

GREEN HORIZON

E-Newsletter

Volume 2 Issue 2


20 December 2021



YENEPOYA
[DEEMED TO BE UNIVERSITY]
Recognized under Sec 3(A) of the UGC Act 1956
Accredited by NAAC with 'A' Grade

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General Information

Green Horizon is a peer reviewed e-newsletter published in English by the Centre for Environmental Studies, Yenepoya (Deemed to be University), Mangalore in two issues per year during June and December. This newsletter publishes manuscript of different categories like original articles, short communications, opinions, research communications, case study etc. We invite original contributions significantly advancing fundamental understanding and that focus on the interconnection of multiple environmental spheres of environment and nature (biodiversity, plants, animals, microbes, conservation, soil, air, water, climate, pollution, waste management, compost, environmental protection, environmental management and ecofriendly approaches). The authors, editors and reviewers need to adhere to the research and publication ethics to enhance the quality of the newsletter.

Aim and Scope

Green Horizon intends to project and share the knowledge on our environment and its protection for the benefit of society. It brings out quality and original materials exclusively on the environment and welfare of the biodiversity. Emphasis should be given to biodiversity, ecology, conservation, waste disposal, prevention of pollution and innovative ideas to protect and nurture our environment towards prolife.

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Printed at

Yenepoya Printers & Publishers, Balmatta, Mangalore 575 001, Karnataka, India

Published by

Yenepoya (Deemed to be University), Deralakatte, Mangalore 575 018, Karnataka, India

Newsletter Design:

Yenepoya Printers & Publishers

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Cover page photo: Oak leaf basket fern *Drynaria quersifolia* in tree canopy

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EDITORIAL

I am delighted to offer the Issue 2 Volume 2 of the newsletter 'Green Horizon'. This issue ventures into several essential concepts to lead our lives in sync with the environment and protect its sanctity. The articles discuss some important concerns about environmental issues directly related to human life. My sincere appreciation goes to all the contributors for providing interesting articles and for the judicious review by the editorial committee.

Living amidst nature has several benefits. Dr. Nisha Kumari emphasizes on the value of the dancing in nature on human health through the emission of phytoncides by trees, which positively influence immunity in humans. We are all depending on plants heavily as sources of food, clothing, shelter and medicine. Importance of ethnically valued tree species *Callicarpa tomentosa* (Rishipathiri or Arthigidu) and its metabolites on human health highlights the value of indigenous plant wealth. Bioactive potential and ethnomedicinal application of this flowering tree has been outlined by Ms. Fathima Riza, Ms. Ayesha Heena and Ms. Ayisha Rasaifa. Pro-environment accomplishments of the YENVIRON Club have been put forth by Ms. Raabia Anwar and Mrs. Sharmila P. Nayak. The practical significance of environmental awareness and actions should go hand in hand to protect our environment and to educate the younger generation.

Tree canopy is a natural repository of biodiversity, which embraces plethora of flora, fauna and microbes. This has been elucidated by Dr. Sridhar. A well grown tree canopy accommodates a variety of life. They are interlinked and serve as major carbon sinks in nature. Although several examples are available on visible diversity, many biota are invisible and they have numerous roles to play in the canopy.

Several tips could be offered or followed to go green in our life. Dr. Vidya Bhat and Dr. Sham Bhat discuss 'green dentistry' and how to go green in our day-to-day life. Under the theme of 'Petrichor' (earthy scent produced when first rain falls on the dry soil), Dr. Nanditha Hegde gives several excellent steps on how to be pro-environment by adopting natural materials as toothbrushes.

Trekking in the wild is a great experience to witness nature's wonders. Such an experience in the Himalayan region has been offered by Dr. Savur. Experience outside the four walls is always fascinating and being a part of nature is soothing and health promoting.

According to a recent report 25,000 tons of COVID-19 related debris (PPE and others) entered into the oceans during the last year. Up to 8.4 million tons of this pandemic-related plastic debris was generated from 193 countries. This indicates that every human health and industrial issue will end up with the generation of huge quantities of pollutants, which exceeds the carrying capacity of the earth and its ecosystems as indicated by Mr. Mahesh Nayak. Every step we follow to protect the environment will save the earth from such hazards. Use, reuse, recycle and right disposal of waste assume importance in our life. What is the significance of elimination of single use plastics? This has been discussed by Ms. Faza. Awareness regarding the dangers of single use plastics and their ban is a welcome stride, heading towards the initiative to bring down environmental pollution.

The dangers of zoonotic diseases should not be neglected and needs health care to avoid the spread of diseases by pets and other animals. Climate change and zoonotic diseases are topics of interest. These have been discussed by Ms. Salja Hashim.

Finally, the question always bothers us about how much we are pro-environment in our profession? Are we trying or attempting to eliminate the use of environmental pollutants in our day-to-day lives? For instance, the replacement of plastic wares with natural materials is the fundamental task to be performed in every step of our livelihood.

This issue of Green Horizon presents several interesting pro-environment views and the responsibility that lies with all of us to protect and preserve our environment from hazards.

Waiting in anticipation of excellent articles for the next volume of Green Horizon,

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Influence of climate change and zoonotic diseases

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The Novel Corona Virus Disease 2019 (COVID-19) is something which came up to the world and caused severe human ailment. The zoonotic disease is caused by SARS-CoV-2.

Does corona virus have a connection with climate change?

Climatic change is a change in the temperature and weather patterns over long duration. This could be a change in how much rain a place usually receives in a year or it could also be a change in the usual temperature pattern at a place in a month or season. The earth's climate is always changing. There have been times when the earth's climate is getting warmer than it is now. There have been times when it has been cooler. These times can last thousands or millions of years in the earth's history.

People who have studied the earth could notice the earth's climate is getting warmer. The earth's temperature has gone up about one degree Fahrenheit in the last 100 years. This may not seem like much. But, small changes in the earth's temperature can lead to huge impacts.

The changes in the climate have increased the risk of pandemics. Other effects such as global warming due to deforestation, loss of habitat forces these animals or people to migrate themselves, such actions may share the virus from place to place.

Zoonotic diseases

Animals provide many benefits to people either domesticated or wild. However, animals can sometimes carry harmful germs that can spread to people and cause illness—such diseases are known as zoonotic diseases or zoonoses. Types

of zoonotic diseases include: viral, bacterial, fungal and parasitic. These are spread by mosquitoes, ticks and mites. Diseases like rabies (viral), anthrax (bacterial), tularemia (rabbit fever) and West Nile fever (by virus). Viruses, bacteria, parasites and fungi can cause many different types of illness in people and animals, ranging from mild to serious illness and even death. Animals can sometimes appear healthy even when they are carrying germs that can make people sick, depending on the zoonotic disease.

What if you have a zoonotic disease?

If you are scratched or bitten by an animal, be sure to have the animal thoroughly assessed by a veterinarian. This is to make sure that they are vaccinated and do not have any other diseases. Some people have a high risk of contacting the diseases. These individuals may also have severe reactions and symptoms. Persons belonging to the high risk group should seek medical support. High risk individuals are pregnant women, adults aged 65 or older, children 5 years older or younger, those with HIV, those with cancer who are going through chemotherapy, others with weak immune system.

How these diseases spread?

Because of the close connection between people and animals, it is important to be aware of the common ways people can get affected and cause zoonotic diseases. There are multiple modes of transmission like direct contact with saliva, blood, urine, mucous, feces or other body fluids of an affected animal. The indirect modes like coming in contact with areas where they live and roam, or objects or surfaces that have been contaminated with germs, being bitten by a tick, or an insect like a mosquito or a flea, food-borne diseases, water-borne diseases. One can control

it by washing hands right after being around animals using disinfectants. Use of disinfectants to clean the floor kills many germs including ticks, fleas and mites.

Nipah outbreak

The 2018, the Nipah virus (NiV) outbreak has created a great hassle all over as this disease has a high mortality rate. Fruit bats belong to the family Pteropodidae are the natural hosts of the Nipah virus. The features of Nipah virus infection in humans range from asymptomatic infection to acute respiratory infection and fatal encephalitis. The case fatality rate is estimated to be 40-75%. This rate can vary by outbreak depending on local capabilities for epidemiological surveillance and clinical management. There is no treatment to humans to animals, while the only primary treatment is supportive care.

Beware!!

People who live in poor air quality are more likely to die from the viral infections. People who are more exposed to air pollution and who smoke leads to worsen the health conditions. Climatic change has already made many infections to spread like malaria and water-borne diseases, which cause fever, malaise and vomiting. Many infections spread through the door handles, coins and currency notes.

For the prevention and control of emerging zoonotic diseases the collaborations and researchers are needed which helps in surveillance among the human and animal interactions and transactions. The concept of “One Health” is adopted to deal with global health challenges.



Impact of COVID-19 on Ocean Plastics

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Post-COVID-19 scenario needs a relook at waste management practices

The COVID-19 pandemic has caused large scale disruption of life. While the economic, social, psychological and public health impact of the pandemic are routinely discussed and debated in the public domain, not much is known of its impact on the environment. It was initially assumed that its positive impact on the environment would be the silver lining to the global pandemic. It was thought that the complete shutdown of industries and the time for reflection regarding lifestyle choices would result in drastic decrease in pollution, carbon emission and environmentally hazardous lifestyle.

But, as the saying goes, when you shut the doors on reality, it inevitably enters through the window. With social distancing keeping people off the roads and out of the skies, air quality has seen drastic improvement around the world. Carbon emissions were projected to fall by 4 percent in 2020 compared to 2019. The flip side to this is that, it is now being reported that about 26,000 tonnes of COVID plastic waste has entered the world's oceans. Most of this waste comprises personal protective equipment (PPE) like single use masks and gloves, testing kits and face visors. 87.4% of the excess waste is from hospitals, rather than from individual use. They are thought to first enter the rivers before eventually reaching the sea.

Since the beginning of the pandemic, an estimated 8.4m tonnes of plastic waste has been generated from 193 countries and so far only an estimated 26,000 tons has reached the sea. Considering that about 14 million tons of plastic

waste enters the ocean every year, this might seem like petty cash. The practical problem with gloves and masks finding their way into our rivers and oceans is that they can easily be mistaken for jellyfish, a favorite food of sea turtles. Because of their elastic components, masks also have increased risks of entanglement for a wide variety of fish, animals and birds.

But this is only a symptom of the problem. The real problem is the widespread disruption of life caused by the pandemic, which has distorted the dynamics of the various processing industry. The pandemic has led to a crash in the price of oil, which in turn is a raw material for plastic. This has made plastic cheaper and made plastic packaging more attractive to both businesses and consumers. Due to lockdown and disruption of life, waste processing facilities are unable to cope with the load, resulting in neglect and output of mismanaged plastic waste (MMPW). As plastic waste no longer fetches the same price as earlier, the waste pickers, who form the backbone of the industry, tend to focus on other materials which fetch better returns.

Hence we can safely conclude that what we are seeing is only the proverbial tip of the iceberg. The post-COVID scenario needs a relook at waste management practices. The world has changed drastically and our outlook too should change in accordance with the reality. The reports of discharge of 26,000 tons of COVID plastic waste should open the eyes of all the stakeholders to realign policies and strategies to the new reality. It is time for the world to discard old ideas and move forward with a fresh outlook.

Bioactive potential of *Callicarpa tomentosa* Linn.

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Introduction

Plants are known for remedial purposes long before the ancient era. The classical Unani manuscripts, Egyptian papyrus, and Chinese scripts proclaimed the use of herbs and the data shows that Indian Vaidyas, Europeans, and Mediterranean civilizations used plants for beyond 4 millennium as medicine. The innate cultures such as Rome, Egypt, Africa, and America used herbs in their healing rituals while the conventional system of medicine continues to be the universally practiced on many accounts [1,2].

With a broad recognition of the importance of plants as a source of medications exists, only a few people recognize the comprehensive role and the rate of pharmaceuticals that owe part of their discovery and development to the natural world. According to the estimates, more than 25% of prescription pharmaceuticals contain plant-derived constituents nevertheless barely a diminutive percentage of the plants in the world have been evaluated for potential pharmaceutical use. According to the WHO estimates, 80% of the earth's population relies on plants for at least some aspect of the primary health care needs. Over the past two decades, there has been an enormous expansion in the use of natural medicine [1,2].

In the present scenario, the focus on plant research has expanded across the world, and countless data has been collected to show the immense potential of medicinal plants used in various traditional systems. Further, more than 13,000 plants have been investigated in the past decade and years. Numerous essential prescription drugs like morphine, codeine,

quinine, caffeine and others are derived from natural plants. However, despite the refinement of modern synthetic chemistry, man still cannot compete with the diverse plant species exposed by the nature throughout billions of years and centuries of progression. Approximately, 3,500 new chemical compounds were described in the year 1985, among them over 2,600 of these were isolated from plants. However, since 1985 many new chemical compounds were identified from plants with assuring outcomes in the treatment of many particular illnesses [3].

Also, natural products have been used as medicinal agents for many centuries and yet, now it advances to be the most valuable origin of new potential therapeutic products. According to the past survey, it was revealed that about 65% of the nearly 900 drugs introduced globally, the origin was sparked by natural products. Despite this, there is still a notable lack of research data in this field [1,2,4].

Callicarpa

Relating to the Verbenaceae family, *Callicarpa tomentosa* Linn. (*C. tomentosa*) is utilized in conventional medicine for the treatment of jaundice, fever, headache, stomach ache, skin, and scorpion bites and others. Commonly, *C. tomentosa* is known as 'Beautyberry' and is a tree approximately 8m tall. The branchlets, inflorescences, and flower stalks of the plant are densely velvet hairy. The leaflets are elliptic, oblong-elliptic, or ovate, leathery, and are densely yellowish-brown velvety underneath the dark green and shiny layer. The base of the leaves is wedge-shaped to rounded, margin undivided. Purple flowers are borne in cymes that are 611 cm across and are carried with 4 angled stalks. *C.*

tomentosa is found in countries like India, Burma, South China, and Malaysia and is known to hold several constituents with potential pharmacological activity-based compounds that are still under research [5-8].

Description

Verbenaceae is a genus largely of tropical flowering plants which constitute herbs, shrubs, and trees. Various plant species in this genus have an aromatic odor and have been proclaimed to have anti-infectious activity. Globally, *C. tomentosa* is a plant or a small tree which is commonly referred to as *Tomex tomentosa*. The *C. tomentosa* is popularly utilized and recognized in tropical countries or south eastern countries like India, Burma, South China, Malaysia and Thailand where it is used in conventional medicine for the treatment of jaundice, fever, headache, stomach ache, skin, and scorpion bites conditions due to its ease of availability[6-12].



Fig 1. *Callicarpa tomentosa* [10]

Table 1. Profile of *Callicarpa* species [9,10,13]

Taxonomical profile	Common name	<i>Callicarpa</i> species
Kingdom: Plantae	English: Velvet Beauty Berry	<i>Callicarpa lanata</i>
Phylum: Tracheopyta	Hindi: Pandavara Batti	<i>Tomex tomentosa</i>
Class: Magnoliopsida	Kannada: Arthigidu	<i>Callicarpa arborea</i>
Order: Lamiales	Bengali: Taramah	<i>Callicarpa villosa</i>
Family: Verbenaceae	Malay: Derdap Dupur	<i>Callicarpa wallichaina</i>
Genus: <i>Callicarpa</i>		<i>Callicarpa americana</i>
Species: <i>tomentosa</i>		

The *C. tomentosa* is a tree or a shrub approximately 8-10m tall consisting of branchlets, inflorescence, and flower stalks that are densely velvety and hairy. The trees are 10m high with barks about 5-8mm thick that are brown in color and have a rough texture; creamy-white with yellow streaks, which becomes darker on exposure. The leaflets are elliptic or ovate, leathery, and are yellowish-brown velvet underneath the dark green shiny layer while the base of the leaves is wedge-shaped to rounded and margins are undivided. Purple flowers are borne in cymes that are 6-11 cm across moreover

carry 4 angled stalks and are bisexual. The fruit of *C. tomentosa* is a drupe, globose of 3mm across, and is glabrous, black with 3-4 seeds, that are oblong and angular[6-12].

Phytochemical constituents

From recent researches, it is clear through phytochemical screening that the *C. tomentosa* leaves showed the presence of various compounds like flavonoids, alkaloids, phenol, tannins, saponins, sterols, phytoconstituents like β -sitosterol, maslinic acid, oleanolic acid, ursolic acids and their methyl ester acetates, lupeol

acetate and β -amyrinacetate. The heartwood of *C. tomentosa* contains β -sitosterol and oleanolic acid, while the bark contains methyl betulinate and β -sitosterol acetate [7,8].

Furthermore, in addition to amino acids, benzenoids, simple carbohydrates, lipids, diterpenes, flavonoids, phytosterols, sesquiterpenes and triterpenes have been detected from the genus *Callicarpa*. Hence, there is a wide range of possibilities that *C. tomentosa* contains many other undiscovered constituents with potential effects. Normally, the leaves, stems, and roots of this genus are generally reviewed as terpenoids are the most abundant components in this genus [14,15].

Ethnobotanical application

Past investigations revealed that *C. tomentosa* is widely used in traditional medicine for the treatment of jaundice, headache, stomach ache, scorpion stings, hepatic obstruction and skin diseases. Mainly, the root and stem extracts were observed to hold antiviral and antifungal properties, while the seeds were discovered to have anti-periodic, antipyretic, and anthelmintic properties. The extracts of the *Callicarpa* genus have always been assessed for their biological activities like the antibacterial, antioxidant, antifungal, and phytotoxicity [6,8].

In Bangladesh, people of the Mama tribe use root extract of *C. tomentosa* in combination with *Streblus asper* to treat irregular menstruation and use *C. tomentosa* leaves chewed with salt as an anthelmintic remedy. In some regions, *C. tomentosa* bark has been are placement for *Piper betle* leaf for many years. Several species are used to regulate fertility and the extract of the chewed leaves is used with several other shrubs and trees to treat infertility [14].

Antioxidant property

Lallianchhunga et al. [6] investigated the *in vitro* antioxidant activity of methanolic extract of *Callicarpa* species namely *C. arborea*. In the investigation they selected three different

methods to determine the activity; namely, DPPH free radical scavenging assay, Ferric reducing antioxidant potential assay, and total phenolic contents by spectrophotometric method. As a result, the DPPH and ferric iron-reducing assay showed values of 9.8mg and 12.8mg Trolox equivalent, respectively per gram of dried leaves indicating the presence of antioxidant property [6].

Antimicrobial activity

Raviraja et al. [16] performed the antimicrobial evaluation of endophytic fungi inhabiting medicinal plants of the Western Ghats of India and *C. tomentosa* was used as a host plant for fungi *Nigrospora oryzae*. As a result, the extract of *N. Oryzae* exhibited considerable antimicrobial activity.

Shrilakshmi et al. [17], attempted assessment of the phytochemical constituents and antibacterial activity of *C. tomentosa*. Different solvent extracts of *C. tomentosa* (leaf, stem, and flower) were subjected to phytochemical analysis and antibacterial activity. The antibacterial activity was carried out by adopting the disc diffusion technique and as a result, significant activity was observed in all the extracts against Gr+ve and Gr-ve bacteria (e.g. *Bacillus subtilis*, *Escherichia coli* and *Salmonella typhi*) [17].

Hepato-protective activity

Zulfkar et al. [7] studied the hepatoprotective activity in Wister rats with liver damage induced by ethanol of the ethanolic extract of *C. lanata* (*C. tomentosa*), which was supported by histopathological studies of liver tissue. The effects of the extract were comparable with the standard drug silymarin at all levels and showed significant results in a dose-dependent manner [8].

Siddha system of medicine

Sundarrajan et al. [18] documented the traditional Siddha medicines for skin diseases and the use of *C. tomentosa* against eczema.

Toxicity studies

Qadrie et al. [8] assessed the safety of the *C. linata* (*C.tomentosa*) leaf extract through acute and sub-acute toxicity studies in rats. In the investigation, acute toxicity was studied for up to 72 hours for the obvious toxic symptoms and mortality while in the sub-acute study the effect of multiple weekly dosing was investigated. For both studies, evaluation was achieved by the hematological parameters, biochemical estimations of hepato-renal parameters, histological studies of the tissue. The result outcome suggested that the extract was safe and can be used in the treatment of diseases without any toxicity[7].

Other activities

Tu et al. [15] analyzed the medicinal uses of the *Callicarpa* genus in Chinese medicine and the crude extracts and isolates exhibited a wide spectrum of (*in vitro* and *in vivo*) pharmacological effects like neuroprotective, anti-amnesic, antitubercular, and analgesic activities. Mixtures made with *Callicarpa* exerted high-grade efficacy on the clinical applications against *Acne vulgaris* and chronic pharyngitis [15].

Conclusions

Hence, with reference to analysis of the literature reports, it is worth conducting or advancing projects with *C.tomentosa* plant in the future. The *C.tomentosa* plant has many more constituents and potential activities that are further to be discovered. Accordingly, the investigations should be carried to examine the therapeutic potential of different parts of the plant for more beneficial therapeutic utilization.

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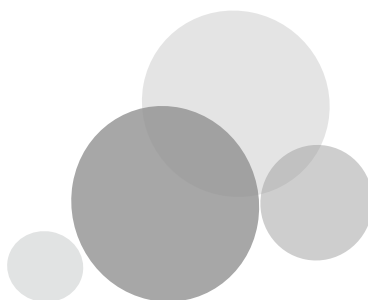
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Dance in Nature - a reflection

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Abstract

Dance has been one of basic instincts of humans as well as animals. But the practice of the same has seen decline over the few decades. Due to faulty food habits, sedentary life, stress and environmental factors diseases or morbidities are raising these days. Human has almost cut the link between himself, the nature and dancing. Dancing imparts physical fitness that directly influences hemodynamics and homeostasis. This physiological activity enhances the gut bacteria to develop required molecular activators that promote immunity. Forest contains various elements that make an ecosystem. The flora and fauna, soil, fungi and algae do interact with humans and influence health. The trees emit phytoncides, the soil contains rhizomorphs, the schumann resonance present in the hum of forest are few of unique resources of forest. Performing physical activity in the form of dance in such forest will give a synergistic enhancement in immunity or general health of human body. *Ayurveda* has told about *Karaprachitiya rasayana* in which at a particular time and day a health seeker should walk in the forest having trees of Indian gooseberry (*Phyllanthus emblica*) and pluck the *Emblica officinalis* fruit in own hand and consume it for rejuvenation of the body. Self-exploration in the forest and self-harvesting indicates the importance of human interaction with the nature to avail its goodness in natural way. Japan explains *Shinrin-Yoku* (forest bathing) the art of forest bath and its effect on immune system stating as increase in the efficiency of natural killer cells which happens by walking in the forest and this phenomenon plays a role in preventing cancer. Thus this article emphasizes on addition of practice of dancing in the forest to avail the benefits of dance, the forest and nature's rhythm to improve one's wellbeing.

Key words: Ayurveda, Rasayana, Shodana, Human microbiota, Endophytes, Phytoncides, Schumann resonance

Introduction

Humans have a biological need to connect with nature. This hypothesis is called Biophilia, hence it is a biological need to connect oneself with nature [1]. The phenomenon of photosynthesis in plants, and the plant's need for animals for carbon dioxide, also the animal's need of oxygen from plants has created a vital bond between these two kingdoms. This symbiosis is a very important part for the functionality and continuity of ecosystem. Like the external ecosystem human body has internal ecosystem made by microbiota which involve in various physiological functions [2]. Dancing as well as understanding the neuroscience of it is a process of self-exploration from the inner impulses. This process connects an individual to the rhythm of nature, reminding the purpose of life and knowing life is beautiful and it is worth living [3]. Dance may promote wellness by strengthening the immune system through muscular action and physiological processes. It conditions an individual to moderate, excrete or avoid chronic fatigue and other disabling conditions that results from day-to-day stress. Experiencing and watching dance can influence immune system. Dancing promotes physical fitness and physical fitness keep up the hemodynamics in normal range to maintain homeostasis. Maintenance of homeostasis is principal key to immune system where in the immune system plays supportive to homeostasis. Lack of active movement causes stagnation of toxins, sluggishness in circulation and slows down the metabolism, which leads to health breakdown. Dancing activates them all

and regularizes the system and its functionality. Dance activity oxygenates brain, does neurological re-patterning, and activates musculoskeletal action and metabolism by raising core temperature due to energy breakdown and utilization. The physical activity raises the metabolic rate and liberates the heat because of activation of biochemical reactions. This liberation of heat activates the process of biotransformation of toxins by means of oxidation and reduction resulting in elimination of transformed toxins through Urine, feces, sweat and so on. The physical activity during dancing enhances circulation providing good oxygen and nutrition including every peripheral cell of the body. The act of dancing increases the heart rate as well as blood pressure in conditioned amount so that it can also remove minor blocks or stagnation in the system of circulation. Enhancement in blood circulation also leads to the collection of accumulated metabolic wastes in every cell and then they are all put into excretory system. All these collectively contribute our immune system. Therefore, this tripod of physical fitness, hemodynamics and homeostasis collectively promote immunity



Fig. 1. Glimpse of nature -Wayanad

Dancing in the woods

The forest has vast array of trees of different sizes herbs, shrubs, climbers and creepers. These trees emit special chemical called phytoncides. The air in the forest is full of phytoncides, aroma of the inflorescence and rhizomes. Phytoncides are natural oils within a plant and tree's defense

system [4]. Trees release phytoncides to protect themselves from bacteria, insects and fungi. Phytoncides are also the communication pathway between trees that do signaling or indicating any kind of danger. The main component of phytoncides is terpenes which is a fragrant. In plants, terpenes and terpenoids are important mediators of ecological interactions.

The phytoncides are volatile chemicals found within and released by trees and plants. They are the elements of defense system in trees. These phytoncides enhance natural killer cells activity inside human body [4]. The natural killer cells stimulate the function of granzyme, perforin and granulysin that causes apoptosis of tumor cells and helps the body in prevention of cancer. The aroma of phytoncides also reduces stress [4] and thus helps to reduce stress induced psychosomatic diseases.



Fig. 2. Dancing in nature

Stress reduces the efficiency of our immune system, dancing in forest and taking the aroma of tree phytoncides reduces stress. This naturally enhances immunity due to reduction in stress. The release of hormone called endorphins during dancing and a boosted immune system makes one feel happy. Overall, the forest atmosphere and the act of dancing reduce anxiety, anger, sleep disorders and thus significantly can reduce the unnecessarily increased blood pressure or heart rate and bring it under physiological limits. The forest ambience suppresses sympathetic nervous activity and increase para-sympathetic activity bringing one's nervous system into

balance and makes the dancer feel comfortable and relaxed. Listening to the birds chirping, the bees buzzing, breeze rustling in the leaves of trees, visualizing various patterns in the clouds, tress and nature, inhaling the fresh and clean air with fragrance from the phytoncides, touching the soil in bare foot that contains *Mycobacterium vaccae* collectively boosts up one's mood and sense of happiness. Thus, it is also a great contributor for ensuring one's emotional wellbeing in patients with mental health disorders [4].

Almost all Indian classical dances are performed bare footed. By dancing in bare foot and feeling the soil beneath us, we will be in constant contact with the electrical energy of the earth. When we are electrically grounded, we are in harmony with nature. This mechanism is also called earthing. James Oschmann a top expert of biophysics energy medicine has shown that the earth is a powerful healing tool. When bare feet connect to the ground, there is transfer of free electrons from the earth through the skin. These electrons have the property of antioxidants [5].

Schumann resonance and human health

The functioning of the brain is supported by certain frequencies that earth creates. These frequencies are called the Schumann resonance frequencies. These frequencies belong to the group of natural electromagnetic Earth energies. The Schumann resonance frequencies are between 7 to 50 Hz (Jaap Van Etten, Gifts of Mother Earth: Energies, Vortexes, Lines and Grids). The Schumann resonance is also known as the vibration of homeostasis produced by the hum of forest and vibration of earth. Humans match through this sympathetic resonance upon direct contact with this frequency. When separated from this vibration body comes out of sync with healthy rhythms. This has direct impact on all metabolic, immunological and neurological process. Schumann resonance signal operates by being resonantly absorbed by brain systems and altering the serotonin/melatonin balance. Melatonin plays a central role in body's highly regulated and strongly integrated system that was developed to produce healthy living in the face of diurnal and

seasonal climatic variations. There are melatonin receptors in vital organs throughout the body. Melatonin has direct action in the immune system through T lymphocytes. Melatonin is also a highly potent antioxidant that scavenges free radicals from cells [5]. If Schumann resonance signal strength and frequency are moved outside the normal range, it alters both the brain and heart synchronization and changes the melatonin levels. This can negatively affect human health including unusual fluctuation in blood pressure, heart rate, cardiovascular and cardiopulmonary mechanisms, as well as neurological and reproductive systems, increasing the carcinogenic possibility and impaired immune system.

Dancing otherwise enhances cardiovascular and cardiopulmonary wellbeing along with activation of neurological re-patterning in the brain. But, dancing in the forest along with Schumann resonance is definitely a synergistic benefit on immune system.

Human gut microbiome and immunity

The external ecosystem when interacts with internal ecosystem of the humans there is impact on human immune system. The internal ecosystem of human body comprises of gut microbiome. There is a vast array of microbes inside our gut carrying the every possible function like synthesis, metabolism, destruction and many molecular signaling during inflammatory process. There should be a good nurture to this microbiome and it can happen only by good nutrition and healthy life style. The mechanical action during dancing increases core temperature by almost one degree. This enhancement of core temperature moderates many microbial activities that stimulate and activates needful immune responses. Other metabolic activity like production, repair, biotransformation, elimination of toxin, neurological signaling are all carried by gut microbiome. Forest ambience and dancing mechanism keeps the gut microbiome in best of its physiological functions.

Summary and outlook

Dancing promotes physical fitness, and physical

fitness keep up the hemodynamics and homeostasis to which our immune system is supportive and this tripod of Physical fitness, hemodynamics and homeostasis promotes immunity. Lack of active movement leads to stagnation and accumulation of toxins, sluggishness in circulation and slow down the metabolism. Dancing activates them all with additional activation of multiple systems and improvises its functionality.

Dancing brings natural fatigue that promotes sleep. A stress-free mind, good sleep, efficient metabolism that eliminates toxins and nourishment to body with well-functioning gut microbiome are all keys for good immunity. With enhanced oxygen uptake, efficient neurological stimulation as well as good cognitive skills, dancing promotes immunity. Dancing influences endocrine system by decreasing cortisol, increasing endorphins, serotonin and melatonin balance. This influence of dance over endocrine system enhances immunity.

Dance involves the culturally mediated body, emotion, and mind. So do illness and pain. Dancing enhancing the physical fitness, Dancing enhancing the core temperature to increase the functionality of gut microbiome, the impact of phytoncides from the trees over human senses and enhancement of natural killer cells, the Schumann resonance and enhancement of T

lymphocytes, the barefoot dance supporting the reception of electrons by mechanism of earthing, receiving plant chemicals via soil by dancing bare foot over them, the fresh air in the forest and captivating green visuals: All these collectively influence Human mind and body to enhance the immune system.

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On the Biodiversity in Tree Canopy

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Introduction

The above ground organs of a tree in a tree community are referred to as the canopy. Forest canopy is an assemblage of tree crowns composed of foliage, branches, twigs and associated epiphytes exposed to the atmosphere (Parker, 1995). The surface area (leaves, twigs, branches and bark) in a tree canopy is the potential region for colonization, adaptation and interaction of various biota. Being structurally diverse, the tree canopy is the site of evolution of unique flora, fauna and microorganisms (Nadkarni et al., 2001). Canopy is rich in biodiversity, and interacts with each other to form an ecosystem by itself. Different fauna help in dissemination of their progeny into other regions (e.g. soil and other tree canopy parts) (Magyar et al., 2021). This article briefly highlights canopy dwelling biota (flora, fauna and fungi) and their significance.

Canopy habitats

Within the tree canopy, different ecological niches exist. Such niches include tree leaves, surface of bark, tree holes, epiphytes (leaves, roots and rhizomes), autochthonous (their own) detritus, allochthonous (from other plants) detritus, crown sediments, honey dew (e.g. aphids) and floral honey (from flowers) (Sridhar, 2009). Architecture of bark differs drastically among trees, which supports a variety of flora, fauna and microorganisms in the surface as well as in the crevices (Fig. 1). Tree holes (also known as dendrotelmata) support many organisms as it receives water and nutrients from the canopy, while the excess water will be drained similar to continuous flow system. Tree holes act as breeding sites for canopy frogs, insects and other taxa. Upon the growth of epiphytes on available surface of canopy, organic matter derived from

decomposition of leaf litter, inflorescence, flowers, bark and wood accumulates. Such decomposed organic matter in the canopy is called the crown humus, which sustain a variety of flora, fauna and microbiota owing to its nutritional value. The secondary habitat within the tree canopy created by the epiphytes harbours its own set of species, making these habitats highly unique.

Flora

Canopy provides mechanical support to innumerable number of vascular (non-parasitic plants, parasitic plants and ferns) and non-vascular (algae, bryophytes, mosses and lichens) epiphytes. Canopy epiphytes have been designated by various terms such as ant-associated epiphytes, atmospheric epiphytes (e.g. orchids), bark epiphytes, humus epiphytes, tank epiphytes (bromeliads), trash-basket epiphytes (*Drynaria*) and corticolous epiphytes (bark-dwelling). According to an estimate, canopy supports over 24,000 species of vascular epiphytes (Nadkarni et al., 2001). Interestingly, *Acacia koa* occupies the canopy and develops root nodules in its adventitious roots in association with brady rhizobia, fixes atmospheric nitrogen and enriches the canopy nutrients (Leary et al., 2004). The occupancy and diversity of flora in the canopy is dependent on various factors such as size of the branch, bark structure, canopy cover over the branches, rainfall, humidity, temperature, direction of the sunlight, slope and so on. A significant proportion of canopy plants have very restricted distribution making them endemic to the region. Flora constantly interacts with fauna for pollination, dispersal and thus maintaining the population in the canopy.

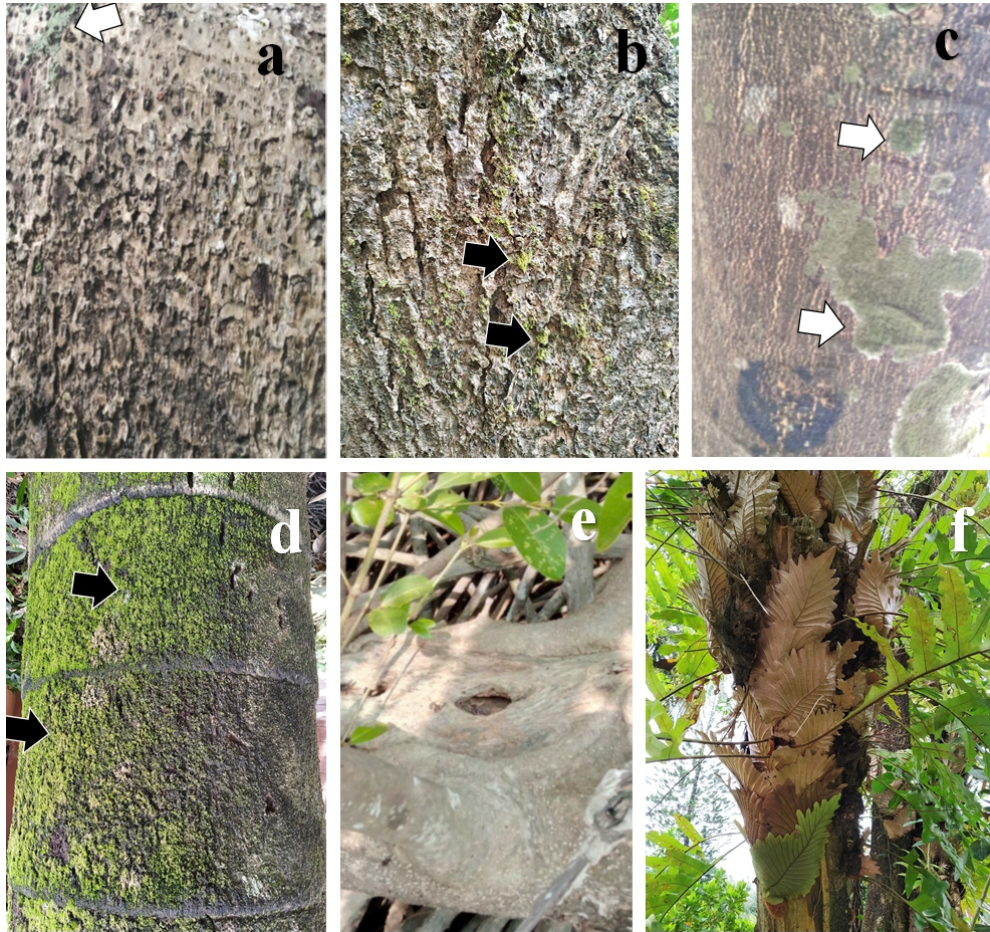


Fig. 1. Surface architecture of bark of *Ficus benghalensis* (a), *Mangifera indica* (b), *Pongamia pinnata* (c), trunk of palm *Caryota urens* (d), tree hole in a mangrove tree *Avicennia officinalis* (e), the oak leaf basket fern *Drynaria quercifolia* (f) (White arrows, lichens on the bark; Black arrows, mosses on the bark) (Pictures a-c and f from the Mangalore University Campus; Picture d, from the Yenepoya Campus; Picture e, from the Nethravathi mangroves) (Photo credit: Picture e, Dr. K. Sharthachandra, Department of Biosciences, Mangalore University, Mangalore).

Fauna

Canopy is a perfect site for survival and activity of many fauna like birds, insects, annelids, gastropod molluscs, millipedes, amphibians, reptiles, mammals and others (Ellwood and Foster, 2004). According to Magyar et al. (2021), 100,000 nematodes and tardigrades, and 1,000,000 rotifers thrive in the stem flow per tree per year. Canopy serves as home for nesting insects and birds and roosting sites for insectivorous and frugivorous bats, birds and other innumerable animal taxa. Many birds and bats (frugivorous) disperse seeds through faecal pellets in to the canopy niches, which perpetuates

in the canopy. Primates such as lion-tailed macaque is a canopy dwelling monkey seldom come to ground for feeding. Similarly, there are other taxa across taxonomic group, which are evolved to survive in the canopy habitat such as canopy dwelling endemic bush frog (*Raorchestesn erostegona*) (Kalpetta yellow bush frog or lichen bush frog) of the Western Ghats spends most of the time in the canopy expect during breeding season (Biju and Bossuyl, 2005). Amphidromus snails from the South East Asia are fully canopy dwelling gastropod molluscs. The list goes on if one starts compiling.

Fungi

Among the microorganisms, several fungi have been reported to occupy the canopy (Sridhar, 2009). They include endophytic, pathogenic, lignicolous, aquatic, water-borne and aero-aquatic fungi. Stem flow (or bark flow), through fall (from the canopy foliage) and tree holes consists of a variety of fungal propagules and their spores (Fig. 2). Many of them have adapted to canopy ecosystems. Floral honey is a nutritional source to many microbes; similarly the honey dew secreted by the aphids will also serve as suitable milieu for fungi.

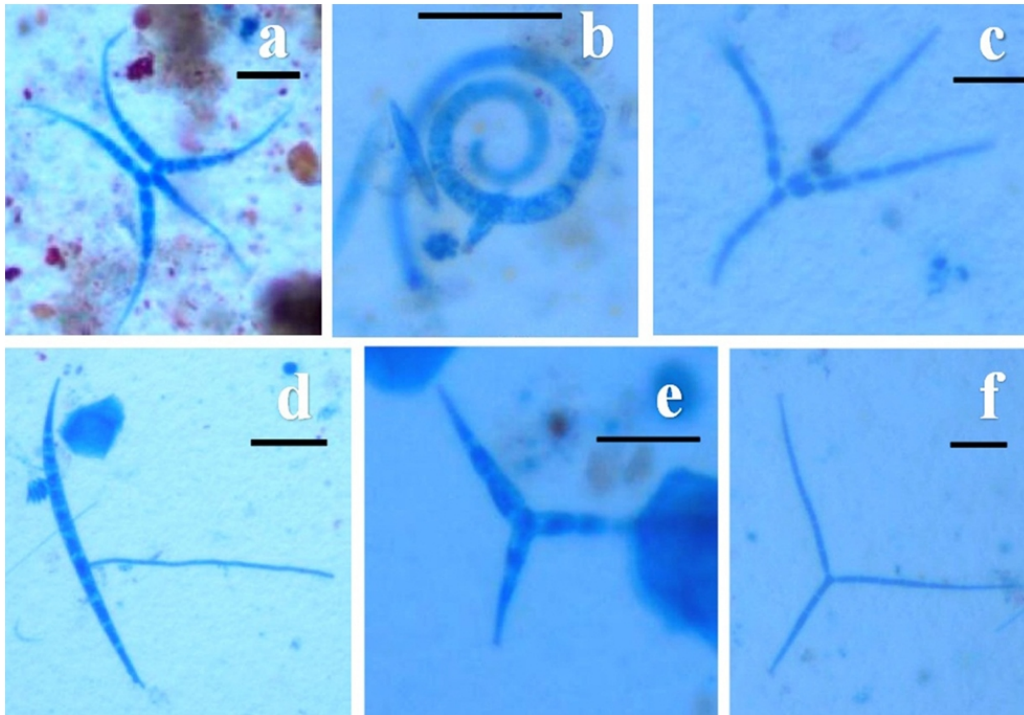


Fig. 2. Selected aquatic and water-borne spores of fungi found in the mangrove canopy: *Dwayaangam* sp. (a), *Helicosporium* sp. (b), *Isthmotricla dialaeensis* (c), *Mycocentro sporaacerina* (germinated at the middle region) (d), *Trinacrium robustum* (e) and *Trinacrium subtile* (f) (Scale bar, 20 m) (Spore pictures from the canopy study of Nethravathi mangroves).

The faecal material of fauna is also a potential source for fungal colonization. Similarly, decomposing trunk in association with ants and termites supports growth of mushrooms (e.g. *Inonotus*, *Termitomyces* and *Xylaria*) (Fig. 3). Mushrooms are usually surveyed on the forest floor rather than canopy, while the canopy supports many mushrooms as the ants and termites disseminate mushroom spores to the canopy. The fungi in the canopy are hardly studied and not given any importance despite they play a significant role in ecosystem services. There may be hundreds to thousands of new fungal species in the canopy, which awaits discovery to fill the gaps of cryptic fungi.

Chauvet et al. (2016) reported fungi in the canopy of 57 plant species. Up to 228 different spores of fungi (mainly aquatic or water-borne) have been recorded from the canopy of 65 tree species (Magyar et al., 2021). Fungal load will be up to 1-100 spores per ml per hectare per annum (Magyar et al., 2021). The biomass of microfungi has been reported up to 450 kg per hectare per annum in twigs and needle surfaces of canopy of Douglas fir forest (Carroll et al., 1980). Such a huge fungal biomass will have a definite role in the canopy and serve as source of nutrition to various fauna. A recent study revealed occurrence of spores of 39 fungal species (mixture of terrestrial, freshwater and marine) in the canopy (through fall, stem flow and tree



Fig. 3. Mushrooms grown on the termite-infested trunks of *Pongamia pinnata*: *Inonotus obliquus* (Chaga mushroom) (a), *Termitomyces eurhizus* (b) and *Xylaria polymorpha* (c) (White arrow, millipede) (Pictures a-c from the Mangalore University Campus) (photo credit for picture a, Dr. K. Sharthachandra, Department of Biosciences, Mangalore University, Mangalore).

holes) of two mangrove tree species (*Avicennia officinalis* and *Rhizophora mucronata*) of Nethravathi mangroves (Karamchand et al., 2021).

Outlook

The canopy is known as the “last frontier”. Canopy science is an interdisciplinary discipline, which helps understanding the structural and functional role of biota and in turn the ecosystem services. Canopy has a strong interaction with surrounding atmosphere, which makes the biota vulnerable to changes in the climate. There will be a regular exchange of nutrients and biota from floor to canopy and vice versa. The canopy biota may differ from region to region. For example, the Western Ghats and west coast receives almost continuous rain during the southwest monsoon season, while other regions will receive lesser rainfall. Because of these conditions, the canopy communities differ to a very great extent and evolved to these regions millions of years ago. Similarly, there will be differences in biodiversity in the canopy between different forest types, regions and habitats. Such

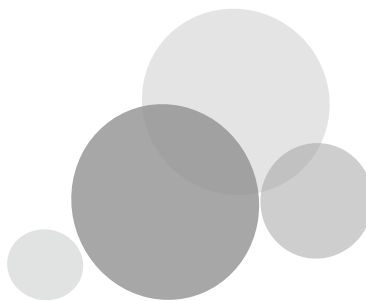
differences may also found among the native and exotic tree species (e.g. *Acacia* and *Eucalyptus*). Assemblage of a variety of flora, fauna and microorganisms in the canopy leads to symbiotic associations. For instance, some of the insects develop plant galls to rear their larva into adult and suitable combination of alga, fungus and or cyanobacteria results in development of lichens.

Although we know a fraction of visible biodiversity in tree canopies, there exist a plethora of invisible microbes, which contributes to the stability of tree canopy. Cutting a trees or disturbing the canopy will have a large number of canopy biota under serious threat or loss. In the urban regions, regular management could be followed to retain the tree canopy in the gardens, parks and avenue trees for purification of air as canopy serves as potential sink for aerosols. Educational institutions in urban region should shoulder the responsibility to prune the canopy appropriately. Strategies like growing the orchids (wild or cultivated) in the tree canopy increase the aesthetic value and educate the public as well as students.

No specific answer yet, what happens to the biota and ecological niches under extreme conditions (heavy rainfall, increased temperature and increased air pollution). Although there are studies from other parts of the world, there are no such studies from Indian region, except from Southern Western Ghats of India. We still need to understand: What is the contribution of canopy flora in carbon sequestration? What is the role of canopy biota in biogeochemical cycling? Although the canopy harbours unique biodiversity, it will be vulnerable to climate change and other perturbations. There is an urgent need to study, conserve the trees and associated canopy biota.

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Green Dentistry

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Introduction

There has been a sharp increase in environmental awareness. Many are confused about the terms like going green, sustainability, and eco-friendly. But the differences between the three are minimal. In simple terms:

- Go green means 'to do things in a way that protects the natural environment'
- Eco-friendly means that a product, practice, or activity won't harm the environment
- Sustainability means avoidance of the depletion of natural resources in order to maintain an ecological balance
- A carbon footprint is defined as the amount of carbon produced by an organization or individual, either directly or indirectly [1]
- In current practice, dentistry has a significant environmental impact due to its high utilization of energy and resources. Day-to-day operations utilize various electronic dental equipment, large amounts of water, and numerous disposable products for preclinical, clinical and post clinical use [2]. Medical and dental waste is a significant contributor to the environmental problems stemming from single-use plastic products.

A life cycle analysis (LCA) was performed for the life cycle of an examination of one patient in a hypothetical dental practice. They found that the impact was on water scarcity, freshwater eutrophication and human toxicity (cancer effects). The major environmental harm of an examination procedure is soaps and detergents, disposable bibs, surface disinfection, stainless-steel instruments, clothing, water use and wastewater [3]. The LCA of endodontic

procedures was carried out. All clinical elements of an endodontic treatment (RCT) were input into Open LCA software using process and flows from the eco-invent database. Travel to and from the dental clinic was not included. Environmental outputs included abiotic depletion, acidification, freshwater ecotoxicity/eutrophication, human toxicity, cancer/non-cancer effects, ionizing radiation, global warming, marine eutrophication, ozone depletion, photochemical ozone formation and terrestrial eutrophication. The RCT procedure contributes 4.9kg of carbon dioxide equivalent (CO₂eq) emissions. This is the equivalent of a 30km drive in a small car. The main five contributors were dental clothing followed by surface disinfection (isopropanol), disposable bib (paper and plastic), single-use stainless steel instruments and electricity use [4].

Many organizations Like - American Dental Association (ADA), US Environmental Protection Agency (US EPA) Organization for Safety, Asepsis and Prevention (OSAP), US Centers for Disease Control and Prevention (US CDC) provide guide lines and protocols for safe usage of materials in Dentistry.

The Eco-Dentistry Association® has free dental resources and access to green dental professionals and provides resources for manufacturers, distributors and key opinion leaders supporting their success in dentistry's green future. It also provides membership and certifies Dental Clinics [5]. Green dentistry is a high-tech approach that reduces the environmental impact of dental practices and

encompasses a service model for dentistry that supports and maintains wellness.

Many ways are advocated to reduce the adverse environmental impact of common products and materials used for treatment. Eco-Friendly dental offices and clinics can implement the Four R's : reduce, reuse, recycle and rethink.

ADA gives 80 tips to go green, a few are listed [6]:

1. Use of energy efficient products
2. Sensor operated faucets and switches
3. Use of LED bulbs
4. Proper maintenance of equipment to prevent power wastage
5. Use of Green products like-recycled and biodegradable paper
6. Use of reusable stainless steel suction instead of disposable plastic
7. Use of digital radiographs
8. Use of disinfectants that are enzyme-free, biodegradable and free of volatile organic compounds
9. Use of reusable Cloth aprons and patient bibs
10. Use of reusable utility gloves during operatory cleanup
11. Teach your patients to turn off the faucet when they brush

We should also be conscious of how we handle the waste generated in the clinic and take measures not to harm the environment. Appropriate handling, treatment, and disposal of waste do much to protect public health. The government guidelines in handling biomedical waste should be followed [7]

We use a variety of chemicals for sterilizing, disinfecting and cleaning. Several of these products may contain active chemical ingredients (e.g. formaldehyde), that may be classified as hazardous. Some of these chemicals may be explosive if released into the sewers in large quantities. Other chemicals may disrupt the microbial process that breaks down wastes in sewage or damage the drainage and sewer pipes over time. Additionally, certain chemicals may

negatively impact the environment and human health using less harmful alternatives, cleaning methods and/or surface barriers can reduce the impact on the environment and the need for special handling of waste in the dental practice. Waste containing mercury or contaminated with mercury should never be placed with the medical wastes as these wastes will be incinerated and there by releasing mercury into the environment.

The Indian Dental Association suggests alternatives such as:

- Pre-capsulated amalgam instead of bulk mercury.
- Digital radiography.
- Steam sterilization instead of chemical sterilization.
- Non-hazardous biodegradable detergents for clean-up.
- Non-chromium containing X-ray system cleaners

As Incinerators produce lot of toxic gases, alternative methods for disposal of biomedical wastes could be thermal, chemical processes, irradiative processes, and biological processes. Use of biodegradable plastics which undergo biological degradation with microbial extracellular enzymes must be encouraged. These microbes utilize these biodegradable polymers as substrate under starvation and in unavailability of suitable substrate [8].

Conclusion

We too can adopt some of the practices so that we leave a greener future. Through soaps and detergents are of the most environmentally harming aspects of dentistry, they are essential for proper infection control. With a potential change to health care practices following the pandemic, the environmental consequences should not be neglected. Small changes in everyday practice and being eco conscious can reduce the environmental impact of dentistry

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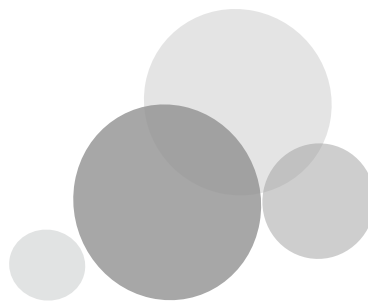
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Together with nature at YENVIRON

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Introduction

“The Earth does not belong to us: we belong to the Earth” Chief Seattle

The natural environment consists of climate as well as nature, both of which can affect health. Climate represents the natural weather conditions which influence nature. Sustainable living ensures harmony with nature. A poor environment can decrease the lifespan of all creatures on earth. It can extremely affect their psychological and physical conditions. In recent years, there have been many natural disasters or calamities giving out negative consequences. Wildfires, earthquakes, floods, famine and other problems are becoming very common. Pollution has adverse effects on the natural environment alongside with its flora and fauna. It changes the natural genetic code of the organisms dwelling in its polluted surroundings. Pollution disturbs not just the food chain but, it ruins the entire food web. It endangers and is accountable for the extinction of living species.

The plantation, restoration, and maintenance of green trees are vital to save the deteriorating environment. Trees play a crucial part – not only to supply oxygen but also to consume carbon dioxide which is dangerous to humans and animals. Deforestation must be discouraged at all costs. The more we plant trees, the more our environment can be preserved. Deforestation leads to a large decline in soil quality and causes landslides. Improved tree plantation causes afforestation that helps to strengthen the soil particles and prevent erosion. Pollution, of all kinds, is a major threat to the environment. Chemicals and insecticides can cause pollution to the same extent as harmful gases, smoke, or dust particles.

Another important initiative to follow for saving the environment is waste management. People should be educated for discarding and managing waste scientifically in their house, area, or city. Frequently cleaning of streets, managing garbage and other aspects of waste management is vital to consider. The US Forest Service scientists and collaborators designed in a study recently published in *Environmental Pollution*, those trees by removing air pollution, are saving more than 850 human lives and stopping 670,000 incidents of acute respiratory symptoms a year. This is the first broad-scale evaluation within the United States. Researchers valued the human health effects of the reduced air pollution at nearly \$7 billion every year in a study published in recent times in the journal *Environmental Pollution*. The study by Dave Nowak and Eric Greenfield of the U.S. Forest Service's Northern Research Station and Satoshi Hirabayashi and Allison Bodine of the Davey Institute is unique in that it directly connects the removal of air pollution with improved human health effects and associated health values. The scientists found that pollution removal is significantly higher in rural areas than urban areas; however the effects on human health are considerably greater in urban areas than rural areas. The environment plays a very crucial role in our existence. One tree provides life to several living beings. The mother earth is filled with life-giving properties. Without the environment no living things would be able to survive. It is our duty to protect, save and nurture our mother earth. Since this is the only place we have to live and we must treat it with care and respect.

For centuries, human beings have been mistreating and taking nature for granted. In order to spread awareness and the message to the

public we have come together to save and protect our environment at the YENVIRON CLUB – started in 2019 by The Yenepoya Institute of Arts, Science, Commerce and Management (YIASCM). The purpose of club is to raise awareness among students so that they understand the environmental issues and to instill a sense of responsibility for the environment and a personal commitment to protect and conserve the environment. The main action is to educate and cultivate an appreciation and interest in the environment. It is a voluntary group comprising of students and teachers which promotes participation in learning about and working towards the conservation and sustainability of our environment.

This club has come up with an aim at creating awareness on the importance of respecting and appreciating our surrounding through four domains, that is,

- To improve leadership skills
- To develop critical and inventive thinking
- To encourage projects and competitions
- To provide service learning

The club has conducted various webinars, activities, competitions, study visits, model exhibitions and other events to promote and spread awareness of protecting and saving the environment. Students have actively taken part in educating people about the environment, its importance and how to save the environment through chart making, creative craft works like fruits and vegetable carvings, food compost, making the best out of waste, creating models on saving the environment and awareness about how to keep away from plastic usage and a pollution free environment. The members as well as the faculties focus on finding ways to save and protect nature and come up with creative and innovative ideas to develop more of a pollution and plastic free environment.

The club has organized guest lectures on the topics “Enabling Youth to Mental Health” and “Understanding the Environmental Laws”. Various online competitions during the COVID lockdown period such as video making, bird feeders and terrarium along with World Earth

Day, Visual Poetry and World Environment Day were also held. Workshops and model exhibitions based on the theme “Craft N Creations” - in order to increase creativity and create nature friendly items, “Prakrathik Exhibit-2020” - models relating to environment awareness were conducted.

Students were taken for field visits to the butterfly garden and Soan's park in Belvai, Moodabidri to study the life cycle of butterflies in the natural habitats, and to Thaneerbhavi beach for an activity of cleanliness drive - an initiative to clean our surroundings and spread awareness for a pollution free environment. Other events like “VanMahotsav Day” were celebrated with great joy by planting a sapling by each student as well as faculty members.

Saving the environment and ensuring that it's well taken care of is our responsibility as it is the only source of survival and heals every living organism. We conclude by quoting Sidney Sheldon who said “Try to leave the Earth a better place than when you arrived”



Fig. 1. Environment Exhibition - Comparison of polluted and green city model.



Fig. 2. Chart making and vegetable carving



Fig. 3. Model making Exhibition and photo booth
(wings made with dried leaves).



Fig.4. Cleanliness drive: Thaneerbhavi beach

Further reading

1. Save the Environment Essay - <https://www.vedantu.com/english/save-environment-essay> accessed on 25th August 2021.

2. Why should we protect the environment, <https://www.ktvn.com/story/41618546/why-should-we-protect-the-environment-5-reasons-everyone-should-work-toward-a-better-future> accessed on 25th August 2021.

3. Environment-Quotes.06.01.2020 <https://www.trvst.world/environment/environment-quotes/> accessed on 25th August 2021.

From a petrichor lover

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“With great power comes great responsibility”. A **toothbrush** is one such powerful tool or device that almost every human being possess, however do we consciously accept the drawbacks that comes along with such power?

As a dentist we recommend to all our patients to replace their toothbrush every 3 months, but how many of us realize that every bit of discarded tooth brush is still part of our ecosystem and causing damage to the earth's soul?

The handle of a toothbrush is made from hard plastics derived from crude oil, a non-renewable resource and the bristles are made up of pure nylon that undergoes extensive manufacturing processes that releases greenhouse gases to the atmosphere, worsening the existing global warming scenario. A toothbrush takes more than 100 years to degrade, eventually causing lot damage to our environment and ecosystems especially to the water bodies. Almost every year tones of discarded plastic wastes leak their toxins into the dumping yards, oceans and rivers.

Owing to the fact that improper disposal of these plastic non-biodegradable tooth brushes is causing irreparable harm to the environment it would be advisable for us to shift our focus to not only using a sustainable and environment friendly toothbrush but also to create awareness and facilities for proper disposal and safe conversion of these single use hard plastics.

As a dental community, it is our duty to not only provide care for oral health problems, but also to be environment friendly and dispose/reduce/reuse the plastic generated through various oral healthcare products. Clinicians can

design collection bins set-up outside their work place and ensure that the contents are eventually disposed of safely. They can also have collaborations with major companies and have exchange programs for a better promotion and response.

As a part of the health care sector the universities has the ability to reach out and create awareness at a global scale. There can be sensitization programs, kiosks, and automated plastic crusher machines set-up across the entire campus to collect and recycle used toothbrushes and other plastic recyclable wastes. To ensure active participation this programme could work on an incentive- based system (rewards could include toothpaste given during promotional activity by various companies, discount coupons and so on). Such a programme would benefit the institute as it can be a part of one of the best practices of the institute, since it would help to reach out to all the employees, students and people who seek health care from the institute. This programme could initially begin within the university, which can be later collaborated with various institutes, private practitioners, oral healthcare brands and dental societies across the country.

Success Stories

Bamboo India

India based startup by Mrs. Ashwini Shinde and Mr. Yogesh Shinde. Their Primary aim is to change the bamboo perception from "The Poor Man's Timber to Wise Man's Timber" providing plastic products replacement using innovative bamboo products. They conduct plastic exchange programs, where they replace your plastic tooth brush with a bamboo toothbrush.



Fig. 1. Bamboo toothbrush with charcoal infused soft bristles with bamboo container (launched by Amazon)

Terra Cycle

It is a United States of America based social enterprise, which accepts toothbrushes and oral care product packaging through its mail-back in Oral Care Recycling Program.

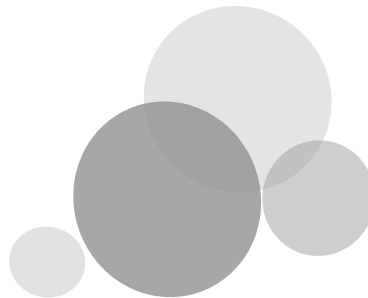
EcoBuddy

A startup by a Pune engineer formed in 2018. Initially conducted awareness drives on the

waste management and eventually moved into production and sale of bamboo based products curated especially by local-based vendors.

Conclusion

The ultimate goal would be to encourage people to rethink the scale and consequences of plastic pollution and do our part to save the mother earth. Although one may think that these contributions may be very negligible and infective, it must be re-thought that a small powerful step in the right direction can help pick up momentum towards achieving a goal that may seem very distant. Petrichor is the earthy scent produced when rain falls on dry soil, under highly plastic polluted soil do we really get such nascent aroma?



The menace of Single Use Plastic

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Sadguru once said, “The problem is not plastic itself. The problem is its irresponsible usage. It's time for an unambiguous policy to eliminate single-use plastic.” I agree with this statement. The key to solving the problem indeed does not lie in plastic, but in the people who are irresponsible in using it. But is it really easy to do away with single-use plastic?

Before I go deep into the topic I would like to focus on the term single-use plastic, which is often also referred to as disposable plastic or SUP. Single-use plastics, as the name suggests, are plastic products which can be used only once, such as straws and carry bags. The most common SUPs found in the environment are water bottles, plates, cups and cigarette butts.

History of SUP

SUPs first became popular in USA in 1979, when the largest chain stores, namely Safeway and Kroger began to offer their customers disposable plastic bags. But it did not catch much attention until 1985, when a speaker at a convention of the Society of Plastics Engineers spoke about how cheap SUP bags are. Then all grocery stores around the US switched over to SUP. It became widely used in urban areas, mainly because of the low price point.

Composition of SUP

'Single-use' means a product that can be used only once. According to the United Nations definition, any plastic that is made from polymers of high-density polythene, low-density polythene, PET, PS, PPE, PS is SUP. There are different types as per chemical composition.

Controversy on the usage of SUP

Single-use plastics are a part of human life now. One cannot imagine a world without it. But because an incident in 2007 led to controversy on the usage of this plastic, in 2007 San Francisco initiated a ban on SUPs. It became official in 2012 and grabbed attention. People began to think about a complete ban on SUP. Now the question arises: Why are SUPs bad?

Why were SUPs bad?

According to World Wide Fund for Nature (WWF) all plastics are harmful to nature and non-biodegradable. Over time they break down into smaller particles known as micro plastics. It takes many centuries for plastic to decompose. It can contaminate soil and water with the toxic chemicals used in plastic, such as Bisphenol A (BPA). This is a hormone disruptor linked to a host of health problems. It was banned by FDA in 2012 and is not found in baby bottles. But studies show that it is likely to be found in other plastics. When this noxious chemical pollutes the water, it gains entry into the food chain and passes on to the human body, leading to many health problems.

Health issues caused by SUP

We all know that plastics, mainly SUPs, are basic to modern living. But its impact on human health is poorly understood. 99% of the plastic comes from fossil fuels. The extraction of oil and gas, and mainly hydraulic fracturing for natural gas, release many toxic substances into the air and water and contaminate them. Many substances which are used in the manufacturing of plastic are said to have a high impact on human health. They

can cause cancer, neurological, reproductive and developmental toxicity, and also cause problems in the immune system. They can have an impact on skin and respiratory tract. While transforming fossil fuel into plastic, resins and additives release 'carcinogens' or cancer causing substances and other highly toxic substances into the air. A survey conducted in 2014 states that it has adverse effects on nervous system, reproductive system and is a reason for leukemia.

India's view on SUP

The Central Pollution Control Board (CPCB) has estimated that each person in India consumes about 9.7 kgs of plastic annually. In his Independence Day address in 2019, Prime Minister Narendra Modi had called upon the people to stop the use of SUP bags and had pledged to eliminate all SUP by 2022. An article published in the Times of India on March 13, 2021 states that India's plans to become a plastic free country by 2022 will be implemented in two phases, so that it doesn't affect the small traders and vendors.

PHASE 1: This begins on January 1, 2022, whereby the authorities will notify all small and large scale businesses across the country. The use of certain items like plastic flags, ear buds with plastic sticks, candy sticks, ice-cream sticks and decoration material will be banned.

PHASE 2: This starts from July, 2022. During this phase use of plastic plates, cups, glasses, forks, spoons, straw, trace sweet boxes, invitation cards and even cigarette packets are banned. Reaching rural areas, they will involve Gram Panchayats for the waste management to ensure the collection, storage, transportation, processing and disposal of plastic waste.

The central government has decided to increase the thickness of polythene bags from 50 microns to 120 microns from September 9, 2021, to enable its recycling.



Fig. 1. Plastic waste dumped in garbage

Role of Covid on the usage of SUPs

While the use of SUPs gradually diminished, Covid pandemic resulted in a sudden spurt in the usage of plastics, starting from the PPE kit. When we visit a restaurant, they provide plastic plates and cups. Even the dining table is covered with plastic and the waiters wear plastic gloves, which is a Covid protocol. The world has changed much due to this epidemic. It would be hard for us to fight the Covid war without these plastics and we do have to admit that it is difficult for us to eliminate SUPs at times like these.

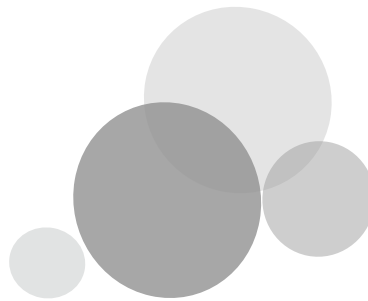
Micro-plastics expert Dr Christian Dunn had said the damage of SUP "would last forever" and governments' immediate action is needed the most now. While the plastic way is the key solution for fighting against coronavirus and protecting the corona warriors, our country has failed to fight the pollution. The rise in the use of single-use masks and plastic bottles will have a large impact on the country. Covid will eventually go away, but the plastic wastes will remain with us forever. This is what the country needs to remember. Our present action will make us lose so many things in our future existence.

Alternate Methods

A survey states that around 40% of the plastic used is SUP. To eradicate the use of SUP, we must come up with alternative solutions. Instead of plastic cups, steel and glass cups can be used. Instead of plastic bags, paper bags or cloth bags can be used. Plastic plates can be replaced with bamboo plates or leaf plates. When we purchase

only few grocery items, we can just carry them with our bare hands or in a cloth bag. For those that like the flexibility of plastic straws, there are other eco-friendly alternatives like paper straws and reusable silicone straws. Or best of all, choose to go straw-free. Instead of plastic packaging, mushroom packaging should be tried wherein a raw material is pressed into the desired shape, then seeded with mushroom spores. After a few days, the spores sprout mycelium that thread through the material, ultimately binding it all together. The new packaging material is heat-treated to kill the spores and prevent further growth.

Although it seems like a big change to replace SUPs, it can be simpler than people think. And it can contribute to the global trend of sustainability. Plastic pollution free world is not a choice but a commitment to life - a commitment to the next generation. Our commitment to the next generation is a toxic chemical free world - not just a plastic pollution free world. So let us all stay united and pledge not to use any plastic, mainly the single-use plastics. Let's protect ourselves and our nation.



Trek, travails and mountain tales!

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Why would a medical specialist, a lady, a mother of two young kids risk a rendezvous with adventure and nature?! Why wouldn't a comfortable resort stay or a trip abroad satiate the need to travel? Why go into wilderness travelling hundreds of miles and find solace in the unknown and uncertain place? This doctor must be crazy!! This is what many of my relatives, friends and acquaintances would say about ME!!

I write this article to answer a few of the many questions I heard. Amongst all addictions, the addictions of the Himalayas are the worst. A childhood dream perhaps buried somewhere deep for years, almost losing its existence suddenly sprung a tendril of hope after joining a group of local trekkers and finally after about a year and a half of local trekking, the Himalayas beckoned and I responded. Thus, began a journey of unending romance...

The Himalayas are quite unlike the Western Ghats. They are more treacherous and



Fig. 1. Tent accommodation in the Bugyal

enchanted. One goof-up and you could be bidding adieu. The rivers, even in summer can be gushing and gurgling with their crystal clear water. For the snow-parched eyes, even a distant glimpse for the first time is so exciting and fulfilling. For bird lovers, the early morning cacophony is soothing...



Fig. 2. Roopkund trek in Uttarakhand

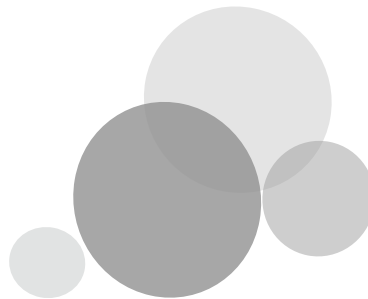
Roughing out is synonymous with trekking, sleeping in tents under the open sky, unaware of the creepy crawlies, battling uncertain weather and announced storms. Relishing simple meals garnished with affection by local cooks and putting endurance to test are some basic experiences. Befriending people of all ages, places and professions, sharing perspectives and many a times changing them, finding inspiration to achieve more in life than materialistic possessions, are unique experiences in itself. In a world, where trust has become a rare commodity, these treks are a testimony that trust still exists. During trekking precarious or treacherous zones,

one has to fully trust the person in front and behind, their safety net can almost be lifesaving. You don't even know them well, but you got to trust them like your life depends on them. That is the way the mountains works...

As one treks up various camps, sometimes worrying about altitude sickness or about the difficulty level, it is imperative that mind eventually gets trained to get better of the negative thoughts and forge ahead. At times, there is no way you can turn back and call it quits. The reward lies in the enhancing, mesmerising beauty as you ascend and all that one feels at the

end of the day is amalgamation with nature. There is no 'the other'...

When approaching the summit, it's humbling. The heart is filled with gratitude for the great mountain has been generous to let you summit! It is almost like we are in front of an ocean... I am grateful for the co-trekkers, who by now are trusted and like family. As you descend your heart begins to ache. The pangs of separation make their presence felt. Such is the attraction... Such is the addiction... No words can describe... It's transformational!!...



Green Horizon

Instructions to authors

All manuscripts (Original articles, Short communications, Reviews etc.,) are to be submitted by email to greenhorizon@yenepoya.edu.in Articles submitted should not be published earlier and after acceptance it should not be considered to be published elsewhere. Articles found unsuitable in terms of the requirements of the newsletter will be declined and informed to the authors. The suitable articles will be reviewed and notified of acceptance, need for revision or rejection of the manuscript. Photos, figures, images and other illustrations to be reproduced in the manuscript must be duly credited.

Manuscript preparation:

All the manuscripts in English should be typed in Microsoft Word with 1.5 Line space, Font size 12 point, Times New Roman. All the text pages should be numbered at the bottom of the page in the centre. The submitted document should have title page, text, acknowledgements, Statement of conflict of interest and references. Title should be brief and specific. The title page should contain title, author's name/names, affiliations and corresponding author with address and email Id and telephone number.

Text: All papers should have a brief introduction and the text should be intelligible to readers. Article should not exceed 1500 words (excluding tables and figures). Tables and Figures with title or caption should be incorporated at relevant place in the text and referred to in numerical order.

Tables/Figures should be submitted separately along with the text file. An inserted photo, image, graph or chart is called a figure. You must create a caption for it, directly below the photo/image/graph/chart in your manuscript. Figures should be in jpg format with a minimum 300dpi resolution. The caption follows this format:

Fig. X. Description of the figure from: Citation for source figure was found in (e.g. a website, a magazine article with date and page number; permission is required from the publisher if it is copyrighted).

References:

References should be numbered in superscript, serially in the order in which they appear, first through the text and then through table and figure legends. References should not include unpublished source materials. The list of references at the end of the text should be in the following format.

1. Lindley ST, Estimation of data. *Ecol Appl.*, 2003; 13: 806813.
2. Martin H, The Archean greyof continental crust. In *Archaean Crustal Evolution* (Ed. Condie, KC), Amsterdam: Elsevier; 1994. pp. 205259.
3. Rao KN, Vaidyanadhan R, Geomorphie and its evolution. In *Proceedings of the National Symposium on Morphology and Evolution of Landforms*, Department of Geology, Delhi University, New Delhi, 1978.
4. The URL of web reference should be given with date of access.

Review Procedure

All submissions to Green Horizon undergo double blind peer review and editorial check for appropriateness and suitability. Authors should respond to the reviewer suggestions and revert with modifications. All modifications should be marked in red. The decision of the editorial board is final in acceptance or rejection of the revised manuscript.



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