

FACULTY OF APPLIED SCIENCES
SABARAGAMUWA UNIVERSITY OF SRI LANKA

OUT OF THE PRESS
OUR PUBLICATIONS -NOVEMBER

VOLUME I ISSUE 4
06TH DECEMBER 2021



PEER-REVIEWED JOURNAL ARTICLES

Climatic control of major and trace elements in paddy soils from wet and dry regions of Sri Lanka

R.T.Rubasinghe, S.K.Gunatilake, Rohana Chandrajith

ABSTRACT

Rice cultivation is a widespread agricultural practice in the dry and wet climatic zones of Sri Lanka. Due to the excessive application of agrochemicals, paddy soils are considered to be polluted, particularly with toxic trace elements. To assess the major and trace element levels in rice paddy soils, 97 samples were collected from the main two climatic regions of Sri Lanka. Total and exchangeable contents of 12 major and trace elements, i.e., Na, K, Ca Mg, Fe, Mn, Cr, Ni, Zn, Pb, Cu, and As were analyzed. Geo-accumulation index and Potential Bioavailability Factor (PBF) was employed to assess the levels of contaminations and results were statistically compared. Paddy soils from both climatic zones contained over 5.0 mg/kg of available-P, which is almost equal to the optimum levels required for rice plants. The total content of trace metals varied in the order Fe>Mn>Zn>Cu>Ni>As in both dry and wet zones, while major elements increased in the order Mg>K>Na. Geo Accumulation indices (Igeo) showed that almost all soils were uncontaminated to moderately contaminated with trace elements.

ABOUT THE JOURNAL

ENVIRONMENTAL CHALLENGES

IMPACT FACTOR – 6.789

DOI -

[HTTPS://DOI.ORG/10.1016/J.ENVC.2021.100361](https://doi.org/10.1016/j.envc.2021.100361)

OUR SCHOLAR

PROF. S.K.GUNATILAKE

PROFESSOR

SKSG@APPSC.SAB.AC.LK



Treatment processes to eliminate potential environmental hazards and restore agronomic value of sewage sludge: A review

Son A. Hoang, Nanthi Bolan, A.M.P. Madhubashini, Meththika Vithanage, Vishma Perera, Hasintha Wijesekara, Hailong Wang, Prashant Srivastava, M.B. Kirkham, Bede S. Mickan, Jorg Rinklebe, Kadambot H.M. Siddique

ABSTRACT

Land application of sewage sludge is increasingly used as an alternative to landfilling and incineration owing to a considerable content of carbon and essential plant nutrients in sewage sludge. However, the presence of chemical and biological contaminants in sewage sludge poses potential dangers; therefore, sewage sludge must be suitably treated before being applied to soils. The most common methods include anaerobic digestion, aerobic composting, lime stabilization, incineration, and pyrolysis. These methods aim at stabilizing sewage sludge, to eliminate its potential environmental pollution and restore its agronomic value. To achieve best results on land, a comprehensive understanding of the transformation of organic matter, nutrients, and contaminants during these sewage-sludge treatments is essential; however, this information is still lacking. This review aims to fill this knowledge gap by presenting various approaches to treat sewage sludge, transformation processes of some major nutrients and pollutants during treatment, and potential impacts on soils. Despite these treatments, overtime there are still some potential risks of land application of treated sewage sludge. Potentially toxic substances remain the main concern regarding the reuse of treated sewage sludge on land. Therefore, further treatment may be applied, and long-term field studies are warranted, to prevent possible adverse effects of treated sewage sludge on the ecosystem and human health and enable its land application.

ABOUT THE JOURNAL

ENVIRONMENTAL POLLUTION

IMPACT FACTOR – 8.071

[HTTPS://DOI.ORG/10.1016/J.ENVPOL.2021.1118564](https://doi.org/10.1016/j.envpol.2021.1118564)

8564

OUR SCHOLAR

DR. HASINTHA WIJESEKARA

SENIOR LECTURER

WIJESEKARA@APPSC.SAB.AC.LK



What drives the pesticide user practices among farmers in tropical regions? A case study in Sri Lanka

R. G. I. Sumudumali, J. M. C. K. Jayawardana, I. D. U. H. Piyathilake, J. L. P. C. Randika, E. P. N. Udayakumara, S. K. Gunatilake, S. Malavipathirana

ABSTRACT

Pesticides are widely used in tropical regions of the world, and therefore explorations of user practices and drivers of pesticide usage among farmers are important for sustainable agriculture. Therefore, perceptions, knowledge, and drivers leading to the practices of pesticide use among farmers were explored using a semi-structured questionnaire survey using 246 farmers in upcountry vegetable growing areas and low country field crop cultivation areas in tropical Sri Lanka. The study revealed a significant increase in pesticide usage in upcountry vegetable growing areas. The differences in pesticide user practices; adulteration of pesticides prior to application ($\chi^2=11.201$, $p<0.05$), environmental and occupational safety ($\chi^2=5.556$, $p<0.05$), adoption of chemical pesticide reduction methods ($\chi^2=12.452$, $p<0.05$) and received training on effective use of pesticides ($\chi^2=9.427$, $p<0.05$). Several reasons of misuse of pesticides by farmers were identified. Among them, lack of technical knowledge on pesticide application and integrated pest management (IPM) practices were the main courses. Most of the farmers tend to use pesticides as a precautionary safety measure before any pest or disease symptoms emerge. Further, pesticide retailers had a strong influence on the selection of pesticides by farmers suggesting that agro-marketing has a significant influence over pesticide usage among farmers. The canonical correspondence analysis indicates that farmers' knowledge of the correct handling of pesticides were positively influenced by the farmers' level of education and training received on pesticide usage ($p<0.05$). The study suggests the importance of training, extension services and farmer education to improve the levels of knowledge and awareness of farmers on the risks of pesticides to human health and environmental pollution.

ABOUT THE JOURNAL

ENVIRONMENTAL MONITORING AND ASSESSMENT

IMPACT FACTOR – 2.513

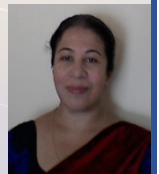
[HTTPS://DOI.ORG/10.1007/S10661-021-09611-Z](https://doi.org/10.1007/s10661-021-09611-z)

OUR SCHOLARS

PROF. J. M. C. K. Jayawardana

PROFESSOR

JAYAWARDANACK@APPSC.SAB.AC.L



DR. E. P. N. Udayakumara

SENIOR LECTURER

UDAYAEPN@APPSC.SAB.AC.L



PROF. S. K. Gunatilake

PROFESSOR

SKSG@APPSC.SAB.AC.LK



DR. S MALAVIPATHIRANA

SENIOR LECTURER

MALAVI@APPSC.SAB.AC.LK



K

Biomechanical Evaluation of the Burpee Test Battery

AWS Chandana, HACS Hapuarachchi

ABSTRACT

This study was aimed at evaluating the performance level of strength, endurance, agility, balance, and coordination with biomechanical factors of youth in Sri Lanka. Most of the available test batteries were designed for particular groups of people, in relation to their anthropometric measurements, Geographic Variation, and socio-cultural factors. Therefore, the modified Burpee test (the 30s, with push-up and vertical jump) was introduced to the subject (n=383, male and n=327, female) to design a test battery. The percentile method was used to distinguish the performance levels. The average number of Burpees of males and females are 9 (SD=3.4) and 6 (SD=2.5), respectively. University students (68), whose, physical fitness levels (satisfactory level or above) were tested for four times through the Eurofit test, were selected to observe their performance levels under the new protocol. Hence, nearly 56 students have demonstrated the average level (or above) of performance. The space of exercise presentation for each performer was defined as the fraction of body height: $0.776^{\circ}H_f^{\circ} \leq d \leq 1.389^{\circ}H_f^{\circ}$ and $0.782^{\circ}H_M^{\circ} \leq d \leq 1.389^{\circ}H_M^{\circ}$. In addition, the vertical displacement of the C.G during a Burpee exercise can measure through the biomechanical model ($0.6389^{\circ}H_f^{\circ}$ and $0.6310H_M$) in any condition.

ABOUT THE JOURNAL

EUROPEAN JOURNAL OF SPORTS & EXERCISE
SCIENCE

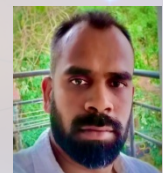
IMPACT FACTOR – 1.02

[HTTPS://WWW.SCHOLARSRESEARCHLIBRARY.COM/ARTICLES/BIOMECHANICAL-EVALUATION-OF-THE-BURPEE-TEST-BATTERY.PDF](https://www.scholarsresearchlibrary.com/articles/biomechanical-evaluation-of-the-burpee-test-battery.pdf)

OUR SCHOLARS

DR. AWS CHANDANA,
SENIOR LECTURER
SURAJCHANDANA@APPSC.SAB.AC.LK

MR. HACS HAPUARACHCHI
LECTURER
SAMPATHHAC@APPSC.SAB.AC.LK





CONFERENCE PROCEEDINGS

Identifying the Type of Chronic Kidney Disease Based on Heavy Metals in Soil using ANN

B.T.G.S Kumara, Banujan Kuhaneswaran, SK Gunatilake

ABSTRACT

Within the recent two decades, chronic kidney disease (CKD) has become a reached global threat. In Sri Lanka, CKD is one of the severe health problems because of the rapid development of CKD of unknown etiology (CKDu) in agricultural zones. Agrochemical and toxic metal contaminations of soil and water, quality of the drinking water, and fluoride level of soil are etiologies for the increase CKDu patients within the farming areas. Early detection of the disease form of the CKD (including CKDu) is critical to prevent and manage the disease and its etiologies. Therefore, this paper introduces an Artificial Neural Network (ANN) model to determine the CKD form based on the physicochemical parameters of the soil in farming areas. The results of the Multi-layer Perceptron (MLP) ANN model have been compared with the Decision Tree and Support Vector Machine (SVM) based on the model accuracy, precision, recall, Root Mean Squared Error (RMSE), and Mean Absolute Error (MAE). According to findings, the ANN model presents the best classification and prediction performance for determining the form of the disease.

ABOUT THE CONFERENCE

THE 3RD SUSTAINABILITY AND RESILIENCE
CONFERENCE: CLIMATE CHANGE
PUBLISHER: IEEE
NOVEMBER 15-16, 2021

MR. BANUJAN KUHANESWARAN
LECTURER (PROB.)
BHAKUHA@APPSC.SAB.AC.LK



OUR SCHOLARS

PROF. B.T.G.S KUMARA
PROFESSOR
KUMARA@APPSC.SAB.AC.LK



PROF. S. K. GUNATILAKE
PROFESSOR
SKSG@APPSC.SAB.AC.LK



Assessment of Groundwater Quality in Relation to Chronic Kidney Disease in Yan Oya River Basin, Sri Lanka

W.A.C. Udeshani, C.L. Vithana, N.H. Koralegedara, S.K. Gunatilake, Siliang Li and R. Chandrajith

ABSTRACT

Chronic Kidney Disease of unknown etiology (CKDu) is a widespread health issue in the Dry Zone of Sri Lanka. Geographically, the disease is more prevalent in the North Central Province and its bordering regions. The disease occurs in certain pockets (hotspots) in the Dry Zone regions. However, it is not reported in some Dry Zone villages (cold spots) and the Wet Zone of the country. This study focused on the Yan Oya watershed, which encompasses CKDu hotspots such as Kebitigollewa, Horowpathana and cold spots including Huruluwewa. A majority of the population in these regions uses groundwater as their source of drinking water. Among the various causative factors proposed for the disease, the quality of drinking water is of high concern. Eighty-five groundwater samples were collected from dug wells and tube wells, from February to April 2021. pH and electrical conductivity (EC) were measured *in-situ* using portable pH and conductivity meters. Alkalinity, hardness, and chloride were measured using a digital titrator while fluoride, sulfate, phosphate, and nitrate were determined using a spectrophotometer. Major cations (Na, K, Ca, and Mg) were measured using Atomic Absorption Spectrophotometry (AAS), while trace metals (Al, Cr, Mn, Fe, Co, Ni, Cu, Zn, As, Cd, and Pb) were measured by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). The mean contents of pH, EC, alkalinity, hardness, fluoride, chloride, sulfate, phosphate, and nitrate in water were higher in CKDu hotspots than in cold spots. The fluoride levels of water in CKDu hotspots varied from 0.02 to 4.00 mg L⁻¹ with a mean value of 0.84 mg L⁻¹, while it varied from 0.02 to 2.26 mg L⁻¹ with a mean value of 0.74 mg L⁻¹ in CKDu cold spots. The fluoride contents in most wells (60%) in the hotspots were above 0.5 mg L⁻¹, while it was 57% in cold spots. Sixty-nine per cent of groundwater samples in hotspots exceeded the highest desirable level of hardness (250 mg L⁻¹) (SLS 614; 2013), whereas only 58% of samples exceed the limit in cold spots. Although toxic heavy metals (Cd, As) are widely attributed to CKDu, none of them were found in excess in the analyzed samples. This study showed that water hardness and fluoride have a considerable impact on CKDu, either for the etiology or the disease progression.

ABOUT THE CONFERENCE

PROCEEDINGS OF THE 8TH INTERNATIONAL SYMPOSIUM ON WATER QUALITY AND HUMAN HEALTH: CHALLENGES AHEAD
POSTGRADUATE INSTITUTE OF SCIENCE, UNIVERSITY OF PERADENIYA, SRI LANKA
26TH & 27TH NOVEMBER

OUR SCHOLAR

PROF. S. K. GUNATILAKE
PROFESSOR
SKSG@APPSC.SAB.AC.LK



In-Vitro Antioxidant and Phytotoxic Properties of Lichen Species *Heterodermia obscurata* Locally Common in Belihuloya, Sri Lanka

L.V. Perera, R.G.U. Jayalal and S.J. Perera

ABSTRACT

Synthetic medicinal drugs and weedicides are causing adverse side effects. Natural bioactive compounds are the best solution to reduce such effects. We investigated antioxidant and phytotoxic properties of the lichen species *Heterodermia obscurata* identified using standard keys from Belihuloya. Methanol, acetone and hexane extracts of fresh lichen samples were prepared and their antioxidant activity was measured using 2,2-diphenyl-1-picryl hydrazyl (DPPH), while the reducing ability was observed using ferric reducing antioxidant potential (FRAP) test using Ascorbic acid as the positive controller for both tests. The total phenolic content (TPC) was evaluated using the Folin– Ciocalteu reagent assay and calculated as gallic acid equivalents for the dry weight of lichen. Further, seed germination and the root length inhibition assays were performed using radish seeds (*Raphanus sativus L.*) to evaluate the phytotoxicity of the extracts using relevant solvents as the negative controllers. Three replicates were used for each and every test. Methanol extract showed the highest antioxidant activity in DPPH assay ($IC_{50} = 273.4$ ppm, $R^2 = 0.927$, p -value= 0.009, $n=3$) and the highest absorbance in FRAP assay (0.277 ± 0.051) compared with Ascorbic acid. TPC of the same extract was significantly higher (16.451 ± 3.802) compared to all the other extracts (p -value < 0.05). TPC of the extracts showed a strong positive correlation with radical scavenging activity (0.806, p -value < 0.2) and the reducing potential (0.949, p -value < 0.1). Inhibition of radish seed germination was significantly high in methanol extract of *H. obscurata* compared to the negative controller after 24 h and 72 h of exposure (p -value < 0.05). Similarly, the methanol extract of the lichen had the highest root inhibition activity after exposure for five days. Hexane extract did not show any bioactivity. Hence, we propose the methanol extract of the *H. obscurata* for further studies on applications of its bioactivity.

ABOUT THE CONFERENCE

IPURSE INTERNATIONAL RESEARCH
SESSION

UNIVERSITY OF PERADENIYA

11 & 12 NOVEMBER 2021

OUR SCHOLARS

DR. RGU JAYALAL

SENIOR LECTURER

JAYALAL@APPSC.SAB.AC.LK

DR. SJ PERERA

SENIOR LECTURER

SANDUN.PERERA@APPSC.SAB.AC.L

K



Evaluation of Microbiological Quality of Commercially Available Bottled Drinking Water in Colombo District, Sri Lanka

D.D.N. Perera, A.T. Herath, J.L.P.C. Randika, H.A.D. Ruwandeepika and R.G.U. Jayalal

ABSTRACT

Recently, the consumption of bottled drinking water has dramatically increased globally and also in Sri Lanka. However, compliance by the manufacturers with the regulations regarding bottled water is debatable. Currently, there is a rising concern regarding the quality of Bottled water. The objective of the current study was to investigate the microbiological quality of bottled water in Colombo district, Sri Lanka. Three bottles each from Twenty-six brands of bottled water were randomly collected from the local market in the Colombo district. Total coliforms (TC) and fecal coliforms (FC) were tested using the Membrane filtration method. The heterotrophic bacteria and fungi were tested using the pour plate method and spread plate method, respectively. Sedgwick rafter cell was used to identify the algae species. Fifty percent of brands tested were positive for the presumptive TC. Out of that, 19% of brands violated the Sri Lanka Standards Institution (SLSI) permitted levels for presumptive TC (<10 CFU/100 ml). Further, fifty percent of brands exceeded the presumptive TC level violating the Health Ministry standards of Sri Lanka and the World Health Organization (WHO) permitted levels (0 CFU/100 ml). Similarly, 23% of brands exceeded the limits for presumptive FC (0 CFU/100 ml following WHO permitted levels, SLSI, and the Sri Lanka Health Ministry requirement). Thirty-five percent of brands showed higher heterotrophic plate count (HPC) which exceeded the WHO guidelines for bottled drinking water (<50 CFU/ml). The dominant fungi identified were *Aspergillus sp.*, *Rhizopus sp.*, *Trichoderma sp.* and *Mucor sp.* Eight percent of brands were positive for algae, and *Chlorella vulgaris* was identified as the algae species in tested bottled drinking water. The results of this study revealed that the bottled water industry needs to be closely supervised by the competent authorities to ensure that customers in Sri Lanka have safe bottled drinking water.

ABOUT THE CONFERENCE

IPURSE INTERNATIONAL RESEARCH

SESSION

UNIVERSITY OF PERADENIYA

11 & 12 NOVEMBER 2021

OUR SCHOLAR

DR. RGU JAYALAL

SENIOR LECTURER

JAYALAL@APPSC.SAB.AC.LK



Developing a Conceptual Therapeutic Garden for the Ecotourism Sector in Sri Lanka: A Perception Analysis

Perera P.R.M, Kudavidanage E.P, Udayakumara E.P.N, Wijesekara S.S.R.M.D.H.R, De Zoysa A.I.U, Kodithuwakku N.D, Perera H.M.R.P

ABSTRACT

The therapeutic garden concept has a historical context in Sri Lanka as its ancient rulers developed multiple measures to ensure the healthiness and prosperity of their kingdoms. This garden concept extends to several ecosystem services, serves recreational and economic value (providing livelihood opportunities for local communities). In the present scenario, before establishing this kind of therapeutic garden, it is essential to be aware of the human thoughts and requirements on its concept. Thus, this study mainly focused on developing an optimal model of a therapeutic garden that combines ancient knowledge and scientific investigations for the provision of medicine while serving as a tourist attraction. The developed model was validated based on tourists' perception, the willingness of the tourists to experience a therapeutic garden, and their requirements for a modern-day experience examined through a questionnaire survey (n= 40). The questions that appeared in the survey were based on the tourists' perception and their requirements in a therapeutic garden (i.e., better infrastructures facilities, sustainable and eco-friendly materials and practices for building and construction, dietary requirements, and healthiness of provided foods). The study locations encompassed four tourist hotspots in Sri Lanka (Galle, Kandy, Dambulla, and Udawalawe) and interviewed 36 local and foreign tourists in each location. The Likert scale qualitative analysis was used to quantify the willingness to experience (perception value). The interviewees' mean acceptance level (IMAL) value for each component was calculated by averaging the perception values of tourists. The IMAL value for all the suggested components (i.e., 40) was above 50%. From all the interviewees, 97% preferred to experience the proposed modern therapeutic garden and showed their specific requirements such as price package systems and proper awareness programs. The initial model was then developed using the perceptions from the questionnaire survey, and sustainably utilizing the land features and native medicinal plants available in Dambulla, the best possible area identified. Discussions with Ayurveda experts enabled the compilation of a document of 150 suitable medicinal plants for introducing in the garden. The 3D model developed integrating bioclimatic considerations, modern architectural concepts, and experts' knowledge in Ayurvedic medicine provided a virtual walkthrough that can be easily perceived by potential investors.

ABOUT THE CONFERENCE

INTERNATIONAL CONFERENCE ON
ENVIRONMENTAL GOVERNANCE
PUBLISHER: CENTRAL ENVIRONMENTAL
AUTHORITY

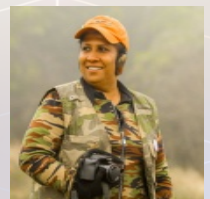
24-25 November 2021

DR. EPN UDAYAKUMARA
SENIOR LECTURER
UDAYAEPN@APPSC.SAB.AC.LK



OUR SCHOLARS

DR. EP KUDAVIDANAGE
SENIOR LECTURER
ENOKA@APPSC.SAB.AC.LK



DR. SSRMDHR WIJESKARA
SENIOR LECTURER
WIJESKARA@APPSC.SAB.AC.LK

