

Annual Report

2023-2024



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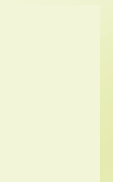
TWENTIETH ANNUAL REPORT
(2023-2024)



TIES – ties Mind and Nature

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Preface

As TIES embarks on its journey into the illustrious milestone of two decades, we find ourselves amidst a sea of change, guided by the gentle hum of honey bees. This year, we unfurled our sails in a new direction with the broadening of the "Bees for Life" project, an endeavor dedicated to sustainable apiculture, empowering marginal farmers while fostering the production of pure honey.

Yet, the shadow of the Covid-19 pandemic loomed large, casting its veil over many of our endeavors and challenging the very fabric of our progress. Nevertheless, in the face of adversity, we persevered, unwavering in our commitment to our mission.

Amidst these trials, we found cause for celebration as we achieved the prestigious ISO certification, a testament to our unwavering dedication to excellence. Additionally, our collaborations with esteemed educational institutions bore fruit, with initiatives ranging from green audits to biodiversity surveys, enriching both our organization and the communities we serve.

In a moment of profound pride, we witnessed one of our own doctoral students reach the culmination of her academic journey, a testament to the spirit of inquiry and scholarship that defines our organization.

To our esteemed board members and cherished well-wishers, we extend our deepest gratitude for your unwavering support and collaboration. With hearts full of gratitude and anticipation, we present the 20th annual report, a testament to our collective resilience and determination.

Together, let us embark on the next chapter of our journey, guided by the principles of sustainability, compassion, and community.

1. RESEARCH AND DEVELOPMENT

TIES have a full-fledged research wing on related issues to different environmental issues. Several study reports have been already published in this regard. Moreover, the extension and education wing of the institution regularly conduct trainings and workshops on several areas for various stake holder groups. Moreover, various projects on conservation of plants, amphibians, butterflies, odonates, birds and mammals are being regularly conducted by TIES conservationists' team.



A. TIES-OWN PROJECTS

I. BEES FOR LIFE

Bees For Life- a sustainable apiculture programme of TIES, is one of the flagship projects of TIES. The project focuses on providing livelihood support, ecosystem services, and guaranteed pure honey. Currently, TIES supports 11 beneficiaries and maintains 140 beehive boxes. Additionally, over 50 bee colonies have been distributed to 10 farmers. To ensure the project's sustainability, the project team conducts continuous monitoring and provides regular training sessions.



Fig 1. Weekly maintenance and feeding of bee colonies

II. KOTTAYAM COLLECTORATE BUTTERFLY GARDEN

It is one of the exemplary project of TIES in the civil station campus of Kottayam district. It was created and is also maintained by TIES. Host and nectarine plants are placed inside the garden for the butterflies. Signages are also placed in the garden showing scientific name, common name and vernacular names of host, nectarine plants and common butterflies. Regular cleaning and weeding out is down under the aegis of TIES every month.



Fig 2. Kottayam Collectorate Butterfly Garden

B. GOVERNMENT PROJECTS

I. FIELD SURVEY TO IDENTIFY POTENTIAL SAND MINING STRETCHES (KADAVUS) AND ESTIMATION OF AVAILABLE SAND VOLUMES THROUGH FIELD/CROSS-SECTION SURVEY IN VARIOUS RIVERS OF KERALA STATE

CSIR-NIIST

CSIR-NIIST has entrusted TIES to conduct the sand auditing of 17 rivers flowing through 10 districts in Kerala to identify potential sand mining stretches (*Kadavus*) and estimation of available sand volume through field/ cross-section survey. As part of this survey was conducted at Pathanamthitta, Kottayam, Ernakulam, Idukki, Thrissur, Palakkad, Malappuram, Kozhikode, Kannur and Kasargode. Approximately 251 km has surveyed as part of this. Bharathapuzha, Chaliyar, Kadalundi, Mahe, Valappattanam, Sreekandapuram, Perumba, Chandragiri, Mogral, Shiriya, Yalkana, Uppala, Achankovil, Pamba, Manimala, Muvattupuzha and Periyar were the rivers surveyed and reports were submitted.



Fig 3. Field Survey- Sand Auditing

II. PAARISTHITHIKAM- MANIMALA RIVER: FLOOD DISASTER MANAGEMENT & SUSTAINABLE LAND USAGE COMMUNITY TRAINING PROGRAMME

DIRECTORATE OF ENVIRONMENT AND CLIMATE CHANGE

As part of Paaristhithikam 2021-2022, a project was initiated by TIES which is aimed at studying the impact of flood disasters in Manimala River basin and developing a disaster management plan based on sustainable land use practices. Structured survey sheets explore the knowledge including traditional knowledge, practices, and community experiences connected with the Manimala River. As part of this a training were given to school students in order to conduct a community-level survey in addition to this, community-level meeting were also arranged to gather the views and experiences of the riverine community. Furthermore, with the help of school students, public and LSG members, riparian plants were planted along the river at several locations and students were entrusted for its continuous monitoring and fertilization .

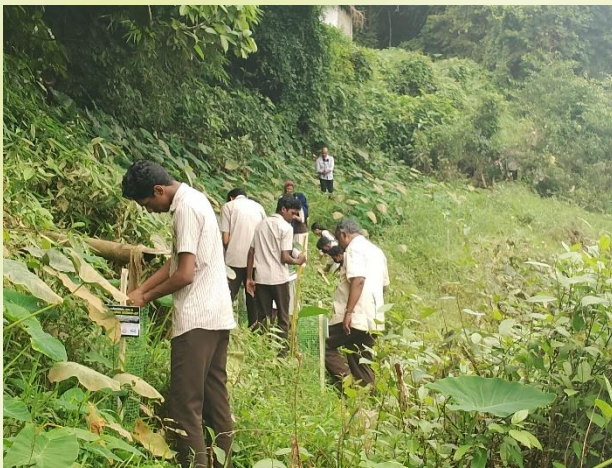


Fig 4. Paaristhithikam riparian tree planting, workshops and surveys

C. OTHER

I. INDIAN SNAKE BITE INITIATIVE

Crowd Funding

In partnership with Indiansnakes.org, TIES has initiated a program to mitigate casualties from snake bites in rural districts of Madhya Pradesh and Chhattisgarh. Support is provided to hospitals in the form of Anti-venom provision, community education and outreach programmes. It is the pioneering project on mitigating the issue on the country that encounter 50,000 snake bites every year.

In the previous TIES distributed snake rescue kits to 25 trained and certified snake rescuers at Kottayam and Idukki districts in Kerala, and thus they have rescued above 500 snakes from various locations including residential areas, uninhabited regions, commercial buildings, schools, and colleges . Among the species we've rescued are the majestic Indian Rock Python, the iconic Spectacled Cobra, the stealthy Common Krait, the elusive Wolf Snake, and the graceful Rat Snake. The professional kit constituted recuse carry case, hooks (large and small), cotton bags, bagger frame.



Fig 5. Snake Rescue Kit Distribution

D. GRANTS

I. DEVELOPING AN ORCHID LIBRARY AND INFORMATION CENTRE: CAPACITY BUILDING AT TIES-KOTTAYAM

New Hampshire Orchid Society, Manchester

An international grant from New Hampshire Orchid Society (NHOS) was received to TIES. The grant was received under the category Conservation Grant. The project was aimed to create a first-time orchid reference and information centre in an organization in the state. Due to the Covid pandemic restrictions the first phase was focused to set up a library and information centre for orchid research and conservation. As part of that relevant books on Orchids were procured. Along with books scientific papers, thesis, dissertations, etc., also availed. An orchid library was setup in the Institute along with an e-library (<https://ties.org.in/ORCHID-LIBRARY>). An orchid field guide was prepared and some native orchid species were planted in the campus along with name boards. Congratulations are due to Dr. Jis Sebastian, Principal Investigator of the project for the successful implementation of the project activities.



Fig 6. Interns with orchid field guides

II. PROTECTION OF FRESHWATER ECOSYSTEMS FOR THE CONSERVATION OF THRETNED SPECIES IN MUNNAR, WESTERN GHATS, INDIA

Fondation Segré Conservation Action Fund, Conservation Action Grants, IUCN

The primary aim of the Fondation Segré Conservation Action Fund is to support conservation and research initiatives, with the overarching objective of enhancing the status of globally endangered animal species and their habitats. This effort is implemented through IUCN Save Our Species. TIES has been awarded this fund to safeguard threatened species in Munnar by focusing on the preservation of freshwater ecosystems. The project entails various activities such as field assessments and monitoring of species within the Territorial Division (Munnar), raising community awareness, conducting water quality assessments, implementing pollution reduction measures through improved waste management practices, and enhancing water services for the benefit of local communities. Seasonal surveys will be conducted to study odonates and fishes, alongside regular water quality monitoring. Community involvement, particularly among tribal and plantation workers, will be fostered through awareness campaigns, workshops, and the provision of eco-friendly sanitation facilities. Over the course of 12 months, the project aims to evaluate biodiversity, raise community



awareness about conservation, and ensure active stakeholder engagement for long-term sustainability.

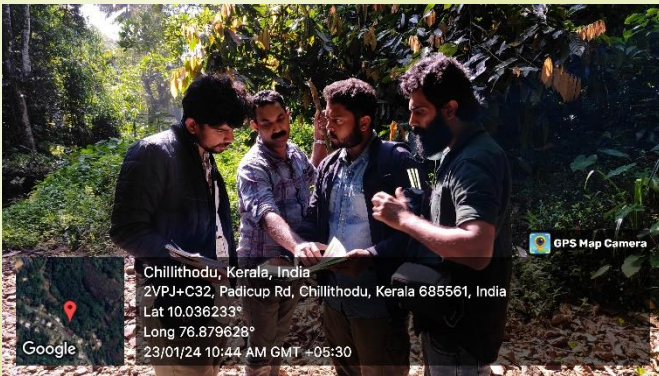


Fig 7. Field study and sample collection

III. PERFORMANCE STUDY OF THE BOMA BIOSAND WATER FILTER

Samaritans Purse Canada, New Life Power Gospel Ministries, University of Calgary, Gordon College

This collaborative project aimed to rebuild a working model of the Boma Bio-sand Filter (BSF) according to recommended specifications and to conduct a comparative performance study incorporating Moringa-based enhanced adsorption. In partnership with TIES, six BSF units were installed following the BOMA Bio-sand Filter Assembly Manual (Samaritan’s Purse, Canada, December 2009) to improve water quality in community and institutional settings. One filter was installed on the TIES campus, with five additional units in community areas. Key objectives included assessing the feasibility of using locally available materials for construction and evaluating maintenance factors, such as biolayer cleaning and ease of daily use. In addition to qualitative data collection, a comprehensive cost analysis was conducted to determine economic feasibility. Water quality testing compared BSF-treated water with control samples, evaluating turbidity, pH, conductivity, and coliform levels to assess filter effectiveness. Furthermore, three BSF units were modified with *Moringa oleifera* to examine potential enhancements in filtration efficiency. This study provided valuable insights into the practical applications and impact of BSF technology within the local context.



Fig 8. Installed BSF’s

1. TRTP- STUDENT PROJECTS

a. "Phytochemical Screening and Antimicrobial Activity Evaluation of Different Parts of *Ocimum tenuiflorum*".

Athulya V. S, B. Sc. Biotechnology and Botany, Submitted to Department of Biotechnology, St. Berchmans College, Changanacherry, Kottayam.

Plants have been sources of medicinal agents since humanity's earliest days. Natural products were once the source of all drugs. *Ocimum tenuiflorum*, also called *Ocimum sanctum* or Tulsi, belongs to the Lamiaceae family. Tulsi contains key chemical constituents such as oleanolic acid, ursolic acid, rosmarinic acid, eugenol, carvacrol, linalool, and β -caryophyllene. These compounds have long been used in food products, perfumery, and dental and oral products.

The aim of this project was to examine the phytochemical screening and antimicrobial properties of different parts of *Ocimum tenuiflorum*. Acetone was used to prepare the extract. The results of the phytochemical screening showed the presence of bioactive components such as tannins, saponins, flavonoids, alkaloids, proteins, quinones, coumarins and phenolic compounds. terpenoids and anthocyanin were absent. The antibacterial and antifungal activity of extract against four bacterial species, *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas sp.*, and *Bacillus sp.*, and two fungal species, *Aspergillus niger* and *Penicillium sp.* were carried out by agar well diffusion method and agar disc diffusion method respectively. The results revealed that among the bacteria *Staphylococcus aureus* exhibited highest susceptibility to the extract and in Fungi it is *Penicillium sp.* The results confirm validity of the use of *Ocimum sp.* as medicine in ancient medicinal traditions and suggest that some of the plant extracts possess compounds with antimicrobial properties that can be used as antimicrobial agents in new drugs for the therapy of infectious diseases caused by pathogens.

Key words: Phytochemical Screening, Antimicrobial Activity, *Ocimum tenuiflorum*, Bioactive Compounds, Therapeutic Potential.

b. "Antimicrobial activity and phytochemical screening of *Aerva lanata* and *Coleus amboinicus* in different solvent systems".

R Sivalakshmi, Ancy Rajan, B. Sc. Biotechnology and Botany, C M S College, Kottayam.

Medicinal plants have long been used in traditional medicine systems worldwide due to their therapeutic properties. In recent years, there has been a resurgence of interest in exploring plant-based compounds as potential sources of new antimicrobial agents, especially in the face of rising antibiotic resistance. *Aerva lanata* and *Coleus amboinicus* are two such plants that have been traditionally used in various cultures for their medicinal properties. This research aims to contribute to the growing body of knowledge on plant-based antimicrobial agents and highlight the significance of selecting appropriate solvents for extracting active constituents. The antimicrobial properties of these plants were evaluated against various bacterial and fungal strains to identify their efficacy in different solvent extracts. Additionally, a comprehensive phytochemical analysis was conducted to determine the presence of bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and terpenoids. The extracts were obtained from the

samples in two solvents which are isopropyl alcohol and distilled water using soxhlet method. The antibacterial and antifungal activity of extract against four bacterial species, *Escherichia coli*, *Streptococcus aureus*, *Pseudomonas sp.*, and *Bacillus sp.* and two fungal species, *Aspergillus niger* and *Penicillium sp.* were carried out by agar well diffusion method and agar disc diffusion method respectively. The aqueous extract of both plants had stronger inhibition against *Bacillus* and *Streptococcus*, the isopropyl extract shows higher inhibition against *E. coli* and *Pseudomonas*. Qualitative phytochemical analysis demonstrated the presence of alkaloids and flavonoids along with carbohydrates and proteins in both plants tested.

Key words: Phytochemical Screening, Antimicrobial Activity, Bioactive Compounds, Therapeutic Potential, Solvent Extraction, Ethanolic Extracts.

c. “A Comparison between Fungal Endophytic Microflora of two species of Malvaceae Family”.

Joshin James Babu, B. Sc. Microbiology, P G M College, Kangazha, Kottayam.

A study was conducted to isolate and identify fungi from *Hibiscus rosa-sinensis* and *Sida rhombifolia*, resulting in the identification of five fungal species based on cultural, morphological, and microscopic observations. *Aspergillus spp.* was the predominant fungal isolate in both plant species, with other isolates including *Fusarium oxysporum* and *Penicillium sp.*. Plant Growth-Promoting (PGP) traits were analyzed, focusing on phosphate solubilization efficiency, siderophore production, indole acetic acid production, and gibberellic acid production. The results of the PGP trait analysis were promising, with all isolates exhibiting phosphate solubilization activity. *Aspergillus flavus* demonstrated the highest siderophore production, while *Fusarium oxysporum* showed the least. Indole acetic acid production was highest in *Fusarium oxysporum* and lowest in *Aspergillus terreus*. *Aspergillus niger* exhibited the highest gibberellic acid production, whereas *Fusarium oxysporum* showed the least. Further research is needed to evaluate the effectiveness of these fungal isolates under field conditions and to explore their potential applications in sustainable agriculture.

Key words: Fungi isolation, Plant Growth-Promoting (PGP) traits, Sustainable agriculture.

d. “Isolation of pigment producing microorganisms, qualitative assessments of their pigments and evaluation of synthetic dye degradation”.

Anjana P S, M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam.

This study focuses on the isolation and characterization of pigment-producing bacteria from various soil samples, their pigment production, and their potential for degrading synthetic dyes. Through morphological and biochemical analyses, the isolated pigment-producing microorganisms were identified as *Staphylococcus sp.*, *Pseudomonas sp.*, and *Bacillus sp.* The research highlights the use of biological methods for dye degradation, which offer a safe, economical, and eco-friendly alternative to physical and chemical methods. The bacterial strains, particularly those isolated from dye-contaminated soil, demonstrated significant dye degradation capabilities. *Staphylococcus* and *Bacillus sp.* exhibited zones of inhibition against Bromophenol Blue and Congo Red, indicating their effectiveness in degrading contaminants. These findings

underscore the potential of microbial degradation as a viable alternative for the biodegradation of synthetic dyes.

Keywords: Pigment-Producing Bacteria, Dye Degradation, Synthetic Dyes, Biodegradation, Dye-Contaminated Soil, Microbial Degradation.

e. “A Comparative study on Carbon sequestration potential and soil quality assessment of monocrop plantation and mixed crop plantation”.

Diyamol, M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam.

The increase in atmospheric CO₂ concentration in recent years has led to a growing interest in understanding the potential of carbon sequestration in different ecosystems. This study aimed to understand and compare the carbon sequestration potential and soil quality of monocrop plantation and mixed crop plantation. This study was conducted in Velloor is a small area in Pampady, Kottayam. Two sites were selected for the study namely Monocrop plantation and mixed crop plantation. The study reveals that mixed crop plantation has much Carbon sequestration potential than the monocrop plantation. Total carbon stock of the monocrop plantation is 26.06 Mg C/ha which is equivalent to 95.65 Mg CO₂/ha and Total carbon stock of the mixed crop plantation is 52.84 Mg C/ha which is equivalent to 193.92 Mg CO₂/ha. From this study it is understood that the trees with higher biomass have more carbon stock and carbon sequestration potential. The woody plants have more carbon sequestration potential than others as, they store more carbon in their woody biomass. There was a significant positive relation between the free DBH and CO₂ sequestration. Of the crops selected for the study Wild Jack has more carbon sequestration potential followed by Jack-fruit, Rubber and Coconut due to the increasing of biomass and the DBH. The study also reveals that the Soil quality of monocrop plantation is better than mixed crop plantation due to various reasons.

Key words: Carbon Sequestration, Soil Quality, Monocrop plantation, Mixed crop plantation.

f. “A Study on biodegradation of synthetic plastic by bacteria”.

Reshma Koshy, M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam.

Plastic wastes accumulating in the environment are posing an ever-increasing ecological threat. Microbes can eliminate harmful plastics from the ecosystem, because of their degradation potential, so biodegradation is an effective solution to plastic pollution. In this study, the biodegradation of plastic disc by bacteria was analyzed using pre-weighing method. For this, soil sample from dump yard was taken. The microbial species found associated with the soil sample were nine gram positive bacteria and one gram negative bacteria. They were identified as *Bacillus sp.*, *Paenibacillus alvei*, *Micrococcus sp.*, *Staphylococcus aureus* and *Pseudomonas sp.*. The efficacy of *Bacillus sp.* and *Staphylococcus aureus* in degrading plastics within 15 days were analyzed, among the selected bacteria, *Bacillus sp.*1 degraded plastic by 0.76 % within 15 days, compared to *Staphylococcus aureus* which does not degraded the plastic disc within 15 days. This work reveals that *Bacillus sp.* has the potential to degrade plastics and could be used as plastic degrading microorganisms.

Keywords: Plastic, Biodegradation, Bacteria, Pre-weighing method.

g. “Identification and Risk Assessment of biofilm associated Bacteria in Drinking Water Distribution Systems”.

Maneesha K T, M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam.

A biofilm is a biologically active matrix attached to the surface of cells and their extracellular products. As they are a mixture of many microorganisms, the microbiological activity of biofilms varies according to their position in the aggregate. With particular emphasis on drinking water distribution systems, this review focuses on the process of biofilm formation, associated pathogenic bacteria and their risk. This study provides an overview of the formation of biofilm, structure, role in microbial communities, diversity of bacteria presented. This study will also discuss the potential health risk concern that arises when certain microbes and their products become a component of the distribution system biofilm. For this study biofilm samples were collected from the consumer end of the 10 taps and 5 filters. The results showed that the presents of *Escherichia coli*, *Enterobacter aerogenes* followed by *Klebsiella pneumonia*, *Aeromonas sp.*, *Micrococcus sp.*, *Staphylococcus sp.*, *Proteus mirabilis*, *Pseudomonas aeruginosa* and *Vibrio sp.* in the collected samples. Most of the bacterial species were identified are pathogenic and they all are disease causing microbes. Majority of the water samples were contaminated in terms of coliforms. Biofilm by bacterial strains indicated that water distribution network might be colonized by potential human pathogens. From this study, it is understood that biofilms and many pathogenic bacteria are present not only at the consumer end of DWD taps but also at the consumer end of water purifiers. The effects of exposure to pathogenic organisms are not the same for all populations. Frequent exposure to a pathogen may be related with a lower possibility of illness due to the effects of acquired immunity. These findings may help the authorities to design and implement effective strategies for controlling biofilms and ensuring the supply of safe drinking water to the community.

Keywords: Biofilms, Drinking Water Distribution Systems, Water Contamination, Public Health Risk, Water Quality Control, Pathogen Exposure, Water Safety.

h. “A comparative study on phytoremediation of greywater using lemongrass and Vetiver with reference to drinking water”.

Alphia S, M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam.

Greywater is the wastewater generated from household activities like bathing, showering, sinks, and washing machines, excluding toilet waste which can be reused for irrigation and other non-potable purposes after proper treatment. Reusing greywater can help conserve water resources and reduce the amount of wastewater entering sewage systems. In this study, a comparative study on phytoremediation of greywater using lemongrass and vetiver was conducted thereby determining the efficiency of the selected plant materials in water treatment. For this, two kitchen sink samples and two drinking water (ground water) samples were collected. Collected samples treated using filters containing lemongrass and vetiver. The parameter analysis of samples before and after treatment were carried out. The concentration of pH, electrical conductivity, total dissolved solids, total acidity, total alkalinity, total hardness, calcium and magnesium content are

reduced. As per the values obtained, we can say that vetiver has better efficiency in removal of calcium hardness and total hardness. On comparing with removal efficiency values of samples treated with vetiver, better result was found in case of physical and chemical parameters. In case of pH better result were shown by samples treated with lemongrass. Both lemongrass and vetiver was found to be ineffective in removal of microbial parameters such as MPN, FC and E. coli. From the results, we can say that vetiver better efficiency than lemongrass in removal of contaminants.

Keywords: Greywater, Phytoremediation, Vetiver, Lemongrass, Water Treatment, Environmental Sustainability.

i. “A Study on Fungal diversity of plastic contaminated soil”.

Sreelakshmi M P, M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam.

Fungi play an important role in the microbial ecology of soil. The majority of fungal species degrade lignin and hard-to-digest soil organic matter; however, during this process, some fungi consume simple sugars for their metabolism. Fungi grow dominantly in low pH or moderately acidic soils wherein the soils tend to be undisturbed. Fungi break down the complex organic substances to simple sugars and make it available to different types of microorganisms. They also decompose dead organic matter and make the residues into usable products. Almost 90% of all plants form symbiotic mycorrhizae fungi interactions by forming hyphae networks. The hyphae assist the plant root hairs in acquiring nitrogen, phosphorus, micronutrients, and water in exchange for utilizable sugars produced by the plant. The study of soil microbial diversity can never be separated from the presence of soil fungi. Fungi have filamentous bodies called hyphae that interact directly with materials in the soil, including plant roots. In soil, fungal diversity performs essential roles related to water dynamics, nutrient cycling, and disease suppression. Fungi in the soil contribute as mycorrhizae, promoter growth, and keep soil moisture. Plastic has become established over the world as an essential basic need for our daily life. Current global plastic production exceeds 300 million tons annually. Plastics have many characteristics such as low production costs, inertness, relatively low weight, and durability. The primary disadvantage of plastics is their extremely slow natural degradation. The latter results in an accumulation of plastic waste in nature. The amount of plastic waste as of 2015 was 6300 million tons worldwide, and 79% of this was placed in landfills or left in the natural environment. Moreover, recent estimates report that 12,000 million tons of plastic waste will have been accumulated on the earth by 2050. Therefore the soil samples were collected from different plastic contaminated sites such as dumping yard, river and beach soil. In this study soil fungus were isolated using sabouraud dextrose agar medium and then it is identified using lactophenol cotton blue stain (LPCB). Major soil fungus was identified from these samples are *Fusarium sp.*, *Aspergillus flavus*, *Aspergillus unilateralis*, *Penicillium sp.*, *Aspergillus nidulans*, *Aspergillus fumigatus*, and *Aspergillus niger*.

Keywords: Soil fungi, Plastic, Microbial Ecology, Symbiotic Mycorrhizae, Water Dynamics, Dumping Yard Soil, Environmental Sustainability.

j. “Comparative study between the soils of Monoculture and Mixed Crop Farming”.

Abdul Razaq, M. Sc. Botany, M.E.S Kalladi College, Mannarkkad, Palakkad.

Agricultural practices have impact on soil health, which in turn influences crop productivity and environmental sustainability. Monoculture, characterized by the repeated cultivation of a single crop, has been a dominant farming practice due to its straightforward management and potential for high yields. However, this method often leads to several adverse effects on soil properties, including nutrient depletion, reduced organic matter, and increased susceptibility to soil erosion and pests. Mixed cropping, presents an alternative approach by cultivating multiple crop species together. This method is believed to enhance soil fertility and structure, promote biodiversity, and improve the resilience of cropping systems. The interaction between different plant species can lead to more efficient nutrient utilization, natural pest suppression, and improved soil microbial activity. This comparative study focuses on evaluating the differences in soil health between monoculture and mixed cropping systems. Soil samples were collected from four different sites, two from monoculture fields and two from mixed cropping fields By Random sampling. Various physical and chemical parameters were analyzed to assess the impact of these agricultural practices on soil quality. The results revealed that mixed cropping soils exhibited higher organic carbon content (1.6%) compared to monoculture soils. Additionally, the average pH for mixed cropping soils was 6.80, while monoculture soils had an average pH of 6.16. Mixed cropping soils also had higher organic matter (5.75%), available phosphorus concentration (0.334 mg/kg), electrical conductivity, and nitrogen content (4.25 mg/kg) compared to monoculture soils. These findings suggest that mixed cropping systems promote better soil health and fertility, highlighting their potential importance for sustainable agricultural practices.

Keywords: Soil health, Crop productivity, Soil erosion, Monoculture, Mixed cropping, Soil microbial activity, Sustainable agricultural practices.

k. "Evaluation of antibacterial activity and antioxidant capacity of *Azadirachta indica*, *Gliricidia sepium* and *Mimosa pudica* extracts against pathogenic bacteria".

Avani N K, M. Sc. Zoology, K. G. College, Pampady, Kottayam.

l. "Physico-chemical and microbial analysis of honey and its antibacterial activity".

Navya K.P, M. Sc. Zoology, K. G. College, Pampady, Kottayam.

2. ENVIRONMENTAL EDUCATION & OUTREACH

Environmental education division of TIES facilitates long term and short-term academic courses, naturalist courses and school/college projects. TIES has published various books, field guides, booklets, pamphlets etc. on different species and environmental causes. Naturalist courses offer specialized and certified trainings to equip passionate people with scientific skills of nature studies and education.



A. PH.D COURSE WORK

Currently, three students are perusing their Ph. D namely S. Sathrumithra, Alex John and Vinod Mathew. In this Sathrumithra has completed his research works and currently carrying out his data analysis and thesis writing. Rest has submitted their thesis and the final viva voce was also completed.



Fig 9. Pre Ph D Presentation of Mr Alex John

B. TIES RESEARCH TRAINING PROGRAM (TRTP)

The prestigious training programme for masters and research students of South Indian and foreign Universities continued during the reporting year too. Four undergraduate students from P G M College, CMS College and St Berchman's College, nine post graduate students from three, has undergone this training. The students were from two universities, Mahatma Gandhi University, Calicut University, respectively.

Table 1: List of student's undergone TRTP training at TIES during 2023-2024.

Sl. No.	Student Name	Topic	Course and College
1	Athulya V. S	Phytochemical Screening and Antimicrobial Activity Evaluation of Different Parts of <i>Ocimum tenuiflorum</i>	<i>B. Sc. Biotechnology and Botany</i> St. Berchmans College, Changanacherry, Kottayam.
2	R Sivalakshmi	Antimicrobial activity and phytochemical screening of <i>Aerva</i>	<i>B. Sc. Biotechnology and Botany</i>

3	<i>Ancy Rajan</i>	<i>Ianata</i> and <i>Coleus amboinicus</i> in different solvent systems	<i>C M S College, Kottayam.</i>
4	<i>Joshin James Babu</i>	A Comparison between Fungal Endophytic Microflora of two species of Malvaceae Family	<i>B. Sc. Microbiology, P G M College, Kangazha, Kottayam.</i>
5	<i>Anjana P S</i>	Isolation of pigment producing microorganisms, qualitative assessments of their pigments and evaluation of synthetic dye degradation	<i>M. Sc. Environment Science and Management, Sree Sankara College, Kalady, Ernakulam</i>
6	<i>Diyamol</i>	A Comparative study on Carbon sequestration potential and soil quality assessment of monocrop plantation and mixed crop plantation	
7	<i>Reshma Koshy</i>	A Study on biodegradation of synthetic plastic by bacteria"	
8	<i>Maneesha K T</i>	Identification and Risk Assessment of biofilm associated Bacteria in Drinking Water Distribution Systems	
9	<i>Alphia S</i>	A comparative study on phytoremediation of greywater using lemongrass and Vetiver with reference to drinking water	
10	<i>Sreelakshmi M P</i>	A Study on Fungal diversity of plastic contaminated soil	
11	<i>Abdul Razaq</i>	Comparative study between the soils of Monoculture and Mixed Crop Farming	<i>M. Sc. Botany, M.E.S Kalladi College, Mannarkkad, Palakkad</i>
12	<i>Avani N K</i>	Evaluation of antibacterial activity and antioxidant capacity of <i>Azadirachta indica</i> , <i>Gliricidia sepium</i> and <i>Mimosa pudica</i> extracts against pathogenic bacteria	<i>M. Sc. Zoology, K. G. College, Pampady, Kottayam</i>
13	<i>Navya K.P</i>	Physico-chemical and microbial analysis of honey and its antibacterial activity	

C. INTERNSHIP

Students during academic benefitted from internship at TIES for varied periods of five days to one month. During the reporting year, 11 students, successfully completed their internship at TIES on various topics of interest.

Table 2: List of intern's undergone training at TIES during 2023-2024.

Sl. No.	Name	Topic	Institution
Academic Interns			
1	Mary Aldima	Testing antimicrobial activity	B. Sc. Zoology, St. Joseph's College for Women, Alappuzha.
2	Meenakshy V		
3	Farhana Shaji		
4	Divya Thadause		
5	Fathimuth Suhra S		
6	Adithya P		
7	Abhaya Sreekumar S S		
8	Dhanusha G Naick		
9	Ashna Sabu		
10	Aravind Sankar	Various Research and education programmes and hand on experience in laboratory procedures.	B. Sc. Biotechnology, Chemistry, Zoology, Christ (Deemed to be University), Bangalore, Karnataka
On-the-job training			
11	Ajohn Abraham	Accounts	B. Com., Girideepam Institute of Advanced Learning, Vadavathoor, Kottayam

D. TIES INTERNSHIP PROGRAMME (TIP)

In order to equip students in sophisticated and deep research TIES started a new programme "TIES Internship Programme (TIP)". This programme aims to give research experience to students those who has completed their bachelor's or master's degree. Interns will get incomparable experience in various microbiological, biochemical, biotechnological and environmental science tools and methods, both lab and field. Along with this they will be provided with experiences in every stages of eco-products preparation- lab to packing.



Fig 10. TIES Internship Programme

Sl. No.	Name	Topic
1	Anjana E S	Various research and education programmes of TIES
2	Balendu Balachandran	
3	Dony Sebastian	
4	Febakutty Varghese	
5	Febin Babu Kuriakose	
6	Geethu Prasannan	
7	Sreelaksmi S	
8	Nandhu Balachandran	
9	Sreelakshmi S	
10	Anjana Elizabeth George	
11	Anusree R	
12	Carolyn Merin Philip	
13	Fathimath Shabna	
14	K H Hazeena Hussain	

15	Miya Rose
16	Arya Shaji
17	Hypha Abdul Jaleel
18	Linda Salin Chacko
19	Mili Mary Joseph
20	Anila Saji
21	Disley Prasandh
22	Janet V J
23	Vijina Vijayan
24	Sangeetha Satheesh

E. COLLEGE- NGO PARTNERSHIP PROGRAM

College NGO Partnership Initiative (CNPI) is a mutually benefitting research cum extension project of TIES, involving students and faculty of affiliated colleges in India. CNPI is basically a student capacity building programme, equipping them to meet the challenges and to evolve a socially and environmentally responsible society and to promote environmental awareness among the community. CNPI helps to inculcate research culture among students and faculty of affiliated colleges to empower colleges to take up social and environmental issues and to develop the right scientific temper and outlook. The technical report submitting after the audit contains the recommendations for improving the energy efficiency, biodiversity, waste management and water usage along with the action plans to reduce resource consumption. CNPI program was inaugurated at Christian College, Chengannur in December, 2016.

This year several colleges has been collaborated with TIES in order to use our expertise in the field of biodiversity conservation, ecosystem studies, waste management, biodiversity surveys, capacity building, etc.

The colleges that signed MoU with us is as follows:

1. Advanced Centre of Environmental Studies and Sustainable Development (ACESSD), MGU, Kottayam
2. Kuriakose Gregorios College, Pampady, Kottayam
3. BAM College, Thuruthicad

F. ISO GREEN AUDIT

This year, TIES achieved the esteemed ISO 17020:2012 certification for conformity assessment and was accredited as an authorized inspection body for performing green audits within educational institutions. As part of this distinguished initiative, TIES conducted an extensive examination at Kuriakose Gregorios College in Pampady, Kottayam. Following the thorough assessment, TIES submitted both a certificate and a comprehensive report. The college emerged successful in completing a rigorous audit process, which scrutinized its Environment Management System (EMS), Energy Management System (EnMS), Water Efficiency Management System (WEMS), Campus Biodiversity Management System (CBMS), Waste Management System (WMS), and Carbon Footprint (CF).



Fig 11. ISO Green Audit at K G College, Pampady

G. ENJOY LEARNING

Enjoy Learning is a customised one-day nature education session designed for school and college students. The sessions include introduction on nature study, medicinal plants, waste management, building walk, research methodology, studying the flora and fauna inside the campus, eco-friendly games, etc. Regardless of Enjoy Learning programme, several other schools and colleges also visited TIES Campus. Enjoy Learning programme was conducted at TIES for the students of :



1. DIET, Pampady
2. Don Bosco HSS, Puthupally
3. BSW Students of BVM Holy Cross College, Cherpunkal.
4. 3rd standard students of Govt L P School, Pirayar.
5. 3rd standard students of Govt L P School, Ayarkunnam.

Fig 12. Enjoy Learning Programme for students conducted at TIES



H. ENJOY LEARNING SKILLS PROGRAMME

Enjoy Learning Skills encompasses a multitude of benefits that extend far beyond the classroom. It enhances academic achievement by engaging students in topics related to nature and biodiversity, which can be applied across all subjects and grades. Enjoy Learning Skills programme was conducted at TIES for the students of :

1. Al Azhar TTI, Thodupuzha: *Introduction to biodiversity, Waste Management and Mushroom Farming Training.*
2. Students of Pallikoodam: *Waste Management, Folk toy making and biodiversity walk*
3. Students of Pallikoodam: *Ornamental Fish Farming*
4. Students of Dept. of Botany, Nirmala College, Muvattupuzha: *Waste Management and Household techniques*
5. NSS Volunteers of DBHSS, Kaavumbaghom: *Apiculture*
6. Students of Pallikoodam: *Ornamental Fish Farming*
7. NSS Volunteers , St Marys College, Manarcad: *Waste Management and Household techniques*
8. B. Sc. Zoology students of St. Teresa's College in Ernakulam: *Apiculture*



Fig 13. Enjoy Learning Skills Programme for students conducted at TIES



I. MEENACHIL RIVER ODONATE SURVEY

The eighth series of the TIES Meenachil Odonate Survey took place on December 9th and 10th, 2023, spanning the Meenachil river basin. Collaborating with the Department of Forests and Wildlife, Kerala (Social Forestry Division), this two-day initiative aimed to monitor and study the dragonflies and damselflies within the basin. The event attracted over 50 participants from various educational and research institutions, with approximately 40 attendees for the survey itself.

Conducted under the guidance of Dr. Punnen Kurian and Dr. Abraham Samuel, the training sessions were designed to acquaint participants with Odonates and survey methodologies. Teams were assigned specific sites, each led by an expert, to conduct population surveys of dragonflies and damselflies. The survey spanned from Adukkam to Pazhukkamalakayal, covering a distance of 27 km and encompassing 12 locations. Each location was manned by 3-8 amateurs alongside a seasoned field expert.

The survey yielded a total of 48 odonate species, comprising 27 dragonflies and 21 damselflies. Noteworthy contributors to the endeavor included Social Forestry Assistant Conservator Sabu Thomas, along with experts such as Dr. Abraham Samuel, Dr. Punnen Kurian, Dr. Nelson Abraham, Manoj P, Sathrumitra, Mohammed Haneefa, Sarath N Babu, and M N Ajayakumar.



Fig 14. Eighth Meenachil Odonate Survey



J. VEMBANAD ODONATE SURVEY

A comprehensive survey of odonates was conducted along the Vembanad lake, spanning a distance of 60km from Vaikom to Chanaganassery and encompassing 13 locations. In the second edition of the TIES Vembanad Odonate survey, a total of 30 species were documented, comprising 19 dragonfly varieties and 11 damselfly varieties.

TIES collaborated with the Social Forestry Division of the Kerala Forest Department for this survey, a continuous effort since 2019.

Dr. Abraham Samuel K, the survey coordinator, emphasized the importance of raising awareness among the younger generation regarding the significance of odonates. The survey, led by Shantry Tom, Ast. Conservator Of Forest, Dr. Punnen Kurian, P Manoj, Ajayakumar MN, Renjith Jacob Mathews, Shawn Paul, Geetha Paul, Vinayan P Nair, Tony Antony, Amrutha V Raghu, Shibi Mosses, Sarath Babu N B, and Anoop Mathews. Participants from various educational institutions and organizations actively took part in the survey.



Fig 15. Second Vembanad Odonate Survey



K. LABORATORY ANALYSIS TRAINING FOR STUDENTS

A hands-on-training in bacteriological analysis of water was given to the final year B. Tech Civil Engineering students of Rajiv Gandhi Institute of Technology (RIT), Govt. Engineering College, Pampady. A total of 70 students attained hands-on training on total coliforms (TCC) analysis of water samples. The session was handled by Dr Punnen Kurian and Neethu Nair M N. The programme is part of academic and research collaboration between TIES and RIT.



Fig 16. Laboratory Analysis Training for RIT Students

L. WORKSHOP ON STUDENT PROJECTS

TIES hosted a workshop on student projects aimed at fostering a strong comprehension of the scientific method among participants. Going beyond project implementation, the workshop delved into the complexities of topic selection and objective establishment, providing students with vital skills. With a total attendance of approximately 265 students across five batches, the workshop effectively engaged a diverse group of learners in enhancing their academic capabilities. The training session was handled by Dr Punnen Kurian, Secretary, TIES. Students from several parts of Kerala attended the training.



Fig 17. Workshop on student project

M. JUNIOR NATURALIST CERTIFICATE COURSE (JNC)

TIES Junior Naturalist Training programme is a programme for children in order to make them passionate naturalists and conservationists. It trains children to watch, observe and identify plants and animals, helps in class room learning, training project mode of study, character moulding and personality development. It also orients towards nature and inculcate the spirit of eco-friendly lifestyles, more health and more vigour, motivate them for a natural heritage, helps to build a career in future. This 15 day camp was attended by 11 students. Dr Punnen Kurian, Dr Abraham Samuel, Dr Nelson P Abraham, Shibi Moses, Manoj P, Jose Louise, Dr C P Shaji, Dr Sajith and Sarath N Babu led the sessions.



Fig 18. Junior Naturalist Certificate Course

N. KOTTAYAM URBAN BIRD SURVEY

On April 22, 2023, TIES successfully carried out the 4th urban bird survey with the participation of approximately 15 individuals. Covering seven key locations including Civil Station Kottayam, Nagampadom Stand, PWD Guest House, CMS College, and Erayil Kadavu, the survey aimed to assess bird populations within the Kottayam town area. Impressively, the team identified a total of 44 bird species, indicating a slight increase compared to previous years' data. Among the notable species spotted during the survey were the White Cheeked Barbet, Purple Heron, and Cotton Pygmy Goose, underscoring the biodiversity within the region.



Fig 19. Kottayam Urban Bird Survey

O. WORKSHOP ON ARSENIC RESEARCH COLLABORATION AND GENERAL SURFACE WATER TREATMENT AND BOMA SAND FILTER (BSF)

TIES, in collaboration with Samaritan's Purse Canada (SPC), launched the BOMA Bio-sand Filter initiative with a three-day workshop held at TIES from May 31 to June 2, 2023. This project addresses the pressing need for safe, affordable water solutions, as domestic water quality in much of India, including Kerala, faces significant challenges. Originally developed in the 1990s by Dr. David Manz from the University of Calgary, the bio-sand filter is a low-cost, locally constructed system shown to effectively reduce bacteria, turbidity, color, odor, and iron by 90-99%. With a simple modification, it can also remove arsenic, making it highly versatile and practical for varied water quality needs. The BOMA Bio-sand Filter, introduced to India for the first time through this project, is tailored for local application and testing.

Commissioned to TIES, the project involves field-testing, evaluating, and standardizing the filter for wider use across Indian states. During the workshop, training sessions were led by Ron Orcajada, SPC's Water Program Manager, with participants including collaborators from Assam, Odisha, Chandigarh, and Maharashtra. The project plan was finalized, with phase one slated for completion by November 30, 2023.



Fig 20. WORKSHOP ON ARSENIC RESEARCH COLLABORATION AND GENERAL SURFACE WATER TREATMENT AND BOMA SAND FILTER (BSF)



P. WORKSHOP ON HONEYBEE FARMING AND CLIMATE CHANGE



Fig 21. Workshop On Honeybee Farming And Climate Change

TIES organized a comprehensive workshop on honeybee farming with a focus on climate change and its impact on apiculture. During the event, a set of best practices for farmers was developed to address the challenges posed by climate change with the support of Kerala State Biodiversity Board (KSBB).

The workshop was inaugurated by Dr. A. P. Thomas, Director of ACESSD, MGU, followed by an introductory session by Dr. Punnen Kurian. Expert-led sessions included insights from Dr. Mani Chellappan (Dean & Professor, Kerala Agricultural University), Dr. Sajan Jose (Regal Bee Garden, Kanjar), Mr. Biju Joseph (Senior Trainer, HortiCorp & Rubberboard), Mr. Joseph Kunju (Infarm Agro Products), Adv. Jose Cyriac, Mr. Noble George (Madikkal Bee Farm), and Mr. Jose Louies (Head, WTI). The concluding session was inaugurated by Dr. Thomson Davis, District Coordinator, KSBB.

TIES team members, including Sarath Babu N. B., Anoop Mathews, and Nowfiya N., also contributed to various sessions. The workshop was attended by postgraduate and undergraduate students, farmers, and researchers, fostering knowledge exchange across the community.



Q. RASHTRIYA AVISHKAR ABHIYAN SCIENCE CAMP AND EXPOSURE VISIT



In a collaborative effort between Samagra Shiksha Kottayam, the General Education Department, and TIES, a two-day science camp was recently held at TIES. This event provided a unique platform for talented school students who excelled in science fairs across the district. Thirty students from 13 Block Resource Centers (BRCs) were selected to participate, engaging in activities designed to spark scientific curiosity and enhance environmental awareness. The camp included eco-games, skits addressing community issues, and interactive sessions on topics like biodiversity, waste management, and Kerala's native flora and fauna. Students also gained hands-on experience in eco-friendly building techniques, innovative farming with grow bags, and water analysis methods. Led by Ms. Dhanya, DPO of Samagra Shiksha Kottayam, with support from resource persons from various BRCs and Dr. Punnen Kurian, Secretary of TIES, the sessions were both informative and inspiring. As these students return to their schools and communities, they carry with them valuable knowledge and a deepened appreciation for science and the environment. This camp's impact will extend beyond the two days, nurturing the next generation of scientists and environmental advocates.



3. COMMUNITY DEVELOPMENT

TIES take initiatives in conducting various community developmental or eco-developmental projects to educate people about the need of sustainable lifestyle these days. These outreach activities are the practical response to various needs of today's world and a practice of the organizations core values through community participation. Sustainable development models are conceptualized and implemented under this project.



I. TREE NAMING PROJECT

A. QR CODE TREE LABELLING AT MAHATMA GANDHI UNIVERSITY, KOTTAYAM

TIES this year launched a project named “ TIES TREE NAMING PROJECT” which is aimed to label trees with QR code based name boards for educational institutions, industries, urban residential complexes, tourist locations, etc. The project will have several benefits which include enhanced learning, interactive experience, promotes conservation, etc. The name board of trees will include scientific name, English common name, Malayalam common name, QR code (that links to a data base which will display photographs and information of the said tree).

In a collaborative venture between the Advanced Centre for Environmental Studies and Sustainable Development (ACESSD) at Mahatma Gandhi University (MGU) Kottayam and TIES, the trees of the campus were labelled with QR Coded boards, the campus boasts a total of 3731 trees. This innovative project is dedicated to labelling and documenting the diverse array of trees adorning the university grounds.

Led by a team of field officers, under the guidance of a plant taxonomist, a comprehensive survey of the entire campus was conducted on foot. Trees with a Girth at Breast Height (GBH) exceeding 20 centimeters were diligently counted, and their GPS locations were meticulously recorded. Leveraging the TIES Tree App—a mobile application designed to capture vital tree data, including common and scientific names, Malayalam names, and location coordinates—details for each tree were systematically documented.

Each board installed features both Malayalam and English names of the tree, its scientific name, and an embedded QR code. The QR code, when scanned, redirects to a dedicated page offering exhaustive information about the specific tree. Dr. C.T. Aravidakumar, the Vice Chancellor of MGU, inaugurated the program by unveiling the book titled "Trees of Mahatma Gandhi University." This initiative marks a significant leap toward digitalizing and preserving the rich arboreal diversity within the university campus..



**Fig 22. Tree Labelling Project
MGU, Kottayam**

II. JALARAKSHA CAMPAIGN

TIES as part of its community development initiatives is conducting a water quality analysis campaign in association with residence associations, lions' clubs, etc. The campaign is called "Jalaraksha Campaign". This year in coordination with Pampady Public Library and Senior Citizen Forum, Kooropada Senior citizen forum and Mattakkara Karshaka Charitable Society tested 440 water samples. The results were distributed in a meeting by explaining the results to the households along with suggestions on what measures can be adopted. The training was led by Dr Punnen Kurian and Ms. Soumya S.



Fig. 23. Jalaraksha Campaign

III. ADOPT A RIVER

A. KODOOR RIVER REJUVENATION

Kodoor River, one of Kerala's smallest rivers, flows from the hills between Kottayam and Pathanamthitta districts to the Meenachil River. Passing through densely populated Kottayam town, the river faces severe pollution and nutrient overload, leading to extensive water hyacinth infestation. This has disrupted passenger boat services, impacted local tourism, and affected the livelihoods of those who rely on fishing, clam collection, and cattle grazing along the river.

In response, the Meenachil Meenanthara Kodoor River Rejuvenation People's Collective, in collaboration with TIES as the technical partner, cleared the invasive water hyacinths. Through mechanized weed removal, the river flow returned to normal, boat services resumed, and the local community regained their livelihood avenues.



Fig. 24 Koodoor River Cleaning Before and After



III. SWACHHTA SAARTHI FELLOWSHIP

As part of the Swachhta Saarthi Fellowship, TIES conducted a comprehensive community survey and a training session on home waste management, designed to empower residents in managing household waste, especially biowaste, at the source. The project began with the identification of a community organization from urban, rural and semi-rural areas and the collection of data on current waste management practices among its members. Survey's were conducted to gather information on waste segregation, management, and community attitudes toward these practices. Following data analysis, 30 to 50 households were selected for the implementation phase of the project.



The training session, attended by 11 participants from diverse community sectors, was led by Dr. Punnen Kurian and included a hands-on demonstration of various waste management techniques, such as pipe composting, vermicomposting, Kamba composting, and pit composting. The demonstration was conducted by Ms. Soumya S., Research Assistant, Lab In-Charge, and a Swachhta Saarthi Fellowship recipient under the Waste to Wealth Mission. This program aligns with TIES' mission to equip the community with practical, sustainable waste management skills..



Fig. 25 Swachhta Saarthi Fellowship

4. CAPACITY BUILDING

A wide spectrum of programmes is offered to various community stakeholders aimed at capacity building to meet the challenges and solve environment related issues. It is a platform to bridge traditional knowledge with modern science and aim at sustainable lifestyles of communities while encouraging preservation of traditional knowledge. Trainings, workshops and day today scientific support are offered by TIES in diverse areas



A. TRAINING ON MUSHROOM FARMING

This year, TIES conducted five mushroom cultivation training programs, reaching a total of 126 participants from across India, including both local and out-of-state attendees. Participants ranged from beginners and students to experienced mushroom farmers and tech professionals, reflecting a diverse interest in this growing field. The training sessions covered a comprehensive set of topics, including tissue culture, mother spawn and spawn production, bed preparation, post-harvest technologies, and mushroom disease management.

Dr. Punnen Kurian opened each session with an introductory overview, while Ms. Soumya S. and Dr. Alex P. John led both theoretical and hands-on sessions. Recognizing the diversity of mushroom species—edible, medicinal, and poisonous—the training emphasized careful cultivation practices, making participants aware of the health benefits and potential risks associated with mushrooms. These programs aimed to increase knowledge and foster a safe, nutraceutical approach to mushroom cultivation.



Fig. 26. Mushroom Farming Training

B. HOMEWASTE MANAGEMENT TRAINING

Homewaste management training is another training given to the community to manage their homewaste at household level. These waste can be transformed into good, eco-friendly fertilizers which help to maintain the soil health. Training covered areas like: waste management, different home waste management techniques, composting (what and how to and what not to) benefits, how to compost at home, etc. The session was led by Dr. Punnen Kurian, Secretary TIES, and Mrs. Anju Ajikumar. The training was attended by 11 people.



Fig 27. Homewaste Management Training

D. FISH FARMING TRAINING

Fish farming training was another training given to the community and was attended by around 36 people. The training was led by Mr. Surendran Nair CR, Retd. Deputy Director of Fisheries. Training constituted an introduction to aquaculture, different types of production systems, fishes that can be farmed at our backyards which can be used for home needs, fish health management, etc. There was also an open forum for the participants to clarify the fish farming related queries and also demonstration of two aquaculture models at TIES. Dr. Punnen Kurian, Secretary, TIES; Sarath Babu, NEO, TIES co-ordinated the session.



Fig 28. Fish Farming Training

E. APICULTURE TRAINING



Fig 29. Apiculture Training

Honey bees, as essential social insects, play a crucial role in maintaining ecosystem services and balance. This year, TIES conducted an elementary course on apiculture for the local community, aiming to build awareness and skills in sustainable beekeeping practices. The course ran in two batches, attended by a total of 34 participants. The training featured live, interactive sessions led by Dr Punnen Kurian, Secretary, TIES and Mr. Sarath Babu N B, Nature Education Officer at TIES. Covering fundamental topics such as bee biology, beekeeping techniques, and apiary management, the sessions also included hands-on demonstrations of essential apiculture equipment.

F. TIES LABORATORY SERVICES (KSPCB APPROVED)

1	Water Quality Analysis	
A	MPN	50 samples
B	MPN/FC/EC	315 samples
C	Full test	368 samples
D	Special parameters	45 samples
2	Dry Rubber Content (DRC)	
A	DRC	1097 samples
3	Lab Tests	
A	Antimicrobial activity	58 samples
B	Minimum inhibitory concentration	8 samples
C	Isolation and identification of microorganisms	48 samples
D	Quantitative estimation of phytochemicals	16 samples
E	Qualitative estimation of phytochemicals	6 samples
F	Estimation of fat ,protein, carbohydrate, Iron	17 samples
G	Estimation of antioxidant activity	3 samples
H	Soxhlet extraction	3 samples
I	Estimation of pH, protein, total solids and lactometer reading	3 samples

J	Total count of bacteria	22 samples
3	Soil Test	
A	Soil quality analysis	18 samples
<p>Samples for lab tests were given by postgraduate students and research scholars of Chemistry, Zoology, Gov. Dental College, and different colleges of Mahatma Gandhi University and Calicut University.</p>		

G. TRAININGS ATTENDED BY STAFF

1. *Workshop on “Honey Bee Farming: Problems & Prospects” from 18th August, 2023 to 19th August, 2023*
2. *Workshop on BOMA Biosand Filter Making from 31st May, 2023 to 02nd June, 2023*



5. CERTIFICATIONS & ACCREDITATIONS

A. CERTIFICATIONS

This year marked a significant milestone for TIES as it was awarded two prestigious ISO certifications: ISO 9001:2015 and ISO 17020:2012. These certifications underscore the organization's commitment to quality management and operational excellence. ISO 9001:2015 certification recognizes TIES's adherence to internationally recognized standards for quality management systems, ensuring that its processes consistently meet customer requirements and regulatory standards.



Fig. 30. ISO 9001:2015 Certification Audit

Furthermore, the ISO 17020:2012 certification highlights TIES's proficiency in conducting inspections and assessments with impartiality, competence, and reliability. This certification is particularly significant as it demonstrates TIES's capability to deliver trustworthy and credible services in various fields. Achieving both certifications reflects TIES's dedication to upholding the highest standards of quality, professionalism, and integrity across all its operations.




Fig. 31. ISO Declaration Function

B. ACCREDITATIONS


This year TIES also started the NABL accreditation procedure for the laboratory and the initial registration with NABL was completed.




6. TIES VISITORS

 **SPC (Student Police Cadet) Camp Students 15th May, 2023**



 **Students from Bhavans School, Parampuzha 30th June, 2023**



 **Reji Varghese, AGM - District Development (Kottayam), NABARD 20th October, 2023**





Dr Joseph Mar Dionysius, Metropolitan of Kollam Diocese of Malankara Orthodox Syrian Church
24th November, 2023

Owners of Vennimala Bungalow
14th December, 2023



Dr Abraham Joseph (Former UN Chief Senior Socio-economic affairs advisor)
28th December, 2023

Dr Gopakumaran Nair, Chief GM, NABARD
22nd January, 2024





**Dr Suresh Balaji 24th January,
2024**

**Dr. T. V. Muralivallabhan,
Principal Marian College and
Legal studies faculty 21st
February, 2024**





7. TIES PUBLICATIONS

- Kalesh Sadasivan, Vinayan P. Nair & K. Abraham Samuel (2023). A review of *Macromia Rambur*, 1842 (Odonata, Macromiidae) of Western Ghats, with taxonomic notes on *Macromia miniata* Fraser, 1924 and *M. irata* Fraser, 1924. *Association for Advancement of Entomology* 2023, 48(2): 253-286.
- Alex John & Punnen Kurian (2023). Isolation, Characterization and Evaluation of Native Antagonistic Rhizobacteria Against *Pythium* Rhizome Rot Disease in Ginger. *Shodh Samagam* 2023; 06(2): 556-565.
- Abraham Samuel et.al.. Taxonomic notes on *Davidioides martini* Fraser, 1924 (Odonata: Gomphidae) and description of its female from Western Ghats, Peninsular India. *International Journal of Odonatology*. 2023, Vol. 26, pp. 114–123.
- J Sebastian (2023). An analysis of gaps and priorities in Indian orchidology using the thirty five year old archive of the journal of the Orchid Society Of India. *Journal of Orchid Society of India* 2023, 37:81-89.



8. CONCLUSION

Each member of TIES possesses ample reason to swell with pride upon reflecting on the journey of our organization since its inception in 2004. Throughout the years, TIES has garnered acclaim as the foremost active force in environmental research within our state.

In the most recent reporting period, TIES bore witness to a remarkable surge in both national and government-funded projects. The contributions stemming from these endeavors stand as testament to our commitment and have earned admiration from peer organizations. Moreover, several flagship initiatives have been successfully inaugurated, marking significant milestones in our collective pursuit.

The roster of research projects, awareness campaigns, and training initiatives has expanded substantially under our stewardship. Distinguished figures and international guests have graced TIES with their presence as part of these endeavors, enriching our collaborative efforts. Our evolution into a seamlessly functioning professional entity has been nothing short of remarkable, buoyed by the expansion of our dedicated staff across various projects.

Additionally, the past year witnessed a notable uptick in support from both governmental and non-governmental entities for our diverse array of programs and projects.

To each and every individual who has lent their help, support, and guidance throughout our endeavors, we extend our sincerest gratitude. With humility and enthusiasm, we present the twentieth annual report to the esteemed general body for their consideration and approval.

Dr. Abraham Samuel

President

Dr.Punnen Kurian

Secretary



20

Years of Committed Service to our Mother Nature



TROPICAL INSTITUTE OF ECOLOGICAL SCIENCES

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