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* Available in the Book "The Shaping of Indian Science" Published by University Press (India) Pvt. Ltd., 3-5-819 Hyderguda, Hyderabad 500 029.

As per decision of Council meeting held on May 03, 2014, Presidential Address will not be printed henceforth in Everyman's Science as they are already printed in the above mentioned book.

EDITORIAL

Epigenetics

Epigenetic refers to any natural process that alters gene activity without changing the DNA sequence, and leads to modifications that can be transmitted to daughter cells. The common types of epigenetic regulation are DNA methylation, histone modifications, and RNA-associated silencing. It is essential to many organism functions, but if they occur improperly, there can be major adverse health and behavioral effects.

We know every cell in our body starts off with the same DNA sequence. Then how different types of cell are present in our body and they function differently. The answer is epigenetics. Epigenetics can be defined as heritable change in gene expression that does not involve changes to the underlying DNA sequence: a change in phenotype without a change in genotype. So it can be referred to the covalent modification of DNA, protein, or RNA, resulting in changes to the function and/or regulation of these molecules, *without* altering their primary sequences. Simply if we consider DNA sequence as an instruction manual of making human body then epigenetic is someone who mark different parts of the instruction manual in different color which demonstrate the part of the text needed to read carefully and this inturn affects how cells read the genes and how they function differently in spite of having same DNA sequence.

The term epigenetics, which was coined by Waddington in 1942, was derived from the Greek word "epigenesis" which originally used to denote the poorly understood processes by which a fertilized zygote developed into a mature, complex organism. A renewed interest in genetic assimilation started during 1990s. This lead to elucidation of the molecular basis of Conrad Waddington's observations in which environmental stress caused genetic assimilation of certain phenotypic characteristics in Drosophila fruit flies. Since then, research have been focused on unraveling the epigenetic mechanisms related to these types of changes. Study of epigenetic is comprised of DNA methylation [DNA methylation is an epigenetic mechanism that occurs by the addition of a methyl (CH_3) group at the 5-carbon of the cytosine ring resulting in 5-methylcytosine (5-mC) in DNA, thereby often modifying the function of the genes], histones and their modifications [A histone modification is a covalent post-translational modification to histone proteins. The modifications made to histone can alter chromatin structure or recruit various histone modifiers], and non-coding RNAs. A non-coding RNA (ncRNA) is a functional RNA molecule that is transcribed from DNA but not translated into proteins]. Acting in concert, these features coordinate intricate regulatory mechanisms that tightly control the expression of the genome.

The study of epigenetic mechanisms has become increasingly important in many areas of research, including DNA repair, cell cycle control, developmental biology, and cancer research, identification of biomarkers, predisposition factors, and potential drug targets. Cancer was the first human disease to be linked to epigenetic. It is found that DNA hypomethylation can activate oncogenes and initiate chromosome instability, whereas DNA hypermethylation initiates silencing of tumor suppressor genes. An accumulation of genetic and epigenetic errors can transform a normal cell into an invasive or metastatic tumor cell. Additionally DNA methylation patterns may cause abnormal expression of cancer associated genes. Epigenetics also has

many and varied potential medical applications. Moreover, there are several pieces of evidence showing that epigenetic errors play a role in autoimmune diseases, immune deficiencies and various other syndromes. Subsequently, these increased knowledge and technologies in epigenetics over the past years allow us to better understand the interplay between epigenetic changes, and human diseases, and will lead to the development of new approaches for molecular diagnosis and targeted treatments across the clinical spectrum.

Dr. M. K. Chakrabarti
NICED, Kolkata

An experinent is a question which science poses to Nature, and a measurent is the recording of nature's answer
-Max Planck,
1858 to 1947, Theoretical Physicist

SHEATH ROT: EMERGING THREAT TO RICE PRODUCTION

Manoj Kumar Yadav, Aravindan S., A. K. Mukherjee, M. K. Bag and S. Lenka

Rice sheath rot disease, caused by *Sarocladium oryzae* (Sawada), is a common rice disease in South East Asia and the Indian subcontinent. The disease is characterized by grayish brown lesions on sheaths enclosing the panicle. Severe infection resulted in partially emerged or totally compressed panicles and chaffy grains. The yield loss caused by S. *oryzae* implies that the disease could be a potential threat to rice production. This article explains an integrated disease management approach which shows to be effective against sheath rot disease in rice.

INTRODUCTION

Rice (*Oryza sativa*) is a staple food for more than half of the world's population. Although rice production has doubled over the past few decades, due to the introduction of high-yielding varieties/hybrids and improved cultivation practices, producers are still unable to meet ever-increasing global demands. Disease damage to rice can greatly reduce yield. They are mainly caused by bacteria, viruses, or fungi. Fungal diseases are one of the major production constraints in most rice growing areas of the world. Among fungal diseases, sheath rot is now emerging as a major constraint in rice production. Rice sheath rot disease incited by the fungus *Sarocladium oryzae* (Sawada) W. Gams & D. Hawksworth, (Syn. *Acrocylindrium oryzae* Sawada) is a common rice disease in South East Asia and the Indian subcontinent. Sheath rot disease is characterized by grayish brown lesions on sheaths enclosing the panicle. Severe infection has been reported to produce partially emerged or totally compressed panicles and chaffy grains with low seed viability and nutritional value[1]. It usually occurs on the flag leaf sheath (boot) that encloses the panicle in the rice plant. The damage and yield loss caused by *S. oryzae* suggests that the disease could be a potential threat to rice production. Depending on the disease severity, yield losses of up to 85% have been reported[4]. The pathogen is known to produce

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secondary metabolites, helvolic acid and cerulenin in liquid culture.

SYMPTOMS

S. oryzae mainly attacks the uppermost leaf sheaths enclosing the young panicles. The lesions start as oblong or somewhat irregular spots 0.5-1.5 cm long, with brown margins and grey centers, or they may be grayish-brown throughout. They enlarge and often coalesce and may cover most of the leaf sheath. Panicles remain within the sheath or may partially emerge. Panicles that have not emerged, rot and the florets turn red-brown to dark brown. Affected leaf sheaths have abundant whitish powdery mycelium.

HOST PLANTS / SPECIES AFFECTED

Host range of *S. oryzae* has not been widely studied, while in cross inoculation studies, it infected the host including, *Echinochloa crus-galli* (barnyard grass), *Cyperus difformis* (small-flowered nutsedge), *Cyperus iria* (rice flatsedge), *Cyperus tenneriffae*, *Echinochloa colona* (junglerice), *Eleusine coracana* (finger millet), *Eleusine indica* (goose grass), *Hymenachne assamica*, *Leersia hexandra* (southern cut grass), *Monochoria vaginalis* (pickerel weed), *Oryza sativa* (rice), *Oryza rufipogon* (wild rice), *Panicum miliaceum* (millet), *Pennisetum glaucum* (pearl millet), *Setaria italica* (foxtail millet), *Sorghum bicolor* (sorghum) and *Zea mays* (maize)[5].

DISTRIBUTION AND ECONOMIC IMPORTANCE

S. oryzae is present in all rice-growing countries worldwide, particularly in rain-fed rice ecosystems and is more widespread during the rainy season. Sheath rot infects the rice plant at all growth stages, but it is mainly destructive when infection occurs during or after the booting stage, before the emergence of the panicle. This disease affects yields to about 3-30%, sometimes reaching 85%. The fungus tends to attack leaf sheaths enclosing young panicles, which retards or aborts the emergence of panicles. Seeds from infected panicles become discolored and sterile, thereby reducing grain yield and quality.

DISEASE CYCLE AND DISSE-MINATION

S. oryzae is seed-borne and seed transmitted disease. The fungus also survives as mycelium in infected plant residues, weed hosts, and soil. Wind, stem-borer, mites, and mealy bugs disseminate the conidia.

FAVORABLE CONDITIONS

Sheath-rot infection occurs due to predisposing factors such as high amounts of nitrogen, high relative humidity, insect injury, presence of entry points, and dense crop growth and leaf canopy that favors sheath rot development. The fungus grows best at 20-28°C.

PHYTOTOXIC METABOLITES OF *S. ORYZAE*

The pathogen is known to produce phytotoxic metabolites namely; helvolic acid and cerulenin in extracts of rice grains from sheath rot infected plants. Both of these secondary metabolites are antimicrobial. Cerulenin inhibits methyl salicylic acid and fatty acid metabolism, whereas helvolic acid interferes with chlorophyll biosynthesis. Both of these metabolites have been reported as phytotoxins

and therefore reduce the seed viability and seedling health. Because of their antimicrobial nature, these metabolites may also increase the pathogenicity and the survival of *S. oryzae* by competing with other seed borne fungi. Isolates producing higher concentrations of helvolic acid provokes a high incidence of sheath rot disease[3]. Still, several other mechanisms such as cerulenin, cellulolytic and pectic enzymes may well have contributed to the aggressiveness of *S. oryzae*.

MANAGEMENT

Cultural Control and Sanitary Methods

- Use healthy seeds as it is a seed-borne disease.
- Elimination of infected stubbles after harvest.
- Optimum plant spacing can decrease the disease.
- Application of potash at tillering stage reduces disease incidence.
- Control weeds and keep field sanitation.
- Minimize insect infestation in rice field as insects cause injuries to the plants which allow the fungi to enter and cause infection.

Host Plant Resistance

- Only a few rice cultivars are reported to be resistant (Kala Namak, KSR white, Tetep, Zenith and Tadukan) to sheath rot.
- Generally, the tall varieties are found to be moderately resistant to sheath rot due to a momilactone (phytoalexin).
- Photoperiod-sensitive tall varieties showed more resistence than photoperiod-insensitive varieties.

Biological Control

- Bacterization with *Pseudomonas fluorescens* reduced sheath rot severity and enhanced crop growth, and increased grain yield[2].
- Application of *Pseudomonas fluorescens* (10^7 cfu/ml) at the booting stage, had

substantially reduced sheath rot severity and considerably increased grain yield.

ι *Bipolaris zeicola* (*Cochliobolus carbonum*), another potential antagonist completely inhibited mycelial growth of *S. oryzae*.

ι Leaf and flower extract of *Tagetes erecta* inhibited the mycelium growth of *S. oryzae*.

Chemical Control

ι Apply seed treatment fungicide like carbendazim, edifenphos or mancozeb as seed treatment.

ι For control of sheath rot, spray the fungicides at the time of panicle emergence.

ι Ediphenphos may be applied by high volume sprayers only.

ι Foliar spraying with carbendazim, edifenphos, or mancozeb at booting stage, was found effective against sheath rot.

ι Foliar spraying with benomyl and copper oxychloride were also found to be effective.

CONCLUSION

Sheath rot is an emerging disease causing serious economic losses in rice growing countries including India. The importance should be given on an integrated management approach, including use of healthy seeds, sanitation, tillage practices, nutrient management, minimize insect infestation, use of bio-control agents, growing of resistant cultivars, and use of fungicides for effective control of sheath rot disease of rice.

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TENDRIL PERVERSION IN CUCURBITS

Ruksana Aziz[1], Anjan Barman[2], Udaratta Bhattacharjee[3],
Rahul Kumar[4], EeshanKalita[5] and Suvendra Kumar Ray*

Tendrils are spiral structures usually occurring in climber plants and provide support and hoist the plant above the ground. Initially tendril develops as an elongated flexible structure, which later wanders for a support within and around its vicinity. In the presence of a support, it starts coiling around it. Subsequently, the linear tendril between the support and its origin grows as a helical structure, which comprises of both right and left handed coils separated by a short linear segment. The presence of both right and left handed helical coils within a tendril, forming a hemi-helix structure, is known as *tendril perversion*. In the present communication attempt has been made to introduce to readers the fascinating phenomenon of 'tendril perversion'.

Plants which grow in upward direction with the aid of solid support are called climbers, and are generally classified into two types depending upon the way they clasp to the shaft. First types are the climbers where the main stem twines spirally round a support (Fig. 1a and 1b). The second category are those which move upward by clasping any object with the help of spiral structures known as tendrils and these are generally modified stem or leaves. Usually the second types of plants bear heavy fruits (e.g. pumpkin, gourds etc.) and to provide durable support to the climbers, evolutionarily tendril structure has been selected in these plants. Given a close look, a tendril would reveal presence of coiled turns that may vary in number. Not only that, one would also find differences in the fashion these coils have formed. For instance, within a single plant, coiling in tendrils can be observed in both right-handed and left-handed fashion (Fig. 1c and 1d). More interestingly, in a single tendril that clasps a support, both right handed and left handed coils are discernible (Fig. 2a).

*,1,2,4,5 Department of Molecular Biology and Biotechnology,Tezpur University, Napaam, Tezpur-784028, Assam,Email: suven@tezu.ernet.in, 3 Department of Bioengineering & Biotechnology Gauhati University, Institute of Science & Technology, Guahati-781014, Assam.

Fig. 1. Coils observed in a climber plant.
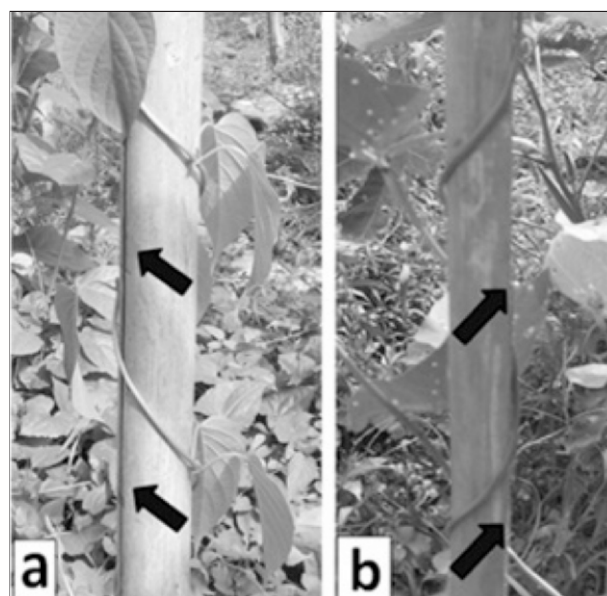**1a. Picture of a climbing plant that coils around a support in a left-handed.**
1b. Picture of another climbing plant that coils around a support in a right-handed fashion.

A tendril may start with left handed helices first which would then be interrupted by a short linear stretch and from the other end of this stretch right-handed helices would resume or *vice versa*.

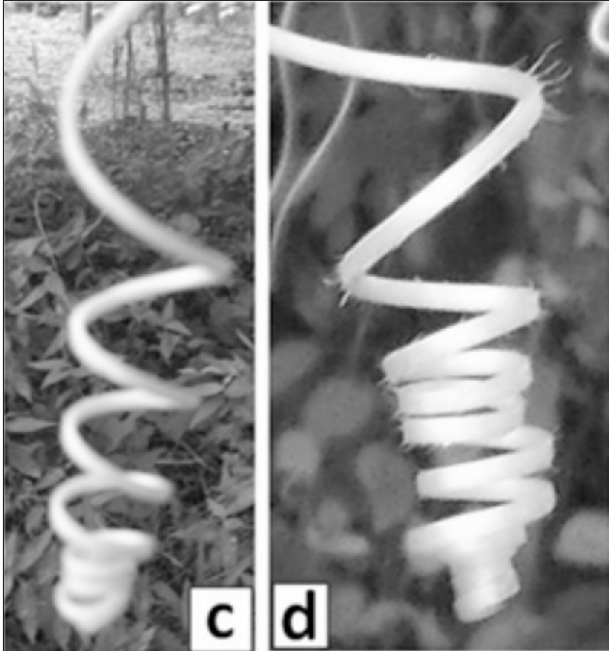This kind of regularity breaking is known as *tendril perversion* where the helix structure hence

Fig. 1c. Picture of a hanging tendril coiled in right-handed fashion.

Fig. 1d. Picture of a hanging tendril coiled in left-handed fashion.
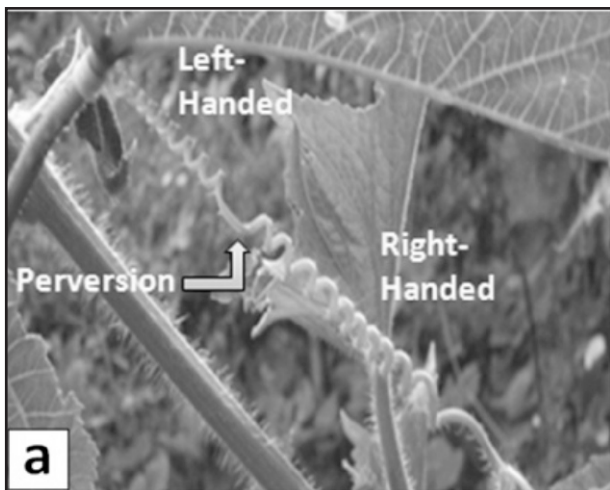
Fig. 2. Images showing perversion (s) in Tendril. A Image of a tendril which is clasping a support, shows both right-handed and left-handed coils.

changes to a hemi-helix conformation[1]. Tendril

perversion is such an exciting phenomenon that any one observing it will come up with several kinds of questions.

FOUNDATION

In as early as 1751, Linnaeus first observed left and right handedness phenomenon in plants. He also observed the *tendril perversion* that was termed as spiral reversal. Later, Asa Gray, a Professor of natural history at Harvard, and a silent advocate of Darwin's theory of natural selection, published a short note on climbing plant's pattern in 1858. He sent seeds of climber plants to Darwin and requested him to check the incredible movements in tendrils by himself. Darwin elucidated his observation of tendril growth and movement in the book "*The Movements and Habits in Climbing Plants*" that he wrote in 1888. In this book, he defined tendrils as dorso-ventral structures which are capable of bending in all directions with their tips intact through an autonomous spinning movement described as *circumnutation* [2, 3]; something not observed in other developing structures of plants such as leaves or branches. He emphasised that, this kind of movement was obligatory, that corresponds to another autonomous movement and is inducible depending on the condition that tendril has found a support!

After Darwin, several others have forwarded numerous vibrant explanations, but, the actual mechanism for such kind of growth still remains unclear. Although the exact mechanism has remained un-elucidated, it is stated that the intrinsic torsion (the act of twisting with the help of shortened inner layer) of tendril filaments cause them to form helical morphology at sub-cellular level[4]. During the coiling process some specialized gelatinous fibre cells becomes lignified to give the tendril its specific shape[5]. There are many genes which are involved during shoot development and based on their origin and arrangement they can be segregated into tendril or inflorescence forming genes. Since, tendrils and inflorescence originates according to their requirement from the common shoot apical

meristem, they are considered as homologous organs[6]. The development of homologous organs is based on cell proliferation function which is regulated by transcriptional components like MADS-box, SPL and FT-TFL1 gene families during the growth of the tendril[7].

In spite of several studies on tendril perversions, a basic unanswered question is why there is a need for a perversion in tendrils of climbing plants. Furthermore, our understanding relating to the benefits a plant gain from tendril perversion is also wanting!

TENDRIL PERVERSION IS A PROG-RESSIVE GROWTH ASSOCIATED PHENOMENON

To have a modest understanding on tendril perversion, authors decided to observe climber plants in a natural habitat. Accordingly, a bottle-gourd plant (*Lagenaria siceraria*) was selected for the study in one of the vegetable gardens within the Tezpur University campus. Many tendrils as finger like elongated structures in the process of forming coils could be seen hanging freely from the plant. They were at the initial stages of tendril formation that would give rise to spiral structures later. Some of the freely hanging tendrils were already coiled either in left or in right handed fashion. Apart from the freely hanging tendrils described above, there were many tendrils observed in the plant that grasped a support and were helping the plant to climb. Each of these tendrils exhibited tendril perversion and so was composed of both right and left handed coils. Interestingly, more than one perversion was observable in a tendril (Fig. 2b & 2c), where left-handed and right-handed coils were occurring several times alternatively. This observation might lead anyone to think, what actually decides the number of perversion in a given tendril*?* And we were also inquisitive about it!

To have an insight of the phenomenon of tendril perversion in the plant that was selected, we
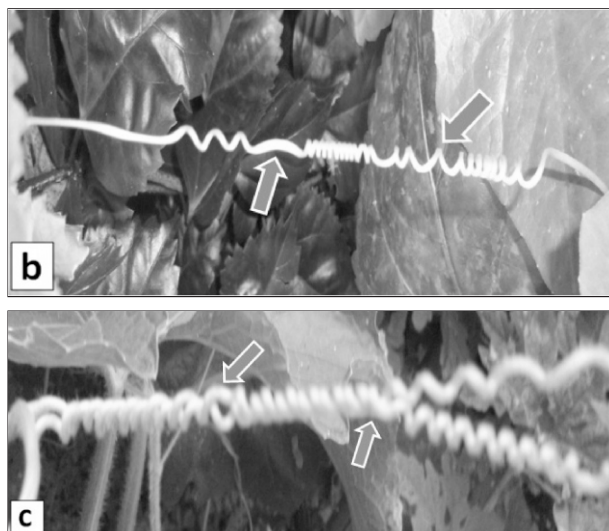
Fig. 2b. An image image showing tendril with multiple perversion(s).

2c. An illustration showing two tendril with multiple perversion(s), inter-twilling among themselves.

specifically an elongated tendril which was just attached to a support and yet to begin coiling. We followed its development at different time intervals. Interestingly, the growth of the tendril from an initial elongated structure, after it bound to a support, till formation of a complete coiled structure comprising a *perversion* could be visualized within 30 hours of duration (Fig. 3). There was an increment of coils at different time periods after the tendril caught hold of

Fig. 3a. At 0th hour: an alongated tendril grasping the support at the begining (a arrow points at the possition of tendril tip).

a shaft. This suggested that coiled structure formation was a slow, progressive and growth associated process. Perversion in tendril was occurring during the formation of the coiled structure and the site of perverted region within the tendril was most likely determined prior to initiation of coiling. During the growth, the predefined perverted region likely carried out a rotational movement. As the
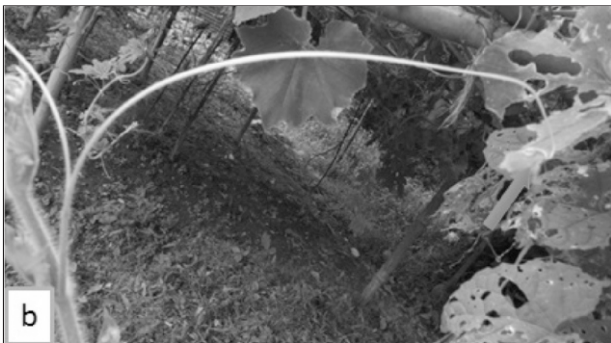
Fig. 3b. After 2nd hour : twisting around the support firmly (a blue arrow points at the position of tendril tip).

perverted region was towards the centre of the tendril i.e. in between the origin and the point of attachment, rotational movement there resulted in formation of equal number of left handed as well as right handed coils in opposite direction on its either sides (Fig: 3). Within the coiled structure of the tendril, now, one
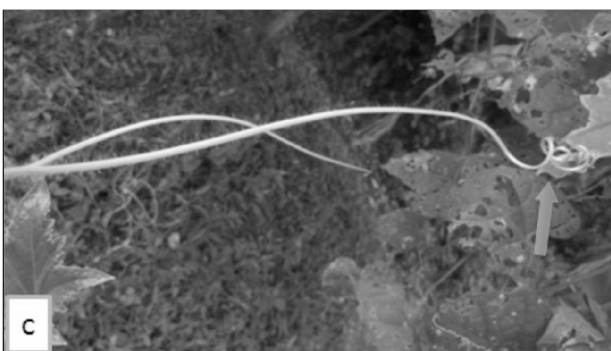
Fig. 3c. After 6th hour : initiation of coiling in the linear tendril (a blue arrow points at the position of tendril tip).

could differentiate between the dorsal and ventral

Fig. 3d. After 8th hour appearance of a perverted region (blue arrow pointed towards).

surfaces, which was otherwise imprecise in an elongated tendril. The ventral surface was always internal both in the right and the left handed coils as

Fig. 3e. After 24th hour : Distinct perversion observed having opposite handed coils on either side of it (blue arrows points at coils of tendrils and perverted region respectively).

these coils were formed by the rotational movement of the perverted region. If such a tendril is pulled from both the ends in opposite direction, the coils would unwind and becomes linear. The reason behind the rotational movement in tendrils is still un-elucidated In case of tendril with multiple perversion we think that more than one perverted regions were predefined in the tendril. For the formation of multiple perversions, the adjacent perverted regions had to rotate in opposite direction i.e. if one perverted region rotated in clockwise direction then the adjacent perverted region had rotated in anticlockwise direction. So, in tendril with two

perverted region, number of coils in the middle region is more than the number of coils on either side of it. The multiple perversions were usually noticed in comparatively elongated tendrils.

Fig. 3f. After 27ᵗʰ hour : Keeping the perversion region constant, Number of coils on either side has increased (blue arrows points at coils of tendrils and perverted region respectively).

Now, a question arises! What are the selective advantages climbers acquire by possessing a tendril
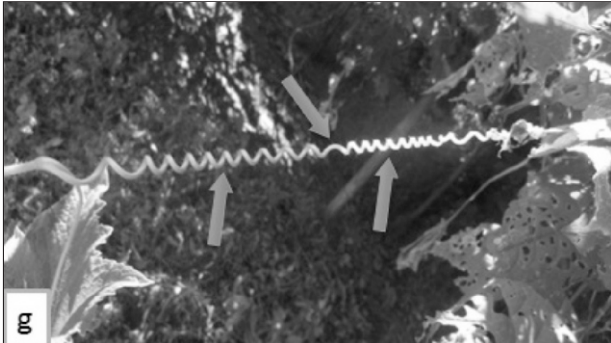
Fig. 3g. After 30ᵗʰ hour : A fully grown tendril with constant number of turns (blue arrow points at coils of tendril and perverted region respectively).

with perversion over a tendril devoid of perversion? The tendril plays an important role in climbers for clasping any support which comes on their way using their sensor cells present at the meristem tip (actively dividing cells at extreme points). After catching hold of the support, tendril forms coiled structure on both sides of the perverted region. This enables the tendril to move freely rather than a probable restricted s

movement due to a linear or uncoiled tendril. The hemi-helix structure formation is having an advantage over a simple helical structure as follows. When a tendril with perversion receives any stress due to the movement of the plant or the support by any external factors like wind or other disturbances etc., it will tend to uncurl itself without putting any strain neither on the support nor on the parent plant. On the contrary, when such a kind of stress is applied on a simple helical structure, the coil would try to extend itself due to the former and subsequently would generate tension on both ends. In that course, the tendril might break! Hence, tendril perversion is important from mechanical point of view as it gives more flexibility than a regular coiled structure in a plant.

With respect to the coiled structure observed in freely hanging tendrils,our simple explanation is that tendrils have a maximum limit to which it can elongate while seeking any support and in the absence of any support around that extent, it goes for coiling with a preordained perversion. The purpose of these unbound coiled structures is unknown. It may be simply that coiling of a tendril is developmentally predetermined and free tendrils also form coiled arrangements. In these free coiled structures too perverted region can be observed. But, these perversions are not distinctly visible as one of its end remains free.

CONCLUSION

From structural point of view, it may be presumed that climbers have developed tendrils with perversions rather than tendrils with only helical coils, rendering better support and flexibility. Recently, many exciting research studies have been carried out about tendril perversion in plants[4,5,7,8]. Still there are few questions yet to be answered which are as follows. (i) What determines the numbers of coils within a tendril? (ii) Why there are formation of multiple in a tendril? We look forward

that scientists in near future would address many other fundamental questions pertaining to phenomenon like tendril perversion!!

ACKNOWLEDGEMENT

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LYMPHATIC FILARIASIS: A NEGLECTED DISEASE OF INDIA

Diksha Katiyar

Lymphatic filariasis (LF) caused by nematode worms *Wuchereria bancrofti* and *Brugia malayi* is a major health problem in India, which afflict mostly poor people. The disease leads to disfiguring pathological conditions, severe social stigma, psychological problems and huge economic losses on affected individuals and communities. With the advent of new and easy to implement control strategies, LF elimination programs have gained much momentum in the past decade but there are still many challenges that stand in the way of achieving the goal of LF free India.

INTRODUCTION

The neglected tropical diseases (NTD) are a group of 13 major disabling conditions that predominantly affect world's poorest people in Africa, Asia and the Americas. Lymphatic filariasis (LF), caused by filarial nematodes *W. bancrofti* and *B. malayi* and transmitted by mosquitoes, is one of the NTD which is prevalent in 81 tropical and subtropical countries. It is estimated that approximately 1.3 billion world population is at risk of filarial infection. About 120 million people are infected with LF and among them 40 million are seriously incapacitated and disfigured. According to World Health Organisation (WHO), LF is the second most common cause of long term disability after mental illness. One-third of people infected with LF live in India, a one third live in Africa and most of the remainder lives in the Americas, the Pacific Islands, and South-East Asia. The burden of LF in humans and its impact on socioeconomic aspects has led to the identification of this disease as one of the priority areas of WHO. In the year 1997, the World Health Assembly at its 50th session passed a resolution (WHA 50.29) to eliminate LF globally as a public health problem by the year 2020.[2] The two main objectives of Global Program to Eliminate LF (GPELF) are (1) interruption of transmission of parasite through repeated annual mass drug administration (MDA), using a combination of ivermectin (IVM) plus albendazole (ALB) where oncocerciasis is co-endemic with LF and diethylcarbamazine (DEC) plus ALB where LF alone is endemic, to all the people living in endemic area and (2) prevention of LF-related disability through morbidity management program. GPELF is benefitted by generous donation of drugs: ALB by GlaxoSmithKline and IVM by Merck & Co., Inc. as long as they are required to eliminate LF.

CURRENT STATUS OF LYMPHATIC FILARIASIS IN INDIA

LF is a major health problem in India and is endemic in 250 districts of 20 states/union territories.[5] In India, *W. bancrofti* transmitted by the ubiquitous vector, *Culex uinquefasciatus,* has been the most predominant infection contributing to 99.4% (bancroftian filariasis) of filarial cases. The infection is prevalent in both urban and rural areas while rest of the infections are caused by *B. malayi (brugian filariasis),* which is transmitted by Mansonia mosquitoes. Brugian filariasis is mainly restricted to rural areas of Uttar Pradesh, Bihar, Andhra Pradesh, Odisha, Tamil Nadu, Kerala, and West Bengal. The incidence of LF in India is very high, currently over 45.5 million people infected with LF lives in India and about 553 million are

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exposed to the risk of infection, of these about 146 million live in urban areas and about 407 million in rural areas. The state of Bihar has highest endemicity of over 17% followed by Kerala (15.7%) and Uttar Pradesh (14.6%). Andhra Pradesh and Tamil Nadu have about 10% endemicity. Goa showed the lowest endemicity of less than 1% followed by Lakshadweep (1.8%), Madhya Pradesh (above 3 %) and Assam (about 5%). The seven states namely Andhra Pradesh, Bihar, Kerala, Odisha, Uttar Pradesh, Uttarakhand and West Bengal contribute over 86% of microfilaria carriers and 97% of disease cases in the country.

SYMPTOMS AND SOCIO ECONOMIC BURDEN

Symtoms of LF can be divided into three basic disease stages (a) asymptomatic (b) acute and (c) chronic. Asymptomatic microfilaraemia is often regarded as a "non-disease" because the individuals concerned have no idea that their blood contains large numbers of microfilariae and this situation may persist for decades without any progression to clinical disease. Most of the signs and symptoms of filariasis are caused as a consequence of the adult worms living in the lymph system. Tissue damage caused by the worms restricts the normal flow of lymph fluid resulting in swelling, scarring, and infections. The most common manifestation of acute filariasis is adeno-lymphadenitis (ADL), which is characterized by intense lymphangitis, lymphadenitis and reddening of the overlying skin. The worst symptoms of the chronic disease generally appear in adults, include persistent lymphoedema of arms and legs, hydrocoel, elephantiasis of genital organs, chyluria (milky urine) and tropical pulmonary eosinophilia. In addition, LF also causes internal damage to the kidneys.[5]

Chronic filarial infections have serious social, psychological and economic effects. The massive swelling of the limbs and disfigurement due to lymphoedema interferes with the day-to-day activities of the sufferers and reduces their productivity resulting in low income and long term poverty. The problem becomes more intense, if the patient is major income earner of the family. In rural areas, where agriculture is the primary source of livelihood, incidence of LF affects the agricultural activity of farmers leading to poor harvest, loss of livelihood and food insecurity. It is estimated that the total disability adjusted life years lost in India due to this disease are around 2.06 million, resulting in an annual wage loss of $ 1 billion.[6] LF also exerts a profound social burden on patients as the chronic manifestations of this disease such as lymphoedema of the limbs, breasts and external genitalia cause social stigmatization of the patients and prevent them from playing their role in society.

LIFE CYCLE AND PATHOGENESIS

Human filarial nematode worms have a complicated life cycle, which requires both a vertebrate host and a blood sucking arthropod vector (Figure 1). Human is the definitive host and arthropod vector is the intermediate host. There are no intervening free-living stages. Microfilariae (mf) are picked up by arthropod vector during their feeding on the infected person. Inside the intermediate host these mf lose their sheath and migrate rapidly to the thoracic muscles where they develop into first-stage larvae (L1) and subsequently into third-stage infective larvae (L3) and migrate through the hemocoel to the mosquito's proboscis. These L3 require human host for their further development. The L3 enter into the human host during a blood meal by an infected mosquito and penetrate into the blood capillaries. Inside human host L3 molt to fourth-stage larvae (L4) in approximately 4-6 weeks. Within nine months they molt again to the sexually mature juvenile adult stage (L5, macrofilariae). The adult filarial parasites reside in the lymphatics, where they can live upto 15 year. The worms have an estimated active reproductive span of 4–6 years. The female worms measure 80 to 100 mm in length and 0.24 to 0.30 mm in diameter, while the shorter males measure about 40 mm by

0.1mm. The mature adult male and female parasite mate and produce millions of very small immature larvae known as mf that find their way into the blood circulation. These mf measures 244 to 296 μm by 7.5 to 10 μm, which are sheathed and have nocturnal periodicity. These are essentially pre-larval stages, which will not undergo further development until taken into the haemocoel of the intermediate host.
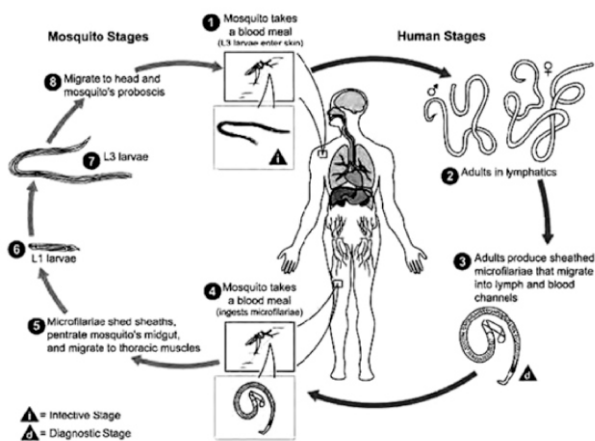
Fig. 1. Life cycle of filarial parasite

PRESENT SCENARIO OF LYMPHATIC FILARIASIS ELIMINATION IN INDIA

Considering the impact of LF on the affected population, National Filaria Control Program (NFCP) was launched in India in 1955 with the objective of delimiting the problem and to undertake control measures in endemic areas. Initially NFCP activities were mainly confined to urban areas, which were implemented through 206 control units and 199 filaria clinics. However, the program was extended to rural areas in 1996 in 13 districts of 7 endemic states through annual MDA with single dose of DEC, covering 41 million population. The program was scaled up to cover a population of 77 million in 2002 with the administration of DEC alone in 19 districts and combination of DEC and albendazole in 11 districts.[7] In 2002, the National Health Policy has set the goal of elimination of LF as a public health problem in India by 2015. For achieving this goal,

MDA with annual single dose of DEC (6 mg/kg body weight) for five or more years to all the population vulnerable to filariasis, excluding pregnant women, children below two years of age and seriously ill persons, was launched in 2004 targeting about 468 million population from 202 districts. It was also proposed to observe National Filaria Day every year from 2004 in all endemic districts. The coverage of MDA has been reported to be 72.6%, 79.84% and 83.67% respectively in the year 2004, 2005 and 2006 respectively. From 2007, the program was scaled up to cover the entire population of 590 million in all 250 endemic districts. Administration of ALB (400 mg) alongwith DEC was included in MDA from 2008 onwards. Besides MDA another pillar for elimination of LF is morbidity management, which includes home based management of lymphoedema cases by simple washing and surgical intervention for hydrocele cases.

MAJOR PROBLEMS AND CHALLENGES FOR DISEASE CONTROL

With the advent of new and easy to implement control strategies, NFCP has gained much momentum in the past decade but there are still many challenges that stand in the way of achieving the goal of LF free India. It is evident from number of studies that some MDAs work better and more efficiently than the others.[8,9] The major challenge of MDA is that it requires very high treatment coverage and compliance (>85%) sustained for consecutive five years, which is believed to be the average reproductive life of adult worms, for achieving transmission interruption of the disease in endemic areas.[4] However, many MDAs have struggled to attain this required level of coverage and compliance and as a result LF could not be eliminated despite several rounds of elimination programs. For example compliance and coverage was found below the optimum levels in spite of several rounds of MDAs with social mobilization in Tamil Nadu[10] and Andhra Pradesh states.[11] The study conducted in Bidar district of Karnataka showed that only 62.3%

coverage and 60.4% compliance could be achieved with MDA, which was much below the expected national standard.[12] The other study in Paschim Midnapur district of West Bengal over a two year period from 2009 to 2010 also indicated low coverage (84.1% in 2009 and 78.5% in 2010) and compliance (70.5% in 2009 and 66.9% in 2010).[13] Similar findings of low compliance ranging from 32.7% to 76.2% were also observed by other studies across India.[14,15] Some of the main reasons, which were cited for insufficient coverage and compliance include: lack of knowledge about the disease and the program among the endemic population, inconsistent drug distribution, inadequate training of health workers and their reluctance in drug distribution, lack of supervised dosing, fear of side effects of drug, incapability of health personnel to convince people, who feel healthy and have no sign of disease, for drug consumption and absence of recipients of drugs at the time of MDA. In addition, MDAs have also been affected by inadequate supply of drug,[16] insufficient time for MDA implementation and shortage of health workers,[17] and repeated postponement of MDA.[18] It has been seen that inadequate compliance is a major impediment to elimination campaign as the non-compliant persons remain microfilaremic and act as a reservoir of infection and plays very important role in resurgence of disease. However, a recent study from Karimnagar district in Andhra Pradesh indicated that besides awareness and education, socioeconomic conditions also plays a vital role in prevalence and transmittance of this disease. Though majority of the respondents in this study were aware about the cause of disease transmittance, LF prevalence and transmission could not be stopped even after several rounds of MDA due to low living standards of the population.[19] In some cases, initial level of LF endemicity also influences MDA outcome for example in highly endemic communities in rural region of South India incidence of sporadic new infections was observed and transmission interruption could not be achieved even after ten rounds of MDAs.[20]

The other challenge to the elimination program is the dearth of antifilarial drugs, currently DEC alone or combination of ALB and DEC is distributed in MDA programs. These drugs are principally microfilaricidal and are not able to kill adult worms and provide only partial benefit to the pateint. Moreover, there prolong use for number of years to prevent the build-up of mf from the surviving adult worm has raised the concern about emergence of resistance.[2]

FUTURE PERSPECTIVES

The success of elimination program depends on sustained and sufficient compliance with MDA rather than MDA coverage. Most of the studies in India indicated that MDA was restricted to tablet distribution only and the major issues of implementation in compliance, in health education, social mobilization, morbidity management and the logistics were not been given due attention. Some imperative steps are therefore urgently needed to improve strategy of MDA implementation through cooperation and coordination of government officials, local health workers, non-governmental organizations and community volunteers. The reluctance of health personnel or drug distributors (DDs) to strictly adhere to the national guidelines for program implementation, which has been cited as the main cause of low compliance and coverage in most of the studies, warrants some strategic changes in drug delivery mechanism so that drugs can be best delivered to the mouth of endemic population.[21] Further, current MDA programs should be supplemented with educational intervention and motivational activities at national level as well as at community level so that maximum number of persons can be informed about cause, transmission and elimination strategy for LF. As DDs interact directly with the population living in endemic areas therefore emphasis should be given on recruitment of well trained, motivated and enthusiastic DDs, who can convince the people for drug consumption. For training of health workers educational camps must be organized at national level with the involvement of

educational institutes. More importantly, drug consumption should be monitored directly by the health workers as insufficient compliance leads to recurrence of microfilaraemia in the affected individuals and also place the community under risk of filarial infections, which in turn necessitates more rounds of MDA and additional fund for the implementation of program. Vector control has played important role in filariasis control in some programs but it has been given very low priority in India.[2] Therefore, in situation where transmission interruption is not possible through MDA alone the role of integrated vector management as a potential supplementary strategy needs to be explored. Further, adequate monitoring and surveillance is also required to determine the new foci in non-endemic areas as these can serve as sites for fresh infection.[22] Though, many research studies discussed here have failed to implement MDAs successfully but they provide some important clues for the development of more effective drug delivery strategies.

Furthermore, drugs for LF are taken for years therefore in consideration of threat of emergence of drug resistance and also to overcome the well-known deficiencies of the existing drugs, policies should be made to create more funds for research and development of new, safe and more effective antifilarial drugs and vaccines. Despite huge detrimental effects on affected individuals and communities, LF is given very low priority and in fact the disease has escaped the attention of planners and policy makers because of low mortality rate and its association with poverty. The NTDs including LF occurs mostly among people living on less than $ 2 per day.[1] The big pharmaceutical companies do not take initiative to embark on research and development activities for LF because of low profit as the people who need new vaccines and treatments the most can never afford to pay for it. The analysis of the outcomes of pharmaceutical research and development over the past 25 years revealed that out of 13,000 chemical entities marketed between 1975 and 1999, only thirteen were for NTDs, of these only three combinations of IVM plus ALB; IVM plus

doxycycline; and ALB plus DEC were registered for LF.[23] With an impressive growth of healthcare industry in the past decade, India has emerged as an innovative developing country which has the capacity of producing its own drugs, vaccines and diagnostics. Therefore, India urgently needs new strategy to stimulate drug research and development program for NTDs through the establishment of public-private partnership of leading government institutions and biopharmaceutical companies.

CONCLUDING REMARKS

In spite of high morbidity, LF remains neglected and understudied as compared to other infectious diseases such as tuberculosis, HIV/AIDS and malaria. Because of the extent of disease problem and its negative impact on affected individuals, some concrete steps should be initiated soon to remedy this gruesome disease. These include to: (1) motivate the community to participate in the MDA program by raising general awareness about the cause and transmittance of the disease (2) educate the communities about cleanliness as inadequate sanitation creates numerous breeding sites for the mosquitoes that transmit the disease (3) earmark the funds for research and development of new, safe and affordable treatment regimens, most importantly macrofilaricidal drugs (4) plan and implement MDA program systematically and efficiently to the entire country within a timeframe without any inconsistency so that required level of coverage and compliance could be achieved (5) generate resources most importantly consistence funding for proper functioning of MDAs. In addition, the elimination programs must focus on morbidity management and disability prevention, so that the diseased persons could be able to live self-dependent and respectful life. Furthermore, tremendous effort are also required by policy makers, program managers, governmental and non-governmental organizations, health workers, community volunteer and individuals residing in endemic areas for the accomplishment of MDAs leading to the success of

NFCP. Though the filarial elimination program in India have geared up a lot during the past decade to make its presence felt worldwide, the Indian government needs to act swiftly in a time-bound manner if it has to achieve the target of eliminating LF in the country by 2020.

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CONSERVATION STATUS OF NICOBAR MEGAPODE *MEGAPODIUS NICOBARIENSIS* IN NICOBAR GROUP OF ISLANDS

Biba Jasmine[1] and Sivakumar Kuppusamy[2]

The Megapodiidae, literally meaning big feet includes megapodes, which are an unique group of birds as they make use of external source of heat to incubate their eggs. There are 22 species of megapodes largely found in Pacific region and South and South-east Asia. The Nicobar Megapode *Megapodius nicobariensis*, a mound nesting, endemic to the Nicobar group of Islands is protected under Schedule I of the Wildlife (Protection) Act, 1972, in India, is considered as globally Vulnerable (IUCN 2013). Nicobar megapdodes have declined by c. 70% since 1994 and the 2004 tsunami is believed to be the major cause of this decline. Although the tsunami had interrupted the breeding in 2005 and 2006, a natural recovery was underway and breeding success had improved; however, some threats, such as the habitat destruction due to plantation and settlements, alien invasive species and hunting have resulted in a population estimate of 376-752 breeding pairs in 2011, suggesting that the population growth rate has remained stable since 2006. Therefore, it is of utmost importance to promote participatory governance and management of Nicobar biodiversity with indigenous communities, for the sustainable and long term conservation of the Nicobar megapode.

The Nicobar Megapode *Megapodius nicobariensis*, endemic to Nicobar group of Islands in the Bay of Bengal in India, is a mound nesting species, separated from its nearest congener by a distance of over 1500 km[1].The Megapodiidae, literally meaning big feet includes megapodes, which are distinctive group of birds as they make use of outside source of heat to incubate their eggs[2]. They are heavy-bodied birds of the forest floor, resemble Galliformes in body shape and plumage[3]. The Nicobar Megapode, protected under Schedule I of the Wildlife (Protection) Act 1972, in India, is considered as globally Vulnerable (IUCN 2013) and has featured in several lists of threatened species, whereby its hunting and trade is prohibited[4]. There are 22 species of megapodes largely found in Pacific region and South and South-east Asia. Major threats like habitat destruction[2], sand mining in coastal areas[5], disaster by invasive species spread, like feral

cats and dogs; and diseases by domestic fowls, especially risk from avian cholera, have threatened 13 of these 22 species of megapodes.

Nicobar group of Islands inhibit two subspecies of the polytypic Nicobar megapode. They are found on the Nicobar group of *M. n. nicobariensis* Blyth, present in the Nancowry group of Islands north of the Sombrero channel and *M. n. abbotti* Oberholser, found on the Southern Nicobar islands lying south of the Sombrero channel. Historically, Nicobar megapode, occurred in abundance on most Nicobar Islands with a few records from the Andaman group of Islands and from further north on the Coco Islands. The species, however, is now believed to be extinct from the Andaman group as none of the records from is of recent origin.

In December 2004, earthquake of magnitude 9.15, with the epicenter being close to the Nicobar group of Islands, greatly affected the Nicobar megapode populations on the Island[6]. The Island having a high level of endemism, suffered negatively from the earthquake followed by the tsunami within a

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few minutes, making conservation of megapode all the more challenging and fierce[6]. Later in 2004, particularly, to assess the degree of threat to the Nicobar megapode, the survey, status, ecology and conservation (especially tsunami aftermath) of the Nicobar Islands was jointly carried out by the Wildlife Institute of India and the Andaman and Nicobar Forest Department[6].

According to Sivakumar 2009 report, the tsunami is believed to be the major cause of the decline of 75% population of megapodes[7]. The populations of megapodes on the Islands of Megapode and Trax were wiped out by the catastrophic blow. It was estimated about 800 breeding pairs of the Nicobar megapode occuring on the coastal habitat of the Nicobar islands after tsunami[7]. The estimated number of breeding pairs in 1994 and 2006 were 3190 and 788[7]. The tsunami also adversely influenced nest-site selection and mound-nest ecology of megapodes[6]. The estimated number of active mounds in 1994 and 2006 were 1159 and 394[7]. However, subsequent surveys conducted in 2009-2011[8] resulted in a population estimate of 376-752 breeding pairs on Megapode island, suggesting that the population has remained stable since 2006 indicating a natural recovery of habitats[8]. In the project conducted by SACON and the Department of Environment and Forests, Andaman and Nicobar Islands, on Monitoring post-tsunami coastal ecosystem recovery in the Nicobar Islands and developing site-specific restoration measures in 2011, Nicobar megapodes were seen at 30 locations. However, the encounter rates were found to be exceptionally high in Bompoka and low in Katchal Island[9].

In order to conserver this threatened species, suggested conservation action plan including long-term monitoring of the Nicobar megapode and its habitat is on the priority list of the Ministry of Environment, Forest & Climate Change, Government of India. The government is working towards preparing a 'Species Recovery Plan' under its 'Integrated Development of Wildlife Habitats' programme[10] for ensuring the successful survival of the species. Tribal heads of Nicobarese villages are also believed to play a significant role in organizing conservation awareness program, to address various declining factors affecting megapode populations across the Island. However, tsunami is suspected to be one of the major factors for the decline of Nicobar megapodes, another factors which might have adversely affected the megapodes are, the large-scale encroachment of coastal forest for coconut and other plantations, which should be avoided in the potential habitat of megapodes[6]. Since habitat destruction is a major human-induced cause for the decline of megapodes[6] it needs to be communicated properly by not encouraging major developmental / infrastructural projects as they are expected to damage the highly sensitive insular ecosystem and its wildlife and also section in the forests department should be involved in the research and monitoring part of wildlife and its habitat.

To address some of the challenges faced by the megapodes, in the 2007 transects were laid for long-term monitoring of megapode in the coastal habitats, but inaccessible terrain and thick vegetation cover, resulted in low detection probability in the interior forests. Therefore, it becomes essential to monitor the number inside the interiors of the forests for the formulation of an effective conservation plan. Tillanchang Wildlife Sanctuary is the only Protected Area for *M. n. nicobariensis*, covering less than 3% of the total habitat of this sub-species though 27% of population occur in this island[6] Remaining 73% of *M. n. nicobariensis* is not protected and their habitat under the severe threat after tsunami due to post-tsunami rehabilitation process[6]. Therefore, involving local communities in the conservation of *M. n. nicobariensis* outside Tillanchang Island is utmost important to prevent further decline of this sub-species from the Nancowry group of islands. Other possible factors which could help megapode population revive on the Island are: developing a project to study the population dynamics of the species by investigating the viability of small populations; formulation of extensive research and monitoring to know the ecology of the species for
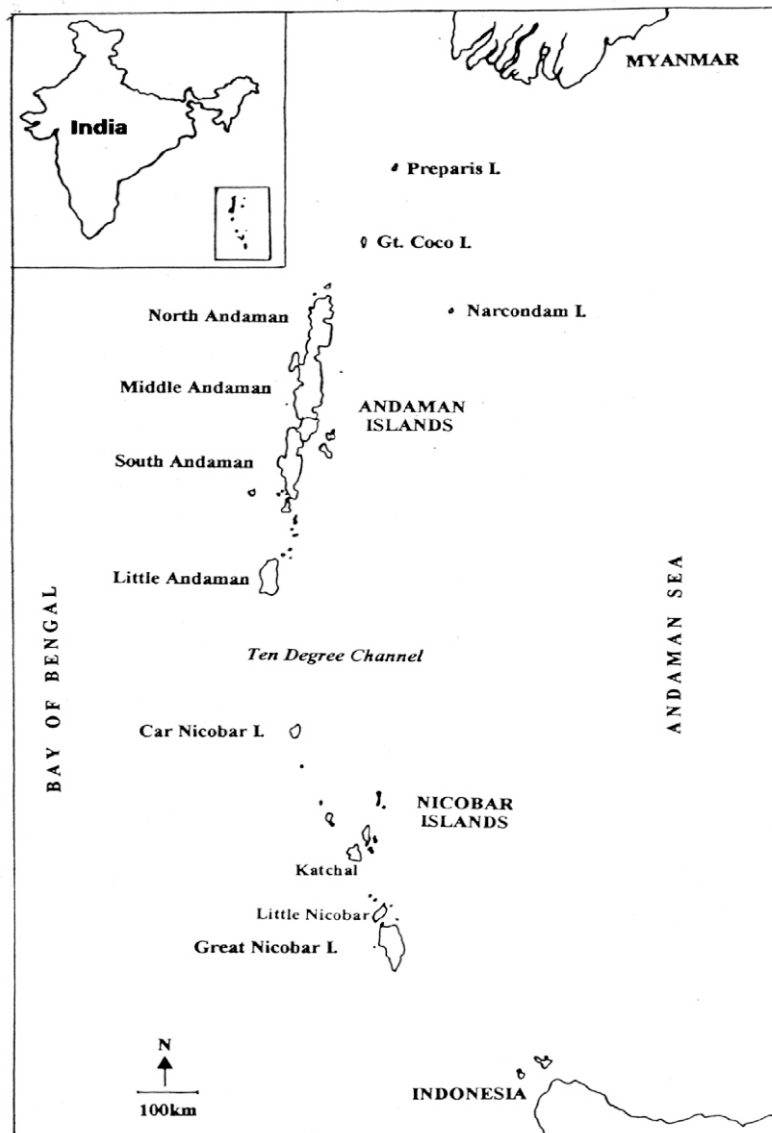
strengthening its management plan; and research the factors which govern the population dynamics of this species for establishing conservation priorities. As the species habitat use and social organization is well known, slight refined research would help in understating ecological needs to direct current conservation efforts[11].

Lately, the majority of megapode habitats have been included in the Protected Areas Network, which is declared as a highly sensitive zone for the insular ecosystem and its wildlife. The habitat-restoration programs have been initiated in the region to save the dwindling numbers of megapodes. To save the vast array of diminishing endemic biological diversity of the Nicobar islands, the Great Nicobar Island has been declared as UNESCO Biosphere Reserve in 2012, which in turn would strengthened the conservation of the Island's natural ecosystem from anthropogenic pressures[12]. However, it is of utmost importance to promote people participation in the governance and management of Nicobar biodiversity for the sustainable, but long-term conservation of the Nicobar megapode.

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ALCOHOL CONSUMPTION, DEPENDENCE, MEDIATED DISORDERS AND CHALLENGES

Subodh Kumar Jain

Alcohol is the most widely investigated drink in the world that plays a major role in many of our lives. Yet it is surprising that only a few of us know what happens when we consume it above a limit. Alcohol taken above a certain level can cause several disorders. The consumed alcohol is diluted in the body by the body fluids differently in men and women due to change in size, ratio of body water to fat, and levels of gastric alcohol dehydrogenase.

INTRODUCTION

Normally alcohol is taken largely by an individual for physiological and psychological effects, but often consumed during specific social and part of religious practices. Administration and systemic concentrations of alcohol are a consequence of its absorption, distribution and metabolism, which display very unique characteristics and demonstrate substantial inter individual variability[1]. According to the researches, alcohol consumption has apparently become an accepted leisure activity for men[2]. Researches revealed that nearly one in three male adults consumes alcohol, and 5% of Indian women are already regular users[3]. In area wise distribution, urban population consume more alcohol as compared to rural and normally started during 21-30 years, followed by 11-20 years and minimum is 41-50 years of age group[4].

The enzyme Alcohol dehydrogenase (ADH) discovered in fruit flies of the Genus Drosophila is known to facilitates the interconversion between alcohols and aldehydes or ketones with the reduction of NAD^+ to NADH. Mammalian ADH is present at high levels in the liver and stomach. This enzyme has five major classes- ADH1α, β and γ; ADH4, ADH5, ADH6 and ADH7. ADH1 α, β and γ have high activity for alcohol oxidation and plays a major role in alcohol metabolism. Polymorphism of ADH1B

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tends to show a faster rate of alcohol metabolism, which increases the production of acetaldehyde and its accumulation in the body. This can result in various toxic side effects *viz.* flushing syndrome with sweating, alcoholic hepatitis, fibrosis or more seriously cirrhosis and hepatocellular carcinoma.

ABSORPTION

Consumed alcohol is diluted in the stomach by gastric juices. A small portion of alcohol directly diffused into the blood stream by stomach wall and left over is absorbed by small intestine. However, it is clear that about 50% of alcohol is degraded in stomach before passing into small intestine. The rate of alcohol absorption is affected by several factors e.g. when a strong alcoholic drink is taken into an empty stomach, it may cause a spasm of the pylorus that will impede passage into the small intestine, resulting in a slower absorption. The stomach filled with fatty food can also delay the absorption rate. Carbonated alcohol *viz.* champagne or alcohol taken with a carbonated beverage such as soda water will be absorbed rapidly. The rate of absorption can also be affected by the emotional state of the drinker. There is an immediate dispose off of alcohol after its absorption, but a small portion is exhaled through the lungs and excreted through sweat and urine while major portion is disposed by metabolic processes in the liver[5].

GENDER AND AGE AFFECTS

Based on the water content of various tissues and organs, alcohol is diffused in the body but higher concentration appears in blood and brain, followed by fat or muscle tissues. Alcohol level in blood raises more in woman because of differences in size, ratios of body water to body fat, and lower level of ADH. One of the enzyme's components, glutathione-dependent fomaldehyde dehydrogenase (x-ADH), is deficient in women, responsible for lower ADH activity levels[6]. ADH activity decreased with increasing age in males, while in females it was higher in 41–60 years of age than those aged 20–40 or 61–80 years. In male aged 20–40 years, consumption of larger quantities of alcohol is related with reduced ADH activity[7].

METABOLISM IN THE LIVER

ADH present in the liver cells is acted upon the absorbed alcohol when it is passed through it and converts alcohol into acetaldehyde, highly toxic substance. Then the enzyme aldehyde dehydrogenase act immediately on it converting acetaldehyde to acetate, most of which enters the bloodstream and is oxidized to CO_2 and water. During this process about 200 calories per ounce of alcohol (about 7.1 calories per gram) is made available to the body which serves as a nutrient[5].

Alcohol metabolism occurs by hepatic oxidation in liver and is governed by the catalytic properties of the alcohol-metabolizing enzymes. Evaluation of both genetic and environmental factors that regulate the rate of alcohol and acetaldehyde metabolism, help us to understand the consequences of alcohol-related organ damage, developmental problems and alcohol dependence[1].

Individuals having normal level of ALDH2, acetaldehyde is directly converted to acetate (non toxic) while in individuals with ALDH2 enzyme-deficient (ALDH2*2), a significant amount of acetaldehyde is accumulated. Acetaldehyde is highly diffusible and can cross biological membrane barriers, circulated in the blood and metabolized in all tissues as ALDH2, which is present in

Normal alcohol metabolism   Metabolism in alcoholics

mitochondria of all cells[8]. The increased level of acetaldehyde is associated with redness of face and skin, burning sensation and general discomfort, collectively termed as the "flushing phenomenon"[9].

According to Seitz and Stickel "Genetic linkage studies with relation to alcoholics supported that acetaldehyde plays a central role in alcohol-associated carcinogenesis" and they suggested that there is high risk of cancer in those individuals who accumulate acetaldehyde because of the presence of alleles of the genes encoding ADH or ALDH[10].

ENZYMES

Drinking heavily leads to adverse health consequences that includes alcoholism, liver damage and various cancers. The enzymes which are primarily involved are aldehyde dehydrogenase (ALDH), alcohol dehydrogenase (ADH), cytochrome P450 (CYP2E1), catalase and glutathione S-transferases (GST). If there is any variation occurs in the genes responsible for producing these enzymes then it would influence the amount of alcohol consumption, tissue damage with respect to alcohol intake and alcohol dependence[11].

ALCOHOL DEHYDROGENASE (ADH)

ADH was discovered in fruit flies, isolated and purified in 1937 from *Saccharomyces cerevisiae* (baker's yeast). This enzyme has five major classes (ADH1 α, β, and γ; ADH4, ADH5, ADH6 and ADH7) aligned along a small region of chromosome 4. Out of which ADH1 α, β, and γ have high activity for alcohol oxidation and has a major role in alcohol metabolism. High level of ADH is present in the liver and stomach. The **ADH4** is highly variable and

substrates, containing ethanol, retinol, other aliphatic alcohols, hydroxysteroids, and lipid peroxidation products.

ALDEHYDE DEHYDROGENASE (ALDH)

This enzyme is present in all living organisms from prokaryotes to eukaryotes, catalyse the oxidation (dehydrogenation) of aldehydes to acetate. There are nineteen ALDH genes identified in the human genome that take part in a variety of biological processes including the detoxification of exogenously and endogenously generated aldehydes. From several isozymes of ALDH identified so far ALDH1 (in cytosol) and ALDH2 (in mitochondria) are involved in metabolizing acetaldehyde.

CYTOCHROME P450 (cyp2e1)

This enzyme is present in the microsomes (vesicles) of the endoplasmic reticulum which contribute to alcohol oxidation in the liver. CYP2E1 is induced by chronic alcohol consumption and metabolize ethanol to acetaldehyde when alcohol
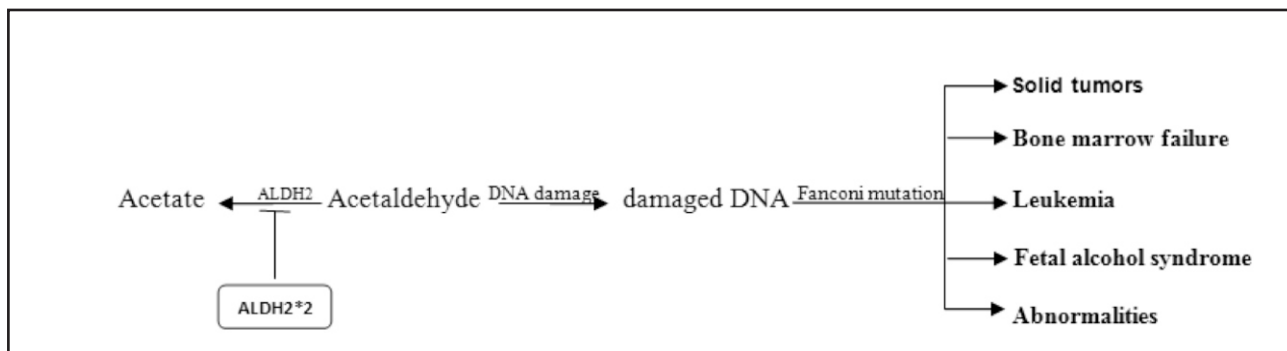
expressed in the liver in lower amounts while ADH5 is expressed universally in cells and organs, and is identical to glutathione (GSH)-dependent formaldehyde dehydrogenase, but ADH6 is present in the stomach and skin, mostly in ethanol-active form and related to first-pass alcohol metabolism probably with retinol dehydrogenase function. On the other hand ADH7 gene encodes class IV alcohol dehydrogenase, and metabolize a wide variety of

concentration is elevated. CYP2E1 dependent alcohol oxidation occurs in tissues including brain, where activity of ADH is low. It also produces ROS (Reactive Oxygen Species), including hydroxyethyl, super-oxide anion, and hydroxyl radicals, which increase the risk of tissue damage[11]. The enzyme cytochrome P450 2E1 (CYP2E1) and catalase also break down alcohol to acetaldehyde. CYP2E1 get activated when a person

consume large amounts of alcohol, and the enzyme catalase metabolizes only a small fraction of alcohol in the body[8]. Small amounts of alcohol can also be removed by interacting with fatty acids to form fatty acid ethyl esters (FAEEs), responsible for liver and pancreas damage[12].

CATALASE

It is present in peroxisomes and oxidizes alcohol in the presence of hydrogen peroxide (H_2O_2)-generating system *in vitro* e.g. enzyme complex NADPH oxidase or the enzyme xanthine oxidase. Quantitatively, this is considered a minor pathway of alcohol oxidation, except in the fasted state[13].

GLUTATHIONE S-TRANSFERASES (GSTs)

The GST can protect the cell against cytotoxic and carcinogenic agents. Diseases like cirrhosis and chronic pancreatitis may be caused by toxic load of cytochrome mediated products leading to a depletion of GSTs[14].

GENETIC POLYMORPHISM

Genetic polymorphisms in ADH1B and ALDH2, and ethnic differences in the prevalence of these polymorphisms, result in increased variation in alcohol metabolism among individuals. Polymorphism in ADH1B gene results in to production of isozymes which metabolize alcohol at a faster rate but polymorphism in ALDH2*2 gene reduce its efficiency, as a result acetaldehyde is accumulated and cause physiological consequences. ADH and ALDH polymorphisms are also associated with a protective effect on the development of alcoholism. There is lower level of ADH1B*2, ADH1B*3, and ALDH2*2 allele frequencies of alcohol dependence compared to controls.

Although CYP2E1 gene polymorphism is not very clear, however accumulation of more acetaldehyde induce sedative, movement, memory impairing and behavioral effects[15].

Polymorphism in GSTM1, GSTT1 and related genes, increase the susceptibility to cirrhosis or pancreatitis in alcoholics. It has been suggested that the GSTM1and GSTT1`null' genotypes are risk factors for tumors such as bladder, breast, oral, lung, head and neck cancers[14].

CONCLUSION

For a normal human being, it has been noticed that generally when a person consume alcohol the ADH1B gene expressed in the liver start functioning. If ADH1B gene is not functioning than CYP2E1, Catalase and GST act upon, however when the expression of ADH1B is more, than the rate of conversion is faster while the ALDH2*2 polymorphism results in a "deficient" form of ALDH2 that causes acetaldehyde accumulation in the body, resulting in toxic side effects i.e. flushing syndrome with sweating, alcoholic hepatitis, fibrosis or more seriously cirrhosis and hepatocellular carcinoma.

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NEPAL ROCKED BY 7.3 MAGNITUDE EARTHQUAKE NEAR MOUNT EVEREST

Arupanand Naik

Two tectonic plates meet beneath the Himalayas along a fault line. The Indian plate is moving North at around 45 mm. a year and pushing under the Eurasian plate. Over time that is how the Himalayas were created. Saturday's (April 25, 2015) catastrophic earthquake in Nepal occurred because of two converging tectonic plates: the lndia plate and the Eurasia plate to the North, the U. S. Geological Survey said, Tectonic, Plates are the large, thin, relatively rigid plates that move relative to one another on the outer surface of the Earth. Plates are slowly moving, but they get stuck at their edges due to friction. When the stress on the edge overcomes the friction, there is an earthquake that releases energy in waves(P,S,L waves) that travel the Earth's crust and cause the shaking that we feel.

Second quake strikes country still recovering from disaster that hit three months ago in which more than 8,000 people were killed.

Nepal has been hit by another strong earthquake, causing widespread panic and casualties just over two weeks after a devastating one killed more than 8,000 people, injured 18,000 and destroyed hundreds of thousands of homes.

The US Geological Survey said the quake had a magnitude of 7.3 and struck 42 miles(68 km) west of the town of Namche Bazaar, close to Mount Everest. lt was followed closely by at least strong aftershocks. Shockwaves were felt as far away as the Indian capital, New Delhi, and Dhaka, the capital of Bangladesh.

The full extent of casualties is unknown, with reports of collapsed buildings and some deaths coming in from remote areas close to the epicenter.

At least four people were killed in the town of Chautara in Sindhupalchok district, north of Kathmandu, after several buildings collapsed and more than a dozen were injured in landslides. Sindhupalchok suffered the heaviest death toll in last April month's quake.

Two deaths been reported in Bhimeshwar, in Dolakha district. There are also concern over a large glacial lake called Tso Rolpa in Dolakha that is held back by a fragile natural dam.The Nepalese home ministry described a disaster in both Dolakha and Sindhupalchok. At least one four-storey building in Kathmandu had collapsed.

As of 1l am GMT, the home ministry said that across the country at least 19 people have been killed and 981 injured. Five people were killed in Indian states bordering Nepal - one in Uttar Pradesh and four in Bihar, officials said. Chinese media reported one person died in Tibet after rocks fell on a car.

At least half a million Nepalese ware already without homes and living in makeshift camps or among the ruins of their houses.

Tuesday's (28th April) quake came from a depth of 11.5 miles, deeper than the 9.3 miles of the quake on 25[lh] April. Deeper earthquakes tend to cause less damage at the surface. At 7.3 magnitude ,Tuesday's quake was about a fifth as strong as 7.8 quake.

In Lamosangu in Sindhulpalchok, witnesses described people " screaming and weeping as if the world was ending. Krishna Lama and his five year old daughter ran from their camp. He said :"I could hardly hold my child as it was shaking so much . My parents died in landslides last year. Now it seems it is our turn."

In Gorkha district, the epicenter of last month's earthquake,there were reports of limited damage. Jen Hardy, of Catholic Relief Service, which is distributing aid to remote villages in the district, said

12, Mansarovar Colony, Near SBI, Adhartal Tiraha, Jabalpur-482004, M.P., E-mail : drupnaik@rediffmail.com

she saw two houses that had been badly damaged in the previous quake fall down.

"We are on a ridge and so got shaken pretty badly. It was quite strong and there was a lot of crying. People are very shaky.The mobile network is down and everyone is trying to reach loved ones. No one is staying anywhere near a building ,"Hardy said.

In Kathmandu, parents could be seen clutching children tightly and hundreds of people were frantically trying to call relatives on their mobile phones. Shopkeepers closed their store and the streets were jammed with people rushing to check on their families.

" I am heading straight home" said Bishal Rai,in his 20's ,who said he was trying to contact his family in the North of the capital."This is a really big one,"said Prakash Shilpakar, a shop owner who was trying to call his parents in nearby Bhaktapur,a town devastated in the 25 th April quake. There are fears of large numbers of death in regions closer to Everest, which lies in the North-East of the country.

The quake's epicenter was close to Everest base camp, which was evacuated after an avalanche triggered by the 25th April quake killed 18 climbers. Mountaineering companies have called off their spring expeditions on the world's tallest peak.

The latest disaster comes amid a humanitarian emergency in Nepal, with aid yet to reach many remote parts of the impoverished Himalayan nation after roads were wrecked by landslides.

The United Nations last week said it had received just $22m((14m. pounds) of the $415m it has appealed for as it called for aid contributions to be "dramatically ramped up". Rows were ongoing over the aid that had been sent, with western officials accusing the Nepalese government of trying to centralize its distribution , hampering efforts to reach those most in need.

Nepal's government came under fire when it closed its only International airport because the runway was deteriorating under the arrival of so many large aircrafts.

The search for survivors trapped in remote areas such as the Langtang valley was continuing as late as last week, with whole villagers in that part of the country which is popular with trekkers - wiped out in last month's quake and after shocks.

More than three quarters of the buildings in Kathmandu had already been judged uninhabitable,unsafe according to a survey carried out at the beginning of May, with tens of thousands of people under tarpaulins on open ground.

THE SCIENCE BEHIND NEPAL EARTH-QUAKES

Nepal sits on the boundary of the two massive tectonic plates that collided to build the Himalayas The ongoing convergence also means earthquakes.

The April 25th,2015 earthquake in Nepal destroyed housing in Kathmandu, damaged World Heritage sites, and trigged deadly avalanches around Mount Everest. The death toll is already reported as being the many thousands. Given past experience, it would not surprise if it were to reach the many tens of thousands when everyone is accounted for.

Nepal is particularly prone to earthquakes. lt sits on the boundary of two massive tectonic plates- the Indo-Australian and Asian plates. It is the collision of these plates that has produced the Himalaya Mountains and with them, earthquakes.

The research in the Himalaya is beginning to shed light on these massive processes, and understands threat they pose to local people.

THE SCIENCE OF EARTHQUAKES

The April 25th quake measured 7.8 on the moment magnitude scale (Richter scale), the largest since the 1934 Bihar quake, which measured 8.2 and killed around 10,000 people. Another quake in Kashmir measuring 7.6 killed around 80,000 people.

These quakes are a dramatic manifestation of the ongoing convergence between the Indo- Australian and Asian tectonic plates that has progressively built the Himalayas over the last 50 million years.

They are but one reminder of the hazards faced by the communities that live in these mountains Other ongoing hazards include floods and

monsoonal landslides, as exemplified by the Kedarnath disaster of 2013 which killed more than 5,000 people.

Earthquakes occur when strain builds up in Earth's crust until it gives way, usually along old fault Lines. In this case the strain is built by the collision or convergence of two plates.

A number of factors made this quake a recipe for catastrophe. It was shallow : an estimated 15km below the surface at the quake's epicenter. lt saw a large movement of the earth (a maximum of 3m.). And the ruptured part of the fault plane extended under a density populated area in Kathmandu.

From the preliminary analysis of the seismic records we already know that the rupture initiated in the area about 70km. North West of Kathmandu, with slip on a shallow dipping fault that gets deeper as we move further North.

Over about a minute ,the rupture propagated East by some 130km and South by around 60km, breaking a fault segment some 15,000 square kilometers in area, with as much as 3m. slip in places. The plates across this segment of the Himalaya are converging at a rate of about 2cm. this year. This slip released the equivalent of about a century of built up strain.

PREDICTING QUAKES

While the occurrence of large earthquakes in this region is not unexpected, the seismological community still has little useful understanding of how to predict the specific details of such ruptures. While the statistical character of earthquake sequences is well understood, we are still unable to predict individual events.

Question as to why such a large earthquake, in this specific location at this time , and not elsewhere along the Himalaya, continue to baffle the research community, and make for problematic challenge of better targeted hazard preparedness and mitigation strategies.

But with each new quake researchers are gaining valuable new insights. As exemplified by the ready availability of quality data and analysis in near

real time provided by Organizations such as the United States Geological Survey and Geoscience Australia, the global network of geophysical monitoring is providing an ever more detailed picture of how the earth beneath our feet is behaving .

SEISMIC GAPS

New techniques are also helping us read the record of past earthquakes with ever greater accuracy. Our research collaboration-involving the University of Melbourne, the Jawaharlal Nehru Centre for Advanced Scientific Research and the Indian Institute of Science in India , the University of Victoria in Canada, and the Bhutan Government - is studying the earthquake geology of adjacent areas of the Himalaya in the state of Uttarakhand in India and in Bhutan.

Indication of tectonic activity are mapped that link the earthquake time- scale (from seconds to decades) to the geological time-scale (hundred of thousands to millions of years).

Using new digital topography datasets, new ways of dating landscape features and by harnessing the rapidly growing power of computer simulation, we have been able to show how large historical ruptures and earthquakes correlate with segmentation of the Himalayan front reflected in its geological makeup.

This is shedding new light on so-called seismic gaps ,where the absence of large historical ruptures make for very significant concern.

The most prominent segment of the Himalayan front not to have ruptured in a major earthquake during the last 200- 500 years, the 700km long "central seismic gap in "Uttarakhand, is home to more than 10 million people. It is crucial to understand if it is overdue for a great earthquake.

Work in Uttarakhand and elsewhere is revealing how the rupture lengths and magnitude of Himalayan quakes is controlled by long-lived geological structures. While little comfort to those dealing with the aftermath of Saturday's tragedy, it is part of a growing effort from the international

research community to better understand earthquakes and so help mitigate the impact of future events.

CONCLUSION

Although a major plate boundary with a history of large-to great -sized earthquakes, large quakes in this area are rare in the documented historical era, the U. S. Geological Survey reports. Over the past century just four events of magnitude -6.0 or larger in the Richter scale have occurred within about 150 miles of April 15's earthquake. Only about 15 earthquakes a year in the world -out of 1.3 million total temblors — are magnitude 7.0 or higher ,according to the U. S. Geological Survey. The devastating earthquake and resulting Tsunami that hit parts of Japan in 2011,killing thousands of people was of magnitude 9.0. An earthquake's power increases by 10 times with each increase in the number of its scale. This means Saturday's (April 15,2015) earthquake of the same magnitude

as the one that hit San Francisco in 1906- was 22 times more powerful than the 7.0 quake that devastated Haiti in 2010. So, earthquakes are unpredictable. Only some animals can pre-sense its occurrence.

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SUNFLOWER PERSPECTIVE IN INDIAN AGRICULTURE AND HUMAN HEALTH

Parveen Sachdeva

Sunflower "Surajmukhi" is cultivated in India since 1969 mainly for its oil that is primarily used for culinary purposes, in the preparation of vanaspati and in the manufacture of soaps and cosmetics and the leftover cake is used as a cattle and poultry feed. Sunflower seeds kernel are enjoyed as a healthy, tasty snack and nutritious ingredient to many foods and are wonderful source of many vitamins, minerals, good fat, and antioxidants that are needed to keep our body healthy. The oil content of seed ranges from 22% to 36% and of kernel ranges from 45-55% and the oil is a combination of monounsaturated (MUFA) and polyunsaturated (PUFA) fat of mostly oleic /omega-9 (42-57%) and linolenic/omega-6 (33-48%) group of oils which is making it as healthy oil. High energy density of the oil and existence of higher amount of Omega 6 fatty acids as against Omega 3 fatty acids are restricting its continuous consumption. Downfall in area under the crop is a matter of concern.

INTRODUCTION

Sunflower (*Helianthus annuus L.*) is probably originated in Southern United States and Mexico from where it was introduced to Europe and former USSR[5,6]. Cultivation of the crop as an oilseed began in the Soviet Union and gradually reached to every corner of the world with its introduction to commercial cultivation in India around 1969[18]. The crop is popularly known as "Surajmukhi" in India and is mainly grown for its oil, which is used primarily for culinary purposes, in the preparation of vanaspati, in the manufacture of soaps and cosmetics, in making of biodiesel and the leftover cake, which is rich in protein is used as a cattle and poultry feed. Sunflower seeds kernels are enjoyed as a healthy, tasty snack and nutritious ingredient to many foods and they are wonderful source of many vitamins, minerals, good fat, and antioxidants that are needed to keep our body healthy.

ABOUT THE CROP

Sunflower is a drought tolerant crop due to its deep tap root, which makes it the best substitute to all rain fed commercial crops. This crop requires a cool climate during germination and seedling growth and warm weather from the seedling stage to flowering and sunny days during flowering to maturity and the crop matures in 90-100 days. The vibrant, sunflower usually showcases bright yellow petals surrounding large flower heads and is therefore recognized worldwide for its beauty. Sunflower young flower buds follow the sun from east to west, and at night, they turn east to await the sunrise and the mature sunflower buds opened bloom become fix on the east with only their leaves continue to track for photosynthesis because at this stage the stem stiffens, making it less possible to turn and stretch towards the sun and once the flowers form seeds, they no longer practice heliotropism[16].

WORLD'S SCENARIO

The world's largest sunflower producers now are Russia, USA, Ukraine, Argentina, China, France, Spain and India. India ranks fourth in area coverage of sunflower but production-wise it ranks 8th. Yield of sunflower in India (646 Kg/ha) has a big gap (-271 Kg/ha) and (-185 Kg/ha) when compared with the major producers France and China[6]. (*Table1*)

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Table1. Area, production and yield of major sunflower crop growing countries (Average of 2006-07 to 2010-11)[6].

Crop	Major countries	Area	Production	Yield	Yield Gap (India) % increase/ decrease
Sunflower	Russian Federation	56.197	63.128	1123	-74
	Ukraine	40.643	58.314	1435	-122
	Argentina	20.793	33.224	1598	-148
	China	9.200	16.894	1836	-185
	France	6.427	15.379	2393	-271
	India	16.720	10.802	645	-
Total Sunflower (World)		234.217	313.929	1340	

INDIAN CULTIVATION AND MAJOR GROWING STATES

Sunflower contribution to Indian oilseed production is about 3.85% and is cultivated over an area of 16.580 lakh ha with a production of 10,706 lakh tones and productivity of 650 kg/ha (average of 2006-07 to 2010-11). Major producing states in India are divided into two important zones: 1: Punjab, Haryana, West Bengal, Bihar, Odisha and 2: Karnataka, Maharashtra, Andhra Pradesh and Tamil Nadu. Out of the two zones; Karnataka, Andhra Pradesh and Maharashtra are the major sunflower growing states contributing about 93% and 84% of the total area and production respectively. There is a continuous reduction in area under the crop during eleventh plan period, which is also having an adverse impact on the production. (*Table2*).

SEED & OIL COMPOSITION

Sunflower seeds are rich in vitamins *e.g* tocopherols '*vitamin E*', niacin, folic acid, thiamin ' *vitamin B1*', pyridoxine '*vitamin B6*', pantothenic acid, and riboflavin. The oil content of seed ranges from 22% to 36% and of kernel ranges from 45-55%. Sunflower oil is a combination of monounsaturated (MUFA) and polyunsaturated (PUFA) fat of mostly oleic /omega9 (42-57%), essential linoleic/omega-6 (40% to 70%) and alpha linolenic/omega3 (1 to 2%) group of oils, which is making it as healthy oil. (*Table3*).

The value of P/S index (6.76) associated to the impact on human health is high for the Sunflower oil[19]. The three most common types of sunflower oil are: NuSun, linoleic and high Oleic, all developed with standard breeding techniques and differ in oleic levels and each one offers unique properties. Linoleic sunflower oil is common cooking oil that has high levels of PUFA with clean taste and low levels of trans fats. Sunflower oil with the high MUFA and PUFA especially the high linoleic-low oleic variety appeared to be suitable for mass consumption to combat malnutrition[2]. High oleic sunflower oil was developed commercially in 1985, which has MUFA

Table2. Area, production and yield of sunflower and total oilseeds in All India and Major Crop Growing States (from 2006-07 to 2013-14)[6].

(Area in lakh ha; Production in lakh tones and Yield in Kg/ha)

		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2006-07 to 2010-11 (Average)	2011-12 to 2013-14 (Average)
Karnataka	A	12.31	10.26	10.01	7.94	4.09	3.81	5.10	4.17	8.92	4.36
	P	5.17	5.86	4.96	3.04	2.54	1.95	2.65	2.53	4.31	2.38
	Y	420	571	496	383	621	512	520	607	484	546
Andhra Pradesh	A	4.46	4.26	4.19	3.50	2.55	1.58	1.42	1.00	3.79	1.33
	P	3.29	4.37	3.26	2.70	1.56	1.24	1,04	0.87	3.04	1.05
	Y	738	1026	778	771	693	785	732	870	814	796
Maharashtra	A	3.61	2.97	2.64	2.19	2.08	0.96	0.78	0.71	2.70	0.82
	P	1.98	2.02	1.55	1.14	1.25	0.56	0.34	0.04	1.59	0.32
	Y	548	680	587	521	601	583	436	620	589	546
Tamil Nadu	A	-	-	-	-	-	-	-	-	0.24	-
	P	0.48	0.70	0.34	0.19	0.10	0.25	0.15	0.13	0.36	0.18
	Y	1828	1590	1329	1334	1151	1809	1357	1564	1522	1577
Total Sunflower (All India)	A	21.65	19.12	18.13	14.77	9.29	7.32	8.31	6.72	16.59	7.45
	P	12.28	14.63	11.58	8.51	6.51	5.17	5.44	5.04	10.70	5.22
	Y	567	765	639	576	701	706	655	750	650	685
Total Oilseeds (All India)	A	265.1	266.9	275.6	259.6	272.2	263.1	264.8	280.5	267.9	269.5
	P	242.9	297.6	277.2	248.8	324.8	298.0	309.4	327.5	278.3	311.6
	Y	916	1115	1006	958	1193	1133	1168	1168	1038	1156

levels/Oleic acid (over 80%) and has higher oxidative stability[14]. Hybrid sunflower oil has MUFA levels lower than oleic sunflower oil. (*Table3*)

HEALTH CONCERNS

The energy density of sunflower oil is extremely high in comparison to leaner foods. For example, 100 g of sunflower oil contains 884 calories. Eating any significant quantity of sunflower oil in a day will therefore use up a large proportion of one's daily calorie allowance, without providing any protein[13].

Sunflower oil is high in linoleic fatty acids (Omega-6) and has traces of alpha linolenic fatty acids (Omega-3). The World Health Organization (WHO) recommends a ratio of Omega-6 and Omega-3 as 5:10 in the diet[17]. Regular intake of high levels of Omega 6 builds up in the cell membranes and sometimes causes inflammation. To counter inflammatory conditions, we need to have Omega-3 fatty acids in the diet, as these are potent activators of G-protein-coupled receptor/sensor 120 (GPR120) and therefore, mediate potent anti-inflammatory effects by inhibiting/blocking certain key inflammatory signaling pathways[12].

Table3. Nutritional values of sunflower seed kernel and oil (standard to high oleic) along-with oil basic parameters.

Oil Basic Parameters	Nutritional Value per 100g (3.5 oz)		Amino acids of sunflower protein g/1000g
	Seed Kernels, dried(Oil%: 48-53)	Oil: Standard to high oleic	
(1) State: Liquid at room temperature	(1) Energy: 2,44 kj (584 kcal or 29%)	(1) Energy: 3,699 kJ (884 kcal)	**Essential↓** (1) Arginine: 59.2
(2) Color: Clear and slightly amber colored	(2) Carbohydrates: 20g or 15%	(2) Carbohydrates: 0 g	(2) Histidine: 14.4 (3) Isoleucine: 29.2
(3) Odor: Fatty	(3) Fat: 51.46g or 172% Saturated: 4.455g (8.7%), Monounsaturated: 18.528g (36%), Polyunsaturated: 23.137g.(45%)	(3) Fat:100 g Saturated(Palmitic +Stearic): 10.3 g to 9.0 g), Monounsaturated: Oleic/Omega-9: 19.5 g to 8 3.6 g, Polyunsaturated: (n-3/ α -linolenic: 1% to 2% and n-6/linoleic: 40% to 70%	(4) Leucine: 38.4 (5) Lysine: 19.5 (6) Methionine: 11.4 (7) Cysteine + cystine: 13.4 (8) Tryptophan: 10.0 (9) Phenylalanine: 29.4 (10) Valine: 34.9 (11) Threonine: 22.3
(4) Smoke point (refined): 232^0C/450^0F and for (unrefined): 107^0C/225^0F			
(5) Density(at 25^0C): 918 kg/m^3	(4) Protein: 14g. to 20.78g. or 28% to 37%	(4) Protein: 0 g	**Total: 279.1**
(6) Refractive Index(at 25 ^{0}C) : ≈1.4646	(5) Vitamins: Thiamine or B1: 129% or 1.48mg. Riboflavin or B2: 30% or 0.355mg., Niacin or B3: 56% or 8.335mg., Pantothenic acid or B5: 23% or 1.13mg., Vitamin B6: 103% or 1.345mg., Folate or B9: 57% or 227µg., Choline: 11% or 55.1mg., Vitamin C: 2% or 1.4mg., Vitamin E: 234% or 35.17mg.)	(5) Vitamins: Vitamin E: 41.08 mg (274%), Vitamin K: 5.4 µg (5%)	**Non Essential↓** (12) Alanine: 24.5 (13) Aspartic acid: 54.9 (14) Glutamic acid: 143.0 (15) Glycine: 33.9 (16) Proline: 31.1 (17) Serine: 26.3 (18) Tyrosine: 14.3 **Total: 327.9**
(7) Saponification Value: 188 - 194			
(8) Iodine Value: 120-145			
(9) Unsaponifiable matter: 1.5 - 2.0%			
(10) Viscosity (at 25^0 C) unrefined: 0.04914 kg/(M*S)			

Units: µg=micrograms, mg=milligrams, IU=International Units.

Sunflower oil is rich in Omega 9 fatty acids, these are not essential in humans because they can be synthesized from saturated fat found in food or from other fatty acids[21]. Sunflower mainly contains phenolic compounds and phytates as anti-nutritional components. Phenolic compounds interact with protein to form complexes with decreased solubility and inhibitory effects on digestive enzymes and the phytic acid binds mineral elements like Ca, Mg, Fe and Zn making them unavailable[19]. Sunflower oil is rich in Vitamin E '*tocopherols*'; these are largely destroyed during frying conditions[11].

HEALTH BENEFITS

We need to have unsaturated fatty acids in oil as our body can itself prepare the intake of saturated fats[6]. Sunflower oil and seeds are rich source of essential poly unsaturated fatty acids '*PUFA*' i.e. Omega 6 '*linoleic*', which is considered good for heart patients[5], as it helps in washing out cholesterol deposition in the coronary arteries of the heart. Higher concentrations of Omega 3 fatty acids '*α - linolenic*' in oils is responsible for flavor problems, limiting their acceptance in cooking and frying[7]; which is not associated with Sunflower oil. Sunflower seeds & oil are rich in mono-unsaturated Omega 9 fatty acids '*oleic*' that increases HDL '*good*' cholesterol and decreases LDL '*bad*' cholesterol and helps to eliminate plaque build-up in the arteries and reduces the risk of cardiovascular disease and stroke. The value of P/S index, which is associated to the impact in the human health is high for sunflower oil, and that makes it one of the most suitable edible oils for mass consumption[19]. Essential Fatty Acids and their long-chain derivatives are important structural elements of cell membranes and are essential for the formation of new tissues, *e.g.* in pregnancy[10]. They are particularly important for the development of the brain, nervous system and retina[1]. Like other nuts, the Sunflower seeds are very good source of protein viz. globulins(55-60%), albumins(11-17%), glutelins(11-17%) and prolamines(1-4%) and also are a rich source of amino acids, that are essential for the growth of children. Sunflower oil is light in taste and appearance and supplies more vitamin E '*tocopherols*' than any other vegetable oil. Vitamin E, acts as antioxidants in promoting anti-atherogenic properties such as decreasing LDL cholesterol uptake[3] and is required for the protection of skin from various diseases.

CONCLUSION

In conclusion; Sunflower oil may be considered as a healthier alternative to cooking oils which are having high saturated fat content and in moderation, it may provide certain health benefits as part of an overall balanced diet. A regular intake of food prepared in Sunflower oil needs to be balanced with Omega-3 fatty acids enriched diet. An immediate attention is needed to curb the decreasing Sunflower cultivation in India.

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GENETICALLY MODIFIED PLANTS: BOON OR BANE?

Ranjana Roy Mishra

There are many apprehensions regarding the acceptability of the genetically modified plants. The concerns are raised by the public and the critics about their applications and release into the environment. These concerns are regarding the biosafety, social, economic and ethical acceptability. Many of these concerns require scientific attention. The social acceptability of the GMO's by the society is a matter of debate and requires massive public awareness by the scientific community. The present article discusses these concerns and the real facts of the genetically modified plants.

INTRODUCTION

Transgenic technology has resulted in the development of various genetically modified plants for the improvement of several agronomic traits. These include crop resistance to biotic stresses like virus, fungus, bacteria, insects and pests, for herbicide tolerance, nutritional enhancement, delayed ripening, increased photosynthetic efficiency, abiotic stress tolerance like drought, salt, frost, salt, for production of edible vaccines, induction of male sterility in plants etc. Some of the very famous examples of genetically modified plants or transgenic plants are Bt transgenics like Bt cotton and Bt brinjal for insect and pest tolerance, Flavr Savr tomatoes for delayed ripening, golden rice for enhanced vitamin A content [1,2,4].

In 1994, the first genetically modified crop was approved for sale in the US and it was Flavr-Savr tomato with improved shelf life[4]. In 1995, some more GM plants were approved in US for sale like Bt cotton, soybeans resistant to the herbicide glyphosate, virus-resistant squash[4]. Ever since the release of transgenic crops for sale as commercial commodity in US or India controversies have always surrounded them.

APPREHENSIONS WITH TRANSGENIC CROPS

There are many apprehensions regarding the

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acceptability of the genetically modified crops. The concerns are raised by the public and the critics about their applications and release into the environment. These concerns are regarding the biosafety, social, economic and ethical acceptability[1,3]. Such concerns are enormous and prevent the worldwide research and field trials of these crops. But the fact is that concerns raised for transgenic plants also stands true for hybrids raised by conventional breeding or fertilization[1]. The social acceptability of the GMO's by the society is a matter of debate and requires massive public awareness by the scientific community of the real facts of these genetically modified organisms.

VARIOUS CONCERNS RELATED TO GM PLANTS

These can be broadly categorized as ethical issues, ecological issues and economic issues.

(A) ETHICAL ISSUES

(a) Unacceptability by the consumers

People want to consume natural products. They do not want to eat food products which are "tempered" in the laboratory and contain alien genes from unrelated species[1]. But scientists have shown genes introduced in transgenic plants are equally digested in our body. The fact is that even our conventional bred food crops are

modified plants developed as a result of natural hybridizations[1,3].

(b) Antibiotic Resistance in humans

One of the major fears among the people is potential risk of antibiotic resistance after consuming GM food. There are apprehensions that consumption of GM foods containing antibiotic resistance marker gene like *Npt II* encoding for neomycin phosphor transferase for resistance to kanamycin and neomycin or gene encoding β-lactamase for resistance to ampicillin may lead to transfer of these genes from GM food to the microbes present in the guts of humans making them resistant to antibiotics[3]. But the fact is that acidic conditions prevalent in stomach or rumen inactivate or degrade the encoded enzyme, neomycin phosphor-transferase II[1]. Even if one assumes these apprehensions to be true, this can be tackled with the introduction of intron-containing *Npt II* gene as a selectable marker. Due to insertion of intron in the *Npt II* gene, the theoretical risk of gene flow from GM plants to enteric bacteria is eliminated[1,2,3].

Also, GM plants with non-resistance based selectable marker genes such as green fluorescent protein encoding gene (Gfp) and β glucuronidase gene (*Uid A*) have been also developed.

(c) Allergens

The other major apprehension regarding GM foods is the risk of being allergic to human body as the nature of these new food proteins are unknown[1,3]. But the fact is that, allergenicity occurs when these food allergens are present in large proportions in the food and the individuals are sensitized to them over time to cause any adverse effects[3]. Thus, it is highly unlikely for new allergens to be introduced into the food supply from GM plants. These studies should be taken case by case as some natural food products like nuts, groundnuts are also known to be allergic to people.

(d) Nutritional Status

Traditional breeding methods have been unsuccessful in producing crops containing a high vitamin A concentration[3]. Transgenic "Golden rice" developed to combat vitamin A deficiency in rice was widely criticized due to its low vitamin A content. Rice is the staple food crop of people belonging to most of the Asian countries. Varied diet for nutritional supplement of vitamin A is beyond the means of poor people in these countries and they have to rely on one or few foods to provide complete nutrition. To address this problem, Syngenta have produced a variety of golden rice, called "Golden rice 2", which produces twenty three times more carotenoids than golden rice (up to $37\mu g/g$) and preferentially accumulates β carotene (up to $31\mu g/g$ of the $37\mu g/g$ of carotenoids)[4]. Instead of criticizing the low content of vitamin A, it should be appreciated that transgenic technology has made it possible to produce vitamin A in rice.

(e) Intellectual property rights and patents issue

This is a matter of real concern because the multinational companies like Monsanto will try to take benefits for the intellectual property like genetically modified plants they produce. This will result in developing world farmers paying for the products that originated from their nation's own resources[1,3]. But this concern can be addressed by proper regulatory mechanisms adopted by the government of the concerned country before the release of transgenic food as commercial commodity.

(B) ECOLOGICAL ISSUES

There is always a risk that the GM plants can interbreed with natural organisms, thereby

contaminating "non-GM" crops and will alter the gene pool. GM plants expressing viral and bacterial genes and their release into the environment is considered to be a threat and called as genetic pollution[1,3].

(a) Pollen-Flow

The major environmental concern with GM crops is the gene flow from GM plants to weedy relatives via pollination may lead to the development of "super weeds. The transfer of transgene to weed species will lead to the generation of "super-weeds". There is also a danger that the GM plants may hybridize with sexually compatible wild type species[1,3,4].

But, this risk of gene transfer to related weedy species through pollen can be eliminated by devising chloroplast transformation procedures[3].

The fact is that the risk of gene transfer to weeds is similar in traditional breeding and GM plants[1,3]. Also, successful breeding depends on sexual compatibility, physical proximity and distance of pollen movement from the GM plants. Moreover, there is no proven evidence of major super weeds developed so far[1,3].

(b) Alteration of gene pool

Another concern is that the introduction of transgenes from fishes, mouse, human and microbes in GM plant for molecular farming results in changing the fundamental nature of the crops and alters the gene pool[1,3]. The fact is that gene transfers have been occurring throughout the course of evolution. At least, in transgenic, the transgene is known and the results are predictable.

(C) Insect resistance to pesticides

It is possible that the widespread use of disease-resistant GM plants may lead to the evolution of several insect pests that are resistant to pesticides. However, development of resistance in insects against any insecticide happens naturally after long exposure to insecticides or pesticide. *Bt* transgenics or any other insect resistant transgenic reduces our dependence on insecticides or pesticides. This technology should be appreciated that it saves lots of money spent on insecticide and pesticides and also saves pollution of soil and atmosphere from these chemicals[1].

(d) Herbicide resistance in weeds

After the generation of herbicide tolerant GM crops, evolution of weeds resistant to herbicides has been reported to increase with the excessive application of herbicides such as glyphosate[1,3]. The fact is that tolerance to a particular herbicide is often developed by evolution of weed gene pool. This happens naturally, and this resistance can be developed by the weeds even while growing along with non GM plants.

(e) Gene flow to non-target organisms

One of the classical examples of non-target impacts of GM plants has been the killing of monarch butterfly in the United States by *Bt* insecticidal proteins[3,4]. However, millions of birds and billions of insects, both harmful and beneficial, are killed each year due to excessive use of pesticides and insecticides[3]. Moreover, non-target organisms are exposed to a much lesser extent to *Bt* transgenic plants than with insecticides or pesticides because only those organisms which feed on the *Bt* plant tissues come into contact with the toxin[3,4].

(f) Loss of Biodiversity

It is argued that there will be biodiversity loss will due to GM plants. This is because GM

plants will encourage monocultures[1,3]. Pros and cons are always associated with any path breaking technology. Because of this concern this great technology cannot be overlooked.

(g) Contamination of Soil and Water

Harmful effect of Bt toxin residues in the soil after harvest of the GM crop on soil invertebrates has been another matter of concern. It is argued that this will change the dynamics of soil. But the fact is that Bt toxin is biodegradable [1]. Moreover, no difference in the total number of other soil organisms (including nematodes, protozoa, bacteria and fungi) between the soil rhizospere of Bt and non-Bt crops has been reported so far[3].

(C) ECONOMIC CONCERNS

Evaluation of production cost versus potential benefits of GM crops is also a matter of concern. It is said that it will result in the exploitation of the poor people because of the monopoly of multinational companies.

The "terminator gene technology" developed by Monsanto was widely criticized as it was a step to build monopoly over transgenic seed production[3,4]. It is argued that GM will increase the corporate control of agriculture. This problem needs to be addressed. There should be regulatory mechanisms to protect the rights of the poor and marginal farmers.

GM REGULATIONS IN INDIA AND OTHER COUNTRIES

Regulatory Mechanisms in India

In India GMOs are regulated by Genetic Engineering Appraisal Committee (GEAC). GEAC is responsible for granting permits to conduct experimental and large-scale open field trials and also approval for commercial release of genetically modified crops. It was earlier known as Genetic Engineering Approval Committee. The committee functions as a statutory body under the Environment Protection Act 1986 of the Ministry of Environment & Forests (MoEF). The rules 1989 notified by MoEF cover the areas of research as well as large scale applications of GMOs and their products. The two main agencies responsible for implementation of the rules are the Ministry of Environment and Forests (MoEF) and the Department of Biotechnology (DBT). They define six competent authorities i.e. Recombinant DNA Advisory Committee (RDAC), the Institutional Biosafety Committees (IBSC), Review Committee of Genetic Manipulation (RCGM), Genetic Engineering Approval Committee (GEAC), State Biotechnology Coordination Committee (SBCC) and District Level Committee (DLC) for handling of various aspects of the rules[5].

Regulatory Mechanisms in other countries

Regulations for GMOs vary in different countries. Many countries like Brazil, China and European Union allow GMO cultivation on a case-by-case basis while countries like Russia, Norway, Israel allow the import of GM food but do not allow its cultivation. Japan, South Korea allows cultivation, but no GM products are yet produced[5]. USA is the largest commercial grower of genetically modified crops in the world. Regulatory policy of United States regarding GMOs is governed by the Coordinated Framework for Regulation of Biotechnology. Food and Drug Administration (FDA) and the Environmental protection agency (EPA) approve the release of a GMO. The US department of Agriculture (USDA) evaluates the plant's potential to become a weed. One of the world's largest producers of GM canola is Canada and it also grows GM maize and soybean. The Canadian regulatory system is based on whether a product has novel features regardless of method of origin. Environmental assessments of biotechnology-derived plants in Canada are carried out by the Canadian Food Inspection Agency's Plant Biosafety Office. European Union (EU) has the most stringent GMO regulations in the world. All GMOs are

subjected to extensive, case-by-case, science based food evaluation by the European Food Safety Authority (EFSA).

CONCLUSION

No technology is foolproof[4]. Case-by-case studies can help in solving the above raised concerns. Besides, public should be well informed that most of their concerns have no scientific grounds and GM plants have tremendous potential in solving the present problems. Like GM crops the information regarding nutritional contents or allergens has never been there with classically bred plants. Moreover with GM plants, at least the source of new genetic material being introduced is known and hence there is possibility of testing predictable and even many unpredictable effects[3].

The transgenic technology is a great technology and can also be called as gene revolution. The possibility of genetically engineered crops and other organisms are immense[1]. The global human population is increasing tremendously and the cultivable land is diminishing. The transgenic technology has the potential to achieve a balance between these two. So transgenic crops are boon not bane!

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103ᴿᴰ INDIAN SCIENCE CONGRESS, MYSORE LIST OF ISCA AWARDEES FOR 2015-2016

1. **ASUTOSH MOOKERJEE MEMORIAL AWARD**

   Prof. Premendu Prakash Mathur
   Vice-Chancellor, KIIT University, Odisha.

2. **C.V. RAMAN BIRTH CENTENARY AWARD**

   Dr. N.K. Venkataramanaa
   Vice – Chairman, BGS Global Hospital, Bangalore

3. **SRINIVASA RAMANUJAN BIRTH CENTENARY AWARD**

   No Award

4. **JAWAHARLAL NEHRU BIRTH CENTENARY AWARDS**

   No Award

5. **M.N. SAHA BIRTH CENTENARY AWARD**

   No Award

6. **P.C.MAHALANOBIS BIRTH CENTENARY AWARD**

   Mr. Satyamurthy Lakkavalli
   President, Telemedicine Society of India, Bangalore

7. **P.C. RAY MEMORIAL AWARD**

   Prof. E.D. Jemmis
   Dept. of Inorganic and Physical Chemistry, Indian Institute of Science, Bangalore

8. **H.J. BHABHA MEMORIAL AWARD**

   Prof. Dinesh Kumar
   Electronic Science Department,
   Kurukshetra Unversity,
   Kurukshetra

9. **J.C. BOSE MEMORIAL AWARD**

   Prof. Aditya Shastri
   Vice-Chancellor, Banasthali University, Rajasthan

10. **VIKRAM SARABHAI MEMORIAL AWARD**

    No Award

11. **B.P. PAL MEMORIAL AWARD**

    Dr. Tarun Kant
    FGTB Division, Arid Forest Research Institute, Jodhpur

12. **M.K. SINGAL MEMORIAL AWARD**

    Prof. Bhola Ishwar
    University Department of Mathematics, B.R.A. Bihar University, Muzaffarpur

13. **JAWAHARLAL NEHRU PRIZE**

    No Award

14. **MILLENNIUM PLAQUES OF HONOUR**

    Dr. J. N. Moorthy
    Dr. Jag Mohan Garg, Chair Professor, Department of Chemistry, Indian Institute of Technology, Kanpur

    Dr. C. N. Manjunath
    Professor & Head of Cardiology, Director, Sri Jayadeva Institute of Cardiovascular Sciences & Research, Bangalore

15. **EXCELLENCE IN SCIENCE AND TECHNOLOGY AWARD**

    No Award

16. **R.C. MEHROTRA MEMORIAL LIFE TIME ACHIEVEMENT AWARD**

    No Award

17. **B.C. GUHA MEMORIAL LECTURE**

    Dr. Arunaloke Chakrabarti
    Professor and Head, Department of Medical Microbiology, Postgraduate Institute of Medical Education and Research, Chandigarh

18. **RAJ KRISTO DUTT MEMORIAL AWARD**

    Prof. (Dr.) H. N. Verma
    Vice-Chancellor, Jaipur National University, Jaipur, India.

19. **G.P. CHATTERJEE MEMORIAL AWARD**

    Prof. Tapas Kumar Kundu
    Transcription and Disease Laboratory, JNCASR, Bangalore

20. **PROF. HIRALAL LAL CHAKRAVARTY AWARD**

    Dr. Priyanka Agnihotri
    Plant Diversite, Systematics & Herbarium Division, CSIR-National Botanical Research Institute, Lucknow

21. **PROF. ARCHANA SHARMA MEMORIAL AWARD**

    Prof . Maitrayee Dasgupta
    Department of Biochemistry, University of Calcutta, Kolkata

22. **DR. V. PURI MEMORIAL AWARD**

    Prof. R.S. Tripathi
    INSA Honorary Scientist, Indira Nagar, Lucknow

23. **PRAN VOHRA AWARD**

    Dr. Sharmistha Pal
    ICAR- Indian Institute of Soil and Water Conservation, Research Center, Chandigarh

24. **PROFESSOR UMAKANT SINHA MEMORIAL AWARD**

    No Award

25. **DR. B.C. DEB MEMORIAL AWARD FOR SOIL / PHYSICAL CHEMISTRY**

    Dr. Pramod Jha
    Senior Scientist (Soil Chemistry & Fertility), Indian Institute of Soil Science, Bhopal

26. **DR. B.C. DEB MEMORIAL AWARD FOR POPULARISATION OF SCIENCE**

    Mr. Tarun Kumar Jain
    Editor, Vaigyanik Drishtikon, Tagore International School Campus, Jaipur

27. **PROF. K.P. RODE MEMORIAL LECTURE**

    Prof. Hari Bahadur Srivastava
    Professor, Department of Geology, Banaras Hindu University, Varanasi

28. **DR. (MRS.) GOURI GANGULY MEMORIAL AWARD FOR YOUNG SCIENTIST**

    No Award

29. **PROF. G.K. MANNA MEMORIAL AWARD**

    Dr. H.P. Puttaraju
    School of Natural Science, Bangalore University, Bangalore

30. **PROF. SUSHIL KUMAR MUKHERJEE COMMEMORATION LECTURE**

    Dr. Saroj Kumar Sanyal
    Formar Vice - Chancellor, Bidhan Chandra Krishi Viswavidyalaya, Kolkata

31. **PROF. S. S. KATIYAR ENDOWMENT LECTURE**

    Prof. Ranjana Aggarwal
    Professor, Chemistry Department, Kurukshetra University, Kurukshetra

32. **PROF. R. C. SHAH MEMORIAL LECTURE**

    Prof. D.S. Rawat
    Department of Chemistry, University of Delhi, Delhi

33. **PROF. W.D. WEST MEMORIAL AWARD**

    Dr. Ajai
    Space Applications Centre, ISRO, Ahmedabad

103ᴿᴰ INDIAN SCIENCE CONGRESS, MYSORE
LIST OF ISCA YOUNG SCIENTIST AWARDEES FOR 2015-2016

S. No.	Section	Name of the Awardee
1	Agriculture and Forestry Sciences	**Saurav Saha** ICAR-Research Complex for NEH Region, Mizoram.
2	Animal, Veterinary & Fishery Sciences	**Bhaskar Ganguly** G.B. Pant University of Agriculture & Technology, Uttarakhand
3	Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)	**Sujeet Pratap** Benaras Hindu University, Varanasi
4	Chemical Sciences	**Arijit Sengupta** Bhabha Atomic Research Centre, Trombay
5	Earth System Sciences	**Amiya K. Samal** Banaras Hindu University, Varanasi
6	Engineering Sciences	**Emmanuel NehemiahJ.** Christ College of Engineering and Technology, Pondicherry
7	Environmental Sciences	**Gaurab Sircar** Bose Institute, Kolkata
8	Information and Communication Science & Technology & (including Computer Sciences)	**No Award**
9	Materials Science	**Gaurav Vats** Indian Institute of Technology, Bombay, Powai
10	Mathematical Sciences (including Statistics)	**Abhik Ghosh** Indian Statistical Institute, Kolkata
11	Medical Sciences (including Physiology)	**No Award**
12	New Biology (including Biochemistry, Biophysics & Molecular Biology and Biotechnology)	**Sonia Kapoor** Indian Institute of Technology, Bombay
13	Physical Sciences	**No Award**
14	Plant Sciences	**Maria Vera Jesus Da Costa** Goa University, Goa

103RD INDIAN SCIENCE CONGRESS, MYSORE
LIST OF ISCA BEST POSTER PRESENTETION AWARDEES FOR 2015-2016

S. No.	Section	Name of the Awardees
1	Agriculture and Forestry Sciences	**1. Chhavi Sirohi** Dept. of Forestry, CCS Haryana Agricultural University, Hisar (Haryana) **2. Avinash Prakasha** Dept. of Studies in Biotechnology, University of Mysore, Mysore
2	Animal, Veterinary & Fishery Sciences	**1. Amita Hembrom** Dept. of Zoology, S S M College, Ranchi **2. Manoj Kumar** Dept. of Botany, University of Lucknow, Lucknow
3	Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)	**1. Paranandi Mallikarjuna** Secondary School Education, Ananthapuramu District, Andhra Pradesh. **2. Rachna Thakur** Dept. of Anthropology, Dr. H.S. Gour University, Sagar
4	Chemical Sciences	**1. Brajendra S. Kusmariya** Dept. of Chemistry, Dr. H.S. Gour Central University, Sagar **2. Jyotirmay Maiti** Dept. of Chemistry, West Bengal State University, Kolkata
5	Earth System Sciences	**1. Leena Kamra** Wadia Institute of Himalayan Geology, Dehradun **2. Shraddha Rajput** Dept. of Geology, University of Delhi, Delhi
6	Engineering Sciences	**1. A.K. Naithani** National Institute of Rock Mechanics, Karnataka **2. Avni Khatkar** University Institute of Engineering & Technology, Maharshi Dayanand University, Rohtak

S. No.	Section	Name of the Awardees
7	Environmental Sciences	**1. Arun Ratn** Dept. of Zoology, University of Lucknow, Lucknow **2. Praveen Dhyani** G.B. Pant Institute of Himalayan Environment and Development, Almora
8	Information and Communication Science & Technology (including Computer Sciences)	**1. D. Jeyamala** Department of Computer Application Thiagarajar College of Engineering, Tamil Nadu
9	Materials Science	**1. Swapna V.P** Department of Chemistry, St. Joseph's College, University of Calicut, Kerala **2. Mritunjay K Pandey** Integral University, Lucknow
10	Mathematical Sciences (including Statistics)	**1. Lakshika Chutani** Dept. of Mathematics, Netaji Subhas Institute of Technology, New Delhi **2. A.S. Praveena** Dept. of Studies in Statistics, University of Mysore, Mysuru
11	Medical Sciences (including Physiology)	**1. Debajyoti Bhattacharya** Dept. of Physiology, Harimohan Ghose College, Kolkata **2. U.H. Shah** Dept. of Zoology, Balwant College, Vita, Maharashtra
12	New Biology (including Biochemistry, Biophysics & Molecular Biology and Biotechnology)	**1. Rohit Goyal** Dept. of Pharmacology, School of Pharmaceutical Sciences, Shoolini University, Solan, HP **2. Dinesh S.M.** Dept. of Biomedical Science, Nitte University Centre for Science, Education and research, Mangalore
13	Physical Sciences	**1. Sangeeta Sagar** Dept. of Physics, University of Lucknow, Lucknow **2. Nishant Kumar** Dept. of Physics, University of Lucknow, Lucknow
14	Plant Sciences	**1. Aditya Abha Singh** Dept. of Botany, Banaras Hindu University, Varanasi **2. Beetika Kohli** Dept. of Botany, University of Jammu, Jammu

103RD INDIAN SCIENCE CONGRESS, MYSORE
INFOSYS FOUNDATION – ISCA TRAVEL AWARD 2015-2016
LIST OF AWARDEES

Sl No.	Name of Student	Name of School
1.	**Greeshma Reddy**	Christ Junior College, Bengaluru
2.	**Nagashree N.R.**	P.U.College, Channaratyapatna
3.	**Afrah Budnar Kunjibettu**	SDM PU College, Ujjire
4.	**Sharman Raj.P.**	SDM PU College, Ujjire
5.	**Ashwin Kumar K.**	VVS Golden Jubilee College, Mysore
6.	**Lavanya Kurun Mehrotra**	Seth Anandaram Jaipuria School, Kanpur
7.	**Divyansh Singh**	Seth Anandaram Jaipuria School, Kanpur
8.	**Shrunga V.E.**	MMK College and SDM Girls PU College, Mysore
9.	**Sahiba Ansari**	Raverrain Public School, Dehradun
10.	**Syed Hazim**	Sadvidya Semi-Residential PU College, Mysore

KNOW THY INSTITUTIONS

National Research Centre for Grapes, Pune

The ICAR-National Research Centre for Grapes under Indian Council of Agricultural Research (ICAR), New Delhi was established on 18th January 1997 at Manjri, Pune, with the mandate to "To undertake mission oriented programme involving basic and strategic research for resolving the major biotic and abiotic constraints affecting the production, productivity and utilization of grapes". Based on this mandate the research is conducted with the following objectives:

ι To collect, characterize, evaluate and catalogue *Vitis* germplasm

ι To maintain core field germplasm with wide genetic base

ι To develop varieties with economically important traits for table, wine, raisins and juice.

ι To develop appropriate and economically viable agro techniques for quality grape production.

ι To sustain the productivity and quality through management of biotic and abiotic stresses.

ι To develop technologies with minimal dependence on agro chemical inputs.

ι To develop appropriate pre and post harvest technologies for extended shelf-life and processing into value added products.

ι To develop strategic alliances for research and transfer of technologies.

ι For this the following five research programmes have been identified in Vision 2050.

ι Climate resilient viticulture.

ι Precision Viticulture.

ι Plant health and vineyard ecosystem management.

ι Value Addition and new generation products

ι Mechanisation for grape production.

Brief history of the Centre

Genesis

The grape growers of India were among the first to form a cohesive non-political, non-racial and

non-religious group for sharing the knowledge and for garnering technical and administrative support for the grape industry in all facets of grape production, processing and marketing. Owing to several problems faced by grape growers with respect to grape production and to get their problems solved, the group approached the Indian Council of Agricultural Research to establish a dedicated research unit for working on grapes. Thus after due deliberation on the research needs of grape growers and the grape industry and also to address the future challenges and opportunities, the Indian Council of Agricultural Research approved the establishment of National Research Centre for Grapes vide sanction letter No.1 (2)/92-PI&M (Part-III) dated 16 September, 1993.

Selecting the location of the Centre

After due consideration of the soil profile characteristics, climatic factors, proximity to other research and development institutes and nearness to commercial vineyards, of the land offered by the states of Maharashtra, Karnataka and Andhra Pradesh; the ICAR selected the land offered by the Government of Maharashtra at Manjri on Pune-Solapur Road for establishment of the Centre.

Acquiring the land

The official decision to hand over the land by the Vice-Chancellor; MPKV to DG, ICAR was announced on 18th January 1997. However, it was later realized that the selected piece of land belonged to the Maharashtra State forest department even though there was no forest cover. Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, facilitated the lease by handing over an equal area of land near Nagpur to the Forest department for which, the ICAR bore the cost of afforestation. The ICAR and NRC for Grapes will be always indebted to the grape growers, State Department of Agriculture and MPKV, Rahuri for their help for its initial establishment. The actual land measuring 46.78 ha was leased to ICAR-NRC Grapes on 29th January, 1998. To commemorate its birth, ICAR-NRC Grapes, Pune celebrates 18th of January as its "Foundation Day".

Establishment

The Centre initially started functioning from the newly constructed R & D premises of the Maharashtra State Grape Growers' Association (MSGGA) which is adjoining to the site selected and also utilized the newly established vineyards of MSGGA for carrying out small scale research experiments.

Formulation of Research Plan

In May 1997, the first Staff Research Council meeting was conducted under the Chairmanship of Dr. S. P. Ghosh, DDG (Hort.), ICAR and short-term Research Projects were formulated to tackle some of the then major problems faced by the grape industry. A group discussion was arranged with representatives of Maharashtra State Grape Growers Association; officials of State Horticulture Department; Scientists of MPKV, Rahuri and Agharkar Research Institute, Pune; to identify and prioritize the research needs of the grape industry.

The first Research Advisory Committee meeting was held in 1998 under chairmanship of Dr. J.C. Bakhshi, Ex-Vice Chancellor, RAU, Bihar, with the Dr. U.V. Sulladhmath, Ex-Prof. of Horticulture, UAS, Bangalore, Dr. R. Jayarajan, Ex-Prof. of Plant Pathology, TNAU, Coimbatore, Sh. C. Venkata Reddy, Sh. K. Nageshwara Rao and Sh. V.D. Patil, progressive grape growers from A.P. and Karnataka helped in guiding the research plan. Dr. Indu S. Sawant was the Member Secretary of this committee. Planting was done in five acre area to raise experimental plots, while need based research was carried out in growers' vineyards.

Important milestones in the Centre's growth

- The construction of the administrative-cum-laboratory building was completed in 2000. Equipments were purchased to initiate research activities. Experimental vineyards were planted to cover most of the area and irrigation facilities were augmented by adding borewells and lift irrigation facility from nearby canal was completed in XI

Plan. Due to severe scarcity of water and bad quality of water from the available water resources experimental vineyards faced severe water and salinity stress. To tackle this problem, canal water was brought during the 11th plan.

l Water storage tanks have been built. The first Perspective Plan of ICAR-NRC Grapes, Vision-2020 was published during the year 1997-98 and subsequently Vision-2030 published in 2011 and is now under revision.

l The Centre organized a National Dialogue on Sustaining the Productivity of Grapes under Adverse Situations in collaboration with The Grape Growers Federation of India on June 7th and 8th 1999, at Pune. More than 300 eminent scientists and progressive grape growers participated in the dialogue.

l Grape field day: The Centre organized a 'National Level Grape Day' on 20th February 2002 for 369 grape growers from Maharashtra, Andhra Pradesh, Karnataka and Tamil Nadu. The growers could see more than 300 coloured / green, seeded / seedless table grape, juice and wine varieties in fruiting. Farmers were familiarised with the latest technologies in the areas of growth regulators, fertigation, water management, disease forecasting, biological control of post-harvest decay during the field visit. An Open House Discussion on various issues of grape cultivation was also arranged to know the problems faced by the grape growers and give the solutions.

l Pesticide residue monitoring program (RMP) in table grapes for export to the European Union was started in 2003-04 season in response to the rapid alerts issued against Indian table grapes in Europe in 2003. The program was initiated to establish complete traceability of grapes for export to the EU countries from farm to consumer levels through a web-based residue monitoring system viz. GRAPENET, declaring ICAR-NRC for Grapes as the National Referral Laboratory (NRL). ICAR has recognized this Centre as the National Referral Laboratory for all fruits and vegetables vide F. No. 5-50/2009-Hort-I dated 21.01.2010.

l An International Symposium on Grape Production and Processing was organized during 6th to 11th February 2006 at Baramati. Main objectives of this international symposium were providing a platform for interaction between the grape growers and the scientists for resolving the problems in production and processing of grapes and creating awareness about new technologies and innovations in viticulture. The delegates from Australia, Brazil, China, US and South Africa were also participated in this event other than delegates from different states of our country. The event was successfully organized with the help of Grape Growers' Federation of India, Ministry of Agriculture (GOI), Ministry of Agriculture (Government of Maharashtra) and International Society of Horticulture Science.

l Since its inception, the Centre has also been strengthened by acquiring high-end equipments for conducting basic and applied research and few posts have been provided.

Contact :

Director

ICAR-National Research Centre for Grapes P.B. No. 3, P.O. Manjri Farm, Solapur Road Pune – 412307, Maharashtra, India Phone: 91-20-26956000 (EPABX) Fax : 91-20-26956099 E-mail : dirnrcg@gmail.com

CONFERENCES / MEETINGS / SYMPOSIA / SEMINARS

Ninth International Conference on Contemporary Computing (IC3-2016) August 11-13, 2016, Jaypee Institute of Information Technology, NOIDA, India

Topics:

Applications	Algorithms
Cloud Computing , Distributed computing – Hadoop and Big Data	Parallel and Distributed Algorithms
Service-Oriented Computing	Optimization Algorithms
Web Services	Complexity Theory
Software Engineering	Graph Algorithms
Information Systems	Randomized and Approximation Algorithms
E-Commerce	Innovative Data Mining Algorithms
Pattern Recognition, Artificial Neural Networks	Algorithms for Security and Privacy
Machine Learning and Natural Language Processing	Numerical Algorithms
Data Mining, Information Retrieval	Scheduling and Load Balancing Algorithms
Image Processing, Computer Vision	Fault-tolerant Algorithms
Audio and Speech Processing	Network and Peer-to-Peer Algorithms

Systems	Education
Ad hoc, Sensor, Vehicular, Underground and Underwater Networks	Curricular Issues in computing programs
Cloud, Cluster, Grid and P2P Computing, virtualization	Competencies and learning objectives
Cryptography and Applied Mathematics	Pedagogy for computing courses
Distributed Computing	Assessment methodology
Embedded Systems and Robotics, Embedded Systems and VLSI	Introductory Computer Science Sequence
Multi-FPGA reconfigurable systems and architectures	Systems, Networks, and Architecture courses
Enterprise, data center, and storage-area networks	Parallel and Distributed Computing courses
Performance evaluation of networks and distributed systems	Programming Language and Tools
High Performance Computing	Algorithms, Automata and Discrete Math courses
Evolutionary Computing	Novel Elective courses
Heterogeneous Computing Models and Systems	Experience and Case Study reports
Information Security	Cyber Security courses
Intelligent Systems, Next generation Internet	Laboratory, Projects, and internship courses
Parallel and Multi-core Computing	Service learning,
Security, Trust and Privacy	Collaborative work and Peer learning
Smart phones and Security	Computer engineering and Computational Engineering programs
Social Network behavior, Modeling, and Analysis	Integrated Multi-Disciplinary Curriculum
System/network-on-chip, Wireless Networking	IT Entrepreneurship education

Contact Person: Dr Divakar Yadav, E-mail: divakar.yadav@jiit.ac.in, Phone: 91-0120-2594253, 2594273(O), 91-9313714418, 91-9313651544
http://www.jiit.ac.in/jiit/ic3/

International Conference on Climate Change and its Implications on Crop Production and Food Security, Banaras Hindu University, Varanasi, 12-13 November, 2016

Topics:

- Climate Change Impacts on Global Food Security
- Targeting Global Sustainability-Food Security, Biodiversity and Climate Change.
- Plant Biotechnology and Climate Change
- Climate Change influence on Environment
- Water and Climate Change
- Consequences of Climate Change on the Oceans
- Climate Change and Economic Development
- Renewable Energy and Climate Change
- Livestock and Climate Change
- The Role of Extension Services in Climate Change Adaptation
- The Need for Accurate Atmospheric Transport in Carbon Cycle Research
- Climate Change and Horticulture

- Technological Advances and Unique Biological Characteristics and Adapting to Environmental Stress.
- Crops and Climate Change progress, trends, and challenges in simulating impacts and informing adaptation.
- Protecting Health from Climate Change
- Developing National Capacity for Assessing Health Impacts of Climate Change
- Carbon Cycle Science
- Sensor Technology and Modern Agronomic Service
- Provision of Ecological Services-Crop Protection. Yield Stability and System Resilience.
- Climate change: Embed the Social Sciences in Climate Policy

Contact : Ratnesh Kumar Rao, Organizing Secretary, Mahima Research Foundation & Social Welfare, 194, Karaundi, BHU, Varanasi – 221 005, Ph: 09335094154, E-mail:mrfsw_kvns@yahoo.com, mahimafound@gmail.com, Website: www.mrfsw.org

ICDM 2017 19th International Conference on Diabetes and Metabolism, February 7-8, 2017, Mumbai.

Topics:

The conference will bring together leading academic scientists, researchers and scholars in the domain of interest from around the world. Topics of interest for submission include, but are not limited to:

- Diabetes and Metabolism
- Clinical Diabetes and Diagnostic Approaches
- Diabetes and its Complications
- Diabetes Management
- Endocrinology: Patient-Oriented Case Management Discussions

- Advanced Technologies for Treatment of Diabetes
- Advancement of New drug/Biomarker Discovery for Treatment of Diabetes
- Computational Approaches for Diabetes
- Regulatory and Economical Aspects in Diabetes Research.

Contact: Web link page : http://www.waset.org/conference/2017/02/Mumbai/ICDM

Twenty-Fourth Congress and General Assembly of The International Union of Crystallography, 21-28 August 2017, Hyderabad.

Contact: G.R.Desiraju(Chair), Solid State and Structural Chemistry Unit, Indian Institute of Science, Bangalore-560012, Ph: +91 80 22933311, E-mail: desiraju@iucr2017.org,website: http://www. iucr2017. org/#

2nd Indian Cancer Congress, 08-12 November, 2017,Bengaluru.

Theme: Insight, Innovation, Integration

Contact: Prof. Ramesh S. Bilimagga, CIM Global India Pvt. Ltd. #2, NG Complex, 2nd Floor, 30th Cross, Bannerghatta Road Layout Jayanagar 4th T Block, Bangalore-560041, Ph.: +91 76 76 11 2017, F: +91 80 2608 0702, E-mail: secretariat@indiancancercongress2017.com

S & T ACROSS THE WORLD

ASTRONOMERS REPORT FINDING WIDEST KNOWN SOLAR SYSTEM BY FAR

Astronomers studying a "lonely" or seemingly unmoored planet drifting through space have found its mom—a star a trillion kilometers (about 6,400 billion miles) away. That would make it easily the largest solar system ever found.

The scientists say the planet, known as 2MASS J2126-8140, has an orbit around its host star that takes nearly a million Earth years and is more than 140 times wider than Pluto's.

"We were very surprised to find such a low-mass object so far from its parent star," said Australian National University astronomer Simon Murphy. "There is no way it formed in the same way as our solar system did, from a large disc of dust and gas" surrounding the star.

"There is little prospect of any life on an exotic world like this," Murphy added. "But any inhabitants would see their 'Sun' as no more than a bright star, and might not even imagine they were connected to it at all."

Only a handful of extremely wide pairs of this kind have been found in recent years, he added. The distance between the new pair is measured as 6,900 astronomical units, or Earth-sun distances—nearly three times that of the previous widest pair, which is 2,500 astronomical units.

The planet's parent is identified as a red dwarf star called TYC 9486-927-1. At that distance, it would appear as only a moderately bright star in the sky, and its light would take about a month to reach the planet.

Murphy is part of an international team of scientists that studied the planet, a gas giant weighing the equivalent of an estimated 12 to 15 Jupiters, as part of a survey of several thousand young stars and brown dwarfs close to our solar system.

The researchers realized the planet and the star were a similar distance from the Earth—about 100 light-years. A light-year is the distance light travels in a year. Having noticed the distance similarity, the astronomers compared the motion of the two through space and realized they were moving together.

"We can speculate they formed 10 million to 45 million years ago from a filament of gas that pushed them together in the same direction," Murphy said. "They must not have lived their lives in a very dense environment. They are so tenuously bound together that any nearby star would have disrupted their orbit completely."

The findings are published in the journal *Monthly Notices of The Royal Astronomical Society.*

"NETWORKS" OF INTELLIGENCE-LINKED GENES FOUND

Scientists say they have identified for the first time entire "networks" of intelligence-linked genes, by uncovering two clusters of genes linked to human intelligence.

Called M1 and M3, the researchers said, these so-called gene networks appear to influence cognitive function—which includes memory, attention, processing speed and reasoning.

These two networks, which each contain hundreds of genes, are likely to be under the control of master regulator switches, they added. The researchers are keen to identify these and explore whether it might be feasible to manipulate them. The research is at a very early stage, but the scientists ultimately want to see whether someone could use this knowledge of gene networks to boost cognitive function.

"We know that genetics plays a major role in intelligence but until now haven't known which genes are relevant. This research highlights some of genes involved in human intelligence, and how they inter

act with each other," said Michael Johnson of Imperial College London, lead author a report on the findings.

"What's exciting about this is that the genes we have found are likely to share a common regulation, which means that potentially we can manipulate a whole set of genes whose activity is linked to human intelligence. Our research suggests that it might be possible to work with these genes to modify intelligence, but that is only a theoretical possibility" for now.

In the study, published in the journal *Nature Neuroscience*, researchers looked at samples of human brain from patients who had undergone brain surgery for epilepsy. The investigators analyzed thousands of genes expressed, or activated, in the human brain. Next they combined these results with genetic information from healthy people who had undergone IQ tests and from people with neurological disorders such as autism spectrum disorder and intellectual disability.

They conducted various computational analyses and comparisons in order to identify the gene networks influencing healthy human cognitive abilities. They found that some of the same genes that influence human intelligence in healthy people were also the same genes that cause impaired cognitive ability

and epilepsy when mutated.

"Traits such intelligence are governed by large groups of genes working together—like a football team made up of players in different positions," Johnson said.

"We used computer analysis to identify the genes in the human brain that work together to influence our cognitive ability to make new memories or sensible decisions when faced with lots of complex information. We found that some of these genes overlap with those that cause severe childhood onset epilepsy or intellectual disability.

"This study shows how we can use large genomic datasets to uncover new pathways for human brain function in both health and disease. Eventually, we hope that this sort of analysis will provide new insights into better treatments for neurodevelopmental diseases such as epilepsy, and ameliorate or treat the cognitive impairments associated with these devastating diseases."

(Courtesy of Imperial College London and World Science , Dec. 21, 2015)

PHYSICISTS STUDY HOW BALLOONS BURST

A moderately inflated rubber balloon pricked
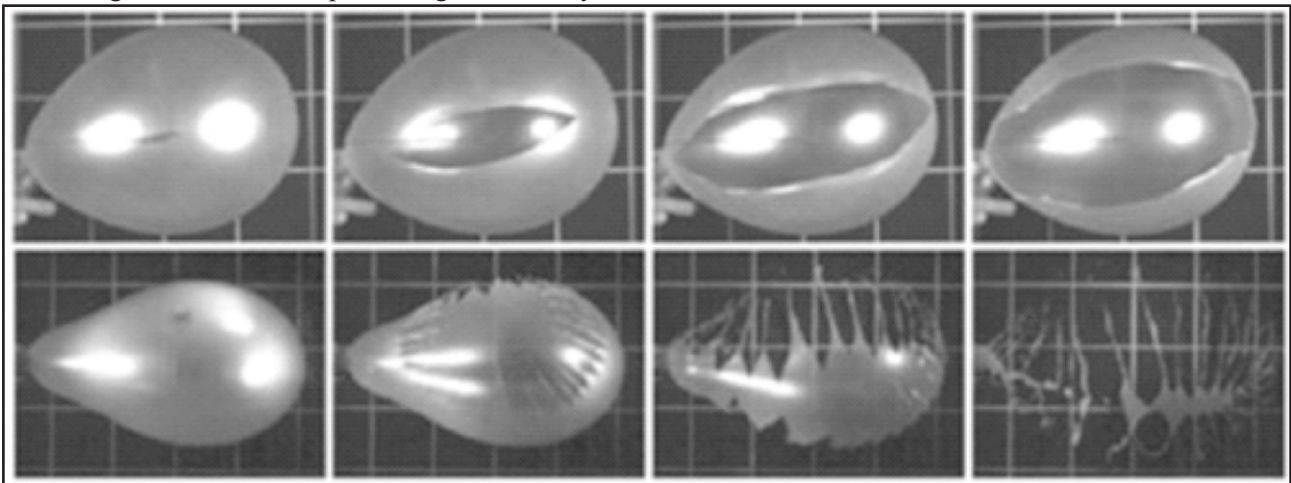
Two explosion mechanisms of a rubber balloon. Images are shown 0.3 milliseconds apart. Top: a moderately inflated balloon. A crack propagates across the membrane, finally splitting it into two. Bottom: a highly tensed balloon bursts into many long shreds. (© Sébastien Moulinet)

with a needle bursts into two large pieces—but if you inflate it until it explodes on its own, you get dozens of shreds.

Those are among the findings of two physicists at the University of Paris Diderot, which they published Oct. 30 , 2015 in the journal *Physical Review Letters*.

While the research appears just in time for the holiday season, the authors see a serious purpose behind it.

"Understanding the physics of fragmentation is important in a wide range of industrial and geophysical applications," write the authors, from the Laboratory of Statistical Physics at the university.

They added that they wanted to shed light on the fragmentation processes in materials subjected to impacts or explosions.

The authors of the paper, entitled "Popping Balloons: A Case Study of Dynamical Fragmentation," studied detailed frame-by-frame images of bursting balloons and offered an explanation of the phenomena.

"Using rubber membranes, we develop an experimental analysis that enables us to track the fragmentation process" in time and space, wrote the authors, Sébastien Moulinet and Mokhtar Adda-Bedia.

When a crack spreading across a balloon reaches a critical speed, they explained, the crack becomes unstable and splits into two new cracks. This is because at this speed, "tip splitting becomes the sole available mechanism of releasing the stored elastic energy," they wrote.

"Bursting a highly stretched membrane," they noted, "yields a treelike fragmentation network that originates at a single seed crack, followed by successive crack tip-splitting events." Thus the balloon bursts into shreds.

(Courtesy of the National Center for Scientific Research, Paris and World Science, Nov. 2, 2015)

BLACK HOLE HEAVY WEIGHTS TRIGGERED GRAVITY WAVE EVENT

The recent detection of gravitational waves is a stunning confirmation of Albert Einstein's theories and the start of a new way of observing the universe. And at the center of it all is a celebrity couple: the first known pairing of black holes and the most massive ones found outside of the cores of galaxies.

On September 14, 2015, the Advanced Laser Interferometer Gravitational-Wave Observatory, or LIGO, sensed a disturbance in spacetime caused by two massive black holes smashing together (*SN Online: 2/11/16*). "It's quite an incredible discovery," says Vikram Ravi, an astrophysicist at Caltech. "They've seen objects that I guess none of us outside the collaboration imagined they might see." With masses of 29 and 36 suns, these black holes were roughly twice as massive as the previous record holders.

Those masses actually aren't too shocking, says Jeffrey McClintock, an astrophysicist at the Harvard-Smithsonian Center for Astrophysics in Cambridge, Mass. Very massive stars, though rare, should give rise to very massive black holes. What would have been more surprising, he says, is if LIGO failed to turn up any black holes this large. "If the nearest 1,000 stars had been investigated and we hadn't found any planets, I would go back to church," he says. "I feel the same way about two 30-solar-mass black holes."

There are heavier black holes. Those monsters live in the centers of galaxies and can weigh billions of times as much as the sun. But they are different beasts entirely, probably built up as galaxies collide. Black holes such as those detected by LIGO are born when a massive star dies. And given their masses, "they likely formed in a fairly different environment than the Milky Way," Ravi says.

How much mass a star ends up with at the end of its life depends partly on its store of elements heavier than helium. Atoms such as carbon, magnesium and iron present larger targets to the light that's escaping a star. As light races outward, it bumps into these atoms, which in turn shove the surrounding gas along. The heavy elements behave like little snowplows attached to the photons, whittling away at the star's mass as the light radiates into space. To make black holes as massive as LIGO's, the original stars must have had fewer of these heavy elements than typical stars in our neighborhood, the LIGO team reports February 11 in the *Astrophysical Journal Letters*.

One possibility is that the stars formed early in the universe before heavy elements had a chance to accumulate. At the other extreme, the stars could have formed more recently in a relatively nearby (or local) and pristine pocket such as a dwarf galaxy. "With one observation, it's impossible to say if it's on one side of the continuum or the other," says Vicky Kalogera, a LIGO astrophysicist at Northwestern University in Evanston, Ill.

The best estimates put the collision in a galaxy about 1.3 billion light-years away (give or take a few hundred million light-years) in the southern sky, roughly in the direction of the Magellanic Clouds, two satellites of the Milky Way. A third LIGO facility, such as one proposed for India, will help narrow down precise positions of future detections. So would a simultaneous burst of electromagnetic radiation from the location of a collision. LIGO has agreements with telescopes around the world (and in space) to keep an eye out for any flashes of light that occur at the same time as a gravity wave detection. For LIGO's debut, no observatories reported anything definitive. But the Fermi gamma-ray satellite did see something interesting, astrophysicist Valerie Connaughton and colleagues report online February 14 at arXiv.org.

"We found a little blip that's weaker than anything we'd normally look at," says Connaughton, of the Universities Space Research Association in Huntsville, Ala. At 0.4 seconds after LIGO's detection, Fermi recorded a very faint flash of gamma rays. "We'd normally never pick it out of the data," she says. Researchers can't pinpoint precisely where the burst came from, but the direction is roughly consistent with LIGO's.

If the black hole collision did blast out gamma rays, theorists are going to have some explaining to do. Merging black holes shouldn't release any electromagnetic radiation. It's only when neutron stars get involved that telescopes should see flashes of light. During a recent phone call with colleagues about the Fermi data, "the theorists were already arguing with each other," Connaughton says.

But before the theorists get too worked up, researchers need to figure out if what Fermi saw had anything to do with LIGO's black holes. "We're definitely not saying we saw an [electromagnetic] counterpart," says Connaughton. It could be just a coincidence. During nearly 67 hours of observing in September, Fermi saw 27 similar gamma ray bursts. The only way to be certain is to wait for more LIGO detections. "If it's real, it's not going to be a one-off," she says.

LIGO's debut detection appeared during a test run in September; researchers are currently analyzing LIGO data accumulated during the four months that followed, and another science run is planned for later this year. The team is optimistic about their chances of finding more events. LIGO could have sensed a collision between two 30-solar-mass black holes out to about 6 billion light-years away. Given that researchers found one (so far) in 16 days of data, and assuming that's a typical couple of weeks in the universe, then researchers estimate that between two and 53 similar collisions occur per cubic gigaparsec per year. (One cubic gigaparsec is a volume of space roughly 4 billion light-years across.)

If those estimates are correct, scientists think LIGO could have detected up to about 10 more similar collisions in its first four months of operation, and possibly hundreds once the facility is running at full sensitivity. And that's not including collisions of black holes with different masses, smashups of

neutron stars or any other cosmic calamities that could rattle spacetime.

As more collisions are found, astronomers should get a better handle on where binary black holes form. "We may find they're all in the local universe and none in the early universe," Kalogera

says. And that would tell researchers something about how massive star formation has changed throughout cosmic history. "We have high expectations now for a bigger sample in the near future."

(Courtesy :February 17, 2016, https:// www. sciencenews.org)

THE INDIAN SCIENCE CONGRESS ASSOCIATION
14, DR. BIRESH GUHA STREET, KOLKATA - 700017

ISCA Best Poster Awards Programme : 2016-2017

To encourage Scientists, The Indian Science Congress Association has instituted two Best Poster Awards in each Sections .These awards carry a sum of ₹ .5,000 /- besides a Certificate of Merit.

1. Applications are invited from members (Life, Annual & Student) of the Association who have paid their subscription on or before **July 15, 2016**.

2. Four copies of full length paper along with four copies of the abstract (not exceeding 100 words) must reach the office of the General Secretary (Membership Affairs) not later than **September 15, 2016**. At the top of each copy of the paper and its abstract, the name of the Section under which the paper is to be considered should be indicated. For details of Sections see http://www.sciencecongress.nic.in

3. Along with the Four copies of paper, Four copies of the Application Form (to be downloaded from ISCA website http://www.sciencecongress.nic.in) with brief bio-data of the candidate (not exceeding 2 pages), full length paper, abstract in the form of a CD must also be sent simultaneously along with the hard copies.

4. The number of authors of each poster submitted for the award shall be limited to two only. **The first author of the poster shall be the presenting author**. **Both the authors should be the members of the Association and have paid their subscription on or before 15th July, 2016.**

5. The research work should have been carried out in India and this has to be certified by the Head of the Institution from where the candidate is applying.

6. The candidate should give an undertaking that the paper being submitted has not been published in any journal or presented in any other Conference / Seminar / Symposium or submitted for consideration of any award.

7. A scientist shall submit only one poster in any one Section (and not a second poster on the same or any other topic in any other Section) for consideration for poster presentation award.

8. A person who has already received ISCA Best Poster Award in any section once will not be eligible to apply for the above Award in the same or any other section.

9. Incomplete Applications will not be considered.

10. Full length papers will be evaluated by experts and twenty posters in each section will be selected for presentation during 104th Indian Science Congress.

11. The final selection for the Awards will be made by a duly constituted committee and the awards will be given during the Valedictory Session of 104th Indian Science Congress session.

12. Applications submitted for the above award will not be returned.

13. The last date for receiving applications for the above award at ISCA Headquarters is **September 15, 2016**.

All correspondences should be made to: The General Secretary (Membership Affairs),The Indian Science Congress Association ,14, Dr. Biresh Guha St.,, Kolkata-700017, Tel. Nos. (033) 2287-4530/2281-5323, Fax No. 91-33-2287-2551, E-mail:iscacal@vsnl.net, Website: http: //www.sciencecongress.nic.in

THE INDIAN SCIENCE CONGRESS ASSOCIATION
14, Dr. Biresh Guha Street, Kolkata - 700 017
ANNOUNCEMENT FOR AWARDS : 2016 - 2017

Nominations/ Application in prescribed forms are invited from Indian scientists for following Awards :

Asutosh Mookerjee Memorial Award
C.V.Raman Birth Centenary Award
Srinivasa Ramanujan Birth Centenary Award
Jawaharlal Nehru Birth Centenary Awards
S.N.Bose Birth Centenary Award
S.K.Mitra Birth Centenary Award
Birbal Sahani Birth Centenary Award
S.S.Bhatnagar Memorial Award
M.K.Singal Memorial Award
Vikram Sarabhai Memorial Award
D.S.Kothari Memorial Award
Jawaharlal Nehru Prize
Millennium Plaques of Honour
Excellence in Science and Technology Award
R.C.Mehrotra Memorial Life Time Achievement Award
B.C.Guha Memorial Lecture
G.P.Chatterjee Memorial Award
Professor Hira Lal Chakravarty Award - Plant Sciences
Pran Vohra Award - Agriculture and Forestry Sciences
Professor Umakant Sinha Memorial Award - New Biology
Dr.B.C.Deb Memorial Award for Soil/Physical Chemistry
Dr.B.C.Deb Memorial Award for Popularisation of Science
Professor R.C.Mehrotra Commemoration Lecture - Chemical Sciences
Prof.(Mrs.) Anima Sen Memorial Lecture - Anthropology and Behairoural Science
Dr.(Mrs.) Gouri Ganguly Memorial Award for Young Scientist - Animal ,Veterinary and Fishery Sciences
Prof.G.K.Manna Memorial Award - Animal ,Veterinary and Fishery Sciences
Prof.Sushil Kumar Mukherjee Commemoration Lecture - Agriculture and Forestry Sciences
Prof.S.S.Katiyar Endowment Lecture - New Biology/ Chemical Sciences
Prof.R.C.Shah Memorial Lecture - Chemical Sciences
Prof.Archana Sharma Memorial Award - Plant Sciences
Dr.V.Puri Memorial Award - Plant Sciences
Prof. W.D.West Memorial Award - Earth Sciences

Last Date for Receiving of Nominations / Application for different ISCA Awards and Lectures for 2016-2017 is **July 31, 2016**. For proforma of application forms and necessary information, please write to the **General Secretary (Membership Affairs).** The Indian Science Congress Association, 14, Dr. Biresh Guha Street, Kolkata-700 017, E-mail :iscacal@vsnl.net.. The form also can be downloaded from http://www.sciencecongress.nic.in

भारतीय विज्ञान कांग्रेस संस्था

14, डॉ॰ बिरेश गुहा स्ट्रीट, कोलकाता – 700 017, भारत

THE INDIAN SCIENCE CONGRESS ASSOCIATION

14, Dr. Biresh Guha Street, Kolkata-700 017, INDIA

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सदस्यता की शर्तें और सदस्यों की विशेषाधिकार/Terms of Membership and Privileges of Members :

संस्था की सदस्यता उन सभी लोगों के लिए खुली हैं, जो स्नातक या उसके समान स्तर पर शैक्षणिक योग्यता अर्जन कर चुके हैं, और जिन्हें भारत में विज्ञान की तरक्की में रूचि हैं।

Membership of the Association is open to person with Graduate or equivalent Academic Qualifications and interested in the advancement of Science in India.

1. **वार्षिक सदस्य :** जो व्यक्ति नये रूप से वार्षिक सदस्यता ग्रहण करना चाहता है उसे वार्षिक सदस्यता शुल्क ₹ 200/- के साथ भर्ती शुल्क ₹ 50/-* (विदेशियों के लिए** U.S. $ 70) मात्र देने पड़ेंगे। वार्षिक सदस्यता शुल्क प्रत्येक वर्ष के 01 अप्रैल को देय हो जाएगा। जो भी 15 जुलाई के भीतर अपनी सदस्यता शुल्क नहीं अदा कर पाएगा वह उस साल के लिए अपनी वोट देने की क्षमता से वंचित हो जाएगा और/या वह उस वर्ष के लिए संस्था के कार्यालय को भी नियंत्रण नहीं कर पाएगा। वार्षिक सदस्य अपनी सदस्यता दोबारा अगले साल 15 जुलाई के भीतर बिना शुल्क दिए पुनः अपनी सदस्यता प्राप्त कर सकता हैं।

   सदस्यगण अपना पेपर कांग्रेस सत्र के समय पेश कर सकते हैं। उन्हें वार्षिक विज्ञान कांग्रेस सत्र की कार्यविवरण की एक प्रति बिना मूल्य में प्राप्त हो सकती है। इसके साथ वे संस्था के रोज़नामचा "एवरीमैन्स साइंस" की प्रति भी बिना मूल्य उस साल के लिए प्राप्त कर सकते हैं। सदस्यता के नवीकरण के लिए कृपया ISCA वेबसाइट से फार्म डाउनलोड करें।

1. **Annual Member :** A person willing to be enrolled as new Annual Member has to pay an annual subscription of ₹ 200/- along with an admission fee of ₹ 50/-* (for foreign ** U.S.$ 70) only. The annual subscription of a Member shall become due on the 1st April of each year. Anyone who fails to pay the subscription on or before the 15th July in any year shall lose the right of voting and/ or holding any office of the Association for that year. A member failing to pay the annual subscription by the end of March of the following year shall cease to be a Member. Annual members can renew their Membership without paying the admission fee in the next year by remitting subscriptions in time i.e. within 15th July. Members may contribute papers for presentation at the Science Congress. They will receive, free of cost, reprints of the Proceedings of the Session of any one section of their interest and also the bi-monthly journal of the Association Everymans Science for that year only. For Renewal of Membership please download the form from ISCA website.

2. **सत्र सदस्य** : यदि कुछ कारणों से वार्षिक सदस्य अपनी सदस्यता उस वर्ष के 15 जुलाई के अंदर दोहराना भूल जाएँ, तो उनकी सदस्यता, सत्र सदस्यता के रुप में बिना वोट डालने की क्षमता में सीमित कर दिया जाएगा। सत्र सदस्य को ₹ 200/- (विदेशियों के लिए $ 50) अदा करना पड़ेगा। एक सत्र सदस्य को लेख/पोस्टर प्रस्तुतीकरण का अधिकार प्राप्त होगा जिस कांग्रेस सत्र का वह सदस्य हैं। एक सत्र सदस्य वोट प्रक्रिया में भाग लेने के योग्य नहीं हैं। सत्र सदस्य को विभागों के व्यवसाय बैठकों और साधारण बैठकों में भाग लेने की योग्यता प्राप्त नहीं हैं।

2. **Sessional Member** : If for some reasons, Annual Members fail to renew their Membership by remitting subscription prior to 15th July each year, their Membership for the year would be restricted to Sessional Membership without voting right. Sessional Member has to pay ₹ 200/- (for foreign $50). A Sessional Member shall have the right to present paper / poster at the session of the congress of which he/she is a member. A Sessional Member shall not be eligible to participate in the voting process. A Sessional member shall not be eligible to participate in the Business meetings of the Sections and the General Body.

3. **छात्र सदस्य** : जो व्यक्ति स्नातक स्तर से नीचे पढ़ाई कर रहा हैं, उसे वार्षिक सदस्यता शुल्क ₹ 100/- मात्र देने पड़ेंगे अपना नाम छात्र सदस्य के रुप में लिखवाने के लिए, बशर्ते उसके आवेदन पत्र पर उसके प्राचार्य/विभागाध्यक्ष/संस्थान के प्रधान के हस्ताक्षर हों। एक छात्र सदस्य को यह अधिकार दिया जाएगा, कि वह अपना पेपर कांग्रेस सत्र के समय पेश कर सकें, बशर्ते वह पेपर वह किसी वार्षिक सदस्य या संस्था के कोई अवैतनिक सदस्य के साथ पेश करें। उसे वोट करने का या कार्यालय को नियंत्रण करने का अधिकार प्राप्त नहीं होगा। छात्र सदस्य को विभागों के व्यवसाय बैठकों में भाग लेने की योग्यता प्राप्त नहीं हैं।

3. **Student Member** : A person studying at the under - graduate level may be enrolled as a Student Member by paying an annual subscription of ₹ 100/- **only provided his/her application is duly certified by the Principal/Head of the Institution/Department.** A student member shall have the right to submit papers for presentation at the Session of the Congress of which he / she is a member, provided such papers be communicated through a Member, or an Honorary Member of the Association. He/She shall not have the right to vote or to hold any office. A student member shall not be eligible to participate in the Business Meetings of the Sections and the General Body.

4. **आजीवन सदस्य** : एक सदस्य अपने भविष्य की सारी वार्षिक सदस्यता शुल्क एक बार में ₹ 2,000/- (विदेशियों के लिए U.S.$ 500) मात्र अदा करके पा सकता हैं। एक व्यक्ति जो 10 साल या उससे अधिक नियमित रूप से सदस्यता प्राप्त कर चुका है, उसे उसकी संयुक्त सदस्यता शुल्क के ऊपर प्रतिवर्ष ₹ 50/- की छूट दी जाएगी, बशर्ते कि उसकी संयुक्त शुल्क ₹ 1,200/- से नीचे न हों (विदेशियों के लिए U.S.$ 12.50 और U.S.$ 300 क्रमशः)। एक आजीवन सदस्य को उसके पूरे जीवन काल में सदस्यता की सारे विशेषाधिकार प्राप्त होंगे।

4. **Life Member** : A Member may compound all future annual subscriptions by paying a single sum of ₹ 2,000/- (for foreign** U.S.$ 500) only. Any person who has been continuously a member for 10 years or more, shall be allowed a reduction in the compounding fee of ₹ 50/- for every year of such membership, provided that the compounding fee shall not be less than ₹ 1,200/- (for foreign** U.S.$ 12.50 and U.S.$. 300 respectively). A life Member shall have all the privileges of a member during his/her lifetime.

5. **संस्थान सदस्य** : एक संस्थान जो ₹ 5,000/- सदस्यता शुल्क के रुप में दे वही संस्था के संस्थान सदस्य उस वित्तीय वर्ष के लिए बन सकता है, (विदेशियों के लिए U.S.$ 2,500)। इसमें वह विज्ञान कांग्रेस के वार्षिक सत्र में अपने एक व्यक्ति का नाम नामांकित कर सकता हैं, जो उनका प्रतिनिधि हों। एक संस्थान सदस्य को वार्षिक विज्ञान कांग्रेस

सत्र की कार्यविवरण की एक पूर्ण प्रति बिना मूल्य में प्राप्त हो सकती है। इसके साथ वे संस्था के रोज़नामचा "एवरीमैन्स साइंस" की प्रति भी बिना मूल्य प्राप्त कर सकते हैं।

5. **Institutional Member :** An Institution paying a subscription of ₹ 5,000/- (for foreign** U.S.$ 2,500) only, can become an Institutional Member of the Association for that financial year. It shall be eligible to nominate one person as its representative to attend Annual Session of the Science Congress. An Institutional Member shall be eligible to receive, free of cost, a copy of the complete set of Proceedings of the Annual Science Congress Session as also a copy each of the Associations journal Everymans Science.

6. **दाता :** कोई भी व्यक्ति जो एकसाथ ₹ 10,000/- (विदेशियों के लिए U.S. $ 5,000) मात्र दें, वह संस्था के दाता बन सकते हैं। एक **व्यक्तिगत दाता** को वह सारे अधिकार और विशेषाधिकार मिलेंगे जो एक सदस्य को उसके पूर्ण जीवन काल में प्राप्त होते हैं।

एक संस्थान जो एकसाथ ₹ 50,000/- (विदेशियों के लिए U.S. $ 25,000) मात्र दें, सदा के लिए इस संस्था के **संस्थान दाता** बन सकते है, जिसे वह एक व्यक्ति को नामांकित करके उसे अपने संस्थान के प्रतिनिधि के रुप में विज्ञान कांग्रेस के वार्षिक सत्र में भेज सकते हैं। एक संस्थान/व्यक्तिगत दाता वार्षिक विज्ञान कांग्रेस के कार्यविवरण और संस्था के रोज़नामचा "एवरीमैन्स साइंस" की प्रति भी बिना मूल्य प्राप्त कर सकते हैं।

6. **Donor :** Any person paying a lump sum of ₹ 10,000/- (for foreign ** U.S.$ 5,000) only, can become an Individual Donor of the Association. An *INDIVIDUAL DONOR* shall have all the rights and privileges of a member during his/her lifetime.

An Institution paying a lump of ₹ 50,000/- (for foreign ** U.S.$ 25,000) only, can become an *INSTITUTIONAL DONOR* of the Association forever, which shall have the right to nominate one person as its representative to attend Annual Session of the Science Congress. An Institutional/ Individual Donor shall be eligible to receive, free of cost, a copy of the complete set of Proceedings of the Annual Science Congress Session as also the Associations journal Everymans Science.

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* भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रुरी है। यह सत्र सदस्य/आजीवन सदस्य/ संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रुरी नहीं है।

* *Admission fee of ₹ 50/- is needed only for becoming a new Annual Member and not for Sessional Member/Life Member/Institutional Member/Student Member/Donor.*

** (एक विदेशी सदस्य का अर्थ है, जो भारतवर्ष के बाहर का नागरिक हों।)

** *(A Foreign Member means one who is normally Resident outside India).*

(अ) **पेपर पेश करना :** एक पूर्ण पेपर की प्रति उसके साथ तीन सारांश की प्रति जो 100 शब्दों से ज्यादा न हों और जिसमें कोई आरेख या फार्मूला न हों, वह प्रत्येक वर्ष 15 सितम्बर के अंदर अनुभागीय अध्यक्ष तक पहुँच जाना चाहिए।

(A) **Presentation of Papers :** A copy of complete paper accompanied by an abstract in triplicate not exceeding one hundred words and not containing any diagram or formula, must reach the Sectional President latest by September 15, each year.

(ब) सभी वर्गों के सदस्य जो विज्ञान कांग्रेस सत्र में भाग लेने के पश्चात लौटते समय के टिकट में रियायत प्राप्त कर सकता है, बशर्तें कि उनकी यात्रा के खर्च का थोड़ा भी भाग सरकार (केन्द्रीय या राज्य),

कोई कानूनी सत्ता या कोई विश्वविद्यालय या कोई नगरपालिका न उठाएँ और उनकी कुल कमाई या परिलब्धियां ₹ 5,000/- (प्रति माह पाँच हजार रुपए) से अधिक नहीं हैं। कृपया ISCA वेबसाइट से रेलवे रियायत फार्म डाउनलोड करें।

(B)   Members of all categories are entitled to **Railway Concession** of return ticket by the same route with such conditions as may be laid down by the Railway Board for travel to attend the Science Congress Session provided that their travelling expenses are not borne, even partly, by the Government (Central or State), Statutory Authority or an University or a City Corporation and their total earning of or emoluments drawn do not exceed ₹ 5,000/- (Rupees Five Thousand per month). Please download the Railway Concession form from ISCA Website.

(स)   संस्था के पुस्तकालय में सभी वर्गों के सदस्य को पढ़ने की सुविधा सुबह 10.00 बजे से शाम को 5.30 बजे तक सभी काम के दिनों में (शनिवार और रविवार) को छोड़कर प्राप्त होगी।

(C)   Members of all categories are entitled to reading facilities between 10.00 a.m. to 5.30 p.m. on all weekdays (except Saturdays & Sundays) in the library of the Association.

(ड)   समय समय पर संस्था द्वारा तय की गई मूल्य दरों पर विश्रामगृह, सभागार आदि सुविधाओं की प्राप्ति भी सभी वर्गों के सदस्य कर सकते हैं।

(D)   Members of all categories may avail Guest House facilities, Lecture Hall hiring at the rates fixed by the Association from time to time.

(ई)   भविष्य में भारतीय विज्ञान कांग्रेस संस्था द्वारा आयोजित परिसंवाद, सम्मेलन और वार्षिक कांग्रेस में सभीवर्गों के सदस्यों द्वारा भाग लेने के लिए अपनी—अपनी सदस्यता पत्र को लाना ज़रुरी होगा।

(E)   Members of all categories should bring the Membership Card always for attending any Seminar, Conference and Annual Congress organized by ISCA in future.

ध्यान दें : (1) सभी बैंक ड्राफ्ट The Indian Science Congress Association   के नाम से ही लिखा जाएँ, और जो कोलकाता के किसी भी शाखा में देय हों। सदस्यों से यह निवेदन किया जा रहा है, कि वे अपनी सदस्यता संख्या का उल्लेख भारतीय विज्ञान कांग्रेस संस्था के कार्यालय के साथ पत्राचार के वक्त अवश्य करें।

(2) भारतीय विज्ञान कांग्रेस संस्था द्वारा मनीऑर्डर, आई. पी. ओ., ई. सी. एस. या चेक से भुगतान ग्रहण नहीं किया जाएगा। कोई भी सदस्यता निर्धारित सदस्यता फार्म (आवेदन-पत्र नई सदस्यता/सदस्यता की नवीकरण के लिए) में विधिवत बिना भरने से नहीं लिया जाएगा।

(3) नकदी केवल ISCA मुख्यालय में हाथ से लिया जाएगा। कृपया डाक द्वारा लिफाफे के भीतर नकदी नहीं भेजें।

Note : (1) All Bank Drafts should be drawn in favour of *The Indian Science Congress Association* Payable at any branch in Kolkata. Members are requested to mention their Membership No. while making any correspondence to ISCA office.

(2) No money order, I.P.O., ECS or cheque will be accepted by ISCA. No Membership will be taken without duly filled in prescribed Membership Form (Application From for New Membership/ Application for Renewal of Membership).

(3) Cash will only be taken by hand at ISCA Hqrs. Pl. do not send the Cash by Post within the envelope.

भारतीय विज्ञान कांग्रेस संस्था

14, डॉ० बिरेश गुहा स्ट्रीट, कोलकाता - 700 017, भारत

THE INDIAN SCIENCE CONGRESS ASSOCIATION

14, Dr. Biresh Guha Street, Kolkata-700 017, INDIA

दूरभाष/Telephone :	(033) 2287-4530, 2281-5323	फैक्स/Fax :	91-33-2287-2551
वेबसाइट/Website :	http://sciencecongress.nic.in	ई-मेल/E-mail :	iscacal@vsnl.net
			es.sciencecongress@nic.in

सदस्यता के लिए नया आवेदन पत्र / Application Form For New Membership

सेवा में/To

महासचिव (सदस्यता कार्य)/ The General Secretary (Membership Affairs)

भारतीय विज्ञान कांग्रेस संस्था/The Indian Science Congress Association

14, डॉ० बिरेश गुहा स्ट्रीट/14, Dr. Biresh Guha Street,

कोलकाता - 700 017/Kolkata - 700 017

स्टैम्प आकार का फोटो / Stamp Size Photograph

महोदय/Dear Sir,

मैं भारतीय विज्ञान कांग्रेस संस्था का आजीवन सदस्य/वार्षिक सदस्य/सत्र सदस्य/छात्र सदस्य/संस्थान सदस्य/व्यक्तिगत दाता/संस्थागत दाता अपना नाम लिखवाना चाहता/चाहती हूँ।

I like to be enrolled as a Life Member/Annual Member/Sessional Member/Student Member/Institutional Member/Individual Donor/Institutional Donor of The Indian Science Congress Association. (Pl. Tick)

मैं इसके साथ ———— सदस्यता शुल्क के रूप मे नक़द ₹ ————/बैंक ड्राफ्ट संख्या ———————— दिनांकित ————— प्रचालक बैंक ————— 01 अप्रैल 20—— से 31 मार्च 20—— तक भेज रहा/रही हूँ।

I am sending herewith an amount of ₹ in payment of my subscription by Cash/Bank Draft No. dated issuing bank from the year 1st April 20 to 31st March 20.

मैं निम्नलिखित विभाग में रुचि रखता/रखती हूँ (कृपया किसी एक में निशान लगाएँ)/ I am interested in the following section (Please tick any one).

विभाग/Sections

1. कृषि और वानिकी विज्ञान/Agriculture and Forestry Sciences
2. पशु, पशुचिकित्सा और मत्स्य विज्ञान/Animal, Veterinary and Fishery Sciences
3. मानवशास्त्रीय और व्यवहारपरक विज्ञान (जिसमें सम्मिलित हैं, पुरातत्व-विज्ञान, मनोविज्ञान, शैक्षिक विज्ञान और सेना विज्ञान)/Anthropological and Behavioural Sciences (including Archaeology, Psychology, Education and Military Sciences)
4. रसायन विज्ञान/Chemical Sciences

भारतीय विज्ञान कांग्रेस संस्था

14, डॉ० बिरेश गुहा स्ट्रीट, कोलकाता - 700 017, भारत

THE INDIAN SCIENCE CONGRESS ASSOCIATION

14, Dr. Biresh Guha Street, Kolkata-700 017, INDIA

दूरभाष/Telephone : (033) 2287-4530, 2281-5323   फैक्स/Fax   : 91-33-2287-2551
वेबसाइट/Website   : http://sciencecongress.nic.in   ई-मेल/E-mail : iscacal@vsnl.net
es.sciencecongress@nic.in

सदस्यता के लिए नया आवेदन पत्र / Application Form For New Membership

सेवा में/To

महासचिव (सदस्यता कार्य)/ The General Secretary (Membership Affairs)
भारतीय विज्ञान कांग्रेस संस्था/The Indian Science Congress Association
14, डॉ० बिरेश गुहा स्ट्रीट/14, Dr. Biresh Guha Street,
कोलकाता - 700 017/Kolkata - 700 017

स्टैम्प आकार का
फोटो /
Stamp Size
Photograph

महोदय/Dear Sir,

मैं भारतीय विज्ञान कांग्रेस संस्था का आजीवन सदस्य/वार्षिक सदस्य/सत्र सदस्य/छात्र सदस्य/संस्थान सदस्य/व्यक्तिगत दाता/संस्थागत दाता अपना नाम लिखवाना चाहता/चाहती हूँ।

I like to be enrolled as a Life Member/Annual Member/Sessional Member/Student Member/Institutional Member/Individual Donor/Institutional Donor of The Indian Science Congress Association. (Pl. Tick)

मैं इसके साथ ———————— सदस्यता शुल्क के रूप मे नक़द ₹ —————————/बैंक ड्राफ्ट संख्या ———————————— दिनांकित ——————— प्रचालक बैंक ——————— 01 अप्रैल 20—— से 31 मार्च 20—— तक भेज रहा/रही हूँ।

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विभाग/Sections

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2. पशु, पशुचिकित्सा और मत्स्य विज्ञान/Animal, Veterinary and Fishery Sciences
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4. रसायन विज्ञान/Chemical Sciences

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ध्यान दें : (i) सभी बैंक ड्राफ्ट The Indian Science Congress Association के नाम से ही लिखा जाएँ और जो कोलकाता के किसी भी शाखा में देय हों।

Note : (i) All Bank Drafts should be drawn in favour of *The Indian Science Congress Association* Payable at any branch in Kolkata.

(ii) सभी सदस्यता और सदस्यता के नवीकरण के लिए आवेदन-पत्र आवेदकों को अपने खुद के पते उपलब्ध कराके करने चाहिए न कि देखभाल के पते प्रस्तुत करने चाहिए।

(ii) All Application Forms for Membership and the renewal of Membership must be submitted by providing the address of the applicants themselves only and not any care of address.

(iii) भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रुरी है। यह सदस्य/आजीवन सदस्य/संस्थान सदस्य/ छात्र सदस्य/दाता के लिए ज़रुरी नहीं है।

(iii) Admission fee of ₹ 50/- is needed only for becoming a new Annual Member and not for Sessional Member/Life Member/Institutional Member/Student Member/Donor.

(iv) सदस्यों से यह निवेदन किया जा रहा है कि वे अपनी सदस्यता संख्या का उल्लेख भारतीय विज्ञान कांग्रेस संस्था के कार्यालय के साथ पत्राचार के समय अवश्य करें।

(iv) Members are requested to mention their Membership No. while making any correspondence to ISCA office.

(v) भारतीय विज्ञान कांग्रेस संस्था द्वारा मनीऑर्डर, आई. पी. ओ., ई. सी. एस. या चेक से भुगतान ग्रहण नहीं किया जाएगा।

(v) No Money order, I.P.O., ECS or Cheque will be accepted by ISCA.

(vi) कोई भी सदस्यता निर्धारित सदस्यता फार्म (आवेदन-पत्र नई सदस्यता/सदस्यता की नवीकरण के लिए) में विधिवत् बिना भरने से नहीं लिया जाएगा।

(vi) No Membership will be taken without duly filled in prescribed Membership Form (Application Form for New Membership/Application For Renewal of Membership)

(vii) नकदी केवल ISCA मुख्यालय में हाथ से लिया जाएगा। कृपया डाक द्वारा लिफाफे के भीतर नकदी नहीं भेजें।

(vii) Cash will only be taken by hand at ISCA Hqrs. Pl. do not send the cash by Post within the envelope.