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THE VALUE OF WILDLIFE AND ITS CONSERVATION FOR HUMAN EXISTENCE

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The millions of different species on our planet are essential for so many of the most important things in our lives. This complex web of life provides the natural systems we depend on – from clean air and water to fertile soils and a stable climate. It gives us food, medicines and materials, and supports millions of jobs. And it also inspires us, making our lives richer in so many ways. But our planet's wildlife is in crisis-numbers have fallen by more than half since 1970, and species are becoming extinct at an alarming rate. We need to reverse this loss of nature and create a future where wildlife and people thrive again. Wildlife is animals that have not been domesticated by humans. This does not mean that wild animals live without human interference. Humans control, manage, manipulate, use, and kill wildlife for various reasons. Humans tend to think of wild animals in terms of the threat they pose to people or the value they hold for them. Wildlife Week is annually celebrated across India between 2nd to 8th October with an aim to protect and preserve the flora

The inauguration function of Wildlife week was scheduled on the 8th October, 2020 by the Chief Guest Dr. Arvind Kumar, Vice Chancellor, RLB Central Agricultural University, Jhansi. Dr. A.K. Pandey, Dean, College of Horticulture and Forestry, RLBCAU delivered the excellence lecture on wildlife conservation and its consequences. Miss Priyansi Rathore, DFO, Datia, M.P., delivered the presidential address on “*Eco tourism for human life*”. Miss Rathore also focused upon the current year's theme of the wildlife (Fig. 2). Another lecture on “*Conservation of animal*” was delivered by Mr. P. K. Verma, DFO, Sheopur, Madhya Pradesh. Mr. Verma highlighted the vital role of humans in wildlife conservation and how it is everyone's responsibility to be respectful and mindful of the environment. He administered the oath to save the forest creatures (Fig. 2). The session discussed that welfare not only applies to domestic animals, but to the wild ones as

and fauna of India. The first Wildlife Week was observed in 1957. The Wildlife Week 2020 is celebrated from 2nd October to 8th October 2020.

Under the SPARSH program, Rani Lakshmi Bai Central Agricultural University (RLBCAU), Jhansi celebrated wildlife week in which College of Horticulture and Forestry, RLBCAU organized one day event on ‘मानव अस्तित्व के लिए वन एवं वन्य जीवन 2020’ (Fig. 1). During the celebration, several competitions among students were conducted to raise consciousness in favor of wildlife preservation. The objective of the celebrations was to create awareness among the public about the importance and conservation of wildlife.



Fig. 1: Celebration of Wildlife Week

well. Inter departmental quiz completion on wildlife was organized through online and a video documentary about the wildlife conservation was screened by Dr. Pawan Kumar in connection with Wildlife Week Celebration (Fig. 3).

The students from different colleges actively participated in different events in Wildlife Week 2020. Students from College of Horticulture & Forestry and College of Agriculture, etc. actively participated in various events. Dr. M.A. Bhat, Dr. Prabhat Tiwari, Dr. Deepika Harate, Dr. Amey Shashikant Kale, Dr. Shedage Swati Mahipati have done painstakingly hardwork to conduct the Wildlife Week successfully. Prof. Manmohan Dobriyal, Head, College of Forestry, RLBCAU proposed the vote of thanks to all the dignitaries who have made it convenient to attend this wildlife week and successfully organized by College of Horticulture and Forestry on behalf of SPARSH committee of RLBCAU, Jhansi.



Fig. 2: Oath to save the forest creature by RLBCAU faculty members and Mrs Priyansi Rathore DFO, Datia, M.P., received memento by Dr Arvind Kumar, Vice Chancellor, RLB Central Agricultural University, Jhansi.

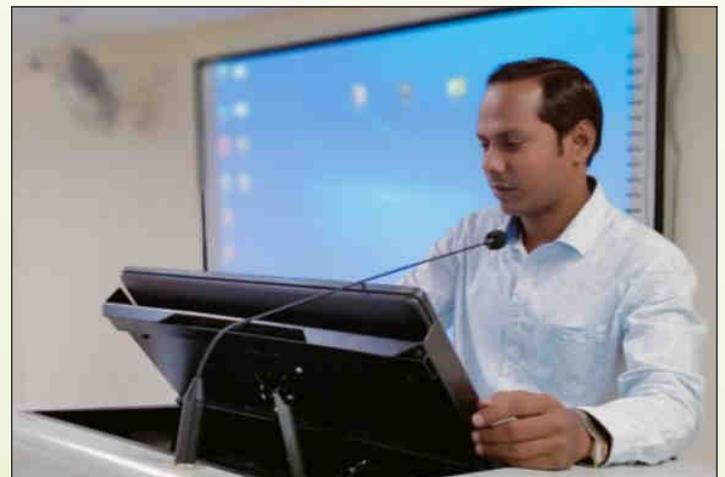


Fig. 3: Wildlife Conservation Painting by student (Miss Shweta, Forestry- IIIrd Sem.) and Dr. Pavan Kumar (Environment Science Faculty, RLBCAU, Jhansi).

PHYTOMEDICINAL POTENTIAL OF ASHOKA (*SARACA ASOCA* ROXB.): AN ENDANGERED MEDICINAL PLANT

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Introduction

Herbal medicine has such an extraordinary influence that numerous alternative medicine therapies treat their patients with Herbal remedies, Unani and Ayurveda. Approximately 25 percent of all prescription drugs are derived from trees, shrubs or herbs. Nature has bestowed our country with an enormous wealth of medicinal plants therefore India has often been referred to as the medicinal garden of the world. So stand the medicinal plants *Saraca asoca* as one of the foremost plants utilized from antiquity till to date. Asoka or ashoka is a Sanskrit words which means “without sorrow” or which that gives no grief.

Ashoka is one of the most legendary and sacred trees of India. Ashoka tree, universally known by its binomial Latin name *Saraca asoca*(Roxb.), De.wild or *Saraca indica* belonging family *Caesalpinaceae*. It is a evergreen tree called in english Asok tree. It is found throughout India, especially in Himalaya, Kerala, Bengal and whole south region. Ashoka is one of the sacred plants of Hindus, and is especially sacred to the Hindu God of Love, Kamadeva, for whom it is worshipped every year on December 27; it is mentioned in Hindu mythology as the Ashoka tree, beneath which the Indian philosopher and founder of Buddhism, Gautama Siddhartha (c.563-483 B.C.) was said to have been born under this tree. The aim of the present study is to provide complete information about the medicinal & pharmacological importance of the *Saraca asoca*.

Botanic description:

Saraca indica Or *Saraca asoca* is a small evergreen tree 7-10 cm high. It occurs the up to the altitude 750 meters. Leaves are parpinnate 15-20 cm long and the leaflets 6-12, oblong and rigidly sub-coriaceous. Leaves are narrowly lanceolate, cork like at the base and with a shot pestistipules are intra-

petiolar and completely united. The bark is dark brown or grey or almost black with warty surface. Stem bark are rough and uneven due to the presence of rounded or projecting lenticles. Bark channeled, smooth with circular lenticles and transversely ridged, sometimes cracked. Fracture splinting exposing striated surface, a thin whitish and continuous layer is seen beneath the cork leaver. Flowers are fragrant. Flowers are Polygamous apetalous, yellowish orange turning to scarlet, in short laterally placed corymbose, axillary panicles, bract small, deciduous, calyx petaloid. Seeds are 4-8, ellipsoid-oblong and compressed.

Home remedies

In Pradara Roga of females, Ksheerapaka of its 6 gm bark powder should be taken. it is so effective in all types of abnormal discharges per vagina. Ksheerapaka is also beneficial in uterine inertia, uterine pain urinary calculus, dysurea. In pain, its paste of bark should be applied on that site. The womenfolk of Chhattisgarh boil the bark of Ashoka in cow's milk, add sugar and consume it once a day for three days and repeat the course after three months to prevent gynecological disorders. In India married Hindu women eat the flower buds of *Saraca asoca* on the "Ashok Shasthi day" to guard their children against grief and sorrow. The persons suffering from mental disorder are advised to take bath under the shade of Ashok tree. For mental piece, the natives prepare special Herbal Mala using root pieces of Sita Ashok and give it to the patients.



Ashoka (*Saraca asoca* Roxb;)

The patients are advised to put the powdered seeds inside the Pan (Betel vine) and eat it empty stomach. It is general recommendation by the healers to boil the bark with cow's milk and take the milk (after removing the bark). For taste, sugar can be added. The healers suggest every female native to take this milk once in a day, upto three days, in every 3 months, as preventive to gynecological troubles. In case of menorrhagia, the healers boil the bark in water and prepare a decoction. In this decoction many other herbs are added. This decoction is given every morning (empty stomach) to the patients. Many healers boil the bark in milk also. The decoction is also used externally for washing. In case of Safed Pani (Leucorrhoea), the healers boil the bark in mixture of milk and water. When water evaporates, the combination is given to the patients

Pharmalogical activity Antimicrobial Activity

Saraca asoca was subjected to antibacterial activity (ethanol : water, 1:1) on agar plate with different organisms such as *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhosa*, *Staphylococcus aureus*, (plant pathogen). *Agrobacterium tumefaciens* showed negative activity. *Saraca indica* dried flower buds tested against antibacterial

activity of methanol extract on agar plate against *Salmonella viballerup*, *Shigella boydii*, *Escherichia coli*, *Vibro cholera*, *Shigella flexneri* and *Shigella dysenteriae* showed active. *Saraca indica* leaves tested against antibacterial activity of ethanol(95%) and water extract on agar plate *Escherichia coli*, *Staphylococcus aureus*. *Escherichia coli* were found active whereas tested against *Staphylococcus aureus* gave negative result. The methanolic extracts of *Saraca indica* was assayed against *Alternaria cajani*, *Helminthosporium sp.*, *Bipolaris sp.*, *Curvularia lunata* and *Fusarium sp.* at different concentrations (1000, 2000, 3000, 4000 and 5000 µg/ml).

Anticancer Activity

The anticancer principle from *Saraca asoca* flowers indicated 50 percent cytotoxicity (in vitro) in Dalton's lymphoma ascites and Sarcoma-180 tumour cells at a concentration of 38 mug and 54 mug respectively, with no activity against normal lymphocytes but preferential activity for lymphocytes derived from leukemia patients.

Antimenorrhagic Activity

Saraca asoca dried bark has been used for menorrhagia in India. In India *Saraca asoca* dried bark as well as flower is given as a tonic to ladies in case of Uterine disorders. *Saraca asoca* stem bark also used to treat all disorder associated with the menstrual cycle. *Saraca asoca* bark in Sri Lanka used for menstrual disorder and menorrhagia. *Saraca asoca* bark in India, used as a uterine sedative and hot water extracts administered to human adult female stimulates the uterus similar to ergot, but without producing tonic contraction. Also employed in menorrhagia, as an emmenagogue, uterine sedative, uterine affections as well as used in several preparations related to female troubles.

Conclusion

Saraca asoca is highly regarded as an universal panacea in the ayurvedic medicine .it is one of the universal plant having medicinal activities .This versatile plant is the source of various types of compounds. In the present scenario many plant are used to treat many diseases. But Ashoka is ancient and reliable source of medicine so Ashoka is used in many pharmacological activities like anti cancer, anti menorrhagic, anti oxytoxic, anti-microbial activity and have extend uses in ayurveda, unani and homeopathy. It have many uses like to treat skin infections, CNS function, genitor-urinary functions as the global scenario is now changing towards the use of nontoxic plant product having traditional medicine use, development of modern drug from *Saraca asoca* should be emphasized for the control of various diseases.

QUICK RESPONSE (QR) CODES IN LATIN AMERICAN BOTANICAL GARDENS

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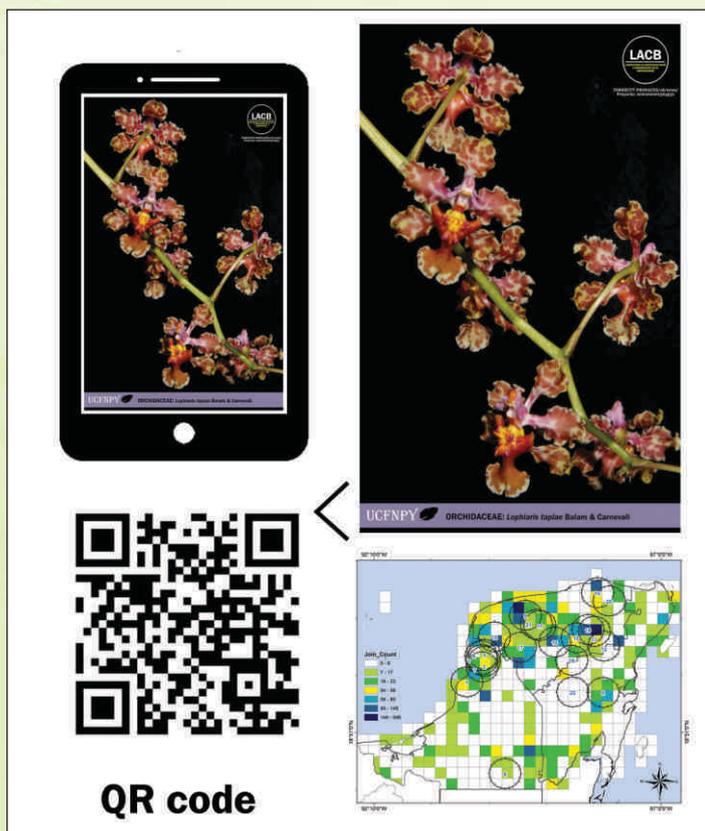
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Quick response codes "QR" is a system that allows information to be stored in a two-dimensional data matrix to be read with an electronic device with a camera. Today, QR codes are a creative, moldable, smart and eco-friendly digital tool for any important use in mobile marketing operations in magazines, daily or food products, in posters or announcements of department stores, food menus and brochures of general way, etc. QR codes are used at tickets to theaters, museums, archaeological sites, botanical gardens, sports venues, as they simplify the job of providing information details at no cost. The advantages of these codes are that they can be adapted in different specific designs, since their position and orientation do not affect their reading to obtain an answer. Likewise, the information associated with the QR code can be constantly updated, quickly and without generating significant costs; allows statistics of how many people view the information and know which ones are in greater demand or are of interest. In recreational sites it allows to know the preferences of the visitors and to continue improving the design and information of less viewed.

In the case of botanical gardens (BG), these are considered public green spaces of great social and ecological

importance, because they protect the biological diversity of the countries in the world. On the other hand, they promote public culture and recreation to cultural development associated with the conservation of the environment, natural resources, whether for their ecological, economic or cultural value; also for historical or educational interpretation, scientific application and research in the field of botany, gardening, plant ecology, ethnobotany, ethnobiology, etc. However, the information present in many of the BGs is limited, since basic information is offered in a synthetic way, particularly in those with space problems, where it is not appropriate to saturate with information that would impress users, as well as contaminate the visual environment. The QR codes in the BG represent a didactic and informative potential, especially in those GBs associated with educational institutions or research centers where knowledge is generated, since it will allow to provide more scientific or informative information in a fast and selective way, depending on of the interests of each user.

We present some examples of botanical gardens that are using or incorporating QR codes to maximize the information on their tours for visitors. For example, the "Jardín Botánico Ambiental" of the Universidad Nacional Autónoma de Nicaragua in Managua, Nicaragua, uses QR codes to provide reliable and concrete tourism data on its native plants. The "Universitario Jorge Enríquez Quintero Arenas botanical garden in Santander, Colombia, developed a software prototype for the management and dissemination of native plants based on QR codes and augmented reality to have control and monitoring of the plants. The "Reinaldo Espinosa



Aguilar”botanical garden of the National University of Loja in Loja, Ecuador, this BG has numerous species from altitudinal floors and ecosystems (páramo, Andean forest, humid tropical forest, dry forest, subtropical forest). To allow a better efficient model of the information of each plant species and BG section, they implemented QR codes to provide more information in text and images, highlighting the information to the botanical family, scientific name, conservation status, origin (native / introduced) and ethnobotanical uses. The La Concepción Historical-Botanical garden, in Malaga, Spain, this English landscape-style garden with more than one hundred and fifty years of history, has at least 128 plants identified by QR codes, in order to facilitate "the dissemination of knowledge botanical among the citizens of Malaga”, as the Park is a green area very frequented by residents of all districts.

In Mexico, some BGs are already beginning to use QR codes. The Soconusco Botanical Garden of El Colegio de la Frontera Sur, Unidad Chiapas, develops a website to implement a virtual tour with QR codes, which will be placed in the garden to access plant information from a mobile phone, in order to facilitate their tours and obtain information about the plants. Likewise, the Botanical Garden of the Unidad de Conservación de Flora Nativa de la Península de Yucatán of the Tecnológico Nacional de México, campus Chiná, in Campeche, has a mobile application in the App Store (UCFNPY) to read QR codes to identify the plants during their tours in the garden, this

application has information on the botanical family, scientific name, common names in Spanish and Mayan, growth habit, phenology, fruiting, types of vegetation where they grow in the region, states of the region where they are found (Campeche, Quintana Roo and Yucatán), botanical origin, ethnobotanical uses in the region and outside the region (other states of Mexico and countries around the world). Also, with iconography of the plants, distribution maps and their main uses. This information will be used for the general public, as well as for producers (artisans, beekeepers, horticulturists) who need to use the information to give added value to their products, by knowing their botanical origin or other information on their biology (Project FORDECYT-PRONACES/18/2020 (Proyecto: 000000000304952).

This type of application is a tool that allows us to give support in a fast and agile way to the different processes that are carried out within a botanical garden, implementing them for the identification of each plant or object is of great advantage since It allows us to support other projects in development and for autonomous tours of the botanical garden when there is little staff of guides. However, one of the disadvantages of QR codes is their dependence on a wireless network to access data information stored on the internet, in addition to having a smartphone, since otherwise there is no way to view the information.

HERBAL ANTHELIA HAND SANITIZER

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During this pandemic situation (COVID-19) there is an extensive usage of hand sanitizers to stop the chain of transmission of deadly pathogens from the contaminated surface/site and from hands to other parts of the body. Some germs linger on surfaces like doornobs, desks, phones, and are transferred via the fingers to the mouth, nose or eyes, so sanitizing hands frequently can protect from the germs that may have been transferred from direct



contact with an infected person (through shaking hands) or indirect contact by touching objects and surfaces. Hand sanitizers of high alcohol contents weakening of child's immunity and drying the skin while alcohol free sanitizers which contain benzalkonium chloride or triclosan

are carcinogenic. Therefore the use of good quality sanitizers to prevent infections such as COVID-19 is one of the critical measures.

The purpose of the present study is to prepare preservative (paraben) free herbal hand sanitizer incorporating the

leaves extracts of Alovera (*Aloe barbadense*), lemon grass (*Cymbopogon flexuosus*) and rose petals that kills 99.9% of most common germs leaving skin soft and hydrated. This project also aims to save the environment from the use of chemicals and preservatives and to development marketing strategies and entrepreneurship skills.

The formulation of this antiseptic, antifungal and antibiotic product was evaluated against the specified microorganism Bacteria *E. coli* (gram-ve), *Pseudomonas aeruginosa* (gram -ve), *Staphylococcus aureus* (gram+ve) and *Bacillus subtilis* (gram+ve) by culture sensitivity test.

ROLE OF PULSES IN SUSTAINING HUMAN HEALTH AND FARMER'S INCOME

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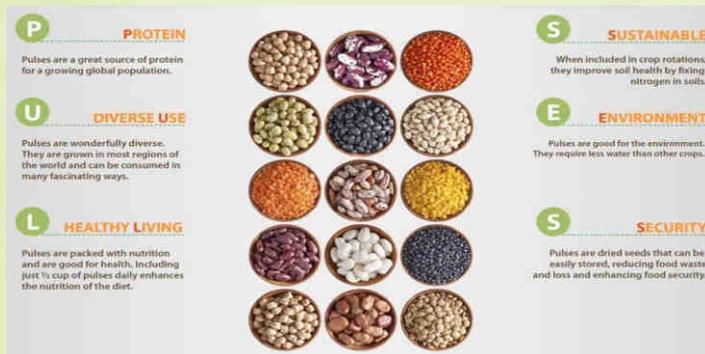
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In India pulses mainly used as an important source of nutrition. Besides of nutritive values it also serves an income source for millions of farmers around the world. However, pulses consumption had seen slow but steady decline in both developed and developing countries. At global level, pulses consumption has foreseen no major changes in comparison with dairy and meat products in per capita consumption of pulses, which is low at 7kg/person/year. Despite low consumption, in many countries including India, the population growth rate exceeds farm output, *i.e.* farmers are not so much capable to grow enough pulses to keep up with increased demand and are forced to import pulses.

Importance of pulses

Pulses are climate resilient and can be sown in rain-fed areas. They can fix nitrogen in the soil and reduce dependence on nitrogenous fertilizers. They enrich the soil in nitrogenous compounds and are beneficial for crop rotation and mixed cropping. Hence increasing area under pulses or planting pulses as an inter-season crop promotes sustainable agriculture; the requirement of nitrogenous chemical fertilizers is reduced for the succeeding crops and periodical crop disease cycles are disrupted by the decreased use of chemical pesticides and weedicides. According to FAO and United Nations, to fulfil the sustainable development goal's three-fold objective *viz.* to achieve food security, to end hunger, to improve nutrition requirements and promotion of sustainable development, pulses consumption and its production should be enhanced in line.

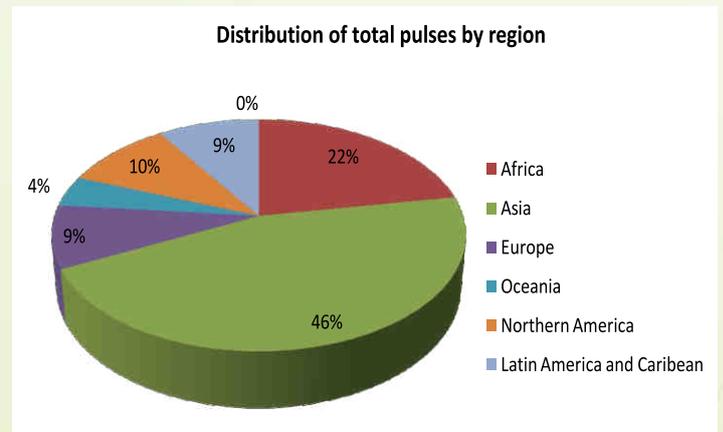


Global scenario of Pulses production

The major producers of pulses in the world are India (23.1 per cent), Canada (6.7 per cent), China (12.08 per cent),

Myanmar (7.57 per cent) and Brazil (4.03 per cent), together accounting for almost half of the global output. India ranks first in terms of area and total production of pulses; yet, it is still not self-sufficient and remains a net importer of pulses because of high consumption needs. In 2013-14, total area under pulses was 25 million ha and production was about 19 mt while the demand was about 24 mt. Also, compared to India, pulse output has been much higher in other major pulse-producing countries. The pulse yield in Canada improved from 1141 kg/ha in 1961 to 1893 kg/ha in 2012. However, the yield in India has not improved much, and has been less than 800 kg/ha even till 2011-12.

On the price front, the government significantly increased the minimum support price (MSP) of pulses and strengthened the pulses procurement mechanism by designating additional central agencies to support farmers. However, till 2014-15, the announcement of MSP had been coming too late. By then the farmers had already decided on the crops to be planted. Meanwhile, price volatility has also been affecting the poor. In 2015-16, the supply of pulses was hit as it was a drought year and prices escalated to almost double of what they were in 2014. State governments have taken proactive steps to make pulses available at reasonable prices, including distribution through the public distribution system (PDS).



Ensuring a smooth supply of pulses at affordable prices remains a major challenge. Also, as mentioned earlier, diet diversification is not essentially associated with nutritional improvements. Given this and the fact that cash transfers are now being considered in lieu of take-home rations, it will be difficult to ensure that the cash transfers are spent on nutrition improvement. An efficient institutional framework is a prerequisite for cash transfers.

The Indian Scenario of pulses

Pulses are grown and consumed all over India. The major pulse crops in India include Bengal gram (chana), red gram (arhar/tur), green gram (moong), black gram (urad) and lentils (massar). Moth bean, Lathyrus, horsegram, peas and red kidney beans are the other pulse crops produced and consumed in India. Important pulse-growing states are Madhya Pradesh, Maharashtra, Rajasthan, Uttar Pradesh, Karnataka, Andhra Pradesh, Gujarat, Tamil Nadu, Jharkhand and Bihar.

In 2013-14, India produced about 19 mt of pulses after that the per capita availability of pulses has been about of 38 g per day which is less than the recommended daily requirement of 40 g per day after accounting for seed, feed and wastage. Only with imports could the daily requirement of pulses be met. Starting year 2000, the net imports have shown an increase. This has been important to meet the demand for pulses. Prior to 2010-11, even after imports, the daily requirement could not be met. Given the malnutrition situation in the country, this is especially problematic. The consumption of pulses also varied among states. Till 2011-12, the majority of the states consumed less than the recommended dietary norm for pulses. In 2014-15, the domestic production of pulses fell to about 17 mt due to erratic rainfall and in 2015-16; it was estimated to be in the range of 17 to 19.5 mt with the demand being 24.61 mt. As imports of 5.8 mt had been projected for 2016, this probably just about helped meet the demand for pulses. The major countries from where pulses are imported are Canada, Australia and Myanmar and now, Mozambique.

On looking at the fractile-wise analysis of consumption of pulses in rural and urban sectors across India in 2011-12, it is observed that only for the highest monthly per capita expenditure (MPCE) class, the per capita consumption has been above the 40 g per day requirement and that too only in the urban sector. For all other fractiles and on the overall, the actual consumption of pulses is much less than the norm.

Pulses scenario on price

The volatility in pulse prices is a major issue and needs to be taken care of. This volatility, which alternates between adversely impacting consumers and farmers, creates dilemmas for public policy. Pulses are grown by small and marginal farmers in dry land areas. Since there are different kinds of pulses, coalitions among farmers are difficult to build.

High MSPs that raise the incomes of pulse-growing farmers can help increase pulse production. There could be a virtuous circle whereby prices and incomes rise, creating a demand pull that further increases yields, productivity and income that further strengthens the production of pulses. The production of pulses in India has not been very responsive to increases in minimum support prices or even in farm harvest prices. Farmers increase the area under pulses and intensify production only when they expect a big rise in prices. Small price increases get ignored because of high relative risks in production. Minimum Support Prices for other pulses should be increased by the same percentage as calculated for tur, urad, and Bengal gram. However, a proper procurement mechanism should also be in place to provide further incentives to farmers.

Consideration could be given to bringing pulses into the fold of PDS. There would be fiscal costs and implementation challenges but also benefits to nutrition and increased consumption of pulses. Distribution in PDS can only be feasible when substantial amounts are

available. This is an important way to cushion poor consumers from inflationary effects of reduced consumption in times of high prices. This is an advantage of PDS over direct cash transfers which are not immune to the inflationary effects.

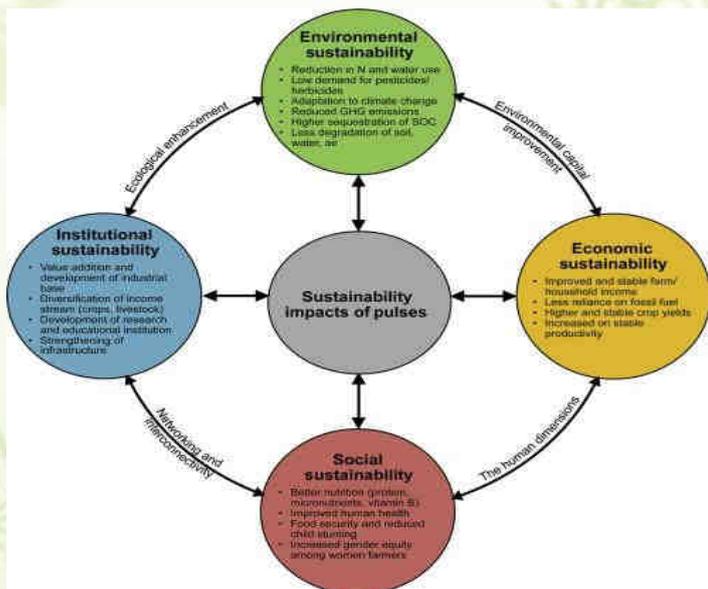
Since the launch of the National Food Security Mission (NFSM) in 2007, the MSP of pulses has been increased. The prices have more than doubled for all pulses between 2007-08 and 2016-17. However, timely announcement of the MSP is a major concern; it has to be announced before planting decisions have been taken by the farmers. Assured procurement and a lucrative MSP can incentivize farmers to increase the area under pulses. The guaranteed market for rice and wheat is a major reason why farmers do not grow pulses and shift to producing wheat and rice.

In spite of having the largest area and production of pulses, India suffers the most because India has more vegetarians than the rest of the world combined roughly a half-billion people. For several decades after India's independence, until 2008, the production of pulses remained almost static in the range of 14 million tons. In 2013-14, India produced 19.25 million tons of pulses, which a year later was only 17 million tons, necessitating more imports. In 2015-16, India imported 5.79 million tons pulses, which made India the largest importer of pulses in the world. In the last five years, except 2013-14, the import rose from 14.09 percent in 2011-2012 to 26.46 percent in 2015-16. With the continuous increase in demand for pulses in India, the import has increased to 72.33 percent in that period. At the global level, India has the largest area and production of pulses but productivity of only 0.65 t/ha, lower than the world's average of 0.9t/ha. The low productivity and increasing demand continue to increase the volume of annual imports.

Deficit production and increasing imports necessitate serious action to promote pulse cultivation at all levels especially in rain fed regions. Approximately 60 percent of the total cultivable land in India is rainfed and could be effectively utilized, saving as much as INR 25,691 crore, the value of total pulse imports in 2015-16.

Future prospects of pulse production

Pulses are an important source of high-quality protein complementing cereal proteins for the substantial vegetarian population of India. Pulses can be produced with a minimum use of resources and hence become less costly even than animal proteins. Pulses meet their nitrogen requirements to a great extent by fixing atmospheric nitrogen in their root nodules. Pulses can provide a sustainable solution in rain-fed area which occupies 67 percent net sown area, contributing 44 percent of food grains and supporting 40 percent of the population. Development and cultivation of more draught-tolerant varieties of pulse can save India's food and nutritional security.



have pulses, especially dais, as an important part of their daily diet, and pulses are the only sources of protein for more than half of the vegetarian population. Pulses can be excellent sources of proteins in our diets. The tremendous increase in pulse prices also contributes significantly to his deficiency. Therefore, mass scale promotion and cultivation of pulses is needed to enhance the income and nutritional security in rural and urban India.

In rain-fed farming systems, pulses can improve overall farm income by introducing short-duration varieties of pulses into existing crop rotations. Traditionally, Indians

DECLINING HONEY BEES IN SAMOA

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Honey bees in Samoa are threatened with great possibility to become extinct in the near future if not addressed seriously. The bees have the principal role for the pollination of many agricultural crops and forest trees thereby increasing seeds, fruits, vegetables and food production. Honey is a nutritious and healthy alternative sweetener with countless benefits that include antioxidant and medicinal properties. Bees wax is also a major component of many industries, pharmaceutical medicines and domestic usages.

The local demand for honey has increased drastically over the years in the South Pacific Islands. Since the introduction of beekeeping in Samoa by the European settlers in the 1970s, it became a potentially viable commercial industry. However, it was always been challenging for beekeepers to maintain the supply and demand for honey bees. Samoa Bee & Honey Co. Ltd (S.A.B.H.O.), the first beekeeping company in Samoa collapsed since 1989 and bee hives were destroyed by cyclones in 1990. Beekeepers and hives had decreased since the last survey in 2009 from 39 beekeepers, 465 hives and 70 apiaries recorded. Great efforts were made to revive the bee industry among long time commercial beekeepers in Samoa like Leicester Dean and Raymond Voigt with the Beekeepers' Association of Samoa Incorporated founded in 1997. Yet, as of 2018-2020, shortage of honey and decreasing population of bees were evident.



Fig. 1: Beehives at Lata Plantation, Savaii, Samoa spotted when bees were scarce by researchers, Dr. Alminda Magbalot-Fernandez and Dr. Stephen Pratt from the University of the South Pacific during their Agritourism research survey in January 2020.

There is honey shortage widely experienced at the moment not only in Samoa but also apparent worldwide. This honey bee crisis is due to climate change, incidence of American Foulbrood (A.F.B.) and other exotic bee diseases, excessive usage of pesticides and other agricultural chemicals like herbicides which kill plants and flowers including foraging bees. The continuous wet weather in Samoa is indeed a major challenge for beekeepers on both Upolu and Savaii. Mean time, honey importation has been prohibited as of Samoa's Prohibition Order of March 2000 which aimed to preserve bee stock from the world's major diseases.

At the moment, there were still thriving apiaries in Samoa mainly for commercial production of honey. There are reported to be 21 beekeepers with 403 hives on 47 apiaries as of 2012. One of which is spotted in Lata Plantation in Savaii, Apia when bees were scarce in January 2020 during an Agritourism research survey done by Dr. Magbalot-Fernandez and Dr. Pratt. They were researchers from the University of the South Pacific, where beekeeping was first taught in Alafua, Samoa (Figure 1). These beekeepers were supported by the Women in Business Development Inc. (WIBDI) and also the Beekeepers' Association of Samoa Inc. (BASI). As of now, the Samoa Women's Association of Growers intended to build apiaries on their land and in national parks to regain the bee population of the country. They are preparing about 60 beehive "starter kits" including beekeeping suits from New Zealand to sustain the bee industry. SWAG is more determined in increasing the population to pollinate plants and keeping fruit and vegetables supplies high. With these, there is still great hope to go back to the time like 20 or 30 years ago where one would see honey bees almost anywhere.

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INSECT PESTS IN CONTEXT TO CLIMATE CHANGE

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Climate change is a reality and one cannot ignore the changing scenario and its impact on agriculture. Several overwhelming scientific evidences has proved that our agriculture system is changing due to change in climate which is unavoidable and this has led to irreversible impact on the system and is on the way of no return. Climate change has not just affected cultivation of agricultural crops but also their associated pest as well. It has resulted in increased pest problems, invasive species, and insect born disease that resulted in larger use of pesticides. It has also affected the individual population of pest, species distribution as well as ecosystem function and composition directly through change in weather parameters or /and indirectly through frequency and distribution of wild fires.

Effect of temperature on insect pest

Changing climatic condition has adversely affected not only on insect pest appearance but also on its distribution in several complex ways. Some researchers believe that due to warmer temperature some insectspecies might tend to depress however most of them believe that there will be more changes in population increase and appearance of minor insect pest as major one that were not prevalent

before in many farming areas. These might cause severe damage in an epidemic form. Being poikilothermic the insect pest have the capacity to adjust with the changing environment that may result in change of geographic distribution of many species, increase overwintering, population growth rate, number of generation, change in crop pest synchrony, change in interspecific interaction and might result in risk of invasion by migrant pest.

Effect of carbon dioxide on insect pest

The impact of elevated carbon dioxide may have indirect effect on insect pest but have direct impact on host physiology which increases the risk of insect damage. Elevated level of CO₂ allows the plant to grow the plant more rapidly and assimilate carbon more quickly. Rising CO₂ can also cause change in C:N ratio which in turn may effect:

- 1) Insect density and feeding behavior.
- 2) Level or concentration of defensive chemical synthesise in plant.
- 3) Competition among insect species to invade.
- 4) Increase in length of insect life cycle by slowing insect development.

Effect of precipitation on insect pest

Moisture is one of the importantfactor for survival and development of insect. It is one of the key variables that affect the crop-pest interaction, distribution and abundances. While excessive rainfall is harmful to many soft bodied insect pests such as thrips, aphids, whiteflies, optimal precipitation has larger impact on pest appearances

and damage cause to the crops. Apart from this, flooding may also have negative impact on soil inhabiting insects however drought may attract more pests due to increase concentration of carbohydrates in the plants.

Exacerbation of insect pest problem due to changing climatic scenario:

Several studies have been carried out by different researchers to have illustrative ideas about the changing pest scenario due to impact of climate change. Due to potentialities of climate change to influence the insect pest appearances their changing variables have become a major indicator for altering the ecosystem during the last decades. Studies have shown serious attack of *Phenacoccus solenopsis* on cotton and *P. marginatus* on papaya. This papaya mealy has found to be challenging over pest control or other integrated pest management (IPM) practices in Tamil Nadu. Another example of *Maconelli coccushirsutus*

(Green) has been reported to extend its host range to over 76 families and 200 generas that includes cotton, coffee, citrus, cucumber, groundnut, guava, coconut, etc. the invasion of sugarcane wooly aphid (*Cerato vacunalanigera*) in Maharashtra in the year 2002 is an excellent example of pest reaction to climate change and getting naturally regulated. This wooly aphid was first reported in West Bengal, India in the year 1958 but was quickly disappeared in 1916. It again reappeared in epidemic form in Sangli provinces of Maharashtra in July, 2002 covering almost 1.43 lakh ha of land by March 2003. This pest later migrates to other areas of Karnataka, Tamil Nadu and Andhra Pradesh. Another example of outbreak of pest due to change in climate change is the *Spodopteralitura* on Soybean in Vidabha region of Maharashtra in August 2008 and outbreak of brown plant hopper in Basmati rice in western Uttar Pradesh and Haryana during the month of Sept-Oct 2008.



Fig 1: Locust swarm at Jhansi.

A recent outbreak of desert locust (*Schistocercagregaria*) in the region of Gujarat, Rajasthan, Haryana, Madhya Pradesh and appearance of locust in farmers field of Jhansi, Uttar Pradesh (Fig 1 and 2) during the month of May 2020 is another example of changing climatic scenario on the appearances and migration of insect pest.

Conclusion

Climate change has a negative impact on some insect species while it favor others. Those who are favored can bring large epidemic covering different geographical areas



Fig 2: Desert locust.

causing huge losses of the crops. Changes in climatic condition not only causes damage on agricultural crops through its direct or indirect effect but also has impact on insect migration, survival, development, distribution and its population size. In order to cope with this impact development of suitable models for predicting the effect of climate change on pest outbreak must be done on the regional, national and international level. Mitigation of adverse effect of climate change can only be possible through development of climate resilient IPM technologies for sustainable management of insect pest in future.



All the readers are requested to share articles related to global, nature, environment, renewable and non-renewable resources, biodiversity and other inter-related topics to publish in the NESA newsletter. The suggestions for the betterment of the society can be shared with others. Our academy is very old and has more than 2200 life members. We hope that members will contribute more articles and send their suggestions/comments in future.

Editor, NESA Newsletter

THE BEE HUNTER'S CHRONICLE

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"Bee Hunter's Chronicle"

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"Chikkamagaluru, located at the South-western part of Karnataka", which takes its name from "chikkamagalauru" meaning "younger daughter's town". It is one of the greenest places having the highest peak in the state, Mullayanagiri. It has a vast biodiversity of flora and fauna with dense forests and being one of India's four biodiversity hotspots. There are many exotic species of birds, which are not commonly seen in the city lights and town limits. Although, you do spot a few bird species soaring and on fences such as kites, crow, myna, pigeons and etc., there are however, a few species which like to stay away from city lights into the developing residential areas and a few which are rare and endemic to that particular region. One such bird is Green Bee-eater.

The Green Bee-Eater (*Merops orientalis*) belonging to order Meropidae can be spotted in evenings in the north-east part of Chikkamagaluru. These are also referred to as "Green Patringa". It is specifically observed in this geographical area

of Chikkamagaluru in the evenings where they come to feast before the sunsets. These birds are diurnal and are much active in the evenings and early mornings.

The Green bee-eater has a very vibrant green colour with a blue throat and a russet crown which is seen in both the sexes. One can also see a black line in the throat region which is called as "gorget" and a black line on its eye region as well. One peculiar feature of Patringa is the extended tail feather or also called a streamer which is black and is very distinct in adults than juveniles. It has a beautiful russet and greyish white underwing which can be only observed when the bird is in locomotion. The beak is black and slightly bent at the tip.

The Patringa's are basically insectivorous. As the name suggest bee-eater, they are the natural predator of bees. They are also seen foraging on insects such as butterfly, bees, termites, moths, grasshoppers, and small beetles. They are highly skilled when it comes to eating bees. They hit the bee on the perch to discharge their sting and then swallow it. Hence, these are said to be helpful in insect-pest

management in controlling the agricultural fields, but can be a problem for apiculture

These species of bee-eaters exhibit sexual dimorphism but is not very distinct. The male and female almost look alike. But the males have a shiny plumage comparatively to the females. They also possess very long streamers which are very distinct and attractive. They cannot be easily spotted between the leaf coverings as they get easily camouflaged due to their green plumage.

Green bee eaters are known for their skilled hunting and show frantic flights and fly very close to the ground to catch a prey when spotted. They are seen hunting low and closer to the ground, veering alternately to left and right at low heights and efficiently catch the prey. This also tell us about their sharp vision in spotting an insect while perching and also in flight. These are always found in groups and emit a high-pitched nasal trilling which sounds like tree-tree or ti-ti.



The question that arises is "Why are they lingering around in residential areas?". This throws light in the major part that is deforestation and industrialization which includes population growth and is the reason why they are found perching on electric wires and

fences.

The western ghats is a blessing to witness different species which add beauty to our existence. One such beauty are the bee eaters which I was fortunate enough to spot in Chikkamagaluru. Their distinct sound caught my attention. Their vibrant colour was a visual delight. I was mesmerized at their flight pattern. They would fly from the electric wire, the place where they perch, and hover for a few minutes and then perch back. Surprisingly, the bee eaters were present in a large number. The prime reason was cause the availability of dense population of insects at this particular region.

The Grey skies were a brilliant backdrop to their distinct colour. It was a live canvas to the eyes. The light showers provide the stage to these palm sized performers, who sync harmoniously as they flap around. Honestly nature displays such divinity in such small beings, so it's a blessing to be a part of it.

BIOPLASTICS: ARE THEY BETTER FOR THE ENVIRONMENT?

¹S. Ponmani and ²S. Shenbagavalli

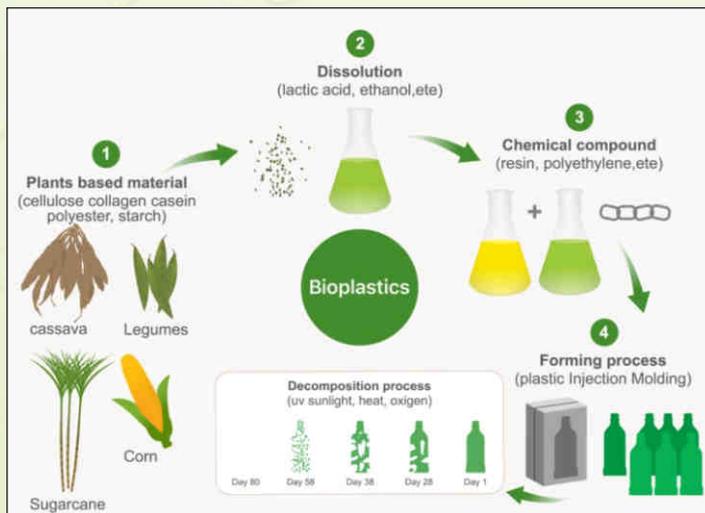
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Plastic materials are currently considered very important materials due to their properties and performance over other materials such as metal and wood. Worldwide annual plastics production is estimated to surpass 300 million tons by 2015. Because plastics are used in a wide range of applications, economic and environmental problems have raised. The problems are: shrinking landfill capacity, accumulation of plastics in oceans, plastic incineration generates toxic emissions such as carbon dioxide and methane, non-degradability or durability and competition for crude oil and energy security.

In recent years, these environmental/economic problems and social concerns have triggered developing environmental friendly materials such as bioplastics.



Schematic diagram of bioplastics production

BIOPLASTIC: are made from renewable resources such as corn, sugars, potatoes, etc. and they are produced by a range of microorganisms.

Photodegradable bioplastics: have light sensitive group incorporated directly into the backbone of the polymer as additives. Extensive ultraviolet radiation (several weeks to months) can disintegrate their polymeric structure rendering them open to further bacterial degradation

Bio-based bioplastics: as “plastics in which 100% of the carbon is derived from renewable agricultural and forestry resources such as corn starch, soybean protein and cellulose.

Compostable bioplastics: are biologically decomposed during a composting process.

ADVANTAGES OF BIOPLASTICS

Potentially, a much lower carbon footprint: A plastic made from a biological source sequesters the CO₂ captured by the plant in the photosynthesis process. Bioplastic, made to be similar to polyethylene or other conventional plastics, stores the CO₂ forever. Even if the plastic is recycled many times, the CO₂ initially taken from the atmosphere remains sequestered.

Independence: Bioplastic is made from renewable resources: corn, sugarcane, soy and other plant sources.

Energy efficiency: Production uses less energy than conventional plastics.

Eco-safety: Bioplastic also generates fewer greenhouse gasses and contains no toxins.

DISADVANTAGES OF BIOPLASTICS:

High costs: It is acclaimed that bioplastics costs two times more than conventional plastics

Recycling problems: Bioplastic material might actually contaminate the recycling process. For example, working with infrared rays in waste separation system, bioplastics cannot be separated and the separating plastics might be contaminated with bioplastics

Reducing raw materials: Bioplastics produced from renewable sources might reduce raw material reserves. Moreover, in order to reduce energy consumption during the production of bioplastics and potential competition with agricultural resources for foods and also to provide additional raw material sources, the exploitation of food by-products is also the current trend

Misunderstanding of terms: The description of bioplastic as compostable can be confusing. All bioplastics are not compostable at home like organic food waste but usually require an industrial composting treatment which is not available at every composting site.

Lack of legislation: Production of bioplastics is projected to increase to over 6.7 million tons by the year 2018. But still, many countries have not used any law or legislation about their production, usage or waste management.

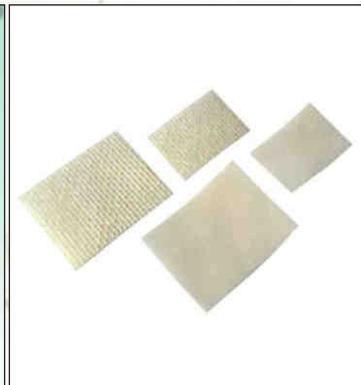
APPLICATION OF BIOPLASTICS:

- ❖ Bags
- ❖ Agriculture and horticulture
- ❖ Disposable housewares
- ❖ Medical devices
- ❖ Consumer electronics



Bags

Agriculture and Horticulture



Disposable housewares

Medical devices



Consumer electronics

Automotive

FISH WASTE COMPOST: A NEW FERTILIZER FOR AGRICULTURAL USE

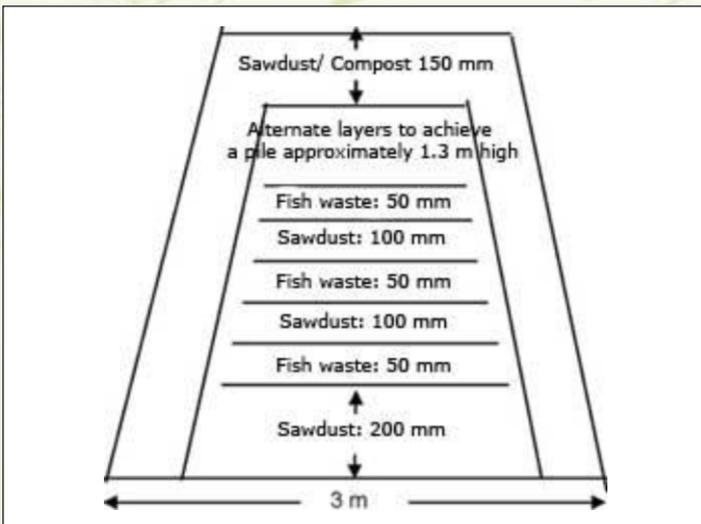
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Fish consumption continues to increase steadily worldwide and seafood is gaining in popularity because of its health benefits. At the same time, large amounts of fish waste are being generated, mostly from the industrial processing of fish. These large quantities of fish waste have not been utilized efficiently, and the disposal of fish waste can have large negative impacts on local environments. Unutilized fish waste is often disposed of by land fill or incineration, or by dumping into the sea. Therefore, there is

an urgent need to find ecologically acceptable means for reutilization of fish waste. Seafood processing activities have raised serious waste production and disposal concerns all over the globe. Commercially, fishing and aquaculture usually generate large amounts of waste that must be disposed. In India many restaurants specialize in sliced raw fish, and large amounts (approximately 2100 t/day) of fish waste are generated every day.

A current farming practice exists where increased plant yield and productivity are obtained by amending the soil with a variety of organic amendments as plant manures. The marine fisheries consist of multispecies composition and the occurrence of by-catch consisting of several species of fish. Due to low quality, small size, low value, inedible and easily perishable, fishes are often discarded that are not



utilized for human consumption are called Trash fishes. The direct input of fish or incorporated with artificial feed to fishes are considered as better alternative in aquaculture. The fish wastes can be used as fertilizer for seafood processing industry and feed for fishes. Trash fishes can provide a balanced diet for optimum growth rate for plants (Kinnunen, *et al.*, 2005).

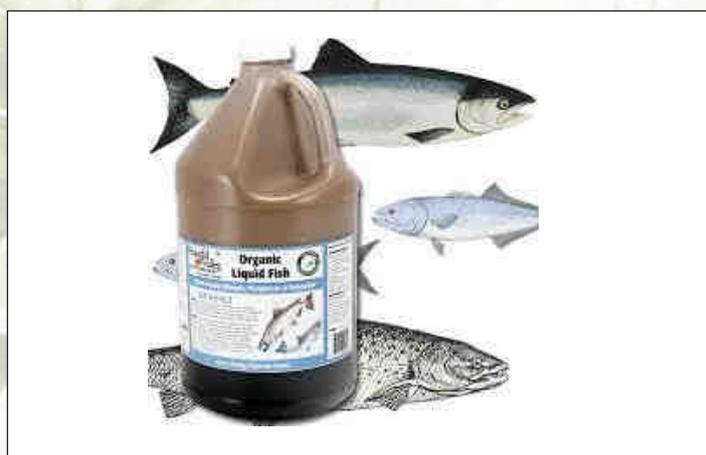
Fish waste: compost

Wastes of finfish and shellfish such as viscera, offal, skin, scales and shells are rich in plant nutrients and free from hazardous contaminants and pathogens. The wastes generated by processing fish, crab and shrimp amount to 30% to 60%, 75-85% and 40-80% respectively. Fish wastes are alkaline in pH, rich in nitrogen and moisture content, high odour levels, low solids, narrow C: N ratio and uniform in nature. The trash fish manure has the high amount of minerals like nitrogen, phosphorous and potassium that are used as nutrients and growth promoters for plants (Alarcon *et al.*, 2002).

About 400 seafood processing plants are now in operation in our country. During 2005-06 the quantity of seafood exported was 5, 12,164 tons valued at Rs. 4,626.87 crores. The average processed yield for whole seafood is approximately 50%; half of the catch meant for processing and exports, however, becomes waste. These wastes are dumped in the vicinity of the seafood processing plants and they lead to environmental pollution. Hence ways and



means of utilizing these wastes for productive purposes need to be examined. Direct use of fish waste for land manuring has been discouraged primarily due to the obnoxious odour of putrefied fish. Fish waste can also be converted as fertilizer through acid digestion and solubilisation of fish waste with urea. However, the fertilizer produced deploying the above method showed poor balance among components like N, P and K. The solid wastes of finfish and shell fish in seafood processing plants and the sludge generated in the wastewater treatment plants can both be converted into manure by composting - a bio-conversion process. Fish manure contains NPK and micronutrients are necessary for plant growth. (Chand *et al.*, 2006).



Fish waste: liquid fertilizer

Fish compost can be prepared with fish wastes such as tissues, bones and scales mixed with three different substrates such as sugar, jaggery and palm jaggery in 1:1 ratio. Fish compost characters such as odour, physical state, weight, pH and protein content were estimated. Fertilizer value was estimated by analyzing the blooming effect and tender leaf formation of rose plant. After 48 days, bad odour gradually turned into fruity odour in fish waste mixed with cane sugar, cane jaggery and palm jaggery. They bone and scales of fish became degraded and turned into liquid state. The blooming of flower in the rose plant was increased after applying liquid fertilizer. Therefore, there is a need to find ecologically acceptable means for reutilization of these wastes.

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APPEAL TO NESA MEMBERS

NESA Life Members are requested to please plant a tree in the periphery of your house or locality and send us photographs with brief write-up so that we can publish the same in our NESA Newsletter. Academy has started this initiative for the Members to plant a tree on the special occasions like birthday, anniversary etc. These small initiatives can bring large change in the environment. The members can suggest or can write their Ideas for the improvement of Academy.

From the Editor's

Dear Readers,

I extend my warm greetings on auspicious occasion of Diwali. This Green Diwali is way to celebrate the festival with minimum consequences to the environment.

In November issue, we recount the various projects and popular articles. Once again, I express sincere gratitude to all the persons who shared articles, without which there wouldn't have been this newsletter issue. Please continue sharing such articles and share with your friends also.

I would like to thank President and General Secretary, NESA, New Delhi, and the Editorial team including Print, Designer and Publication committee for their nonstop support and efforts throughout this edition.

Hope this edition makes an interesting read. Please feel free to offer any suggestions for improvement.

Dr. Ram Sewak Singh Tomar

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