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ANNUAL MAGAZINE OF JAGADISH CHANDRA BOSE ECO-CLUB, DEPARTMENT OF BOTANY

Editors

Dr. Biswarupa Ghosh and **Dr. Suchismita Chakraborty**

ECO-CLUB, DEPARTMENT OF BOTANY

Brahmananda Keshab Chandra College
Kolkata-700108

Preface

The Sir Jagadish Chandra Bose Eco-Clubof Botany Department was established in 2013 for the all-round development of the students of Brahmananda Keshab Chandra College, Kolkata. The main objective of the Eco-Clubwas to enhance the scientific enquiry among students. The students further honed their literary, artistic and social skills through community activities carried out by the Eco-club. The Eco-Club strived to bring about awareness for biodiversity conservation through celebration of World Environment Day in the college premises since 2014. The students of Eco-Club under the guidance of the Eco-ClubCoordinator carried out PBR studies around the Bonhooghly lake that not only prepared them with future research aptitude but also improved their academic score through internal assessment. The best Eco-Clubstudents were awarded for their performance in 2016 during the Diamond Jubilee Celebration of the College. Earlier, the Eco-Clubpublished its literary work from student projects through Wall Magazine in the college premises.This year they have gone a step ahead and are publishing the first volume of work related to biodiversity conservation and other areas. I wish them all success ahead.

Prof. (Dr.) Papia Chakraborti

Principal

Acknowledgement

The Eco-Club activities of the Botany Department has its genesis in the need for improving and innovating classroom teaching for the students. The open air, activity-based learning has always been fruitful in attracting and motivating students for general learning as well as specializing in a given subject. The Eco-Club listed few activities for the students mostly from life science to carry out PBR studies, projects on medicinal plants and crude drugs, World Environment Day celebration, Medicinal plant garden maintenance, Wall magazine, Cultural celebrations, Community services and others. The activities were designed to make them efficient in data collection, analysis and presentation. It also aimed at building up team spirit and increase social responsibility to make them a better citizen.

Since, its inception in 2013, the Eco-Club graduated to taking up additional social and environmental responsibilities in the college such as carrying out regular green audit and preparing signage for the tree flora of the premises. The recorded activities of the Eco-Club facilitated the college to get registered under the National Service Scheme (NSS) unit of West Bengal State University in 2015 for all round development of students from all the streams. In 2016 the setting up of Janaki Ammal Sacred Grove in the forested backyard of the college was another sustainable biodiversity conservation initiative of the Eco-club. Students have benefitted through the Eco-Club activities in their skill development, environmental awareness and memorable outdoor learning experience.

I take the opportunity to express my gratitude to all the faculty members of Botany and Zoology department for their kind co-operation in carrying out the Eco-Club activities. The non –teaching staff members of the department have been equally helpful in maintaining the interest of the students in such activities. The HOD of the Department and faculty members have been a consistent support system in promoting the Eco-Club activities. I thank all the Eco-Club members for their enthusiasm, dedication and handwork in completing this project. I thank Prof. (Dr) Papia Chakraborti, Principal of the college for her constant support and encouragement. I am grateful to Dr. Sangita Gangopadhyay, the HOD of the Department during the formation of Eco-Club whohas been one of the strongest pillars in the establishment of the Club. I am thankful to Mrs. Sunita Saha previously a non-teaching Staff of the Botany Dept who has been quintessential to the successful execution of all club activities. The last but not the least appreciation is for our faculty Dr. Suchismita Chakraborty and our student Mr. Arghya Dey who have edited the entire magazine in a very short time and materialised a long-awaited objective of Eco-Club into a reality.

Dr. Biswarupa Ghosh
Coordinator, Eco-Club
B.K.C College, Kolkata

Dedicated

In Loving Memory of Utsav (Eco-ClubStudent Member)

6th August 1996 –9th November 2020

Mr. Utsav Saha was an Alumni of IFF of Brahmananda Keshab Chandra College who had been an active, courteous and spirited member of the Sir Jagadish Chandra Bose Eco Club of Botany Department. He has been a pillar of support to the Eco Club in its formative years even when he wasn't a member of the Club due to the encouragement of our staff Eco Club member, Mrs Sunita Saha from Department of Zoology.

We at BKC College and Eco Club dearly miss the presence of Utsav (Sobuj) who was a willing worker with a smiling face. We dedicate the first issue of Eco-ClubJournal **Science and Society**, Vol-1 in his loving memory.

Eco Club wishes Utsav a safe abode in heaven and will be always remembered by us.

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People's Biodiversity Register: Tool for Biodiversity Conservation and Sustainable Development

Biswarupa Ghosh
Faculty, Department of Botany, BKC College Kolkata.
Corresponding author- biswarupaghosh100@gmail.com

Introduction

People's Biodiversity Register (PBR) is a tool for Biodiversity Conservation involving local traditional knowledge and helps in conserving, improving and mitigating environmental issues related to cleanliness, sanitation, water quality, green cover, floral and faunal diversity, human health, nutrition and livelihood sources (Gadgil et al., 2000). As an outcome of 2030 Agenda for Sustainable Development a blue print was laid down for peace and prosperity for people and the planet with 17 Sustainable Development Goals (SDGs). The PBR addresses many of these goals as follows

Goal No. 3. Good Health and Well Being.
Goal No. 11. Sustainable Cities and Communities.
Goal No. 13. Climate Action.
Goal No. 17. Partnership for the Goals.

The Kolkata edition of Times of India daily on 22nd May, 2022 has reported the preparation of PBR (People's Biodiversity Register) by the Kolktata Municipality involving 144 wards. This collaborative work by KMC was released on the UN Biodiversity Day. This PBR is highly commendable for creating a local baseline data for biodiversity of the city. The record of Flora and Fauna and its regular rapid assessment drives will provide a bench mark for creating green cities for Sustainable Development.

The Sir Jadish Chandra Bose Eco-Club (JCBEC) of Botany Department, Brahmananda Keshab Chandra College, Kolkata has been training undergraduate life science students in preparation of PBR of the Bon Hooghly lake since 2013-2019 (Fig. 1). This initiative was taken up by the Eco-Club coordinator for promoting skill development program for the students through data collection, analysis, report writing and team work. The program acted as an innovative teaching tool with certain improvements to the standard PBR format.

This activity encouraged students' participation in the PBR by giving them a performance score in the practical assessment that also reflected in their university marksheet.

Fig. 1: View of Bon Hooghly Lake, Baranagar

Methodology

The final year general students and second year honours students were divided into three teams namely, animal group, plant group and human group. The animal group consisted mostly of students from zoology department who recorded the animal, birds and insect sightings over a fixed period of time in and around the lake. The plant group had students mostly from the Botany Department who collected data on the plants growing in the area. The human group had students from different streams who interviewed households around the lake with semi structured questionnaires (Desai, et al., 2010).

Bon Hooghly lake is located at Bon Hooghly under the Baranagar Municipality (Fig. 2). The water body is about 14.67 acres area with great depth and surrounded by variety of plants and animals. The data on surrounding flora, fauna, peoples' profile and their use of the lake collected by the various groups were cleaned, analyzed and presented in tabular and graphical form.

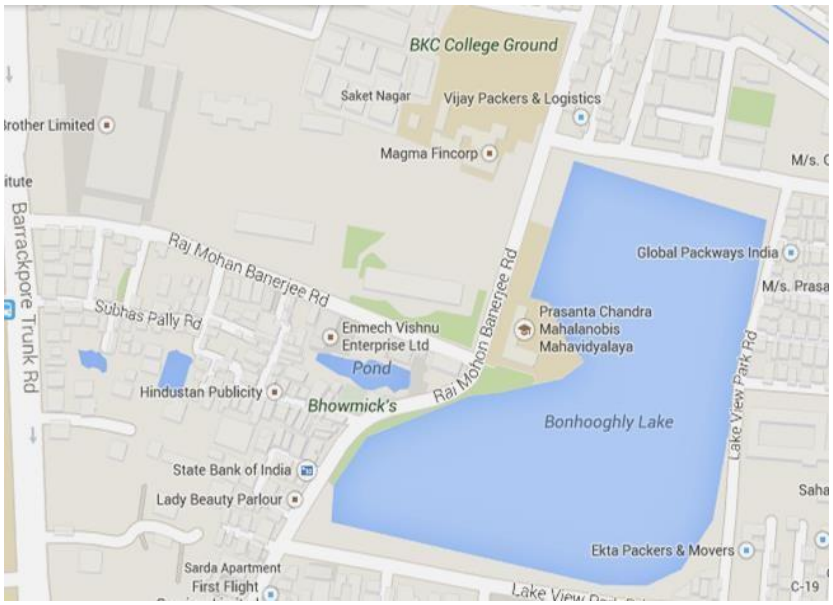

Fig. 2: Map of Bon Hooghly lake, Baranagar. (Lat. 88º22ʾ52ʺE , Long. 22º38ʾ50ʺN).

Results

Flora: About 60 to 70 types of plant species recorded around the Bon Hooghly Lake were divided into the following categories namely, Aquatic plants, Herbs, Shrubs, Trees

In the flora of Bon Hooghly lake the tree category exhibited maximum no of species followed by herbs (Fig. 3). A detailed understanding of the various plant categories gives us an idea of the ecological and social implications of the plant species in the lake area.

Aquatic plants: Aquatic plants are adapted to living in aquatic environments. They are also referred to as hydrophytes. These plants require special adaptations for living submerged in water, or its surface.

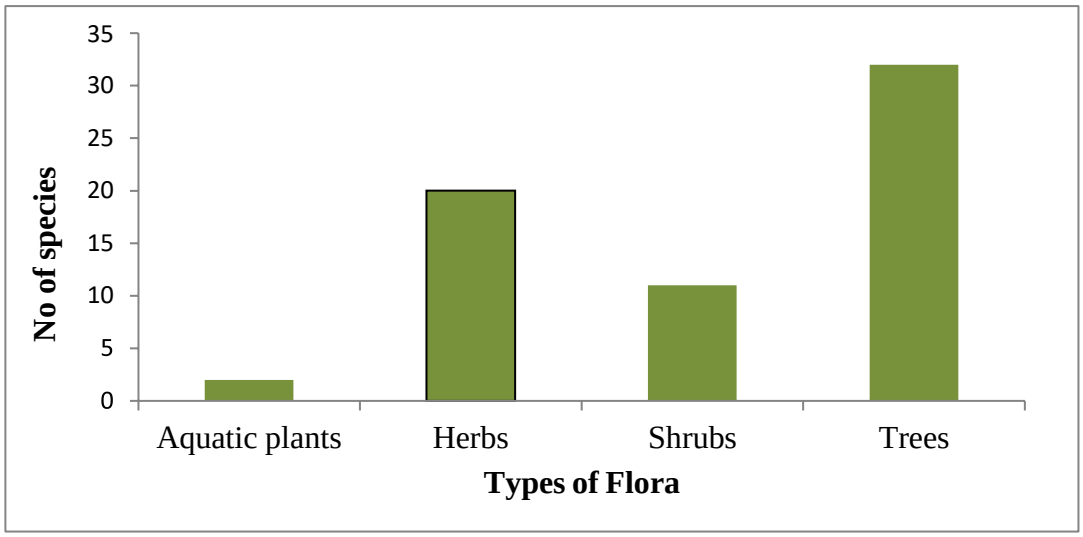

Fig 3. Species distribution in different plant categories of Bonhooghly lake PBR.

Aquatic plants like Kochuripana (*Eichhornia crassipes*) and Kolmi shak (*Ipomoea aquatica*) are seen to cover the entire lake surface. *E. crassipes* is an invasive species and can take over other aquatic plants of the area. A large number of these plants are removed from the lake water during fishing activities by the Fisheries Department at Bon Hooghly.

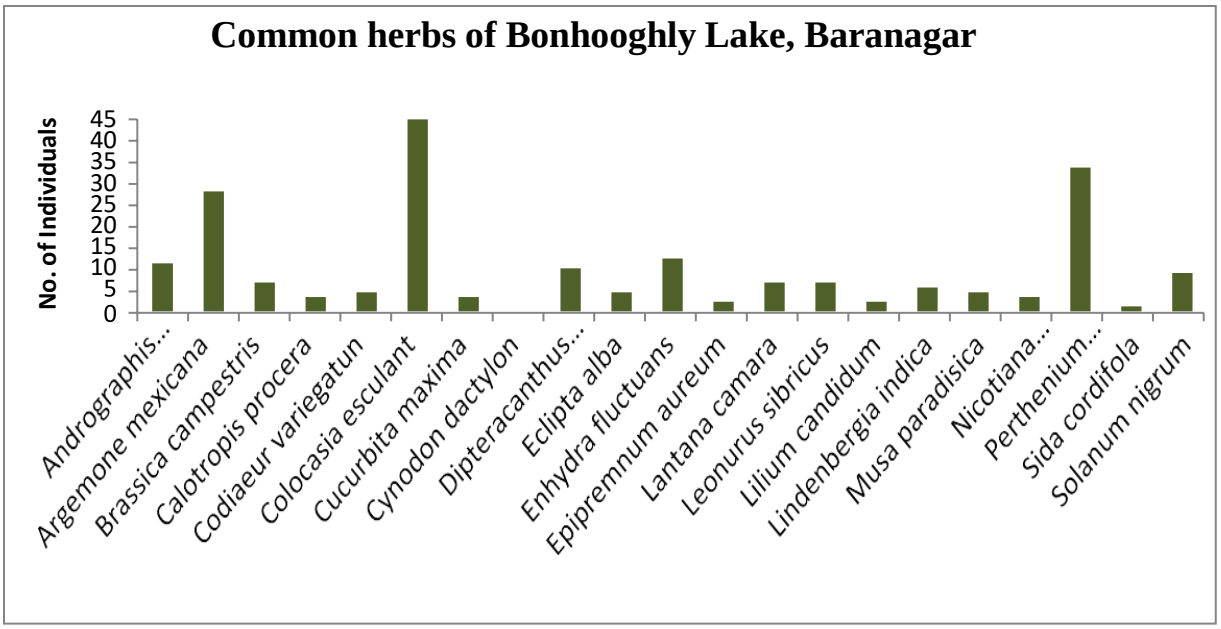

Fig 4. Population density of different herb species around Bon Hooghly lake, Baranagar.

Herbs: About 19 types of herbs were recorded from the bank of the lake by the method of quadrat studies employing several 1x1 m. sq. quadrats (Fig. 4). These herbs can be used for different purposes like flavoring, food or medicine. Some of the common herbs were parthenium, Kochu,

Helencha, Basanti, Raktadrone, Keshut, Bon tamac, Bhui kumro, Bhui amla, Kachu, Durba ghash and Akonda etc were present. The presence of Kochu (*Colassia esculenta*) in large number could provide food security to the local inhabitants, while the presence of large number of the invasive species parthenium (*Parthenium hysterothorus)* can cause allergy in the surrounding population.

Shrubs: A shrub is distinguished from a tree by its multiple non-woody stems and shorter height, usually less than 3 m tall and less than 10 cm circumference. Around 11 species of common shrubs like Nayantara, Heena, Akondo, Arhar, Ghetu, Tulsi and others were recorded from 5x5 m. sq quadrats around the lake. The presence of *Lantana camara*, an exotic and invasive species in the lake area poses a threat to dominate the local floral biodiversity and result in overall biodiversity loss.

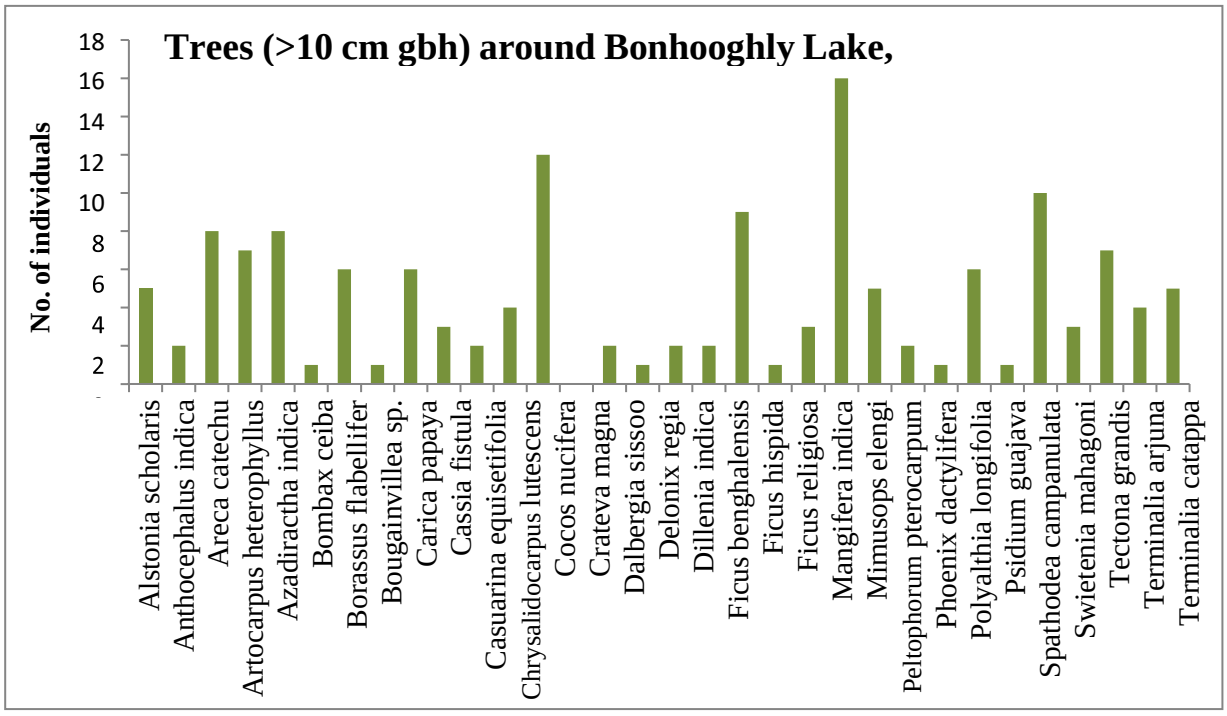

Fig No 5. Population density of different tree species around Bonhooghly lake, Baranagar.

Trees: Tree is a perennial plant with an elongated stem, or trunk, supporting leaves or branches with height greater than 3 mts. A tree typically has many secondary branches that acts as a habitat for birds, insects and animals. The tree roots branch and spread out widely and serve to hold the soil in the banks of the lake. They also consistently provide flowers and fruits for animal and human consumption. Trees of ≥10 cm girth that included young and matured trees were documented by total count around the lake.

PLATE 1: PLANTS SURROUNDING BONHOOGLY LAKE AREA

Polyalthia longifolia (Debdaru)

.

Spathodia sp
(Aksah pradip)

Cassia sophera
(Kal kasundi)

Ceiba speciosa (Swet Shimul)

Alstonia scholaris (Chatim)

Albizia lebbeck (Shirish)

Sterculia foetida (Baksho badam)

Riccinus communis (Redri)

Cocus nucifera (Narkel)

About 32 tree species were recorded from around the lake that included kathbadam, bakshobadam, akash pradip, mahagony, narkel, supari, tejpatta, radhachura, kul, tal, arjun, neem and others (Fig 5).

The diversity of the tree species was high around the lake. The species composition with high numbers of individuals of *Mimusops elengi* (bakul), *Cocus nucifer* (narkel), *Azadaractha indica* (neem), *Carica papaya* (papaya), *Swietenia mahogany* (mahogony) exhibit human intervention in enriching the flora of the area (Plate 1). Also, the tree species can provide coconuts, betel nuts, mango, papaya, Crataeva fruit, wood, and other commodities**.**

Fauna-All animals, birds, insects, fishes, reptiles constitute the faunal diversity of an area. In Bon Hooghlylake and the surrounding area the faunal diversity was high due to various kinds of habitats ranging from terrestrial, aquatic, marshy and urban.

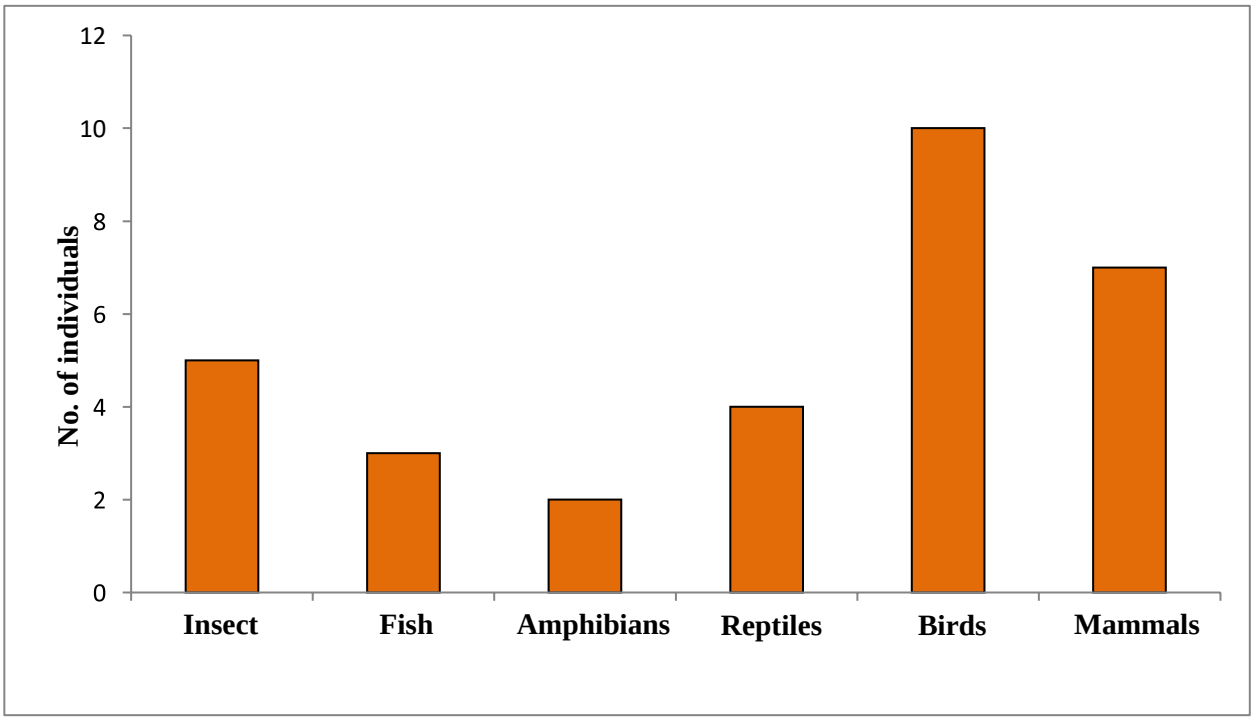

Figure 6. Species distribution in different animal categories of Bonhooghly lake PBR.

The faunal record of Bon Hooghly PBR shows that the area has rich bird diversity among the animal categories (Fig. 6). This is mostly due to the availability of fish and other aquatic animal as food for the birds. Also, big trees on the bank of the lake provide safe nesting ground to the birds such as common king fisher (*Alcedo atthis bengalensis*), *Halcyon smyrnensis* (white throated kingfisher), cormorents (*Phalacrocorax auritus*), parrot (*Psittacula eupatria*), woodpecker (*Dinopium sp)* and others.

PLATE 2: THE FOOD CHAIN CENTERED AROUND THE LAKE FOR BIRDS

Migratory white stork (*Anastomus ocitans*) was recorded around the lake area and Janaki Ammal sacred grove of BKC College in 2014 and 2020. The presence of the lake is a source of water and food for most of the birds and other animals (Plate 2).

Human Profile

Households were interviewed around the lake with a semi structured questionnaire. The demographic output of the area was 55% adult population as compared 18% young and 29% old people. Most of the households had literate people who had completed school education in all age group, while few had completed college and fewer had attended the University (Fig 7). The population earned its livelihood mostly through salaried jobs and business. However, a large section of the population was unemployed and carried out small dailywaged activities that involved fishing in the lake, cleaning the lake, collecting and selling leafy vegetables (Kochu, Tulsi, Kaalmegh, Arjun bark) from around the lake.

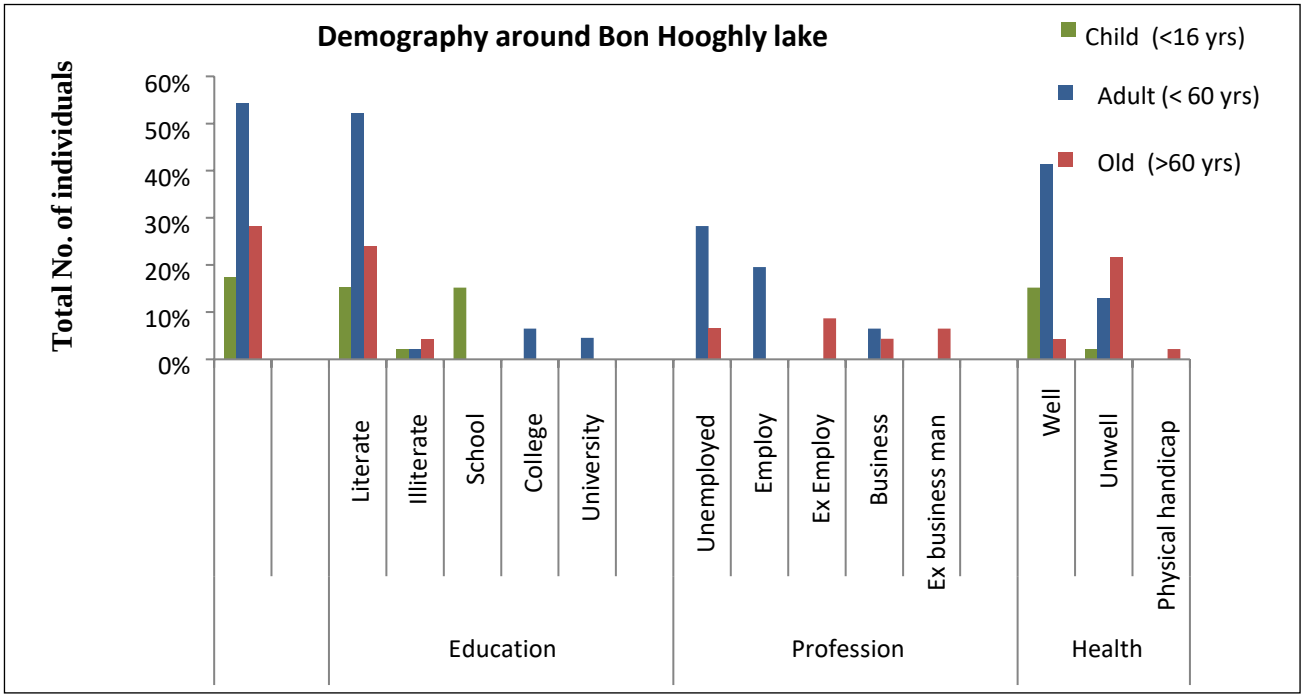

Figure 7: Socio-economic profile of respondents e in the PBR of Bon Hooghly lake .

Others carried out scrap collection/selling and commercial car cleaning on the banks of the lake. Younger people were involved in recycling and car repair activities. In general, the people of the area were recorded to be healthy (42%) as compared to unhealthy (22%).

The lake water is mostly used for washing clothes, religious activities and bathing (Fig 8). The banks of the lake also form an important site for religious activities such as durga puja, kali puja, last rites (shrad), marriage rituals (jol bhora) etc. About 49% respondents collected leafy vegetables for their nutritional requirement and some respondents used fruits of *Crataeva* for making chutney from the banks of the lake. Many older population and women gathered on the banks of the lake for jogging, chatting, meditation and playing cards as a part of recreation.

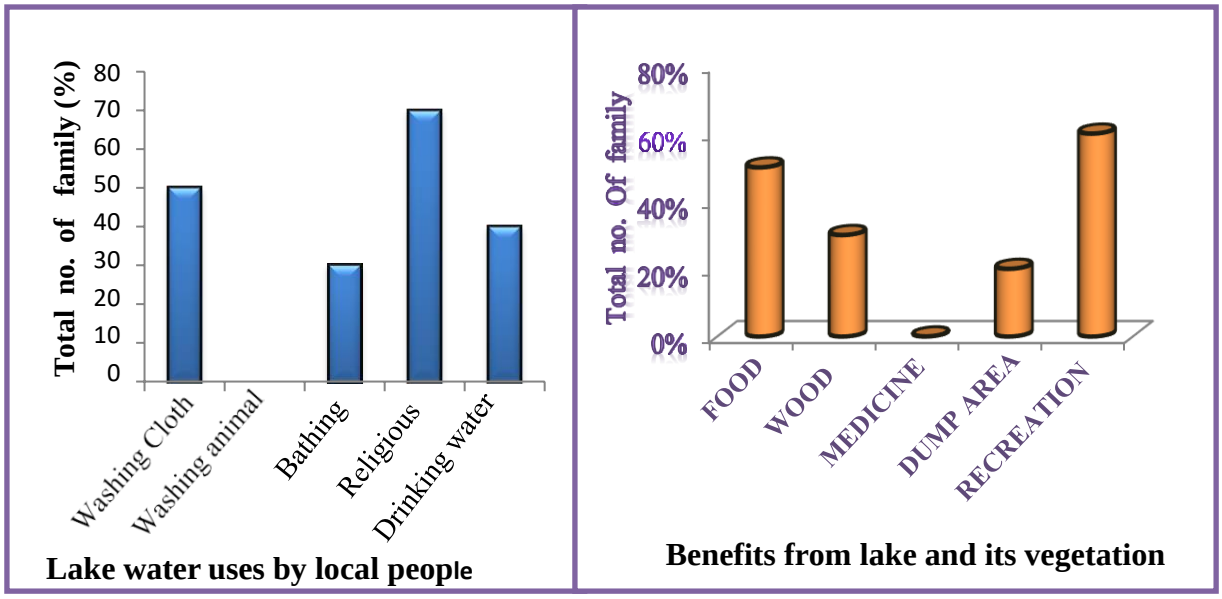

Figure No 8. Dependence of respondents on the lake water, its banks and its vegetation.

Some households collected twigs for fuelwood and branches for making pole and fence from the lake area. While, others dumped paper, plastic and other waste in the lake area. Surprisingly, only 2% people used the lake flora for medicinal purposes. The plants used for medicinal purposes were Kaalmegh leaf (*Andrographis paniculata*) as a deworming agent for children, bark of arjun (*Terminalia arjuna*) tree for patients of high blood pressure and Tulsi (*Oscimum sanctum*) for cough and cold.

Discussion:

Near about 60 to 70 types of flora like aquatic plants, herbs, shrubs and trees make the environment cool and green around the Bon Hooghly lake. The most common trees around the lake were mainly coconut, neem, arjun, mahogony, spathodia, gulmohar, radhachura and others. The faunaldiversity was also reported to be good in the area. Birds like cormorents, kingfishers, herons regularly visited the lake. The lake itself was a habitat to common fishes such as telapia, carps and molluscs and crabs. The bird diversity of the area is also rich due to the plant diversity and the varied ecosystems available. A wide variety of vertebrates and invertebrates were also recorded. The West Bengal State bird, the white-breasted Kingfisher (*Halcyon smyrnensis*) was a common observation in the study. The visit of migratory birds was also recorded in the study. The Bon Hooghly Lake provides a unique ecosystem that acts as a safe ground for the birds and other animals by providing constant supply of fresh water, food and shelter among the surrounding trees and green vegetation. The undisturbed Janaki Ammal Scared Grove vegetation of BKC College premises and the marshy backyard of MSME testing Centre adjacent to the lake act as a wetland corridor for the birds and animals that depend on the lake for food and water. The lake phytoplankton can also facilitate carbon sequestration and mitigate local greenhouse gases to reduce the impact of global warming and climate change.

The inhabitants around the lake area dependent on the lake water and its banks for income generation as well as collection of food, wood, medicine, religious activities, recreation and forms an integral part of their daily social life. They also use the water to wash clothes and cars, bathe and dump waste. However, it was found that some valuable flora was destroyed regularly and cannot establish properly. Unfortunately, unemployment in the area is high among youths and resulted in mushrooming of small businesses that are sometimes not beneficial for the lake. The small-scale business of recycling of garbage is a two-edged sword. On one hand it provides livelihood and clears many garbage of the area. On the other hand, some garbage is dumped into the lake itself. The vehicle repair garage also introduces some chemicals and oil into the lake water while cleaning the vehicles. The cleanliness of the lake needs more attention to maintain the aquatic life forms of the lake.

In rainy seasons the flooding of the lake with dirty water from nearby drains during rainy season pollutes the lake and negatively impacts its biodiversity. The regular immersion of idols in the lake water results in siltation and introduction of toxic chemicals in the water posing threat to its aquatic biodiversity. The Eco-Club members tried to create door-to-door awareness among the lake inhabitants regarding the misuse of the lake and the negative impact on its aquatic and terrestrial biodiversity.

Conclusion

The PBR represents a diverse flora of Bon Hooghly lake which is good for the homeostasis of the lake ecosystem. The rich flora invites a wide variety of insects, birds and animals to reside in the surrounding of the lake. The lake ecosystem provides services such as food, clear air, clear water, oxygen, pollinators and scenic beauty. Hence, the Biodiversity of the lake needs to be protected with regular PBR exercise that can be carried out by the Eco-Club of BKC College. Unfortunately, the Department of Environment could not register the Eco-Club for official status and financial support due to absence of funding for an Eco-Clubin West Bengal; as available in other States. The Baranagar Municipality can take initiative in this regard for collaborative PBR preparation of Baranagar with Eco-Club of BKC college under the biodiversity management committee (BMC) of Kolkata Municipality Corporation.

Acknowledgement: I am thankful to the host institute and all the Eco-Clubstudent, teacher and staff members for facilitating the PBR of Bonhhoghly Lake.

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PLATE NO 2. HUMAN ACTIVITY IN AND AROUND THE BONHOOGHYLAKE

Fisherman in the Lake.

Laying the bait early in the morning

Hauling the catch-livelihood of many

Fish collected from the net

Recycled garbage collected within the fence-Livelihood source.

Vehicle repair and washing at the lake

Entertainment-boating

dumping of household garbage

Threat to native biodiversity- ***Lantana camera***

PLATE NO 3. BKC COLLEGE STUDENTS GROUP IN THE PBR ACTIVITY OFBONHOOGHLY LAKE

Eco-ClubPBR Team of Students and Guide Teacher

Community Survey Eco-ClubStudents and Guide Teacher

Field Study by Eco-ClubStudents and Guide Teacher

Bioluminescence in Fungi: A Mycologist's Delight and a Layman's Enigma

Srijita Bhattacharjee[1] and Suchismita Chakraborty[2]
[1] Student, Department of Botany, B. K.C. College, Kolkata.
[2] Faculty, Department of Botany, B. K.C. College, Kolkata.
Corresponding author -suchismita.chak@gmail.com [2]

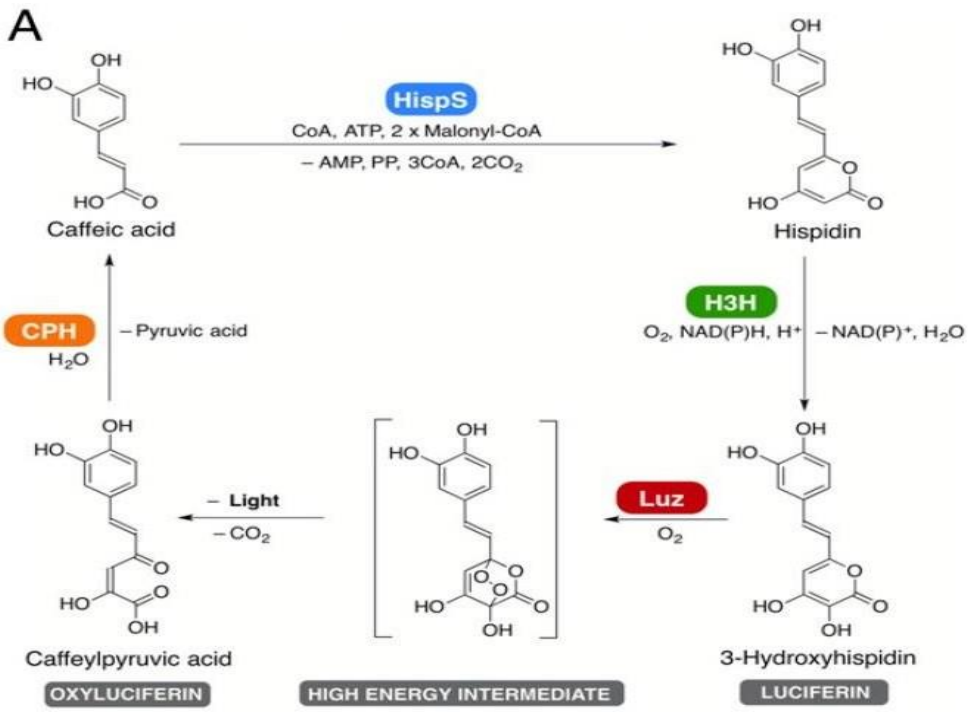
Introduction

Night brings with it a sense of enigma and fear. Ever thought of a situation when you are lost in a deep jungle and there is no source of light to guide you through except for the faint light of the night sky. You close your eyes out of fear for a second and as you open you see eerie green glow on forest floor or on tree limbs silently guiding you through the unknown. However, when the torch is lit, the eerie glow vanishes and the surrounding seems normal. Once you put off the light and get used to the darkness, the twig starts glowing again! It so happened with two farmers from the village of Panchal in Bankura, West Bengal when they suddenly spotted an unusual faint greenish-blue light coming from the bamboo grove as reported by Gopa Bhattacharjee in her internet article entitled "Rare ghost fungus spotted in Bengal' dated 26.6.2021. It was a fungus that was later identified as *Omphalotus nidiformis*, a species not common in India.

Bioluminescence is the production and emission of light by living organisms. It is a form of chemiluminescence and occurs widely in marine vertebrates and invertebrates, as well as in some fungi.

The science behind the glow:

The mechanism of bioluminescence involves atleast six components. They are water, NADPH, oxygen, ATP and two groups of substances- Luciferin and enzyme luciferase. The luciferin and the luciferase, are the principal light generating elements and light generation is an oxygen requiring ATP dependent process.



Proposed pathway of fungal luciferin biosynthesis and recycling. Caffeic acid is converted to hispidin by hispidin synthase (HispS) and hydroxylated by H3H in presence of molecular oxygen and NADPH, yielding 3-hydroxyhispidin (fungal luciferin). The luciferase (Luz) adds molecular oxygen, producing an endoperoxide as a high-energy intermediate with decomposition that yields oxyluciferin (caffeylpyruvate) and light emission. Oxyluciferin can be recycled to caffeic acid by caffeyl pyruvate hydrolase (CPH). Source: PNAS 115 (50):12728-12732

Bioluminescent fungal diversity

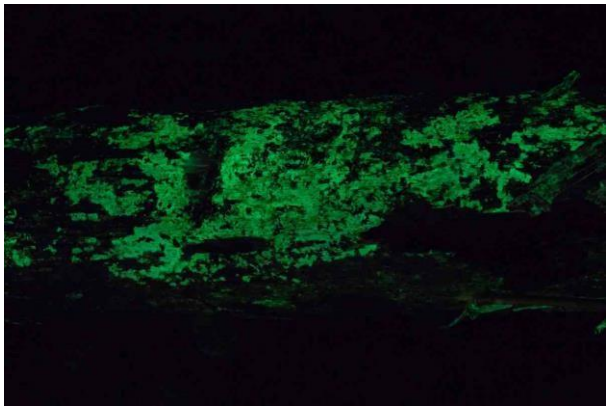
According to Huei-Mien Ke and I.J. Tsai (2022) a total of 109 luminescence fungi, have been recognized that are classified into four molecular lineages; 12 in the Omphalotus lineage (historically unresolved taxonomic group known for its large mushrooms), 10 in the Armillaria lineage (luminescence only occurs in mycelium, not fruiting bodies), 85 in the Mycenoid lineage (mostly Mycenaceae; diverse in color, shape, habitat and nutritional strategies representing saprotrophic, parasitic, and mycorrhizal forms; luminescence occurs in diverse tissue from mycelium to fruit bodies) and two in the Lucentipes lineage. They have been found mainly in temperate and tropical regions in Europe, North and South America, Southeast Asia, Japan and Australia.

Only a few species of glowing fungi have been reported from India. Two have been reported from the Western Ghats, one in the Eastern Ghats, and one in the state of Kerala, among others. Glowing fungi have also been spotted in the forests of Maharashtra, Goa (part of the Western Ghats) In recent years they have been reported from Meghalaya and West Bengal but not all have been scientifically reported. Scientists believe that the actual number of bioluminescent fungi in India must be higher.

These fungi typically sprout on decaying wood and are capable of digesting lignin in plant debris. Most of them belong to a genus called *Mycena* (Bonnet mushrooms). A recent yet-to-be-peer-reviewed study that sequenced the genomes of five *Mycena* species, four of which are bioluminescent, showed that bioluminescence evolved in the common ancestor of *Mycena* and another marasmoid clade and originated around 160 million years ago in the late Jurassic period.

Mycena

Reported in many of the leading national newspapers (Indian express and Times of India) between Nov. 2020 and April 2021, the scientists from India and China during their fungal foray in the Northeast states of India discovered a new variety of glowing mushroom, close to a water stream in Mawlynnong in East Khasi Hills district of Meghalaya**,** used by locals as natural torches and fondly referred to as "Electric mushroom". It was named ***Roridomyces phyllostachydis*** after the host bamboo tree, *Phyllostachys*, from where it was first collected by the research team post sequencing of the ITS gene of the mushroom.



This mushroom was unique in two ways first it was found growing only on dead bamboo (*Phyllostachys manni)* and secondly it was found to be the only member in the genus which has a glowing stalk or stripe. The reasons are unknown and needs more research to understand why they grow on this bamboo species or why only the stipe is luminous.

Role of luminescence in fungi:

Bioluminiscence fungi offer many advantages mentioned below although their role is debated.

1. Attracting insects for dispersal of fungal spores.
2. Functions as predators of fungivores.

Future scopes:

1. Creation of an autonomously luminescent plant as a novel form of street lighting, replace electricity-draining conventional streetlights, lit up road signs and interior lighting. The trees would come "on" at night and go "off" during the day. The trees would need only air, water, and soil nutrients to maintain their urban lighting duties.
2. Agricultural signs: When crop need water or nutrients they will be able to tell farmers. Plants could even go to red, yellow or green "alert" to give farmers early warning about disease and invasions by harvest-destroying pests.
3. Environmental pollution bioassays: The natural bioluminescent enzyme reaction in fungi provides a platform for environmental bioassays based on the changes in bioluminescent intensities in fungal mycelia exposed to metals or organic compounds.
4. Bioluminescence will provide a new dimension of lighting, healthcare and food industry. Adoption of these technologies will lead to a massive growth of Bioluminescence.

Conclusion:

When technology matures and becomes economically feasible, it will definitely offers a superior value proportion.

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Biodiversity

Arpita Sarkar
Student, Department of Botany, B. K.C. College, Kolkata.
Corresponding author-- arpitasarkar042000@gmail.com

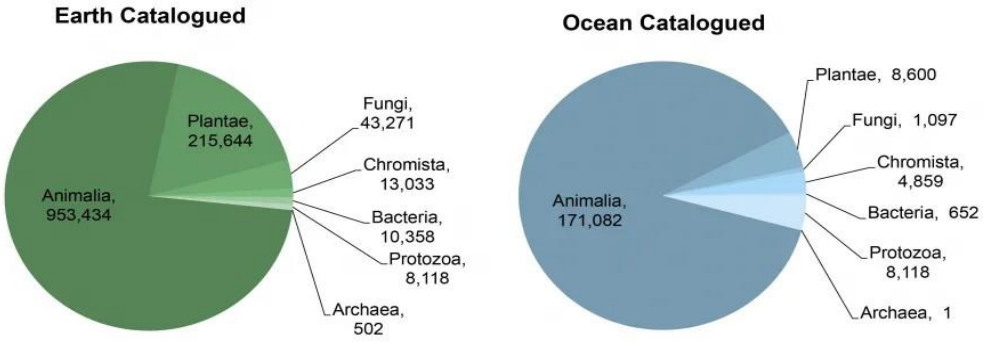
Introduction:

The term "biological diversity" was first used by Raymond F. Dasman - a renowned scientist and conservationist in the year 1968 in his book entitled "A different kind of Country " advocating conservation.

In December 2000, the UN General Assembly adopted 22nd May as International Day of Biodiversity, to commemorate the adoption of the text of the Convention held on May 22, 1992 by the Nairobi Final Act of the Conference for the Adoption of the Agreed Text of the Convention on Biological Diversity. Until 2000, Biodiversity Day was observed on December 29. Since then, International Day for Biological Diversity or World Biodiversity Day is observed on 22nd May every year to increase awareness and understanding of the issues of biodiversity. This year the theme is 'Building a shared future for all life'. The theme was chosen to continue developing momentum and support the post-2020 global biodiversity framework at the forthcoming UN Biodiversity Conference (COP15).

What is biodiversity?

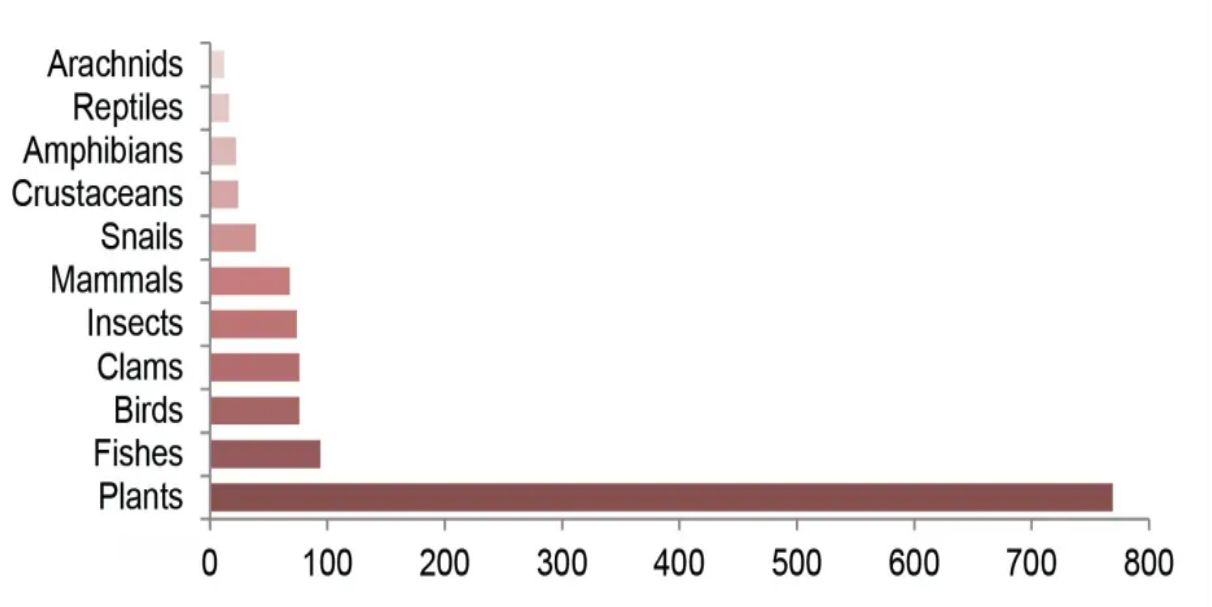
Biodiversity is all the different kinds of life found in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balanceand support life. Biodiversity supports everything in nature that we need to survive: food, cleanwater, medicine, and shelter.



Source: Center for Sustainable Systems, University of Michigan. 2021. "Biodiversity Factsheet." Pub. No. CSS09-08.

But as humans put increasing pressure on the planet, using and consuming more resources than ever before, we risk upsetting the balance of ecosystems and losing biodiversity. WWF's 2020 Living Planet Report found an average 68% decline in global populations of mammals, fish,

birds, reptiles, and amphibians since 1970. The 2019 landmark Global Assessment Report by the Intergovernmental Platform on Biodiversity and Ecosystem Services reported one million animal and plant species are now threatened with extinction – the highest number in human history.



Source: Center for Sustainable Systems, University of Michigan. 2021. "Biodiversity Factsheet." Pub. No. CSS09-08.

Three-quarters of the land-based environment and roughly 66% of the ocean environment have been significantly altered. More than a third of the world's land surface and nearly 75% of freshwater resources are now devoted to crop or livestock production. Climate change worsens the impact of other stressors on nature and our wellbeing. Humans have overfished the oceans, cleared forests, polluted our water sources, and created a climate crisis. These actions are impacting biodiversity around the world, from the most remote locales to our own backyards.

Components of biodiversity.

Total biodiversity of a particular area may be divided into two hierarchical components:

1. The number of functional type of organism (Nitrogen-fixing plants, carnivorous plants) or ecosystems (Tundra, desert, coniferous forest etc.). There are various marine invertebrates which are all predators with different niches. These marine invertebrates form different functional groups. For example - jellyfish floats in the open water.
2. The number of functionally equivalent organism/genotype within each functional type. These organism plays the same role in an ecosystem. For example- several species of wood rotting fungi decomposed wood log in forest.

Types of Biodiversity

Biodiversity is studied at three different level

1. **Species or phenotypic diversity:**

   Species diversity refers to variation in physical trait or phenotypic character of the organism, such as different inmorphological, anatomical, physiological, biochemical or behavioural characteristic. For example- There are 6100 types of fishes in the world. A forest of tropical countries yieldvarious kind of fruits.
   Whittaker developed ways to characterize species diversity in a given geographical area. He defined three distinct levels of diversity for biodiversity measurement guideline:

   a) **Alpha diversity**: It refers to the number of species that can coexist in a small area of more or less uniform habitat. It is measured by counting the number of species within a given area. For example- alpha diversity of woodland habitat is 10, while the diversity value in open field habitat is 7 and in Marshy land habitat is 3.
   b) **Beta diversity**: It refers to the number of species unique to one region relative to another. This gives a measure of relative change in species diversity between areas. Thus beta diversity defines the response of organism to spatial heterogeneity. It is expressed in terms of similarity index between community of different habitat in the same geographical area. High biodiversity indicates low similarity between species composition of different habitats. For example-beta diversity between woodland and open field is 7, between woodland and marshy land is 13, and between open field and Marshy land is 8.
   c) **Gama diversity**: It is the measure of the overall diversity for all habitats a large region. This diversity is similar to Alfa diversity, only measured in a large scale. For example- this diversity encompasses all the three habitats, i.e. the total number of plant species distributed within the three habitats in a large region.

2. **Genetic diversity**:

   There are further variation within a species due to slight variations in their genetic organization due to mutation. Hence, a single species may have different varieties, form, subspecies, or strains which slightly differ from each other. Genetic diversity refers to the variation in the nucleotides, genes, chromosomes or whole genome of organism. For example- the normal human haemoglobin differs from mutant adult haemoglobin in sickle -shaped anaemic person by the difference of a single nucleotide.

3. **Ecosystem diversity:**

   An ecosystem is a community plus the physical environment that it occupies at a given time. Tropical rain forests, old-growth forest, coastal wetland, coral reefs are some examples of ecosystem. Ecosystem diversity is assessed through the study of communities in various ecological niches within the given ecosystem. describes the variety of biological communities and their associations with the ecosystem of which they are part.

Conclusion

Actions taken to create awareness among people regarding different issues of biodiversity though a days celebration and indulging people in biodiversity conservation is also a significant step in today's world, given the type of lifestyle we lead. It is biodiversity that not only provides a home for many of the world's species, but also serves as asource of food, water, and other resources that we rely on to thrive. Understanding the value of biodiversity and acknowledging the problems is therefore the need of the hour.

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War, Seed Bank and Biodiversity

Rishin Bhattacharyya
Student, Department of Botany, B. K.C. College, Kolkata.
Corresponding author- bhattacharyyarishin.2000@gmail.com

The War !!

In the present ensuing war with Ukraine, Russia's attempted takeover of Kharkiv, a vital seed preservation and storage plant was seriously damaged.

Serhiy Avramenko, the director of the Yuriev Plant Production Institute of the National Academy of Agrarian Sciences, announced the news on his privately accessible YouTube account on May 16, as per the Odessa Journal. According to him, the essential seed bank, which was formed in 1908 and survived World War II, was nearly destroyed.

It housed around 160 different plant seeds and agricultural crop hybrids, including some that are no longer available in Europe. It is one of the world's largest plant gene banks, as well as Ukraine's sole one. Seed breeders from all over the world, including Russia, would order samples from the institute.

The International Center for Agricultural Research in the Dry Areas (ICARDA), a global agricultural-research organization that had been based in Syria had also met with a similar fate and was forced to flee its headquarters, just outside of Aleppo, leaving behind its seed bank because of the civil war, losing world's most valuable collections of seeds, containing some of the oldest varieties of wheat and barley.

What is a seed bank?

A seed bank is a facility that stores seeds in order to maintain genetic variety for future generations. Typically, they are flood, bomb, and radiation-proof vaults that house jars of seeds from various plant species. The seeds are usually stored in low humidity and frigid temperatures (about -20°C). This aids in the preservation of the seeds, guaranteeing that they will grow when needed later.

Where are they located?

There are over 1,000 seed banks around the world, each with its own type, size, and concentration. The Millennium Seed Bank in Sussex, which is managed and directed by the Royal Botanic Gardens, Kew, is the world's largest. It first opened its doors in 2000 and now has seeds from approximately 40,000 different species from all over the world, including nearly all of the UK's native trees and plants.

Over 5000 seed accessions are stored in India's seed vault, which is located near Chang La, Ladakh, in the Himalayas. One accession consists of a set of seeds of one species collected from different locations or different populations. The vault is a collaboration between the Defense Institute of High-Altitude Research and the National Bureau of Plant Genetic Resources which is part of the Indian Council of Agriculture Research under Defense Research and Development Organization.

Another such example is a resource critical to humanity's future which hides deep under the bowels of an icy mountain on an island above the Arctic Circle between Norway and the North Pole.

The Global Seed Vault, often dubbed as the "Doom's day" vault on Spitsbergen, part of Norway's Svalbard archipelago, holds millions of seeds from over 930,000 species of food crops. It's a giant safe deposit box that houses the world's largest collection of agricultural biodiversity. This structure has 13,000 years of agricultural history.

Seed bank: The guardian of biodiversity

Over the past 50 years monoculture cropping practices with technological advances have led to large scale crop production and increased yield at the cost of biodiversity so much so that only 30 crops provide 95% of human food energy needs. It also leaves food supplies more vulnerable to threats like drought and diseases.

It is estimated that 40% of plant species are threatened with extinction on a global scale. A seed bank is a type of insurance, allowing us to safeguard as many plant species as possible from extinction. This is more important now than it has ever been. One glaring example is that of the re-establishment of seed bank of ICARDA in 2015 in Lebanon and Morocco after it was destroyed during the civil war in Syria in the year 2012, using seeds from the Svalbard vault—the first-ever withdrawal there. The seeds were planted, and their offspring were carefully collected and processed to return to the vault.

Plants are threatened by a variety of factors, including loss of habitat, climate change, pollution, pests, and diseases.

The rate at which they have an impact is likewise increasing, raising the possibility of an incremental and catastrophic loss. We may be losing plants at a quicker rate than we are discovering them.

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Judicious Use of Plastic- As We Have Only One Earth

Angana Sengupta
UG, Student, Department of Botany, B. K.C. College, Kolkata.
*Corresponding author-*anganamail@gmail.com

Introduction

Led by the United Nations Environment Programme (UNEP) and held annually on 5th June since 1974, World Environment Day is the largest global platform for environmental public outreach and is celebrated by millions of people across the world. This year it is hosted by Sweden.

This year UN has declared "Only One Earth" as the theme for World Environment Day celebration. So let's pledge to take care of our Earth as in the universe there are billions of galaxy and in our galaxy we have only one earth which is habitable.

Triple Planetary Emergency faced by Earth

1. Climate is heating up too quickly for people and nature to adapt
2. Habitat loss and other pressures mean an estimated 1 million species are threatened with extinction.
3. Pollution continues to poison our air, land and water. Greenhouse gas emissions can be reduced by 40-70% by sustainable lifestyles and behaviours by 2050 (studies show)

Today plastic pollution has become one of the most pressing environmental issues of the our times.

What is plastic?

Plastic is defined as a material that contains an essential ingredient, an organic substance of large molecular weight. It is also defined as polymers of long carbon chains. They are non – biodegradable and they remain on earth for several years. There are of two types of plastic- thermoplastic and thermosetting plastic.

Plastic hazards:

We cannot think of life without plastic and use different products made of plastic. Since plastic in non-biodegradable over a period of time, through sun's effect it breaks down into smaller particles both in water and land and enters the ecosystem. So, if we look at the water ecosystem there are different kinds of wastes which are taken by animals resulting in death and species loss

Birds are most affected. They ingest plastic which results in biomagnification, leading to death of young ones, and ultimately to species loss.

The aquatic animals especially the turtles, they love jellyfish and often mistake the floating polybags for jelly fish and they ingest it. This results in bursting of their internal organs and causing death and the species loss.

Humans and fishes are also not spared from the detrimental effects of plastic wastes. Biomagnification of plastic waste occurs in the food chain of aquatic animals including fishes and eventually when that fish comes to humans and when we humans consume it these small plastic particles enter our bodies and harm our health. Plastic products contain chemical additives. A number of these chemicals have been associated with serious health problems such as hormone-related cancers, infertility and neurodevelopment disorders like ADHD and autism. A well-known endocrine disrupting chemical (EDC), is bisphenol A (BPA),

Even burning of plastic wastes releases dioxins which causes cancer and also effects our immune system and in this covid situation we can very well understand if our immune system is poor we will not be able to fight this battle.

How to mitigate plastic wastes through use of technology?

Plasma Pyrolysis Technology (PPT**)** is very environment friendly and it can recycle plastic waste ,we can also go for liquid plastic which we used for making durable roads , we can also go for making fuel from plastic waste thereby conserving the ecosystem, the fossil fuel that is our earth and eventually each one of us can reduce our use of plastic ,we can carry our own bags, we can use less disposable plastic, we should revive our use of jute .In West Bengal the jute industry can be revived and each one of us can do this.

Let's pledge to have a better tomorrow by making this world plastic free or using minimum plastic.

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Fungal Diversity and It's Mysteries

Deepanjan Banerjee[1] and Saptarshi Sarkar[2]
[1&2] Student, Department of Botany, B. K.C. College, Kolkata.
Corresponding author- deepanjanbanerjee18@gmail.com [1]

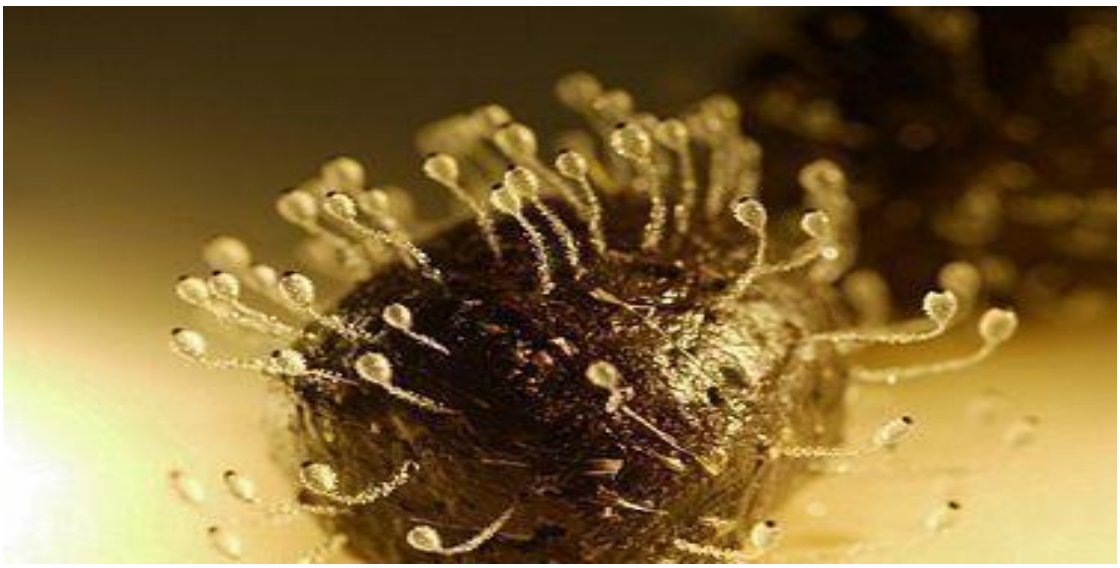
- ***What are fungi?***

  Fungi are achlorophyllous thallophytes having heterotrophic, eukaryotic and spore bearing organs surrounded by a well- defined cell wall made up of chitin, along with many other complex organic molecules. They are diverse groups of organisms containing some of the most bizarre and fascinating species. There are about 100,000 known speciesof mushrooms, rusts, molds, mildews, stinkhorns, puffballs, truffles and other organisms assigned to the Kingdom Fungi, and hundreds of new species are described each year. Theycome in an astonishing variety of shapes, colors and sizes, from brilliant red cups and orange jellylike masses to strangefungi resembling golf balls, bird nests with eggs, starfish, parasols and even dead man's finger. Because of their peculiarities they have always been thought of as being mysterious. Here are a few examples of some mysterious fungi.

- **Dung Cannon *(Pilobolous crystallinus):***

  This species of fungus belongs to the order Mucorales. The dung cannon is indeed the fastest organism: The fungus launches its crystalline spores at an acceleration rate of 1.7 million m/s^2 - faster than guns and even rocket ships.

  Ecological significance: It plays a role into transmission of in- effective lungworm larvae which causes parasitic bronchitis in cattle and some other ruminants



- **Devil's Fingers *(Clathrus archeri) :***

  Clathrus archeri, commonly known as octopus stinkhorn or devil's fingers, is a fungus which has a global distribution. It belongs to the order Phallales. Devil's finger grows around leaf litter, decaying stumps, and woodchips. It's "fingers" are smelly and meant to attract flies which then carry it's spores away with them.

  Ecological significance: It can be eaten at the egg stage. It helps to decompose wood and improve soil.

- **Bleeding Tooth Fungus *(Hydnellum Peckii):***

  Hydnellum peckii also known by the name 'Strawberries and Cream' is a fungus belongs to the family Bankeraceae. It is a hydnoid species, producing spores on the surface of vertical spines or tooth-like projections that hang from the under surface of the fruit bodies. It is one of the ugly looking fungi. The red liquid oozing out of it is not blood. It in fact emerges due to guttation to excrete excess fluids.

  Ecological significance and commercial use: It is a mycorrhiza forming species that establishes mutually beneficialIt is used commercially to make dye. It contains the chemical compound atromentin, which is like heparin and can be used as an anti-coagulant to keep blood clots from forming.

- **Zombie fungus *(Ophiocordyceps unilateralis):***

  This fungus is an insect pathogenic fungus, discovered by theBritish naturalist Alfred Russel Wallace in 1859 and currentlyfound predominantly in tropical forest ecosystems. It belongs to the order Hypocreales. The fungus can infect ants and manipulate their behaviour in a way that is beneficial for fungus growth and transmission. These infected ants are also called zombie ants.

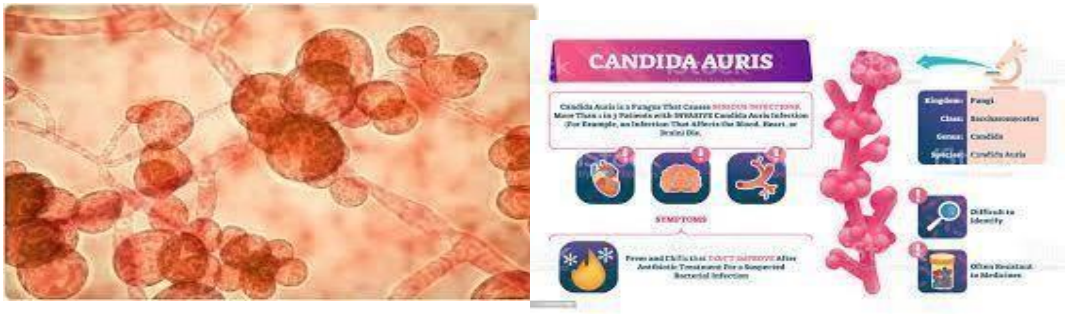
  Medicinal uses: *Ophiocordyceps unilateralis* and relative species are known to make supplements to improveimmunity. It might also help to fight cancer cells.

- ***Candida auris* : (A kind of pathogenic yeast)**

  They are one celled fungi that belongs to family Saccharomycetaceae and Order Saccharomycetales. It is one of the few species of the genus *Candida* which causes candidiasis in humans. An uncommon fungus that can cause serious bloodstream, wound and ear infections. Often, candidiasis is acquired in hospitals by patients with weakened

immune systems. Once infected it is hard to get cured as somestrains of *C.auris* have developed drug resistant factors making them a significant health threat. Common symptoms include a fever and chills that do not go away after taking antibiotics.

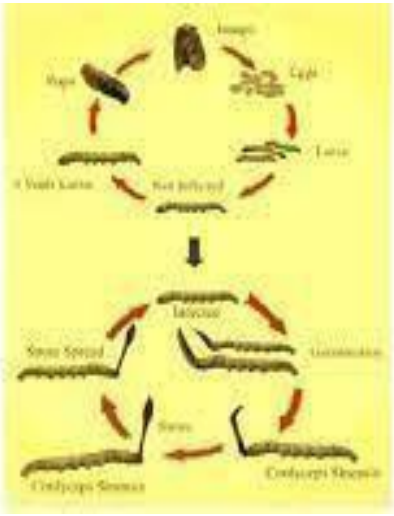
The way to get away from this fungus is to maintain basic hygiene and to disinfect surfaces contaminated with *C.auris* by 10% bleach or such specified product. A clan of antifungal medication called echinocandins are used to treat *C.auris*.



- **CATERPILLAR FUNGUS *(Ophiocordyceps sinensis):***

Ophiocordyceps sinensis also known as caterpillar fungus belongs tothe order Hypocreales and family ophicordiscipitaceae. Unlikeits infamous cousin *O.unilateralis* (which turns ants into zombies), it is only found on the Tibetam plateau, where it infects the larvae of ghost moths. For centuries it has been used as Chinese and Indian medicine for a number of benefits. It is called the 'Himalayan viagra' as it boosts energy.

Medicinal Uses: It is used as a medicinal mushroom as a dietary supplement for various health conditions, including fatigue, chronic inflammation and male impotence. It's commercial uses are increasing day by day. 1kg of *O. sinensis* cost about20 lakhs of Indian rupees as it is very rare and hard to collect.



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Genetically Modified Crops

Ravi Kumar[1] Mandal, Riya Koley
UG, Student, Department of Botany, B. K.C. College, Kolkata.
Corresponding author-ravimrmandal@gmail.com [1]

Introduction

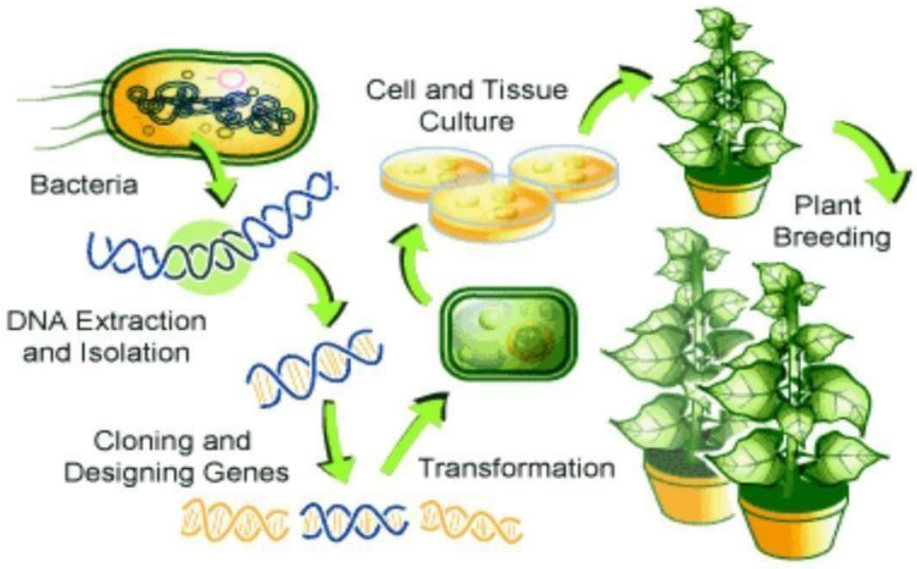
Genetically modified crops are plant used in agriculture for crop improvement, the DNA of which has modified using genetic engineering techniques. Genetically modified crops were first introduced in U.S.A in1994.

Why?

- To introduce a new trial to the plant which does not occur naturally in the species like resistance to certain pests, disease, environmental condition etc.
- Genetic modification in crop is also done to increase nutritional value and for other purpose like productionof pharmaceutical agents.

Process

Genetic modification is a technology that involves inserting DNA into the genome of an organism. To



produce a genetic modified plant new DNA is transferred into plant cells usually the cells are grown in tissue culture where they develop into plants. The seed produced bythese plant will inherit the new DNA.

World-wide Cultivation of GM Crops

Genetically modified crops were grown in more than 28 countries and in 179.7 million hectares of land U.S.A, Brazil,Argentina, China are leading producers.

Maize (U.S.A)

Cotton (India)

Golden Rice (Bangladesh, Philippines)

Soya Beans (Argentina)

Genetically Modified Crops Cultivation in India

BT cotton is the only genetically modified crop that is allowed in India. BT cotton is insect resistant cotton variety. Strains of the bacterium *Bacillus thuringiensis* produce different BT toxins.

BT toxins are insecticidal to the larvae of moth's bollworms etc. but are harmless to other forms of life.

In 2002, a joint venture between Monsanto and Mahyco introduced BT cotton in India after getting permission from Genetic Engineering Appraisal Committee (GEAC).

Benefits of Genetically Modified Crops

- GM crops have more nutritional value.
- It increased supply of food with reduced cast largershelf life.
- These crops are grown with fewer pesticides, which may helps in sustainable development.
- It can produce more in small areas of land and can feeda large number of population.
- It can grown in arid condition for better yield.

Issues of Genetically Modified Crops

- Genetically modified new traits could cause adversehealth reaction (long-term).
- Patents restricts farmers from assessing GM seeds.
- Crops may limit biodiversity and local environment andcan also effect our food chain.
- Causes additional expenses on labelling and processing.
- Cross pollination of GM crops with weeds could result insuper weeds.

Future of Genetically Modified Crops

- Many countries including India expected Genetically Modified crops but it still needs researchable to prove long-term efficiency and safety of genetically modified crops.
- Future of GM crops in India depends on those varieties which can address the countries from efficiency, sustainability and food security.

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Medicinal Benefits of the Backyard Medicinal Herb Vasak(*Adhatoda vasica* Nees)

Dipika Jani[1] and Biswarupa Ghosh[2]
[1] *Student alumni, Department of Botany, B. K.C. College, Kolkata.*
[2] *Faculty, Department of Botany, B. K.C. College, Kolkata.*
Corresponding author-dipikajani9073@gmail.com [1]

Adhatoda vasica of Acanthaceae family is a well-known drug in Ayurveda and Unani medicine. The plant has been used in indigenous system of medicine in India for more than 2000 years (Kokate 2001). This plant is also commonly known as Vasaka (Sanskrit), Malabar nut (English), Basak (Bengali) and Arusha (Hindi). The plant is found to grow throughout Indian peninsula up to a altitude of 1300 m invarious habitats. In West Bengal, it is commonly grown inthe backyard garden for medicinal and ornamental value.
In rural areas of West Bengal,Vasaka bushes are used as boundary wall for fencing much like bamboo bushes.

The plant is small evergreen perennial shrub, reaching the height of 1-2.5 m. The leaves are simple, opposite, lanceolate and leathery, 7-19 x 4-7 cm in size. The leaves are dark green on dorsal surface and whitish green on ventral surface. Flowers are conspicuous, white, lower lip of corolla streaked with pink. Flowers are at the axial of leafy bracts in anaxillary spike. Fruits are loculicidal capsule (Prain, 1981).

The leaves of Vasaka provide an important drug prescribed for treating malarial fever caused by pitta and kapha, chronic fever, intrinsic hemorrhage cough, asthma, skin diseases and piles. The pharmacological activity of Vasaka is due to its ability to purify blood and lower blood pressure. The leaf juice is good for the health of the heart and acts like as a cardiac tonic. It balances pitta and kapha dosha that keeps the liver and gallbladder healthy. It clarifies voice and maintains the clarity of voice. The leaf extract is also good for skin health because of its anti-inflammatory and anti-microbial features. The pharmacological activities of the leaf extract are induced by the presence of the phyto-chemicals such alkaloids, tannins, saponins, phenolics and flavonoids. The active chemical constituents present in the leaves of the species are vasicine, a quinazoline alkaloid and an essential oil. It also has other chemicals such as luteolin tritriacontane, B–sitosteroid Kaempferol, 3-sophoroside, adhatodic

acid, 9-hydroxyvasicinine Vit-C, vasicol, vasicinol, vasicinolone, adhatodine, adhavasinona, anisotine, carotene, vasakin, vasicinone, vasicinolone, vasicilinone and many more.

The side effects of using vasaka need to be noted for expecting mothers. The leaf juice phytochemicals can impact the uterus carrying the fetus. It also reduces blood sugar levels in diabetic patients and should not be over consumed by them.

In West Bengal, decoction of Vasaka leaves with Tulsi and ginger are prepared for gurgling to treat tonsillitis. To treat asthma dried leaves are burnt and the smoke inhaled. Decoction of the leaves is administered orally for treating common cold and cough. Dried bark of the plant is boiled in water for preparing a decoction that is administered orally for treating acidity problem. In market commercial Vasaka products are found that signifies that there is a demand for Vasaka as a medicinal plant in the country.

Vasaka capsule is a pure herb extract. Vasaka capsules contain the personalized alkaloids, including vasicine, vasicol and vasicnone constituent that provides overall support for respiratory function. The Himalaya Vasaka product comes with anti - inflammatory and antitussive property for treating cough and cold. The frequent use of home grown Vasaka can provide good respiratory health in a polluted environment for all age groups. Hence, this plant which is of Least Concern Status according to International Union of Conservation of Nature (IUCN) should be maintained and conserved in our kitchen garden or backyard gardens.

Acknowledgement:

This writeup is an outcome of our Eco-Club projects on Medicinal Plants of West Bengal. I thank Dr. Biswarupa Ghosh as my guide teacher and Prof. Papia Chakraborti, Principal BKC College for all the support.

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A Report on Sustainable Development Through Water andLivelihood Security Initiatives in Rural India

Suchismita Chakraborty
Faculty, Department of Botany, B. K.C. College, Kolkata.
Corresponding author-suchismita.chak@gmail.com

This is a story of how for more than 30 years Samaj Pragati Sahayog, a wing of Baba Amte Centre for People's Empowerment is working at grassroot levels, collaborating with genuine and selected grassroot partners, training them and hand holding them until they become self-sufficient in their demand for water and livelihood through various initiatives like watershed management, sustainable agriculture etc. It is also about how the Centre has been successful in (a) empowering women through these activities and (b) bringing about lab to field transition of beta tested technology while partnering with a wide range of research Institutions and government departments and turning million acres of barren arid land across 72 drought prone, tribal districts of Madhya Pradesh into vegetation rich area.

The Centre has also been imparting a 2-month basic training course on Watershed development and at the request of the Union Ministry of Rural Development SPS has prepared watershed works manuals under MNREGA scheme which has been distributed by the Bihar, Chattisgarh and Himachal Pradesh governments to their gram panchayats and concerned officers.

SPS also offers internships for students. Many students from reputed institutions from all over the country like TISS, IIT, XISS, Young India Fellowship-Ashoka University, Azim Premji University, IRMA, Department of Social Work-Jamia Milia Islamia, Delhi School of Social Work, GB Pant Social Science Institute, JNKVV-Jabalpur, NID, Indore School of Social Work, had been here for their internships.

They also offer job opportunities to people who have the passion, determination and energy to work on myriad development interventions that the organization is involved in.

For further detail about the activities of SPS one can visit their website at https://www.samajpragatisahayog.org/

Acknowledgement

The author is thankful to Dr. Debasish Banerjee, Scientific Advisor, Baba Amte Centre for People's Empowerment, Samaj Pragati Sahyog, Dewas, Bagli, Indore, Madhya Pradesh for sharing the information and news clips. Dr. Banerjee is a scientist and social engineer who has dedicated his life for sustainable development in our country.

Baba Amte Centre for People's Empowerment

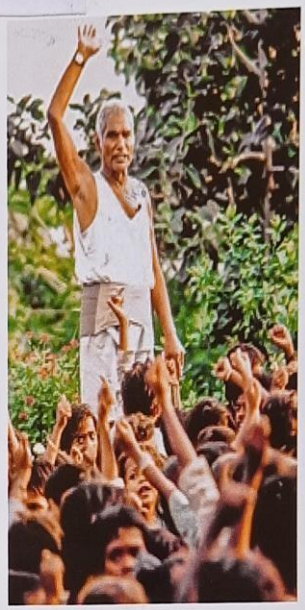
Rather than directly expanding the scale of our own operations (and risk bureaucratisation), we have opted to remain a lean, learning organisation that builds on partnerships. In this way, we are able to retain quality while achieving scale, thus overcoming the oasis syndrome that most NGO work suffers from. Our direct interventions are concentrated in the tribal pocket around Bagli. But we upscale the impact of this work through the Baba Amte Centre for People's Empowerment. The Centre has been set up to carefully select, train and hand-hold genuine grassroots partners for a few years, after which we believe they can do this work, potentially better than SPS could have. The Centre also builds close partnerships with a wide range of research institutions and government departments, some of which are doing excellent but largely unrecognised work. We help bring this research out of ivory towers by linking lab to land, while also securing invaluable feedback for scientists from farmers. This beta-tested technology is then transmitted to our partners through the Baba Amte Centre. Through this "creative, organic churning", R&D inputs are finalised. These are then disseminated not only in our area but also to people throughout India via our network of NGO and government partners.

We conduct a variety of training courses at the Centre, including a 2-month Basic Training Course on Watershed Development covering surveying and mapping, earthen and masonry engineering, hydrogeology, nursery and plantation, dryland NPM agriculture, double entry accounting, attitude behaviour change, PRA and conflict management. At the request of the Union Ministry of Rural Development (MoRD), SPS has prepared watershed works manuals in the MGNREGA context (300 pages+ in both English and Hindi). The Governments of Chhattisgarh, Bihar and Himachal Pradesh have distributed these manuals to all their Gram Panchayats and concerned officers. We have also converted each of the 16 chapters of these manuals into stand-alone booklets.

Samaj Pragati Sahayog

Over the last 3 decades, Samaj Pragati Sahayog (SPS) has grown to be one of India's largest grass-roots initiatives for water and livelihood security, working with its partners on a million acres of land across 72 of our most deprived districts, mainly in the central Indian Adivasi belt. We take inspiration from the life and work of Baba Amte (our *Pramukh Sahayogi*) who rejected charity and successfully empowered even the most challenged. SPS is headquartered in a drought-prone, tribal area in the Dewas district of Madhya Pradesh, which typifies the most difficult problems facing the country. We believe that to address India's long-standing problems, we must graduate to an alternative development model based on the principles of equity, sustainability and people's empowerment. Our focus has been on finding sustainable ways of ensuring water security, which provides the foundation for livelihoods and economic growth. We have tried to address the crisis of Indian agriculture by evolving an alternative low-risk and low-cost approach, reducing dependence on chemical inputs. We have also attempted to work out alternative livelihoods, which reduce the dependence of people on agriculture.

We believe that all this work has to be based on strong institutions, led by women.



In our view, persistence of poverty in India owes a great deal to the absence of powerful institutions of the poor. We also believe that these institutions have to be led by women.

Experience of development programs all over the world, as also our own work over the last 3 decades, underscores the key role played by women's leadership in their success. For it is only women who show a steadfast commitment to a sustainable path to development.

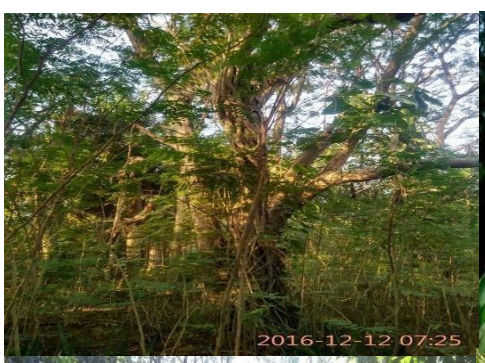
বনানী ও সৃষ্টিছাড়া

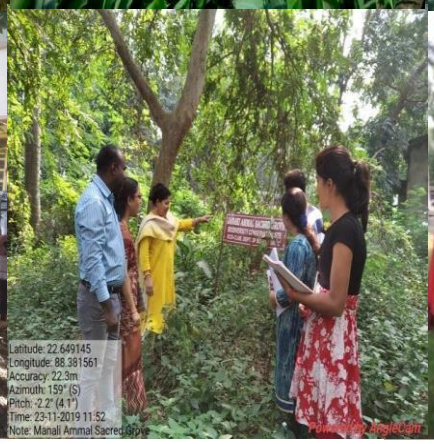
~সুস্মিতা বিশ্বাস

PG Botany Semester IV, B.K.C. College, Kolkata

আমরা শুধু স্লোগান লিখি
আমরা করি গান,
পারছি কোথায় সামলে রাখতে
পরিবেশের সম্মান?
মিথ্যে শুধু কন্ঠে মোদের,
মিথ্যে শুধু বুলি
কাজের সময় যেই না এল
ও মা আমাদের চোখে ঠুলি;
সংরক্ষণ হোক পরিবেশ,বেঁচে থাকুক প্রাণ;
কাটবো না গাছ, করবো না শিকার
এই হোক মূল মন্তর
মান আর হুশ খুঁইয়ে বুঝি;
আমরা আজকে যন্তর?
দরাজ হাতে বিলোচ্ছে যারা
করছি তাদের হনন,
ভারসাম্য বিঘ্নিত করে কীই বা হচ্ছে খনন?
হিমালয় থেকে কন্যাকুমারী
সবটাই থাক সবুজ,
খেলে বেড়াক প্রাণ
এটাই হোক চোখের আরাম আর আত্মাভিমান;
ধ্বস না নেমে কেবল ফুলে উঠুক ধরা;এই টুকুই আবদার এই সৃষ্টিছাড়ার.

Green campus of BKC College is a live laboratory of Eco Club





Department of Botany
Brahmananda Keshab Chandra College
111/2, BT Road, Bonhooghly
Kolkata 700108

9 789334 049084

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unique.publishinghs@gmail.com