan obtained by Nora to save her husband from the fatal disease that he was suffering from. Consequent to the conflict, the false image of Nora built up at the beginning as a carefree, happy lady, collapses Nora falls into mental stress in her effort to cover this lie.

At the end of the play, when Helmer says "No man would be ready to compromise his respect, for his love", Nora retorts "Thousands of women do so" This clarifies that all women have sacrificed their humanity to maintain the balance between family and society. With the realization that she had been behaving like a doll before and after marriage, Nora leaves her husband and children by way of questioning the scope available for women's humanity in the family and society.

Whereas this questioning has become a practical problem in current society, the objective of this study is to build up a discourse about the problems and challenges presented to society and the family by examining how women's humanity has been depicted through the characters, occasions and incidents in Ibsen's play "A Doll's House"

Keywords – A doll's house, women, humanity, family, society
EURIPIDES’ PORTRAYAL OF MEDEA: ‘THE OTHER’ OF THE GREEK SOIL

Sepali Bamunusinghe

Faculty of Management Studies and Commerce, University of Sri Jayawardenapura
sepalibamunusinghe@sjp.ac.lk

It was before thousands of years that the Greek dramatists laid the foundation of Western Drama in ancient Greece. Euripides was a dramatist who brought change to Greek tragedy and being an intellectual dramatist, his career mirrors a modern look and many critics regard him as an explorer of human psychology. Euripides’ heroes are the common men and women we meet every day: heroes in rags, when compared with the larger than life character portrayals of Aeschylus and Sophocles. ‘Medea’ is one such tragedy by Euripides in which he depicts Medea, the woman who came from a distant and exotic land: she is “the other”, foreign, unknown, savage and superstitious. The main objective of this study is to evaluate the depiction of Medea by Euripides; her plight in this new land, her fight for survival amidst the new customs, traditions and way of life. Along with the scholarly views on ‘Medea’, this study has identified the instances presented in the drama which prove the fact that Euripides’ portrayal of Medea is the difficult plight of being the “the other” of the Greek soil. Medea is the woman who betrayed her own land and her kin for her love for Jason and it is this same man who abandoned her for a royal marriage. According to Jason, he is not bound to be grateful to Medea for what she has done for him as he has given her the great benefits of Greek civilization in return. Through the character portrayal of Medea, Euripides unveils the Greek view of ‘The Other’ and the foreignness. She is identified with the attributes which are considered barbaric by the Greeks such as violence, uncontrolled emotions, and expertise in sorcery. Medea is the woman who arrives to the Greek world from the faraway land Colchis and the drama depicts Medea's emotional transformation, a progression from suicidal despair to sadistic fury.

Keywords: ‘The Other’, Euripides’ Tragedy, Greek World
നിങ്ങൾ നേരിടുന്നത് കാരാട്ട് യും നോർമങ്ങളും മനോഹരമായവും

കാരാട് യും

നിങ്ങൾക്ക് എന്തുകൊടുക്കുന്നത് എന്ന് മനോഹരമായവും

ഒപ്പം എന്തുകൊടുക്കുന്നത് എന്നാണ് മനോഹരമായവും

നിങ്ങൾക്ക് എന്തുകൊടുക്കുന്നത് എന്നത് മനോഹരമായവും

111 | Page
The development of legal sector is one of the most important factors to the development of human life. So, many studies for the recent legal environments focus on the ICT and Legal convergence to aim for smart and ubiquitous legal services. However, the research on legal knowledge management in Sri Lanka is still in its infancy, the close relationship between legal ontology and legal knowledge inspired to combine the ontology theory with legal knowledge management in the research. Therefore, development of an ontological approach to represent the necessary legal information and relevant knowledge within the user context is necessary. Based on this, designing targets modelling the ontology at the district court in a particular location of the country. This describe the ontologies as a type of knowledge representation and, specifically focuses on legal ontologies as the form of representation and formalization of legal knowledge, and discusses issues related to knowledge acquisition, knowledge extraction, modelling methodologies, tools for ontology construction and ontology evaluation.

**Keywords:** legal knowledge, knowledge management, ontology modelling
A STUDY ON HEALTH WORKFORCE IN SRI LANKAN GOVERNMENT SECTOR ALLOPATHIC HEALTH SYSTEM


Ministry of Health, Sri Lanka
samiddhisamarakoon@hotmail.com

Sri Lanka has achieved remarkable high standards in health indices in healthcare service comparing to many countries even to developed countries. In this success story, commitment of the health workforce from policy makers to field workers is unforgettable. Without a dedicated, motivated staff, such achievements are highly impossible. Any leader with a good vision for the success of the organization should engage with proper management of the human resource of the organization initiating with a proper analysis on the organizational workforce. Recent complaints from institutions and other provinces / districts regarding the shortages and maldistribution as well as public complains on media and staff complaints on their grievances and dissatisfaction highlighted the gaps in the organizational objective of providing quality efficient health care services through government health sector by adequate, well developed, dedicated and satisfied health workforce. This cross sectional descriptive study was planned with objectives to study on the current health workforce in the health workforce in Sri Lankan government sector allopathic health system.

Methodology- Current health workforce was studied on the available data in relevant documents and accepted norms and cadre under the criteria of availability and distribution, demand and supply, termination and migration, performance and satisfaction, policy and planning as well as development. Focal group discussions were conducted to gather expert opinion. Information gathered through the web based literature survey on worldwide HRM research articles were helpful in view of providing vital, realistic and evidence based recommendations. Results- results shows that 106,298 total number of health workforce in public sector western type health service are deployed in the provincial health service - 48,839 and 57,459 in the line ministry. Comprising as 1% consultants, 11% medical officers, 24% nursing officers and 9% Public Health Midwifes were consisted while 36% was non technical minor staff and 8% was attendants, health workforce has been distributed with remarkable variation in provinces, among institution and sectors -preventive and curative. Having illustrated variation of availability, supply and shortages of selected key health personnel categories the persistent demand and supply mismatch for almost all categories, it highlights unplanned production of almost all the categories of staff during the whole period considered. Lack of proper continuous development mechanism was identified. Conclusion- All the results displayed ineffectiveness of HR planning, management and development in relation with current health workforce of government health service highlighting the failure in the current HR management system in the government health service. Hence, it is concluded with recommendation to develop a proper HR Management and Development system based on properly developed policy and evidence based strategic plan.
INVESTIGATION OF FACTORS AFFECTING THE REVERSE LOGISTICS IN AUTOMOBILE INDUSTRY: A CASE STUDY IN COLOMBO REGION

Imaya Rathnayake, Dilrukshi Hewage

Faculty of Management, Cinec Maritime Campus. Malabe
imayarathnayake@gmail.com

This paper gives an overview of reverse Logistics practices in automobile industry. The study is done with the objective of identifying factors affecting to reverse logistics and how reverse logistics align with the consumer requirements. And also highlight how the Reverse Supply Chain becomes an important feature in the related industry. There are two sub objectives in order to succeed the task such as; to prove Reverse logistics is matched to the automobile industry with every individual’s requirements of Colombo region and to implement suggestions to improve efficient use of reverse logistics in automobile industry and related sub industries. Reverse Logistics is a newly introduced process in Logistics. Reverse Logistics system for Automobile Industry is more popular in present scenario. Due to high initial capital in Automobile Industry using Reverse Logistics is more effective. Reverse Logistics is process is flown from point of consumption to point of origin for the purpose of recapturing value or proper disposal. The reverse logistics process includes manufacturing, refurbishing, recycling, obsolete equipment disposition and asset recovery activities. The process does not consist of huge inventory management process however process transparency is very low. Industries which have larger portion of operational cost tend to have reverse logistics practices. The best example is Automobile Industry. At present Automobile Industry in Sri Lanka has been modernised with emerging market trends. And also Reverse Logistics concept has become a common practice in Automobile Industry since the second hand vehicles are popular in the market. Most importantly, it is needed to look the life cycle of automobiles and what happen to them after reaching to end of life. The iron which is used for vehicles is reusable through considerable amount of time. Without letting them to scrap end customer can send them to again to production line or can repair the defects. The study is based on mainly six categorical factors such as; Demographic factors, future vehicle expectation, purchasing behaviour factor, ownership of vehicle, consumer behaviour factor, customer services factor. The paper is used primary data extracted from the structured Questionnaire Survey with the collection of data with the sample size of 250. The sample of the research would be customers who are the vehicle owners. The main research question could be stated as, What are the factors affecting on customer behavior towards Reverse Logistics practices in Automobile Industry? In the questionnaire, descriptive design research questions permits to ask questions starting from who, what, when, where and how not why. This research also belongs to Descriptive design. Factor Analysis is main analytical method with the aim of identifying relationships among variables. Descriptive Analysis provides the background of demographic factors and reliability test is done using the statistic of “Cronbach’s alpha”. Mann Whitney Test and Kruskal-Wallis Test are used to determine significance of determinants found in factor analysis. This is an example which shows feasibility of approaches of reverse logistics to the Automobile Industry. Finally Reverse Logistics factors and Consumer behavioral factors are identified with relate to research question. In conclusion, consumer behaviour on reverse logistics depends on factors of emission levels, the resale value, brand, cost of the vehicle, availability of spare parts. The reverse logistics practices change with according to consumer behavior factors such as age and civil status of consumers in Colombo region (P < 0.05). Moreover, the results of this research would help to Automobile manufacturers, sellers, assemblers and related industry people to identify the consumer requirements on reverse logistics practices.

Keywords: Reverse Logistics, Automobile Industry, Reverse Supply Chain, Consumer Behavior, Factor Analysis, Sustainability
COMPARATIVE ANALYSIS OF OFFICE RENT DETERMINANTS IN NUGEGODA AND BATTARAMULLA URBAN AREAS IN COLOMBO

P. S. Ranaweera ¹, N.C. Wickramaarachchi ²

¹ Land Officer, Land Division, Urban Development Authority
² Department of Estate Management and Valuation, University of Sri Jayewardenepura

sanjayasrr@gmail.com

As office properties share a considerable portion of the land use in an urban area, it comes frequently for property valuation purposes. The available literature discusses the importance of identifying the significant variables that effect on the rental value. Literature discusses the use of econometric models to determine the rent determinants and frequently been used the size, age, number of floors, condition, building amenities, and distance to town center as determinants.

Office properties contribute a significant role to National Economy of Sri Lanka through the service sector in the country. The share of the service sector in GDP lies between 50% -60% on average. The current method applied in valuing the office properties in Sri Lanka, has been subject to criticisms as it accompanied a lot of personal judgments. This paper focuses on analyzing the significant determinants of office rent with special reference to Nugegoda and Battaramulla selected as two attractive town areas for office development. The study uses data, collected both from the Govt. Valuation Department and through a field survey on 262 and 177 office units selected using the systematic random method. The size, age, number of floors, vertical location, quality of construction, type of building, condition, building amenities, locality and distance to town center have been used as predictor variables and an econometric model was applied to analyze the data. It was identified that the majority of the office properties in both locations are less than thousand square feet and compared to Battaramulla town, the Nugegoda town has more office properties above four thousand square feet.

The estimated results reveals that the floor area of the building (0.74 and 0.75 in both locations) is statistically significant and has a positive effect on the rental value. The location as well as the type of the building is also statistically significant. These are the strongest predictors among the significant variables to determine the rental value, irrespective of the different geographical areas. The rent model explains 83.6% of the variation in rent in Nugegoda area while in Battaramulla it explains 73.5% of rent variation suggesting further that use of a model with predetermined variables is an approximate guideline to value an office in a primary location.

Keywords: Property Valuation, Office property, Rent Determinants, Urban area, Sri Lanka
A CRITICAL EVALUATION OF ASSESSOR’S POWERS IN RESPECT OF TAX ASSESSMENT IN SRI LANKAN CONTEXT: WITH SPECIAL REFERENCE TO TAX PAYER’S PROCEDURAL DUE PROCESS RIGHTS

Chathurika Sisimali Gunasekera

Faculty of Law, General Sir John Kotelawala Defence University, Ratmalana, Sri Lanka
sisimali92@gmail.com

The self assessment system that operates in Sri Lanka requires the tax payer to furnish his own return in respect of his profits and income for the respective year of assessment. Accordingly, the tax payer is expected to act honestly and transparently in making the return. Hence, the assessor’s power to make tax assessments commences when the tax payer fails to act in conformity with the self assessment scheme as stipulated in the Inland Revenue Act No 10 of 2006 as amended. However, in exercising his powers in respect of tax assessment more often the assessor fails to recognize and give adequate concern for the tax payer’s rights thereby placing the tax payer in a vulnerable situation. In this backdrop, the objective of this study is to critically evaluate the assessor’s powers in respect of tax assessment and tax payer’s due process rights in Sri Lankan context in light of Indian and Australian jurisdictions and make recommendations for the further development of law in this field. The second objective is to analyze how the judiciary has contributed for the evolution of the tax jurisprudence in Sri Lanka in this regard. Hence, this research will be conducted as a qualitative research based on books with critical analysis, journal articles, statutes, case laws and also data collected from legal experts and relevant policy making authorities. The assessor being an administrative official is under an obligation to act in compliance with relevant statutes and administrative law principles when exercising his powers. In Sri Lanka, the assessor’s powers in respect of tax assessment are stipulated in the Inland Revenue Act No 10 of 2006 as amended. Although the domestic legal framework provides substantive safeguards to ensure the tax payer’s rights in respect of tax assessment, numerous drawbacks exist in respect of its implementation and most importantly the law is yet to be developed. Hence, this study analyses the relevant case laws where such issues were brought into judicial attention and proposes the improvements that can be incorporated into the existing legal framework. And also a comparative analysis will be made to India and Australia. In the absence of much legal authority in this regard, this research will thus provide guidelines for professionals such as lawyers, policy makers and the assessors in Sri Lanka.

Keywords: Assessor’s powers, Tax assessment, Tax payer’s rights, Due Process rights, judicial interpretations
Due to the improvement of new technologies, the financial sector has become much more complicated than ever before. These improvements have completely changed the traditional ways of thinking. Therefore using new technologies, the factors that affect loan performance can be identified, thus making the ability to identify the life cycle of a loan transaction in advance. In this research, the reasons/factors of a loan to become a non-performing were studied, with respect to a reputed Insurance Company. Decision Trees, Neural Networking and Clustering algorithms were used to create mining models using the Business Intelligence Tool. The best algorithm was selected by comparing each model. 750 records and eighteen variables were used to identify factors. Among those variables, eleven variables namely: Age, Area, Branch Name, Customer Job, Income, Mortgage, Number of Terms, Overdue Days, Product Type, Interest Rate, and Loan State were selected. Having considered all these factors, the most influential factor/s was/were identified. The predicted probabilities of Decision Trees, Neural Networks and Clustering models were 0.44%, 1.57% and 10.46% respectively. Clustering algorithm was selected as the best algorithm for this study since the probability of clustering algorithm shows higher value of 10.46%. After analyzing this algorithm Product Type, Customer Job, Mortgage, Income, Number of Terms and Interest Rate were identified and shortlisted as the factors which affect the most for non-performance of loans. The research revealed that the Product Type is the factor affected most for non-performing loan state. If the customer is self-employed, a small property owner, having a lower income, the longer period for loan repayment, higher interest rates and depending on the type of mortgage the loan tend to be non-performing. An Insurance company will be able to maximize its profits if they focus mostly on such customers and implement appropriate alternative options based on the strategies of individual companies in industry. The model will aid any Insurance Company in identifying the amount of loans that could be transformed into non-performing state. Therefore the findings of this research would benefit the Insurance industry to minimize the risk on granting non-performing loans in the future.

Keywords: Business Intelligence Tool
THE INFLUENCE OF BUSINESS STRATEGY ON OUTSOURCING HUMAN RESOURCE FUNCTIONS: A STUDY OF THE MANUFACTURING SECTOR IN SRI LANKA

P.C.K. Mahil Asanka¹, Bhadra J.H.Arachchige²

¹ Human Resource Manager, Royal Ceramics Lanka PLC
² Department of Human Resource Management, University of Sri Jayewardenepura

bhadra@sjp.ac.lk

In the process of enhancing the wealth of the shareholders, in the last few decades, business organizations have tried to achieve their objectives by using many strategic decisions and doing those through different managerial techniques; Total Quality Management (TQM) and Business Process Re-engineering (BPR), Rightsizing, Downsizing, Restructuring and Business Process Outsourcing (BPO). Outsourcing HR activities fell under this BPO. This research study examines whether outsourcing human resources functions have any relationship with the business strategy that consists of basically quality-based strategy, proactive strategy, breadth strategy and reactive strategy. Further it explained how business strategy jointly and collectively influences outsourcing HR activity and which business strategy has the most influence on transactional and traditional HR activity in the manufacturing sector in Sri Lanka. With the intention to answer the above this study selected the manufacturing companies in Sri Lanka. The selected sample is public quoted companies in the Colombo Stock Exchange. A survey was conducted to collect primary data with a structured questionnaire. According to the findings the payroll, training, recruitment and selection activities have been outsourced by most of the organizations. The most outsourced activity was payroll. The hypothesis tested on this study shows that quality based strategy has a relationship with neither transactional nor traditional HR activities outsourcing. Statistically there is a positive relationship between proactive business strategy and transactional HR activities. However, the relationship with the outsourcing of traditional HR activity, only outsourcing of training has a positive relationship. In the breadth strategy and the reactive strategy, also has no relationship with both business strategies and transactional and traditional HR activities. Among all business strategies, the proactive business strategy is the most influential business strategy in outsourcing of HR activities especially on Payroll HR activities. Overall the transactional HR activity is the most influenced HR activity from business strategies.

Keywords: Outsourcing, Human Resource Management, Business Strategy, Manufacturing Sector, Sri Lanka
EUTHANASIA: THE RIGHT TO DIE WITH DIGNITY AND THE LEGAL DILEMMA

G.A.C. Sajeevi

Department of Commerce, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura
chathusajeevi@gmail.com

“How can it be lawful to allow a patient to die slowly, though painlessly, over a period of weeks from lack of food but unlawful to produce his immediate death by a lethal injection, thereby saving his family from yet another ordeal to add to the tragedy that has already struck them?”


Debate over Euthanasia has been a constant phenomenon over the past few decades all over the world. The term ‘euthanasia’ literally means ‘an easeful death’, the practice of bringing about death in a manner that causes less suffering to a patient. The public opinion, judicial decisions, ethical considerations and legal and medical approaches taken by various states towards the concept have been conflicting. The crux of the debate concerns one’s right to life recognized and guaranteed by domestic and international instruments. The question whether one’s right to life include right to die is highly debated, but no answer has been arrived at.

The research aims to provide a critical analysis of the legal debate that arises regarding the life ending decisions of people. A greater emphasis is placed on the analysis of the human rights specifically the right to life and freedom from torture, inhuman or degrading treatment. The potential criminal liabilities that arise with murder and assisted suicide and the causation issues that arise with the difference between acts and omissions are also discussed with a brief background on the basis of criminal law. The research approach is a desk study using domestic, regional and international instruments, case laws, and a range published works and internet sources.

Right to life is a right recognized and guaranteed by Article 3 of UDHR and Article 29 of the ICCPR. Although 1978 constitution of Sri Lanka does not expressly provide for the ‘right to life’, in a series of judicial decisions including Wewalage Rani Fernando v. OIC, Minor Offences, Seeduwa Police Station it has been recognized that right to life is implied through the provisions of fundamental rights in Article 13 (4) and 11. A careful examination of the legal provisions suggests that right to die with dignity can be assumed from the protected rights of right to life and freedom from torture and specifically in Sri Lanka Article 13(4) and 11 can be interpreted to accommodate euthanasia. However, the question that arises next is ‘is it the right to die or the right to kill?’ Law facilitates one to commit suicide which is a single tragic act, but euthanasia is not a private act and it’s about letting one person to facilitate the death of another. On the other hand the question is ‘should people be forced to stay alive?’ Neither the law nor the medical ethics require that “everything be done” to keep a person alive. As was decided in Re F and Bolam v. Friern Hospital Management Committee, the consideration here is the “best interest” of the patient.

The responses to euthanasia worldwide vary and most countries including Sri Lanka, are responding in an inadequate manner to the evolving attitude and the demand for euthanasia. While, this paper emphasizes vital role played by human rights in the legal debate of euthanasia and the need of attention of both the legislature and the judiciary, it also highlights the real reason to reject euthanasia is the fear of possible abuse of a scheme for euthanasia. In the words of R. Dworkin, an advocate of euthanasia, “A state may not curtail liberty, in order to protect an intrinsic value, when the effect on one group of citizens would be special and grave.”

Keywords: Euthanasia, right to life, right to die with dignity, crime, best interest of the patient
FOURIER ANALYSIS ON MODELING SECTOR RETURNS OF SRI LANKAN SHARE MARKET

W.G. S. Konarasinghe¹, N. R. Abeynayake², L.H.P.Gunaratne³

¹ Postgraduate Institute of Agriculture, University of Peradeniya, Sri Lanka
² Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka, Makandura, Gomawila (NWP), Sri Lanka
³ Department of Agricultural Economics and Business Management, Faculty of Agriculture, University of Peradeniya, Peradeniya, Sri Lanka

sinasisi@gmail.com

Sector returns of Sri Lankan share market shows wave like patterns. Wave can be viewed either in time domain or in the frequency domain. Time domain analysis is known as time series analysis. The frequency domain analysis is known as Spectral Analysis or Fourier analysis. Fourier transformation has been applied to transform a series into set of trigonometric series. Initially the technique was established in physics and engineering in order to explain the heat waves, sound waves etc. Later it has applied in explaining the behavior of economic variables. However applications of Fourier analysis in economic time series were limited in Sri Lankan context. Current study was focused on testing Fourier transformation along with Multiple Regression on forecasting sector returns of Sri Lankan share market. Random sample of five business sectors of Colombo Stock Exchange (CSE) were selected as the sample. Auto Correlation Functions (ACF) and Partial Autocorrelation Functions (PACF) were used to test the stationary of data series. Model assumptions were tested by residual plots, Anderson Darling test and Durbin Watson Statistic. Mean Square Error (MSE) and Mean Absolute Deviation (MAD) were used for model assessment. Tested technique was successful in four out of the five sectors. MSE and MAD of the models were less than 7 in all the models in both model fitting and verification. Residuals of the models were normally distributed and uncorrelated. It was concluded that Fourier transformation along with Multiple Regression is suitable in forecasting sector returns of Sri Lankan share market. It is recommended to test the aforesaid technique on individual company returns as well.

Keywords: Spectral Analysis, Fourier transformation
BEHAVIORAL STOCK MARKET MODEL TO REFLECT THE INFLUENCE OF GREED AND FEAR OF TRADERS IN COLOMBO STOCK EXCHANGE

M. T. M. Perera

Department of Mathematics, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
madu.thamali@sjp.ac.lk

In a real market, stock prices show fluctuations overtime and sometimes they show trends. As a general consequence when prices showing an upward trend, investors tend to invest more. But high volatility and crashes in stock prices would undergo short in stocks. In behavioral models, the trading activities of agents can be characterized by two emotional states, greed and fear where traders act greedily when prices show an upward trend and will anxiety to invest when there are unusual fluctuations.

To study the impact of emotional factors of traders in Colombo Stock Exchange (CSE), the All Share Price Index (ASPI) was selected and ASPI daily data from 2005 to 2014 were collected from CSE. Actual data reveals some of the stylized facts such as long run upward trend with regular crashes, gain/loss asymmetry and absence of autocorrelations in log returns.

This study examines a deterministic behavioral financial model which reflects the real dynamics of ASPI in which traders are driven by their emotions, and mimic the stylized factors. In order to identify the relationship between trading activity and asset price in the market a log linear price impact function has been used to make price adjustments which captures the price movements caused by the execution of an order. The study was done under the assumption that traders can switch between two activity levels ($S_t$) at a time. If market volatility is low, traders are calm and maintain their usual trading behavior; otherwise they are rather vigorous and show greedy or fearful buying behavior. Two separate values have been determined through the analysis to represent those activity levels, considering the average volatility in last five trading periods. So then the demand function was determined in the form of $S_t$ such a way that it would capture the greed and fear of the traders.

The model has the ability to produce the long run upward trend with several crashes, volatility clustering and some of the stylized facts as in the real market. The model suggests that emotions such as greed and fear may play a role in determination of index prices.

Keywords: greed and fear, stylized facts, volatility clustering, price impact function.
The purpose of this paper is to examine the impact of Intellectual Capital (IC) on market value and financial performance of Sri Lankan banks for the period of 2008 to 2014. Our analysis is about the level of intellectual capital and the level of value creating competency of Sri Lankan banks. The Value Added Intellectual Coefficient (VAIC™) approach developed by Pulic is used to determine the IC performance. Return on Assets (ROA), Return on Equity (ROE), and Market to Book Value Ratio (M/B) are used to measure the financial performance and value creating competency of selected banks. The data obtained from corporate annual reports are regressed to measure the impact of intellectual capital constituents on financial performance.

The analysis indicates that the level of relationships between different intellectual capital constituents such as human capital, structural capital, relational capital, innovation capital and capital employed etc. and financial performance indicators are varied from one to other. However, Sri Lankan banks, in general, have relatively higher human capital efficiency. So the results depict a greater impact of human capital efficiency on financial performance compared to remaining intellectual capital constituents.

Our findings would be both conceptually and practically appealing for bankers to apply knowledge management practice in their institutions. Findings would also highlight the factors affecting the performance of intellectual capital in order to maximize the value creation. Further this study would provide some information to the stakeholders and potential investors to assess the value creating capabilities of selected banks.

**Keywords:** Intellectual Capital, Human Capital, Financial Performance, Value Creating Competency, Sri Lankan Banks
CAPITAL STRUCTURE, LIQUIDITY MANAGEMENT AND THEIR IMPACT ON PROFITABILITY: A COMPARATIVE STUDY OF BEVERAGE FOOD AND TOBACCO FIRMS AND MANUFACTURING FIRMS IN COLOMBO STOCK EXCHANGE (CSE) IN SRI LANKA.

Niththiya Shanmuganathan¹, Priya Muraleetharan ²

¹Department of Accounting, University of Jaffna, Sri Lanka
²Department of Accounting, University of Jaffna, Sri Lanka
niththi04@yahoo.com

The Capital Structure, Liquidity Management and Profitability are very important issues in the growth and survival of the business. Therefore, this study seeks to examine Capital structure, Liquidity Management and their impact on profitability: A comparative study of Listed Beverage food and tobacco firms and Manufacturing firms in Colombo Stock Exchange (CSE) in Sri Lanka.

The present study covered Listed Beverage food and tobacco firms and Manufacturing firms over the period of past 7 years from 2008 to 2014. Correlation and regression analysis were used to analyze the data. In this study, Capital structure is represented by three indicators: Debt to Equity Ratio (DE), Debt to Total Assets (DTA) and Gearing ratio (GR) while the liquidity management examined by Current ratio (CR) and Quick Ratio (QR). The profitability examined by Gross Profit Ratio (GPR), Net Profit Ratio (NPR), Return on Capital Employed (ROCE) and Return on Assets (ROA).

According to the findings there is a significant impact of Capital Structure and Liquidity Management on profitability of Listed Beverage food and tobacco firms and Manufacturing firms. There is a positive relationship between capital structure and profitability and also positive relationship between liquidity management and profitability of Beverage food and tobacco firms. But there is a positive relationship between capital structure and profitability and there is a negative relationship between liquidity management and profitability of manufacturing firms. The Beverage food and tobacco firms have greater significant impact of capital structure liquidity management on profitability than manufacturing firms.

Since, this research focused only two determinants of profitability as capital structure and liquidity management, so other dimensions like firm size, growth rate should also be considered for future researchers. Moreover this research study took place only in two sectors in CSE in Sri Lanka; therefore increasing the sample size in terms of number of firms, sectors and year could also provide more accurate and generalize results.

Keywords: Capital Employed, Capital Structure, Gearing Ratio, Liquidity Management, Profitability
Corporate governance is about putting in place the structure, processes and mechanism that ensure that the firm is being directed and managed in a way that enhances long term share holder value through accountability of managers and enhancing organizational performance. As a strategic resource, the board is responsible to develop and select creative options in advancement of the firm. The main objective of this study is to find out the Impact of Board Characteristics on Dividend Policy of listed companies in Sri Lanka. In a way, the present study is initiated with the samples of 50 listed companies out of 297 companies listed in Colombo Stock Exchange (CSE) using the data representing the periods of 2009 – 2013. Board Size, Board Independence and CEO Duality were used as the characteristics of Board Structure whereas Dividend per Share (DPS) and Dividend Yield were used as the measures of Dividend Policy. The statistical techniques were used includes: descriptive statistics, Pearson’s correlation and regression analyses. The study found that Board Characteristics has weak negative significance relationship with Dividend per share as well Board Characteristics except Board Independence negatively impact on Dividend per share but those variables are insignificant with Dividend Yield as the measure of Dividend policy. The study contributes to literature in Sri Lanka. Furthermore, the finding of the paper can be considered as helpful for managers and users that are anxious to develop financial description quality and practices of corporate governance.

Keywords: Corporate Governance, Dividend Policy, Board Size, Board Independence, CEO Duality
FIRM SIZE ON PROFITABILITY: A COMPARATIVE STUDY OF STATE AND PRIVATE COMMERCIAL BANKS IN SRI LANKA

Vijithan Sripathmanathan¹, Priya Muraleetharan²

¹Department of Accounting, University of Jaffna, Sri Lanka
vijithan09@hotmail.com

The banking organizations are moving towards the goal of integrated financial solution in terms of strong competition and rapid changes in technology in providing services. In developing countries like Sri Lanka, the banking institutions are the main source of funding for the financial needs of the organizations as well as the individuals. The financial sector in Sri Lanka stated its contribution towards the post war development to push Sri Lankans towards Asia’s fastest growing economy as a part of their overall economic plans and growth. This Comparative study is evaluating the impact of the firm size on profitability of State and Private Commercial banks in Sri Lanka.

This Comparative study is evaluating the impact of the firm size on profitability of State and Private Commercial banks in Sri Lanka. In this research, researcher taken Bank of Ceylon (BOC) and People’s Bank as the State banks and for the Private banks Commercial Bank of Ceylon PLC (CBC) and Hatton National Bank (HNB) with 10 years accounting period: 2004-2013. In this study, Firm Size is represented by three indicators: Natural Logarithm of Gross Income (LLGI), Natural Logarithm of total Assets (LGA) and Natural logarithm of Advances (LGAD). The profitability examined by Operating Profit Ratio (OPR), Net Profit Ratio (NPR), Return on Equity (ROE) and Return on Assets (ROA).

According to the findings there is a significant impact of Firm Size on Profitability of State and Private Banks in Sri Lanka. There is a positive relationship between Firm Size and profitability in the both State and Private Commercial Banks in Sri Lanka.

Most of the studies on Firm Size on profitability are with reference to developed economy but fewer are with reference to developing economies like Sri Lanka. In this study researcher used Firm Size, profitability and contribute to the literature by analyzing the impact of Firm Size on Profitability and validating the findings of previous studies.

Keywords: Firm Size, Profitability, Natural logarithm
Ayurveda, which is mainly indebted for its philosophical ideas on samkhya and vaisesika systems of philosophy has, emphasized different aspects of human mind. The immediate problem in human resource management is full understanding of human functioning is that the inner subjective experiences of consciousness based in strategic human recourse management. However, temperamental groups are consisted in combination and analysis is based on subjective criteria. Research work sated that the method of analyzing temperamental groups is not consistent. Although practitioners use a questionnaire but leads several problems like dependencies among the questions in the questionnaire and analysis of the temperamental groups. The aim of the research is to identify the influences of developing a commonsense knowledge system to understand the nature of human personality in the strategic human management. The objectives should a) contribute to a better analyzing of the temperamental groups in manas prakrti. b) to analyze the gap between current state of work with values of work. This paper I present a novel tool, which is incorporated of modeling of commonsense knowledge for analyzing of the temperamental groups in manas prakrti based on a commonsense knowledge systems. Effective decision-making in human resource management for classified knowledge has been derived by fuzzy logic based on an integrated principal component analysis approach. At the initial stage commonsense knowledge base on manas prakrti is converted into a questionnaire. Each of the three major temperamental groups are again subdivided into several sub groups, viz seven of sattvika, six of rajasika and three of tamasika as per sutra samhita are consisted in the questionnaire. Removal of dependencies among the questions in the questionnaire is modelled using principal component analysis. Principal component analysis is considered as a multivariate statistical technique to reduce dependencies. Classification of Tamas-Rajas-Sattva temperamental groups is processed through fuzzy logic module, which is constructed on the basis of extracted principal components. Further explanations for classified knowledge are derived by expert system technology. The researcher have implemented the system using FLEX expert system shell, SPSS, XML and VB.

**Keywords:** Ayurveda, Manas prakrti, Temperamental groups, commonsense knowledge system, Strategic Human resource management
Electronic Commerce is accepted as an organizational strategy and approach that facilitates global market with unprecedented opportunities for organizations with remarkable cost savings. Transaction cost theory suggests that hoteliers should provide assistance in generating competitive advantage through e-commerce service offerings. Internet use, by competitors’ especially online travel agents to research, promote and sell products or services is ever increasing; especially most international travelers search the web before they decide to visit new destination quite often.

E-commerce is the best strategy and medium of instruction that are more efficient and flexible. As far as Sri Lankan hoteliers are concerned, it is evident that they are struggling on integrating e-commerce into their business process. As a result, online Travel Agencies (OTAs) like Pagoda.com, Booking.com etc are offering Sri Lankan hotel rooms at rock bottom prices while respective hoteliers charging extra ordinary prices from direct booking customers including domestic travelers.

In this research a user centric approach was adapted. To ascertain whether potential customers are served with standard user interface design and whether hotelier devote required attention on Search engine marketing.

The main collection of data done through a web survey and web content analysis. Initial hypothesis testing was conducted based on the data collected through web survey. The navigation and navigation design features which prevent customers on transaction were highlighted in the web content analysis. Internet use, by competitors’ especially online travel agents to research, promote and sell products or services is ever increasing, especially most international travelers search the web before they decide to visit new destination quite often.

It is readily available on the web site, since it has become a universal knowledge. Competitors will have easy access to information and to-the-minute price to both customers. This has turned into a net at the end rather than the price of a price cutter Equalizer.

To be successful as transaction cost theory suggest, hoteliers should provide assistance in generating competitive advantage through e-commerce service offerings. Internet use, by competitors’ especially online travel agents to research, promote and sell products or services is ever increasing; especially most international travelers search the web before they decide to visit new destination quite often. It is readily available on the web site, since it has become a universal knowledge. Competitors will have easy access to information and to-the-minute price to both customers. This has turned into a net at the end rather than the price of a price cutter equalizer.

There is well implementable outcome based on user interface designed analysis of existing web sites. It can be implemented by web administrators, search engine specialists and in general all marketers involved in hospitality marketing.
EMPLOYEE MOTIVATION AND JOB PERFORMANCE; CASE STUDY ON PRIVATE SECTOR COMPANY

Pramoda Sarojini¹, Nandaka Wickramasinghe²

¹ Sri Lanka Foundation, Colombo 07
² Sri Lanka Air Force, Sri Lanka

saro499@yahoo.com

It is widely recognized in the management of human resources that promotion of the employees in private and public sectors lead to higher performance. If employees can be satisfied with their job, and then their performance will increase expectedly. Employees of any organization have different levels of motivation. It will directly affect to quality and quantity of work which they carry out. The objectives of this study are to identify the factors influencing on motivation of employees, to identify relationship between the employee motivation and job performance and to recommend alternatives getting to enhance the motivation of the employees. One of the leading companies in Sri Lanka was selected as the case study to collect data. Interview method applied to collect primary data. Human resource managers and few employees from each department in different levels were selected to collect data. Research revealed that to motivate employees, money in the forms of pay and wages or some other sort of remuneration, is the most obvious extrinsic reward. Nevertheless money provides the means to achieve a number of different ends. It is a powerful force because it is linked directly to the satisfaction of many needs and it affects the growth of performance. Therefore employers use variable –pay programs in terms of financial rewards to motivate their employees. Variable pay is used generally to recognize and reward employee contribution toward company productivity, profitability, team work, safety, quality and to some other metrics deemed important. The employee who is awarded variable compensation has gone above and beyond his or her job description to contribute to the organization’s success. Variable pay is awarded in a variety of formats including profit sharing, bonuses, holiday bonus, deferred compensation, cash, goods and services such as a company sponsored trip. Identifying the link between motivation and performance shows that motivation is clearly linked to performance. However, in many cases motivation is not the problem. The performance problem may be due to lack of required skills, poor organization, flawed strategy, or a host of other factors. Measuring performance is the difficult and the most significant practical problem in a variable pays system. But paradoxically, precise measurements may lead people to do precisely the wrong thing. A well designed variable pay program that truly rewards an individual will motivate him/her to perform more productively and efficiently.

Keywords: Employee, Performance, Motivation, Organization
ANALYSIS OF THE REDEVELOPMENT STAGE OF A REAL ESTATE; A CASE IN THE CITY OF COLOMBO

W M I P Wickramasinghe¹, N G C Bandaramanike², T A P Kumara², M K L C Perera², L N Suduarachchi², N C Wickramarachchi¹

¹Department of Estate Management and Valuation, University of Sri Jayewardanepura,
²Government Valuation Department

It is challenging, to utilize the land at a maximum rate to respond the increasing population and the associated needs. Therefore maintaining an effective system to manage the land resource will be a crucial factor for a developed nation. In case of that, redevelopment and point of redevelopment are vital factors to be analyzed which will facilitate the better use of land. This paper aims to identify the redevelopment point of a potential real estate site which is already developed. For this purpose a site located at No. 05, Lesley Ranagala Mawatha, Colombo 08 consisting of 40 perches of land was identified which is currently using as a store room. The redevelopment stage occurs when the present value of the expected future net returns from the existing use of the land resource becomes less than the capital value of the desired site. Therefore present value of the expected future net returns of the existing use was estimated with the data gathered from primary sources. Value of the cleared site has obtained by the present value of the most profitable alternative use (proposed a mixed development of residential, office and commercial uses) less the cost of clearing the site and total cost of rebuilding for the new use, including ripening costs and normal profit. The comparative method and the project evaluation methods have been used to evaluate alternative uses to assess the viability of the project. The analysis indicates the redevelopment stage is in year 2015 and need the immediate attention. It can be concluded that applying methodological process to all properties is an immense help as to put the land into its best use.

Keywords: Redevelopment, highest and best use, Cleared site value, present value, Obsolescence
ESTIMATING THE BEST TIME FOR REDEVELOPMENT OF A REAL ESTATE: A CASE STUDY IN BAMBALAPITIYA

R.M.K.B Rathnayaka¹, U.N Piyadarshani², W.R.H Alwis², A. Vinothkumar², A.W.P.N.A Kumara², Y.S. Ruwanmali², N.C Wikaramarachi¹

¹Department of Estate Management and Valuation, University of Sri Jayewardenepura,  
²Government Valuation Department  
kosalabuddhini@gmail.com

Investing in a real property is a long term beneficial decision taken by the investors. However economic life of a property exceeds when operating cost of the property exceeds its net annual return. Increasing operating cost caused to the value of the cleared site implies that the property become and it would not match with the current use. It gives a hint to a rational investor that he should consider about the value of next best use as the existing use has reached to the stage of redevelopment. The time becomes a crucial dimension on the redevelopment process which effect on the technical obsolesces of the property. This paper focused on estimating the redevelopment stage of a commercial property. For this purpose a particular case study was identified as the assessment no. 03 Galle Road, Bambalapitiya Terrace. The gross annual returns and the operating cost of the existing property calculated according to the actual cost incurred. Based on the comparative method the expected net annual returns and the discounted rate were analyzed to identify the future returns of the expected development. The analysis reveal that the property become outdated in the year 2020 where the expected future net returns from the existing use became less than the operating cost. Thereafter the cleared site value is increasing. From the analysis it has been decided that the semi luxury residential apartment for the existing outdated property. Therefore the results suggest that this method will guide the investor in deciding the redevelopment stage of a property.

Keywords: Redevelopment, value of cleared site, operating expenses, present value, highest and best use
A STUDY ON THE IMPACT OF WORKPLACE ENVIRONMENT ON THE EMPLOYEE’S PERFORMANCE

Piumi Lankeshwara

General Sir John Kotelawala Defence University, Ratmalana
nishu.prabha@gmail.com

In the current era of highly volatile business environment, organizations are facing emerging challenges in achieving operational excellence with the intention to offer a competitive advantage and secure lasting results for their customers. The most crucial factor that affects the organization performance is its employee since human resources are considered as a source of sustainable competitive advantage. The workplace environment gives an immense impact to the employees either towards the negative outcomes or positive outcomes. The objective of this study was to identify the impact of workplace environment on the employee’s performance. The study has utilized primary data and a sample of size 85 has chosen in accordance the Morgan approach of sample selection including both managerial and non-managerial employees from Brandix Intimate Apparel- Awissawella through the proportionate sampling technique, using already developed self-administered questionnaire. Multiple Regression Model has been utilized as the main data analyzing technique. The survey results revealed that the job aids, supervisor support and physical work environment as positively influential for the employee’s performance and supervisor support as the most critical predictor. Implications of the findings and recommendations are offered.

Keywords: Employee’s Performance, Job Aids, Supervisor Support, Physical Work Environment
MODERN TECHNOLOGY AND APPLICATIONS
EVALUATION OF THE BEACH NOURISHMENT PROJECT AT PALLIYAWATTA-USWETAKEIYAWA SRI LANKA


Department of Earth Resources Engineering, University of Moratuwa, Sri Lanka
rakazoor@gmail.com

Beach Nourishment is a soft engineering solution increasingly used to combat erosion. Sri Lanka's first major Beach Nourishment project was carried out over a 1.8 km stretch in the Uswetakeiyawa Palliyawatta area by the Coast Conservation Department (CCD). The Project was conducted in January 2012 and 300,000 cubic meters of offshore sand was pumped ashore using a dredging vessel. Dredged sand was used to nourish the stretch of eroded beach with a total project cost of USD 300 million. This research was carried out to assess the performance and to forecast future performance of the above Nourishment project. Topographic data and grain size data at the site were gathered and analyzed over a period of six months (spanning a monsoonal cycle). Satellite imagery obtained for a much larger time period were also analyzed and complemented the field data. The findings of the research indicate that due to incorrectly oriented sand retention structures and the incorrect grain size of nourished sand, the nourished area is currently undergoing rapid erosion. It was forecasted that due to erosion, the beach will return to its pre-nourished stage after a period of 12 months. This will result in the exposure of a beach rock at the mean sea level and will cause the beach to lose its recreational and aesthetic value. In order to prevent this and to retain the nourished sand, the correct orientation of the retention structures and the appropriate grain size for nourishment are proposed.

Keywords: beach nourishment, erosion prevention, performance forecasting, coastal protection, sand retention structures
ENERGY DEMAND FORECASTING FOR SELECTED SECTORS IN SRI LANKA

Kalani Hasanthika

Department of Statistics, University of Sri Jayewardenapura, Sri Lanka
kalanihasanthika@gmail.com

With the rapid growth of population demand for energy had been one of the most talked topics in the recent past. Among all the energy sources, electricity nowadays has become a vital need in human life. Electric power industry is one of the fastest growing industries in our country, so forecasting electricity demand for future would be of great importance to many sectors. The main objective of this study is to find the best method to forecast the monthly electricity demand for Colombo district, Sri Lanka and four different sectors, namely residential, commercial, industrial and public lighting, among the five methods classical, exponential smoothing, stochastic, ANN (Artificial Neural Network) and a relatively unexplored model, GMDH (Group Method of Data Handling) networks. For all three time series approaches models were developed and forecasts were obtained using MINITAB 14 software. In order to build artificial neural networks MATLAB (2013 edition) software was used. Monthly total electricity sales for Colombo district from 2001 January to 2013 December and for the above mentioned sectors data from 2004 January to 2013 December were used. Among the results obtained, for Colombo district classical decomposition method with a quadratic trend and for Sri Lanka both ANN and \textit{SARIMA}(1,1,1)(1,1,3)_{12} model performed well. For sector wise data, for residential sector exponential smoothing model, commercial sector classical model, industrial sector exponential smoothing method and finally for public lighting classical method had the highest forecasting accuracy. To summarize results from all the methods for all the datasets time series methods had the highest forecasting accuracy compared to neural networking methods. For Sri Lanka ANN methods had better forecasting ability than GMDH methods, though most of the previously conducted studies for different countries indicated that GMDH method performs better than ANN and time series methods.

\textbf{Keywords:} Electricity, Forecasting, Neural network, Exponential Smoothing, Stochastic method
LOW-COST REAL TIME STEREO VISION BASED AUTONOMOUS ROBOT NAVIGATION SYSTEM

Nalan Karunanayake

Department of Electrical & Computer Engineering, Sri Lanka Institute of Information Technology,
Malabe, Sri Lanka
nalan.k@sliit.lk

The main part of an intelligent mobile robot system is the capability to operate in uncharted indoor environments and avoid the obstacles accurately. Most of the existing auto navigation robot systems are based on infrared sensors (IR sensors), sonar sensors and laser range finders which are unreliable compared to a vision based system. This research work describes a low implementation cost and real time stereo vision based intelligent mobile robot navigation system. Real time vision based mobile systems are rapidly developing areas in the field of autonomous robot navigation. The proposed algorithm works in an indoor surrounding with various size and types of obstacles. A dense disparity map is computed from the stereo images captured by two cameras carried by the robot. By using the real time 2D disparity map obstacles can be avoided in indoor environments and reproduce a three dimensional model of the same environment to get the depth information. The only sensor used is a stereo camera. The proposed system expressed by three blocks. The first block is produce an accurate depth map using the captured stereo images. The second block is a decision synthesizing process that analyze the created depth map and conclude the most convenient path for the robot to avoid the obstacles. Furthermore, the third block reconstruct the 3D environment. The developed system has been tested in six different indoor environments and the proposed algorithm is able to avoid static and dynamic obstacles with 95% of accuracy and reproduce the 3D scene to extract the depth information. The robot is designed to reach and explore positions unreachable by human beings.

Keywords: Stereo Vision, Mobile Navigation, Obstacles Avoidance, Point-Cloud, Disparity Map, Raspberry-Pi, Low Cost.
SRI LANKA AS A POTENTIAL HUB FOR IT/BPO SERVICES

Chinthaka Jayasundara¹, Niroshini Perera²

¹ Department of Economics, University of Colombo, Colombo, Sri Lanka
² National Savings Bank, Colombo, Sri Lanka

chinthaka@econ.cmb.ac.lk

Sri Lanka’s strategic location in the Indian Ocean on the major air and sea routes between Europe and the far East is an advantage to positioning Sri Lanka as a global logistics hub. However mainly due to economic instability created by prolonged war, Sri Lanka had been less popular as a centre for delivering IT, business process outsourcing (BPO) or knowledge services until recent past. Today, Information and Communication Technology (ICT) has been pivotal for the socio economic development of a country. The main objective of this study is to investigate the position of Sri Lanka in the Asia Pacific region as a potential destination to IT/BPO services delivery. The research has carried out a PESTEL analysis on IT industry. Furthermore, it has conducted a regional comparison of IT industry mainly considering competitive countries in the Asia Pacific region. Although IT sector employees draw higher salaries when compared to most of other sectors in Sri Lanka, salary level still remains lower when compared to most of competitive countries. Hence, this is a critical factor for companies choosing where to locate or outsource their service operations. From an economic point of view we are way ahead than the competitors in the same income group level. Relative average costs of compensation for knowledge services in Sri Lanka are lower than most of competitive countries in the region. Furthermore, from a technological stand point, Fixed Broadband Internet tariffs are very competitive and minimal in Sri Lanka. Moreover, the sub index of regulatory environment pillar of Networked Readiness Index (NRI) has been attempted to compare the regional index values in order to spot Sri Lanka’s position within Asian region and it suggests that the country’s regulatory system is more favorable for business when compared with India, Pakistan, Philippines and Nepal. This study has conducted a comprehensive analysis on each of the pillar of PESTEL, and found that Sri Lanka is a hidden gem in many ways for IT/BPO services delivery. Sri Lankan government ought to take proactive measures such as conducting international investor promotions, introducing new tax holidays, increasing the intakes of Computer Science / IT undergraduates, etc. to extend the country’s competitiveness further and grab this regional opportunity as a destination for IT/BPO services delivery.

Keywords: NRI, IT/BPO, PESTEL Analysis, Regional Comparison
ABSTRACT ON GLOBAL KNOWLEDGE SHARING FOR IMPLEMENTING A DIGITAL MANUFACTURING LAB (FABLAB) FOR RURAL DEVELOPMENT IN SRI LANKA

Chaminda Hettiarachchi 1, Priyantha Palapathwala 2, Gayan Srinath 3

1 Dil Consultancy
2 MEASA Consulting (Pvt.) LTD
3 University of Colombo
dilhanake@yahoo.com

Digital Manufacturing is changing the way the world has seen manufacturing. By sharing designs and blueprints over the internet, it will be possible to digitally print 3-dimensional objects locally from anywhere (“print almost anything”). Some consider this as “the next industrial revolution”. Started as project at MIT, the concepts of digital manufacturing is spreading all over the world in the form of Fabrication Laboratory (FabLaB). A group of Sri Lankan Social Scientists from Sri Lanka, Europe and United States has been conducting a project to explore the opportunities for digital manufacturing in post-conflict economic development in Sri Lanka. The group has been collaborating over the internet in setting up of a FabLaB for empowerment and economic development of a rural community in Sri Lanka. The objectives of the project are to share knowledge, enhance innovation and technology transfer in community development, to engage multi-stakeholders including Universities, the government, private sector, NGOs, community and other key players. This paper will discuss the objectives, process, progress and challenges faced in this project. The purpose of the paper is to demonstrate the use of Web technologies in conducting a global knowledge sharing project and also to discuss the power of digital manufacturing to empower rural community in developing country context. The paper will discuss the dimensions of project covering the planning process, implementation strategies, challenges faced and expected outcome.

Keywords: Digital Manufacturing, 3-D Printing, innovation, knowledge sharing, social enterprise.
This research demonstrates the value of integration Electric Transmission Line (ETL) routing with Geographic Information Systems (GIS) to find ways to make routing decisions automate, standardize, more quantifiable, consistent, and defensible.

With the increase of population and the economic development of the country the demand for energy and electricity are also expanding. However, as the population indicator of Sri-Lanka continues to sprawl into more rural areas especially to Northern and Eastern provinces in a scattered manner, there is a need to build up a new transmission line to meet their demand for electricity.

One of the most important problems in energy transmission is finding the best route in any area. Many people from different disciplines have been reported together to find the best routes by manual methods like using paper maps for the determination of which route is the least cost path (LCP) to the destination point. On the other hand, in order to find the best route it is a very important to consider criteria such as slope, landslide, road, railway crossing, distance to buildings, national parks, archaeological areas, residential areas, forests, river crossing etc.

In GIS tools, techniques, procedures, statistical evaluation methods and stakeholder collaboration used to produce the new siting methodology; Multi Criteria Decision Methods (MCDM) like as Analytic Hierarchy Process (AHP) have been used to make the most accurate decision. By this study, the mistakes identified by manual methods decrease in ETL routing and other routing problems.

This research study is implemented within a limited scope to find the best route between given two points. However, according to the introduced rules, conditions and parameters the new transmission line were accurately drawn between given source and destination locations.

The prepared model has converted to a computer programming language to create a tool for easy access. Once the tool is executed, required inputs parameters can be change depend on the geographic conditions of the project area for finding the best route.

Introduced weighted ranking system has used to create a suitability index for geographic factors, which are influencing for Electric Transmission Line Routing process. Finally, it is intended to highlight the need for the standardization and automatic integration of the system for the effective management of electric transmission line routing.

Keywords: Electric transmission line routing, Geographic Information System, Least Cost Path.
NONLINEAR DYNAMICS OF THE DENGUE MOSQUITO PROPAGATION WITH RESPECT TO CLIMATE FORCES: A DISCRETE TIME DENSITY DEPENDENT FUZZY MODEL

W.P.T.M. Wickramaarachchi, S.S.N. Perera

Research and Development Center for Mathematical Modeling, Department of Mathematics, University of Colombo

Dengue is one of the major public health problems particularly in the tropical and sub-tropical regions in the world and each year millions of people are vulnerable to this disease. Dengue disease is endemic in Sri Lanka now, since it was first identified in 1960s. Each year, thousands of people in Sri Lanka get infected with dengue which disturbs the national economy and the well-being of the society. Various mathematical models have been developed to understand the dynamic of the transmission of dengue disease. However the fixed parameter values have been used in these models so the real dynamics of the transmission is not explained completely. The mosquito density is an important parameter in these mathematical models which depends heavily on climate factors such as rainfall and temperature. The aim of this research is to construct a mathematical model to study the nonlinear behavior of mosquito density. This model consists of two additive components, namely the biological component and the climate force. In the biological component, we assume that the number of adult mosquitoes at time \( t \) depends on the number of adult mosquitoes at time \( t-1 \) plus the number of growing juveniles at time \( t-1 \). The Gompertz model is used to model the number of growing juveniles which is again a function of number of adult mosquitoes in the previous time. Fuzzy logic and fuzzy set theory is used to model the component of climate forces to grow mosquitoes. The fuzzy membership functions are constructed for each factor rainfall and temperature where the membership value in \([0, 1]\) explains the degree of unfavorability to mosquitoes from each factor in different levels. The Modified Einstein Sum operator is used to compute the overall measure of unfavorability from climate factors. We simulated this model using climate data from year 2006-2011 and the results show a periodic behavior of mosquito density with an increasing trend.

Keywords: Mosquito density, Fuzzy logic, Climate forces, Gompertz model, Mathematical models
AN EMPIRICAL STUDY OF SITUATIONAL, LEADER AND TEAM MEMBER CHARACTERISTICS ON COACH LEADERSHIP BEHAVIOR STYLES EXHIBITED BY THE COACHES OF STATE UNIVERSITIES IN WESTERN PROVINCE

H. P. N. Perera 1, M.D. Pushpakumari 2

1 Faculty of Applied Sciences, University of Sri Jayewardenepura
2 Department of Business Administration, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura
piumiri@yahoo.com

Leadership in sports has been studied mostly in terms of coach-leadership. Coach leadership behavior has an impact on players’ performance. The purpose of this study was to investigate the impact of situational characteristics, leader characteristics, and team member characteristics on coach leadership behavior styles in sports in state universities in Western Province (University of Colombo, Kelaniya, Moratuwa and Sri Jayewardenepura) Sri Lanka. This study was conducted during the inter-university games held in 2014 considering the events of basketball, netball, volleyball, and Elle. Two hundred and ninety one athletes from Western Province state universities participated in this study. Gender, age, locus of control, and level of education and training variables were considered under coach characteristics. Nature of the sport, level of competition, and previous success and/or failure records were considered as situational factors which affect coach behaviors. Team member characteristics taken into consideration were gender, age, culture, and experiences. Data were collected through a standard questionnaire which was derived from the revised leadership scale for sports. The questionnaire was further modified to suit the Sri Lankan context. Mean calculations was used as a parametric test to derive the influence of situational characteristics of the coach, leader characteristics and team member characteristics on coach leadership behavior. Statistical calculations were done using SPSS. It was found that coaches carry out more training and instruction behavior in relation to females than males. Further, compared to females, males urge a higher influence on coaches to follow an autocratic behavior. Results further revealed that when the experiences of the athletes are less, they prefer their coaches to be more democratic. Additionally, it is found that the coaches carry out more situational consideration behavior when the level of competition is high. It can be concluded that the situational, leader, and team member characteristics have a moderate influence on coach leadership behavior. Further, the research on sports management is in primary stages in Sri Lanka. The findings of the present study may influence researchers to engage in further research and also will be helpful for coaches to make decisions on athletes.

Keywords: Coach leadership, team member characteristics, situational characteristics, leader characteristics, athletes
The research has focus on building a tool that could be used for effective dissemination of knowledge to the general public who does not have access to computers. A single board computer was chosen and prepared to deliver Power Point type Presentations / Multimedia content. The idea is to use multimedia as a medium over presenting textual content (presented in the form of printed books / E readers) to increase the effectiveness of communication and as a better tool to aid teaching. This device could be used with a standard TV set as display and proves to be a valuable tool for teaching in the rural areas and for conducting public campaigns.

The other important concept introduced in this research is the idea of lending a computer in place of a book. The concept of lending a book has been practiced for many decades, with the decrease of the cost of a computer it is practical to lend a computer with content loaded in it to be used by plugging a standard TV as the display.

To implement the proposed system in a proof of concept level, a suitable single board, low cost needed to be identified. The two most popular systems that are freely available with good community support and at a low cost were compared. The two most widely used systems, namely Arduino and Raspberry Pi were compared (http://readwrite.com/2014/05/07/arduino-vs-raspberry-pi-projects-diy-platform). At an additional cost of USD 5, Raspberry Pi (www.raspberrypi.org) offers a host of features that support graphics rendering and functions at a clock rate much higher than the Arduino, (700MHz against 16MHz). Therefore the Raspberry Pi Model B was chosen as the best platform to be used for building the low cost lendable computer.

To achieve the objectives and make an effective low cost teaching tool that could be simply used as lending a book with public funding to build more devices, the chosen system was built and multimedia content was loaded as a proof of concept.

- Provide rural public the option of having access to multimedia presentations
- Effective knowledge dissemination (Text content with Multimedia)
- Provide a way to own or lend the device as lending a book in a public library

**Keywords**: Information Dissemination, Learning Tool, Multimedia Content, Low cost
THREE TIER DESIGN FOR HEALTHCARE SERVICE SOLUTIONS

Gilmini Geethika Tudawe Dantanarayana¹, Prasad Jayaweera²

1Department of Computer Science, Faculty of Science, University of Ruhuna, Sri Lanka
2Department of Computer Science, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka
gilmini.td@gmail.com

Ever increasing diversity and differentiation due to expansions in service providers, variety of service organizations and constantly created new medical specialties has resulted challenging, complex and highly dynamic environment for e-Health solution developer. Therefore it is necessary to design a systematic approach to capture highly dynamic and emerging organizational requirements in order to achieve successful e-Health solution meeting stakeholders' needs while facilitate systematic alignment between higher level strategic and motivational requirements with lower technical level realizations.

This research work is an initiative contributing to get established a framework catering different modeling aspects of service design work flow. The proposed framework uses value orientation as the basis of the proposed approach. The framework consists of three modeling layers HC Motivation Modeling (HMM), HC Value Modeling (HVM) and HC Service Process (HSP) Modeling together with related artifacts. The adopted value orientation and in particular HVM in the proposed framework is detailed out by means of Value Object (VO) classification schema. A Value Activity (VA) classification and an initial intuition on VA choreographing are fundamental for successful service designing effort and that have been introduced in the framework as the foundation of HSP. Further, one of the promising approaches to tackle afore mentioned interoperability issues are the development of complete and sound enterprise-wide ontologies. However in the proposed framework this requirement has been accomplished by means of defined set of healthcare related meta-models. These meta-models have also been extend with Reference Information Models based on VO schema that capable of covering information modeling aspect of HSP layer.

The work reported here introduced a contribution in an endeavor to develop a complete and sound value oriented service designing framework. Besides modeling and designing higher motivational requirements to be realized on technologies, the importance of addressing value oriented modeling layer was illustrated in detailed. Value oriented modeling layer mainly consisting Value Objects and Value Activities performed by Value Actors and further these layers that serves as an intermediate layers between higher level motivation/goal modeling layer and lower level service designing technological realization layer. Yet another commendable contribution is the facilitation to bi-directional traceability between these modeling layers that designers could be achieve with the adoption of the proposed framework.

Keywords: Motivation Modeling, Value Modeling, Reference Information Models
Effectiveness of the legal sector is highly relying on the coordination of collaborative workflow activities to cope with highly dynamic and complex information exchanges among many different partners. In the context of ever increasing number of legal cases and roles offering different legal services, the appropriateness of the adaptation of workflow management systems in legal sector have been discovered to address the resulting complexities and performance issues in legal service collaborations. In this work, a Legal Collaboration Modelling Framework has been introduced with the objective of assisting in modelling legal collaboration workflows in such a way as to provide a useful input for the creation of legal workflow specifications for setting up legal workflow management systems. The two main contributions of this work are a collaboration modelling framework and an application of the framework in a district courts collaborating situation. The proposed framework was semantically rich enough for composing complex multi-party legal collaborations with the promising results in workflow coordination. The application of modelling framework resulted possibility of streamlining and then to ensure the coordination among the workflow activities to achieve productivity and efficiency.

**Keywords:** Legal Workflow, Legal Collaboration Modelling, Workflow Management, Transaction Patterns
IMPROVED AUTOMATED NUMBER PLATE RECOGNITION SYSTEM WITH HISTOGRAM AND TEMPLATE MATCHING

L.D.S.B. Weerasinghe¹, T.G.D.S. Tennegedara¹, T.M.K.K. Jinasena²

¹Department of Computer Science, General Sir John Kotelawala Defence University, Sri Lanka
²Department of Computer Science, University of Jayewardenepura, Sri Lanka

sidath.weerasinghe@gmail.com

Automatic Vehicle number plate recognition (AVNR) is a very popular and highly demanding in transportation industry, law and enforcement such as automating fines for traffic rule violations, automating parking lots, entry and exit in highways, quickly identifying granted vehicles. Most of the AVNRs use image processing techniques such as image enhancement, restoration, segmentations, block-based character recognition, optical character recognition and template matching. This paper presents the design and implementation of such a system to military organisations to capture and recode vehicle logs. People face difficulties at the gate premises due to the existing manual system. To collect the data, qualitative research techniques such as interviews and observations were used. Once an image captured, median filters were used to remove noises. Sharpen filters used to detect edges. Camera calibration was used to correct the perspective view. Lines were detected using Hough transformation and, rectangles were identified. Histogram processing is used to identify the number plates. Template matching with different letters, numbers, and special character were used to recognize its content. Once a license plate is found, its figures are recognized, displayed on the user interface and checked in the database for grants. Moreover arrival or departure times are being recorded. MATLAB was used to develop the prototype together with MySQL. Two cameras with 720x480 resolution and an i5 laptop with 4GB RAM is used to test the system. 96 vehicles were tested under different conditions and the overall accuracy of the system was 84%. Although the system miss reads number 3 or 6 as 8 or vice versa 12% times, it didn't record as false positive. Miss read mostly happened with older number plates since they didn't have proper style. The other fact was the muddy conditions. However, 8% of false negative has been recorded. But as the database groves and close numbers are entered, there is a possibility of getting false positives. Further quantitative measures such as light conditions, and distance from vehicle to camera have been collected and analysed. Post research questioners have proven that the system is very useful and time saving methods for military organisations and also its reliability.

Keywords: Image Processing, Camera Calibration, Histogram, Template matching, AVNR
INTEGRATION OF MODERN APPLICATION FOR MEDICAL CODING SYSTEMS AND ELECTRONIC PATIENT RECORDS

Mahesh Liyanawatta, Sirimevan Widyasekera

Department of Medical Physics and Informatics, Faculty of Medicine, South Asian Institute of Technology and Medicine (SAITM), P.O.Box 11, Millennium Drive, Off Chandrika Kumaratunga Mawatha, Malabe

mahesh.saitm@gmail.com

During the past decade Sri Lankan healthcare industry has put considerable efforts to develop electronic healthcare record systems. But no successes have been reported. The International Classification of Diseases (ICD) is the standard international biomedical terminology and a coding system of classifying mortality and morbidity statistics which can be used to provide healthcare facilities to define diseases and allocate resources accordingly to provide additional care. ICD treated as a standard diagnostic tool for epidemiology, public healthcare management and clinical purposes. It can be used to monitor incidence and prevalence of diseases, classify diseases to maintain the quality of diagnostic statistics and make health and vital records such as diagnostic records or a death certificate of a particular patient or population. In Sri Lanka, all universities and institutions that are providing medical education use paper-based clinical portfolio to monitor their clinical data which are relevant to all medical students. The “e-Portfolio for Medical Students” will improve the quality and the standards of monitoring of clinical experiences of the medical students since it is a computer based software application that helps the medical students to query the history of hospital or ward visits and analyse their medical experiences. Faculty head(s) or the concerned person(s) can view and analyse all the records of hospital or ward visits done by students based on the student registration number or the ICD code. It will also help to keep tracks of diseases within the geographical area through ICD coding system with the standard definition of the symptom(s). ICD coding system act as a common language to compare and share health information between hospitals, regions, settings and countries and it also allows for easy storage, statistical analysis of health information for evidence based decision making. The software application allows storing diagnosis information of all the patients and analyse that information through different perspectives like reports, charts and other graphical data. According to the analysis, government and hospitals can do their resource allocation for the patients and population to clarify diseases and other health problems according to the priority.
USING DATA MINING TECHNIQUES TO ANALYZE CRIME PATTERNS OF NATIONAL CRIME DATA

Samantha Kumarapathirana ¹, Saminda Premaratne ²

¹ University of Ruhuna
² University of Moratuwa
suman.kumarapathirana@gmail.com

The concern about national security of citizens of any country has increased significantly during the last three decades. And this issue is continuing to grow in intensity and complexity. Crime is an offence against a person, or his/her property or the State regulation and occurs in a variety of forms. These forms have been recognized internationally as traffic violations, sex crime, theft, fraud, etc. Criminology is an area that focuses the scientific study of crime and criminal behavior and law enforcement and the process aims to identify crime characteristics. A crime analysis tool analyzes and summarizes collected data, identifies the patterns of happening crimes quickly and predicts for future crimes using the patterns generated. High volume of crime datasets and also the complexity of relationships between these data have made criminology an appropriate field for applying data mining techniques where important results can be gained providing betterment for the society. Many classic data mining techniques have been successful for crime analysis generally, such as association rule mining, classification, and clustering. The purpose of this survey is to summarize major findings in mining of crime data and to review the applicability of various data mining methods and Geographic Information Systems in crime analysis and visualization. The Regional Crime Analysis Program uses data mining and data fusion techniques in order to catch professional criminals. Another framework for crime trends uses a new distance measure for comparing all individuals based on their profiles and then clustering them accordingly. This method also provides a visual clustering of criminal careers and identification of classes of criminals. Exploratory Data Analysis techniques are interactive and visual, and there are many effective graphical display methods for relatively small data sets. Spatial point patterns (SPP) are based on coordinates of locations of crime incidences and is typically interpreted as analysis of clustering. Since crime data is increasing to very large quantities, in turn the need for advanced and efficient techniques for analysis is increasing. Data mining as an analysis and knowledge discovery tool has immense potential for crime data analysis. This field is not mature and needs further investigations.
WEB BASED GIS APPROACH FOR GEOMORPHOLOGIC CHANGE DETECTION ON THE MOUTH OF RIVER "KALU", SRI LANKA

M. S. P. M. Siriwardane

supunsiriwardane@gmail.com

Geographic Information Systems (GIS) can be identified as a powerful technology which supports better decisions in many disciplines. Recent past, traditional GIS has engaged with a trend of transforming towards web based GIS applications that are encouraging more users to retrieve benefits. This study has been focused on the geomorphologic change detection on the mouth of river Kalu that located at the Kalutara district in Sri Lanka. During the period of several years, high resolution GeoEye satellite images were taken and visual interpretation was done. The shoreline and the changes of river mouth has been detected in a significant way by using shoreline detection tools with ArcGIS software. According to the results, it can be detected that both physical factors as well as human activities have influenced for many changes. Using the identified land forms, a web based GIS application has been developed to understand the changes using an interactive web map. The time aware datasets were uploaded to this system and they were able to represent temporal variations in an effective way. Most important process was the development of tools which are embedded to the web application for particular operations. The ability to detecting changes within a period of time, then derive a map with results, downloading the necessary data sets and exporting the changes in tabular formats are some important functions which can be executed by running the tools. As the conclusion, the main fact which was identified that the change detection methodology in GIS has been enhanced with web technologies while preserving the same abilities of traditional GIS. The advantage is that, the application can be used with more users as the simplicity and accessibility is convenient. Therefore, decision supporting ability of GIS has been increased in a user friendly manner.

**Keywords:** Geographic Information Systems, Web GIS, Geomorphologic Changes, Decision support
IDENTIFICATION OF FACTORS AFFECTING MISSING VALUES IN SURVEY DATA AND COMPARISON OF IMPUTATION METHODS

D.A.N. Ranasinghe, N.A.D.N. Napagoda

Department of Mathematical Sciences, Wayamba University of Sri Lanka
arunirans1989@gmail.com

Data of most surveys comprise missing values. Missing values create serious problems for all the parties involved with surveys. Incomplete data occurs when there are no answers for a particular question in the survey questionnaire and it makes analysis of data more challenging. Furthermore, missing values can lead to incorrect decisions. Missing value imputation is used to alleviate these by replacing incomplete data using suitable values.

Imputation methods create a way to obtain accurate results of a survey. This study attempts to investigate the factors affecting missing values and identifies the most appropriate imputation method out of several methods. It helps to increase the accuracy of the survey results and it may help to collect complete data for a survey with the awareness of affecting factors.

Survey data of Annual Surveys of Industries (ASI) collected by the Department of Census and Statistics (DCS) were used for the study. Diffusion of missing values among each identified variables were comprehended and the factors affecting missing values were employed using binary logistic regression model. Moreover, five imputation methods were selected for the comparison such as cold-deck imputation, multiple imputation, expectation maximization, linear interpolation and linear trend at point. The differences between actual and imputed values of each method were calculated and one-way analysis of variance (ANOVA) was used to identify the pairs that have unequal differences.

The results suggest that there are four factors affecting missing values; such as Establishment type, Area, Legality type and Number of total employees. Expectation Maximization (EM) method was identified as the most appropriate method for missing value imputation in ASI according to the comparison carried out. EM has the lowest mean difference than other four methods.

ASI results provide the annual summary performances of local industries; it also reflects the social and economical state of the country. Hence, accuracy of the ASI results is crucial for making correct policy decisions regarding the industries. Hence, this study facilitates more reliable data analysis leading to correct decisions for the development of the country.

**Keywords:** Binary logistic regression model, Expectation maximization, Imputation, Missing values, Survey data
Sri Lankan tourism industry plays an important role as one of the core contributors of foreign exchange earner in an overall economy of the country. After war period number of arrivals showed an increasing trend. This development facilitated to increasing of income from international tourism in Sri Lanka. Forecasting income in the tourism industry is essential in assessing budget, planning, strategy development, policy development and other decision-making process within the economy in macro and micro level. Therefore forecasting international tourism income in Sri Lanka in the post-war period was considered as the objective of the study. Monthly income data utilized from January 2009 to December 2013. Data obtained from annual reports of Sri Lanka Tourism Development Authority. Descriptive Statistics was obtained as summary measures. Autoregressive Distributed Lag Model (ADLM) was tested on forecasting tourism income at different lags. One way Analysis of Variance (ANOVA) technique was used for overall model testing and t-test was used for individual parameter testing. Residual plots and Anderson-Darling test for residuals were used as the model validation criterion. Forecasting ability of the models was assessed by considering adjusted $R^2$ and three measurements of errors. Box and whisker plot showed no outliers in the data set. The model was tested at different lags. Lags 1, 2, 4, 5 and 6 were significant and a linear model with those lags had the least MAPE in both model fitting and verification (10.3% and 15.2%) respectively. Adjusted $R^2$ of the model was 84%. Residual plots and Anderson-Darling test confirmed the normality of residuals. Also, residuals Vs fits confirmed the independence of residuals. It was concluded that the ADLM model is suitable for forecasting international tourism income in Sri Lanka. It is recommended to test Auto Regressive Integrated Moving Average (ARIMA) models on forecasting international tourism income in Sri Lanka.

**Keywords**: Autoregressive Distributed Lag Model, Residuals, Income
Crude oil is the most important natural resource sought by the industrialized nations. It is in particular used to generate heat, drive machinery and fuel vehicles and airplanes. The price of crude oil plays a significant role in the global economy. Nowadays, the need of crude oil increases and at the same time the price fluctuates widely. So, the modeling of crude oil price is essential to make effective decisions in the future. In this study two modeling techniques were proposed to model the monthly crude oil prices of Euro Area, based on data obtained from 1985 to 2014. First, the so-called Box-Jenkins’s technique was considered to develop an Autoregressive Integrated Moving Average (ARIMA) model for the oil prices of Euro Area. The KPSS test was used to check the stationarity of the series in addition to the graphical identification. Sample Auto Correlation (SAC) and Sample Partial Auto Correlation (SPAC) plots were used to identify the tentative ARIMA model. Initially, several non seasonal ARIMA models were postulated for further analysis. These models were then estimated and compared for their adequacy, based on the significance of the parameter estimates, mean square and Modified Box-Pierce (Ljung-Box) Chi-Square statistic. By means of Mean Square Error, AIC and BIC, the model ARIMA (2, 1, 3) was recommended for short term forecasting. As the second technique, Markov analysis was used to predict the future behavior of the crude oil price by means of long run probability. Under this technique, we first divided the monthly crude oil prices into four non-overlapping intervals as states and verified that the observed crude oil price series during the states follow a Markov Chain by applying the chi-square test. Next, by calculating the transition probabilities the trend of oil prices was observed. Finally, the short term forecasting was made by means of long-run probabilities.

**Keywords:** Markov chain, Crude oil, ARIMA, Stationarity, Auto-correlation
FORECASTING GROSS DOMESTIC PRODUCT (GDP) IN SRI LANKA USING TIME SERIES ANALYSIS

P.W.K.M. Ranasinghe, D.J.C. Suriyaarachchi

Department of Statistics and Computer Science, University of Kelaniya
krishanthi908@gmail.com

Gross Domestic Product (GDP) is the most comprehensive macro-economic indicator of a country and it is used by policymakers and businessmen to plan economic policies. GDP is the market value of the final goods and services produced within a country in a year, or a given period of time. Real GDP is calculated using the prices of a given “base year”. In Sri Lanka, it is calculated in Million Rupees. GDP is measured in three approaches namely, Income approach, Expenditure approach, and Production approach. According to the economic theories, these three types finally give the same value for the GDP. Purpose of this study is to forecast GDP using two models and compare them.

This study is based on the data of current Gross Domestic Product (Rupees in million) in Sri Lanka from 1959 to 2013 which consist of 53 observations. 95% of the total observations were used to fit the Auto Regressive Integrated Moving Average model and Vector Auto Regressive (VAR) model and 5% of the total observations were used to check the validation of the models. To fit the ARIMA model, Auto Correlation Function (ACF) and Partial Auto Correlation Function (PACF) were used to identify the AR and MA terms. ARIMA (1, 1, 0) model was selected as the best model to forecast GDP in Sri Lanka which satisfied all the assumptions. Based on the preliminary analysis, Exchange rate (Sri Lankan rupees per dollar), 91 day Treasury bill yield (per cent per annum) and reserve money (Rupees in million) were selected as the independent variables for the VAR model. The results of VAR model showed that GDP of the previous year and 91 day Treasury bill yield of the previous year have effect on the GDP in the current year. MAPE value was used to evaluate the fitted models.

ARIMA (1, 1, 0) model was fitted with 2.27% MAPE value and VAR model was fitted with 3.99% MAPE value. ARIMA model can be identified as the most suitable model to forecast GDP in Sri Lanka compared to the VAR model.

**Keywords:** Gross Domestic Product (GDP), Autoregressive Integrated Moving Average model (ARIMA), Vector Auto Regressive model (VAR), Mean Absolute Percentage Error (MAPE), Auto Correlation Function (ACF)
EASY AND EFFECTIVE RE-SCHEDULING OF TRAIN TIMETABLE FOR SRI LANKA RAILWAYS IN THE EVENT OF DELAY IN ONE OR MORE TRAINS

U. N. I. Priyadarshana¹, R. Sanjeewa ¹, P. D. S. Bandara Chandrasena ²

¹ Department of Mathematics, University of Sri Jayewardenepura, Sri Lanka
² Sri Lanka Railway Department, Colombo, Sri Lanka

nilantha_indrajith@yahoo.com

Well over 350 turns of trains occur between Slave Island and Dematagoda daily which makes these two destinations the hub of the entire railway system. During a rush time period if any one of the trains gets delayed for some reason within the hub it creates a big traffic jam which ultimately affects the entire system. The basic objective of this research is to take measures to reduce delays of trains within the hub for an efficient and effective railway system throughout the country. We focus on 10 am to 11 am during weekdays within the hub and use graph colouring technique to address this situation. Hence the railway system is converted into a graph and use railway lines as edges and platforms & signal lights together as vertices. Then the adjacency matrix of our graph can be obtained. The adjacency matrix helps us to derive all these possible paths. When the first delayed train reaches the signal light of either side of the hub the vertex of the relevant signal light is given a specific colour. After checking the possible paths that this train can follow from the adjacency matrix and the existing train time table the path that the train can follow is selected. Once the path is selected the same colour is given to the platform at the end of this path which is considered as a vertex. Then this particular train can move along the vertices in the same colouring. Then considering the coloured path and existing time table we colour the rest of the graph. Based on this colouring and using the information about the time taken by a train to travel between two vertices the re-scheduled time table is prepared. This method can be extended to reschedule the existing time table per entire day in the event of delay.

Keywords: graph, vertex, edge, colouring, adjacency matrix
DESCRIBING ROTATIONS OF THREE DIMENSIONAL OBJECTS USING QUATERNIONS

I.H. Kumarasiri 1,2, G.J.K. Silva 1

1Department of Mathematics, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka
2Sri Lanka Institute of Information Technology, Sri Lanka

isurukuma@gmail.com

In the field of Mathematics, Quaternions plays a major role in enlarging complex numbers. Presently, there are diverse practical applications of Quaternions involving Geometry, Game developing, Flight simulations. Euler angles and Matrices are the two existing methods available for describing rotations of any object. However, as many matrix multiplications are essential in describing rotations, these methods are relatively time consuming and less accurate in practical scenarios. As a result of that it is important to utilize a more accurate method. Describing rotations by Quaternions can be considered as a better implementing method to describe rotations rather than Matrices and Euler angles. Multiplication of three matrices gives the next position when Euler angles are concerned. So if Euler angles are used to describe rotations, it may give some deviations from the correct position after it’s rotated. In other words an error can be occurred because of matrix multiplications and it consumes more time relative to Quaternion rotations. Therefore if a target is there to be reached, Quaternions is the more efficient method to calculate rotations.

A computer program to explain Quaternion rotation of a three dimensional object has been developed using MATLAB 7 software. The inputs of the program are rotating axis and coordinates of a particular vertex point on the object. New coordinates of the vertex point is calculated by multiples of five degrees when it is rotated around the given axis. When the object is rotated around the axis \(i + j + k\) by 60 degrees, the initial vertex on the object which is \((0.5, 1, 1)\) becomes \((0.6667, 1.1667, 0.6667)\). Consequently, the results are verified via manual calculations. Finding of this study adds simplified, effective and accurate method for industrial applications where rotations of objects are used. Therefore, when compared with existing methods, Quaternions method is the most effective regarding time and accuracy. When computer games and video animations were designed, rotations had been described mostly by matrix method and Euler angles. Since Quaternions method is more effective, it can be implemented more frequently in practical scenarios.

**Keywords:** Quaternion rotations, Matrices, Euler angles
OPTIMAL ONE DAY INTERNATIONAL CRICKET SQUAD SELECTION
BY GENETIC ALGORITHM

I.H. Kumarasiri ¹, S.S.N. Perera ²

¹ Department of Information Technology, Sri Lanka Institute of Information Technology, Malabe
² Research and Development Center for Mathematical Modeling, Department of Mathematics,
University of Colombo
isurukuma@gmail.com

Cricket is one of the most popular sports in the world. At present it is played professionally and amateur level around the world. Therefore it has an immense financial value. Winning more matches will generate more money for the winning countries. Selecting the optimal squad for a particular series is always a challengeable task. This study is an attempt to develop an algorithm to select optimal one-day Cricket squad of Sri Lanka for 2015 world cup which is played in Australia. The process of this study is a combination of Ranking method and Genetic Algorithm method. Initially all 30 players in the one-day international cricket pool are categorized as batsmen, fast bowlers, spin bowlers, all-rounders and wicket keepers. Then players’ performance values are evaluated using variables such as batting average, batting strike rate, bowling average, number of wickets per match and experience. After that fitness function is defined by considering each individual’s performance in Australia and overall performances. Players are ranked on their performances. After defining an initial population and constraints of the squad, Genetic Algorithm is applied through cross over and mutation processes until the optimal cricket squad is observed. The model is validated using Pakistan 1992 world cup squad which was the winning squad of 1992 world cup and it was played in Australia. It is found that proposed model correctly selected 13 players out of 15 for 1992 Pakistan world cup squad, which accounts 86% accuracy. Proposed model selected 12 players out of 15 for the 2015 Sri Lankan World cup squad, which accounts 80% accuracy. According to the 1992 world cup squad obtained by Genetic Algorithm, two players are not in the original squad. The main reason for that is, in 1992 these two players had played only few matches. Therefore due to lack of international data their rank values are very low. Proposed model can be improved by considering players performances of club level and league matches. Because of any series we expect at least one or two new players, 80% accuracy is highly encouraged.

Keywords: Genetic Algorithm, Optimal selection, cross over process, mutation process
ANALYSIS OF STOCK PRICES USING MARKOV CHAIN

Premini. V, N. Varathan

Department of Mathematics and Statistics, University of Jaffna, Jaffna, Sri Lanka
varathan10@gmail.com

The stock market is a public market. In the recent scenario, it has become a vital part of the global economy. The economic situation of any country is influenced by the market fluctuation. Sri Lanka’s stock market is called as Colombo Stock Exchange (CSE). Analyzing stock prices is essential from the investor’s point of view to make effective decisions regarding their investment; such include buying, holding and selling. Further, these prices are not constant for a specific period and fluctuate from time to time based on the market conditions. However, the investors need to predict the future behavior of the prices of the stock to make effective decisions. Therefore, it is essential to study the stock trends of the market for different companies. This study aims to analyze the behavior of daily stock prices trend of the companies: (1) JOHN KEELS HOLDING(JKH) (2) COMMERCIAL BANK OF CEYLON(CBC) (3) CEYLON TOBACO(CT), which have been listed as the top three companies of Sri Lanka by CSE during the period of 2013-2014. The current research has been undertaken considering the closing prices of 354 trading days (from Jan-2013 to Jun-2014) of each of the above three companies by adopting the famous Markov analysis, which is seen to be relevant to make probabilistic statements about future stock price levels. Two models were highlighted by means of defining the states of the system. For each company, the states of the chain were considered as gain or loss for Model 1 and small gain, moderate gain, large gain, small loss, moderate loss or large loss for Model 2, and we compared the stock prices of these three companies by means of long run probabilities. Results reveal that the chance of gain is comparatively high among CBC share holders. This motivated us to predict the immediate future stock prices for CBC. For this purpose, the Markov technique was again applied to differenced data of moving averages and actual closing prices. Finally, we predicted the stock prices of CBC for next few days using this method. Results from this study help investors to make effective decisions regarding their future investments.

Keywords: Markov chain, Stock trend, Steady state, Closing price
EFFECT OF PROCESS PARAMETERS ON WASTE PLASTIC PYROLYSIS IN A SEMI BATCH REACTOR

E.P.Rohan, N. K. Hettiaarachchi, B. Sumith

Department of Mechanical and Manufacturing Engineering, Faculty of Engineering, University of Ruhuna
nandita@mme.ruh.ac.lk

Disposal of solid waste has become a major environmental issue in Sri Lanka. That is further aggravated by non-biodegradable solid waste like plastic and polythene because the polymer compounds used in plastic and polythene are hardly degradable in natural manner and causing numerous negative environmental impacts. Pyrolysis of plastic waste has gained increasing attention as a promising method for the treatment of mixed and contaminated plastic waste in environmental friendly manner. In the pyrolysis, plastics are thermally degraded to produce useful liquid hydrocarbons, which can then either be added to existing fuel or solvent product, or returned to a refinery where they can be added to the feedstock. The objective of this research is to reduce environmental impacts and recover green alternative energy from waste plastics by converting them into hydrocarbon fuel using pyrolysis process.

A reactor system has been developed for the waste plastic pyrolysis process. The developed system which mainly consists of a semi batch reactor, a condenser and a liquid-gas separator, is capable of converting waste plastic (PE and PP) into hydrocarbon fuel at a maximum conversion rate of 99%. The maximum liquid and gas yields are 66% and 31% respectively.

The effects of pressure, batch size and set temperature on the waste plastic pyrolysis were experimentally analyzed. Optimum pressure was found to be near atmospheric slightly positive pressure (around 0.06 bar). Optimum batch size and set temperature were found to be, 3000 g and 425 °C respectively. Increasing pressure was found to increase reaction time and solid residue left in the reactor at an approximately same liquid yield. The small batch sizes were found to decrease both liquid yield and reaction time at an approximately same solid residue amount. The low set temperatures such as 400, 375 °C were found to drastically increase solid residue amount and reaction time at an approximately same liquid yield. The high set temperatures such as 450, 475 °C were found to decrease liquid yield and reaction time at an approximately same solid residue amount.

The waste plastic pyrolysis process is affected by many process parameters such as pressure, batch size, set temperature, heating rate, reactor design etc. The optimized process parameters lead to obtain high liquid yield at a minimum input energy in a comparatively small reaction time. Further, physical and chemical properties of the fuel are affected by the process parameters. Therefore optimized process parameters are very important in pyrolysis of waste plastics in terms of obtaining usable fuel efficiently.

Keywords: Process parameters, Pyrolysis, Waste plastics, Semi batch reactor, Hydrocarbon fuel.
Polymer based products are finding an important role in different applications today. Polymers fulfill the every aspect of daily life and it is hard to visualize modern society without synthetic and natural polymers. Polymer products can be lightweight, hard, strong, and flexible, and may have special thermal, electrical, or optical characteristics. They have very wide range of applications due to low cost, high specificity and adaptability. However, most plastics are durable and degrade very slowly after the usage. These polymers have strong chemical bonds that make them so durable and tend to make them resistant to most natural processes of degradation. These non - degradable polymer based products create lot of environmental problems after the usage. Bio-based polymers offer important contributions by reducing the dependence on fossil fuels and through the related positive environmental impacts such as reduce carbon dioxide emissions and environmental pollution .The objective of this research is to extract cellulose- hemi cellulose from sugarcane waste to produce degradable composite materials for packaging applications. Cellulose- hemi cellulose mixtures are predominant constituent in cell walls of most plants. Cellulose- hemi cellulose was extracted using sugarcane waste in this research. Extracted materials were verified using FTIR spectroscopic techniques. Extracted percentage of cellulose- hemi cellulose was 49.6 wt.%. Extracted product was mixed with Low Density Polyethylene (LDPE) by differing cellulose- hemi cellulose concentration 1 wt%. to 6 wt% using laboratory type internal mixer. The degradability of LDPE with cellulose – hemi cellulose biodegradable composite was studied for 90 days in under buried condition. Degradability of the developed composite material was evaluated by tensile test, soil burial test and water absorption test. The experimental results of 6 wt%. cellulose – hemi cellulose containing samples indicated that 47% reduction of tensile strength after 90 days. Percentage elongation of the composites displayed a gradual decrease up to 90 days during the soil burial test. Elongation properties gradually reduced with increase of cellulose – hemi cellulose concentration from 1 wt% to 6 wt%. The 6 wt%. cellulose – hemi cellulose containing sample showed the maximum elongation reduction and it was 58% after the 90 days of soil burial test. There was a significant increase of weight loss property during the soil burial test. Maximum weight loss (3.7%wt.) was observed by 6% wt. cellulose – hemi cellulose containing sample. Water absorption properties significantly increased with the time up to 90 days. The highest water absorption (63%) was observed in 6% wt. cellulose – hemi cellulose containing sample after 90 days. These experimental results clearly showed the degradation of developed composite within tested time period. This developed cellulose – hemi cellulose biodegradable composite material can be used as an alternative material to conventional synthetic polymer to protect the environment.

**Keywords:** Cellulose- hemi cellulose, LDPE, biodegradable
SYNTHESIS OF LOW DENSITY POLYETHYLENE BASED PHOTODEGRADABLE POLYMER COMPOSITE USING CINNAMON LEAF OIL

A.M.P.B. Samarasekara¹, K. P. T. Sandamal¹, S. H. Liyanachchi¹

¹Department of Materials Science and Engineering, University of Moratuwa, Sri Lanka

banduamp@yahoo.com

Polymers are considered among the most important materials in science, technology and engineering these days. The chemical, medical, agricultural and packaging as well as many others are greatly dependent on a wide variety of polymers. Every year, around five hundred billion packaging items are used worldwide. Polymer packaging are difficult and costly to recycle after the usage and most end up on landfill sites where they take around three hundred years to degrade. Polymer packaging items are made of basic polymer materials and various other chemicals which are mainly toxic during the degradation process. That is certainly very harmful to the health and the environment. One solution is introduction of photodegradable polymers. Most of the photodegradable polymers are developed with the help of photosensitizers. The objective of this research is to produce Low Density polyethylene (LDPE) based photodegradable polymer composite using locally available cinnamon leaf oil. Cinnamon oil was used as photosensitizer. Cinnamon is presently cultivated in in Kalutara, Galle, Ambalangoda, Matara and Ratnapura areas in Sri Lanka. Cinnamon oil contained two main photosensitizers namely Eugenol and Cinnamaldehyde. High quality cinnamon leaf oil is an anti-bacterial powerhouse that is often used to neutralize odors and create a pleasant exotic scent. Cinnamon leaves were subjected to distillation to extract cinnamon leaf oil. FTIR spectrometer was used to identify the extracted product. LDPE and extracted cinnamon oil were mixed using laboratory scale mixing equipment by varying cinnamon oil concentrations form 2 wt% to 10 wt%. Hydraulic press was used to prepare the test samples. Ultra Violet (UV) exposure test, tensile test, water absorption test, weight loss test and colour variations were observed during the testing period. Samples were exposed to 120 hours to UV. Tests were conducted every 24 hours period. Cinnamon oil containing samples experimentally showed the reduction of tensile strength and percentage elongation with increase of UV exposure time. Further, tensile strength and percentage elongation gradually reduced with increase of cinnamon oil concentration. Samples containing 10 wt% cinnamon oil with LDPE showed the maximum tensile strength reduction, maximum percentage elongation, maximum water absorption and maximum weight loss properties. 10 wt% cinnamon oil with LDPE sample showed the 22% tensile strength reduction, 88% percentage elongation reduction, 98% water absorption and 1.2% weight loss after 120 hours exposure to UV. Samples at initial stage showed yellowish colour but by the time it turned out to be brownish in colour exposure to UV. According to these experimental results showed the clear indication of photodegradation of photosensitizer containing samples. Newly developed LDPE based photosensitizer containing composite material can be used for the non-food packaging applications to minimize the environmental pollution.

Keywords: LDPE, Photodegradable, Cinnamaldehyde, Eugenol, Cinnamon oil
INVESTIGATION OF THE TECHNICAL PROPERTIES OF THE TYRE RETREADING COMPOUND FORMULATED WITH RSS/SCRAP RUBBER BLENDS

K. G. ALAHAPPEUMA,

Department of Manufacturing Technology, University of Vocational Technology, Ratmalana.

gayanthi111@yahoo.com

Due to higher demand of petroleum and petroleum based synthetic rubbers, the price of Ribbed Smoked Sheets (RSS) has been gone up. Therefore, local rubber industries, particularly re-treading tyre industry has started replacing RSS grade partly with a cheaply available scrap grade of Natural Rubber (NR) in their re-treading tyre compounds. It is reported that most of tyre re-treading rubber industries, with the sole aim of getting profits, blend the scrap rubber with RSS in arbitrary ratios even at the expense of quality of tyre re-treads. It is indeed a regrettable situation in the local rubber industries today. RSS grade, as the name implies is produced from the coagulum of latex, after smoke drying under control processes, whereas the scrap grade is prepared by just mixing the dried tree laces and cup lumps collected from plantation sites.

As a result, RSS grade possesses better technical properties (processing and strength properties) than the scrap grade rubber. The aim of the research was to find an appropriate economical blend of scrap rubber and RSS to produce optimum quality tyre re-treading compound.

Keywords: Technical properties. Tire retreading compound, Ribbed Smoked Sheets, Scrap rubber, Rubber blends
SYNTHESIS OF SPIRONAPHTHOXAZINE DERIVATIVE TO BE DEVELOPED AS A NOVEL SMART MATERIAL

A.M. Jayasinghe, K. M. Thilini, D. Gunasekera

Department of Chemistry, University of Sri Jayewardenepura
thilinidkm@gmail.com

Smart materials also called intelligent materials are capable of changing one or more of their properties in a precise manner upon external stimuli for instance temperature, stress, light, magnetic field, and pressure. Inherited smartness of these materials has opened up new pathways in many disciplines such as chemical industries, textile, pharmaceuticals, civil engineering, aerospace, etc.

Structure of the smart material contains trigger sensitive molecule/functional group which bridge the connection between the smart material and the trigger. The molecule Spironaphthoxazine has been used as an excellent light sensitive molecule reversibly converts its hydrophobic nature to hydrophilic nature with a clear color change. This research is ongoing work of developing such a smart material using Spironaphthoxazine and the work disclosed here are the synthesis, purification and analysis of Spironaphthoxazine derivative. We have identified 1,3,3-trimethyl-9'-hydroxyspiroindolenaphthoxazine molecule as a fatigue resistant, photoresponsive, and reversible Spironaphthoxazine.

Synthesis of 1,3,3-trimethyl-9'-hydroxyspiroindolenaphthoxazine has been carried out using 2,7-Dihydroxynaphthalene as the precursor which undergo two steps to reach to the final product. Products of each steps has been characterized by melting points, Thin Layer Chromatography, IR and GC-MS spectroscopic methods. The product 1; 2,7-Dihydroxy-1-nitroso compound, has the melting point of 285°C, depicted IR peaks at naphtha OH (3141.25 cm⁻¹), NO (3141.25 cm⁻¹), C=C stretching (1558.62 cm⁻¹ - 1525.50 cm⁻¹), C-H plane deformations (1145.78 cm⁻¹ - 1117.54 cm⁻¹), and C-H plane stretching (723.59 cm⁻¹ - 710.55 cm⁻¹). Product 2; 1,3,3-trimethyl-9'-hydroxyindolenaphthoxazine; IR spectrum depicted the peaks of naphtha OH (3399.88 cm⁻¹), C-H (2922.53 cm⁻¹), spiro C=N (1623.65 cm⁻¹), Ph-N (1357.35 cm⁻¹), spiro CO (1242.33 cm⁻¹), and spiro COC=C (1031.53 cm⁻¹). The fragmentation of the MS spectrum are 344.3 [M⁺], 329 [M-CH₃]⁺, 314 [M-2CH₃]⁺, and 159.1, 131.0.

1,3,3-trimethyl-9'-hydroxyindolenaphthoxazine was purified by Column Chromatography. Final yield of the product is 77.84%. Photoresponsive behavior of the synthesized Spironaphthoxazinederivative was studied using UV-Vis Spectra. UV spectra (CH₂Cl₂) show the peaks at lambda max 257 nm, 337 nm, and 512 nm. The synthesized photoresponsive chromophore has the ability to respond to light in a reversible manner.

**Keywords:** Smart materials/ Spironaphthoxazine/ photoresponsive /chromophore / reversible
SPECTROPHOTOMETRIC DETERMINATIONS OF COPPER WITH 3-HYDOXY-3-METHYL-1-P-METHOXY PHENYL TRIAZENE

Chayan Mehta
Government College, Jodhpur (Raj.), India
Chayanmehta39@gmail.com

3-Hydoxy-3-methyl-1-p-methoxy phenyl triazene has been established as a new reagent for determination of Copper.

3-Hydoxy-3-methyl-1-p-methoxy phenyl triazene has been prepared[1] (m.p. 80°C) by coupling methyl hydroxylamine with diazonium salt in 1:1 molar proportion at 0-5°C. The reagent solution was prepared in ethanol. The standard solution of copper was prepared by dissolving requisite quantity of copper sulphate pentahydrate (B.D.H., A.R.) in double distilled water. A few drop of concentrated H₂SO₄ were added to the solution to prevent hydrolysis. It was further standardized with EDTA using murexide as an indicator[2]. A systronics UV-VIS spectrophotometer-108 was used for spectrophotometric work and for pH-measurements systronics pH meter-324 was used. The green Cu (II) complex was soluble in ethanol and its color was stable for more than 24 h. It gives maximum absorbance at 380 nm but subsequent absorbances were made at 430 nm against solvent blank. Eight fold excess of the reagent was used and pH was kept between 6.0 to 6.6. The system obeys Beer’s law in the range from 15.88 ppm to 31.77 ppm of copper. Sandell’s sensitivity is 47.4 ng/cm² and molar absorptivity is 2,040 liter/mole cm. The Job’s method[3], Slope ratio method[4] and mole ratio methods- (i) Yoe& Jones[5] and (ii) Zolotov’s[6] gave 1:2 (Fe:R) stoichiometry for the complex. Interference of 22 diverse ions was studied in determination of 31.77 ppm of copper. K(I), Cl⁻, Br⁻, SO₄²⁻, NO₃⁻ and CO₃²⁻ did not interfere when present in 100 ppm concentration. In addition to these ions, Na(I), NH₄⁺, Br⁻, CH₃COOH, and PO₄³⁻ did not interfere when present in 50 ppm. The precision study was carried for 31.77 ppm of Cu (II), standard deviation was 0.03 ppm of copper. The solid complex was obtained as brown micro crystal, m.p. 158°C with molecular formula Cu(C₁₄H₂₀N₆O₄).H₂O. This molecular formula corroborates the composition of the complex found with solution studies.

Keywords: Sandell’s sensitivity, Molar absorptivity, Interference, Precision study
SENTIMENTAL ANALYSIS BASED ON SINHALA LANGUAGE SOCIAL MEDIA UPDATES

Shanmuganathan Vasanthapriyan
Department of Computing & Information Systems, Sabaragamuwa University of Sri Lanka.
priyan@appsc.sab.ac.lk

The World Wide Web plays a critical role in collecting public opinion where these opinions play an important role in making business decisions. For factual and subjective information about companies and products, analysts are turning to the Internet to gather information. Extracting the public opinion is the difficult task in a country like Sri Lanka, because most of the time the language spoken is, Sinhala or Tamil rather than English. Sentimental Analysis being a major research topic in computational linguistic community is quite popular and has led building of better products, understanding user’s opinion, executing and managing of business decisions. However most of the researches never focused on South Asian languages like Sinhala, often used in Social media websites such as Face book, Twitter and etc. Motivated by Sentimental Analysis researches based on Hindi, another south Asian language, we proposed and developed a system that analyzes social media updates in Sinhala language for the sentiments. Starting with three basic sentiments; Positive, Negative and Neutral we retrieve a set of live updates based on Face book and Twitter. This data set is then deployed in to a cloud service and analyzed and give the proper output. Sinhala is a free order language compared to English which adds complexity while handling user generated content. Our finding focuses on how to build a better platform on sentimental analysis to help bloggers to stop spam, business firms to get feedback, and government firms to get urgent service requests. We hope to do more investigation on implicit factors in Sinhala language and give them as features for the models we described in our work.

Keywords: Sentimental analysis, Social media, Linguistics, Opinion mining
A STATISTICAL STUDY ON G.C.E. (O/L) RESULTS IN JAFFNA AND VALIKAMAM EDUCATIONAL ZONES

N. Jeyamathy, S. Arivalzahan

Department of Mathematics and Statistics, University of Jaffna, Jaffna
mathyn17@gmail.com

General Certificate of Education Ordinary level examination is one of the important public examination in Sri Lanka. Student those who have qualified in the above examination can study the G.C.E Advanced Level. A large number of students fail to qualify the above examination. Moreover, even less number of students qualify for the science stream studies in A/L. The main purpose of this study is to identify the factors that influence both of the above cases (qualifying for A/L and qualifying for A/L science stream) and develop statistical models.

A random sample of 50 schools from the Jaffna and Valikamam educational zones were considered for the study. We have considered all the 3105 students those who have sat for the G.C.E(O/L) examination in the year 2013, from the above sample of 50 schools. The factors such as Gender, Medium of instruction, School category and Type of the school are being considered in this study. School category has been classified as provincial schools and other category schools (National Schools and Private Schools). Moreover, Type of School is being classified as co-educational schools (Mixed school) and non-coeducational schools (Boys school and Girls school). But in our selected area most of the other category schools are non-coeducational schools. Therefore, a relationship might exist between these two factors. A contingency table chi-square test showed a P-value of 0.000 and it is significant.

Therefore, one factor would be redundant for the model. Thus, we end up by considering two models one with type of school as a factor and the other one with category of school as a factor. We end up with two models for each of the two response variables (qualifying for A/L and qualifying for A/L Science Stream). Binary logistic regression models were fitted for the above cases. All four factors are found to be influencing the G.C.E(O/L) performance. As per the medium of instruction, English medium students are performing better than the Tamil medium students. Moreover, other category school students are performing better than the provincial school students. The performance of the non-coeducational students is better than the performance of the coeducational school students.

**Keywords:** Logistic Regression, Contingency table, Odds Ratio, Goodness of fit, model selection.
FORECASTING TOURIST ARRIVALS TO SRI LANKA USING ARIMA AND ARFIMA APPROACH

A. P. Mary Siamila, N. Satkunanathan

Department of Mathematics and Statistic, University of Jaffna

siamilaarul@gmail.com

Sri Lankan tourism plays a significant role in the generation of income, foreign exchange and provision of employment opportunities. Therefore, forecasting tourist arrivals becomes essential. In this study, we proposed short memory autoregressive integrated moving average (ARIMA) and long memory autoregressive fractionally integrated moving average (ARFIMA) approach to forecast tourist arrivals to Sri Lanka. Further, the Akaike information criteria (AIC), mean absolute percentage error (MAPE), mean absolute error (MAE) and root mean square error (RMSE) were used to measure the forecast accuracy. The secondary time series data were obtained, from January 1980 to December 2014, for this study. Based on the AIC value, ARIMA(2,1,3)(2,0,2)\textsubscript{12} and ARFIMA(1, -0.459601, 0)(0, -0.190273, 2)\textsubscript{12} were fitted as a best model in the class of ARIMA and ARFIMA models respectively. In addition, the chosen models were used to forecast the future values of tourist arrivals for a period covering from January 2015 to December 2015. The forecast results showed that the monthly tourist arrivals are expected to increase in 2015 and it will reach approximately 0.209 million and 0.198 million in December 2015, respectively. The approximate 95% forecast confidence interval for monthly tourist arrivals will be 0.134 to 0.323 and 0.114 to 0.313 in December 2015, respectively. Nevertheless, the lowest value of MAPE, MAE and RMSE revealed that ARIMA model brings better results than ARFIMA model.

**Keywords:** Tourist arrivals, ARIMA models, ARFIMA models, forecast accuracy
IRON DETERMINATION WITH 3-HYDOXY-3-METHYL-1-P-METHOXY PHENYL TRIAZENE

Manojkumar S. Chhangani

Department of Chemistry, Government Meera Girls’ College, Udaipur (Raj.)-313001, India
dr.mksc@gmail.com

3-Hydroxy-3-methyl-1-p-methoxy phenyl triazene has been established as a new reagent for spectrophotometric determination of iron.

3-Hydroxy-3-methyl-1-p-methoxy phenyl triazene has been prepared\(^1\) (m.p. 102\(^\circ\)C) by coupling methyl hydroxylamine with diazonium salt in 1:1 molar proportion at 0-5\(^\circ\)C. The reagent solution was prepared in ethanol. The standard solution of iron was prepared by dissolving requisite quantity of A.R. grade ferric nitrate nona hydrate in double distilled water. To prevent hydrolysis a few drop of concentrated nitric acid were added to the solution. The solution was then standardized with EDTA using sulphosalicylic acid as an indicator\(^2\). A systronics UV-VIS spectrophotometer-108 was used for spectrophotometric work and for pH-measurements systronics pH meter-324 was used.

The green Fe(III) complex was soluble in ethanol and its color was stable for more than 24 h. It gives maximum absorbance at 730 nm therefore subsequent absorbance were made at 730 nm against solvent blank. Six fold excess of the reagent was used and pH was kept between 2.0 to 3.0. The system obeys Beer’s law in the range from 13.96 ppm to 27.92 ppm of iron. Sandell’s sensitivity is 43.93 ng/cm\(^2\) and molar absorptivity is 1,270 liter/mole cm. The Job’s method\(^3\), Slope ratio method\(^4\) and mole ratio methods- (i) Yoe & Jones\(^5\) and (ii) Zolotov’s\(^6\) gave 1:3 (Fe:R) stoichiometry for the complex.

Interference of 26 diverse ions was studied in determination of 13.90 ppm of iron. Na(I), K(I), Ba(II), NH\(_4\)+, Cl\(^-\), Br\(^-\) and SO\(_4\)\(^2-\) did not interfere when present in 100 ppm concentration. In addition to these ions, Mn(II), Ni(II), Cd(II), I\(^-\) and CO\(_3\)\(^2-\) did not interfere when present in -10 ppm.

The precision study was carried for 13.96 ppm of Fe(III), standard deviation was 0.096 ppm of iron. The solid complex was obtained as blue micro crystal, m.p. 147\(^\circ\)C with molecular formula Fe(C\(_8\)H\(_{10}\)N\(_3\)O\(_2\)). This molecular formula corroborates the composition of the complex found with solution studies.
NATURAL SCIENCES
The study was conducted to analyze the proximate composition of fresh and dehydrated hibiscus powder petals and its use as natural colourant for product preparation. Different drying methods were employed such as sun drying, solar drying, freezing for one hour followed by drying using lab scale air oven at 55°C, vacuum drying at 50°C and drying using lab scale air oven at 55°C. Three different formulas of jelly powder mix were prepared. Physiochemical properties and retention of antioxidants in dehydrated hibiscus powder and prepared formulas were evaluated. Data obtained were in triplicate (n=3) and the results were assessed by completely randomized design using ANOVA. The nonparametric data were analyzed using Friedman test with Minitab statistical package.

The proximate analysis of fresh hibiscus flower petals showed the moisture 89.34%, fat 2.76%, protein 4.12%, total ash 7.23%, fiber 10.75% and anthocyanin content 877.04 mg/100g. Dehydrated hibiscus powder recorded the maximum retention of ash and fiber when drying with air oven. Higher concentration of protein (4.05) and anthocyanin (107.5 mg/100g) were recorded in vacuum dried sample and it was significantly different (α= 0.05) from other drying methods employed. Four different formulas of instant jelly powder mix containing sugar, citric acid, hibiscus powder and thickening agent (varying proportions of pectin in mix 1 (4.61%) and mix 2 (2.53); gelatin in mix 3 (4.61) and mix 4 (2.53) were evaluated for its physico-chemical characteristics upon storage of 60 days. All formulas resulted lower microbial load (1.8*10^3 CFU/g) also the fat and the total ash content decreased throughout the storage. A significant loss of anthocyanin content was observed and the highest anthocyanin content was given by mix 2 at the end of storage (10.47 mg/100g). The colour intensity (L* value) indicated that the prepared jelly was brighter in appearance and the maximum was recorded by mix 3 followed by mix 4 at the end of storage. Higher a* value was recorded by mix 4 followed by mix 3.

Among different drying methods, vacuum drying can be recommended as a most effective drying method showed better retention of physico-chemical characteristics of dehydrated hibiscus flower petal powder. Among the sensory quality attributes evaluated, appearance, aroma, flavor, texture were significantly different (p<0.05) among treatments and Mix 4 (which contained 2.53% gelatin as a thickening agent) was scored higher estimated median (4 like moderately to 5-Like extremely) for all its characteristics considered.

Keywords: dehydration, proximate compositions, hibiscus powder, storage, jelly
CHARACTERIZATION OF SOME FINGER MILLET (*ELEUSINE CORACANA* L.) GERmplASM ACCESsIONS AVAILABLE IN SRI LANKA USING MORPHOLOGICAL MARKERS

P.N. Dasanayaka

Department of Botany, University of Sri Jayewardenepura, Nugegoda, Sri Lanka

Finger millet (*Eleusine coracana* L.), an annual allotetraploid cereal, is widely cultivated in the arid and semiarid regions of the world. Characterization of conserved germplasms of the crop is of primary importance for the effective use of genetic resources and refines conservation strategies. Currently there are more than 200 finger millet germplasm accessions conserved at Plant Genetic Resource Centre (PGRC) Gannoruwa. Objective of this research was to characterize some of these accessions using morphological markers. Twenty four finger millet accessions were randomly selected from the available germplasm accessions at the PGRC as an initial attempt to understand the genetic structure of the crop. These 24 accessions comprised two recommended varieties of Sri Lanka, two varieties from Zimbabwe, two introduced varieties from India and eighteen accessions collected from different geographical areas of Sri Lanka. These 24 accessions were characterized using 31 morphological markers. Genetic distance among accessions ranged from 0.03 to 0.97 with an average 0.35. Dendrogram constructed based on those distances to assess the genetic relatedness of these accessions, clustered all accessions into two major groups. The first comprised 19 accessions with an average genetic distance 0.3 and the second comprised 5 accessions with an average genetic distance 0.5. The two recommended varieties in Sri Lanka grouped within two major groups separately exhibiting their genetic distances. The two introduced accessions from India also clustered within two major clustered and introduced accessions from Zimbabwe grouped within the same second major cluster. This study highlights the importance of characterization of available germplasm accessions for the improvement of the crop.

**Keywords:** Finger millet, *Eleusine coracana*, Germplasm accessions, morphological markers, genetic distance
FATTY ACID COMPOSITION OF KADAL PRAWN (*METAPENAEUS DOBSONI*, MIERS, 1878)

J. H. Rupasinghe, M. V. E. Attygalle

Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
jaan2naps@gmail.com

In the Sri Lankan market, the prawn *Metapenaeus dobsoni* has not received a satisfactory attention with regard to nutritional value compared to the other available prawn species. As the biochemical composition of this species is still inadequately understood the present study principally entailed to explore the fatty acid composition of *M. dobsoni*. The prawns were obtained from Bolgoda lake area and the fatty acid profile was constructed from the standard GC/MS analysis.

The fatty acid profile obtained by GC/MS analysis for *M. dobsoni* contained 14 different types of fatty acids. It demonstrated a high amount of saturated fatty acid (SFA) (59.69%) followed by monounsaturated fatty acids (MUFA, 20.84%) and polyunsaturated fatty acids (PUFA, 18.46%). The major fatty acids identified in *M. dobsoni* were 16:0 palmitic acid (37.68%), 20:5\_\text{\textit{n}}3 eicosapentaenoic acid (EPA, 15.76%), 18:1\_\text{\textit{n}}7 vaccenic acid (14.39%), 17:0 margaric acid (11.92%) and 16:1\_\text{\textit{n}}7 palmitoleic acid (6.46%) respectfully. In addition, the total value obtained for n-3 polyunsaturated fatty acids was higher than that of n-6 polyunsaturated fatty acids. The EPA/DHA ratio was greater than 1 indicating that the EPA percentage is higher than the DHA. Both atherogenic index (AI) and thrombogenic index (TI) were below 1.

In conclusion, *M. dobsoni* revealed desirable qualities when the level of EPA, n3/n6 ratio, AI and TI are considered, and thus may provide many health benefits to the consumer. Although consumers may receive health benefits regarding high amount of MUFA, particularly EPA, consumers who suffer from coronary illnesses should be cautious about consuming *M. dobsoni* due to its high SFA content.

**Keywords:** *Metapenaeus dobsoni*, Fatty acids, EPA, SFA, Prawns
Potassium (K) is considered as a beneficial nutrient element for a large variety of crops in disease management and quality enhancement. This study was conducted to investigate the effect of potassium on anthracnose disease resistance and some physical and physiochemical parameters of capsicum cv. ‘Hungarian Yellow wax’. Plants were treated with three doses of potassium i.e. recommended dosage of Department of Agriculture (control) -180g (1K), double the dosage- 360g (2K) and triple the dosage- 540g (3K) per 300ft². Disease resistance to anthracnose in pepper fruits were evaluated by measuring the lesion area for 10 days after inoculation with (DAI) Coletotricchum capsici. Potassium at higher doses significantly (at \( P \leq 0.05 \)) reduced the severity of disease with higher reduction (95% and 74%) in treatments received 3K and 2K of potassium respectively. There was a strong negative correlation (\( R= -0.802 \)) between the increasing of K dose and the total lesion area developed for 10 DAI. Disease initiation was delayed by 4 days after inoculation with \( C. \) capsici in 3K treated fruits compared to the control. Physical and physicochemical parameters of harvested fruits at colour break stage were measured and a significant increase of fruit weight (27%), length (66%), width (13%) and TSS (9.8%) was observed in K3 treated fruits. However, no significant difference was observed in terms of fruit pericarp thickness, pH and % titratable acidity among the three treatments. Fruit firmness and cell wall thickness of the epidermis of 3K treated fruits were found to increase by 24% and 31% in contradictory to the control. The results suggest that application of thrice the dose of potassium is an effective means of improving quality parameters of the cultivar. In addition, anthracnose disease caused by \( C. \) capsici in \( Capsicum \) annum L. cv. ‘Hungarian Yellow Wax’ could be effectively supressed by 3K application and the induced fruit firmness and increased cell wall thickness might have acted as a physical barrier against the infection and invasion of \( C. \) capsici.

**Keywords:** Potassium, *Colletotricchum capsici*, capsicum anthracnose
PRELIMINARY YIELD PERFORMANCE AND LATEX PHYSIOLOGICAL PARAMETERS OF RUBBER (HEVEA BRASILIENSIS) PLANTED IN INTERMEDIATE ZONE OF SRI LANKA

R. G. N. Lakshman\textsuperscript{1}, K. V. V. S. Kudaligama\textsuperscript{1}, V. H. L. Rodrigo\textsuperscript{1}, S. M. M. Iqbal\textsuperscript{1}, A. Nugawela\textsuperscript{2}

\textsuperscript{1} Rubber Research Institute, Dartonfield, Agalawatta
\textsuperscript{2} Wayamba University of Sri Lanka, Makandura, Gonawila

Rubber had mostly been limited to Wet zone (WZ) of island since beginning of its cultivation. In recent past it has gradually expanded to the Intermediate zone (IZ), due to decline of available land for further cultivation in wet zone. Mature rubber fields cultivated by a smallholder farmer in the Eastern Province (IL2) and in Polgahawela substation of Rubber Research Institute of Sri Lanka (IL1a) were used to assess the yield performance and latex physiological parameters. For comparison, a rainguarded rubber field in Kuruwita substation of Rubber Research Institute of Sri Lanka was also used (WL1). Latex volume and dry rubber content in latex were measured for a period of one year and with the knowledge on number of tapping days, yield per tree per year (YPT) was estimated. In latex, sucrose, thiol and inorganic phosphorous content were assessed and also the plugging index.

In Kuruwita, Polgahawela and Padiyathalawa tapping days recorded were 160, 133 and 140, respectively. In all three sites, dry rubber content of latex was above 38% and showed no significant variation among the agro ecological zones. Daily latex yield per tree recorded in Kuruwita, Polgahawela and Padiyathalawa were 41.31g, 25.99g and 20.2g, respectively. Latex sucrose content was higher in IZ where rubber yield was low. Comparatively higher sucrose content observed in both IZ sits revealed that consumption of sucrose for latex regeneration is low leading to low daily latex yield. Average latex thiol content at Kuruwita trees was 0.38mM whilst that in Polgahawela and Padiyathalawa resulted in 0.58mM and 0.64mM, respectively. Comparatively higher thiol content of latex in trees in IZ indicates a low level of toxic oxygen specie in latex due to low rate of regeneration of latex. In organic phosphorous content of trees in Kuruwita was 6.17mM whilst it was 38.96mM and 41.45mM in Polgahawela and Padiyathalawa. Although, the laticifers of trees in IZ appears to be more metabolically active with a higher yield potential, low dripping time and higher plugging index limited the latex output in harvesting.

\textbf{Keywords:} Hevea, Intermediate zone, Latex physiology, Latex sucrose content, Yield
IN VITRO SEED GERMINATION AND CALLUS INDUCTION OF GYRINOPS WALLA GAERTN

A.N. Buddhapriya, W.T.P.S.K. Senarath

Department of Botany, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
wtpsk2011@yahoo.com

Gyrinops walla gaertn. (Thymalaeaceae) is a well-known plant species out of eight members of genus Gyrinops which is used for the extraction of agarwood resin. Due to the deep fragrance of the resin produced by G. walla, the species has great demand in Sri Lanka as well as worldwide. Overexploitation diminishes the natural population. Illegal felling decreases the natural population before maturity. As there is a high demand for the plant species in establishing plantations, micropropagation may be a feasible alternative to provide healthy planting material in commercial scale. Different surface sterilization procedures for mature seeds were carried out to eliminate microbial contaminations, using carbendazim, Clorox® and ethanol. Optimum concentrations of each solution and the duration of the surface sterilization were determined. In vitro seed germination method was studied to obtain G. walla seedlings with minimal microbial contaminations. Effect of different concentrations of plant growth regulators - gibberellic acid (GA₃), indole-3-acetic acid (IAA) and kinetin (Kin) and their interactive effects on in vitro seed germination and seedling development were studied. When seedlings were established cotyledonary parts, shoot tips, axillary buds and leaves were cultured in MS basal medium supplemented with different growth regulators for multiple shoot and callus induction. Completely randomized design was used in all experiments and data obtained were analysed using ANOVA. Carbendazim 0.2%, Clorox® 10% and ethanol 70% solutions found to be optimum for surface sterilization of seeds. Scarification enhanced the in vitro seed germination. MS medium supplemented with 1.0 mg/L GA₃, 2.5 mg/L IAA and 2.0 mg/L kin found to be ideal for in vitro seed germination. Callus initiation was observed in MS medium supplemented with 2.0 mg/L kin and 2.0 mg/L 2,4-D. From the results obtained, it would be suggested that callus induction is possible through cotyledonary leaves and shoot tips obtain from in vitro seedlings.

Keywords: Gyrinops, agarwood, seed germination, seedlings, plant growth regulators, callus induction
Copper and zinc are considered as essential micronutrients for living organisms, although these two metal ions are hazardous at high concentrations. Consequently, these metals and their compounds present in wastewater should be removed prior to its release to the environment. Adsorption is an effective method to remove metal ions in wastewater, especially when present at low concentrations. The widely used adsorbent, activated carbon, requires high production cost, promoting low-cost masses, such as plant materials, animal waste and naturally occurring minerals for metal removal. In the present study, one such low-cost adsorbent, coir dust, is studied to check the employability to remove copper and zinc ions from industrial waste water. Batch experiments were used in the removal of selected two metal ions. Fourier transform infrared spectroscopy reveals that O-H bonds, C-H stretching of alkanes and C=O stretching of carboxylic groups are present in the constituents of coir dust. The specific surface area of coir dust particles determined using the Methylene Blue Test is 285 m$^2$ g$^{-1}$ with the point of zero charge at pH = 5.0, as determined by surface titrations. This reveals that coir dust is a good adsorbent. Optimization of experimental parameters using synthetic Cu$^{2+}$ and Zn$^{2+}$ solutions by varying one parameter at a time reveals that 1.0 h shaking time and 10 min settling time are optimum for both metal ions, and pH 7 and 8 were the optimum pH values for Cu$^{2+}$ and Zn$^{2+}$, respectively. Adsorption equilibrium experiments performed over a concentration range from 10 ppm to 2000 ppm fulfill the requirements of the Langmuir model which is a monolayer adsorption, with adsorption capacities of 34.6 mg g$^{-1}$ and 27.0 mg g$^{-1}$ respectively, for Cu$^{2+}$ and Zn$^{2+}$. Further, the method of initial rates applied for investigation of the interaction of Cu$^{2+}$ and Zn$^{2+}$ with coir dust indicates the validity of the pseudo second order kinetic model. When considering above facts, use of coir dust is an effective biosorbent to remove Cu$^{2+}$ and Zn$^{2+}$ without any prior treatment. Further experiments are needed to evaluate the employability of coir dust in large scale waste water treatment.
CADMIUM, ARSENIC AND FLUORIDE IN GROUNDWATER AT GIRANDURUKOTTE AND NAGADEEPA, BADULLA DISTRICT, SRI LANKA

Wasantha Senadeera¹, Swarna Piyasiri¹, Wasantha Nandalal², Rohana Chandrajith³, Kamal Rantunga¹

¹Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka
²Department of Civil Engineering, Faculty of Engineering, University of Peradeniya, Sri Lanka
³Department of Geology, Faculty of Science, University of Peradeniya, Sri Lanka
wasantha.senadeera@gmail.com

Water is considered as essential forms of every animal life and plant type; thereof groundwater is the most essential resources for human. On the other hand, one of important environmental issue is contamination of groundwater in the world. Hence, study on groundwater quality is vital to get idea of water health.

The present study deals with the variations of Cadmium (Cd), Arsenic (As) and Fluoride (F) in Nagadeepa (81°4'21.126"E, 7°21'18.0924"N & 81°8'42.2501"E, 7°13'41.5306"N) and Girandurukotte (80°58'30.1537"E, 7°32'30.979"N & 81°2'52.1278"E, 7°24'53.7772"N) areas in Badulla district. Samples were collected once a month between January, 2014 and June, 2014 from 28 wells representing each area. The samples were analyzed using ICP-MS and Hach SpectroPhotometer.

The results compared with WHO maximum permissible levels of Cadmium, Arsenic and Fluoride are 3.0 µm/l, 10.0 µg/l and 1.5 mg/l respectively.

The obtained results of the study vary; Cd from 0.002 to 0.78 µg/l and 0.005 to 0.86 µg/l; As from 0.01 to 0.97 µg/l and 0.008 to 15.5 µg/l; F from 0.0 to 1.74 mg/l and 0.0 to 2.05 mg/l in Girandurukotte and Nagadeepa respectively.

The recorded values of As and F were above the maximum permissible level and Cd levels was below the maximum permissible level.

Keywords: Nagadeepa, Girandurukotte, Groundwater quality, Cadmium, Arsenic & Fluoride.
Although the wet zone of Sri Lanka is known to harbor a large number of endemic, vulnerable and threatened herpetofauna data related to their abundance, species richness and species diversity are scarce. Present study concentrated on the species specific data of the reptiles at Yagirala forest reserve situated in the wet zone of Sri Lanka. Data was collected monthly from January to December, 2014 by visual encounter surveys along three 200m linear transects marked in three habitat types namely degraded forest habitat, riverine forest habitat and natural forest habitat. Shannon-Weiner index of species diversity was calculated. Five hundred and eighty four reptiles belonging to the orders Squamata, Crocodylia and Testudines were recorded. These included five Agamidae species, nine Gekkonidae species, eight Scincidae species, two Varanidae species, eight Colubridae species, five Natricidae species, one Elapidae species, one Crocodylidae species and one Bataguridae species. Twenty two endemic reptile species were observed including Sri Lanka Kangaroo lizard (*Otocryptis wiegmanni*), Hump-nosed lizard (*Lyriocephalus scutatus*), Mollogoda’s Daygecko (*Cnemaspis molligodai*), Forest Daygecko (*Cnemaspis silvula*), Cetenated Lankaskink (*Lankascinus dorsicatenatus*), Common Lankaskin (*Lankascinus fallax*), Gans’s Lankaskink (*Lankascinus gansi*), Three-toe Snakeskink (*Nasia burtonii*), Toelss Snakeskink (*Nassia monodactyla*), Small Snake (*Aspidura guentheri*), Flower krait (*Balanophis ceylonensis*), Sri Lankan keelback Water Snake (*Xenochrophis asperrimus*), Streaked Kukri Snake (*Oligodon sublineatus*) and Beddome’s Cat Snake (*Boiga barnesii*). Contrary to the expectations highest diversity of 2.95 was recorded in the degraded forest habitat and the lowest diversity of 2.66 was recorded in the natural forest habitat respectively. The total number of reptiles recorded was highest in degraded forest habitat with 7.25±10.96 (Mean±SD) reptiles and the lowest number of reptiles was recorded in natural forest habitat with 2.1±2.99 (Mean±SD) reptiles. Riverine forest habitat had 4.35±6.77 (Mean±SD) reptile species. Highest species richness of 40 and lowest species richness of 24 were recorded in degraded and natural forest habitats respectively. Relative abundance indicated that *O. wiegmanni* (0.18) was the most common reptile species. *Chrysopelea ornate* and *Lycodon striatus* were the least abundant reptile species. The present study indicates a rich species diversity of reptiles in the Yagirala forest reserve and hence warrants protection for herpetofauna.

**Keywords:** Herpetofauna, Reptile, Shannon diversity index
SEASONAL VARIATION IN FAT CONTENT OF SARDINELLA LONGICEPS BY MATURITY STAGE

A.H.G.S. Udari, M.V.E. Attygalle

Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
shanika.udari@gmail.com

The Indian oil sardine (Sardinella longiceps) is a commercially important small pelagic fish in the Indo-Pacific region. During one year of sampling, 833 fish were collected on monthly basis and were studied for the seasonal variations in maturity stages and fat content of edible tissue. A macroscopic eight-stage maturity scale was used to determinate the gonadal maturity state of the fish which were classified as virgin-I, maturing virgin-II, developing-III, developed-IV, Gravid-V, spawning-VI, spent-VII, resting-VIII. All eight stages were observed in the males, whereas one of the stages, “female-spawning VI” was not observed in the present study. The above stages were broadly categorized into four phases as, immature phase (stages I,II), developing phase (stages III,IV), mature phase (stages V,VI), spent phase (stages VII, VIII) for ease of analysis.

Analysis on GSI variations according to different maturity stages of female revealed that females in mature phase recorded GSI values of more than 7 and were recorded only during July. According to the seasonal variation in mean GSI of females, GSI values started increasing gradually from March reached a maximum (above 7) in July and decreased rapidly to September. The rapid decline of GSI from July to September suggests that spawning occurs during this period. Seasonal variations in mean GSI for both males and females showed a similar pattern.

The results suggest that sexual maturity of the males and females are synchronized. The active phase of the sexual cycle extended from April to September for females, and from May to September for males. The period of maturation occurred in July for females and from July to August for males.

The fat content varied considerably with the season in both sexes. High fat values were recorded in fish in the immature phase which extended from October (5%), through December (9%) to February (6%). Fat values gradually decreased in the developing and mature phases through April (5%) to July (2%), suggesting fat mobilization from body reserves to thematuring gonads. Following spawning, in the spent phase fat levels gradually built up again during recovery from September (4%) through December (7%) to February (6%).

**Keywords:** Sardinella longiceps, Maturity stages, GSI, Seasonal variations, Fat content
POTENTIAL USE OF NS1 AG STRIPS TO DETECT DENV INFECTION IN FIELD COLLECTED FEMALE *Aedes aegypti* MOSQUITOES FROM DENGUE HIGH RISK AREAS IN COLOMBO DISTRICT.

P.D. Dayananda¹, D. B. Seneviratne², B. G. D. N. K. De Silva¹

¹Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka
²Genetech Molecular Diagnostics and School of Gene Technology, Colombo, Sri Lanka

Dengue has become the major mosquito borne viral infection in Sri Lanka. Prevention and control of dengue relies heavily on surveillance and vector control. Since entomological and human-virological surveillance is less effective in predicting outbreaks, virological surveillance of dengue vectors has now become an area of interest. Potential of dengue NS1 Ag strips (Standard Diagnostic Inc, Korea) to detect dengue virus (DENV) infection in field caught adult, female *Aedes aegypti* mosquitoes from selected dengue high risk areas in Colombo District was examined in the study.

Three areas (Maharagama, Boralesgamuwa, Nugegoda) were selected. Mosquitoes were collected daily, identified and stored in – 80 ºC for NS1 antigen detection. Sampling of mosquitoes was carried out during the period of dengue outbreak (May, 2014) in Maharagama, whereas it was carried out in Boralesgamuwa (March, 2014) and Nugegoda (April, 2014) during the period just after a dengue out break. Heads and thoraxes of mosquitoes were separated, homogenized (as singles, pools of 8-10 mosquitoes) with PBS and each homogenate was used on NS1 Ag strip. Laboratory infected and uninfected *Ae. aegypti* mosquitoes were tested as controls.

Study revealed the presence of NS1 antigen in field collected mosquito samples, from single mosquitos; 41% (n=24), 36% (n=22), 19% (n=31) and from pools; 2 of 5, 1 of 3 and 2 of 5 respectively of Maharagama, Boralesgamuwa, and Nugegoda. Results illustrated the presence of DENV infected *Ae.aegypti* vectors in three sites. Study confirmed the potential use of NS1 strips for detection of DENV in *Ae.aegypti* for the first time in Sri Lanka, as a rapid approach that can easily be used under field conditions with minimal training. The study suggests, adult mosquito screening for NS1 Ag, as a practical approach that provide promising results in risk assessment for DENV transmission in Sri Lanka.

**Keywords:** *Aedes aegypti*, NS1 antigen, NS1 antigen strip
STUDY ON THE OCCURRENCE OF ANTIBIOTIC CONTAMINATIONS IN THE AQUATIC ENVIRONMENT, SRI LANKA

Gayani Yasodara Liyanage, Pathmalal M. Manage, Ajantha de Alwis

Department of Zoology, University of Sri Jayewardenepura, Gangodawila, Nugegoda, 10250, Sri Lanka
pathmalalmanage@yahoo.com

Antibiotics are among the emerging micro contaminants in aquatic environment due to their potential adverse effects on the ecosystem and possibly on human health. Four important antibiotic classes, sulfanomides [sulfadiazine (SDI), sulfamethoxazol (SMX)], penicillin [amoxicillin (AMX), ampicillin (AMP)], tetracycline [oxytetracycline (OTC), tetracycline (TC)] and macrolids [erythromycin (ERM)] which are commonly used in human and veterinary medicine, were studied in detail. Forty sampling sites were selected including hospitals, animal farms, aquaculture sites, veterinary clinics, tributaries, lakes, lagoons, national zoological garden and horton plains for the present study. Three samples of both water and sediment were collected in each location. Sample preparation was based on solid-phase extraction (SPE) and antibiotics were quantified using High Performance Liquid Chromatography (HPLC). Percentage of recoveries obtained for above mentioned antibiotics remained between 85% to 95%. The highest environmental contaminations of AMP (water; 0.019-0.546 ppm, sediments; 0.001-0.004 ppm), AMX (water; 0.0198-0.704 ppm, sediments; 0.001-0.010 ppm) and SMX (water; 0.001-0.034 ppm, sediments; 0.001-0.002 ppm) were detected in hospital effluents while the highest concentrations of OTC (water; 0.001-0.231 ppm, sediments; 0.001-0.056 ppm), TC (water; 0.001-0.112 ppm, sediments; 0.001-0.067 ppm) and ERM (water; 0.001-0.324 ppm, Sediments; 0.002-0.004 ppm) were recorded in effluents collected from fish farms and shrimp hatcheries. Results of the present study also indicate that among the antibiotics few of them were detected in lower concentrations in Beira lake and river mouths. OTC (water; 0.001-0.021 ppm, sediments; 0.001-0.002 ppm), TC (water; 0.001-0.032 ppm), AMP (water; 0.002-0.010 ppm), AMX (water; 0.001-0.078 ppm) and ERM (water; 0.001-0.005 ppm, Sediments; 0.001-0.003 ppm) were detected in river mouth of Walawe river. In Beira lake, AMP (water; 0.345 ppm), AMX (water; 0.101ppm), SMX (water; 0.001ppm) and ERM (water; 0.013ppm) were detected.

The antibiotic concentrations recorded in most environmental samples have exceeded the maximum permissible level (< 0.001ppm-water and < 0.1ppm- sediments) recommended by World Health Organization. Therefore, results of the present study provide important information on environmental exposure of antibiotics, which can be incorporated into environmental risk assessments of the particular antibiotics in Sri Lanka.

Keywords: Ampicillin (AMP), Amoxicillin (AMX), Sulfadiazine(SDI), Sulfamethoxazole (SMX), Oxytetracycline (OTC), Tetracycline (TC), Solid Phase Extraction (SPE)
ASSESSMENT OF NI, CD AND CU IN SOIL, IRRIGATION WATER AND GREEN LEAFY VEGETABLES CULTIVATED IN AND AROUND COLOMBO DISTRICT, SRI LANKA

Thilini Kananke 1, Jagath Wansapala2, Anil Gunaratne3

1Department of Food Science and Technology, Faculty of Applied Sciences, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka
2Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka
3Department of Livestock Production, Faculty of Agriculture, Sabaragamuwa University of Sri Lanka, Belihuloya, Sri Lanka

thilini.kananke@yahoo.com

Green Leafy Vegetables (GLV) are key component of the Sri Lankan diet. However, GLV are more prone to the bioaccumulation of toxic heavy metals when they are grown in heavy metal contaminated agro soils which may causes potential health risks for humans. The present study was conducted to evaluate the levels of trace metals (Cd, Ni and Cu) in five types of GLV ["Kankun" (Ipomoea aquatica), "Mukunuwenna" (Alternanthera sessilis), "Thampala" (Amaranthus viridis), "Nivithi" (Basella alba) and “Kohila Leaves” (LASTIA spinosa)] collected randomly from six different cultivation areas [Wellampitiya (11 sites), Kolonnawa (5 sites), Kottawa (5 sites), Piliyandala (9 sites), Bandaragama (5 sites) and Kahathuduwa (5 sites)] located in and around Colombo District, Sri Lanka, using Atomic Absorption Spectrophotometry. Soils from GLV cultivation lands and irrigated water were also tested.

The average concentrations of heavy metals, Ni, Cd, and Cu in soils were 51.5±45.5, 1.4±1.1 and 66.5±59.5 mg kg⁻¹ respectively. The highest Ni contamination was detected in the irrigated water samples from Wellampitiya (2.02 mg L⁻¹) followed by Kolonnawa (1.02 mg L⁻¹) and Kahathuduwa (0.25 mg L⁻¹) areas. This has exceeded the WHO/FAO guideline (0.2 mg L⁻¹). However, Cd and Cu contents in all tested irrigated water samples were well below the detection limits (0.001mg L⁻¹ for Cd and 0.05 mg L⁻¹ for Cu). Significant differences in heavy metal contamination were observed between cultivation areas and between types of GLV analyzed at P<0.05. The mean concentrations (mg kg⁻¹, dry weight basis) of heavy metals, Ni, Cd and Cu were recorded in Mukunuwenna (6.48±6.74, 0.20±0.11, 11.85±7.51), Thampala (5.95±7.18, 0.22±0.11, 9.19±7.25), Nivithi (6.53±7.97, 0.20±0.12, 10.07±8.75), Kohila (11.24±10.36, 0.33±0.20, 17.73±10.03) and Kankun (7.90±8.61, 0.21±0.12, 14.13±8.90) respectively. In contrast to Ni and Cd, mean concentrations of Cu estimated in all the five types of GLV were below the WHO/FAO safe limit (Permissible limits: 4 mg kg⁻¹ for Ni, 0.2 mg kg⁻¹ for Cd and 40 mg kg⁻¹ for Cu). According to the results Kohila Leaves are more prone to accumulate Ni, Cd and Cu from the environment.

Among the six cultivation areas, the uppermost contaminated GLV were reported in the Kolonnawa area (21.73±10.73, 0.39±0.20, 21.97±13.59 mg kg⁻¹), followed by Wellampitiya (10.06±7.46, 0.29±0.16, 18.13±6.48 mg kg⁻¹) and Kottawa (7.15±3.61, 0.22±0.11, 13.73±7.57 mg kg⁻¹) areas for Ni, Cd and Cu respectively. Comparatively Piliyandala (2.50±1.97, 0.15±0.06, 6.77±2.84 mg kg⁻¹), Bandaragama (3.15±1.72, 0.16±0.04, 7.72±3.00 mg kg⁻¹) and Kahathuduwa (2.33±1.58, 0.16±0.04, 5.28±2.23 mg kg⁻¹) areas showed significantly low Ni, Cd and Cu concentrations in GLV. This study has demonstrated the potential risks involved in the consumption of leafy vegetables cultivated in the contaminated areas.

Keywords: Cadmium, Contamination, Copper, Green Leafy Vegetables, Nickel
The adsorption capability of activated carbon is applied to remove large variety of compound from contaminated water through carbon adsorption. The scope of this study was to investigate the water purification capabilities of prepared activated charcoal from dried Palmyrah (*Borassus flabeliffer*) kernel shell. 18 types of different activated charcoal samples were prepared through the following steps as carbonization, chemical activation and pyrolysis. Carbonized kernel shells which were prepared at 400 °C, 500 °C and 600 °C for 10 minutes and 20 minutes, were chemically activated by base (Potassium hydroxide), acid (Phosphoric acid) and water. Finally activated kernel shells were pyrolyzed at 800 °C for 30 minutes. Physico-chemical analysis of collected pond water before and after filtration using prepared activated charcoal was carried out. The pH and conductivity were measured by electrometric method. The calcium and magnesium were determined by ethylene diamine tetra acetic acid complexiometric titration method. Mohr’s argentometric method was used to determine chloride. Nitrate and ammonia were determined by Kjeldhal method. The phosphate content determination was carried out by spectrophotometric (Vanadomolybdate colour development) method. All results were analyzed in SAS software and the mean separation was done by LSD at \( p=0.05 \). Results of analyzed water quality parameters revealed that the best thermal condition to carbonize the kernel shell was at 600 °C for 20 minutes and base chemical activation was the best than acid or water activation. 41.7 % of nitrate, 54.5 % of ammonia, 58.3 % of calcium, 57.8 % of phosphate and 42.3 % of chloride were removed from collected pond water during water treatment by using activated charcoal produced at best carbonization and activation conditions. The physical characteristics such as colour, odur and taste were analyzed by organoleptic method and these characteristics were also superior in treated pond water than untreated pond water for all the activated charcoal treatments. This study will be a positive sign to prepare activated charcoal by applying different pyrolysis conditions and which is applied to treat water from natural contaminated water bodies and industries.

**Keywords:** Palmyrah (*Borassus flabeliffer*) kernel shell, pyrolysis and carbonization
SEASONAL DISPERSAL PATTERNS OF *ADENOMUS KELAARTII* (AMPHIBIA: BUFONIDAE) IN AND AROUND THOTAHAOYA, YAGIRALA FOREST RESERVE, SRI LANKA.

H. D. D. C. Gunasekara, W. A. D. Mahaulpatha

Department of Zoology, University of Sri Jayewardenepura, Sri Lanka
dahamg@gmail.com

*Adenomus kelaartii* is an endemic species in an endemic genus to Sri Lanka which was only recorded from the wet zone usually in close proximity to streams. It was listed under endangered species category by IUCN and it is in a threat due to inadequacy of data about its seasonal dispersal patterns during the year which are needed for their effective conservation. The present study was thus carried out to discover relevant information that can fill the gaps in herpetology Sri Lanka which helps in conserving Sri Lankan amphibian populations.

To study the seasonal dispersal patterns of *A. kelaartii*, a census was carried out at Thotaha Oya in Yagirala forest reserve Sri Lanka which was situated in the Low Country Wet Zone. It was conducted in three consecutive days per month in January 2014 - February 2014 (Northeast monsoon season-NEM), March 2014 – April 2014 (First inter-monsoon season- FIM), May 2014 – June 2014 (Southwest monsoon season-SWM), October 2014 – November 2014 (Second inter-monsoon season-SIM). Three transacts which were 25m long and 2m wide were marked along the stream and the adjacent forest habitats. A distance of 30m was kept between the stream and stream adjacent forest transects. All six transects were surveyed both in the morning (5:30 hrs to 9.30 hrs) and night (17:30 hrs to 21:30 hrs).

The results revealed that the average number of *A. kelaartii* recorded in stream adjacent forest habitats during the NEM, FIM, SWM, SIM were 1±0.57, 14±2.00, 22±2.08, 19±1.00. Average number of *A. kelaartii* recorded in stream habitats during the NEM, FIM, SWM, SIM were 20±2.88, 19 ± 1.00,1±0.57, 1±0.57. Relatively a higher numbers of *A. kelaartii* were encountered in the stream habitats during the Northeast monsoon which was relatively a dry period on for the forest. *A. kelaartii* numbers increased in the stream adjacent forest habitats from Northeast monsoon to Second inter-monsoon which was relatively a wet period for the forest and *A. kelaartii* have abandoned the use of stream habitats during wet season. Present study clearly demonstrated the dispersal patterns of *A. kelaartii* during the year.

**Keywords:** *Adenomus kelaartii*, seasonal dispersal patterns, amphibian conservation

A. G. W. U. Perera, M. M. S. C. Karunaratne

Department of Zoology, University of Sri Jayewardenepura, Faculty of Applied Sciences, Gangodawila, Nugegoda, Sri Lanka

wathsalauda@gmail.com

In view of worldwide interest and greater public awareness in finding plant products as the most promising, ecologically safer, and economical alternatives for synthetic insecticides for post-harvest protection of stored rice, present study was undertaken to explore the potential of leaves of *Ruta graveolens* (Aruda) as a repellent against *Sitophilus oryzae* infestations. Leaf powder and solvent extracts of *R. graveolens* were evaluated under laboratory conditions (29 ± 2°C and 84±2 % RH) for their contact and fumigant repellent properties against seven day old *S. oryzae* adults. In contact repellency test, weevils (20 each) were exposed to 1.0 g, 3.0 g, 5.0 g, and 7.0 g of leaf powder mixed with white raw rice grains (30 g) in a modified cup bioassay apparatus. Fumigation repellency of leaf powder was tested using same dosages and number of weevils in a fumigation-repellency chamber. Number of weevils that moved from the bioassay chamber was recorded one hour after weevil introduction. To evaluate the repellent action of leaf extracts, leaves of *R. graveolens* were extracted in hexane, ethyl acetate, methanol and distilled water. Four extracts of different concentrations 10, 50, 100% (v/v) were assessed separately for repellent activity by means of an area preference bioassay. In all experiments, ten adult weevils for each were tested and the number repelled was recorded 30 minutes after weevil introduction. Both contact and fumigant repellent effects of plant powder against *S. oryzae* were significantly high at all doses and the results indicated that repellency rate increased with the increase of dose. Highest contact and fumigant repellent effects were elicited by 7.0 g of leaf powder resulting in repellency of 96% and 95% respectively, whilst lowest dose also produced more than 50% weevil repellency indicating extremely strong repellent action of the plant powder. In comparison, aqueous leaf extract exhibited the most potent repellent activity (91%) while hexane, ethyl acetate and methanol extracts also produced 72%, 79% and 84% of repellent effects on weevils respectively at the concentration of 100% (v/v). Overall findings of the study suggest that both powder and extracts of *R. graveolens* leaves could be used as eco-friendly agents for post-harvest rice protection.

**Keywords:** *Ruta graveolens, Sitophilus oryzae, stored rice, leaf powder, repellent*
MICROBIAL DIVERSITY IN NITROGEN FIXING NODULES OF CASUARINA EQUISETIFOLIA AND ITS IMPACT ON PLANT GROWTH AND SOIL QUALITY

D.T.W. Gunasekera, D. Gunawardana, H.S. Jayasinghearachchi

Department of Botany, University of Sri Jayewardenepura, Gangodawila, Sri Lanka
jayasinghe148@gmail.com

Actinorhizal plants can contribute to the rehabilitation of poor and disturbed soils by stabilizing the soil and building up its nitrogen content. In addition, they can withstand under various environmental stresses such as high salinity, heavy metal, etc., Casuarina equisetifolia is an actinorhizal plant which is important in agroforestry, land reclamation and natural ecosystems. The aim of this study was to explore microbial diversity in nitrogen fixing nodules of C. equisetifolia and to assess its impact on plant growth and soil quality.

Double layered agar plate technique was adopted to isolate microorganisms from surface-sterilized root nodules. Isolated microorganisms were identified based on distinctive morphological characteristics of colonies and mycelia which were observed under light microscope. Ability of isolates to grow with cadmium up to 10 mg/mL was also tested. Two weeks old seedlings of C. equisetifolia which were grown in ¼ strength Hoagland’s nutrient solution (pH 6.8), were inoculated with different isolates to examine infectivity, nodulation and their effect on shoot and root growth of C. equisetifolia. The root, shoot length, lateral root formation, nodulation were recorded. The plant assay was conducted in triplicate in a completely randomized block design.

Three actinomycetes species; Frankia sp., Micromonospora sp. and Streptomyces sp. were identified from nitrogen fixing root nodules. Further, synergistic growth of all three isolates in liquid media with and without any nitrogen supplement was observed. While Frankia sp. promoted the shoot and root growth by 87% and 55% respectively with nodulation of C. equisetifolia, about 28% increase in shoot and root growth of C. equisetifolia by Micromonospora sp. without nodulation was observed. In contrast, lateral root formation of C. equisetifolia found to be triggered by Streptomyces sp. indicating its potential to modulate host developmental pathways. This study provides novel data on isolation of root inhabiting Streptomyces sp. which could probably play a vital role in exchanging complex signals between plants and the microorganisms and alleviating cadmium toxicity to the plant by depleting cadmium availability in soil. In conclusion, the plant probiotic role of nodule inhabiting actinomycetes of C. equisetifolia would significantly contribute to the plant growth and soil quality.

Keywords: C. equisetifolia, actinomycetes, nodulation, plant growth, soil quality
Antibiotics are required for the treatment of infectious diseases caused by microorganisms. Many causative agents have developed resistance against antibiotics that have been used against them. Therefore, it is vital to look for new antibiotic producers. This study was done to screen for antibiotic producing bacteria in soil.

Samples collected from different soils were analyzed for the presence of antibiotic producing bacteria. First, soil bacterial colonies were obtained on nutrient agar plates by pour plate method. For this purpose, a dilution series from $10^0$ to $10^{-7}$ was prepared using sterile distilled water. After a 48-hour incubation period, well-separated and morphologically different colonies on these plates were given a number for easy recognition. Then the antibiosis of these suspected colonies against selected known bacterial species was tested. *Escherichia coli*, *Bacillus subtilis* and *Staphylococcus aureus* were used as known test bacteria.

For testing antibiosis of selected colonies, both primary and secondary screening was done. Primary screening was done by spot test. In this test, first of all overnight broth cultures of each known bacterium were prepared. This was done by inoculating nutrient broth (50 ml broth in 250 ml flasks) with loopful of bacterium and incubating it overnight in a shaker. Then they were introduced onto nutrient agar surface by spread plate method. After that suspected soil bacteria were spotted on each test bacterial spread using a sterile inoculating loop. The formation of inhibitory zones around the suspected colonies was observed. The pure cultures of the colonies that gave inhibitory zones were obtained by streak isolation method.

Next, secondary screening was done. Both cross streak method and agar well diffusion method were used for this. In the cross streak method, known bacterium was first introduced onto nutrient agar surface as a streak line and then the suspected soil bacterium was inoculated over it as a single line. The formation of inhibitory zones along the isolate was observed. Agar well diffusion method was performed in Muller Hinton agar plates. The known bacterium in overnight broth was introduced onto the surface by spread plate method and small wells were formed on agar. Filtered solution of an overnight broth culture of suspected soil bacterium was used as the antibiotic solution and it was filled into wells. The formation of inhibitory zones around the wells was observed. The antibiosis of each suspected soil bacterial isolate was confirmed by this screening method.

Using morphology as well as biochemical testing, suspected soil bacterial cultures were identified up to species level.

The most promising antibiotic producer was further investigated in order to determine the effect of carbon source on the antibiotic production using different carbon sources; glucose, sucrose, fructose, starch, peptone, xylose and mannitol.

M9 minimal medium which is a liquid medium containing all elements required for microbial growth was used here. It was treated with the relevant carbon source. The initial concentration of carbon source in this medium was 1%. Loopful of the isolate was inoculated into a 250 ml flask containing 50 ml of above medium. It was incubated in
a shaker at 150rpm for more than 18 hours. This broth was used as the antibiotic solution for the analysis. Before further analysis this solution was plate in nutrient agar by pour plate method just to determine whether a microbial growth has occurred.

After that the filtered broth was diluted using twofold broth dilution method (from 1:1 to about 1:128). This was used as the antibiotic solution series with different concentrations. If the antibiotic is present its concentration is reduced along the series. Then the known test bacterium (S.aureus and E. coli were tested separately) was inoculated as an overnight broth (0.10 ml) into each tube in the dilution series. The tubes were incubated for 18 hours at 37°C temperature and compared the growth with a control which was prepared by inoculating known bacterium into nutrient broth. The turbidity was compared here. Then the highest dilution at which the growth was not observed was reported. According to the carbon sources used, this point up to which the growth was not given was different. If the inhibition was reported in higher dilution that could be due to the presence of higher yield in the initial solution and although it was highly diluted the active concentration still remained and vice versa.

According to the results, four bacterial isolates were identified as Pseudomonas aeruginosa, P. putida, Chromobacterium violacium and Alcaligenes faecalis. All isolates exhibited inhibitory activity against S. aureus. Except the antibacterial compound produced by P. putida, the compounds produced by all other were inhibitory against B.subtilis as well. Among all the isolates, P. aeruginosa was the most promising antibiotic producer, in which the inhibitory substance was effective against E. coli also. Therefore P.aeruginosa was used for further analysis.

When P.aeruginosa was introduced into different carbon sources, the growth was not observed in starch, fructose and sucrose containing media. Not surprisingly, the inhibition was not observed in test tubes. Even in the initial tubes the turbidity was observed clearly. Therefore, it was concluded that these carbon sources were not utilized by the microorganism for antibiotic production.

When glucose, peptone, xylose and mannitol were used as the carbon source, bacterial colonies were observed in nutrient agar plates. That means these carbon sources were utilized by bacterium for growth. In the two fold dilution series of the antibiotic solution, when glucose was used, the growth was inhibited up to 1: 64 dilution and after that the turbidity was observed. That means from the initial tube up to that dilution, the antibiotic is present in the medium in an active concentration against the test organism. In other words, in the initial broth there was a considerable yield of the antibiotic and it was diluted in the series up to 1:64 levels. When peptone, xylose mannitol were used this level was consecutively reduced (1:16, 1:4 and 1:1 consecutively) Therefore it was concluded that glucose is the carbon source that gave the highest antibiotic yield. This could be explained as due to rapid population increments that took place in the glucose containing medium. When the population gradually increases in the medium the nutrient limitations could be expected with times which lead to antibiotic production in the relevant medium in a higher yield than with other carbon sources.

**Keywords:** optimum antibiotic production, Pseudomonas aeruginosa, antibiotic resistance, antibiosis, antibiotic yield
CHARACTERIZATION OF EFFICIENT ROCK PHOSPHATE SOLUBILIZING BACTERIA FOR USE AS BIOINOCULANTS FOR RICE

A.A.L. Ratnatilleke, M.B.D.S.S. Gunawardana

Department of Chemistry, Faculty of Science, University of Kelaniya

Rice (Oryza sativa) represents the staple diet of Sri Lankans. Rice growth is strongly limited by key nutrient Phosphorus (P), supplied mainly through phosphate fertilizers which are costly. Rock Phosphate (RP) is regarded as a cheaper alternative, but due to its lack of water solubility, its usage is limited in rice cultivation. However, certain bacteria in rice rhizosphere have shown the capability of solubilizing RP and making P readily available for rice plants. This study was undertaken to investigate the possibility of using RP as a P source in rice cultivation, together with efficient RP solubilizing bacteria.

A total of 165 rice root associated bacteria in rice plants isolated previously were screened for their RP solubilizing capability using solid and liquid PVK (Pikoskaya) selective media. The most efficient RP solubilizing bacteria were identified and their culture filtrates were subjected to High Performance Liquid Chromatography (HPLC) analysis to determine the secreted organic acids by the isolates. To observe their role in plant growth promotion, a pot experiment was carried out. The selected isolates were inoculated to the rhizosphere of traditional variety Suduheenati and modern variety BG-352 rice seedlings, amended with RP (40 kg/ha per pot) and other nutrients. Results of the pot experiment were subjected to statistical analysis by Minitab version 14.0 and significance at 5% level was tested. All experiments were performed in triplicates.

RP solubilization by bacteria strains in PVK media occurred with a concomitant decrease in pH. The results showed that strains 36 and 52, identified as the most efficient RP solubilizing bacteria, released phosphate concentrations of 88.7±0.04 mg L\(^{-1}\) and 80.3±0.02 mg L\(^{-1}\) respectively. According to the HPLC analysis, both strains predominantly produced oxalic and gluconic acid. Strain 36 had produced more oxalic acid (30.28 ppm) and gluconic acid (1689.37 ppm) than strain 52, which were 3.24 ppm and 252.25 ppm respectively. Inoculation of strain 36 increased root and shoot lengths of Suduheenati by 89.7% and 40.9% respectively, and dry weight by 12.34% while in BG-352 it was by 57.4%, 51.25% and 10.23% respectively compared to rice plants with no inoculation. Strain 52 in Suduheenati increased root and shoot lengths by 52.67% and 31.05%, and dry weight by 10.27%, and in BG-352 by 75.24%, 58.71% and 9.45% respectively compared to rice plants with no inoculation. Overall, both strains seemed promising bioinoculants for utilizing RP as a potent P fertilizer for rice cultivation.

**Keywords:** Rice, Rock Phosphate, Phosphate solubilizing Bacteria, HPLC, Plant growth promotion
SIGNIFICANCE OF LACCASE BY RIGIDOPORUS MICROPORUS, THE CAUSE OF WHITE ROOT DISEASE OF RUBBER

H.K.I. Madushani¹, T.H.P.S. Fernando¹, R.L.C. Wijesundara², D. Siriwardane¹

¹ Department of Plant Pathology & Microbiology, Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka.
² Department of Plant Science, Faculty of Science, University of Colombo, Sri Lanka.

Laccases are lignin degrading enzymes and distributed widely in a wide range of living organisms such as higher plants, insects, fungi and bacteria. Majority of laccases characterized so far have been derived from fungi, especially white rot Basidiomycetes that are efficient lignin degraders. *Rigidoporus microporus* has wide host range and is the causative agent of the most destructive white root disease. The pathogen has the ability to produce high level of laccase enzyme which causes wood-decaying. The laccases have been isolated from *R. microporus* which has potential applications such as degradation of lignin and phenolic compounds, bleach of pulps, removal of oxygen from oil products, detoxification of inhibitors in fermentation, protein treatment, medical analysis etc. In this study, the isolation and screening of *R. microporus* for laccase production were carried out with twelve isolates of *R. microporus* were isolated from symptomatic *Hevea brasiliensis* (R1, R4, R11, R12), *Macuna bractiacta* (R2), *Cinnamomum zeylanicum* (R3), *Camellia sinensis* (R5), *Artocarpus nobilis* (R6), *Murraya koenigii* (R7), *Salix babylonica* (R8), *Alstonia macrophylla* (R9), *Alstonia heterophyllus* (R10). The isolates were screened for laccase enzyme secretion on solid media containing colour indicator of guaiacol. Qualitative screening method for laccase production was carried out by inoculation of 0.5 cm diameter of mycelium from 7 days old cultures into 2% PDA plates supplemented with 0.2 % glucose as a laccase degrading substrate with 0.02 % Guaiacol (pH 5.5) and then incubated at 30 °C. The formation of reddish brown halo indicated a positive laccase secretion. After, an incubation period of 4 days, the enzyme activity was examined by scoring the decolorization intensity. Test was repeated twice. All the tested *R. microporus* isolates were laccase positive and R6 isolate produced higher intensity showing larger diameter of the reddish brown halo. Laccase is responsible for making a polyphenolic glue that sticks the hyphae together. Isolate R6 showed adpressed hyphae on culture plates which further confirmed the high level of laccase. Additional physiological functions of fungal laccase in fruit body formation and pathogenicity expression have also been suggested by various researchers and it tightly bound to the cell wall contributing to the resistance to fungicides. The pathogen of *R. microporus* has a great potential application in laccase production in environment protection.

**Keywords:** Laccases, *Rigidoporus microporus*, Basidiomycete, Guaiacol
CHARACTERIZATION OF RALSTONIA SOLANACEARUM WHICH CAUSES BACTERIAL WILT OF POTATO

A. A. U. Perera¹, P. N. Dasanayaka², O. V. D. S. J. Weerasena¹

¹Institute of Biochemistry, Molecular Biology and Biotechnology, University of Colombo
²Department of Botany, Faculty of Applied Sciences, University of Sri Jayewardenepura

aauperera@gmail.com

Bacterial wilt of potato caused by Ralstonia solanacearum is an important disease, causing huge losses worldwide. The estimated crop loss of potato due to bacterial wilt in Sri Lanka is around 5-25% causing high financial losses to the growers. R. solanacearum is a Gram-negative, rod-shaped bacterium. Four biovars of the bacterium were distinguished and among them biovar 1 has not been recorded in Sri Lanka. This study was conducted to characterize the pathogen based on Badulla district which is one of the major potato producing areas in Sri Lanka, contributing about 75% of the production. Samples of wilted potato plants were collected from the fields in the areas of Kahagolla, Haputhalegama and Diyathalawa in the district. R. solanacearum was isolated on triphenyl tetrazolium chloride (TTC) agar medium using infected stem sections and tubers of the potato plant samples. Isolates were characterized biochemically using potassium hydroxide test, catalase test, oxidase test, citrate utilization test, nitrate test, starch hydrolysis test and gelatin liquefaction test. Genomic DNA of bacterial isolates was extracted using cetyltrimethyl ammonium bromide (CTAB) method and isolates were identified on molecular basis using species-specific primers, Rsol_fliC. Biovar of the isolates was determined based on their ability to utilize disaccharides and to oxidize hexose alcohols. Isolates of R. solanacearum from wilted potato plants produced mucoid, irregular, white colonies with red centres on TTC medium. According to biochemical tests isolates of R. solanacearum were Gram negative, positive for potassium hydroxide reaction, catalase activity, oxidase reaction, and citrate utilization, were able to reduce nitrate to nitrite and were negative for starch hydrolysis and gelatin liquefaction. In the polymerase chain reaction (PCR) with the Rsol_fliC primers, 06 isolates produced a 400 bp size amplicon, confirming their identity as R. solanacearum. All 06 isolates belonged to biovar 2, being able to utilize cellobiose, lactose and maltose, but not able to oxidize dulcitol, mannitol or sorbitol. The causal organism of bacterial wilt of potato in the selected areas was successfully characterized as R. solanacearum biovar 2.

Keywords: Potato, bacterial wilt, Ralstonia solanacearum, characterization, biovar
CLEANER PRODUCTION ASSESSMENT: IMPROVING RESOURCE EFFICIENCY IN REBUILD AND DAG TIRE INDUSTRY, Sri Lanka

H. M. L. P. Karunaratne¹, U. S. E. Udagedara², S A Vanniarachchi³, D. V. D. Nisansala⁴, M. A. D. Umayangani⁴

¹Department of Estate Management and Valuation, University of Sri Jayewardenepura
²Faculty of Graduate Studies, University of Colombo
³Carbon Consultant, Prime Consultancy Co Ltd
⁴Faculty of Graduate Studies, University of Colombo

The objective of this study is to assess the present material, water and energy consumption of the factory operations and take necessary actions to improve efficiency of material, water and energy in the factory while reducing the negative impacts to the environment from factory operations. The methodology used in this study is Cleaner Production Assessment. Accordingly, the assessment covered all the major activates and areas in the tire factory. Primary data and secondary data were gathered a cross sections of the employees including the senior management were interviewed. After completion of the assessment, considerable amount of saving potential was identified. The main solutions that were raised from this analysis are repairing of steam leak, insulation of distribution lines, expansion of feed water tank, fixing up compressed air leak; avoiding the water leak from water pump and installation of low flow rate shower instead of the shower with higher flow rate. Expected annual saving from recommended projects for water conservation would reduce the water bill by 12.5%. The primary energy source is the electricity received from the national grid and secondary energy sources are furnace oil. Proposed annual saving through reduction of energy bill is 1.14%. This will mainly contribute to improve environmental image of the company and effective resource utilization. This will pave the path for green production concept as well. Further, optimum usage of water and energy gives direct cost saving as well as contribute to reduce the GHG emissions from the factory and hence will improve the image of the organization to acquire more business opportunities. The implementation will improve good housekeeping practices. Continuous capacity building of factory staff, proper record keeping, regular testing and improvements are the great necessity for implementation of CP in the factory.

Keywords: Cleaner Production, Material Balance, Waste Cause Analysis, CP option generation
Contamination of freshwater bodies in Sri Lanka with hepatotoxic cyanotoxin, microcystin (MC) gained much attention of water treatment facilities recently. Most of the Islandwide water bodies were identified as potential sources of cyanobacterial contaminations and temporal contaminations of MCs. This group of toxins are synthesized by a large gene cluster (≈55 kb) consisting of non-ribosomal peptide synthetases and polyketide synthases in a variety of distantly related cyanobacterial genera. Twenty one reservoirs were selected for the present study belonging to Western, North Western, Southern, Sabaragamuwa, Eastern, North Central and Uva provinces which were considered as sources for the supply of drinking water. Total MC contamination levels were assessed with the Enzyme Linked Immuno Sorbent Assay (ELISA). Actual potential of the reservoirs for production of MCs was evaluated by the Polymerase Chain Reaction (PCR) using specific primers for three genes involved in MC biosynthesis namely, \textit{mcy A}, \textit{mcy B} and \textit{mcy E}. All the reservoirs were having considerable levels of total MCs ranging from 0.025 (±0.001) to 434.5 (±1.16) ppb and Labugama, Kalatuwawa, Rathkinda and Minneriya reservoirs were not having detectable amounts of MCs. Eventhough, PCR confirmed the presence of MC producing genotypes in the reservoirs with detectable amounts of MCs. PCR also revealed that though there were no detectable MCs, Minneriya reservoir was having cyanobacterial genotypes with MCs biosynthesis capability. Absence of MCs in Labugama, Kalatuwawa and Rathkinda reservoirs was proven by the negative results for PCR. Molecular screening could reflect the actual ability of MC production even when the toxin is not in detectable levels at a given moment. PCR could engaged as a new pre-screening method for cyanotoxin biosynthesis in water bodies in Sri Lanka.

\textbf{Keywords:} Microcystin, contamination, biosynthesis, potential, screening, PCR
EVIDENCE OF RESTRICTED MATERNAL GENE FLOW OF PURANA (OLD) POPULATION IN THE SUBURBS OF SIGIRIYA, SRI LANKA

K. M. Chandimal 1, S. G. Yasawardene 2, R. J. Illeperuma 3

1Department of Basic Principles, Gampaha Wickramarachchi Ayurveda Institute, University of Kelaniya
2Department of Anatomy, Faculty of Medical Sciences, University of Sri Jayewardenepura
3Molecular Forensics Unit, Genetech, Colombo

Population movements, social structure and caste endogamy are some of the important determinants of the genetic structure of world population. Historical records indicate that the ancestry of the Purana (old) population living in the suburbs of Sigiriya in Sri Lanka can be traced back to the times of the Sinhalese Kings of the 5th century A.D. (1,450 YBP). Previous studies done on the Purana population reported that they were biometrically different from the rest of present Sri Lankans and other population in the world. This study was carried out to investigate maternally inherited Mitochondrial DNA (mtDNA) of Purana population in the suburbs of Sigiriya. Forty four Purana inhabitants belonging to Purana pedigrees were recruited in the study. Mitochondrial DNA was extracted amplified in PCR and sequenced. Polymorphisms of mtDNA HVS –I ranged from 16,004 – 16,411bp length were noted using CLUSTALX option of MEGA VA 4.0 sequence alignment software. In order to investigate genetic affinity of Purana population, Arlequin software version 3.11, analysis of molecular variance (AMOVA) were used by using reported similar genetic data of present Sri Lankans such as Sinhalese, Sri Lankan Tamils, Indian Tamils, Sri Lankan Moors and Vedda. Genetic relationships of Purana population with other Sri Lankans were further explored by phylogenetic analysis. Genetic dissimilarity among groups was higher (2.81%) when populations were grouped into two as modern and Purana than grouping them according to their ethnic basis (0.00%). This indicates a restricted mtDNA flow between the two groups (Purana and rest of the Sri Lankans) that made Purana population was maternally isolated from the rest of Sri Lankans. This isolation is also collaborated with the reported morphological and morphometrical variations such as dominant mesocephalic cephalic phenotype (35%), leptoprosopic facial phenotype (38%), mesorrhine nasal phenotype (56%) ,blood group O (46%) etc when Purana population is compared with present Sri Lankans. Detailed phylogenetic analysis of the study revealed that they are maternally more related to Sri Lankan Tamil than to any other present Sri Lankans.

Keywords: Mitochondrial DNA, Maternal Inheritance, Purana population
EXPOSURE OF MALE WISTAR RATS TO COMMERCIALLY AVAILABLE ETHREL: SHORT TERM, LONG TERM EFFECTS AND RECOVERY

T.T. D. Chathuranga, L. Dinithi C. Peiris

Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
newdilhan@gmail.com

Recently, artificial fruit ripening using ethrel (ethephon) has become a major health concern. The present study investigated the effects of ethrel on behavioural, haematological and biochemical parameters on male Wistar rats. Rats (N = 6/group) were exposed to acute doses of ethrel [2000 mg/kg, 1000 mg/kg, 500 mg/kg body weight (BW) or distilled water (DW: control)] and clinical signs were recorded. To study chronic effects, rats (N = 9/group) were treated with 100, 250, 500 mg/kg BW of ethrel or DW for 90 consecutive days. Another two sets of animals (N = 6/group) were orally treated either with 500 mg/kg BW of ethrel or DW for 90 days and were kept for another 28 days without treatment (recovery) to evaluate the reversibility, persistence or delayed occurrence of toxic effects. Food intake and BW changes were recorded weekly. Exploratory behaviour parameters, muscle strength and coordination were determined. Animals were autopsied and biochemical parameters [alanine aminotransferase (ALT) and erythrocyte cholinesterase (EchE)], haematological parameters (erythrocyte count, total and differential leukocyte count, platelet count, hematocrit and haemoglobin) and sperm parameters (concentration, motility and DNA damage) were measured. Acute treatment did not induce BW change, any overt signs of toxicity or mortality up to 14 days. Treatment with ethrel for 90 days did not reveal any toxicity with respect to clinical signs, food intake, and BW gain. Similarly, exploratory behaviour parameters, muscle strength and coordination, haematological and sperm parameters did not change significantly. However, ethrel induced a significant EchE inhibition at doses of 250 mg/kg (by 9.93%), 500 mg/kg (by 5.75%) and 500 mg/kg – recovery (by 14.62%). Further, ALT activity in treated groups (250 mg/kg, 500 mg/kg and 500 mg/kg - recovery) was significantly different from the control. The percentage of relative organ weights did not differ significantly. However, ratio of liver/body weight increased significantly at 500 mg/kg of ethrel. But, there were no apparent pathological changes in the liver. In conclusion, exposure to higher doses of ethrel may lead to liver damage and decrease EchE activity.

Keywords: fruit ripening, ethrel, ALT, erythrocyte cholinesterase
THE VARIATION OF FRUIT COMPONENTS IN CONSERVED COCONUT GERMPLASM AT POTTUKULAMA FIELD GENE BANK IN SRI LANKA

K.N.S. Perera, H.M.N.B. Herath, S.A.C.N. Perera

Genetics and Plant Breeding Division, Coconut Research Institute, Lunuwila
chandrikaperera2003@yahoo.com

Characterization of conserved coconut germplasm has been undertaken globally for identification of important features of different accessions for them to be effectively used in coconut breeding. One hundred and fifty seven accessions comprising of local and exotic material have been conserved in ex-situ field genebanks of Coconut Research Institute. The objective of this paper is to quantitatively characterize fruit components by weight based analysis. Twenty local tall coconut accessions; Moorock, Palugasewa, Pityakanda, Clovis, Namalwatta, St. Anne’s, Margaret, Kasagala, Debarayaya, Razeena, Ambakelle special, Melsiripura, Mangalaeliya, Goyambokka, Goluwapokuna, Keenakelle, Maliboda, Horakelle, Walahapitiya, Wellawa conserved at Pottukulama Gene bank were characterized following Bioversity International descriptors for coconut. Sampled nuts were scored for weights of fresh nut, husked nut, split nut and kernel and the weights of husk, water, and shell of each nut were derived from the scored data. Analysis of variance by general linear models procedure and mean separation by Duncan’s multiple range test were performed in SAS v8 and principal component analysis and cluster analysis using squared Euclidean distances were performed in Minitab V17. General linear models procedure revealed significant differences for all the components at 5% probability level. Clovis recorded the highest values for most of the parameters followed by the accession Margaret. The highest per nut kernel producer, Clovis, was followed by Margaret with statistically equal performances and this is important because kernel is the main economically important component followed by the husk. Principal Component (PC) Analysis was performed to describe the diversity among variables and the first three PCs accounted for 79.1%, 16.2% and 2.7% of the variation respectively accumulating to a total of 98% variability among the evaluated coconut accessions. The PC plots and the dendrogram revealed three major groups at 66.6% similarity level and four distinct accessions namely; Clovis, Namalwatta, Margaret and Goyambokka grouped together having higher values for fruit components. Results revealed diversity of fruit components among tall accessions indicating the potential of them to be utilized in breeding programmes. The study also unveiled the duplications among accessions with respect to fruit components which will help in formulating future conservation strategies.

**Keywords:** Coconut, Germplasm, Fruit Component Analysis, Characterization, Multivariate Discrimination
SCREENING OF HEVEA CLONES AGAINST CORYNESPORA LEAF FALL DISEASE: THE MOST DESTRUCTIVE FOLIAR DISEASE OF RUBBER

T.H.P.S. Fernando, P. Seneviratne, N. Nishantha, D. Siriwardena

Rubber Research Institute of Sri Lanka, Dartonfield, Agalawatta, Sri Lanka

thpsfernando@yahoo.com

Corynespora leaf fall disease (CLFD) is regarded as the most destructive leaf disease of rubber plantations in Sri Lanka. The disease is caused by the fungus Corynespora cassiicola. This disease caused several global epidemics and Sri Lanka was seriously affected. During the first epidemic, this disease devastated one of our prestigious clones RRIC 103 and we lost more than 4500 ha. At that time three options were given: the first was to graft at the base or for the crown, the second was chemical control but the growers accepted the third option: uprooting and replacing with disease resistant clones. Since then steps were taken to screen the clones intensively to identify Corynespora resistant / susceptible clones. Throughout the recent past, RRISL was in a position to avoid many disease susceptible clones due to the adoption of below screening protocol. Rubber Research Institute recommends the clones under three groups based on their performance on various primary and secondary characters. After evaluation, clones were included to group III and then, the promising clones are upgraded up to the group 1. The evaluation of clones against Corynespora is first done under laboratory level using conidia or artificially prepared toxic metabolites. Then the clones are tested in bud wood nursery type of experiments where the test clones are grown mixed with highly disease susceptible clones. Furthermore, the clones are evaluated for Corynespora under natural field conditions. The test clones are observed for both disease incidence and severity levels – Average Disease Severity Index (ADSI). Analysis of the results from three test methods during the period of year 2012-2014 showed that 80.64% of the clones in the recommendation list can be ranked as resistant. The percentage of highly susceptible clones was 6.45% and they have been already removed from the list of clonal recommendation. The clones identified as moderately or mildly susceptible were downgraded in the recommendation list and were monitored for the disease severity levels. The cultivation of resistant clones with a wide genetic base is considered as the most reliable long-term solution for the management of CLFD. The findings will be helpful in environ-max planting systems and for future breeding programmes.

Keywords: Corynespora Leaf fall disease, clonal screening, conidia, toxin
COMPILATION OF AN INFORMATIVE SSR MARKER SET FOR MOLECULAR CHARACTERIZATION OF FINGER MILLET (*ELEUSINE CORACANA* L.) GERMPLASM ACCESSIONS OF SRI LANKA

P W Wakista¹, P N Dasanayaka², R J Illeperuma¹, S A C N Perera³, S. P Bandara⁴

¹ Genetech, No 54, Kitulwatta Road, Colombo 08, Sri Lanka
² Department of Botany, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
³ Genetics and Plant Breeding Division, Coconut Research Institute, Lunuwila, Sri Lanka
⁴ Plant Genetic Resource Center, Gannoruwa, Sri Lanka

Finger millet (*Eleusine coracana* L.) commonly known as “Kurakkan” in Sri Lanka and has been cultivated since ancient times as the second staple food after rice. Because of its high nutritional value, excellent storage qualities and its ability to adapt to a wide range of adverse agro-ecological conditions, it is worthy to have continuous efforts on improvement of the productivity and conservation of crop genetic diversity. The germplasm identification and characterization is an important link between the conservation and utilization of plant genetic resources. Molecular markers have provided a powerful tool for breeders to identify the new sources of variation. 82 SSR (Simple Sequence Repeats) markers have been published by Dida et al (2007) for finger millet and only 31 of them are mapped. This study was conducted to compile an informative set of SSR markers out of mapped 31 markers using 48 different finger millet germplasm accessions with different geographical origins. Polymorphism, efficiency of amplifying the target loci and ease of scoring on polyacrylamide gels were evaluated for the markers. Nine markers out of 31 were monomorphic (UGEP06, UGEP08, UGEP26, UGEP52, UGEP56, UGEP76, UGEP104, UGEP107 and UGEP108). UGEP 01 could not amplify the target loci for most of the samples and scoring of additional three markers (UGEP53, UGEP60 and UGEP65) was difficult. Two markers (UGEP03 and UGEP21) amplified duplicate loci were scored as two separate markers each. This resulted in a set of 20 informative markers (UGEP03.1, UGEP03.2, UGEP05, UGEP10, UGEP11, UGEP12, UGEP15, UGEP18, UGEP21.1, UGEP21.2, UGEP24, UGEP31, UGEP68, UGEP77, UGEP78, UGEP81, UGEP90, UGEP102, UGEP106 and UGEP110). Across the 48 accessions, the total number of alleles amplified by the selected 20 markers was 69, ranging from 2 to 7 alleles per locus. The major allele frequency ranged from 0.66 to 0.98. The Polymorphic Information Contents (PIC) ranged from 0.04 to 0.60 and heterozygosity ranged from 0.016 to 0.044. The selected set of markers was successfully used to assess the genetic diversity of 48 finger millet germplasm accessions of Sri Lanka. The selected set of markers was successfully used to assess the genetic diversity of 113 finger millet germplasm accessions of Sri Lanka and will be used to assess the remaining accessions available at PGRC, Gannoruwa as future work.

**Keywords:** Finger millet, SSR markers, genetic diversity, germplasm, *Eleusine coracana*
ETHYL METHYL SULFONATE (EMS) INDUCED HERBICIDE RESISTANCE IN SRI LANKAN RICE (*ORYZA SATIVA*) VARIETIES

E.M.S.I.Ekanayaka, S. R. Weerakoon, S. Somaratne

Department of Botany, The Open University of Sri Lanka, Nawala, Sri Lanka

shyamaweerakoon@gmail.com

Rice cultivators continuously apply a massive amount of herbicides on rice crop to reduce the effects of weed population. *N*-phosphonomethyl) glycine commercially known as Glyphosate, a broad-spectrum herbicide targets the enzyme 5-pyruvyl shikimate 3-phosphate synthase (EPSPS) which involves in biosynthesis of aromatic amino acids in plants which affect the weed as well as the crop. Therefore, it is vital to carry out studies on Herbicide Resistant (HR) rice varieties. Ethyl Methyl Sulfonate (EMS) is the most commonly used chemical mutagen in plants which causes sequence change of functional mutations. Studies on induced herbicide resistance in Sri Lankan rice varieties are limited and there is a need of such studies for the inclusion of HR rice in a cropping program along with a range of weed management strategies. Mutants of EPSPS occur in Glyphosate tolerant crops and in the present study attempts were made to establish HR rice lines by conventional breeding methods instead of applying genetic engineering methods. Seeds of 25 rice varieties (*S₀*) were subjected to EMS treatment and non-treated seeds were served as the control. After mutagenesis, plants were exposed to Glyphosate (0.5 g/l) to check for herbicide resistance, which was examined up to the second generation (*S₁*) of tested rice varieties. Complete Randomized Design with three replicates was used as the experimental design. Plants with ≥ 50% resistance to Glyphosate were considered as resistant varieties. Vegetative and reproductive characters were recorded from the survived plants. Results indicated that fourteen varieties increased the resistance to Glyphosate (*Bg94*-*1, Bg352, Bg359, Bg360, At362, Bw364, Ld365, Bg366, Bg379-2, Bg403, Bg454, Kaluheenati, Pachcha perumal and Madel) in the first generation (*S₀*). The pair-wise statistical analysis of variance of agro-morphological characters clearly showed significant differences (*p* ≤ 0.05) between control and treated plants. Percentage of resistance of *S₁* was almost similar to *S₀* indicating that herbicide resistance was segregated to the second generation. EMS application was successful in enhancing herbicide resistance in certain rice varieties. Findings of the study can be used in the identification of HR rice varieties which could be used in rice breeding programs.

**Keywords:** *Oryza sativa*, Herbicide resistance, EMS, Glyphosate, Weed Management
Cassava (*Manihot esculenta*), is one of the most important food crops in the humid tropics. Sri Lanka has a surplus production of cassava. Developing of proper technologies is needed to increase the utilization of cassava as processed foods for increasing the potential utilizations and minimizing the postharvest losses of the crop. Cassavacrocket, cassava chips and cassava starch are few popular processed cassava products available in the local market. Investigations were carried out to identify the wastes generated during the processing of cassava crocket and chemical analysis were carried out to identify the potential utilizations of the wastes as a preliminary study to apply Resource Efficient and Cleaner production (RECP) Technology to improve the cassava crocket processing.

Processing of cassava crocket was observed at the manufacturing plants at “Maharagama” and “Peradeniya” and the data were collected. The samples of wastes were collected on site, according to the random sampling method to calculate the amounts of waste. The proximate composition of the cassava wastes was analysed according to AOAC methods.

The major wastes of the cassava crocket processing were cassava peel and the liquid squeezed out of grated cassava. According to the results 21.5±1.3 percent and 20.8±1.7 percent of the total weight of raw cassava root was wasted as peel and liquid squeezed respectively. From the peel waste 3.6±0.5 percent of total cassava root is the brownish peel which is the periderm and 17.7±1.0 percent of the total cassava root is thick peel which is the cortex. Results obtained from the proximate analysis of raw cassava tuber showed, the moisture content as 63.07±0.4 percent, protein content as 1.5±0.3 percent, fat content as 0.5±0.03 percent, crude fibre content as 3.7±0.4 percent, ash content as 1.0±0.2 percent and carbohydrate content as 30.23±0.2 percent. Proximate composition of cassava peel (cortex) had moisture content of 7.5±0.3 percent, protein content of 8.2±0.1 percent, fat content of 3.1±0.4 percent, crude fibre content of 12.5±0.2 percent, ash content of 6.5±0.2 percent and carbohydrate content of 71.6±0.5 percent.

According to results the total waste generated in the cassava crocket was 42.3% of the total weight of raw cassava root. The thick peel which is high in nutrients can be used as a good source of animal feed and the squeezed liquid can be used to develop snack foods like “Kokis” by incorporation of coconut milk and spices.

**Keywords:** Cassava, Cassava crocket, Cassava peel, waste quantification, proximate analysis
IMPACT OF GEOGRAPHICAL LOCALIZATION ON SEED MORPHOLOGY, OIL CONTENT AND FATTY ACID COMPOSITION OF MADHUCA LONGIFOLIA GROWN IN SRI LANKA

Mihiri Munasinghe, Jagath Wansapala

Department of Food Science & Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri Lanka
mihirimunasinghe@gmail.com

*M. longifolia* (Sapotaceae) is a locally available plant in Sri Lanka which is valued for its seeds as a source of edible oil. Past studies revealed that the quantity of oil in seed is over 50% of its weight, yet this remains as an under-utilized source of oil. The aim of this study was to identify the variation in morphology of seeds, variation in fatty acid profile and in oil content of *M. longifolia* seeds from different agro-ecological zones in Sri Lanka. Simultaneously, to determine the relationship of oil content and fatty acid profile with some geographical factors. Dried, fallen seeds were collected from randomly selected 16 plants (4 from each zone) representing four agro-ecological zones in Sri Lanka based on the availability of plant. They were low country dry zone (LD), low country wet zone (LW), low country intermediate zone (LI) and mid country intermediate zone (MI). The length, width and the weight of seeds were determined as morphological characteristics. Oil from seed kernel was extracted using Soxhlet method (AOAC, 1990) using n-Hexane (bp. 65-70° C). Fatty acid methyl esters were prepared and identified using GC-MS. Significant differences (P<0.05) were observed within agro-ecological zones on seed morphology (in terms of all 3 tested characteristics). Results ranged from 2.73-3.43 cm for length, 1.06-1.30 cm for width and 0.93-1.40 g for weight. Significant differences were resulted (P<0.05) in oil content also (50.07-53.85%) among agro-ecological zones. As the major fatty acids, Oleic, Stearic, Palmitic and Linoleic were resulted in all four agro-climatic zones. The total saturated fatty acid content (C18:0, C16:0, C14:0, C17:0, C19:0, C22:0, C24:0, C26:0, C20:0 and C8:0) varied from 40.87-47.20%. However the total unsaturated fatty acid content (C16:1, C18:1, C18:2, C20:1) was observed in the range of 49.6-53.86% (TMUFA+TPUFA). The highest total fatty acid content was recorded in low country intermediate zone and the lowest in mid country intermediate zone. A considerable variation was shown among the individual fatty acid contents obtained from different agro-climatic zones. Oil content and the fatty acid composition were not correlated with the studied geographical parameters (altitude, longitude and latitude).

**Keywords:** *M. longifolia*, Fatty acids, oil extraction, agro-climatic zones
ARTIFICIAL ASEXUAL PROPAGATION OF SEA ANEMONE 
(ENTACMAEA QUADRICOLOR) USING ARTIFICIAL PROPAGATION METHOD


¹ National Zoological Gardens, Dehiwala
² Department of Zoology, Faculty of applied science, University of Sri Jayewardenepura, Nugegoda

Sea anemones (Phylum Cnidaria; Class Anthozoa, Order Actiniaria) exhibit a diversity of developmental patterns that include cloning by fission. The genetic diversity is different form asexually breed anemone to sexually breed anemone. Sea anemone exhibits iconic symbiotic association with clown fish and other reef fish in reef environments. Clown fish are very important specie in aquarium trade and they need sea anemone for their survival. These host anemones represent high-value species for collectors.

This study explores asexual propagation as a method for invitroculturing of a geographically widespread and commonly traded species of host sea anemone, Entacmaea quadricolor. Experiment was conducted to establish size influenced survival after cutting into halves. Sea anemones were purchased from commercial ornamental fish trader and the experiments were carried out in the laboratory of aquarium of National Zoological Garden, Dehiwala from March 2013 to October in 2013. Ten anemones with an average diameter of 15 cm were used for the experiment. The anemones were cut in to halves using a dissecting blade and observed the growth pattern and survival rates. The results showed a high survival rate of 90%. The anemones took up to 40 days to form an off-centre mouth under natural sunlight and salinity of 25ppm.

This simple and cost effective method of propagation could be used to produce individuals throughout the year. This shows the potential use of this method to fulfill the high demand of sea anemone in sea water aquarium trade or to restock depleted coral habitats, thus supporting biodiversity conservation in coral reef areas.

Keywords: Sea anemones, anemone fish, Entacmaea quadricolor, propagation, asexual reproduction.
INDUCED BREEDING OF STRIPED CAT FISH (PANGASIANODON HYPOPHTHALMUS) USING OVAPRIM AT NATIAL ZOOLOGICAL GARDENS SRI LANKA.

Udeshika Wimalasiri¹, Chamika Siriwardhana¹, Sumeda Abeysinghe², Dinusha Silva¹, Krishantha Kularathne¹

¹University of Sri Jayewardenepura, Nugegoda
²National Zoological Garden, Dehiwala
udshikamanike@gmail.com

Abstract: Striped catfish or iridescent shark (Pangasianodon hypophthalmus) is a highly popular omnivorous fish with a high growth rate. They are schooling fish which makes a delightful display in an aquarium. This fish do not reproduce in natural or captive environments in Sri Lanka. Therefore they have to be induced using artificial technique in order to get offsprings. This study was conducted to implore the potential of captive breeding of striped catfish using artificial induce technique. The brood stocks with average length of 35 cm were collected from the holding tanks of National Zoological garden, Dehiwala. Once the gravid females and male were identified they were subjected into hormone treatment. separated hormonal treatments of Synthetic hormone, Ovaprim was given to male and female. Two doses of 0.5 ml/kg were given to female apart from 6 hours and male was given one dose of 0.5 mg/kg body weight, at the time of second injection to female. Stripping was considered as best technique to fertilize the eggs and dry method of egg fertilization was followed in trials. The fish responded positively and ovulated within 5-6 hours after the second injection. Average 150000 eggs was recovered from female he fertilization rate ranged from 85-95%. The hatching period ranged between 24 to 26 hours at a water temperature of 28-32°C. After 10 days, black body color appeared in hatchlings and they started to feed rapidly with artemia and egg York. Results of the present study would help the hatchery managers in managing the induced breeding programs of P. hypophthalmus and other catfishes. It will help to fulfil the rising demand for striped catfish in ornamental culture trade.

Keywords: Striped catfish, Pangasianodon hypophthalmus, Ovaprim, ovulation, fertilization rate
CAPTIVE BREEDING OF *DAWKINSIA SRILANKENSIS* (DANKUDU PETHIYA)

A.H.M.S.S.K. Abeysinghe¹, K.D.S.Y Kularathne², D.D.B. Silva², C.Sirwardhana², H.B.U.G.M. Wimalasiri²

¹National Zoological Garden, Dehiwala, Sri Lanka
²Department of Zoology, University of Sri Jayewardenepura

The *Dawkinsia srilankensis*, commonly known as blotched filamented barb or “Dankudupethiya”, which belongs to family Cyprinidae, is categorized as a critically endangered endemic species. Due to high rates of exploitation, habitat destruction and pollution in their natural habitats, captive breeding and rearing seems to be a more effective solution. The study was carried out at aquarium, National Zoological Garden, Dehiwala from March 2013 to October in 2013. Sexually matured fish (4.0 cm) were captured from wild in Knuckles region. During the first month, fish were kept in an earthen pond. When they formed pairs, two pair of fish were moved into an especially constructed rocky habitat to help the fish to acclimatize to the artificial environment. The temperature was maintained at 25 °C with natural sunlight, salinity 30 ppt, pH 8.2 and NO₂ and NH₃ < 0.03 ppm. The pond was especially modified into three compartments enabling the water circulation at a flow rate of 1.0 cm/s. The fish were fed twice a day with egg yolk and fish feed. Their reproductive behavior was observed closely. The two pairs of fish showed chasing behavior prior to the spawning. After 9 weeks hatchlings were detected in the pond system. They were fed with Artemia and egg yolk. Nearly 100 of hatchlings were counted and after 01 week there were 75 fingerlings of 1.0 cm in length with a survival rate of 75%. After 2 weeks the mean length of fingerlings reached 2.0 cm. This is the first study carried out of captive breeding of *Dawkinsia srilankensis*. Therefore this implies the possibility of captive breeding of endemic fish that has faced the threat of extinction. Thus being a positive step towards their conservation.
SCREENING OF ANTIFUNGAL ACTIVITY OF SELECTED SPICES AGAINST CANDIDA SPECIES.

K.V.D.S.H. Karawita 1, K.M.E.P. Fernando 1, W.A.S. Wijendra 2

1 Department of Botany, University of Sri Jayewardenepura, Gangodawila, Nugegoda
2 Department of Mycology, Medical Research Institute, Colombo 8

tshiranya@gmail.com

The fungus Candida is an opportunistic pathogen which causes superficial and systemic candidasis, and associated with significant mortality and morbidity in health care settings. Development of resistance towards antifungal drugs which are currently used to treat Candida infections and associated high risk of side effects of some drugs have been reported. It is imperative to explore suitable alternative treatments for Candida infections. The objective of this study was to evaluate antifungal activity of selected spices against Candida species. Aqueous and methanol extracts of five different medicinal plants; Garlic (Allium sativum L), onion (Allium cepa), ginger (Zingiber officinale), lime (Citrus aurantifolia) and nutmeg (Myristica fragrans) which are consumed as spices were screened for antifungal activity against four Candida species; C. albicans, C. tropicalis, C. glabrata and C. parapsilosis. Well diffusion method and bioassay method on percentage inhibition of mycelial growth were carried out to determine the inhibitory activity of the extracts. Ketoconazole was used as positive control while water and methanol were used as negative controls.

Aqueous and methanol extracts of garlic, methanol extracts of onion and nutmeg exhibited antifungal activity against tested Candida species giving remarkable inhibition zones. Methanol extract of garlic showed higher antifungal activity (inhibition zone range from 38.00 to 45.66 mm) than that of positive control (inhibition zone range from 20.33 to 32.33 mm) against all Candida species tested. All the tested Candida species exhibited 100% growth inhibition for methanol extracts of nutmeg and garlic. Relatively low antifungal effect was observed for methanol extract of onion showing low percentage of mycelial growth inhibition for C. glabrata (24.66%) and C. tropicalis (28.00%). Aqueous extracts of ginger and lime did not show antifungal activity. This study reveals that aqueous and methanol extracts of garlic and methanol extracts of nutmeg and onion exhibit antifungal activity against tested Candida species. Fungicidal properties of the extracts indicate the potential of selected spices as a source of alternative drug for Candida infections. Further studies are needed to identify active compounds responsible for the antifungal activity of these spices.
Corcyra cephalonica (Lepidoptera: Pyralidae) is considered a major pest of stored cereals and cereal commodities that causes substantial loss in quality and quantity. Growth regulators are found to be one of the best sources of protection against insect pest attack, affecting the oviposition, egg hatchability and adult emergence. The present study was thus carried out to assess the growth regulatory effects of neem seed oil against C. cephalonica, in the search for a more environmentally sound and an effective approach in stored grain protection.

To evaluate the growth regulatory effects, five different concentrations of neem oil in n-hexane (0.5, 1.0, 2.0, 3.0 and 4.0%v/v) were tested. Oviposition deterrence, egg hatch inhibition and adult emergence were used as indices of growth regulation. All bioassays were carried out under ambient laboratory conditions (29±2°C and 84±2% RH). A single-choice and a dual-choice bioassay were used where the number of eggs laid on neem oil treated and untreated surfaces by mated female moths was taken as a measure of oviposition deterrence. Inhibition of egg hatching was evaluated by recording the number of hatched eggs exposed to different oil treatments for 3 hours. Adult emergence was determined by recording the number of adults emerging from 15-17d old larvae fed on neem oil treated food medium.

The results revealed that oviposition deterrent effect increased with the increase of oil concentration. The lowest number of eggs indicating the highest deterrence (24.6±4.9) was observed at the highest concentration (4.0%v/v) when compared with the control (203.1±7.1). The results of egg hatch inhibition also showed that the highest concentration was the most effective, indicating 100% ovicidal property of the oil. Similarly, neem oil has evoked 100% reduction in adult emergence at the highest concentration. Neem oil has also induced physiological disturbances leading to growth abnormalities in the adults. The incidence of inhibition in the development was most prominent at higher doses and abnormal forms of adults exhibited varying degrees of wing deformities. The overall results of the study demonstrate a high possibility of utilizing neem oil as a protectant for sustainable insect pest management in stored grains.

**Keywords:** Azadirachta indica, Neem oil, Corcyra cephalonica, Growth regulatory effects
PROXIMATE COMPOSITION AND ANTIOXIDANT ACTIVITY OF
FOUR PENAEID PRAWN SPECIES

J. H. Rupasinghe, M. V. E. Attygalle

Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
jaan2naps@gmail.com

Due to the necessity of investigation on the nutritional value and the antioxidant activity of penaeid prawn, the present study was conducted for commercially available four penaeid prawn species namely; *Penaeus indicus*, *Penaeus monodon*, *Metapenaeus dobsoni* and *Metapenaeus ensis* found in the Sri Lankan market. This study is principally channeled towards proximate analysis of the biochemical composition following the standard AOAC methods and assessing the antioxidant potentials by DPPH radical scavenging assay. All statistical analyses were conducted using MINITAB program, version 14 with statistical significance at $P < 0.05$. The comparison overall demonstrated high amounts of moisture and protein with low amounts of total fat in all the four prawn species investigated. The moisture content ranged from 74.61% to 78.65% followed by the crude protein content which ranged between 18.29 - 19.87%. Total fat content added up to 1.32 - 1.53% and the ash content varied from 0.64% to 2.98%. The highest values for crude protein and total fat were recorded for *P. monodon* followed by *M. dobsoni*, *P. indicus* and *M. ensis*, respectively. The highest value for ash content was recorded for *P. monodon* and the lowest for *M. ensis*. The methanolic extracts of the analyzed four prawn species showed potent antioxidant activity in which IC$_{50}$ ranged between 0.038-0.099 g/mL, in the DPPH radical scavenging assay. These extracts from all the four species possessed DPPH radical-scavenging activity in a concentration-dependent manner. The highest IC$_{50}$ was shown by *M. ensis* followed by *P. indicus*, *P. monodon* and *M. dobsoni* orderly. As evidenced by the lowest IC$_{50}$ value (0.038 g/mL), *M. dobsoni* exposed the highest antioxidant activity and thus rate as a much important source of natural antioxidants compared to the other three species. As a whole, the present study revealed that the four penaeid prawns investigated comprise reasonably good nutritional value as well as possess antioxidant properties confirming the presence of potent natural antioxidant substances.

**Keywords:** Penaeid prawn, biochemical composition, nutrition, antioxidant activity, DPPH
DETERMINATION OF NUTRITIONAL FACTS OF PALMYRAH
(BORASSUS FLABELLIFER) SAP BASED PRODUCTS EXISTING IN THE
MARKET OF JAFFNA PENINSULA

A.M Nilushiny¹, J.W.M.Arahchige², S. Mary¹, S. Srivijeindran ¹

¹Palmyrah Research Institute
²Department of Food Science and Technology, Faculty of Applied Sciences, University of Sri Jayewardenepura

A study was carried out to determine the nutritional composition of Palmyrah sap based products (jaggery, treacle and sugarcandy) existing in the market. The study was conducted at Palmyrah Research Institute in order to determine nutritional variation in such products and to display nutrient and proximate composition on food label of the respective products. Since five Palm Development Co-operative Societies (PDCS) out of 16 in Jaffna Peninsula only had produced Palmyrah sap based products as jaggery, treacle and sugarcandy in the year 2014, all five were selected for the study. An experiment was performed in Complete Randomized Design (CRD). Protein, fat, carbohydrate (total sugar and reducing sugar), phosphorous, calcium, magnesium and iron contents were determined in AOAC method. All results were analyzed in SAS software and the mean separation was done by LSD at p=0.05. Protein content of the sap based products has ranged from 0.62% to 0.86%. Wide variation in fat content of the jaggery was observed among areas and it varied from 0.056% to 0.52%. Percentage of fat in treacle and sugar candy was found 0.012% to 0.018%. Total sugar content was varied differently in sap based products and jaggery (from 78% to 94.6%), for treacle which is 62% to 67%, and for sugarcandy that is from 85% to 95%. Reducing sugar content of the products was found in very trace amount. Among mineral composition analyzed for the products, calcium content was higher both in jaggery and treacle and phosphorous content (0.1% to 0.13%) was higher in sugarcandy. Among three products magnesium content was also higher in jaggery (0.04% to 0.06%). Iron content ranges from 0.007 to 0.025%, 0.021% to 0.035% and 0.008 to 0.017% in jaggery treacle and sugarcandy respectively.

Keywords: Palmyrah, Nutrient, Proximate, Mineral, Sap
EFFECT OF STORAGE ON NUTRITIONAL AND SENSORY QUALITIES OF YOGHURT MADE FROM COW MILK

G. Jayapiradha, K. Premakumar, Y. Inthujaa

Department of Agricultural Chemistry, Faculty of Agriculture, Eastern University, Sri Lanka
yinthujaa@gmail.com

A study was conducted to assess the quality and the shelf life of yoghurt prepared from cow milk. Milk was boiled, sugar and gelatin were added, boiled milk was then cooled down to near 42°C and vanilla flavor was added, inoculated with starter culture at the room temperature, poured into the plastic cups and kept at an incubation temperature for 42°C until complete coagulation. The sample was stored in a refrigerator at about 4-5°C for one month. Yoghurt was subjected to nutritional (Titrable acidity, pH, Moisture, Ash, Lactose, Protein and Fat), microbial (Total Plate Count) and sensory assessment (Colour, Aroma, Taste, Texture and Overall Acceptability) after formulation and during storage. Seven points hedonic scale ranking method was used to evaluate sensory characters. Quality assessments of yoghurts were carried out in one week interval throughout the storage period. Nutritional analysis of fresh yoghurt revealed that, 86.35% moisture, 3.75% lactose, 4.55 pH, 1.35% acidity, 3.65% protein, 3.75% fat and 0.85% minerals. The results of storage studies revealed that, increasing trend in acidity, minerals and protein and decreasing trend in pH, moisture, lactose and fat; from 1.33 to 1.76%, 0.85 to 1.22% and 3.82 to 4.41% respectively and from 4.55 to 3.11, 86.35 to 82.47%, 3.75 to 2.38% and 3.75 to 1.57% respectively. According to Tukey’s test, sensory evaluation of fresh yoghurt showed acceptable consumer response for colour, aroma, taste, texture and overall acceptability of 6.40, 6.45, 6.40, 6.20 and 6.40 respectively and sensory evaluation of stored yoghurt showed slight difference in the sensory attributes within the limit. The findings of microbial studies showed no harmful total plate counts were observed in the fresh and stored yoghurt. Nutritional and sensory parameters of yoghurt were significantly (p<0.05) affected during the storage period without any loss in the quality.

Keywords: Composition of milk, nutritional quality, overall acceptability, shelf life, yoghurt
EFFECT OF INCORPORATION OF FUNGICIDES INTO TISSUE CULTURE MEDIUM ON FUNGAL CONTAMINANTS OF IN VITRO GROWN KAEMPFERIA GALANGA

T. C. Y. De Silva, K. M. E. P. Fernando, W. T. P. S. K. Senerath

University of Sri Jayewardenepura, Gangodawila, Nugegoda, Sri-Lanka
wtpsk2011@yahoo.com

*Kaempferia galanga* is an important medicinal plant used in Ayurvedic medicine. To meet the increasing demand in Ayurvedic medicine, tissue culture protocols have been developed to produce healthy plants for mass propagation. Fungal contaminants growing on cultured tissues even after intense surface sterilization cause a great problem that adversely affects the survival of *in vitro* cultured tissues. There is a necessity to develop a method to suppress the growth of fungal contaminants without causing adverse effects on tissue cultured plantlets. In this study, rhizome buds were surface sterilized using the standard protocol and cultured on Murashige and Skoog (MS) basal medium supplemented with 3% (w/v) of sugar, 0.01% (w/v) of myo-inositol and 0.8% (w/v) of agar. Cultures were incubated at 25±1°C under 16 h light. Fungal contaminants from rhizome buds of *K. galanga* were isolated and identified using morphological characters. Four broad spectrum fungicides; Hayles-carbendazin, topsin M-70, dithane M-45 and coblite-copper oxychloride were tested for their effectiveness of inhibiting isolated fungi using well-diffusion method. Effectiveness of fungicides was evaluated using the inhibition zones produced by fungicides against fungal contaminants. The effective method of incorporating fungicide into tissue culture medium for inhibition was determined by performing three methods; incorporating fungicide in powdered form into MS molten medium, fungicide solution onto solidified medium and dipping the explants in fungicide solution at different time intervals. Minimum inhibitory concentration was determined incorporating different concentrations of the most effective fungicide into the medium. Observations were made after 60 days of incubation.

Five fungal isolates were identified as *Aspergillus niger*, three other *Aspergillus* species and *Rhizopus* species. Hayles-carbendazin exhibited the highest inhibition of fungal contaminants of tissue cultured plantlets. Incorporation of 750 ppm of Hayles-carbendazin powder into molten tissue culture medium prior to solidification was observed as the most effective method. Results reveal that incorporation of the fungicide Hayles-carbendazin into tissue culture medium is an effective method for suppressing fungal contaminations in tissue culture of *K. galanga*. However, the concentration of fungicide added to the medium markedly affects the growth of the plant tissue. As literature evident that contamination is one of major problems associated with *K. galanga* tissue culture and different surface sterilization methods used could not eliminate the fungal contamination, the results of this study would be an important finding in eliminating the problem. However, results obtained suggest that use of suitable concentrations of fungicides is a prime importance in tissue culture of *K. galanga*.

**Keywords**: *Kaempferia galanga*, Fungal contaminants, Hayles-carbendazin, Tissue culture, Fungicide concentrations
Type 2 diabetes is an endocrine and metabolic disease defined by elevated blood glucose level (hyperglycemia). Current studies have revealed that phenolic and flavonoids present in plants can inhibit key enzymes such as alpha glucosidase and alpha amylase which are linked to hyperglycemia. Therefore the purpose of this study was to determine the inhibitory potential against alpha glucosidase and alpha amylase by leaves of Tricosanthes dioica (Padwal), Moringa oleifera (Murung), Costus speciosus (Thebu), and fruits of Averrhoa carambola (Kamaranga). Plant materials were dried, powdered and refluxed with 75% ethanol and fractionated with ethyl acetate. Finally obtained 75% ethanol extract, ethyl acetate and aqueous layers. Each layer was tested for the total phenolic content and expressed as Gallic acid equivalence. The percentage reducing activity was measured with FRAP assay, using BHT as the positive control. Finally IC$_{50}$ values of alpha amylase and alpha glucosidase inhibition activities were determined using biochemical assays. Among four plants T. dioica 75% ethanol extract (51 mg/g) has the highest amount of phenolic content and the ethyl acetate layer of C. speciosus (3 mg/g) has the lowest. The highest reducing power was shown by A. carambola 75% ethanol extract (711). The lowest value was in C. speciosus (146) ethyl acetate layer. Most samples showed higher reducing power compared with standard BHT (317). In determination of IC$_{50}$ value of alpha amylase, ethyl acetate layer of A. carambola (57 µg/g) showed the lowest value and the highest IC$_{50}$ value was obtained for T. dioica aqueous layer (1227 µg/g). The lowest IC$_{50}$ value of alpha glucosidase was in M. oleifera (281 ng/g) aqueous layer and the highest value was for the ethyl acetate extract T. dioica (9.08×10$^5$±1.11×10$^4$ ng/g). Considerable inhibitory potential against alpha glucosidase was not shown by T. dioica, aqueous layer. In the present study the selected plant materials have high phenolic contents and percentage reducing power. It also revealed excellent inhibitory potential against alpha glucosidase and alpha amylase in vitro.

**Keywords:** post prandial, glucosidase, amylase, blood sugar
A PRELIMINARY STUDY TO ANALYZE *Aedes aegypti* DIVERSITY IN SRI LANKA USING MITOCHONDRIAL DNA VARIATIONS.

H. S. D. Fernando¹, M. D. Hapugoda² and B. G. D. N. K. De Silva¹

¹ Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura, Sri Lanka  
² Molecular Medicine Unit, Faculty of Medicine, University of Kelaniya, Sri Lanka

*Aedes aegypti* is the primary vector of dengue - which has become a major public health problem in Sri Lanka during the recent past. In the absence of an effective drug and vaccine, mosquito control appears to be the only way to protect human from this deadly virus. This in turn reveals the need for more detailed understanding of the diversity and distribution of this mosquito species in Sri Lanka.

A preliminary study was done to analyze genetic variability of *COI* region in *Aedes aegypti* mosquitoes in Sri Lanka. Mitochondrial *Cytochrome C Oxidase subunit 1 (COI)* gene was sequenced and analyzed from 50 mosquito samples collected from five districts, Colombo, Jaffna, Galle, Ratnapura and Batticaloa. DNA was extracted from sampled adults and larvae - which were reared to adults. PCR amplification was carried out for *COI* region. Post PCR products were sent to Macrogen Inc. Korea for sequencing and the results were analyzed using DnaSP, v. 5.0. A total of 9 haplotypes were identified from the fifty individuals sequenced. Mainly two haplotypes were shared among populations. Haplotype 1 was present in all districts except Ratnapura, whereas haplotype 6 was present in all districts. Majority of haplotypes (4) were only found within a single district. Haplotype 7 was only present in Colombo and Ratnapura district whereas haplotype 5 was present in Galle, Ratnapura and Batticaloa populations. The nucleotide diversities were characterized in 13 polymorphic sites, of which 12 sites were parsimony informative. The overall nucleotide diversity per site was 0.01099± 0.00056, whereas haplotype diversity was 0.726 ±0.051 indicating low levels of genetic diversity.

This is the first study to analyze the genetic diversity of *Ae. aegypti* populations in Sri Lanka using mitochondrial DNA variations. Although low levels of genetic diversity among the populations is revealed, the need for further studies exists in order to have an insight into the role of control programmes in shaping the genetic composition of the mosquito populations. Further, the study would pave the way in predicting the dispersal patterns and the behavior of the mosquito species enabling more effective mosquito control.

**Keywords:** *Aedes aegypti*, mitochondrial DNA, *COI*, haplotype diversity
ROLE OF *STENOTROPHOMONAS MALTOPHILIA* IN THE DEGRADATION OF ANTIBIOTICS AND HYDROCARBONS

Sumaiya F Idroos, Pathmalal M Manage, B.G.D.N.K.De Silva

Department of Zoology, University of Sri Jayewardenepura
sumaiyaidroos@gmail.com

Antibiotics, aromatic hydrocarbons and polyaromatic hydrocarbons (PAHs) are emerging contaminants of water. The present study assess the efficiency of *Stenotrophomonas maltophilia* a potential degrader of Microcystins, on the removal of antibiotics; Oxytetracycline (OTC) and Ampicilin (AMP), crude oil and PAHs; Naphthalene and Phenanthrene.

0.5ml of overnight starved bacterial suspensions were introduced into media containing each antibiotic at 50ppm to 300ppm. Triplicate samples were incubated at 28°C with shaking at 100rpm. 0.5ml sample aliquots were removed at 2 days interval for a period of 14 days. Samples were analyzed by High Performance Liquid Chromatography (HPLC). Crude oil degradation was determined by inoculating 0.5ml of bacterial suspension (equalized to $A_{590} = 0.35$) into 9ml of filter sterilized (0.2µm) sea water, containing 0.5ml of crude oil at 1% (v/v). Triplicate samples were prepared and incubated at 28°C ±1°C with shaking at 100rpm. 1ml sample aliquots were removed at every two days interval and remaining crude oil quantity was assessed spectrophotometrically at 400nm. PAH degradation was studied by inoculating the bacterial strain into LB broth incorporated with PAH (1%v/v) and redox indicator (2% v/v) and incubated at room temperature (28°C) with shaking at 180rev/min for 14 days. 1ml sample aliquots were removed at every two days interval and remaining Naphthalene and Phenanthrene quantity were assessed spectrophotometrically at 609 nm.

*S. maltophilia* degraded OTC and AMP at rates of 1.43±0.02µg/day 0.89±0.06 µg/day respectively. *S. maltophilia* showed complete degradation of OTC and AMP at 200ppm and 250ppm respectively. Moreover, 82% of crude oil, 64.6% of Naphthalene and 37.5 % of phenanthrene removal was recorded following 14 days of incubation. Therefore, *S. maltophilia* posses genes which are responsible to degrade Microcystins, antibiotics and hydrocarbons. Thus, it can be utilized as a bioremediation agent of many environmental contaminants.

**Keywords:** Oxytetracycline (OTC), Ampicilin (AMP), Crude oil, Poly aromatic hydrocarbons (PAHs), *Stenotrophomonas maltophilia.*
**CULTIVATION OF MICROALGAE; *CHAETOCEROS CALCITRANS* FOR BIODIESEL PRODUCTION AS AFFECTED BY DIFFERENT NITRATE CONCENTRATIONS AND SALINITY LEVELS**

A.M. Gammanpila¹, C.P. Rupasinghe² S. Subasinghe²

¹Faculty of Graduate studies, University of Ruhuna, Sri Lanka
²Faculty of Agriculture, University of Ruhuna, Mapalana, Kamburupitiya, Sri Lanka

shanigam@yahoo.com

Microalgae are considered as a promising biological material for the production of biodiesel. The key to economic algal biomass production for biodiesel is, optimization of the growth conditions. The aim of the present work was to study the effect of nitrate concentration and salinity level on growth and lipid production of marine diatom, *Chaetoceros calcitrans* cultured in an outdoor culture system, in view of its possible utilization as novel raw materials for biodiesel production. Guillard and Ryther’s modified F/2 media was used as the culture media with different sodium nitrate concentrations such as, 0.0375 g/L, 0.075 g/L and 0.15 g/L. In the second experiment, *Chaetoceros calcitrans* was cultured in different salinity levels; 35 ppt, 30 ppt and 25 ppt. At the end of the 15 days growth period, cells were harvested by flocculation and dry weight and the percentage lipid content were estimated. Average dry matter yield and the % lipid contents were observed as 0.5 g/L with 6.5 % lipid, 0.6 g/L with 6.2 % lipid and 0.7 g/L with 6.0 % lipid in 0.0375 g/L, 0.075 g/L and 0.15 g/L nitrate concentrations respectively. Significantly lower average dry matter yield and significantly higher % lipid content was observed in the treatment with lowest nitrate concentration (p > 0.05). Further, no significant effects on measured parameters were observed when *C. calcitrans* cultured in different salinity levels, which reveals its ability to grow in range of salinity (25 ppt to 35 ppt). Therefore, it is clear that *C. calcitrans* can be cultivated at low nitrate concentration (0.0375 g/L) and wide range of salinity levels (25 ppt to 35 ppt) to produce biodiesel.

**Keywords:** *Chaetoceros calcitrans*, nitrate, salinity level, dry weight, lipid yield
ASSESSMENT OF SEASONAL VARIATION IN GROUNDWATER QUALITY OF KELANI RIVER BASIN BY MULTIVARIATE ANALYSIS

M.G.Y.L. Mahagamage, Pathmalal M. Manage

Department of Zoology, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
pathmalalmanage@yahoo.com

Kelani river is considered as one of the major river and it is the second largest river basin in Sri Lanka. It contributes mainly for drinking water supply, recreation, irrigation and livestock of the country. Multivariate statistical methods support the interpretation of complex data matrices to better understand of water quality and allows for identification of the possible factors that are responsible for the variations in water quality. The present study was focused to analyze the seasonal variation of ground water quality in the Kelani river basin by using multivariate analysis. Fourteen vital physico-chemical and microbial parameters (pH, TDS, nitrate, nitrite, electrical conductivity, salinity, hardness, COD, DO, BOD, phosphate, total coliform and fecal coliform) were used for thirty ground water sampling locations in the river basin from 2013 to 2014. The highest values of total phosphate, nitrate, nitrite and COD were detected during the rainy season, where high electrical conductivity, salinity, hardness and BOD were recorded in dry period. The lowest pH and the highest DO were recorded during the intermediate period of the study. PCA analysis of 14 variables showed that the differentiation between each season and it is symbolized seasonal changes of water quality changes in each location of the river basin. PC scores in to General MANOVA test was done to confirm differentiation between each season and that indicated significant difference (p<0.05) between each season. Cluster analysis of variables was done to determine correlation of variables and indicated four clusters according to their correlation. 1st cluster represent the ionic compounds and organic matter content measuring variables in water, 2nd cluster related to chemical compound variable in water, 3rd cluster symbolized microbial quality parameters in water and 4th cluster explained dissolve oxygen of the water respectively. The overall statistical analysis of ground water in the Kelani river basin revealed that there is a clear seasonal variation in ground water quality.

Keywords: Kelani river basin, Ground water, Physico-chemical and microbial parameters, PCA and cluster analysis, Seasonal variation
The value of medicinal plants is not only to the pharmaceutical industry but also these plants are essential part of the natural eco system. They play a vital role in maintaining the ecological balance, in preserving soil fertility, and in sustaining the health of wild and domesticated fauna. The objective of the study was to determine the flora of VellaiMalai forest a dry mixed evergreen forest in Mullaitivu District. The forest was surveyed for medicinal plants over a period of three months (August 2014 – October 2014). Using a belt transect method. Interview was conducted with traditional physicians practicing around the surveyed area, to gather ethno-botanical information on medicinal plant flora of the forest. A total of 270 medicinal plants species belonging to 64 families were recorded during the study. This comprises of perinnials (74.07%), annual (18.5%), and biennial (7.4%) poisonous plants which was only 8% were also recorded at vellaimalai forest. Out of 270 plants, 20 were used for diabetic mellitus, 10 in rheumatic diseases, 15 in treating skin diseases, and 20 for respiratory diseases. Further grouping based on morphology revealed herbs(40), trees(140), shrubs(52), climbers(24), Lianas(05), cacti(02), creepers(02), hole parasites(02). Based on the usage of plant parts the plant species are grouped as whole plant(30), leaves(45), roots(60), flowers(12), Buds(12), young pods(04), dry fruits(14), bark(35), rhizomes(06), gums(08), galls(02), root barks(21), and weeds(11). Out of the 270 plant species 40 were spinaches. It was observed that the species are collected for medicinal purposes by the Siddha Ayurvedic physicians surrounding the forest. Solanum xanthrocarpum, Salvadora persica, and Andrographis paniculata were recorded as economically useful medicinal plants in the surveyed area. Among the medicinal plants species recorded, 12 species were identified as native species, one endemic species, and one critically endangered species (Rauvolfia serpentina). In addition, medicinal plants recommended in Pararaja Sekaram(1929), a Jaffna Siddha text, for Siddha medicine, namely Azima tetracantha, Malletus philippensis, Erythroxylum monogynnum, Scutia indica, Trichosanthes palmate, Hugonia mystax, Capparis spinasa were also found in vellaimalai forest.

Keywords: VellaiMalai forest, Diversity, Medicinal plants
Cashew is a highly abundant crop mainly grown in tropical countries. Millions of tones of cashew apple are being wasted annually because the focus was on the nuts alone. Cashew apple is rich in Vitamin C and minerals (i.e., Ca, P, Fe). In fact, its vitamin C content is 4-5 times higher than that in Citrus. Despite its high nutritive values and economic potential, it has been known as a virtually unconsumed product, because of its astringent and acrid principles. In this study a simple cost effective methodology was established to prepare ready to eat snack with improved consumer acceptability and long shelf life by applying osmo-dehydration and subsequent drying and packing.

Conditions for osmo-dehydration were optimized, changing the parameters such as sucrose concentration and composition in the hypertonic solution, immersion time, fruit : syrup ratio and the mechanical pretreatment. To improve the shelf life of osmo-dehydrated fruit pieces, two drying methods were tested; freeze drying and hot air drying. Packing were also done under vacuum and under nitrogen. Storing the samples were done at ambient temperature. Microbiological analysis were performed fortnightly. Nutritional analysis and sensory evaluation of the final product were also carried out.

Findings showed that immersing the fruit pieces for 12 hours in 50% sucrose solution (fruit: syrup ratio) 1:4) fortified with 2% CaCl$_2$ at ambient temperature (30°C) were the optimum condition for osmo dehydration. Hot air drying for 48 hours at temperature below 60°C (fan speed inside the dryer was ~1200 rpm) provide the fruit with improved organo-leptic properties. Packing the product under vacuum in a nylon vacuum packaging showed shelf life of 6 months at ambient temperature 30°C±2. Phosphorus, ash, fiber content and total acidity of final product found to be remained almost the same. Retained moisture and ascorbic contents were nearly 8% and 63% respectively. The estimated medians for colour, taste, aroma, crispness and overall acceptability scored 6 in 7-point Hedonic scale.

Described methodology provides a value added product with improved consumer acceptability and longer shelf life that can be easily used to generate a healthy profit - with minimal investment costs.

Keywords: cashew apple, improved consumer acceptability, longer shelf life, Osmo dehydration, value added product, healthy profit
PRODUCTION OF EXTRACELLULAR AMYLASE BY ASPERGILLUS NIGER UNDER LIQUID SUBMERGED FERMENTATION USING JACK FRUIT RAG AS THE CARBON SOURCE

S.A.P.M. Piyarathne, M.K.B. Weerasooriya

Department of Chemistry, University of Kelaniya, Sri Lanka
bandu@kln.ac.lk

Amylases find potential application in a number of industrial processes such as food, detergent, textiles, brewing and paper industries. Further, they would be potentially useful in the pharmaceutical and fine chemicals industries. A wide range of micro-organisms such as bacteria and fungi namely Aspergillus and Trichoderma sp are used for the industrial production of amylases. Several carbon sources such as banana peel, wheat bran, wheat straw, rice straw, rice bran, corn bran, rice husk, maize bran, sugarcane bagasse, pomegranate peel, pine apple peel, rye grains, vegetable waste etc. have been used as carbon sources for the production of amylase.

In this study, locally available inexpensive agricultural waste Jack fruit rag powder was used as the carbon source for extracellular amylase production by Aspergillus niger under submerged fermentation. Various parameters such as incubation period, pH of the medium, substrate level and nitrogen source were changed to establish the optimum conditions for amylase production. Maximum enzyme production was observed in 5 days old cultures which was grown at pH 6.5 and ambient temperature 30°C. Optimum concentration of jack fruit rag powder for amylase production was 20gL⁻¹. As nitrogen sources NH₄Cl, KNO₃ casein and beef extract were tested. Except NH₄Cl all other sources enhanced the amylase production. Kinetics of extracellular and intracellular amylase production with the culture growth was also studied. Extracellular amylase production was always found to be higher than that in intracellular. Crude amylase obtained from culture filtrate was partially purified with ammonium sulphate fractionation followed by DEAE Cellulose chromatography. Yield of enzyme was 8400unts/g. Thus purified enzyme exhibited optimum pH and incubation temperature at pH 6 and 60°C respectively. Optimum activity at 60°C, and pH 6 indicates its suitability for various industrial applications such as starch liquefaction. Shorter incubation period and lower substrate cost offer the potential for inexpensive production of amylase, making the process industrially and economically feasible.

Keywords: amylase, submerged fermentation, jack fruit rag powder, Aspergillus niger,
EXPOSURE ANALYSIS OF DRINKING AND DIETARY CONTAMINANTS IN A SELECTED POPULATION, PADAVIYA, ANURADHAPURA.

D.M.K.M. Dhanapala¹, H.B. Asanthi¹, M.H.J.P. Gunarathne²

¹Department of Limnology, Faculty of Fisheries and Marine Sciences & Technology, University of Ruhuna; ²Department of Agricultural Engineering & Soil Science, Faculty of Agriculture, Rajarata University of Sri Lanka.

Water and foods are the main exposure pathways for many of contaminants causing severe health damage in human. This study focused on exposure of selected drinking and dietary contaminants and assess their risk in selected population of Padaviya, Anuradhapura. Thirty families were randomly selected as fifteen with CKD patients and other fifteen families without CKD patients. The questionnaire based social survey was conducted and relevant data were collected for the risk analysis. Water, rice and soil samples in each family were collected. Nitrate-N, total hardness and fluoride are varied within the range as 1.01 - 23.4 mg/L, 40.04 – 644.58 mg/L and 0.47 – 1.92 mg/L and mean values were varied respectively 3.51± 5.32, 161.48 ± 152.05 and 0.73 ± 0.37. All physiochemical parameters are significantly different between wells (P<0.05). pH, Conductivity and TDS in well water are below of Sri Lankan standard for portable water level (SLPWL: pH- 6.5 - 9.0, Conductivity-750 – 3500 μs/cm, TDS-500 – 2000 mg/L). But in some wells exceed SLPWL of NO₃-N, hardness and fluoride (SLPWL: NO₃-N-10 mg/L, hardness-250-600 mg/L, fluoride-1.5 mg/L). Both iron and copper concentration in well water are lower than the provisional maximum tolerable daily intake (PMTDI) of WHO (Fe: 2 mg/L and Cu: 2 mg/L). Dietary iron and copper concentrations in rice are higher than the PMTDI of WHO (0.5 mg/kg). Copper and Iron are varied within the range of 1.55 – 48.4 mg/kg dw and 467.08-893.61 mg/kgdw in soil. Probable exposure concentration in case group is higher than probable non-exposure concentration in non-case group for all selected contaminants in studied population. Relative Risk is greater than 1 for all selected contaminants (NO₃-N, hardness, fluoride, Copper and Iron) and it explains that there is a risk due to drinking water and eating rice for the selected contaminants. Non-cancer risk values in selected families were higher than 1x10⁻⁶. It reveals, in a population of one million people, additional person or persons would be expected to develop risk from relevant contaminants. And also when compare the risk values separately; male group is the most vulnerable for drinking and dietary contamination than other two groups. Since exposure of studied contaminants of drinking water and rice in Padaviya area especially, fluoride, calcium, magnesium and iron content may be risked for human health and Iron rich soil and over use of agrochemicals & fertilizers may induce this problem.

**Keywords:** Exposure, Contaminants, drinking, dietary, risk, recommended level
DETERMINATION OF IRON CONTENT IN SELECTED EDIBLE VEGETABLES BY USING SIMPLE COLORIMETRIC METHOD IN TWO LOCATIONS OF BATTICALOA DISTRICT

S. Arasaretnam, S. Thevakumar

Department of Chemistry, Eastern University, Sri Lanka
s_arasaretnam@esn.ac.lk

The concentration of iron (Fe) was determined in the leaves of spinach (Amaranthus caudatus), spinach (Amaranthus viridis), Moringa oleifera, Alternanthera sessilis and Justicia tranquebarensis cultivated in batticaloa district. All samples were randomly collected from two different areas of mandoor and chenkalady. The determination was done by simple colorimetric phenanthroline procedure. The levels of Fe obtained in mandoor for the leaves of spinach (Amaranthus caudatus) ranges from (25.11±0.01mg/Kg to 27.54±0.02mg/Kg), spinach (Amaranthus viridis) (7.10±0.01 to 7.43 ±0.03), Moringa oleifera (38.55±0.41 to 42.43 ±0.17), Alternanthera sessilis (4.10±0.07 to 8.43 ±0.13), and Justicia tranquebarensis (3.10±0.01 to 6.43 ±0.33). The data were analyzed with t-test and analysis of variance (ANOVA). There were significant differences (p<0.05) between the Fe level in the vegetables obtained from these areas. The levels of Fe in vegetables were higher in mandoor than chenkalady area. The results were however lower than recommended maximum acceptable limits proposed by the Joint FAO/WHO (Food and Agriculture Organization/World Health Organization) Expert Committee on Food Standards. The consumption of these vegetables as food may not pose possible health hazards to human at the time of the study.

Keywords: iron, colorimetric, analysis of variance, FAO/WHO, health hazards
GROWTH CYCLE CHARACTERISTICS OF SELECTED WILD PLANTS 
TO ENHANCE BIODIVERSITY

S.A.E.C. Wijesinghe¹, K. Yakandawala¹, W.A.I.P Karunarathne²

¹ Department of Horticulture and Landscape Gardening, Faculty of Agriculture and Plantation Management, Wayamba University of Sri Lanka
² Department of Zoology, Faculty of Science, University of Peradeniya, Sri Lanka

yakandawalakapila@gmail.com

Provision of floral resources of wild plants is one of the most commonly used strategies in developed countries to conserve and maximize biodiversity in neglected areas. However, scarcity of information on potential wild plants hinders the utilization of such species in Sri Lanka. Hence, the objective of the study was to identify growth cycle characteristics of six wild plants to promote them in biodiversity conservation. Based on previous studies on insect visitation and seed germination, Leucas zeylanica (L.) R. Br, (Geta-thumba), Tridax procumbens (L.) Kurunagala daisy), Merremia tridentata Linn, (Heen-madu), Emilia sonchifolia (L.) DC. Ex Wight, (Kadupahara), Ipomoea triloba (L.) (Walthalkola) and Vernonia cinerea (L.) Less. (Monarakudumbiya) were selected and 16 individuals were planted and height, spread at maturity, growth habit and life span were recorded in weekly intervals for 10 weeks. Data were subjected to ANOVA and analyzed by Minitab (version 16).

There were significant differences in plant height (p=0.00) and spread of canopy (p=0.00) among all the species. Merremia tridentata and I. triloba showed a creeping habit and branching was observed at the heights of 2.8 ± 0.9 cm and 5.2 ± 1.3 cm respectively. While other species showed a vertical growth habit and they attain their maximum height and spread within 7 weeks. Among them, the height was significant (65.3 ± 12.4 cm) in V. cinerea. The height difference of species could be effectively combined to use in an aesthetically pleasing planting designs. Ipomea triloba recorded the significantly higher spread (238.3 ± 54 cm) followed by M. tridentata (230.5 ± 25.7 cm). As they produced a well spread canopy with prostrate branches, a lower seed rate can be used when establishing plants in the field. Among other species, maximum spread was not significantly different. All the vertical growers completed their life cycle within 4 months period. While creepers required more than 4 months. Hence once combined, creepers will perform even after the vertical growers complete their life cycle. All these species are naturally occurring in all the three major climatic zones in Sri Lanka. Hence, special agronomic practices are not required in maintenance. Therefore, the selected species can be recommended to use in establishing low-maintenance planting designs to conserve and maximize biodiversity.

**Keywords**: Biodiversity, Growth cycle characteristics, Planting designs, Wild plants
NUTRITIONAL AND SENSORY QUALITIES OF SWEET ORANGE BLEND STAR FRUIT CORDIAL

J. Kesavanath, K. Premakumar and Y. Inthujaa

Dept. of Agricultural Chemistry, Faculty of Agriculture, Eastern University, Sri Lanka
yinthujaa@gmail.com

Star fruit (Averrhoa carambola L.) is one of the tropical fruit and large numbers of ripened star fruits are wasted during the fruiting-season. Therefore, a study was conducted to develop mixed cordial from star fruit and sweet orange. Star fruit juice, in the amounts of 80, 70 and 60 ml were mixed with sweet orange juice for the formulation of 100 ml of cordial. The cordials were subjected to nutritional (Titrable acidity, pH, ascorbic acid and total sugar, microbial (Total plate count) and sensory analysis (Colour, Aroma, Taste, Consistency, Absence of off-flavour and Overall acceptability) after formulation and during storage. Sensory attributes were evaluated by 30 trained panelists using seven-point hedonic scale. The nutritional analysis of the developed cordials revealed that, titrable acidity (as citric acid), ascorbic acid and total sugar increased with increase in the level of sweet orange juice, with the 30% sweet orange juice level having the values of 0.42%, 23.72 mg/100 ml, and 10.34% respectively and pH 3.46. Sensory analysis showed significance difference between treatments. The cordials were subjected to storage studies at 30 °C and RH of 80% for 11 weeks. The storage studies revealed that, the declining trends in ascorbic acid, pH and total sugar and increasing trend in titrable acidity. After 11 weeks storage, the mixed cordial of 70% star fruit juice with 30% sweet orange juice contained 6.96% moisture, 0.95% titrable acidity (as citric acid), 16.8 mg/100g ascorbic acid, 7.2% total sugar and 3.1 pH. No remarkable changes in sensory characters during storage period. The mixed cordial of 70% star fruit juice with 30% sweet orange juice received high acceptability for all the sensory attributes. No harmful total plate count was observed in cordials after formulation and during storage. Based on the results of assessment, the mixed cordial of 70% star fruit juice with 30% sweet orange juice was selected as best mixed cordial and which could be stored for 11 weeks without any significant changes in the quality attributes.

Keywords: Cordial, quality characteristics, shelf life, star fruit juice, sweet orange juice
The dry zone of Sri Lanka has comparatively high fluoride and hardness levels than other areas. Rock types play significant role in elevating the concentration of these parameters in groundwater. Chronic Kidney Disease of uncertain etiology (CKDu) is prevalent in several areas in Sri Lanka and scientist argue that fluoride (F\textsuperscript{-}) or hardness or combine effect of both may be one of a causative factor to the disease. Therefore, this research is focused on assessing the fluoride and hardness levels in two study areas. Medawachchiya is as CKDu prevalent area and Huruluwewa is considered non-prevalent area. There were 29 sampling sites from Madawachchiya and 27 from Huruluwewa. Source of groundwater include dug wells and tube wells. Each area was divided into thirty quadrates and dug well and tube well closest to the center of quadrate was selected as groundwater source.

F\textsuperscript{-} was determined by SPAND spectrophotometric method using HACH 2700DM Spectrophotometer and hardness was analyzed with titrometric method. The study was carried out from September 2013 to September 2014. Data were compared using Paired T-test and interpolated maps were generated by ArcGIS 10.1.

F\textsuperscript{-} concentrations of Medawachchiya area ranged from 0.06 mg/L to 1.51 mg/L where Huruluwewa was from 0.11 mg/L to 1.93 mg/L. Hardness concentrations in Medawachchiya ranged from 100.0 mg/L to 600.0 mg/L where Huruluwewa was from 50.0 mg/L to 830.0 mg/L. 0.27% of groundwater sources tested exceeded the WHO drinking water standards of F\textsuperscript{-} in Medawachchiya area where as 9.41% in Huruluwewa area. 0.27% of wells exceeded the WHO drinking water guidelines of hardness in Medawachchiya area and 5.29% in Huruluwewa area. According to the paired t-test there was no significant different between the means of fluoride (p=0.644) and hardness (0.134).

Therefore, it can be concluded that the levels of concentration of F\textsuperscript{-} and hardness in both areas are not different from each during the research period. The threshold levels have to be adjusted according to water quality status of the country. It cannot conclude that two elements are not effect to the CKDu in the study region. Further, investigation on screened locations compared with other water quality parameters is needed.

**Keywords:** Medawachchiya, Huruluwewa, Ground water, Fluoride, Hardness
A STUDY ON FACTORS AFFECTING THE GROWTH PERFORMANCE OF CALVES IN THREE VETERINARY RANGES IN GALLE DISTRICT, SRI LANKA

P.G.M. Kalpani 1, K.A.M. Sudarshani 2, H.C.E. Wegiriya 2

1Department of Botany, Open University of Sri Lanka, Nawala
2Department of Zoology, University of Ruhuna, Sri Lanka
hemantha@zoo.ruh.ac.lk

Growth measurements of dairy cattle are important in determining their future performances especially in milk production. Different factors such as the breed of calf, management system, diseases etc. affect the growth of dairy calves. The present study was carried out to compare the growth performance of dairy calves born under artificial and natural breeding methods and rearing under semi intensive and free - range management system in Labuduwa, Rathgama and Yakkalamulla veterinary ranges in Galle district, Sri Lanka. The study was started with three months old male and female calves. The studied calves belonged to cross breeds of Jersey, Friesian, Sahiwal and AFS. Jersey was the most common breed among studied breeds. During the study period, there was no significant difference in the growth increment among studied breed types. However, AFS breed has the highest growth performance among the studied breeds. The growth performance of calves and the milk production of mother cows reared under semi intensive management system was higher than that of free range management system (p<0.05). In addition, results revealed that the milk production of artificially inseminated mother cows was higher than that of the naturally bred mother cows (p<0.05). According to the findings of the present study, the effect of the cattle management system has considerable impacts on growth and milk production of dairy cattle breeds in studied veterinary ranges in Galle district.

Keywords: Calves’ Growth, Cattle breeds, Cattle management system, Milk production
DEMOGRAPHIC STABILITY OF ANOPHELES CULICIFACES SIBLING SPECIES E (DIPTERA: CULICIDAE) IN SRI LANKA

I.N. Harischandra 1, R.S. Dassanayake 2, B.G.D.N.K. De Silva 1

1Department of Zoology, Faculty of Applied Sciences, University of Sri Jayewardenepura
2Department of Chemistry, Faculty of Science, University of Colombo

Anopheles culicifacies sibling species E is the major vector of malaria in Sri Lanka. Malaria has caused thousands of deaths in the past in Sri Lanka. However, it has now been in eliminated stage with zero indigenous cases and further, continuous insecticide spraying is also has stopped by the health authorities to control the mosquito vector. Transmission of malaria by Anopheles mosquitoes needs to be completely interrupted for three consecutive years to confirm a malaria free country. The population parameters of major vectors are needed to be critically known to prevent any outbreaks. Therefore, the study was carried out to understand the population status of the sibling species E population of Sri Lanka. Mosquitoes were collected from six localities of Sri Lanka except the North and Eastern area. To determine the presence of recent population bottleneck and/or expansions, heterozygosity tests were used to test for Mutation-Drift Equilibrium (MDE) within loci, using BOTTLENECK 1.2.02 software. Estimates of expected heterozygosity under MDE were calculated assuming that Stepwise Mutation Model (SMM) and Two Phase Model (TPM) with 10–30% indels are larger than the repeat unit. Statistical significance of the deviation from MDE was assessed for each sample across all loci by the Wilcoxon signed rank tests and sign tests and found all localities were in MDE and the departure of pooled population from the MDE in Wilcoxon signed rank test (p<0.05). Further, this analysis also revealed that number of (He > Heq) loci were lower than the (He < Heq) loci, suggesting a recent demographic expansion of the population. However, applying the bonferroni correction for the multiple comparisons, the significant departure from the MDE was not observed (P < 0.0062) suggesting the fact that the sibling species population is maintaining an effective population size to be in MDE. This stability of the population size might be achieved after ceasing of the continuous insecticide spraying practices in vector abundance areas. Therefore, the ongoing control practices of health authorities need to be focused towards the vector populations to control the population to minimize the impact for any future possible disease outbreaks.

Keywords: Anopheles culicifacies, malaria, population expansion/bottleneck, MDE
CRYOPRESERVATION OF COCONUT (*Cocos nucifera* L.)
EMBRYOGENIC CALLUS FROM UNFERTILIZED OVARY BY
ENCAPSULATION-DEHYDRATION; A PRELIMINARY STUDY

W W M A Iroshini1, H D D Bandupriya2*, G A U Jayasekera1, V R M Vidhanaarachchi2, S A C N Perera3

1 Department of Plant Sciences, Faculty of Science, University of Colombo
2 Tissue Culture Division, Coconut Research Institute, Lunuwila
3 Genetics & Plant Breeding Division, Coconut Research Institute, Lunuwila

dbandupriya@yahoo.com

Coconut is a perennial oil crop with a large seed which shows recalcitrant behavior. Coconut seed does not have a dormancy period thus limits the application of conventional storage methods. Coconut germplasm are conserved only in field gene banks, making problems with maintenance, labour, cost, adverse weather, pest and diseases. Cryopreservation is the only viable option available for the long-term conservation of coconut germplasm. In this method, plant tissues are stored at an ultra-low temperature, usually that of liquid nitrogen (-196 ºC). As a result, cell division and metabolic activities are arrested and thus, plant material can be stored for an unlimited period of time. The objective of the study was to develop a reliable cryopreservation technique for coconut using unfertilized ovary derived embryogenic callus. Embryogenic calli were induced from unfertilized ovaries excised from immature female flowers of variety Dwarf x Tall hybrid (DxT), cultured on modified Y3 medium and cryopreserved by encapsulation-dehydration method. Calli were encapsulated in sodium alginate beads and pretreated with two sucrose concentrations (0.5 M and 0.75 M) for different durations (1, 2 and 3 days). Before application in liquid nitrogen, calli were subjected to dehydration in silica gel for 8 and 16 hours. Water loss from alginate beads after dehydration was observed and survival and recovery of calli were recorded. According to results, water loss (on fresh water basis) is higher in 0.75 M sucrose than in 0.5 M sucrose. The survival of frozen and unfrozen calli in all treatments which were initially pretreated with 0.5 M sucrose was 100%. At 0.75 M sucrose, survival was 100 % except for the treatment of 16 hours dehydration at 3 days interval (90%). Recovery of both frozen and unfrozen calli was affected by treatments and their interactions at both sucrose levels and recovery was very low. Cryopreserved calli pretreated with either 0.5 M or 0.75 M sucrose for one day and dehydrated for 16 h showed 10 % recovery. Overall, the highest recovery frequency was (20%) observed when the calli were pretreated with 0.75 M sucrose for three days and dehydrated for 8 h.

**Key words:** Coconut, Unfertilized ovary, Callus, Cryopreservation, Encapsulation-dehydration
Anopheles subpictus sensu lato is an important secondary vector of malaria in Sri Lanka. Molecular phylogenetic studies using Internal Transcribed Spacer 2 (ITS2) and Cytochrome c Oxidase subunit-I (COI) gene have identified two sibling species An. subpictus A and B in Sri Lanka. The objective of the present study was to further investigate and confirm the status of An. subpictus species complex in Sri Lanka exploiting Compensatory Base Changes (CBCs), based on the reproductive isolation in sibling species. CBCs are double-sided base changes that occur in nucleotide pairs of helices of ITS2 secondary structures. Universal folding pattern of ITS2 region, depicting a eukaryote-universal core structure is preserved by the occurrence of CBCs. The CBC species concept is that having at least one CBC between two organisms denotes sexual incompatibility and hence the organisms belong to two different species. However, it is a one-way tool that its absence does not necessarily mean sexual compatibility and it may or may not belong to the same biological species. Morphologically identified An. subpictus specimens (n=29) from five localities in Sri Lanka were sequenced for ITS2. The full sequences of ITS2 were subjected to annotation by ITS2 Database and analysis by Software RNAstructure and 4SALE. The most stable ITS2 secondary structures having hallmark characteristics were selected and used as template for homology modeling. The generated ITS2 secondary structures were analyzed for the presence of CBCs. Eight distinct ITS2 sequence haplotypes were obtained and among the respective ITS2 secondary structures, two distinct secondary structure patterns were revealed. These two ITS2 secondary structure patterns were found to have two CBCs each depicting two sexually incompatible sets of individuals among the An. subpictus specimens. The two distinct types of ITS2 secondary structures each having two CBCs, clearly corresponded to sibling species A and B revealed from previous studies. However, noting the one-way nature of CBC approach, it can be concluded that, this study confirms the presence of at least two distinct sibling species in An. subpictus species complex, which is consistent with the previous studies as An. subpictus A and B in Sri Lanka.

Keywords: Malaria, Anopheles subpictus, sibling species, ITS2 secondary structures, Compensatory Base Changes
DEVELOPMENT OF A HPLC METHOD WITH UV DETECTION TO DETERMINE VITAMIN A PALMITATE CONTENT IN MULTIVITAMIN SYRUPS THROUGH THE DIRECT EXTRACTION OF THE ANALYTE

Y.N.A. De Silva, T. Perera

Department of Chemistry, University of Sri Jayewardenepura, Sri Lanka

theshi.sjp@gmail.com

Vitamins are essential for human lives which are required in small quantities. Normally, lack or excess of vitamins can cause health problems as they play a vital role in human metabolism. Among all other vitamins, vitamin A palmitate is important in regulating the immune system, maintaining surface lining of the eyes and helps to prevent the infection in both respiratory and intestinal tracts. Industries always look for several productive analytical methods to be used in quality assurance to ensure the quality of the vitamin products.

A simple reversed phase HPLC method was developed to determine vitamin A palmitate in multivitamin syrup which also contained other active substances. The chromatographic conditions; mobile phase of methanol: water (98:2 v/v), 2 ml/min flow rate in isocratic mode, injection volume of 20 µL, UV detection at the wave length of 325 nm and temperature of 40 °C in the column oven were optimized for the method. As it is very important to be cost effective for industrial purposes, direct extraction of vitamin A palmitate into HPLC grade methanol was achieved by degassing the sample for 18 minutes in the sonicator. The method was compared with the hexane extraction of the sample into HPLC grade methanol to clarify whether degassing had given a high extraction of the analyte.

The new method was validated using the guidelines of International Conference on Harmonisation (ICH) of technical requirements for registration of pharmaceuticals for human use. Linearity, limit of detection and precision were checked. Obtained results were statistically analyzed. Under regression analysis, correlation coefficient was 0.999 for the calibration curve. The recovery amount of vitamin A palmitate from the direct extraction method was 407,418.1818 IU / 1000 ml and percentage of recovery amount was 99.4%. The error percentage was 0.63%. Limit of detection on visual based was 0.1 ppb. Recovery amount of vitamin A palmitate from the hexane extraction was 391,636.3636 IU / 1000 ml and percentage of recovery amount was 95.5%.

Keywords: HPLC, vitamin A palmitate, UV detection, direct extraction, Sonicator
PRELIMINARY INVESTIGATIONS ON THE CHANGES OF SOME PHYSIOLOGICAL PARAMETERS OF FIELD GROWN RUBBER PLANTS FOR THE DRY PERIOD IN THE DRY ZONE OF SRI LANKA

R.P. S. Randunu¹, K V V S Kudaligama¹, V. H. L. Rodrigo¹, S. M. M. Iqbal¹ and A. Nugawela²

¹ Rubber Research Institute, Dartonfield, Agalawatta
² Wayamba University of Sri Lanka, Makandura, Gonawila

Traditionally, rubber cultivation in Sri Lanka was mostly practiced in the Wet Zone (WZ). With the grown demand and lack of suitable land area in the wet zone, its cultivation has extended rapidly to the Intermediate Zone (IZ) of the country. With the success in IZ, government of Sri Lanka intends to cultivate rubber in Dry Zone (DZ), particularly in war-torn region of North.

To investigate physiological responses leading to the success in field establishment, observational plots were established with three popular Hevea genotypes i.e. RRIC 121, RRSL 203 and RRISL 2001 in Vavuniya with smallholder farmers under irrigation. This area comes under the agro-climatic zone of DL 1b. At three months intervals, stomatal conductance and chlorophyll content (indirect) were measured together with weather condition in those areas for a period of one year after establishment. Crop micro environment was assessed at the time of measurements.

Despite the irrigation, soil moisture content decreased during the dry period. In general, stomatal conductance and chlorophyll content decreased with the decreased in soil moisture content. However, the values of declined of those parameters were less in clone RRIC121 indicating its possibility for dry zone. Need of further study are discussed to ascertain its suitability interns of photosynthesis of growth.

Keywords: Chlorophyll content, Dry zone, irrigation, stomatal conductance, water stress
SOCIAL SCIENCES
AN ANALYTICAL STUDY ABOUT THE ILLEGAL MIGRATIONS IN POST WAR SRI LANKA
(WITH SPECIAL REFERENCE TO AUSTRALIA)

H.E.N. Priyadarshani

Department of Political Science, Faculty of Humanities and Social Sciences, University of Sri Jayewardenepura,
Gangodawila, Nugegoda, Sri Lanka
nilupriyadarshani120@gmail.com

Human migration is not a new thing which started in recent time but it is a phenomenon, which occurred in the ancient time due to many reasons. When the relationship is discussed about the migration there are two sectors. They are internal migrations and international migrations. It can be divided as legal migration and illegal migration as well. It is important to analyze illegal international migrations in relation to Sri Lanka according to this research. When compared through new developments more than the legal people migration, illegal people migration has increased gradually in the world. It can be shown up that Illegal migration has increased gradually especially in a developing country like Sri Lanka. There are reports that Tamil nationals have migrated to countries such as Italy, Canada, Australia and India as refugees during the war time. But during the post conflict era these illegal people migrations have not minimized. In relation to this research, as the problem for researching, a research was conducted why the people in Sri Lanka are attempting to migrate to Australia illegally in the post conflict era. As the objectives of this research, activities were executed to look into reasons and facts for illegal migrations, to look into the reasons and facts of migrating the majority to Australia and to study the legal frame, which is available to prevent the illegal migrations and etc. The preliminary data and secondary data were utilized for this study and as the limitations of the study were to be limited for an assignment and had to comply with the limitation of time. As the results of these research economic reasons, domestic violence and curiosity about the journey can be pointed out. This condition has increased as especially majority of Tamil people are engaged in these illegal migrations and since the Australians are in a high level for hospitality. The people, who are engaged in the employments related to fisheries industry have thoroughly compelled to this situation. Because of these illegal international migrations, economical, social and political scandals have been created in Sri Lanka.

Keywords: Illegal migration, Refugees, Migrants, Economic Issues
THE COMMON LAW APPROACH TOWARDS THE DISSOLUTION OF MARRIAGES; THE SRI LANKAN PERSPECTIVE

Ishara Kumudumalee Munasinghe

Faculty of Law, General Sir John Kotelawala Defence University, Sri Lanka
isharakumudumalee@gmail.com

The bedrock feature of the Sri Lankan legal regime is the nature of legal pluralism, where the Roman Dutch Law (RDL) functions as the common law against every individual, except the issues governing under their own personal laws. Further, a large population of the country either contract or prefer to contract their marriages under the common law, which let them to follow the statutory formalities and requirements in terms of obtaining a divorce as a remedy. The section 19(2) of the General Marriage Ordinance, No. 19 of 1907 specifies three grounds for obtain a divorce as malicious desertion, adultery and sexual impotency at the time of marriage. The research question of the study is, whether those of three grounds of dissolution of marriages are comprehensive enough to address and gather the situations of the present Sri Lankan society? The objective of the study is to discuss the possible suggestion to revise the existing divorce grounds according to the modern requirements of the society. The study is totally based on qualitative approach, which largely focused on the provisions of General marriage Ordinance, Constitution of the Democratic Socialist Republic of Sri Lanka and other relevant domestic/ international legal instruments/materials. Finally, the study suggests to incorporate new divorce grounds such as habitual drunkenness, imprisonment of a spouse, disappearance of a spouse, domestic violence etc as an amendments to the present statute.

Keywords: Roman Dutch Law, Divorce, Sri Lanka
A non-marital child is a child whose biological parents weren’t married to each other when the child was born. Inheritance means a property received from a decedent and it can be happened in two ways, by a will or without a will. Non marital children in Sri Lanka are not treated in the same way as legitimate children and considered as a product of a non-marital union, which is morally unaccepted within the society. Accordingly, non-marital children are discriminated under the general law and also under personal laws, in the area of intestate succession of the father.

The main objective of this research is to critically analyse Sri Lankan Laws which is applicable to intestate property rights of non-marital children in Sri Lanka. The objectives also includes to examine the adequacy of the protection given by Sri Lankan laws, in the light of the provisions in the Convention on the Rights of the Child, and the legitimacy of retaining a discrimination in the area of intestate property inheritance for non-marital children in Sri Lanka.

Statutes, journal articles, international conventions, academic expressions and books in the area of intestate property inheritance have been taken into consideration to examine the legitimacy of retaining a discrimination for children, who have born outside the legally recognised family unit. Researcher has identified that, there’s no uniformity in the personal laws in Sri Lanka, in the area of inheritance of the father’s intestate property. Even the existing intestacy laws are inflexible in nature with regard to non-marital children in Sri Lanka, countries such as South Africa and India have taken steps to uplift the status of non-marital children by abolishing the discriminatory classifications. As the Convention on the Rights of the Child guarantees non-discrimination and ensures best interest of the child in all matters relating to children, this research proposes some recommendations which can minimize the existing discriminations, also by emphasizing the necessity of DNA testing in the area of intestate property inheritance, to uplift the standard of non-marital children in Sri Lanka.

**Keywords:** Intestate, property, inheritance, discrimination, best interest
Youth ganging and related delinquent behaviors have become a deviant fashion in urban societies. It is a social phenomenon that has turned into a critical social issue in the world. This serious global issue of gang culture has put the main societies in a high risk by challenging the safety, security, well-being, ethics, rights and law and order of those societies and their individuals.

This research was conducted with the participation of 493 gang members of identified 75 gangs in 14 GN Divisions in the Colombo city. The information were gathered using a questioner survey, In-depth interviews, focus group discussions observations, case studies and information collected from Police and other institutions. The data and information have being carefully analyzed in numerous ways to derive important findings, arrive at conclusions and make recommendations for remedial actions.

The research could derive and provide foundation for several important findings such as a database on youth gangs in Colombo city with its membership, activities engaged and linkages with drug dealings, prostitutions and links to political arena etc. It revealed that the real ‘core’ factors such as freedom, friendship, protection income generation substance usage and sexual needs etc. are causing youths to get attracted to gangs. Nearly all the gang members are found to be addicted to substances and involved in crimes of different scales. Gang members have freedom, protection from legal authorities and opportunities for delinquencies, substances use, enjoyment, prostitutions, and access to sexual activity, income generation and heroic states by being members of youth gangs. Thus all the anti-social behaviors are strongly linked with gang culture; for its origination, attract members, stability and development.

**Keywords:** Anti-Social Behavior, Colombo City, Culture, Delinquent, Urban Youth Ganging
ON POVERTY AND ENVIRONMENTAL DEGRADATION: BASED ON RAMMALE KANDA RESERVE IN A PASSGODA DSD AREA

B.A. Sumanajith Kumara, K.T.L. Sathsara

Department of Geography, Faculty of Humanities and Social Sciences,
University of Sri Jayewardenepura, Nugegoda

Since the idea of sustainable development has dominant one in development theory, the commitment for a link between economic growth and environmental degradation has been highlighted. In discussion about how to oversee the environment while still promoting economic growth, the assumption is often made that poverty promotes environmental degradation. In case of degradation mainly occur clearance for state agriculture and Chena cultivation, for the dwellers, fuel wood and commercial timber exploitation. The processes are operated by four interrelated factors, population growth, land alienation, lack of land security, and common property although there disagreement which is primary cause.

The main objective of the study is analysis relationship between poverty and environmental degradation in Rammale kanda reserve in Passgoda DSD area. In additionally the research attempts to analysis the significance of the interaction between man and environment. Since the study not all area considered in reserve but where mainly had happened environmental degradation were based on. According objectives could be identified clearly how people involved with reserve area in history and how the problems are raised in presently. The questionnaire has been addressed above different situation, focus on day today experience who directly involving with forest. On the other hand data collected based on quantitative analysis such as measured soil erosion, lack of water capacity. The conclusions are based on quantitative and qualitative analysis.

Tea plantation mainly additional avenue for earning money, cinnamon cultivation, wood production, particularly timber, Chena cultivation can be seen in the area. There may be opportunities of secondary income derived from manufacture of products frame wood-based material. Income generation refers to a process by which is individuals are able. Then all of villagers have to face many problems on effect environmental degradation. The conditions can be considered as following, direct loss forest, physical loss of soil covered by down slope transportation, loss of nutrients soil connected with overworking and other forms of chemical degradation such as Stalinization and physical deterioration of the soil. In the case of Pasgoda DSD area poverty promotes environment degradation.

Keywords: sustainable development, environmental degradation, chemical degradation.
COMMUNITY EMPOWERMENT AS A HOSTAGE OF THE CONFLICT BETWEEN DEVELOPMENT GOALS AND POLITICAL GOALS
(A case study of Sri Lanka)

Aruna Jayathilaka

Department of Social and Institutional Development, Sri Lanka Foundation Institute
arunaa2010@yahoo.com

Community empowerment is the process of enabling communities to increase control over their lives. Political leadership in social safety nets serve a pivotal role in alleviating poverty by empowering communities. Hence, a sustainable mechanism in poverty reduction can only be developed by promoting a healthy relationship between the state and the civil society. For achieving a win-win relationship between state and society, it is necessary to improve connections between citizens and public officials across the public-private divide. Further, mutually supportive relations should be strengthened between these two actors. Of the several attempts in Sri Lanka to bridge the divide between the state and the civil society, Samurdhi, the previous main social safety net in Sri Lanka, can be considered the most significant attempt. This study places its main emphasis on researching the fact that whether the Samurdhi program brings community empowerment by promoting constructive engagement between the state and the civil society. The research focused on Matara district in Sri Lanka and qualitative methods have been applied in order to obtain more in-depth, comprehensive information about the program and thus about the potential positive synergy between state and civil society. The research used method triangulation for obtaining different kinds of data by combining different research methods such as semi-structured interviews, observation and focus group discussions (FGDs). The study shows that political involvement in the program has created a ‘distorted form of state-society interaction’, thus leaving community empowerment as a hostage of the conflict between development goals and political goals.

Keywords: community empowerment, social safety nets, state-society interaction, Samurdhi, political goals
The present study examines the long-term GDP growth rate in India and Sri Lanka using Thirlwall’s (1979) balance-of-payments constrained GDP growth (BOPCG) model. Thirlwall’s BOPCG model survived more than three decades through various empirical studies that examined the long-term GDP growth dynamics of various countries across the world using export growth and import elasticity of imports. In order to test for long run relationship between export growth and GDP growth in India and Sri Lanka we apply cointegration analysis using annual data on real GDP, real exports, and real imports for the period 1950-2013. Unit root tests suggested that real GDP and real exports are integrated of order one, I(1). Both trace and max eigenvalue statistics suggested that real GDP and real exports are cointegrated. Results show that there exists a long-run relationship between export growth and GDP growth in case of India and Sri Lanka.

Thirlwall’s law remarkably predicts the following GDP growth in India for four sub-periods out of six sub-periods: 5 percent for 1961-1970, 3 percent for 1971-1980, 6 percent for 1991-2000, and finally 6 percent for 2001-2013. However, the model was further off for two sub-periods: 1951-1960 and 1981-1990. However, we find quite a different picture in case of Sri Lanka. Except the near accurate prediction for the period 1966-1975, the prediction of GDP growth for Sri Lanka by Thirlwall models was quite far apart from the actual growth observed during different sub-periods. The results are puzzling and we need to research the puzzle further to understand which factors contributed to the results observed in the study.

**Keywords:** Balance of Payments Constrained Growth, Income Elasticity of Imports, Export Growth, Thirlwall’s law, Cointegration, India, Sri Lanka
National security is the most important phenomenon in the context of governance for a country. As a country, recently Sri Lanka defeated LTTE (Liberation Tigers of Tamil Eelam) terrorist group and ensured the national security of Sri Lanka. Even though Sri Lanka defeated them, the threat of terrorism still has the possibility for existence. The study is focused “to identify the future national security concerns of Sri Lanka in the context of terrorism”. Methodology that have used for the study, is characterized by qualitative and descriptive analysis method while using both primary and secondary data. Purposely selected sample of 150 people in the fields of government, academic, military and other professionals have been used for the study. According to the study, as future national security concerns in the context of terrorism are identified as, possibility of re-emergence of LTTE terrorist activities, influences of LTTE Tamil Diaspora, cyber terrorism against Sri Lanka, and the threat of emergence of other terrorist extremist groups. As per the primary data, the most pressing security concerns are identified as possibility of re-emergence of LTTE terrorist activities and threat of emergence of other terrorist extremist groups. To ensure the national security, Sri Lanka should have a strong security policy along with cooperation of all citizens of the country and at the same time, mutual cooperation with the regional powers would be an advantage in strengthening the security of Sri Lanka.

**Keywords:** National Security, Terrorism, Sri Lanka, Concerns
Disabled person is someone who has a physical or mental impairment that has a substantial and long-term adverse effect on his or her ability to carry out normal day-to-day activities. There are 549,422 of disabled people are estimated to live in Sri Lanka. The needs of disabled people could become a more important component in operations when they are included in the initial analysis for country programming. For that the needs of people with disabilities have to be identified earlier in the operational cycle, project activities with a disability dimension. So, identifying the factors affected for the economically empowerment of disabled persons was the main objective of this study. In order to achieve this objective the data were collected through both methods; primary and secondary. Primary data is collected by the interview method through questionnaire using the multi stage cluster sampling method and 150 samples were selected from the 22 G.N divisions of the certain D.S division in Alaiyadivembu Divisional Secretariat and secondary data is collected from the related documents of the Alaiyadivembu Divisional Secretariat. Disabled persons whose age above 14 are only selected for this study as that is the minimum age of a person who is able to attain a job. Data is analyzed through the Chi-square method while employment status of the person taken as the dependent variable. The study found that 46% of the disabled persons are economically empowered while 54% of them are not economically empowered according to the sample. Also, almost all the disabled persons (approximately 91%) are living at home except 9% of them who lives in the orphanages. One of the major finding is that the economically empowerment of the disabled person is depend upon their gender, age, educational level, residential sectors, vocational trainings that they have and various aids provided to them except the living place, race and religion.

Keywords: Disabled person, effectiveness, factors
THE INFLUENCE OF SOCIAL CAPITAL IN RURAL DEVELOPMENT IN SRI LANKA

R.M. Vijeratne

Sri Lanka Foundation Institute, Colombo 07
vijeratne@gmail.com

The paper addressed the influence of Social capital in rural development in Sri Lanka. Social capital has been taken into account among scholars last period of time. Although many researches have been conducted on influence of social capital for rural development it is not enough to weigh its strength in rural development. Therefore it was an insufficient exploratory volution of development sector in Sri Lanka. Many researchers have argued that the weight of social capital is more influencing factor of rural development. Drawing attention on this case of rural development, this paper, argued that the effective influence of social capital in rural development. The objective of this study was to inspect the influence of social capital in rural development projects in the sabaragamuwa province. The sample size was taken 100 individuals from the project using random sampling method. Questionnaire was the data collection tool. The weighted principle component was used to develop indices for social capital. Social capital describe as one depth component of rural development. Finally, in this research paper, as a result found that the social capital mainly contributed a vast hidden portion in rural development projects. The prevailing characteristics of poverty and deficient diversity in social capital were taken in to account as major factors in rural development. As a useful hidden resource it facilitated social interaction and cooperation. Also it helped to improve community livelihood and capacity building. A significant finding was that social capital produce supreme outcome if it is used in line with the local conditions of given society. In this paper the findings suggests for policy makers to use social capital as a resource in order to achieve sustainable development.

Keywords: Social Capital, Rural Development, livelihood, community Development
THE ROLE OF INTELLECTUAL PROPERTY RIGHTS IN FACILITATING THE 'KNOWLEDGE ECONOMY' OF A DEVELOPING COUNTRY

Kosalai Mathan

Department of Law, University of Jaffna, Jaffna
kosi_4@yahoo.com

The law on Intellectual Property Rights (IPR) receives much attention in the present era. Sri Lanka is a signatory to the International TRIPS agreement and passed the Intellectual Property Rights Act in 2003.

The failure to adopt a proper IPR framework in the country particularly in a developing country, would adversely impact on the knowledge economy of it. Sri Lanka has adopted an IPR framework which indeed faces many challenges. The main objective of the research study is to explore the rationale for protecting the rights of holders of Intellectual Property such as patents, copyright, designs and trademarks. One of the objectives of the research is to focus on the role of IPR in promoting creativity in a country and its impact on the education, welfare, health, etc rights of people in a country. The research study explores the question ‘should the law governing IPR of a developing country be different from that of a developed country?’

The research is primarily desk based, reading relevant statues and text books. The comparative analysis of the Intellectual Property regime of Sri Lanka with that of different countries such as USA, India etc will be done.

The Intellectual Property Rights Act of Sri Lanka (No 36 of 2003) was enacted with the purpose to provide for the law relating to intellectual property and for an efficient procedure for the registration, control and administration thereof. But the IPR are not constitutionally guaranteed and have not been recognized as fundamental rights. Unlike Sri Lanka, the USA and South Africa have constitutionally guaranteed the IPR. Sri Lanka as a developing country should examine the factors which influenced the other countries like USA to incorporate IPR in to fundamental rights and at the same time refer to the situation in India and to the factors which prevented India from signing the TRIPS agreement. The comparative analysis will help Sri Lanka to adopt a relevant policy on IPR mutatis mutandis.

It is true that the protection of IPR promotes creativity in a country on the one hand, and there is a serious question on the other hand whether the protection will prevent the public utility of the Intellectual properties and negatively impact on the education, welfare, health etc. The state machinery should adopt appropriate mechanism to balance the competing interests.

Keywords: Intellectual Property Rights, Protection, Rationale, Constitutional status and knowledge economy
An outward looking regime favours the productivity performance of developed as well as developing market economies. In the literature, causality from exports to economic growth in terms of real output growth is recognized as the Export Led Growth (ELG) hypothesis. Larger exports contribute to the stock of knowledge, human capital and output. Thus ELG hypothesis postulates a positive relationship between exports and economic growth.

This research aims to test the applicability of the ELG hypothesis in the context of Sri Lanka. Moreover it aims at identifying any causality relationship between exports and GDP growth during the period 1960 to 2010. For the purpose of this analysis, data on constant exports and constant GDP (SLR) in Sri Lanka from 1960 to 2010 is obtained from the World Development Indicators website. This analysis employs time series methods such as unit root test and cointegration (Simple Regression Analysis) to examine the dynamic relationship between export growth and economic growth. The model is developed using E-views 3.1.

The estimated equation based on the sample, suggests that when everything else is held constant, a 1% increase in Constant Exports will on average lead to an increase in Constant GDP by 1.003%. Thus there is a positive relationship between the two variables. However we infer that there is no cointegration and cohabitation between constant GDP and constant exports based on cointegration test. This indicates that the two variables do not move in the same direction in the long run. Perhaps this could be due to the omission of other important variables that affect GDP in Sri Lanka.

Appropriate macroeconomic policies such as low fiscal deficit, low inflation and a flexible and realistic exchange rate policy are important for vital export growth. Neglecting these while using micro strategies to encourage exports would fail. However, from a policy point of view, it is recommended that some institutional bottlenecks and or structural problems including tariff reforms might explain the failure of the ELG hypothesis. Therefore, rather than rejecting the ELG hypothesis and export-oriented policies, the country might cautiously need to look at its structural problems.

**Keywords:** Exports, GDP, Economic Growth, Developing Countries, Good Governance
ECONOMIC LIBERALIZATION AND ITS IMPACTS ON THE MANUFACTURING SUB SECTOR IN SRI LANKA

J. M. G. Lalani

Department of Social Sciences, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Mihintale
lalani.mihin@yahoo.co.uk

Economic performance of post independent Sri Lanka has faced dramatic changes with introduction of different policies. Introduction of economic liberalization policy in 1977, it affected for economic performance of Sri Lanka. Between 1948-1977, economic performance was at inactive level. In 1977 manufacturing sub sector started to play an important role in the economy in various streams as production, export earnings, and employment in which agriculture sector held its domination since independence. General objective of this research is to study impacts of economic liberalization on manufacturing sub sector in Sri Lanka. Specific objectives are to examine the relationship between growth of manufacturing sub sector and economic growth, to study structural change of industry, structural change within manufacturing sub sector, structural shift in exports and the effects of this sector for employment generation. In order to accomplish the objectives set for this study secondary data over last 35 years (from 1977 to 2012) and descriptive and simple regression model are employed. Data series used were obtained from annual statistics of Central Bank of Sri Lanka, annual reports of Department of Statistics and Census. When economic growth rate declined from 7.7% in 2006 to 6.4% in 2012, growth rate of manufacturing sector is also declined from 5.5% in 2006 to 5.2% in 2012. Share of manufacturing sub sector in GDP increased from 12% in 1977 to 17.1% in 2012. Share of construction sub sector increased from 7% in 1977 to 10% in 1980. However its share is declined to 8.1% in 2012. Share of mining and quarrying sub sector in GDP remained 2.8% in 2012. Textile, wearing apparel and leather products sub sector share for total manufacturing output increased from 10% in 1977 to 25.4% in 2012. Agricultural exports of 80% in total exports in 1977 declined to 23.9% in 2012. Industrial exports increased from 14% in 1977 to 75.4%. Share of textile and garments in total exports increased to 55% in 2012 from 16% in 1977. Employment share in public sector has declined from 63,530 in 1978 to 31,440 in 2003 while in private sector it has increased from 2761 in 1978 to 540,744 in 2003. So there is an effect of economic liberalization on manufacturing sector.

Keywords: Manufacturing sub Sector, Economic Liberalization, Exports, Economic Growth, Structural Changes
The overall aim of this study was to evaluate the structural changes in economic development in Sri Lanka after 1977 with the introduction of open economy policy. The study attempted to investigate the structural changes that occurred in development process in terms of production, employment level and foreign trade in Sri Lanka after 1977. In order to accomplish the objectives set for this study secondary data over last 36 years (from 1977 to 2013) are employed. Percentages, frequencies, and descriptive analyses were used to analyse the data. The results clearly show that the share of the agriculture sector to the GDP has decreased to 11.1% in 2012 from 26.7% in 1977. Share of industrial sector to the GDP in 1950 was about 24% and it has decreased to 22.5% in 1977 and increased to 30.4% in 2012. Service sector contributed 55% to GDP during 1961-1965, and 58% during 1971-1977. The highest contribution was recorded in 2007 as 59.6% after 1977. Employment in the agriculture sector has declined to 29.7% in 2013 from 46.8% in 1990 while the industry and service sectors’ employment are increased as to 26.2% in 2013 from 14% in 1997 and 37% in 1946 to 44.1% in 2013 respectively. In 1950, 90% of export earnings was given by the agriculture and it was declined to 32.1% in 1991. While the industrial export earnings to the total export earnings was increased to 61.8% in 1991. In 1977 the expenditure on import of consumer goods was 42% out of the total import expenditure and it has declined to 17.7% in 2013.

Keywords: Economic development, Employment, Foreign trade, Production, Structural changes
STATE SOVEREIGNTY AND UNNECESSARY INTERNATIONAL INTERFERENCE

Malavige Jeewanthi
Open University of Sri Lanka, Nawala
mkgj26@yahoo.com

The meaning of concept State Sovereignty has expanded in different form time to time due to the development of international law. In 1648, the Westphalia treaty interpreted Sovereignty rigidly, where it excluded all external powers and recognized the principle of non-interference. By the passage of time, due to many reasons such as continuous violations of human rights in domestic level, military and humanitarian interventions and failed states, the meaning of State Sovereignty was differed from the Westphalia meaning and it recognized the certain areas where international community can intervene to domestic affairs of countries. The main objective of this research was to critically analyse about this concept with the international human rights law and particularly this study focused about the available international human rights mechanisms. The set hypothesis for this study was "International human rights law has set in a way, to give highest level of recognition for state sovereignty, for countries which have strong, independent, impartial human rights protections mechanisms and procedures, and the international influences will dig up progressively when domestic mechanisms collapsed." This normative study was mainly based on the literature review and it will critically comment on relevant concepts. Finally it could conclude that almost all the mechanisms implemented for the protection and promotion of human rights has given a prior place for state Sovereignty; example, sending periodic reports, participation for Universal Periodic Review process, Principle of complementarity, and requirement of exhausting domestic mechanism when sending individual petitions. If a country can show the highest standard taken at domestic level in relation to the protection of human rights it is very much hard for external people to interfere to that country’s autonomy. So rather than finding faults of interference and unnecessary pressure from the international community it is highly recommended to strengthen domestic human rights mechanism.
Tamil estate workers, who came to serve in the cultivation economy, which was introduced to this country during the era of British colonialism, have been a decisive factor when the pluralism is illustrated in Sri Lanka. By present days the way of executing specific task in the Sri Lanka political system by these estate labours and the way of successfulness of achieving a decisive power in politically in the independent Sri Lanka comparatively in the morning can be seen. They entered the Sri Lanka political system by gathering around the trade unions in morning, after-words by establishing the political parties, which represent the estate labours and based on the political power, which was built in this way, they were successful to achieve their entitlements and necessities by influencing the governing administrators, haggling with them. But nowadays a problematic condition, which has risen in the estate politics, has been recognized. The ability of haggling and the influencing the governors, who are in the power, have been minimized at present. The research poser of this study is why they have faced the challenge of collapsing the political autonomy, which has been built by the Indian estate workers, who live in the Sri Lankan political system. It is a timely and national importance matter to study in an experimental level. The primary and secondary data was utilized for that purposes. As the objective of this research, political representation character estate workers, the political process of the estate workers, its development and its associated conditions, new progresses in the estate politics and this study was occurred under several limitations. Through the assigned period, while it was limited due to the inability to deduce accuracy of data gained through the preliminary sources determinedly, internal and external influences were affected to collapse the autocracy of the Indian Tamil estate labourers in this manner were able to deduce as reasons.

**Keywords:** Estate workers, British colonialism, Political system, Cultivation economy, Power
INFLUENCING FACTORS OF SOCIO-ECONOMIC AND DEMOGRAPHIC CHARACTERISTICS ON URBAN FEMALE MIGRANTS SRI LANKA

D.P. Kanthi Manel¹, Sunethra Perera²

¹ Department of Demography, University of Colombo, Sri Lanka
² Department of Demography, University of Colombo, Sri Lanka
dpkmanel@yahoo.com

Like in many other developing countries, Sri Lanka also, urban female migration becomes a common phenomenon in the internal migration process. With the introduction of open economic system in 1977, there was a huge trend of young females moving from rural areas to urban locations accessing employment opportunities in the Free Trade Zones. However, recent decades’ females’ migration to urban areas are shaped by number of social, economic and demographic factors. Hence, this study tries to identify what the factors are influencing on female migration to the urban areas in Sri Lanka.

The study is based on both quantitative and qualitative data gathered in three Urban Council (UC) areas of Kalutara district in Sri Lanka. The quantitative data related to socio-economic and demographic characteristics of migrants collected through a sample survey which consist of 639 female migrants. The factors related to the socio-economic, demographic characteristics of female migrants’ and other environmental factors are analyzed by using descriptive analysis method (tabulation, graphs and charts). Logistic regression analysis was used to show the significant factors towards the female migration.

The findings of this study reveal that the approximately 15 percent women have migrated to urban areas due to their marriage, others have another reasons such as accompanied with family members, natural disasters, development programs induced migration and other reasons. Ethnic group of Sinhalese are higher (71%) among respondents related to marriage reason for migration. Although, the females who migrate to urban locations due to their marriage belong to middle aged between 31-35 years, approximately 36 percent females are in 41-59 aged have migrated to urban areas related to other reasons such as seeking employment opportunities, to obtain better education for children etc. Moreover, results evident that most of migrated women (approximately two third females) in the survey area due to marriage reason engage in the informal sector economic activities such as service related employments and elementary employments. In addition, the results of logistic regression analysis suggested that the respondent’s age, employment category related to elementary employments and marital status of are significantly affected on their cause of migration. Further, qualitative findings reveal that the most migrant females are vulnerable regarding their employments, living condition and left behind family members.

According to these reasons, it should be introduced some policies need to reduce generally urban ward migration especially women migration. The appropriate policies and programs are need to empower females who engage in the informal sector in rural and sub urban areas to prevent overcrowding due to illegal migration in urban council area.

Keywords: Female migrants, Urban, Socio-demographic, economic, Sri Lanka
AN ANALYSIS OF ENVIRONMENTAL FACTORS THAT INFLUENCED *HOMO SAPIENS* IN ESTABLISHING HUMAN SETTLEMENTS AT BATADOMBALENA

Ven. Pahiyangala Sumangala, G.B.I. Weerasingha

Department of Archaeology, University of Kelaniya

chapa.weerasingha@ymail.com

Batadombalena cave is situated at Kuruvita area in Ratnapura district. The cave measures approximately 15 m in high, 18 m in width, and 25 m in length, totaling the internal cave area to 6,800 m². According to current excavation researches, the settlements dates back to 27000 years. Batadombalena is recognized as one of the oldest settlements in South Asia. Research problem was “what are the environmental factors influenced in establishing settlements of *Homo sapiens* at Batadombalena cave?” Information and data were gathered through primary and secondary sources including literary sources, field based survey, site observation conducted during two weeks in December 2014. The research discusses how strongly the geophysical factors have affected on *Homo sapiens* in establishing settlements around Batadombalena cave. Geophysical factors including location, drainage pattern, soil, flora and fauna, climate, rock and minerals and physiography were identified as the key factors in establishing human settlement nearby the cave. Hunter gathering pattern was the basic livelihood of the pre historic man. Natural environment, specific landscape, geophysical condition with hedge stone caves around the periphery can be recognized as the much supportive elements for human settlement. As the cave is located at a high elevation from the sea level pre historic man had occupied this cave mainly to escape from torrential rain, natural hazards and anima affects. Pre historic man has created stone tools using the quartz and chert minerals were found nearby the cave. Geometric microlithic of exceptionally high quality, beautifully pressure-flaked ‘Balangoda Points’, bone tools, beads of marine shells, and anatomically modern human skeletal remains-from the earliest layer upwards. Due to those factors it shows that pre historic man has occupied this place for establishing their settlements.

**Keywords:** Pre historic man, Cave, Flora and Fauna, Climate, Geography
CHARACTERISTICS OF MULTICULTURAL NATURE THROUGH THE MULTIDISCIPLINARY RESEARCH OF THE JETAVANARAMA ARCHAEOLOGICAL SITE IN ANURADHAPURA, SRI LANKA

A.M.P.Senanayake¹, R.M.M.Chandraratne¹, K.K.D.C Ranaweera¹, H.M.T.G.A Pitawala², G.A.D Perera³

¹ Department of Archaeology, University of Peradeniya
² Department of Geology, University of Peradeniya
³ Department of Botany, University of Peradeniya

The Jetavanarama is located in the world heritage city of Anuradhapura consisting of the gigantic stupa and the Buddhist Vihara complex and was constructed by King Mahasena (274-301AD). At present, Jetavanarama site is vital for many multidisciplinary archaeological investigations. The Jetavanarama history goes back to the Mesolithic period, according to the scientific research excavations and explorations carrying out after 2000 AD, which reveals the details for the Jetavana and Pre-Jetavana Periods.

The Buddhist temple was built at the end of the century 4th century AD with reference to the historical and literary; and archaeological sources. Cultural factors relating to the prehistory, protohistory and early history are represented by the pre-Jetavana period. Further, various multicultural evidence included the Pre-Jetavana era. It is not only Buddhism, but other religious and philosophical evidence also have been revealed from the literary and archaeological sources.

Evidently, many factors could be identified concerning Jainism and Hinduism in the pre-Jetavana period, before constructing the Buddhist temple complex. During the Jetavana and post-Jetavana periods, the Teravada and Mahayana Buddhist features have been emerged in relation to the archaeological and scientific research. The scientific subjects like archaeo-zoology, archaeo-botany, palynology, sedimentology, geochemistry, including geographical information systems and remote sensing application were applied for the multidisciplinary research, that reveals the ancient cultural landscape and the multicultural nature of the Jetavanarama site.

Keywords: Jetavanaramaya, multidisciplinary, multicultural nature, archaeology.
මාය ආරක්ෂාව : එම කතාව මිශ්න් දෙදීමේදී පළමුවක් කරන
MONEY USAGE IN THE ANCIENT PERIOD OF ANURADHAPURA

J.M.G. Lalani

Department of Social Sciences, Faculty of Social Sciences and Humanities, Rajarata University of Sri Lanka, Mihintale, Sri Lanka
lalani.mihin@yahoo.co.uk

Money is any object or record that is generally accepted as payment for goods and services and repayment of debts in a given socio-economic of a country. The main functions of money are distinguished as: a medium of exchange; a unit of account; a store of value; and, as a standard of deferred payment. Any kind of object or secure verifiable record that fulfills these functions can be considered money. In ancient Sri Lankan economic history people have been used many items as commodity money such as sea shells, beads, metals, oysters as well as many other things that are thought of as having value. In this period there was a barter system. It requires the wants. By overcoming the limitations of simple barter, commodity money makes the market in all other commodities more liquid. Money has been used in the period of Anuradhapura which is the first kingdom of Sri Lanka. The research is focused on for studying of the money usage, identify the types and properties of money and purpose of money usage in this period. The secondary data collected from books, magazines and internet. The study founded that in Anuradhapura period money has been circulated by the effects of domestically and internationally.

Keywords: Ancient, Barter system, Exchange, Money, Wants.
Flood incidences are now city life experience in most parts of Nigeria causing untold hardships and sometimes loss of lives and properties. Within the decade 2004 and 2014, Ilorin the study area in this investigation experienced a total number of eight floods incidents. The persistent problems induced by this extreme hydro-meteorological event of flood in the study area has made urban flood problems and issue of growing concern, hence this study which investigates man-induced reasons for flooding in the study area. Data used were generated from direct field measurement, satellite imagery interpretation and questionnaire administration. Such data were on distance of houses from river banks, landuse/vegetation characteristics, frequency of flood experience and damage caused by flooding. Collected data were subjected to descriptive statistics and cross tabulation. Results obtained indicate that substantial portion of the floodplains of the rivers channels investigated have houses located on them. Most alluvial plains hitherto being used for farming now have buildings on them. The study also revealed that most residents of the city dump refuse into flowing water when it rains. This practice has made most of the respondents to suffer losses from flooding with damages incurred reflecting the degree of encroachment on flood plains. The study thus, suggests landuse planning and environmental education towards solving the incessant flood problem in the city.

**Keywords:** Landuse, Flood, Urbanization, Runoff, Encroachment
Motorcycle is a popular mode of public transport in most of the countries in Africa and is not a new transport mode in Nigeria. The use of motorcycles for public transport began in the mid-1970s and its widespread use for this purpose is intensifying. Indeed, both rural and urban areas in Nigeria are experiencing a surge in the use of motorcycles as alternative means of public transport and there are indications that this trend is unlikely to diminish in the near future. This study therefore examines the conditions which made it possible for motorized two-wheelers to become a major public transport mode in Ogbomoso, Oyo State and to highlight their role in daily travel. Data were collected through questionnaire administration and personal interview adopting simple random sampling method. Two types of questionnaires (A and B) were administered to motorcycle operators and passengers respectively, at 16 motorcycle terminus/stops within Ogbomoso metropolis. A total of 160 operators and 80 passengers were sampled for the study. In addition to the use of tables, percentages and graphs the Pearson chi-square technique was used to test for significant relationship between the level of income of users and the level of patronage of public motorcycles. Results show that commercial motorcycle operation is a major source of employment to the active male population in the area because, 61% of the operators fall within the age bracket of 21-50 years. In addition, all the operators are in the business either as a result of unemployment or as a means of augmenting their income from other poorly paying occupations. The study also confirmed that commercial motorcycles are patronized by both males and females and by people of different socio-economic status. The result of the Pearson Chi-square test shows that there is significant variation in the patronage level of motorcycle among different income groups. The use of motorcycle as a means of public transport is more popular with the low income group. Commercial motorcycles were however found to have poor safety records and are often used to perpetrate criminal activities. It is recommended that road worthiness of motorcycles should be enforced to ensure safety of both operators and passengers. In addition, the government should encourage the replacement of motorcycles with tricycles which have better safety records. Efforts should also be directed towards improving mass transit systems in Nigerian cities.

**Keywords:** Transportation, Public Transport, Commercial Motorcycles, Road Safety.
A GIS MODEL FOR SITE SELECTION OF INDUSTRIAL ZONES IN SRI LANKA
(A Case Study of Kesbewa Divisional Secretariat Division in Colombo District)

G.M.T.S. Fernando¹, Ven. Pinnawala Sangasumana², C.H.Edussuriya¹

¹ Research & Development Unit, Central Environmental Authority, Sri Lanka
² Department of Geography, University of Sri Jayewardenepura
thanuja86@cea.lk

Site selection of industrial zones in Sri Lanka has become a critical issue and a sensitive decision making process that may create a range of socioeconomic and environmental problems over time. Hence, several site selection criteria and appropriate methods for establishing industries have to be concerned by the decision makers and authorities before locating industrial zones in particular regions. Though, at present the enormous data volume and complex criteria regarding this field are available, the suitable site selection process is still problematic. Therefore, this paper assumes that, in some extent, such failures can be overcome by applying Geographic Information System (GIS) and Multi-criteria Decision Making Techniques into the site selection process of industrial zones.

In this study, a GIS based model is proposed to screen most suitable locations for establishing Industrial Zones in Kesbewa Divisional Secretariat Division of Colombo District, Sri Lanka. In methodology, initially seven set of site selection criteria were identified through a literature survey and consultation of expertise. Land use, Water, Soil type, Wildlife, Archeological sites, Roads and Power lines were the selection criteria relevant to this study area. Next, attribute values of the criteria were entered into a multi-criteria decision making scheme by using GIS model. Consequently, a suitability map was created by the weighted overlay method of the model so that it could easily identify the suitable sites that have met the entire requirements. The final step of the methodology of this model was to reunion the selected sites with two compulsory sub criteria; minimum land extent of 25 acres and applicability of 100m buffer zone (green belt) ordained by the authorities. In order to identify the status of available sites, a suitability scale was created with the categories of Excellent, Very good, Good, Fair and Not suitable.

The result flags that there is no any block of land under the ‘excellent’ category that can be associated with suitable site selection model for establishing an industrial zone in the study area but two block of lands were identified under the ‘very good’ category. Finally, only one site was able to select by matching with the two compulsory sub criteria for establishing an Industrial Zone in Kesbewa DSD but with some restrictions. This GIS analysis and output model can be used to speed up the site selection procedure of industrial zones in Sri Lanka but it need to be further developed by using variety of socio-economic and environmental criteria in order to get more accurate outcome.

Keywords: Industrial Zones, Site selection, GIS Application, Multi-criteria Analysis
CAUSALITY RELATIONSHIP BETWEEN TOURIST ARRIVALS AND EXPORT: EMPIRICAL EVIDENCE FROM SRI LANKA

M.R.S. Mudunkotuwa

Faculty of Humanities and Social Sciences, Colombo International Nautical & Engineering College (CINEC), Colombo, Sri Lanka
mrmudunkotuwa@gmail.com.

Tourism has been recognized as a dominant industry in Sri Lanka since it plays an imperative role in the economy. The objective of this research is to test the causality between tourist arrivals and export of goods and services. The main purpose of this study is to identify the influences of exports of goods to the attraction of tourists to the relevant economy. The study uses number of tourist arrivals and real export of Sri Lanka from 1976-2013. The result of Johansen co-integration test shows the existence of one co-integrating equations. Vector Error Correlation (VEC) model was applied since co-integration test reveals that existence of the long run relationship between variables. Furthermore diagnostics tests for the error correction model were confirmed that normality distribution of residual. Tourist arrivals forecasting model has been estimated. Granger causality test reveals that, uni-directional causality is running from tourist arrivals to export of goods and services. Further it can be seen changes and innovations and developments in Real export was contributed considerable portion in variation in tourist arrivals in Sri Lanka according to the variance decomposition. This analysis provides guideline for policy makers to create new policies which affecting the development of the tourism sector with collaboration of export of goods and services.

Keywords: Tourist arrivals, Real Exports, Co-integration, VECM, Causality
AN ETHNOGRAPHICAL STUDY ON RIVER GEM MINING IN RATHNAPURA DISTRICT SRI LANKA

Tharaka Ananda, Charmalie Nahallage

Department of Sociology and Anthropology, University of Sri Jayewardenepura
tharakaananda@hotmail.com

Sri Lanka is known as the Jewel Box of the Indian Ocean, Plethora of gem species and varieties found in the country has been the reason for it from the very early times. The discussions on Sri Lankan gems can be seen in early literature such as Mahabharata, Arthashasthra tikawa as well as in Ptolemy, Kosmas, Flahian, Marco polo, Iban Battuta’s peregrination records. Rathnapura, also known as the “town of gem” is the heart of the Sri Lankan gems. Land gemming was the famous method for gemming from the ancient time. Later miners have discovered that valuable and precious gems are lying in the beds of the rivers and have introduced novel methods for gemming in rivers. Traditional river gem mining; adhum pathal, adina pathal or gange pathal is particular to Rathnapura District and have hundreds of years of history. Main objective of this research was to discover the traditional river gem mining techniques and the extent of machinery replacement on the traditional ways of gemming life. Participant observation and in-depth interviews were done to gather data on traditional river gemming industry between the periods of January to May 2015. Miners should obtain permission from the government for river gemming and also parts of the river were put up for auction and miners have to bargain to get a part of the river for gemming. Most of the Rathnapura District river miners do not have licence; regardless of this they continue their gemming in many of the rivers and streams in Rathnapura District. River gemming starts with worshipping and the vow made to the Katharagama deity for the protection as well as for finding gems. In traditional method of river gemming first they select a portion of a river or stream and make a scaffold across the river. Then placed tropical almond (Kottamba) or arecanut stems on the scaffold faced to the upside of the river. Miners stand on these stems while unearthing minerals from the river bed in to the river surface called hiti adiya using a mamotee. A long shaft made of hora tree (Dipteroacarpus zelanicus) was attached to the mamotee, the length of the shaft (10ft. to 50ft) depend on the depth of the illam (vein of mineral ore). They use Paththa (stake) and suraya (motor made from a used vehicle accelerator that joined to a wooden stem) to loosen the illam. Now a days “The Sucker machine” has replaced the above mentioned traditional gemming system. However it is legally prohibited due to the large scale environmental damage. At present the society’s traditional ways of gemming was replaced by machines and new technologies. There is a trend in young generation to use machines for easiness in the operation and disregard the traditional ways which cause less damage to the environment than the new technology. Thus these traditional gemming systems should be studied in detail and preserved before it becomes completely machinerized and traditional knowledge of the miners can be used to make new eco-friendly machines.

Keywords: Ethnographies, Gemming, Machines, Traditional industries
සිංහල ආකාශයේ අතීත ව්‍යුහස්ථානීක මාධ්‍යයන්: කියි ස්ථානයට පිළිතුරුවන්
වැදගත් ප්‍රශුද්‍ය අපිරිසුම්වරයන්

උදාහරණ 1, උදාහරණ 2

1 උදාහරණ ඉදිරිපත්‍රකරණය ලබන විශේෂ ප්‍රශ්නය වීම අඩියමක් නෙයි. උදාහරණ උදාහරණ 2 ඉදිරිපත්‍රකරණය ලබන විශේෂ ප්‍රශ්නය වීම අඩියමක් නෙයි. උදාහරණ 1 උදාහරණ 2 ඉදිරිපත්‍රකරණය ලබන විශේෂ ප්‍රශ්නය වීම අඩියමක් නෙයි.

මිලියන් යාබොං ආරක්ෂාත්මක ප්‍රශ්නය විශේෂ ප්‍රශ්නය පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන්.(granatic gneiss) මිලියන් යාබොං ආරක්ෂාත්මක ප්‍රශ්නය විශේෂ ප්‍රශ්නය පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන්(granatic gneiss) මිලියන් යාබොං ආරක්ෂාත්මක ප්‍රශ්නය විශේෂ ප්‍රශ්නය පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන් 2014 අතර ආරක්ෂාත්මක ප්‍රශ්නය පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් (granatic gneiss) මිලියන් යාබොං ආරක්ෂාත්මක ප්‍රශ්නය විශේෂ ප්‍රශ්නය පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන් 2014 අතර ආරක්ෂාත්මක ප්‍රශ්නය විශේෂ ප්‍රශ්නය පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරුවන් දකුටුණු ආකාශයේ අපිරිසුම්වරයන් කියි ස්ථානයට පිළිතුරු. 

 vários skeptical, premature, illusion, speculative or experimental.
A STUDY ON THE BUDDHIST STRATEGIES ADOPTED FOR COPING WITH STRESS

W.M. Dhanapala

Department of Sociology and Anthropology, University of Sri Jayewardenepura, Sri Lanka

wmd63@yahoo.com

This research study is concerned with the Buddhist strategies applied for the management of stress and tension. The transition of rural society from simple structure to complex structure seems to gather more and more stress and tension as people strive to achieve the social goals of modern society. As the coping strategies are concerned, Buddhism plays a vital role assisting people to manage their stress and tension. Accordingly, the research problem was articulated to understand as to how Buddhist religious teachings, beliefs and rituals have been adopted as stress management strategies in the day to day life of people. The central objective of the research was to explore and explain coping strategies which had been adopted from Buddhist teachings and practices in Sri Lanka. A random sample of 50 families consisting 225 members were selected from a village in Uva province for the study. Data were gathered by means of a questionnaire and focused group interviews with selected families. As was evident from the research findings, some Buddhist teachings, Buddhist rituals, practices, religious consultations and pilgrimages had been adopted as coping strategies with Buddhist cultural and traditional interpretation of them in most of the cases. In particular, the concept of Karma, Impermanence, Loving kindness, Morality, Practice of listening to Dhamma, Bodhipuja, Chanting of Pirith and Seth Pirith, Dana-Alms Giving, Observance of the Eight Precepts on full moon day, Meditation, mindfulness, Discussions with Maha Sangha, and pilgrimage to selected Buddhist religious temples and sacred places and seeking of their blessings were identified as prominent traits of those strategies. One or some of these strategies had been adopted depending on the nature of and type of the source of stress and tension. Strategies of coping have been traditionally defined and interpreted for various problems of suffering and they seem to have been followed in compliance with those traditions. Accordingly it is contended and concluded that number of coping strategies have been adopted from Buddhist teachings and practices and they have been further culturally sophisticated and institutionalized with specific meanings for dealing with different source of stress.

Keywords: Buddhist Strategies, Stress, Stress Management, Buddhist Teaching and Practices
BUDDHIST STANDPOINTS ON NATURAL DISASTERS

Ven. Suhadagama Anuruddha

Department of Pali and Buddhist Studies, University of Peradeniya
anuruddhasuhadagama@gmail.com

The world that we are live today has been under going too many affects. One of those affects is the natural disasters that still are unmanageable. The main reason for that is the man himself enlarges this problem day by day in a very harmful manner. People want to billionaires in a short period of time. The problem is so severe that people are dying at unexpected moments due to natural disasters. They are floods, landslides, earthquakes volcanoes etc. Similarly abductions, robberies, and new kinds of diseases that are difficult to cure are also widespread in the society. Therefore we have to go back to the religious teachings, especially to the Buddhist teachings. At present, when we consider about disasters, we mainly focus only on natural disasters. But Buddhism discusses this matter in a broad sense such as mental and spiritual disasters. As far as Buddhist teachings are concerned, it directs the person to find a better solution for this matter. Though this paper, I expect to discuss this matter based on the relevant Buddhist teachings in the canon. The purpose of this research paper is to introduce the way of managing the disasters and making people enlightened on this matter. Although Buddhism is a spiritual movement it also concerns about the social, political, and environmental fields. Without well-established condition of those factors people cannot be aware of spiritual progress. When we go through the Buddhist teachings, we can clearly see various occasions where disasters are variously defined in both natural and man-made ways. We can quote disasters that are available in Buddhist texts in the following ways: Rājatovā (by kings), Coratovā (by thieves), Aggitovā (by fire), Udakatovā (by water), Nakkattatovā (by effects of planets), Janapadarogatovā (by epidemics), Amanussatovā (by non-humans). The special feature of the Buddhist standpoint on disasters is not only on present disasters namely but also it provides the causes for such kinds of crises and the way of managing and eradicating disasters. Under light of Buddhist teachings, we can create a pleasant and secured world. That will really show the path to find a solution for whatever disasters.

Keywords: Disasters, Disaster management, Religious teachings, Upaddava
IMPACT OF ALCOHOL CONSUMPTION AMONG YOUTH TOWARDS THEIR SATISFACTION: A PROBLEM OF PERSONALITY DEVELOPMENT OR A SOLUTION FOR STRESS RELEASE

Manoj Jinadasa

Department of Mass Communication, Faculty of Social Sciences, University of Kelaniya, Kelaniya, Sri Lanka
Manojjina78@kln.ac.lk

In Sri Lanka, Alcohol consumption has been relatively increased by growing rate in the last couple of years. This is much significant among youth. This study focuses on examining the factors causes on increasing Alcohol addiction and further searching whether it is a problem of personality development or taking alcohol as a stress manager. Having concerned on the background on the matter, it assumes that number of teens and youth are highly interested in consuming Alcohol for their leisure and in the instances where they free from the heavy workload. This suggests that the use of Alcohol has been a treatment for getting freedom from the existing suppressed mental behavior, so that it works to change their mental perception.

The study limited only to teens and youth generation between 15 to 25 and 26 to 36 age categories covering both rural and urban sectors in the time-frame of December 2012 to December 2014. As study cover both qualitative and quantitative aspects, content analysis using in-depth interviews and survey study using questionnaire were conducted in this study.

In conclusion, this study mentions that number of Alcohol users are addicted by their intimate association. With the time past, when the subjects are freed from their competitive work environment, they are victimized by the increasing consumer of the Alcohol in their day to day life. Alcohol addiction is a problem of personality development is significant, while some of the other consume Alcohol as a stress releaser.

Keywords: Alcohol Addiction, Personality Development, Stress Releaser, Teen and Youth
Happiness is one of the most important aspects of Quality of life. It determinates good life of person. Notions about a good life are linked to one’s culture. Notion of good life vary from country. Happiness is associated with non-rational dimensions and it comes to people who live in harmony with his or her nature. The educators Dalkey and Rouke,(1994) define quality of life as a “person’s sense of well-being, his or her satisfaction or dissatisfaction with life or happiness or unhappiness”. The World Health Organization (2005) defines QL as ‘the individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals.

In this study explored people’s perception of happiness and how it to connect with their quality of life. In relation to that, several indicators have been developed to measure level of happiness among the people. Both qualitative and quantitative data were collected covering fourteen GS Divisions in Colombo, Kurunegala and Gampaha districts. 560 households were randomly selected for the sample.

In this study it was found that reasons for very happy life situations were mainly fulfillment of goals in life and simple way of living in all areas. Happiness in their life determinated strong relationship with relatives, neighbors and family members. It is a good indicator of high quality of life as there is peace and harmony. They were happy with the environment and other relations. Index of happiness relating to life situation was generally high. Indices relating to ‘living with relatives’ and relationship with family were excellent among them. Happiness within family was high as there was no discrimination. They most admired persons are parents and their teachers. As well as they were happy with life situation in the present living environment. One of the major factors that forced them to live in the same locality was their traditional property.

Keywords: Happiness, quality of life, relationship, indicators
This research is concerned with the impacts of illegal abortion of Sri Lankan society. With the change of organic society to anomic society, people have experienced many deviant behaviors. Illegal abortion is one of these deviant behaviors. It causes many side effects and sometimes result can be immediate death. The research problem was that the way illegal abortion impact upon the Sri Lankan society. The main objective of the research was to explore the effects of the illegal abortions. And to find out the methods used by the respondents for abortion. In 2013, 41 illegal abortions were reported in Sri Lanka. Out of these the maximum numbers of 10 cases were reported in the Polonnaruwa District. Therefore, Polonnaruwa was selected as the research area. The data were gathered using in-depth interviews and questionnaire. Major findings of this study were 80% of respondents who had abortion experiences were married women. In addition to that lack of education, poverty, anti accepted sexual behaviors was associated with the problem. Those abortions had been carried out using by various methods of folk medicine. Such as herbal plants, poisons etc. The findings revealed that, there were many effects of abortion such as risk of fertility, uncertainty of ovum canc and breast cancer and irregular menstruation. On the other hand, two of the responders never got married due to the experience they had on abortion. In order to resolve this problem, prevalent laws regarding the illegal abortion should be changed as required of the modern society.

**Keyword:** sexual life, effects, deviant behavior, abortion, folk medicine
The caste, race and religion are three of the most important factors which have been influencing to marriage, since then and today. The "mixed marriage” can be defined as the marriage between different castes, races and religions. This paper discusses the research problem whether the mixed marriages can be considered as a reason for domestic conflicts. The relevant information were gathered from ten of the twenty mixed marriage families in Nugawela Grama Niladari Division of Alawwa Divisional Secretariat in Kurunagala District, with the strategies of distributing questionnaires and conducting interviews. According to the results 28% of conflicts in "mixed marriages" are occurred due to the community based differences .Most of the positive ideas towards the concept of mixed marriages were changed after their marriage in 70% of families. Therefore it is significant that community based differences are a main reason for the domestic conflicts of mixed marriages in the society.

**Keywords:** Mixed marriages, Community, Conflicts, Race, Caste, Religion
This paper has two objectives: 1) to examine various norms of gender and sexuality in the historical context and 2) to review those notions as human nature without differentiation or prejudice on sexuality. The data of this research has been collected from the primary and the secondary sources. The collected data were observed on the historical, comparative and critical bases.

‘Diversity’ is the hallmark of modern society. Despite the astonishing advancement and spread of various cultures, however, it is distinctly clear that it still lacks diversity. We often run into unforeseen changes in social norms and they met with strong opposition from conventional or stereotyped ideas. For example, diverse terms like LGBTQ, sex orientation, homosexuality, bisexuality, intersexuality etc. are emerging in the gender and sexuality. Most people feel uncomfortable to these unfamiliar terms and are at a loss how to face with unexpected event like same-sex marriage.

Organisms of many species are specialized into male and female varieties, each known as a sex. Myths, historical materials, and existing facts show that there are different ideas and various examples beyond time and space. The so called the sexual minorities have been in society since societies began, but up until now, all homosexual acts were still illegal in most countries. Of course, many people often and still feel awkward, uncomfortable, or even lost around people with the sexual minorities. With stereotypes and prejudices, however, there are personal abuse and criminalization of sexual minorities still in modern society.

According to the International Bill of Gender Rights (IBGR), all human beings have the right to define their own gender identity regardless of chromosomal sex, genitalia, assigned birth sex, or initial gender role. We live in an era of uncertainty and variety. Breaking away from the traditional norms isn’t always easy, even so, we should bear firmly in our mind that there must be human rights to all, or there can be human rights for none.

**Keywords:** Gender, LGBTQ, sex orientation, sexuality
AN ANALYSIS ON FLOOD MAPPING AND MITIGATION FOR AKKARAIPATTU MUNICIPAL COUNCIL AREA

M.M. Mohamed Nouffer

University of Sri Jayewardenepura, Nugeoda, Sri Lanka
nouffer@gmail.com

This Study was conducted in Akkaraipattu Municipal Council Area in Ampara District of Sri Lanka. Where Flooding has been found as an annual disaster, there also lack proper drainage system, or an early warning system for quantifying effects of the flood in advance. This study uses GIS as a platform with available data from the area to map the flooding and measure the effects to find out ways to mitigate the damage in early.

The primary objective of this project is to develop Hydrologic and Hydraulic models using GIS tools and techniques for the flood plan analysis of Akkaraipattu Municipal area. The model simulation output will be use to analyze mitigation alternatives within a Geographic Information System.

Hydrological and Hydraulic modeling is to be performed using HEC-HMS and HEC-RAS Software. After delineating catchment basin model using HEC-GeoHMS in ArcGIS environment. The Geometry of a natural drainage model will be created using HEC-GeoRAS in ArcGIS. And will be exported to HEC-RAS with Flow data from HEC-HMS to map the inundation area with depths.

Using GIS people and properties effected will be measured for such a flood with the help of population and statistical data. There will be an analysis to find out access routes to safer places identified by local authorities to evacuate or reach the effected peoples in the flooded area without crossing the major flow path of the floodwater.
SOCIAL IMPACT, ATTITUDES AND BEHAVIOURAL PATTERN OF BUSY LIFE STYLES DUE TO MICRO-SLEEPINESS SRI LANKA

Prasanga Liyanage, S.B. Nawaratne Nawaratne, Indira Wickramasinghe, K.K.D.S. Ranaweera

University of Sri Jayewardenepura, Nugegoda
rumeshprasanga@gmail.com

Survey was carried out to identify human attitudes on micro-sleepiness and preventive measures with a view to develop a food product to combat micro-sleepiness. Statistical data pertaining to road accidents were collected from, Sri Lanka Police Traffic Division and were statistically analyzed to identify the social impact. Results revealed that peak level of road accidents is observed at 14.00-20.00h (38.2%) and intensity of micro-sleepiness falls at the same time period (37.36%) while 14.00 to 16.00h is the peak time, 16.00 to 18.00h is the least; again 18.00 to 20.00h it reappears slightly. Peak hours of micro-sleepiness occurs at 14.00-20.00h and it was also validated by the statistics from Sri Lanka police during last ten years. Even though respondents of the survey expressed that peak hours of micro-sleepiness is 14.00-16.00h, according to police reports, peak hours fall in between 18.00-20.00h. Reason for this disparity is due to stressful condition of the drivers, traffic jams, mental stress, rushing to attend urgent matters and bad light. Out of the interviewees, 69.27% strongly wanted to avoid micro-sleepiness and intend to spend LKR 10-20 on a commercial product to combat micro-sleepiness. As age old practices to suppress micro-sleepiness are time taken, modern day respondents (51.64%) like to have a quick solution through a drink. Moreover, 46.94% respondents proposed a product developed from plant based materials and 94.5% expressed formulation of a product is of nationally importance. Survey further disclosed that about, 76.84%, 96.39% and 80.93% taking heavy diets for their breakfast, lunch and dinner respectively. Therefore, food habits of morning and noon may cause for micro-sleepiness while dinner may cause for both, natural and micro-sleepiness due to heavy glicemic load of food. According to the study micro-sleepiness can be categorized in to three zones such as low-risk zone(08.00-10.00h and 18.00-20.00h), managable zone(10.00-12.00h), and high-risk zone(14.00-16.00h).

Keywords: Micro-sleepiness, Fatigue, Drowsiness, Road Accidents, Exhausted behaviour
EFFECT OF WOMEN’S MIGRATION ON FAMILY INVESTMENT BEHAVIOR

Iresha Chathuranganie

Department of Economics, University of Sri Jayewardenepura, Nugegoda, Sri Lanka
Whchathu88@gmail.com

Foreign migration constitutes the largest foreign exchange source in Sri Lanka. Female migration of domestic labor was a dominant factor in the employment in Sri Lanka. Migration occurs for various reasons such as education, business, seeking refuge, training and employment. But Sri Lankan women’s migration is based on employment. This paper provides an overview of women’s migration and family investment behavior in Sri Lanka. Data from 200 families collected by structured questionnaire in Kurunagala district in the North Western Province. Data was collected from families which have experience in the foreign employment. Analysis was done by using descriptive analysis, including mean, median and percentage. According to the data the highest percentage of foreign immigration reported in females. Among them, 90% of migrant women have been gone abroad for five years or less. The Majority migrant workers are focused to the Middle East countries, from them 45% female have been migrated to Qatar. 52% female is in above 29 and below 40 age limit. The highest percentage of responders’ level of education is below ordinary level. 48% migrant workers were housemaids and 19% were unskilled laborers. Overall savings have been increased and the indebtedness of family has been decreased. When considering about their expenditure, the highest percentage of income spends to consumption. 65% women’s long term investments are education and housing. They have invested 8% for vehicle and 10% for land. The lowest percentage of investment was self-employment or family business. 12% invested in other assets. There is a different between male and female investment behavior. The reason is male’s investment on self-employment or family business is 30%. Accordingly migrant women have risk averse investment behavior than men. Therefore, government should involve improving women’s knowledge about income generating investments. The government can promote self-employment opportunities among the women employees who have already been abroad. And also the government, banks can provide loans with low interest rates.

Keywords: investment behaviour, poverty, women’s labour force participation, women migration
This paper discusses about how households’ social and economic factors affect their borrowing behaviors. Credit facilities are an important part of improving income generation opportunities and overall living conditions among households. The main objective of this study is to recognize the differences of their borrowing behaviors according to their demographic factors. This study covers urban, rural and estate sector in Sri Lanka and the data was collected from individual questionnaires distributed among three districts; Colombo, Monaragala and Nuwaraeliya. The sample consists of 225 households to which the questionnaires are distributed based on the population share in each district. Data was analyzed employing qualitative and quantitative analysis. Multiple regression model was used in the quantitative analysis. The key social economic factors that influence borrower behavior were gender, education level, financial literacy, income, savings, expenditure patterns, living area, the cost of the investment project and the marketing success of the project. Household borrowing behaviors were different according to their demographic factors; mainly living area and gender. More than urban sector, a large percentage of households in rural and estate sector concentrate on the informal market for their financial needs. Mainly women concentrate on small and middle range credits than men. Household savings have an impact on their credit demand. In estate and rural sector correlation between credit demand and savings was negative, whereas in the urban sector, there was a positive correlation between them. Financial literacy of householders influences to choose the type of market; formal or informal, for their financial needs. When householders concentrate on the informal market, their cost of the loan is higher. To decrease the borrower’s credit cost, government should take necessary steps to improve the household financial literacy, especially in estate and rural sector though informal education. Improving the financial literacy of householders helps to improve borrowing behaviors in order to minimize borrower’s cost of credit and maximize their utility. Micro finance institutions are particularly important for the lower income groups and distribution of them should be familiar to the borrower. Provisioning of facilities for formal markets to take over informal market activities can minimize the cost of formalizing thus, delivering benefits to society to achieve a Pareto improvement.

Keywords: borrowing behavior, credit demand, financial literacy, financial market, financial needs