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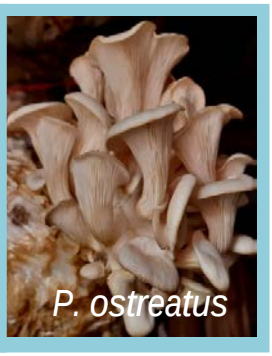
EDITORIAL

Mushroom Cultivation: A Novel Avenue for Women Empowerment

The raw materials required for mushroom cultivation are easily accessible in rural areas and the ecoclimatic conditions are also suitable for growing of commercially viable *Pleurotus* species, viz. *P. ostreatus*, *P. dzamor*, *P. euos*, *P. florida*, *P. flaballatus*, *P. cornucopiae*, etc.



UNEMPLOYMENT and food crisis are epidemic problems across the third world. It is urgent to find ways to protect human life and livelihoods. Nutritional security, health care and employment generation are the key issues India is facing. The strength of our economy still lies in agriculture. We have achieved food security, but struggling to achieve nutritional security. Ensuring food and nutritional security, while meeting the challenges of land depletion, water shortage and environmental degradation, requires agriculture to be diverse and sustainable. Growing edible mushrooms can not only diversify farming but also provide quality food, address health and environmental issues and generate employment.

In spite of significant production of pulses, fruits, vegetables and milk, the problem of malnutrition, particularly of protein and vitamin deficiency, is still widespread. The Indian diet, particularly for vegetarians, is often deficient in proteins. Mushrooms are a complete, easily digestible vegetarian food suitable for all age groups. They are rich in protein, dietary fibre, vitamins, specially vitamin B and minerals. The carbohydrate content is 26-82%. They have insignificant lipid level, resulting in low calorific yield. With no cholesterol, their ergosterol content is a precursor for vitamin D synthesis. Moreover, mushrooms have medicinal importance due to their anticancer, anti-ageing, probiotic and immuno-potentiating properties. Thus, increasing mushrooms production could be the perfect solution to the problem of malnutrition among the Indian populace.

In a developing nation like India, empowering women can become fruitful for economic growth. Employment leads to women entrepreneurs creating new jobs for themselves and others. Their entrepreneurship can contribute to the economic wellbeing of the family and community, poverty reduction and women's empowerment. Government and non-government organizations (NGOs) across the world are promoting women entrepreneurs through schemes, incentives and promotional measures. In India the micro, small and medium enterprise development organisations, small industries development corporations, nationalized banks and NGOs are conducting various programmes including Entrepreneurs Development Programmes (EDPs) to help potential women entrepreneurs, who may not have adequate educational background and skills. There are also several other schemes of the Government at central and state levels for needy women to make them economically independent. Small Industries Development Bank of India (SIDBI) has also been implementing special skills for women entrepreneurs.

Mushroom cultivation is a labour-intensive activity. It can be taken-up on different scales like home-based, small-scale or large-scale. It is a wonderful employment generating opportunity especially for the rural women. Thus, the introduction of scientific cultivation of edible mushrooms followed by the their organised cultivation can help generate income and employment, especially for women and ultimately leads to sustainable rural development.

Asis Kumar Pal
Assistant Professor & Editor
World Mangrove Day, July 26, 2023

Botanical Society of Bengal: Maiden Outreach Event

THE Botanical Society of Bengal had selected our college to launch its social outreach programme on December 17, 2022. The objective of this event was to get in touch with both honours and general undergraduate students of our department through an awareness programme entitled "Plants and Society" that covered diverse fields of botany and their potential role in entrepreneurship. The popular lectures by Prof. Ruma Pal, President of the Society, followed by Prof. Santanu Pal and Dr. Debabrata Maity, all from the University of Calcutta, and Dr. Biswajit Ghosh, from RMKVC College, Rahra, were followed by a live demonstration of algal culture and a plethora of algal products, as a novel plant resource for creating new business innovations and opportunities (see figs.).

--Eds

A Workshop Conducted by Our Alumnus

THE department organized on November 17, 2022, a hands-on training workshop in herbarium techniques for the honours students. Dr. Shuvadeep Majumdar, Assistant Professor, Dept. of Boyany, Parimal Mitra Smriti Mahavidyalay, and an alumnus, was the resource person. The initial session in Vivekananda Sabhaghar provided the students an in depth impression about herbaria and its specimens. The next session involved the collection of plant specimens in the college campus (see fig.). Finally, the nuances of preparing herbarium specimens were aptly demonstrated in the General Laboratory of the department (see fig.). The participants prepared 10 herbarium specimens now deposited in the departmental herbarium.

--Eds

A Himalayan Voyage: Sittong the "Orange Village"

THIS year, like every year, the department organised an excursion to the Darjeeling hills of Eastern Himalayas, from May 12 to 17, 2023. Dr. Sutapa Kumar (Rai), Prof. Meenakshi Mukherjee and Dr. Kuntal Narayan Chaudhuri escorted and guided eleven Botany Honours fourth semester students at (Middle) Sittong, Kurseong, West Bengal (see fig.).

Known as the "Orange Village" of Darjeeling, Sittong Khasmahal (660—1,400 m) is a cluster of villages poised at the heart of these hills in the thickly forested valley of the river Riyang, and these verdant hill slopes have been intermittently cleared for a multitude of orange orchards, several cinchona and *dhupi* plantations, few tea estates, and numerous hamlets, dotted across the mixed temperate forests. The rich flora of the Eastern Himalayas was documented during field studies along trekking trails in Lower, Middle and Upper Sittong (see fig.). Along with four economically-valuable species: orange (*Citrus sinensis*), cinchona (*Cinchona succirubra* and *C. calisaya*), tea (*Thea sinensis*) and *dhupi* (*Cryptomeria japonica*), a rich diversity of trees and weeds, both native and alien, that co-exist in this landscape were also recorded. Many of these are valuable local plant resources for the locals as wild food and folk medicine. Finally, the process of manufacturing tea was observed during a visit to the tea factory of the iconic Makaibari Tea Estate, the oldest tea factory producing Darjeeling tea—the champagne of teas.

--Eds

Our Students at the Science Fair

ELEVEN Botany Honours fourth semester students of our department represented the college at the Science Fair for school students on the second day of the First Botanical Congress (2023) of the Botanical Society of Bengal, at the Ballygunge campus of the University of Calcutta, on March 24, 2023 (see fig.). Our pavilion, named "The Green Window" was an endeavour to explore art in life, bring science to society, and nurture entrepreneurship. To the young visitors, the participants demonstrated simple plant-based innovations as sustainable living models: "Reviving a Dying Art: Traditional Vegetable Dyes from Plants", "Herbal Cosmetics: The Natural Way to Beauty" and "Reduce, Reuse, Recycle: Eco-friendly Seed Paper Pens"; and received the President's Special Prize at the conclusion of the Botanical Congress (see fig.).

--Eds

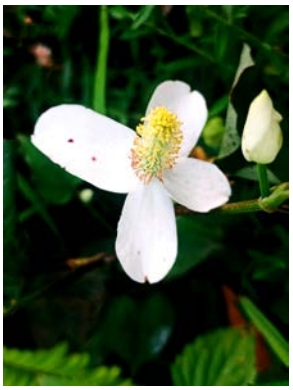
REFLECTION

WORDS AROUND SILENCE

Passion
Upasak Majumder
Botany H.(Sem. 4)

Green and Gold
Anindita Mondal
Botany H. (Sem. 4)

Ferns and Petals
Harsh Choudhary
Botany H. (Sem. 4)



Serenity
Sneha Chowdhury
Botany H. (Sem. 4)

Exotica
Sohini Ghosh
Botany H. (Sem. 6)

Dancing Doll
Shreya Mondal
Botany H. (Sem. 4)

Beauteous Bloom
Asis Kumar Pal
Assistant Professor

The Dying Viola
Kuntal Chaudhuri
Assistant Professor

BIO-TOONS

A Fairy Ring:

Circle of Mushrooms

Srija Ghosh
(Sem. II)

REFLECTION

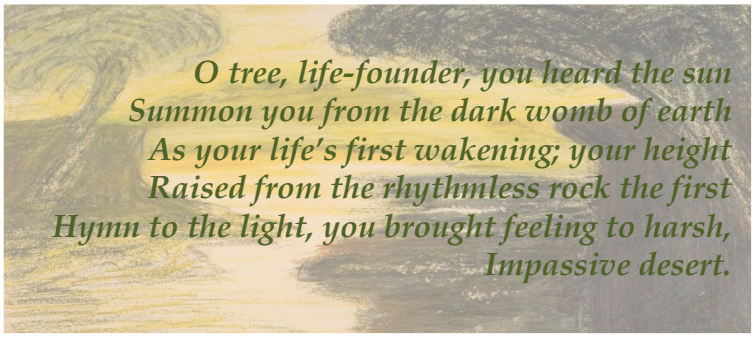
A Treeless Heritage?

Kuntal Narayan Chaudhuri
Assistant Professor

Heritage—tangible or intangible, cultural or natural—is the legacy inherited from the past, preserved in the present, and bequeathed to the future. On 18th April, global celebrations of the International Day for Monuments and Sites highlight the importance of heritage and its protection. However, the focus is on cultural heritage, thus neglecting our equally rich natural heritage. Thus, the word 'heritage' itself evokes images of the Taj Mahal and such iconic monuments. In articles, talks and exhibitions on heritage, the diversity of life—the vegetal world, becomes invisible or blurred into the background, and even the giant trees of yore sink into the ignominy of oblivion in our collective memories.

In the treeless apocalyptic visions of the public and policy maker alike, the trees of our neighbourhoods are vanishing due to apathy, neglect and denial. The merciless summer heat had decimated Kolkata. El Niño events have triggered 'heat islands' across the increasingly treeless cityscape. And it is only now that the citizens are realizing the usefulness of urban greenery, the importance of avenue and garden trees, and the value of shady bowers. Only recently, some heritage enthusiasts are up in arms against developers not only for demolishing heritage buildings, but also for felling the trees grounded therein. However, fellow citizens could have benefited had they listened to an insightful discourse on trees delivered by H.S. Debnath, who heads the West Bengal Biodiversity Board, at the state Heritage Commission's recent event to mark World Heritage Day. He suggested every tree standing tall with its spreading canopy that is no less than 200 years old must be identified and preserved in Kolkata and mofussil areas as 'heritage'. With 342 blocks, the state could develop refugia for more than 300 ancient trees, with native species such as *bat* [*Ficus benghalensis* L. (Moraceae)], *pakur* [*F. rumphii* Bl. (Moraceae)], *phalsha* [*Grewia asiatica* L. (Malvaceae)], *gab* [*Diospyros malabarica* (Desr.) Kostel. (Ebenaceae)], among others. Trees are priceless, and the very old ones are even more so. As keystone species of rural and urban environments, they provide critical habitats for a plethora of lichens, fungi, insects, birds, mammals, and even other plants. They are also critical food resources for myriad frugivores. This is reminiscent of a folklore: a bird and a squirrel brought home as pets soon flee, but on planting a tree they return gleefully—the story of biodiversity around a tree as a microcosm. With the looming climate crisis gripping our planet, environmentalists and town planners in the developed world are stressing on endeavours to ensure the presence and existence of the ancient trees of cities, as equal home for non-humans. Citizens lives would be incomplete and adverse without the natural and multifarious co-existence with urban flora and fauna. Artificial and unplanned 'Biodiversity Parks' can never adequately replace the biodiversity around olden trees.

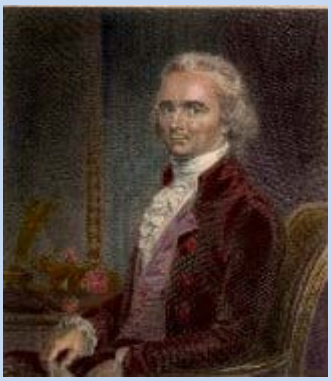
Yet, the olden trees of Kolkata are fast vanishing. The people's struggle is still on to prevent the felling of the iconic trees along the Jessore Road. The apprehension of losing the greenery in the heart of the city itself is no less. Or else, on the warmest day of the city, there will be not even a bit of shade left.



PERSONALITY

William Roxburgh (1751-1815): The Father of Indian Botany

Namrata Dhar Gupta
Botany Hons. (Sem. VI)



William Roxburgh, a Scottish surgeon and botanist who worked extensively in British India in describing plant species of economic value, is rightly called the "father of Indian botany." The results of his studies on Indian plants were embodied in his posthumously published "Flora Indica." The huge collection of botanical paintings, published later as "Icones Roxburghianae Or Drawings of Indian Plants", were meticulously made by local Indian painters using traditional vegetable dyes, who were commissioned by him.

WILLIAM Roxburgh, born on June 3, 1751, in Ayrshire, Scotland, was born to William Roxburgh (Sr.) and Elizabeth Walker. His early education was at Underwood Parish School. He studied medicine at Edinburgh University and matriculated ca. 1771. He studied surgery under Alexander Monro and botany under John Hope. In 1776, he received his first M.D. degree from Edinburgh University.

Roxburgh joined the Madras Medical Service as an Assistant Surgeon in 1776 and was promoted to the rank of Surgeon in 1780. He received second M.D. degree in 1790 from Marischal College, Aberdeen. He began to work in the Carnatic region from 1781 and became the Company Botanist in Madras Presidency in 1789. As superintendent of the garden in Samalkot, he experimented in economic botany. He was then appointed as Naturalist of the Madras government in 1789. From 1793, Roxburgh helped establish another garden at Corcondah (Korukonda) where he worked on sugarcane and indigo. He also studied the prospects of introducing sago as famine food. Roxburgh became the superintendent of Calcutta Botanical Garden after the death of Colonel Robert Kyd in 1793. He made rapid progress, brought plants from all over India and developed an herbarium that eventually became the Central National Herbarium of the Botanical Survey of India. As member of the Asiatic Society, he contributed many valuable papers that included the lacca insect from which lac is made. He also produced an annotated list of plants of St. Helena which was the only available floral account until 1875.

In 1791, Roxburgh was elected a Fellow of the Royal Society of Edinburgh. In 1799 he was elected as a Fellow of the Linnean Society. In 1802, he was elected as a member of the American Philosophical Society in Philadelphia. In 1803, he received a gold medal for communication on growth of trees in India and a second medal in 1805 for the Promotion of Arts. In 1814, he was presented a third gold medal by the Duke of Norfolk.

In 1813, Roxburgh returned to Scotland via St. Helena, to recover from his poor health. He lived close to his original Edinburgh lodgings where he died on February 18, 1815. In 1820, William Carey posthumously edited and published the first volume of Roxburgh's *Flora Indica* Or Description of Indian Plants. In 1824, Carey edited and published the second volume of the same book that included extensive remarks and contributions by his eventual successor Nathaniel Wallich at his beloved "*Paradisus* on the banks of the river Hooghly."

DO YOU KNOW?

Selenicerus grandiflorus: Queen of the Night

Anisha Khatun
Botany Honours (Sem. VI)

QUEEN of the Night, *Selenicereus grandiflorus* (L.) Britton *et* Rose (Cactaceae), is an interesting cactus native to Central and South America, but now cultivated across the world. It's known for its large, white, fragrant, and beautiful flowers that bloom only at night, and only once a year. These flowers open in the evening, after sunset, and reach their peak beauty and fragrance during the night. By the next morning, the flowers begin to wither and close. The entire blooming process lasts only for a few hours, making it a fascinating and enchanting sight to witness. Due to its ephemeral nature and the rarity of its singular nocturnal blooming habit, this showy cactus has gained a certain mystique and now it has become the subject of fascination among many plant enthusiasts.

Pachypodium lealii: The Bottle Tree

Anubhav Sinha
Botany Honours (Sem. IV)

BOTTLE Tree, *Pachypodium lealii* Welv. (Apocynaceae), endemic to Namibia and Angola, has been described as one of the most deadliest trees on the Earth. This xerophytic tree that is commonly found in the Etendeka plateau of Namibia, gathers its name from its bottle-like trunk. Its specific epithet honours the Portuguese geologist Fernando da Costa Leal, who discovered this bizarre tree during a 19th century expedition in Angola. Its watery sap is extremely poisonous and was used as arrow poison by indigenous hunter-gatherers in the past. The latex can produce blindness. The pink and white flowers with a red centre are cluster at the tips of branches. The lack of young specimens, and the removal of wild plants for trade has listed this species on Appendix II of CITES.

Dancing-Lady Orchids: Unveiling their Elegance

Soumyadeep Banerjee
Botany Honours (Sem. VI)

DANCING-Lady Orchids belonging to the large genus *Oncidium* Sw. (Orchidaceae), are a taxa of epiphytic orchids native to Central and South America. The true enchantment of these exotic ornamentals lies in their beautiful blooms, with the tiny flowers emerging on long arched pedicels that are held high above the green foliage. Each tiny flower resembles graceful dancers in mid-spin. The tepals often have a creamy yellow or pale green hue, with the labellum showing vibrant shades of yellow, orange or red. Along with the visual appeal, emission of a delightful fragrance entices the pollinators. These mesmerizing orchids as embodiments of nature's stunning artistry are without doubt exquisite additions to any orchid collection.

HERBAL HEALER

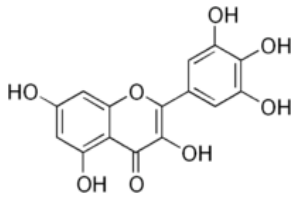
Moringa olifera: The Miracle Tree

Sutapa Kumar (*Rai*)
Associate Professor

DRUMSTICK tree, *Moringa oleifera* Lam. of the family Moringaceae, is a versatile tree native to the Indian subcontinent. It is a small to medium deciduous tree (up to 10-12 m in height); stem covered with hairs; bark grey; branches fragile, drooping; leaves tri-pinnately compound; flowers borne in many-flowered spreading panicles, cream coloured, appearing from February to March and August to September; fruit three-valved capsule; seeds oily with three papery wings. The tree is easily propagated by seeds and cuttings and cultivated in the tropical and subtropical regions of the world. It is commonly called *sajne* in Bengali, *sahjan* in Hindi, *Surajana* in Sanskrit and *murungai* in Tamil.

M. oleifera has rightly been called the 'miracle tree' because various parts of this plant, such as the roots, bark, leaves, flowers, immature pods and seeds, have worldwide use in traditional medicine to treat various ailments. In traditional system of medicines such as Ayurveda, Unani and folk medicine, it is used as part of the diet as a potent immunity booster and is well-known for cleansing and detoxifying effects. Root is used to manage kidney stones. Bark is used to treat headaches. Leaves are used for insomnia, sores and constipation. Flowers can intestinal worms. Seeds improve eyesight. It possess diuretic, cardiostimulatory, hepatoprotective, hypo-cholesterolemic, anti-inflammatory, antiulcer, antispasmodic, antihypertensive, antioxidant, antipyretic, antidiabetic, antiepileptic, anti-tumour, antibacterial, antifungal and immuno-modulatory properties.

M. oleifera is a rich source of diverse phytochemicals such as flavonoids, alkaloids, saponins, tannins, steroids, phenolic acids, glucosinolates and terpenes. It is especially rich in flavonoids such as quercetin (see fig.), myrecytin and kaempferol.



The high flavonoid and other phenolics in *M. oleifera* contribute to its antioxidant activity. The most important dietary flavonoid, quercetin, is a potent scavenger for free radicals due to its hydroxyl group which inactivates hydrogen peroxide, superoxide and hydroxyl radicals by providing active hydrogen, and thus oxidizes free radicals, make them stable and prevent unsaturated fatty acid metabolism leading to cardiac failure. At lower concentrations quercetin acts as an antioxidant, but at higher concentrations it behaves as pro-oxidant which prevents the growth of tumors.

Used as a common vegetable in tropical and subtropical countries, *M. oleifera* can really work wonders. This plant species needs the attention of researchers and industries to commercially exploit its tremendous potential as a superfood, in developing a wide range of herbal cosmetics, alongside its prophylactic and therapeutic uses, which could help attain not only food and nutrition security, but sustainable economic development as well.

A Frozen Microbiome at the Top of the Earth's Tallest Mountain

Meenakshi Mukhopadhyay
Associate Professor

MT. Everest (*Sagarmatha*) is one of the most "extreme" terrestrial environments on Earth with temperatures reaching −33°C, air pressure one-third of that at sea level, maximum wind speed of 66.5 $m.s^{-1}$, maximum insolation of 1,500 $W.m^{-2}$ and extremely low levels of oxygen and water. This highest alpine environment is typically populated by a small number of polyextremophilic taxa. These microbial communities face a variety of challenges to survive. To explore the impact of such elevation on microbial habitability and community structure, N.B. Dragone and his team of the University of Colorado recently analyzed frozen samples from the South Col (7,900 m) of Mt. Everest and published the findings in the journal *Arctic, Antarctic, and Alpine Research*. They explored how these microbes remain active at such extreme adversities using culturing and next generation metagenomic sequencing, and studied the phylogeny and taxonomy of these samples from complex microbiomes. They detected low diversity of bacteria, protists, and fungi, including cosmopolitan taxa and specialized microbes found at high elevations like those of the genera *Modestobacter* and *Naganishia*. Though they were able to grow viable cultures of many of these taxa, it remains likely that few, if any, can be active *in situ* at the South Col. These high-elevation surfaces might have acted as deep-freeze collection zones of organisms deposited from the atmosphere or left by climbers scaling the Earth's highest mountain.

Human Infection by A Plant Fungus: A Case Reported from Kolkata

Ashutosh Mukherjee
Assistant Professor

A plant pathogenic fungus *Chondrostereum purpureum* has been reported to infect a 61 years old male individual from Kolkata, India. The fungus is known to cause silver leaf disease mostly in plants of the Rose family. However, this is the first case of infection of a human host by this pathogen. This case report has been published by Soma Dutta and Ujjwayini Ray of Apollo Multispecialty Hospitals, Kolkata, in the journal *Medical Mycology Case Reports*. The infection caused paratracheal abscess to the patient. The patient denied to work with this particular fungus but reported to work with other plant fungi and decaying material as part of his research activities. Evidence of human infection by plant pathogens are emerging recently. This can be the result of global warming, alteration of ecosystem, unplanned urbanization and international travel. These factors can also be responsible for various zoonotic viral and bacterial diseases. We have already witnessed a devastating pandemic probably by a zoonotic virus (Covid-19). So, global climate change may trigger more such infections by previously unknown or lesser known pathogens.