

Life Science: Research, Practices and Application for Sustainable Development

Editors:
Dr P Ponmurugan
Dr V Ramasubramanian
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Recent trends in Life Science

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Dr. T. Marimuthu

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LIST OF FULL LENGTH PAPERS

ISOLATION AND IDENTIFICATION OF PLANT GROWTH PROMOTING BACTERIA FROM RHIZOSPHERE OF PEANUT (<i>ARACHIS HYPOGAEA</i> L.) <i>M. Agila, P. Radha Priya, Dechen Khando, Mangai and P. Palani</i>	1
EFFECT OF SALT STRESS ON TOTAL CHLOROPHYLL CONTENT IN <i>LEUCAS ASPERA</i> <i>K. Agnes Nirmala and M. Kanchana</i>	7
TALC BASED FORMULATION OF CHINESE CATERPILLAR FUNGUS, <i>OPHIOCORDYCEPS SINENSIS</i> [BERK.] AGAINST <i>FUSARIUM</i> SPP <i>S. B. Akshaya, A. S. Krishnamoorthy, and C. Sangeetha</i>	10
PREPARATION OF VERMICOMPOST AND ITS IMPACT ON PLANT GROWTH (<i>VIGNA UNGUICULATA</i>) <i>Akshita Devanga, S. Preetheswari, A. Anjalai, P. Kathireswari and K. Saminathan</i>	13
<i>LACTOBACILLUS FERMENTUM</i> : A POTENT PROBIOTIC WITH IMMUNE MODULATORY HEALTH BENEFITS <i>Ann Catherine Archer, S.P. Muthu Kumar, and M.H. Prakash,</i>	18
ANTIMICROBIAL EFFICACY OF SILVER NANOPARTICLES SYNTHESISED FROM MARINE ACTINOMYCETES – <i>STREPTOMYCES</i> SPP <i>N. R. Arshiya Khan and J. Immanuel Suresh</i>	24
ISOLATION AND CHARACTERIZATION OF RESISTANT <i>STREPTOCOCCUS MUTANS</i> FROM DECAYED TOOTH SAMPLES <i>S. Ashokraj and V. Brindha Priyadarisini</i>	29
MOLECULAR PHYLOGENETIC ANALYSIS OF PULMONATA (GASTROPODA) BASED ON 16S, 18S & 28S RDNA SEQUENCE INFORMATION <i>Vijaya Sai Ayyagari and Krupanidhi Sreerama</i>	37
POTENTIALITY OF <i>SUAEDA MARITIMA</i> (L.) DUMORT. A SALT MARSH HALOPHYTE ON BIOACCUMULATION OF HEAVY METALS FROM TANNERY EFFLUENT <i>D. Ayyappan, G. Sathiyaraj, Zakir Hussain Malik and K. C. Ravindran</i>	40
DIVERSITY AND UTILIZATION OF PLANT SPECIES IN HOMEGARDENS OF LOKAMALESWARAM VILLAGE, KODUNGALLUR, THRISSUR, KERALA <i>E.C. Baiju, K.J. Arya and P.P. Mini</i>	48
IDENTIFICATION OF BIOACTIVE COMPOUNDS FROM ETHYL ACETATE EXTRACT OF ACTINOMYCETES ISOLATED FROM VERMICAST SOIL <i>R. Balachandar, N. Karmegam and J. Praburaj</i>	62
TAILORED PHOP GENE AS A POTENT THERAPEUTIC TOOL FOR MULTI DRUG RESISTANT SALMONELLA SPP. ISOLATED FROM VARIOUS GEOGRAPHICAL REGIONS IN TAMIL NADU <i>G. Balasubramaniand M. Marudhamuthu</i>	71

EXOGENOUS AUXINS IMPROVE ADVENTITIOUS ROOTING AND ENHANCE SALT TOLERANCE IN PETUNIA HYBRIDA <i>Muthusamy Balasubramanian, Ramalingam Radhakrishnan, Girija Shanmugam, Chang Kil Kim and Muthukrishnan Arun</i>	77
STUDY ON HABITAT CONDITIONS OF FEW BIRD SPECIES AT MYSORE DISTRICT, KANRATAKA, INDIA <i>S. Basavarajappa and H.S. Shruthi</i>	83
EFFECT OF <i>SACCHROMYCES CEREVISAE</i> ON REDUCTION OF METHANE EMISSION IN PADDY STRAW BASED TOTAL MIXED RATION FOR SUSTAINABLE PRODUCTION IN DAIRY CATTLE <i>A. Bharathidhasan</i>	90
EVOEVOLVING CONNEXIONIST SYSTEM (ECOS) SCHEME FOR EARLY PLAQUE DETECTION IN CORONARY ARTERY <i>Bharath Ganesan</i>	95
POTENTIAL PROTECTIVE EFFECT OF MANGIFERIN ON ANTILEUKEMIC DRUG ARSENIC TRIOXIDE INDUCED HISTOLOGICAL CHANGES, OXIDATIVE STRESS, IMPAIRED HEART AND LIVER FUNCTIONS IN WISTAR RATS <i>Binu Prakash, and Raveendran Harikumar Nair</i>	100
HYDROBIOLOGICAL ANALYSIS AND ITS INFLUENCE ON THE MYCODIVERSITY OF APPA ISLAND IN THE GULF OF MANNAR, EAST COAST OF TAMIL NADU <i>R. Carmel Mary and A. Panneerselvam</i>	108
POLYMORPHISM OF <i>IGF1</i> GENE AND THEIR ASSOCIATION WITH GROWTH RATES IN MECHERI SHEEP BREED <i>R. Chitra, V. Senthilkumar, M. Prabu, R.S. Kathiravan and A. Kirubakaran</i>	115
EFFECT OF INCREASING CONCENTRATIONS OF CADMIUM ON GROWTH, BIOCHEMICAL AND PHENOLIC ACID CONTENTS OF HORSE GRAM <i>K. Chitra</i>	120
STUDIES ON THE PHYSIO-CHEMICAL PROPERTIES OF THE OOTY LAKE <i>R. Christy Shaila, M. Manimegalai and P. Kathireswari</i>	126
<i>IN SILICO</i> EVALUATION OF ANTI-MALARIAL AGENTS FROM AS INHIBITORS OF <i>PLASMODIUM FALCIPARUM</i> LACTATE DEHYDROGENASE (<i>PFLDH</i>) ENZYME <i>J. Devakumar and S.S. Sudha</i>	130
TIME-MORTALITY RELATIONSHIP BETWEEN DNA UNVACCINATION AND VACCINATION OF RECOMBINANT VIRAL PROTEINS (VP19 AND VP28) AGAINST WSSV IN MARINE ORNAMENTAL SQUAT SHRIMP THOR AMBOINENSIS <i>N.S. Dhanasekaran and V. Priya lakshmi</i>	137
PERFORMANCE EVALUATION OF SOLAR PHOTOVOLTAIC (SPV) POWERED VAPOR COMPRESSION REFRIGERATION SYSTEM <i>A. J. Dhondge and S.R. Kalbande</i>	140

EFFICACY OF DIFFERENT INSECTICIDES AGAINST CASHEW STEM AND ROOT BORER, <i>PLOCAEDERUS FERRUGENIUS</i> L. (COLEOPTERA: CERAMBYCIDAE) <i>S. Jaya Prabhavathi, D. Keisar Lourdusamy, S. Vincent and M. S. Aneesa Rani</i>	222
PHYSICO – CHEMICAL AND BACTERIOLOGICAL PROPERTIES OF POTABLE WATER IN TWO TALUKS OF KANYAKUMARI DISTRICT <i>S. Jayakumar and D. Moni</i>	227
NEW BACTERIAL STRAINS FROM RIVER KAVERI, KODAGU, KARNATAKA <i>M. Jayashankar and Krishna</i>	231
ISOLATION AND IDENTIFICATION OF BIOSURFACTANT PRODUCING <i>BACILLUS</i> SP. <i>A. S. Jayasree, D. Latha and V. Muthu Laxmi</i>	241
MOSQUITOCIDAL PROPERTIES OF <i>SYZYGium LINEARE</i> (MYRTACEAE) AGAINST MEDICALLY IMPORTANT MOSQUITO VECTORS <i>A. Jeyasankar and S. Gandhimathy</i>	245
BIODIVERSITY AND ECOLOGICAL CATEGORY OF EARTHWORMS IN PERIYA OF WAYANAD FOREST DIVISION, KERALA <i>Jijo George, M. P. Deepthi, K. Saminathan and Kathireswari</i>	251
DIVERSITY OF PLANT ASSOCIATED BACTERIA ISOLATED FROM DIFFERENT MEDICINAL PLANTS AND THEIR ANTAGONISTIC POTENTIAL AGAINST WILT CAUSING PLANT PATHOGENS FUSARIUM OXYSPORUM AND RALSTONIA SOLANACEARUM <i>Jinal H. Naik and Natarajan Amaresan</i>	254
DESIGN AND EVALUATION OF BIOMASS COMBUSTOR CUM HOT AIR GENERATOR RETROFITTED WITH SOLAR TUNNEL DRYER <i>S. R. Kalbande</i>	259
IDENTIFICATION OF SATURATED HYDROCARBONS FROM JASMINE (<i>JASMINUM SAMBAC</i> L.) BUDS DAMAGED BY GALLERYWORM, ELASMOPALPUS JASMINOPHAGUS HAMPSON THROUGH GC-MS ANALYSIS <i>I. Merlin Kamala and J.S. Kennedy</i>	268
BIOSYNTHESIS OF SILVER NANO PARTICLES FROM MARINE ACTINOMYCETES AND THEIR EFFICACY AGAINST BACTERIAL ISOLATES FROM THE PUS OF DIABETIC FOOT ULCER <i>N. Kandanila, J. Immanuel Suresh and K. Satheesh Kumar</i>	277
FASCIATION IN <i>MERREMIA TRIDENTATA</i> (L.) HALLIER. F. - CONVULVULACEAE <i>I. Kanivalan, M. Parthipan and A. Rajendran</i>	281
DENDRIMERS: A TINY REVIEW ON BIOMEDICAL APPLICATIONS <i>Ayyavoo Kannan</i>	283
PRELIMINARY PHYTOCHEMICAL ANALYSIS AND ANTIBACTERIAL POTENTIAL OF LEAF EXTRACTS OF <i>COUROUPITA QUINENSIS</i> <i>A. Karthi and S. Premalatha</i>	287

MOLECULAR CHARACTERIZATION OF HEPATITIS B VIRUS (HBV) GENOTYPES IN IRULA TRIBAL POPULATION, TAMIL NADU, INDIA <i>E. Ramya, S. Ramalakshmi, P. Rajendran, S. P. Thyagarajan, Joseph C. Daniel and P.V. Geetha</i>	516
CARBON SEQUESTRATION AND DIVERSITY ASSESSMENT IN MANGROVE ECOSYSTEM OF THRISSUR DISTRICT, KERALA, INDIA <i>C.R. Remya Krishnan, C. N. Sunil, E.C. Baiju and P. P. Salma</i>	524
EFFECT OF COPPER ON AQUATIC MACROPHYTE (<i>PISTIA STRATIOTES</i> . L) <i>N.M. Rolli and R. B. Hujaratti</i>	530
A PRELIMINARY STUDY ON THE POLLEN FLORA OF MAHATMA GANDHI GOVT. ARTS COLLEGE, MAHE, U.T. OF PUDUCHERRY, INDIA <i>S. M. Safwana, K. Sasikala and M. Reema Kumari</i>	535
THREATENED MEDICINAL TAXA IN NILGIRIS BIOSPHERE RESERVE, WESTERN GHATS OF TAMILNADU, INDIA <i>P. Samyudurai, C. Rajasekar, A. Rajendran, S. Jeevith and M Saradha</i>	542
COMAPARITIVE STUDY ON EARTHWORM REPRODUCTIVE POTENTIAL OF <i>EUDRILUS EUGINIAE</i> USING DIFFERENT MEDIA <i>T. Sandra Rajan, M. P. Deepthi, K. Saminathan, and P. Kathireswari</i>	545
DIVERSITY OF AGARIC MYCOTA IN PALAMALAI HILLS WESTERN GHATS OF TAMILNADU <i>S. Santhoshkumar, N. Nagarajan, P. Samyudurai, and K. Shanmugasundaram</i>	548
DIVERSITY AND DISTRIBUTION OF ORCHID SPECIES IN EASTERN GHATS OF TAMILNADU, INDIA <i>M. Saradha,a G. Divya Bharathia and P. Samyuduraib</i>	553
OPTIMIZATION OF ULTRASONIC PRETREATMENT OF LEATHER INDUSTRY EFFLUENT FOR BIOMASS PRODUCTION OF <i>SCENEDESMUS QUADRICAUDA</i> KÜTZ <i>Sarumathi and K. Dhandayuthapani</i>	556
IN VIVO STUDIES ON THE ANTHELMINTIC EFFICACY OF ETHANOL EXTRACT OF <i>SYZYGIUM AROMATICUM</i> AGAINST <i>HAEMONCHUS CONTORTUS</i> <i>S. Sathish Kumar, L.Veerakumari, and Soundarajan</i>	563
MARINE <i>ACTINOMYCETES</i> AS AN EFFECTIVE BIOCONTROL AGENT AGAINST <i>RHIZOCTONIA SOLANI</i> - A PROMISING SUSTAINABLE ECOFRIENDLY ALTERNATIVE TO SYNTHETIC FUNGICIDES <i>B. Sathya Priya and T. Stalin</i>	571
PRODUCTION OF ECOFRIENDLY ALTERNATIVE TEXTILE DYES USING NOVEL ACTINOMYCETES <i>B. Sathya Priya,a T. Stalin,b V. Karthicka and S. L. Soundryaa</i>	574
TOXICITY ANALYSIS ON EDYSONE AGONIST, CHROMAFENOZIDE IN <i>SPODOPTERA MAURITIABOISD</i> (LEPIDOPTERA: NOCTUIDAE) <i>K. P. Sathyakala, C. Ayishabanu, Praseeja Cheruparambath, V. Reshma and E. M. Manogem</i>	577

A COMPARATIVE STUDY ON THE OIL CONTENT OF SEED OF THREE INDIAN <i>GARCINIA</i> SPECIES <i>Satyanshu Kumar, Raghuraj Singh, Azazahemad A. Kureshi, Premlata Kumari, Tushar Dhanani, Tabaruk Hussain, P C Baruah, Madhumita Talukdar and Amit Balwant Mirgal</i>	584
FLASH FLOOD IN CHENNAI AND THE FUTURE TREND <i>Masilamani Selvam, A. Chandini, G. Vyshnavi and B. Devipriya</i>	588
APPLICATION OF LOW-COST ADSORBENT FOR THE HEAVY METAL TREATED <i>LYCOPERSICUM ESCULENTUM</i> MILL. <i>P. Selvarathi and R. Murugalakshmi Kumari</i>	593
FACTORS INFLUENCING ECONOMIC LOSS DUE TO KETOSIS IN DAIRY ANIMAL <i>V. Senthil kumar, A. Mohamed Safiullah, G. Kathiravan, M. Prabu and R. Chitra</i>	598
EFFECT OF ADHATODA VASICA, CHROMOLAENA ODORATA, AND CLITORIA TERNATEA EXTRACTS AS AN IMMUNOSTIMULANT AGAINST AEROMONAS HYDROPHILA AND PSEUDOMONAS AERUGINOSA IN ORNAMENTAL FISH DANIO RERIO <i>V. Ramasubramanian and M. S. Shabana</i>	601
RARE MEDICINAL PLANT DIVERSITY IN CHITTERI HILLS, DHARMAPURI DISTRICT, EASTERN GHATS OF TAMILNADU, INDIA <i>K. Shanmugasundaram, S. Santhosh kumar and N. Nagarajan</i>	608
THE NUTRIENT DYNAMICS OF TERMITES MOUND SOIL AND ADJACENT SOILS <i>V. Sijina, M. P Deepthi, R. Chisty Shaila, K. Saminathan and P. Kathireswari</i>	610
A COMPARATIVE STUDY ON BIOLEACHING OF NICKEL AND CHROMIUM BY <i>ACIDITHIOBACILLUS FERROXIDANS</i> FROM ELECTROPLATING INDUSTRIAL CONTAMINATED SOIL <i>Hemalatha Sivasubramaniam, Karthika Ravichandran, Swathy Thiagarajan and Bharath Ganesan</i>	613
INVESTIGATION ON HEAT TRANSFER MECHANISM OF DOUBLE BASIN SOLAR STILL INTEGRATED WITH VACUUM TUBES <i>S. D. Deshmukh, S. R. Kalbande and V. P. Khambalkar</i>	619
CHARACTERIZATION OF EUKARYOTIC TRANSLATION INITIATION FACTOR 5 ALPHA IN <i>ORYZACOARCTATA</i> UNDER ABIOTIC STRESS <i>Soni Chowrasia, Alok Kumar Panda, Hukum Rawal, Abhishek Majumdar, Harmeet Kaur and Tapan Kumar Mondal</i>	625
STUDIES ON THE IMPACT OF TREE CANOPY COVER ON HERBACEOUS VEGETATION STRUCTURE AND ITS INFLUENCE ON THE REPRODUCTIVE SUCCESS OF AN EXOTIC WEED <i>LANTANA CAMARA</i> AT KARANTHAMALAI HILLS OF TAMIL NADU <i>N. Soundararajan, N. Kamaladhasan, S. Saravanan, B. Parthiban and S. Chandrasekaran</i>	632
EFFECT OF ANTENNAL ABLATION ON MATING AND OVIPOSITION BEHAVIOUR OF <i>PLUTELLA XYLOSTELLA</i> L. (LEPIDOPTERA: PLUTELLIDAE) <i>M. Soundarya, G. Gowri and K. Manimegalai</i>	638

THE NUTRIENT DYNAMICS OF TERMITES MOUND SOIL AND ADJACENT SOILS

V. Sijina,¹ M. P Deepthi,¹ R. Chisty Shaila,¹ K. Saminathan² and P. Kathireswari^{*1}

ABSTRACT

The influence of soil organisms on the availability of nutrients to other biota within ecosystem can be content dependent. In this work the advances made in our knowledge of the effects of termites on the physicochemical properties of soils when compared to the adjacent soil. Soil samples were collected from the inner parts of termite's mounds and also adjacent soils in Palakkad district, Kerala. Generally, termite activities in the soil affect the nutrient and organic matter dynamics and also the productivity of the ecosystem via carbon sequestration, nutrient recycling as well as some properties of the soil.

Introduction

Termites are social insects of the order Isoptera with about 3,000 known species, of which 75% are classified as soil-feeding termites. They are predictable as “ecosystem engineers”(Dangerfield et al., 1998) because they promote soil transformations by their degradation processes. Construction of mounds from mixture of soil and other material within soil horizons must affect the physical and chemical characteristics of both the soil used for construction and the soil of the surrounding areas from which the materials are derived (Lee and Wood, 1971). The present study is to assess the termite activity and understand its impacts on soil properties in different locations viz., Orrapadam, Nellikad, Matumandha, and Mathur regions of Palakkad district, Kerala.

Materials and Methods

The field experiment was done within the limits of Palakkad district during rainy season in the month of June 2017. Different areas having termite infestation were observed and four sites were selected to set up different experiments in the Orrapadam, Nellikad, Mathumandha and Mathur regions of Palakkad District, Kerala. About half kg of soil was collected in polythene bags and sent to District Soil testing laboratory, Thikkoti, Kozhikode in Kerala for analyzing the pH, TSS, Organic carbon (Colorimetry. Walkley Black digestion method, 1934), macro nutrients viz., Nitrogen, Phosphorous (Colorimetry Bray's method. 1948) and Potassium (Flame photometry) and micro-nutrients viz., Zinc, Copper, Manganese and Iron analyzed by Atomic Absorption Spectrophotometry

The results were analyzed and interpreted to observe the enrichment of termite mound soil in comparison with control soil.

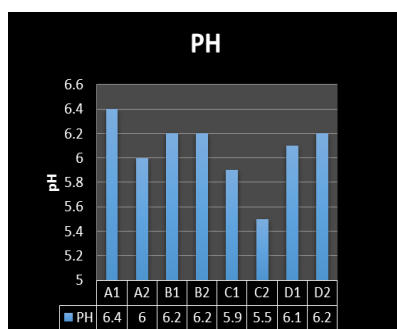
Results and Discussions

In the present study the soil samples were collected from four different sites in Palakkad district showed that the pH was mostly acidic and slightly increased in termite mound soil when compared to the surroundings soil except sample D1 and D2. The changes in pH depend upon species and soil types. From the table (1) the TSS value of sample get little increased in B1 than adjacent soil B2. In sample A1 and A2 remains constant. In case of sample C and D the TSS value get decreased. The decreased amount of TSS in termite soil may be due to heavy rain and other climatic factors. Organic Carbon content in the mound soil sample shows lesser than the adjacent soil samples and it shows that termites can able to store less OC content than that of the adjacent soil. OC content may get reduced in termite mound samples than adjacent soils may be due to the gut microbial process of termites and its respiratory activity.

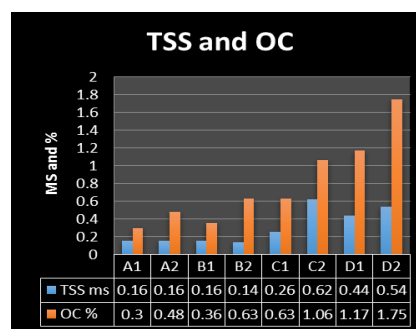
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²Department of Chemistry

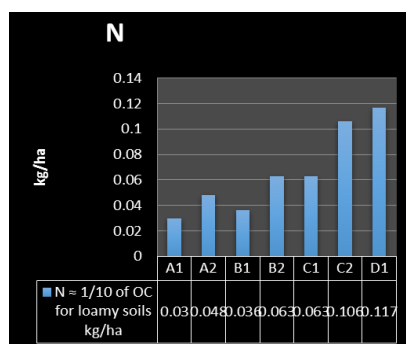
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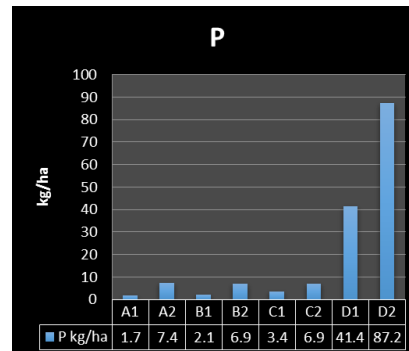
Graph-1: showing pH



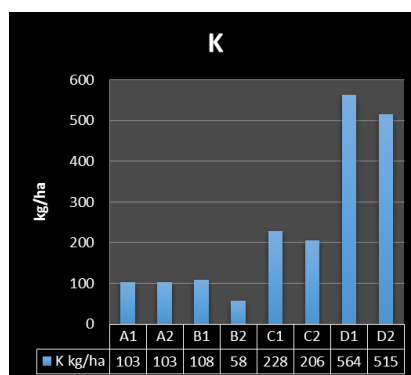
Graph-2: showing TSS& OC



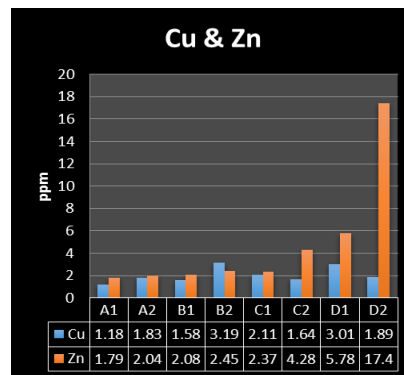
Graph-3: showing available Nitrogen



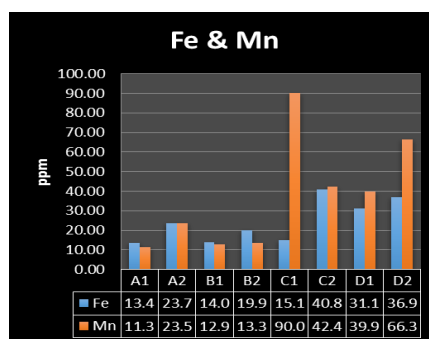
Graph-4: showing available phosphateavailable Nitrogen



Graph-5: showing available potassiumavailable Nitrogen



Graph-6: showing micronutrients Cu& Znshowing available potassiumavailable Nitrogen



Graph-7: showing micronutrients Fe& Mn

Footnotes

A1=Kodumbu Mound Soil /A2=Adjacent Soil
 B1=Nellikadu Mount Soil /B2=Adjacent Soil
 C1=Matumandha Mount Soil /C2=Adjacent Soil
 D1=Mathur Mount Soil /D2=Adjacent Soil

The level of potassium in mound soils is lesser than the adjacent soil samples because of heavy rain during the time of soil collections. The main role of K is to provide the ionic environment for metabolic processes which regulates various processes including growth regulation. Nitrogen is as necessary macronutrient for the plant growth and key regulator of ecosystem processes (Paster et.al, 1984). The increased N causes acidification and eutrophication (Linda et.al, 2010). The Phosphorus was found to be higher in surrounding soil than the mound soil in all samples may also because of heavy rain during sample collections and due to less mineralization in the gut of termites.

Table (1) shows that amount of zinc, copper, Manganese, Iron are lesser in mound soil than adjacent soil in all samples may be due to heavy rain during sample collections and further study needed to conform in different seasons. Zinc is essential for plant such as production of auxins, activates enzymes in protein synthesis, regulation and consumption of sugars, starch formation and root development. It is necessary for the formation of chlorophyll and carbohydrates. The copper is essential for plant such as a catalyst in photosynthesis, respiration, several enzyme systems for carbohydrate and protein metabolism. It is important for the formation of lignin in plant cell walls. Copper also affects the flavor, the storage ability and the sugar content of fruits. Manganese is essential for many enzymatic reactions involved in metabolize of organic acids. Manganese along with Fe plays role in the formation chlorophyll in plants. Nutrients level is lesser in mound soil than the adjacent soil shows variation in result when compared to other research papers (Dangerfield,et. al, 1998),(Abbadie,et.al, 1989),(Arshad et. al,1982),(Hesse et. al,1955) and (Anderson et.al,1984) that we verified that may due to heavy rain and we further concentration in different seasons in soil nutrient dynamics.

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