

**Diversity of ants in Idukki district and
Antibacterial screening of bacteria isolated
from ant gut**

*Dissertation Submitted to Mahatma Gandhi University in Partial
Fulfilment of the Requirements for the Degree of*

Master of Science in Zoology

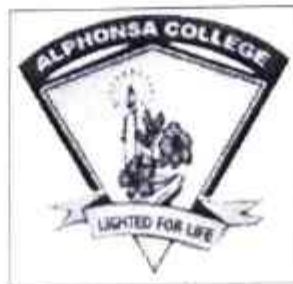
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SEPTEMBER-2023

ABSTRACT

The present study was done with an aim to determine the species diversity of ants along different habitats of Idukki district. Ants were collected by bait trap, pitfall method, opportunistic observation method and quadrat method for a period of three months. A total of 12 species of ants belonging to 10 genera and 3 subfamilies were collected. The most abundant species of ant in the study area is *Paratrechina longicornis*. The most diverse habitat was banana plantation. Most abundant subfamily was Formicinae (5 genera with 6 species). Genera such as *Paratrechina*, *Oecophylla*, *Polyrhachis* were mostly found in all the 4 habitats studied. The study also investigated community composition of ant gut associated bacteria and their antimicrobial activity. Gram positive (11) and Gram negative bacteria (2) were identified. The antibacterial bioassay showed that ant gut associated microbiota have antibacterial activity. Isolated microbes showed antibiosis towards *Bacillus lentus* and *Pseudomonas stutzeri*. These isolates might have potential application in drug development.

Key words : ant diversity, *Paratrechina longicornis*, antibiosis.

**IDENTIFICATION AND CHARACTERISATION OF
BACTERIA ISOLATED FROM HEAVY METAL
CONTAINING EFFLUENTS OF KMML SPONGE
FACTORY, CHAVARA**

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ABSTRACT

The present study was done with an aim to identify and characterise bacteria isolated from heavy metal containing effluent of KMML sponge factory, Chavara, Kollam. The study was conducted during March -June of 2023. The study area includes the surroundings of KMML industrial zone. Physicochemical test such as colour, odour, temperature, pH, TDS and Electrical conductivity are done. Considering the physicochemical analysis, the quality of water and soil were deteriorating due to the industrial waste. Presence of heavy metals such as Chromium and Zinc were determined by Atomic Absorption Spectroscopy. Bioassay using *Allium cepa* root tip showed the cytotoxic effects of the effluent leaching out from the factory. Four different kinds of bacteria were isolated from the waste water. They includes Bacillus, Pseudomonas, Micrococcus and Achromobacter. The bacteria isolated from this effluent water have the survival capacity in heavy metal like chromium, zinc, lead, titanium etc. So it can be used for the future studies. For evaluating the genome of bacteria, sequencing of Pseudomonas aeruginosa were done.

Key words: Heavy metals, microorganisms, pseudomonas aeruginosa, Allium cepa bioassay, Chromosomal aberrations, identification of bacteria, industrial effluent, pollution and Mitotic index.

A STUDY ON THE BIODIVERSITY OF MOLLUSC SPECIES IN DHARMADAM BEACH OF KANNUR DISTRICT, KERALA

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ABSTRACT

Diversity of mollusc species in Dharmadam beach, Kannur district, Kerala was assessed. The samples were collected for a period of 6 months from December, 2022 to May, 2023. A total of 47 species belonging to 24 orders and 26 families were recorded. Among these 21 species of Gastropoda belonging to 5 orders and 13 families whereas the 25 species of Bivalvia belonging to 10 orders and 12 families. Single species of Cephalopoda was observed. *Vepricardium asiaticum* observed to be most abundant species. *Nacella lapillus* and *Cardites antiquates* were least abundant species. Simpson's diversity index was 0.953. Mollusc species showed monthly variation. *Vepricardium asiaticum* showed dominance through out the study period.

Key words: Diversity, Mollusc, Monthly variation, Simpson's diversity index, Abundance.

STUDY ON THE DIVERSITY OF MOTHS IN KEEZHMAD GRAMAPANCHAYAT

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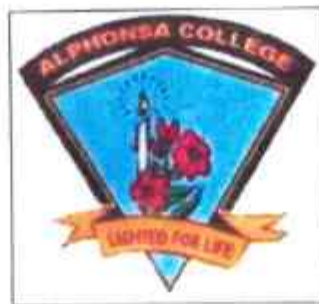
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ABSTRACT

The present study was an attempt to explore moth diversity from three different habitats of Keezhmad Gamapanchayath in Ernakulam district, Kerala, India. The study was carried out from December 2022 to May 2023. A total number of 53 individuals of 22 species were identified. These include seven families Crambidae, Lymantriidae, Geometridae, Pyralidae, Erebidae, Limacodidae and Tineidae. Light trap method was used to collect specimens, a moth screen was setup with white cloth and lamp. Among the families reported, Crambidae (7species)was the most dominant family followed by Erebidae(6 species), Pyralidae(3species), Geometridae(3species), Lymantriidae(1), Limacodidae(1) and Tineidae (1). The diversity index for moth have been calculated using Simpsons Diversity Index (D) and abundance was also calculated. The Simpsons Diversity Index (0.95) reflects that moth fauna is diverse in the areas.

Keywords: Lepidoptera, diversity, moth, family, light trap, Keezhmad Gamapanchayat

**PHYSICO - CHEMICAL AND MICROBIAL
ANALYSIS OF
Sceliphron caementarium MUD NESTS**

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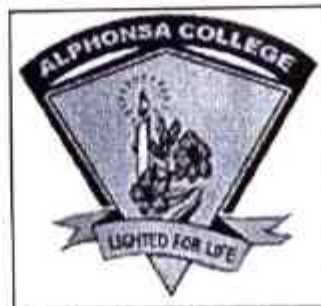
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ABSTRACT

Sceliphron caementarium mud nest was studied to find out physico - chemical and microbial analysis of mud used in its nest construction. This study was conducted for a period of six months, from February 2023 to July 2023 with special reference to *Sceliphron caementarium*. Mud-dauber wasps of the genus *Sceliphron* build aerial nests using mud collected at humid-soil sources and carried to the nest in the form of spherical mud-balls. Prey species were isolated from four different wasp nest is 279, including 239 spiders of 6 different family and 40 lepidopteron larvae belongs to various families. Spider family includes salticidae, Araneidae, Theridiidae, Anyphaenidae, Oxyopidae, Thomisidae. Nests of *Sceliphron caementarium* (black and yellow mud dauber) were collected from Pala municipality Ward 22, Carmelaram Hostel and analysed for their physico - chemical composition. The investigation gave results for the nest as - pH 6.57, moisture content 1.42%. Values obtained for the ordinary soil from where have pH 7.82, moisture content 1.01%. Higher content of chloride and magnesium were found in nest clay samples as compared to the normal soil. This study also involves determination of the chemical composition of wasp's nest soil and simple clay soil. Research showed that it builds nest by excreting saliva to mixture of water and various building materials which include paper and clay soil. Antimicrobial activity test was showed positive result on pathogenic microbes such as *Escherichia coli*, and *Staphylococcus* against nest soil where as *Pseudomonas otitidis* showed 2 & 3 mm inhibition zone.

Keywords: Mud dauber nest, *Sceliphron caementarium*, spider, Prey diversity.

DIVERSITY OF HERMIT CRAB AT KALPENI ISLAND, LAKSHADWEEP

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ABSTRACT

Diversity of Hermit Crab in Kalpeni Island, Lakshadweep was assessed. The samples were collected for a period of 3 months from May,2023 to July 22023.The study was conducted in two stations. A total of 11 species belonging to 2 families and 3 genera. *Coenobita rugosus* observed to be most abundant species in North tip beach (site:1) and Whirlpool of Agatthiyatti Stone(site:2).The Simpson diversity index of North tip beach (site:1) is 0.678 and Simpson diversity index of Whirlpool of Agatthiyatti Stone (site:2) is 0.717.

EXTRACTION AND USE OF CHITOSAN FROM DISCARDED CRAB SHELL

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ABSTRACT

Crab shell waste consists mainly of protein, chitin and CaCO_3 with species and seasonal variation. Crab shell waste is the most important source of chitin and chitosan. Chitin is a linear polysaccharide of the amino sugar N-acetyl glucosamine and the second most abundant polysaccharide. Through enzymatic or chemical deacetylation, chitin can be converted to its derivative, chitosan. Deacetylation of chitin involves the transformation of the N-acetyl groups in chitin to amino groups. The non-toxic, biodegradable and biocompatible properties of chitin and chitosan provide much potential for food, pharmaceutical and biotechnology applications. The study was conducted to find out productive ways to convert discarded shell waste into valuable products. In the present study, chitosan was extracted from crab shells the yield of chitosan obtained is 13.6%. Studied the flocculent nature of chitosan was studied by adding chitosan to the turbid water collected from a pond. Chitosan was found to be good at flocculation. Chitosan has film-forming properties, the biofilm obtained was used to increase the shelf life of fruits and vegetables. The biodegradability of the biofilm was also checked.

Keywords: Crab shell waste, Chitin, Chitosan, Biofilm, Flocculant, antibacterial activity

**STUDY ON BIOLOGY BIONOMICS AND
PARASITOID ATTACK ON THE COMMON
MORMON *Papilio polytes***

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ABSTRACT

This project is a preliminary study on the life cycle of *Papilio polytes*, Common Mormon, with particular attention to the interaction between host plants and parasitoids. Butterflies have a unique life cycle, transitioning from egg to caterpillar to chrysalis and finally to an adult butterfly. Host plants play a critical role in this life cycle, providing food and shelter for the caterpillar. However parasitoids can also target caterpillars, laying their eggs inside them and ultimately killing them. Also, we will discuss various behavioural aspects of butterflies during its complete life cycle and changes caused by the attack of parasitoids. Through careful observation and data collection, we will identify patterns and trends in parasitoids activity and explore the potential impact of host plant selection on butterfly survival. Ultimately this project aims to provide a deeper understanding of the complex ecological interactions between butterflies, host plants and parasitoids.

Keywords: *Papilio polytes*, *Pachliopta aristolochiae*, sexual dimorphism, Batesian mimicry, parasitoids, life cycle, butterfly

EFFECT OF ORGANIC AND CHEMICAL FERTILIZERS ON SOIL PARAMETERS AND EARTHWORM SPECIES

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ABSTRACT

Fertilizers are intentionally added to the soil to improve the crop yield. But their application may affect the soil organisms particularly earthworms and the soil fertility may end in risk. The present study was conducted to know the effect of organic and chemical fertilizers on soil parameters and earthworm species. Four different types of plantation were selected for the study. The nutmeg plantation, rubber plantation, grass, and Tapioca field are applied with fertilizers cowdung, Potash, urea and ash respectively. The toxic effect of organic and chemical fertilizers on earthworms was studied by simple contact paper method. The micronutrients and macronutrients are higher in organic fertilizers applied to soil. The population density of earthworm is higher in organic fertilizer applied soil, chemical fertilizer are toxic to earthworm.

Keywords : soil; macronutrient; macronutrient; fertilizer; earthworm

**ANTIBACTERIAL EFFECTS OF *Tridax procumbens*,
Azadirachta indica, *Plectranthus amboinicus* AND
ANTIBIOTICS ON DIABETIC FOOT INFECTION
PATHOGENS.**

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ABSTRACT

Antibacterial resistance is a pressing issue in the medical field, leading scientists to explore alternative treatments for bacterial infections. With the prevalence of diabetic foot infections caused by bacteria, the search for alternative treatments have become even more critical. This study aims to evaluate the antibacterial efficiency of *Tridax procumbens*, *Azadirachta indica*, *Plectranthus amboinicus* and antibiotics on *E.coli* and *S.aureus* isolated from diabetic foot infections. Ethanol extracts of the selected plant materials were prepared and the antibacterial efficiency test was carried out with agar well diffusion method. Results showed that all the plants extracts exhibited antibacterial activity against the isolates, where the antibacterial activity of *Azadirachta indica* and *Tridax procumbens* against the Diabetic foot infection pathogens *S.aureus* and *E.coli* is 1.5cm and that of *Plectranthus amboinicus* is 1.25 cm. A Comparison of the effects of these selected plant extracts and antibiotics on the bacterial isolates using one-way ANOVA showed the effects of *Tridax procumbens* and *Azadirachta indica* extracts does not differ significantly from the antibiotic Ceftriaxone as p value >0.05 while that of *Plectranthus amboinicus* differ from that of Ceftriaxone. Meanwhile the effect of all the three plants extracts and Magnus forte differ significantly. This shows that *Tridax procumbens* and *Azadirachta indica* could become a promising natural antibacterial agent. In future studies the synergistic interaction between these two plants may yield a potent antibacterial effect surpassing that of conventional antibiotics.

Keywords: *Tridax procumbens*, *Azadirachta indica*, *Plectranthus amboinicus* Antibiotic resistance, Antibiotics, Diabetic foot infection bacteria.

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ODONATE DIVERSITY ALONG FOUR
MAJOR CHECK DAMS IN MEENACHIL
RIVER, KERALA

ABSTRACT

Key words: *Anisoptera*, *Zygoptera*, *Abundance*, *Diversity*, *water quality*

Order Odonata comprising the dragonflies and damselflies. The study was conducted in order to study Odonata diversity along check dams of Meenachil river, Kottayam, Kerala. Check dams such as Perunilam check dam, Elakkayam check dam, Kalariyammackal check dam, Kattachira check dams were selected for study. The study was conducted in the period of 6 months from November 2022 to April 2023. A total of 34 species were obtained, out of which 19 species belong to Suborder Anisoptera and 15 species belong to Suborder Zygoptera. Out of 19 species, 18 species belong to family Libellulidae and are the most diverse forms and only 1 species belong to family Gomphidae. In Zygoptera, Out of 15 species, 8 species belong to family Coenagrionidae, 2 species belong to family Chlorocyphidae and 1 species were found in family Protoneuridae. Simpson's diversity index was higher in Kattachira check dam (0.96385). Physico- chemical and biological parameters such as pH, Conductivity, Hardness, Acidity, Alkalinity, Salinity, Dissolved oxygen, Phosphate, Nitrate, MPN count, FC count, and amount of *E coli* were analysed. Most of them were in desirable ranges even though site specific variations were seen. Most of the parameters were positively correlated with diversity shows that there is higher diversity and habitat is good and healthy. Odonata diversity along the selected check dams of Meenachil river is stable and safe

**INSECTICIDAL EFFECTS OF SELECTED PLANT
EXTRACTS ON THIRD INSTAR LARVAE OF
*Oryctes rhinoceros***

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ABSTARCT

Oryctes rhinoceros or Rhinoceros beetle play a major role in damaging the agricultural crops. It can be controlled by applying chemical pesticides and pheromones such as ethyl-4-methyloctanoate. Environmental pollution is caused by the use of synthetic pesticides and chemicals. This study aims to evaluate the insecticidal effects of selected plant extracts on third instar larvae of *Oryctes rhinoceros*. Leaves of medicinal plants like *Biophytum sensitivum*, *Murraya koenigii*, *Carica papaya*, *Ocimum tenuiflorum*, *Plectranthus ambionicus*, *Piper nigrum* and *Azadirachta indica* were used for prepare 5%, 10% and 15 % concentrations of extract. Three larvae of *Oryctes rhinoceros* 3rd instar were introduced into each concentration of extract for 10 days. Results showed that the third instar larvae in *Biophytum sensitivum* and *Murraya koenigii* plant extracts was no changes in its 5%, 10% and 15% concentrations. Leaf extract of *Carica papaya* and *Ocimum tenuiflorum* exhibit slight larvicidal activities against 15% concentration, ie, physical conditions of larvae was bad compare to normal larvae in control beaker. Leaf extracts of *Plectranthus ambionicus* and *Piper nigrum* have larvicidal activity against *Oryctes rhinoceros* beetle larvae. In 10% concentration larvae were physically changed than their normal condition. In 15% concentration, 1 of 3 become died in both extract. Leaf extracts of *Azadirachta indica* have excellent potential as larvicidal agent against *Oryctes rhinoceros* beetle larvae. In 10% concentration, 1 of 3 become died and in 15% concentration 2 larvae become died. This shows that 15% concentration of *Azadirachta indica* plant extract have excellent insecticidal activity against *Oryctes rhinoceros* beetle. Use of this extract to control the coconut and palm trees reduce the damage and also protect environment from chemicals insecticides.

Antimicrobial activity of different plant extracts against selected bacteria

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ABSTRACT

This study was focused on exploring the antimicrobial properties of the plants that are commonly used as traditional medicines. The ethanol extracts of nine medicinal plants were evaluated for activity against medically important microorganisms. The antimicrobial activity was tested by agar well diffusion method in a culture of *Staphylococcus aerus*, *Pseudomonas aeruginosa* and *E. coli*. Nine different plants were selected for the test of antimicrobial activity. The selected plants were *Morinda citrifolia*, *Indigofera tinctoria*, *Eclipta alba*, *Bacopa monnieri*, *Strobilanthes hynaeanus*, *Azadirachta indica*, *Plectranthus amboinicus*, *Lantana camara* and *Saraca indica*. *Eclipta alba*, and *Lantana camara* showed high antimicrobial activity against *pseudomonas aeurginosa*. *Eclipta alba* and *Plectranthus amboinicus* showed high activity in *staphylococcus aerus*. *Azadirachta indica* *Lantana camara* showed high activity in *E. coli*. Some mixed plant extracts showed high synergetic activity than individual plant extract. From the nine extracts, three mixed extract were also prepared. One mixed extract were prepared by *I. tinctoria* and *S. hynaeamus*. Second mixed extract were prepared from *P. amboinicus* and *B. monnieri* and Other mixed extract were prepared by *A. Indica* and *L.camara*. The synergistic activity from first and plant extract is high in *S. aerus* and third mixed extract showed high against *E. coli*. Combinations of different plants elicit several advantages including enhancing the effectiveness of other antimicrobial agents, reduction in dosage, fewer side effects, better synergistic effect, attack of multiple target sites, reduced risk, and exhibition of potent and rapid antibacterial effects against pathogens.

Key words : Antimicrobial activity, plant extract, bacteria, zone of inhibition and synergism.

**STUDY OF PROTEIN CONCENTRATION IN
FRESH, SUN-DRIED AND OVEN – DRIED FISH
SPECIES.**

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ABSTRACT

The aim of the present study was to assess and compare the nutritional quality of fresh, sun dried and oven dried fishes. Seven fish species (*Stolephorus indicus*, *Lactarius lactarius*, *Nemipterus japonicus*, *Rastrelliger kanagurta*, *Sphyraena jello*, *Sardinella longiceps*, *Cynoglossus macrostomus*) were collected from different fish markets of (palai, kidangoor & Eetumanoor) of kottayam district. All species were processed and dried by the sun rays and in the oven (105°C) for different hours depending on the different species. Then the protein analysis were done by using standard Lowrys method. The highest protein content was found in oven dried *N. japonicus* (48.095%) and the lowest was found in unprocessed (fresh) flesh of *S.indicus* (11.28%).

Key words – *Stolephorus indicus*, *Lactarius lactarius*, *Nemipterus japonicus*, *Rastrelliger kanagurta*, *Sphyraena jello*, *Sardinella longiceps*, *Cynoglossus macrostomus*, sun -drying, oven- drying, colorimeter, optical density.

**ICHTHYOFAUNAL DIVERSITY AND PHYSICO-
CHEMICAL ANALYSIS OF WATER IN THE MIDDLE
STRETCH OF VEMBANAD LAKE**

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ABSTRACT

The status of finfish and shellfish diversity and monthly variation in their distribution and abundance were investigated in the middle stretch of Vembanad Lake at 4 selected sites in Kerala. The study was carried out for a period of 7 months from December 2022 to June 2023. In total 31 species of finfishes and shellfishes belongs to 8 orders, 23 families and 29 genera were recorded from the study areas. Calculated values of Biodiversity indices were Shannon Weiner diversity index highest at Vaikom site 3 (3.4022), Simpson diversity index highest at Manakunnam (0.9538), Margalef's richness index highest at Manakunnam (4.346) and Pielou's evenness index highest at Thaneermukkom (0.8573). *Etroplus suratensis* and *Villorita cyprinoides* were the most abundant species from all the four study sites. Three species are under the category of threatened they are *Oreochromis mossambicus*, *Horobagrus brachysoma* and *Hyporhamphus xanthopterus*. The result of the present study indicates that Northern part of Thaneermukkom barrage is endowed rich edible fish fauna. The physicochemical parameters of water were analysed during pre-monsoon and monsoon period. Salinity was higher on the Northern side of barrage. During pre-monsoon period temperature, EC, TDS, alkalinity and salinity were high and during monsoon period hardness, DO, BOD, Phosphate and Nitrate were high when compared with pre-monsoon but all are within the recommended limit.

Keywords: Vembanad Lake ; Finfish ; Shellfish ; Biodiversity indices; Physicochemical analysis.

Repellent potential of herbal extracts and chemicals against insects

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ABSTRACT

In the present study, 'Repellent potential of herbal extracts and chemicals against insects', five synthetic chemicals and parts of eleven herbal indigenous plants (leaves, rhizome and fruit) in the form of extracts and powders were tested against five household insects (*Luprops tristis* (Mupli beetle), *Drosophila melanogaster* (Common Fruit fly), *Camponotus atriceps* (Carpenter ant), *Periplanata americana* (American cockroach) and *Coptotermes formosanus* (Formosan subterranean termite)). Chemical insecticides protect us from insects, but they also have major negative effects due to the dangerous compounds they contain. Indigenous herbal extracts and powders are potent insect control agents, which are non-toxic and environmentally friendly. Efficiency of selected chemicals and indigenous plant extracts and powders were different in the different insects selected for study. Khatnil was more effective in four of the five insects selected (*Periplanata americana*, *Drosophila melanogaster*, *Luprops tristis* and *Coptotermes formosanus*) and KoshaaFen was least effective in three of the five insects selected (*Coptotermes formosanus*, *Periplanata americana* and *Camponotus atriceps*). Extracts of *Citrus limon* was observed to be most effective in controlling *Drosophila melanogaster*. *Camponotus atriceps* revealed maximum percentage repellency towards extracts of *Glycosmis pentaphylla*, while *Coptotermes formosanus* showed highest mortality towards extracts of *Mentha spicata* and *Chrysopogon zizanioides*. *Periplanata americana* have highest percentage repellency towards *Lantana Camara*. The selected herbal extracts was not effective in controlling *Luprops tristis*. As the dose and time of exposure increased the efficiency also increased. Natural repellents may be less effective than synthetic chemicals in controlling insects but is more safe and eco- friendly. So, such plant extracts and powders can be used to control insect population.

Keywords: Repellents, extract, exposure, Dose, Eco- friendly