

EVERYMAN'S SCIENCE

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A 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**Natural Resources and Environmental Sustainability**

Environment and natural resources preservation is of vital importance to the economic growth of any country or a region in many ways but also susceptible to the extent that their utilisation, management and sustainability can be effected by performance of various interventions within society. The natural resources and environmental issues matters and apprehensions are cross-sectoral but also render input in every sector in terms of reducing poverty and indigent condition of millions of people, hence, require highest precedence within the overall framework of poverty reduction programmes in the society.

India constitutes 2.4% of land and 16% of populations on the planet earth. The rural areas of Indian subcontinent, people are living under the conditions of poverty, due to climatic factors, demographic factors, as well as personal, economic and social causes are main factors. Most of the natural resources are being depleted and degraded due to the lack of institutional services, productive resources and available technology. The people below the poverty line in these regions and their day to day livelihood activities exert more pressure on existing eroding land interns of deforestation, overgrazing and over cultivation causes decline in soil fertility and therefore aggravate poverty. It has a serious concern over the livelihood of hundreds of millions of Indians that live off the land.

It is necessary to assess the extent to which the existing issues on environment and natural resources have been integrated and proposed actions that can accelerate the mainstreaming of these issues in government sectors and their poverty eradication programmes as well as schemes. The cause and effect relationship between rural poverty and environmental degradation is addressed directly, the sustainability of rural development schemes will be destabilised and endeavours to lesson rural poverty will be endangered.

There is still a challenge on reduction on poverty in our country as well with considering the preservation on the existing natural resources. If the development plans are highly ambitious, there is still a low success in sustainability of natural resources. It is quite necessary to assess environmental issues on the judicious use of resources natural resources to achieve the optimum sustainability. Perhaps, the scientific look on these issues is still playing a dominant role in developmental policy by the nation. There is a need to prioritise our future research on alleviation the environmental sustainability. We encourage new findings on these issues through the Everyman's Science from members of Indian Science Congress Association in the future.

*Prof. Arun Kumar
Manipur University, Imphal*

*There are no such things as applied sciences,
only applications of science.
- Louis Pasteur*

ENVIRONMENTAL THREATS POSED BY GENETICALLY ENGINEERED VACCINES

Vishal Sharma, Sikander Saini and Dhruva Malakar*

Genetically engineered vaccines are finding increasing applications in Medical Science, Veterinary Science, Fish farming etc. These vaccines are considered as safe vaccines, unlike conventional vaccines, as the chances of disease occurrence by these vaccines are negligible. But, recently a few questions have been raised regarding their safety and thus their consequences on the environment or ecosystem, especially in long term studies.

INTRODUCTION

Conventionally vaccines are developed by inactivation/killing or attenuation of pathogen. These vaccines are developed without an extensive knowledge of the mechanisms involved in causing disease by these pathogens. Recent advancement in genetic engineering technology along with growing knowledge of the immune system, highly targeted vaccines are in focus nowadays. Development of these highly targeted vaccines is based on the knowledge of genomic sequence of pathogen and mammalian immune response. Thus modern molecular biology, recombinant DNA technology and genetic engineering have paved a new way for vaccine production. During last decade these genetically engineered vaccines are gaining more importance and finding their common use within various medical fields like medicine, veterinary medicine, fish farming etc.

Genetically engineered vaccines are produced by the deletion, insertion or using only a structural component of the microbe or pathogen, rather than the whole pathogen, so that the pathogen is unable to cause disease but still induces the immune response of host. These vaccines were considered to be totally innocuous until the publication of major research report by Professor Terje Traavik, which raises concerns about these genetically engineered

vaccines and warns in conclusion that many live, genetically engineered vaccines are inherently unpredictable and possibly dangerous¹. In addition to the evaluation of quality, safety and efficacy of the product before marketing authorization or clinical trials, genetically engineered vaccines require ERA (Environmental Risk Assessment).

ENVIRONMENTAL RISKS FROM GENETICALLY ENGINEERED VACCINES

SYNTHETIC AND RECOMBINANT VACCINES

Synthetic vaccine is composed of mainly synthetic peptides or antigens. The risks associated with unintended release of such vaccines will be toxic, allergic and other unwanted immunological reactions in animal or human individuals within the release area. However, if the DNA constructs used to produce recombinant vaccines, or the cell cultures used to express them, are released in the environment they will represent the same potential hazards as any other genetically modified nucleic acids or organisms.

GENETICALLY MODIFIED (GM) LIVE VIRUS VACCINES

Release of gene expressing and/or replicating GMV (Genetically Modified Viruses) into an ecosystem may pose special theoretical hazards, some of which may be impossible to predict. For

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GMVs unwanted ecological consequences are established because different strains of the same viral species may have different pathogenicity, as well as host-cell or -species tropism. Some of the major consequences are as:

1) Unintended Spread and Non-target Effects

Minor genetic changes in viruses can result in dramatic changes in host spectrum and pathogenic potential². To overcome host-species restriction, recombinant adenoviruses containing host-range mutations allowing human adenoviruses to infect non-permissive host cells were constructed^{3,4}. But this obviously makes the resultant vectors more risk-prone in an ecological and environmental context as they can affect wider range of host species, some of which might not be known today. Their detrimental effects will be on unintended non-target species, and hence on the ecosystems. This may relate to acute disease symptoms, but also to persistent infections, which interfere with reproduction and behaviours.

Although gene-deleted viruses were initially considered as safe, but recently experiences with an AIDS-related vaccine have raised serious concerns about both target and non-target effects of such vaccines. A vaccine made by deleting several genes from the Simian Immunodeficiency Virus (SIV), supposed to be safe, caused AIDS in infant and adult macaques⁵. Gene deleted Pseudorabies vaccine, removes gE (an essential protein in transneuronal spread of Pseudorabies virus). Gene-deleted pseudorabies vaccines have now been shown able to infect sheep⁶.

2) Genetic Pollution

GMV may cause pollution of genomes in related, naturally occurring viruses, or in the DNA of host cells. If GMV is able to integrate its DNA into unintended host cell chromosomes, dramatic biological and ecological effects in shorter or longer time-span may occur². When GMV particles are broken down in the environment, naked nucleic acids will be released in the environment. In such situations, horizontal gene transfer (non-sexual transfer of genetic information between genomes like genomic sequences transfer from eukaryotes to

prokaryotes, from prokaryotes to eukaryotes, between prokaryotes and between eukaryotes) of GMV genomes or parts thereof, is a potential hazard¹. In such cases genetic information could move between distantly related species which can give rise to mosaic genes. For any given gene construct or GMO which is released to the environment, our present knowledge neither allows pre-assessment of probability nor do consequences of horizontal gene transfer hence, risk assessments become impossible at the moment.

Avian influenza or "bird flu" outbreak in Asia is another example. Whether the occurrence of the highly pathogenic H5N1 2004 strain is a product of natural evolution or horizontal gene transfer brought about by GM organisms is difficult to trace. Avian flu virus that seems to be more efficient in transmission to humans represents another alarm in the potential consequences following horizontal gene transfer⁷. There is a general concern that H5N1 virus strain may merge with a human flu virus, resulting in a highly contagious flu strain.

3) Homologous Recombination by Genetically Modified Viruses Used for Immunization

Norwegian orthopoxvirus strains, isolated from a clinically ill house-cat and a woman, show genetic characteristics that are similar to both vaccinia virus and cowpox virus¹. Thus it becomes important to gain knowledge about the biological and genetic diversity among the Norwegian orthopoxviruses, as well as about their ecology and reservoir species. It is also important to verify recombination events occurring among the Norwegian orthopoxvirus strains that can give rise to new strain in future. Finally, one needs to investigate the recombination potential between naturally occurring- and genetically modified orthopoxvirus in authentic Norwegian host animals.

4) Risk of Tumors

Genetically modified viruses inherit the potential to undergo chromosomal integration or insertional mutagenesis. This may lead to random insertions of vaccine constructs into host cellular genomes, resulting in alterations of gene expression.

One such alteration of gene expression may be the activation of cellular oncogenes which raises the concern of tumors. The fact that vaccine strains may persist in the vaccinated recipients also raises concern that if the target species is a food-producing animal, the virus may cascade down the food chain.

5) Latent Infections

These are the infections in which the virus is present in the host, but the virus genome does not transcribe or replicate and thus no sign of the disease are produced. But this latency may be broken when the host cells receive new signals from endogenous or exogenous sources and the viral genomes become active. Gene-deleted PRV mutants in some cases may act as Defective Interfering (DI) viruses which may contribute in establishing persistence of wild type virus during co-infections⁸, or result in unexpected increase in the cytopathogenicity and acute disease⁹.

GENETICALLY MODIFIED (GM) BACTERIAL VACCINES

Recently it has been demonstrated that GM bacteria may transfer their transgene efficiently to indigenous bacteria in the mammalian gut¹⁰. This possibility has not been investigated for other GM bacteria which are now being used as oral vaccines. If genetically engineered bacterial vaccine vectors are released or escape to the environment, their DNA may be spread by the same processes as any other DNA.

DNA VACCINES

Generally it was considered that naked DNA introduced to an animal would very quickly be broken down and thus lacks biological importance. However this dogma got setback, when naked DNA injected intramuscularly (i.m.) in mice, it was discovered that the muscle cells of mice efficiently took up DNA and produced larger quantities of the protein¹¹. Intravenous injection of plasmids in liposomes when given to mice gave expression in several organ systems including the ovaries¹². This is highly undesirable because of possible integration of plasmid DNA in the chromosomes of the sex cells

that can lead to the inheritance of a genetic change. Similarly in many biological systems, it has been demonstrated that mammalian cells can take up foreign DNA in a manner that permits biological activity. Similar problems have been highlighted during gene therapy trials in animals as well as humans¹³. Transgenic animals were created unintentionally by the uptake of naked DNA by sperm cells of marine organisms and mammals¹⁴. These vaccines may produce anti-DNA antibodies and thus autoimmune reactions which is another concern¹⁵.

EDIBLE VACCINES

Edible vaccines express the immunogenic genes in the edible plant or fruit. Recently it has been demonstrated that transgenic plants may alter their biological environment. Transgenic DNA in food (antibiotic resistance marker genes) was found to be taken up by bacteria in human gut or pathogenic bacteria, making infections difficult to treat¹⁶. Genetic pollution from GMPs can be exerted by cross-pollination, unplanned breeding and horizontal gene transfer¹. GM potato plants expressed an inserted lecithin gene in order to reduce aphid attacks. Reproduction and fertility was significantly reduced in the ladybirds preying on aphids containing aphids¹⁷. Researchers have demonstrated serious harm to lacewings foraging on aphids affected by the insecticide Bt toxin produced by GM maize¹⁷. Similar consequences can occur in case of edible vaccines.

CONCLUSION

Genetically engineered vaccines are safe as compared to the conventional vaccines but a long term study is required to assess their safety, as they have some environmental issues. These vaccines should be regulated carefully and their blind use in the field or clinics should be reduced to the least. Though the risk assessment of these genetically engineered vaccines is difficult but still their effect should be followed up for long term before declaring them to be safe.

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VERMITECHNOLOGY: A TOOL FOR ORGANIC WASTE MANAGEMENT

Pulikeshi M. Biradar

Vermitechnology has become a popular method for the safe disposal and cost effective treatment of diverse organic wastes for the production of Vermicompost and worm biomass. It is an environmental friendly, rural based technology for sustainability as it process diverse organic wastes in the nature, avoids pollution through recycling of plants nutrients. The disposal of organic wastes in unscientific manner causes many more problems such as fly breeding, transmission of pathogenic microorganisms, soil and air pollution. Earthworms are considered as natural bioreactors, which proliferate along with saprophytic microorganisms, provide necessary conditions for the bio-processing of organic wastes. Hence, the review assesses the significant role of earthworms through vermitechnology in management of organic wastes and sustainability of environment and their future prospects. The product like vermicompost and vermiwash in the form of organic fertilizer and bio pesticide helps to improve physico-chemical and biological parameters of soil and acts as a soil conditioner that indirectly increase food production and soil health.

INTRODUCTION

Vermitechnology is a combination of both vermiculture and vermicomposting. Vermiculture defines the rearing of special types of earthworms such as epigeic and anecic types, which involves multiplication of earthworms stock by providing optimum environmental conditions such as proper moisture, temperature and sufficient food etc. Vermicomposting involves bio-oxidation and stabilization of organic wastes through the interaction between earthworms and microorganisms. Earthworms play an important role in the fragmentation process and providing substrate so as to increase the surface area for growing microorganisms².

Solid waste management is essential to maintain healthy environment in the nature. There are many problems in the environment concerned with high production and accumulation of large amount of organic wastes⁸.

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Indiscriminate spreading of these organic wastes can cause soil and water pollution ultimately leads to soil fertility damage and health problems. These environmental problems can be avoided, if these organic waste materials are pre-processed before their disposal into the nature. To process these wastes aerobic biodegradation is must for safe disposal so as to produce good quality processed product. The natural process of breakdown of organic wastes by saprophytic microorganisms can be doubled by using special varieties of earthworms through the process known as Vermitechnology (vermiculture and vermicomposting).

Vermitechnology has become a popular method for the safe disposal and cost effective treatment of domestic and agricultural organic wastes. Since, 2010 remarkable work have been published in organic waste management and research on this technology for the transformation of energy rich organic matter into humus like product 'vermicompost'.

WASTES UTILIZED IN VERMITECHNOLOGY

Earthworms can be fed easily on different forms of non toxic organic waste foods produced in the nature. The common wastes produced by the forests, agriculture and urban areas are mainly abundant organic wastes. They include kitchen wastes, vegetable market wastes, sewage sludge, garden wastes, animal excreta, weeds coir wastes, leaf litter, paper and pulp wastes, feed and fodder wastes and aquatic biomass⁵.

The disposal of these organic wastes in an unscientific manner causes many problems such as fly breeding, pig menace, transmission of pathogens, soil and air pollution, surface and ground water pollution, irritating odour⁷. The lack of awareness, co-operation among people and even shortage of funds by state and central Governments are the main causes of improper disposal of solid waste management especially in urban areas¹⁰.

The biologically degradable and decomposable organic wastes can be commonly used as composting materials in vermitechnology are

Animal dung: Cattle, sheep, horse, goat, poultry wastes etc.

Agricultural wastes: Agri-wastes obtained during and after harvesting and threshing.

Forestry wastes: Wood shavings, peels, saw dust and pulp etc.

City garbage and leaf litter: Kitchen wastes and leaf litter of street plants and residential areas.

Paper and cotton industry wastes: Wastes generated from paper and cotton cloth industry.

Biogas slurry: After the recovery of biogas, slurry is used.

Industrial wastes: Wastes from food processing industries like dal mill, rice mill etc.

EARTHWORMS USED IN VERMITECHNOLOGY

Only few epigeic and anecic earthworm species are widely used in vermitechnology throughout the world for the production of vermicompost and

worm biomass. In India, only three species are being extensively used for vermiculture and vermicomposting practices such as

1. *Eudrilus eugeniae* - African Night Crawler
2. *Eisenia fetida* – European Night Crawler
3. *Perionyx excavatus*, – Oriental worm

Several other species can also be used, but they have to be tested before their use with different aspects like inbuilt adaptability to climatic conditions, feeding and breeding rates, life longevity, distribution range and availability etc.

ROLE OF EARTHWORMS IN ORGANIC WASTE MANAGEMENT

Earthworms not only act in the soil as aerator, grinders, crushers, chemical degrader and biological stimulators. They also secrete many more enzymes namely proteases, lipases, amylases, celluloses and chitinases, which brings about rapid biochemical conversion of the cellulosic and proteinaceous materials of various organic wastes and in fast recycling of available plant materials.

Earthworms create aerobic conditions in the waste materials inhibiting the activity of anaerobic microorganisms, which can cause foul smell. Further, earthworms release coelomic fluid in the decaying organic materials, which have antibacterial properties that kills pathogens in the produced vermicompost⁶.

VERMICOMPOSTING METHODS

There are various methods designed to have vermicomposting process, basically all are same but vary with respect to amount of wastes. Generally, two methods were followed in practicing Vermitechnology as follows

1. Small scale or indoor method
2. Large scale or outdoor method

1. Small scale or indoor method: It is usually practiced in areas where protection from climatic adversities like high rain, high and low fluctuations in temperature, predators like ants, rodents and large insectivorous birds are abundant. This method is

used mainly for multiplication of earthworms for large scale vermicomposting.

2. Large scale or outdoor method: Large scale vermicomposting may be of two types a) In-situ culturing of earthworms, it may be simple in the field after harvesting of crops or may be natural culturing of earthworms in gardens and orchards b) large scale commercial units in open heaps, here locally available large amount of various organic wastes can be utilized for commercial production of Vermicompost.

VERMICOMPOST

Vermicompost is an aerobically degraded organic matter. It is also called as "Black Gold", it is a granular, aggregate, coated with mucopolysaccharides of microbes and earthworms¹. The vermicompost contains humified organic matter characterized by high molecular weight and an enzymatically active humic fraction, which stimulates plant germination and growth⁴. The nutrient present in the casts are readily soluble in water and are rich sources of macro and micro nutrients, vitamins, enzymes, antibiotics, growth hormones and immobilized micro flora⁹. Vermicompost is rich in available plant nutrients such as N, P, K, Ca, Mg, S and micronutrients like Fe, Zn, Mn, Cu etc. The Vermicompost has many more plant growth hormones and rich in saprophytic microorganisms.

SIGNIFICANCE OF VERMITECHNOLOGY

Vermitechnology is a process of composting organic wastes into valuable organic fertilizer by the action of earthworms. It is an effective, eco-friendly, cheap and easy method for recycling of biodegradable organic wastes using selected species of earthworms (epigeic and anecic species). It is a cost effective, efficient, safe disposal of all kinds of organic wastes apart from producing very useful product called vermicompost³.

CONCLUSION

Earthworms can consume large quantity of organic wastes rapidly and process them through

gizzard and microorganisms so as to excrete vermicasts. Thus, treatment of any non toxic organic wastes by Vermitechnology is not only reduces pollution, eliminating pathogenic diseases but also produces a valuable product immense to agriculture; hence, vermitechnology is called 'wealth from wastes'

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ORGANIC FARMING, CONVERSION & CERTIFICATION

Anamika Verma

Organic farming has emerged as a potential alternative for meeting food demand, maintaining soil fertility and increasing soil carbon pool. India has a great potential for organic farming using traditional wisdoms prevailing in the villages of India. Promotion of organic farming in India could prove beneficial to increase the share of Indian agricultural export in the world export. Farmers need to go through organic conversion and certification of their farms for getting certified as organic producers producing organic agricultural products. For this crop-specific and farming situation-specific package of practices for organic cultivation should be developed. No clear-cut evidence is available to support consumer perceptions regarding potential health benefits of organic foods. An in-depth research on quality aspects is also required.

INTRODUCTION

'Green Revolution' with high synthetic fertilizer input use caused many hazards like soil erosion, decreased groundwater level, pollution due to fertilizers and pesticides, genetic erosion, reduced food quality and increased the cost of cultivation, rendering the farmer poorer year by year¹. With the increase in population we need to stabilize agricultural production in a sustainable manner. Thus, a natural balance needs to be maintained at all cost for existence of life and property. Organic agriculture is a sustainable and environmentally friendly production method², which has particular advantages for small-scale farmers. It contributes to poverty alleviation and food security by a combination of many features, such as increasing yields in low-input areas, conserving biodiversity and nature resources on the farm, increasing income and reducing costs, producing food in sustainable manner in the long term. A combination of agriculture with dairy and poultry farming fetches the small farmers more average net income than other enterprises³. Organically cultivated soils are relatively better attuned to withstand water stress and nutrient loss. Their potential to counter soil degradation is high and

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several experiments in arid areas have revealed that organic farming may help combat desertification.

ORGANIC FARMING

FAO suggested that "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs". Organic farming is being promoted in India under National Project on Organic Farming (NPOF) since October 2004; National Centre of Organic Farming (NCOF) at Ghaziabad; National Horticulture Mission (NHM); and Rashtriya Krishi Vikas Yojana (RKVY). India produced around 3.88 m MT of certified organic products which includes edible products along with organic cotton fibre. Total area under organic farming in India in year 2010-11 was 7.8 mha (including certified cultivated area and in conversion cultivated area). Approximately, 5.55 mha area is under organic certification in year 2011-12⁹. The states of Uttarakhand and Sikkim have already declared their states as 'organic states'.

The basic concepts of organic farming includes a) protecting the long term fertility of soils; b) nitrogen self-sufficiency; c) effective recycling of organic materials including crop residues and

livestock manures; d) weeds, diseases and pests control relying primarily on crop rotations and resistant varieties; e) maintaining ecological balance. According to "The International Federation for Organic Agriculture Movement (IFOAM)" there are four principles of organic farming *viz.* principle of Health of individuals, communities and ecosystem, principle of Ecology to attaining ecological balance; principle of Fairness with everyone involved, by providing good quality of life to people and animals as well; principle of Care by preventing significant risks by adopting appropriate technologies and rejecting unpredictable ones.

ORGANIC CONVERSION

When a farmer switches over to the system of organic farming from the conventional system of farming, it is known as conversion and the time between the start of organic management and certification is called conversion period. A farm may be converted step by step. The standards requirements shall be met during the conversion period. The application for certification programme should be applied from the very starting of the conversion period. The start of the conversion period may be calculated from the date of application of the certification programme. If the whole farm is not converted, the certification programme shall ensure

that the organic and conventional parts of the farm are separate and inspectable. To ensure a clear separation between them, a buffer zone or a natural barrier should be maintained⁸.

REQUIREMENTS FOR ORGANIC CONVERSION

Farmer should meet all the necessary requirements to fulfill conversion leading to certification procedure which includes practices like mixed farming including animal husbandry, poultry, fisheries, etc., crop rotation should be practiced in annual crops, cover crops, green manure as well as fodder crops to minimize weeds; intercropping (mono cropping should be avoided), when perennial crops are grown, cover crops should be grown to protect the soil. Planting materials should be of organic origin or chemically untreated, resistant varieties should be grown and use of genetically engineered seeds, pollen, transgenic plant material is prohibited. Synthetic fertilizers, synthetic herbicides, fungicides, insecticides and other pesticides should be avoided and residues of the plants after harvesting should be incorporated in the soil. List of the permitted and not permitted products has been provided in Table 1⁸. Use of biofertilizers should be done; they fix atmospheric nitrogen with the help of some soil micro-organisms. The seeds of

Table 1. List of the permitted and not permitted products⁸.

On farm products	Permitted/ Restricted
FYM, Poultry manure, Slurry & Urine	Permitted
Crop residues and green manure	Permitted
Straw and other mulches	Permitted
Biofertilizers & Biodynamic preparations	Permitted
Peat & Vermiculite	Permitted
Products produced outside organic farms including FYM, straw, fish products, meat, synthetic chemicals and fertilizers	Restricted
Plant based extracts (eg. Neem, garlic, pongamia etc)	Permitted
Compost from plant residues	Permitted
Minerals like: Ca carbonate & Ca chloride, clay Mg Suphate & gypsum	Permitted
Biocontrol agents like biopesticides	Permitted
Homeopathic and Ayurvedic preparations	Permitted
Mulches, nets and Pheromone Traps	Permitted

legumes can be treated by the *Rhizobium* culture for proper nodulation. An integrated pest management system should be incorporated which use cultural and biological practices to overcome the damage or attack of several pests and pathogens (Table 2)⁵. Other practices like soil and water conservation using mulching; micro-irrigation system can be incorporated for judicious irrigation. The processing of the products should be done by using solar drying, freeze drying, hot air chambers etc. Plant products produced can be certified organic when the national standards requirements have been met during a conversion period of at least two years for annual crops and three years for perennial before the first harvest of products. The certification programme may allow plant products to be sold as "produce of organic agriculture in process of conversion". Mainly high value crops like wheat, paddy, maize, pigeonpea, chickpea, greengram, blackgram, groundnut, mustard, cotton, sugarcane, ginger,

India, Agricultural Processed Foods Export Development Authority (APEDA) under Ministry of Commerce is the controlling body for organic certification for export. There are 11 certified agencies authorized under National Program on Organic Production (NPOP). The standards and procedures have been formulated in harmony with international standards such as those of Codex and IFOAM. The National Accreditation Body (NAB) is responsible for giving approval on the authorization of an applicant Inspection and Certification Agency. On approval given by NAB, the APEDA issues a Certificate of Authorization, containing the details like certificate of Authorization Number, the name and address of the inspection and certification Agency, nature of the activities covered and the date of issue and date of expiry. Farms that have been free from use of synthetic or chemicals for three years; maintaining strict physical separation of organic products from non-certified products and undergoing

Table2. List of biopesticides, major target pests and their trade names⁵.

Generic names and formulations	Type	Target/Functions	Trade name
<i>Bacillus thuringiensis</i>	Bacterium	Lepidopterans, insects; Insecticides	Dipel-8L, Kurstaki , Halt, Biobit ,Biolep and Delfin
<i>Trichoderma viridae</i>	Fungus	Soil borne disease; Fungicide	Ecoderma
<i>Trichoderma harzianum</i> 0.5WS	Fungus	Soil borne disease; Fungicide	NIPROT
NPV of <i>Helicoverpa armigera</i> of 0.43 AS	Virus	<i>Helicoverpa armigera</i> ; Nucleopolyhydrosis virus	HELICIDE
NPV of <i>Spodoptera litura</i> 1 AS	Virus	<i>Spodoptera litura</i> ; Nucleopolyhydrosis virus	SPODOCIDE
<i>Pseudomonas fluorescens</i> 1.75	Bacterium	Soil borne disease; Fungicide	Biocure B

turmeric, cumin, tea, coffee, cardamom, banana, papaya, tomato, brinjal, cole crops, leafy vegetables etc., are grown as organic in India⁸.

ORGANIC CERTIFICATION

Organic farming and certification are attractive alternatives for both farmers and policymakers⁵. In

periodic on-site inspections are certified as organic. Certification is essentially aimed at regulating and facilitating the sale of organic products to consumers. It is intended to assure quality and prevent fraud. For organic producers, certification identifies suppliers of products approved for use in certified operations.

For consumers, "certified organic" serves as a product assurance. The labeling should tell the accurate information about the organic status of the product (i.e. conversion in progress or organic). The details like name of the product, quantity of the product, name and address of the producer, name of certification agency, certification, lot number etc. are to be given in the label⁸.

CONSTRAINTS

Organic farming is productive and sustainable, but there is a need for strong support to it in the form of subsidies, agricultural extension services and research. Organic farming is highly knowledge intensive farming. Collection and processing from wastes are most complicated. There is lacking of adequate research & development backup as well as training in Organic Farming in India. There is problem in availability, transportation, and application of biological materials to meet the nutrient demand of the crops. Biological pest control is very knowledge intensive. There are strong views against organic farming mainly on the grounds of practicability of feeding a billion people, its financial and economic viability, and availability of organic inputs and dissemination of know-how⁷.

CONCLUSION

Organic farming is a method of raising the crop by using natural or organic products/wastes to the maximum extent and avoiding the use of synthetic fertilizers and pesticides. Therefore, it is a socially just, environment friendly and economically viable alternative to chemical oriented farming. It

contributes to poverty alleviation and food security. Organic certification is an essential procedure which aims at regulating and facilitating the sale of organic products to consumers and identifying the suppliers of products approved for use in certified operations.

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DEHYDRATION OF FLOWERS AND FOLIAGE AND FLORAL CRAFT

S. K. Datta

Shelf-life of fresh flower is very limited. Road side, rural and hilly areas are covered with different types of colourful flowers and foliage at different seasons round the year and all these are wasted under natural process. Nowadays, market is flooded with artificial flowers. Techniques have been developed by which flowers, braches, twigs, leaves etc. can be dehydrated in their original shapes, colours and size. The entire seasonal colourful vegetations can be converted into value added products by using simple dehydration technique. Dried flowers and foliage have multipurpose use. A cottage-scale industry based on floral craft can come up for self-employment of unemployed youths and for earning money to the housewives as well as rural women through this creative occupation.

INTRODUCTION

Floriculture industry is expanding day by day in India. Cut flower is one of the main components of floriculture trade. In spite of using best chemicals for improvement of keeping quality and enhancement of vase life, the cut flower cannot be stored for a long time. Some flowers bloom in summer and some in winter. Some flowers bloom only in hills. Non-availability of flowers at time and places where one wants them very much is an additional problem. Home garden, road side, rural and hilly areas are covered with wide range of wild/unutilized/ underutilized flowers and foliage at different seasons round the year and all these are wasted under natural process.

Nowadays, market is flooded with artificial flower's vendors. A large variety of materials are used to manufacture artificial flowers, and this has changed over time. The most recent materials used for these types of flowers are carved or foam soap, silk (real silk, silk blend, polyester fabric), glass, paper, cotton, cloth, nylon netting, Sola Protea, ground clay, mass produced plastic moldings etc. The range of artificial flowers and colours that are

available is endless. Artificial flowers are created with the true realistic look and feel of nature. Offices and showrooms have in many cases opted for artificial flowers, plants, trees and flower arrangements as an alternative to the costly maintenance and replenishment of fresh. The technology for making artificial flowers that imitate nature to pretty fine details has been in existence for just several years. And it has been improving rapidly but steadily using modern machine tools and expert know-how. The artificial flower industry becomes a multi-billion dollar business since the vast improvements in the artificial flowers quality and the lifestyle of people.

The processing of present day dry flower industry of dried flowers involve drying, bleaching and colouring after their collection. Bleaching and dyeing are the important steps in the processing of plant materials. Various oxidative bleaches (sodium chlorite, hypochlorite, peroxides) and reductive bleaches (sulfites) are widely used. Both natural and artificial dyes are used. Enamel, poster paint, interior paint and tube paint are also applied through brush, spray or by dip. The present Indian byproducts of flowers for export are dried flowers and plant parts in bulk, potpourri, arrangements (with dried plant materials and dried flowers) and floral handicrafts.

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Considering above facts attempts were made to find out whether there is any alternative of fresh flowers and/or present day artificial flowers. Perhaps we have never thought of giving dry flowers to a friend. Dried floral arrangements make wonderful gifts. Dry flowers that are near naturals, dried and preserved, have an ever lasting value that can be cherished for longer periods and require little care.

Dry flower market has grown exponentially as consumers become "eco-conscious" and choose dried flowers as the environmentally friendly and biodegradable alternative to fresh flowers. Dried flowers are exported either as assortments or value added items. Dried flowers are commonly known as "everlasting flowers" or "dehydrated flowers". They are nature's treasures, beautiful and ever lasting and make a perfect gift, which can be treasured over the years.

Different methods for drying and dehydrating plant materials have been tried to retain their original colour and form for a long period. Different methods used for dehydration are air drying, sun drying, press drying, embedding, oven drying, microwave oven drying, freeze drying, glycerine and desiccants. The optimum stage, time of harvesting and time required for dehydration have been extensively studied and standardized for several common flowers and leaves of commercial importance¹⁻⁵.

Techniques have been developed by which flowers, branches, twigs, foliage etc. retain their fresh look for several months or even years. The original shape, colour and size remain as they were before dehydration and, thus, making them highly suitable raw materials for interior decoration and may be enjoyed for a long time and can be used for any occasion.

AIR DRYING

Flowers are dried under natural conditions. This is one of the most simple and cheap method. The main drawback of the method is that it is weather dependent and the quality of the product is not good. The shape of the flower is distributed due to shrinkage. Originality of flowers and foliage can not be maintained.

PRESS DRYING

Flowers or leaves are placed between the blotting sheet and pressed dried with the help of "Plant Press". The plant press is made up of two square wooden board fixed with nuts and bolts at four corners. The size of plant press may vary (6" X 12" to any desired size). Pressed leaves/flowers are dried within few (5-8) days. The drying time can be reduced if the stakes are kept in hot air oven at an appropriate temperature (60°C) for 2-4 hours.

Dehydration through press drying have already been standardized both for wide range of seasonal cultivated flowers/flower petals and unutilized rural, road side, hill side flora :

Acylapha, Bougainvillea, Ixora, Jarul, Caesalpinia, Lantana camara, Panicum, Mussanda, Radhachura, *Euphorbia hirta*, *Triumfetta rhomboidea*, Polygonum, Oxalis, Cycas, *Cleome viscosa* and *Cleome rutidosperma*, *Desmodium gyrans*, *Mikania cordata*, *Atlantia sp.*, *Oplismenus compositus*, *Hemigraphis hirta*, *Ipomea tridentate*, *Hemidesmus indicus*, *Vitex negundo*, *Teramnus pabiales*, *Zizyphus aenoplia*, *Limonia acidissima*, *Cleome rutidosperma*, *Peperomia pellucida*, *Sida rhomboidea*, *Morus alba*, *Tephrosia purpurea*, *Scoparia dulcis*, *Phyllanthus simplex*, *Sapium cebiferum*, *Vitis sp.*, *Merrimia tridentata*, *Phoenix pelludosa*, *Triumfetta rhomboidea*, *Boerhavia repens*, *Pouzolzia hirta*, *Prosopis juliflora*, *Ageratum conyzydes*, *Commelina benghalensis*, *Alysicarpus bupleurifolius*, *Urena lobata*, *Spyllanthus calva*, *Cestrum fasciculatum*, Fern, *Adiantum*, *Sellaginella* and a large number of unidentified materials.

EMBEDDING AND DRYING

Embedding is one of the most important process for dehydration. Flowers and foliage are embedded very carefully in drying materials. The materials which are used for embedding and drying flowers and foliage should be very fine (0.02-0.2 mm). Borax, sand and silica gel are the most commonly used drying materials. Borax is hygroscopic and bleaches petals embedded for long time. Silica gel and fine white sand have been found to be the best materials for embedding.

Flowers and foliage are embedded very carefully in drying materials, either in sand or silica gel in a container (dust-bins, desk trays, earthen pots, etc.). Size of container depends upon the size of material to be embedded. About one inch thick layer of sand is spread in the container. The surface of sand is made even. Flowers are arranged vertically on the surface. Sand is poured slowly, carefully and gently so that all gaps in between petals and other floral parts are properly filled up and the original shape of the flower is not disturbed. About half inch sand layer is maintained above the flower. More than one layer of the flowers may be embedded.

By this method the original shape and colour of the flower is maintained. The embedded materials may be dried in different ways:

The container may be kept in room temperature till the materials are dried properly. The method is simple and inexpensive. But the success of the method depends upon the weather conditions. This method of dehydration is time consuming and not suitable for commercial purpose.

The container may also be kept in direct sun, daily. Here, the dehydration is faster. This method is also weather dependent. Quality of product is affected due to change in day and night temperature and extra labour is involved for shifting of the containers. This is also not recommended for commercial purpose.

For quick dehydration, the containers are kept in the electrically operated hot air oven at a controlled temperature (45-60°C) for a specific period (48-72 hours). This process is faster and the quality of the product is very good. This method is advantageous as weather does not have any role for dehydration.

The materials may also be dehydrated under microwave oven. The materials are dehydrated with the help of electronically produced microwaves. Flowers or foliage are embedded in fine silica gel in nonmetallic earthen container or glass container and kept in the microwave oven for a few minutes (1-4 minutes). This method is fastest among all and the quality of product is also excellent. The materials

after taking out from microwave oven are kept for a specific time for setting (2 hours) at room temperature.

PRECAUTIONS

For better result and quality product, following precautions are to be observed at different steps. Collection of materials should be done a day or two after irrigation of the field (for cultivated crops). Materials are to be collected after the dew and surface moisture have evaporated. Residual moisture on the materials should be soaked with blotting paper. Fresh materials should always be collected. All stages of flowers should be collected. Materials should be embedded/pressed immediately after plucking. One type of flower should be embedded/pressed at one time. Undesired portions should be removed before embedding/pressing. Flowers for press drying should be spread uniformly on blotting paper to ensure uniform pressure.

SUITABILITY OF TECHNIQUE

Dehydration technique has been standardized for a wide range of cultivated flowers, grasses, ferns, ornamental foliage etc. The optimum stage, time of harvesting and time required for dehydration varies from material to material. The technique has been extensively used for dehydration of several popular and common flowers like *Acroclium*, *Antirrhinum majus*, *Bougainvillea*, *Candytuft*, *Callistephus chinensis*, *Carnation*, *Chrysanthemum*, *Dahlia*, *Delphinium ajacis*, *Euphorbia*, *Gladiolus*, *Gerbera*, *Gomphrena globosa*, *Helichrysum*, *Iberis*, *Ixora*, *Phlox*, *Marigold*, *Mussanda*, *Narcissus*, *Nymphaea*, *Pansy*, *Rose*, *Legestromia indica*, *Lantana*, *Limonium* (statice), *Zinnia linearis*, etc.

POST DEHYDRATION CARE

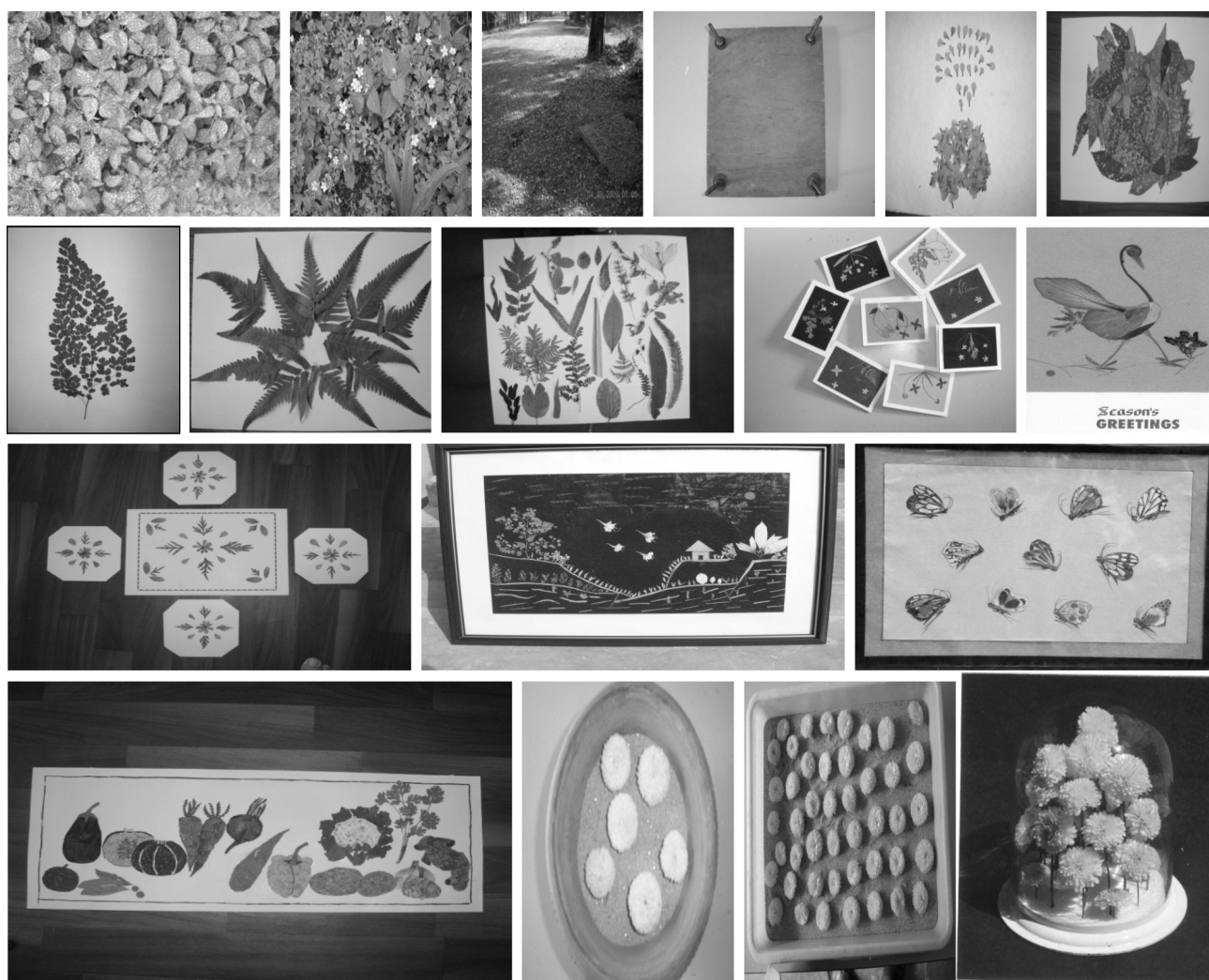
Dehydrated flowers and foliage are very delicate and they need special care during handling. Dry flowers absorb atmospheric moisture and lose their shape. Therefore, they should be stored immediately in moisture proof containers. Different containers, like glass desiccators, tin boxes, plastic bags and carton wrapped with plastic sheet or wax paper are used for storage. Small quantity of silica gel should be placed inside the container to absorb the

moisture, if any. Dried materials should be protected from light and direct sunlight to preserve colour. Care should be taken to protect them from insect attack. Moth balls should be kept in storage containers. Different types of flowers should be stored separately.

UTILIZATION

Both press dried and embedded dry materials may be used for preparation of diversified value added products like : bouquets, gift boxes, wall

hanging, pot pourries, artistic greeting cards, get well cards, wall plates, calender, pictures, flower baskets, refrigerator magnets, mirror decoration, hats, embedding in gold/silver or resin to use as jewelry, landscape, table mats, coasters, three dimensional arrangements of flowers for interior decoration etc. Floral album may be prepared for identification of plants for taxonomic studies. Dehydrated flowers may be used as botanical specimens for demonstration and for teaching students^{6,7}.



Figs. A and B – Road side vegetation; Fig. C – Avenue tree; Fig. D – Plant press; Figs. E-I – Pressed dehydrated leaves; Figs. J and K – Greeting cards; Fig. L – Table mat and coaster; Figs. M-O – Landscapes; Fig. P – Embedding of flowers in sand; Fig. Q – Three dimensional arrangements of dry flowers.

CONCLUSION

India has rich source of plant materials year-round because of its diversity of topography and climate. Highly diversified agro-climatic conditions of India undoubtedly offer virtually countless varieties of wild flowers. Every state is very rich in natural resources of vegetations. A good amount of natural vegetations are wasted every year due to natural process. The entire seasonal colourful vegetations can be converted into value added products by using simple dehydration technique. Collection of these vegetations will not create any imbalance in nature. The technique has been simplified in such a way that one can learn it within two days. A cottage scale industry based on dehydrated floral craft can come up for self employment. Such a creative occupation will help rural women to come out from their drudgery of daily life. There is large potential to develop the dry flower industry in India and to provide employment generation besides self employment as the industry is labor intensive. This is indeed what Rural India needs. Lack of basic infrastructure, information and lack of State initiative are some stumbling blocks for this industry. With innovative training programmes and awareness campaign there is a lot which could be done for promotion of dry flowers' export.

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SPRAY DRYING: APPLICATION IN MICROENCAPSULATION OF FOOD INGREDIENTS

A. Jeyakumari*, U. Parvathy, L . Narasimha Murthy
and S. Visnuvinayagam

Spray drying is one of the most commonly used microencapsulation and drying technologies in food and pharmaceutical industries. It produces the microcapsules in the micrometer to millimeter range. Microencapsulated food ingredients are used for developing healthy and novel functional foods.

MICROENCAPSULATION

Microencapsulation¹ is a process of coating of small particles of solid or liquid material (core) with protective coating material (matrix) to produce microcapsules in the micrometer to millimeter range. The active agent that is encapsulated is called as core material, the active agent, internal phase, or payload phase. The material that is encapsulating is called as coating, membrane, shell, carrier material, wall material, external phase or matrix. There are two forms of encapsulates they are i) reservoir type; and ii) matrix type (Figure 1). In reservoir type, the active agent is surrounded by an inert diffusion barrier. It is also called single-core or mono-core or core-shell type. In matrix type, the active agent is dispersed or dissolved in an inert polymer.

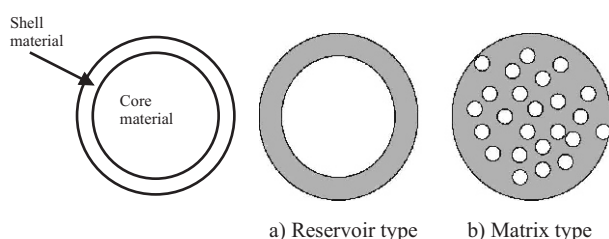


Fig. 1. Morphology of microcapsule

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PURPOSE OF MICROENCAPSULATION

In the food industry, the microencapsulation process is applied for following purposes²;

- To protect the core material from degradation and to reduce the evaporation rate of the core material to the surrounding environment.
- To modify the nature of the original material for easier handling.
- To release the core material slowly over time at the constant rate.
- To mask unwanted flavor or taste of the core material.
- To reduce each nutrient interaction with other ingredients

SPRAY DRYING

Spray drying³ is one of the most commonly used microencapsulation and drying technologies in food and pharmaceutical industries because the process is flexible, economical, efficient, easy to scale-up, easily available equipment and produces good quality powder. It has been extensively used in the encapsulation of bioactive food ingredients such as proteins, fats, vitamins, enzyme and flavours. Microencapsulation of food ingredients by spray drying involves three major steps;

- 1) Preparation of Emulsion: For encapsulation of any bioactive compounds, preparation of stable emulsion is a primary step³. Emulsion is a

mixture of two or more liquids that are normally immiscible. To aid the process, the addition of emulsifiers is required. Emulsifier is a substance that stabilizes the emulsion by reducing the interfacial tension between the two phases by forming a rigid interfacial film which serve as mechanical barrier to coalescence. Once the wall or coating material is selected for encapsulation of active ingredient, it must be hydrated. After solubilization of wall material, the active ingredient to be encapsulated (ex. flavors, vitamins, minerals, oil etc.) can be added to wall material solution. Then, the mixture to be homogenized to create small droplets of active ingredient within the wall material or encapsulating solution. A typical ratio of encapsulating agent to core material is 4:1. Emulsion can be prepared either two layers or multilayer system (Figure 2) for improved stability⁴.

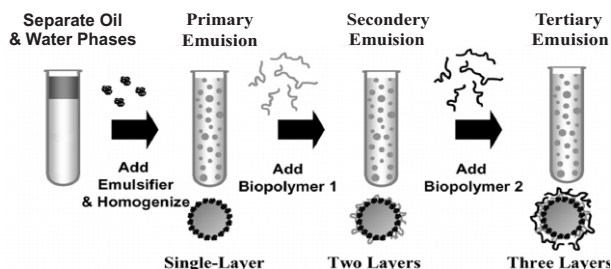


Fig. 2. Preparation of Multilayer emulsion

- 2) Atomization of the In feed Emulsion: The core-wall material mixture or emulsion is fed into a spray dryer where it is atomized through a nozzle or spinning wheel. The major components of a standard spray dryer include an air heater, atomizer, main spray chamber, blower or fan, cyclone and product collector (Figure 3).

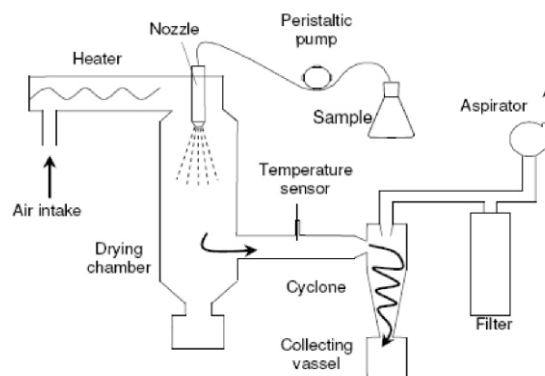


Fig. 3: Schematic diagram of Spray drying

- 3) Dehydration of the Atomized particle: When the atomized particle contacts hot air flowing in either a concurrent or countercurrent direction, water is evaporated and a dried encapsulated product will be produced. Morphology of microencapsulated product obtained by spray drying will be matrix type with the particle size of 10-400 μ m.

Coating/wall materials used for micro - encapsulation of food ingredients by spray drying³

The choice of a wall material for microencapsulation of food ingredients by spray-drying is very important to achieve better encapsulation efficiency and microcapsule stability. The wall material plays a major role in protection of core or active ingredient from factors that may cause its deterioration and also limit the volatile losses. The criteria for selecting a wall material are mainly based on the physico- chemical properties such as solubility, viscosity, molecular weight, glass/melting transition, film forming, and emulsifying properties etc. Hence, the selection of wall material or encapsulating material according to the desired application is an important task. Wall materials used for microencapsulation of various food ingredients by spray drying are given in Table 1.

Table 1: Wall materials used for microencapsulation of food ingredients by Spray drying^{2,8}

Food ingredients	Coating material used
Fish oil	Gelatin, maltodextrin, casein, lactose, sodium caseinate, dextrose equivalence, highly branched cyclic dextrin, methylcellulose, hydroxypropyl methylcellulose, n-octenylsuccinate, derivatized starch/glucose syrup or trehalose, sugar beet pectin, gum arabic, corn syrup solids, egg white powder
Poly phenols: Black carrot extracts (anthocyanins), procyanidins, olive leaf extract, <i>Hibiscus sabdariffa</i> L. extract (anthocyanins), soybean extract, grape seed extract, apple polyphenol extract, olive leaf extract, oregano essential oil, mint oil, cardamom oleoresin, black pepper oleoresin, cumin oleoresin, turmeric oleoresin	Maltodextrin, gum arabic, chitosan, citrus fruit fiber, colloidal silicon dioxide, maltodextrin and starch, sodium caseinate, soy lecithin, skimmed milk powder, whey protein concentrate, gelatin
Vitamin C, vitamin A	Tripolyphosphate, cross-linked chitosan, starch, β -cyclodextrin, maltodextrin, gum arabic,
β -Galactosidase, lipase from <i>Y. lipolytica</i>	Chitosan, modified chitosan (water soluble), alginate, calcium alginate and arabic gum, α -amylase, gum, α -amylase,
Hydrolysate and peptide	Soy protein isolate, gelatin, whey protein concentrate, alginate, maltodextrin, gum Arabic, carboxymethylated gum

ADVANTAGES AND DISADVANTAGES OF SPRAY DRYING PROCESS²

Advantages

- | Relatively simple, fast and easy to scale-up, equipment is readily available
- | The cost of spray-drying method is 30–40 times cheaper than other encapsulation method
- | Both hydrophilic and hydrophobic polymer can be used
- | Ideal for production of sterile materials
- | Rapid solubility of the capsules
- | It increases stability and shelf-life of food product
- | It improves handling of the viscous and sticky food materials.

Disadvantages

- | Considerable amounts of the material can be lost during the process due to sticking of the microparticles to the wall of the drying chamber.
- | Process variables that should be optimized for encapsulation
- | Non uniformity of microcapsule size
- | Limitation in the choice of coating material
- | Produce very fine powder which needs further processing
- | Not good for heat sensitive material

CHALLENGES

Microencapsulation by spray drying offers numerous benefits to the materials being

encapsulated. It provides an effective protection for active agent against oxidation, evaporation or migration in food and to convert liquids to powders. In spite of recent developments of spray drying technique, the process remains far from completely being controlled for microencapsulation of active food ingredients. Spray drying technology is yet to become a conventional tool for food industry to produce encapsulated ingredients. To produce effective encapsulated products, the appropriate selection of coating material is great challenge which can be achieved by multidisciplinary based research approach and consideration of industrial requirements and constraints.

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KNOW SOMETHING ABOUT THE MEDICINAL VALUE OF PLANTS WHICH ARE NATURALLY PROPAGATED DURING MONSOON SEASON

Gamit Yogita B*

Today traditional systems of medicine which utilize mostly plant derived prescriptions, remain the source of primary health care for more than 3/4th of the third world population. It is estimated that a one third of a world pharmaceuticals are of plant origin. It is naturally felt that there is a need to make on humble attempt to acquiring and familiarize every sector of human society which are available to us. This article deals with the beneficial role of plant "*Achyranthus aspera*" & *Cassia tora L.* These are naturally propagated during monsoon season found along road side wastelands. Now a days the majority of rural people who poor and can not afford costly allopathic drugs. On the other side the above mentioned plants are easily available, affordable and without any adverse effects. All part of these herbs are very useful for human health. Popularly this herbs are commonly known as *Anthedo* (*Achyranthus aspera*) *konarriaya* (*Cassia tora*). These plant have been used in the treatment of in diarrhoea dysentery, menorrhagia, piles, rheumatism, skin diseases, toothache.

INTRODUCTION

India has rich history of using plant for medicinal purposes. "*Anthedo*" & "*Konarriya*" are useful herbs which are naturally propagated during monsoon season. (a) The botanical name of *Anthedo* is *Achyranthus aspera*. Its Family name is Amaranthaceae. Its English name is Prickly-flower. Its local name is latjira.(b) The botanical name of *Konarriya* is *Cassia tora*. Its Family name is Ceasalpinaceae and English name is Foetid cassia. Its local name is prapunnada.

General Description: Anthedo is erect branched annual herbs with quadranches; leaves opposite, elliptic to ovate or obovate; flowers greenish-white, peduculate, deflexed. In terminal or axillary growing undershades of forests and along road-side wasteland. Konarriya is annual herbs or undershrubs; leaflet 3 pairs, with linear-cylindric glands; flowers yellow axillary solitary, or in 1 to 3-flowered racemes; with 7 fertile stamens; pods linear-cylindric beaked, 15 to 25-seeded rhomboidal, glossy, dark coloured. Common weed of road-sides and wasteland, also found in degraded forest areas

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forming ground vegetation. The World Health Organization (WHO-2002) estimated that 80% of the population of developing countries relies on traditional medicines, mostly plant drugs for their primary healthcare needs. Plants are the most consistently successful source of drug leads. These medicinal herbs have been commonly used for treatment of various ailments in traditional way for several generations. In many countries traditional medicines provide the only affordable treatment available to poor people. In the last few decades there has been probably an upsurge in the use of drugs based on plant sources because of the miraculous effect and no side effects like that of synthetic medicines. Much modern day medicines are directly or indirectly derived from plant sources. So this article highlights on the potential of this plants for further treatment cure on various major diseases. Drugs in chemical doses or synthetic form have swapped herbal healing at a certain level. But, now people have started realizing various problems related with synthetic drugs like side effects, chemical pollution, cost efficiency and availability. Renaissance and awareness on herbal medication is

now accelerating its pace. Anyone can easily afford these herbal medicines. Various parts of the herbs like the stem, leaves, roots, flower and fruit are used to cure health and skin disorders. In the age of speeding up medical cost and their side effects, people are turning to herbs, the "natural medicines".

We must consider seriously the importance of medicinal plants in the developing countries. In many cases, these countries simply cannot afford to spend millions of dollars on imported medicines which they could produce or extract from their tropical forest plants. In many research paper, I propose the type of plants which are naturally propagated after monsoon season. They are locally available and are usually readily accepted by the people. So there is no need for investment for growing these plants.

ANTHENDO (PRICKLY FLOWER)

Chemical Constituents: The roots contain triterpenoid, saponins, betaine, achyranthine, hentriacontane, ecdysterone and two glycoside of oleanolic acid have been reported. The dried dehusked seeds contains amino acids and potassium¹.

Properties: Plants is acrid, bitter, thermogenic, expectorant, carminative, digestive, stomachic, laxative, anodyne, depurative, anthelmintic, diuretic, lithontriptic, sudorific, demulcent, haematinic and antiinflammatory².

Medical Importance: The Juice of the plant is abortifacient. It is given in diarrhoea, dysentery, menorrhagia, piles, rheumatism, inflammation of internal organs, skin diseases, toothache etc. As a diuretic a decoction of the herb is given in one to two doses three times a day. It is used in case of renal or urinary calculi & the decoction is given to a pregnant lady. It would act as an abortifacient and also cures boils pimples, skin rashes. Oral application of plant powder is effective in treating whooping cough and rheumatism. External application of dried plant is used in snake bite & mild fever. Dried Aerial parts are used in menstrual problems. It is used as an emmenagogue, abortifacient, anti arthritic and to

expel the dead foetus. Oral application of seeds power is useful in treating snake bite & hydrophobia. The ash of the weed contains a high proportion of potash & therefore the ash is an important constituent of alkaline medicine and caustic pastes³.

The powder of the root & add honey to it & drop of the same are placed in the eyes. It is good in cataracts & root powder with water given after dinner everyday is useful in night blindness. A paste of the roots is applied in ophthalmia and opacity of the cornea. To induce abortion, prepare decoction of the root & apply 2 ml of it the interior part vagina. To induce labour pain, paste of the fresh root is applied on the outer parts of the vagina. 3-4 ml of fresh decoction of root is given orally twice day for 7 days for anorexia. An Infusion of the roots is a mild astringent; it is for bowel complaints, puerperal, infertility in woman decoction of the stem & roots is given thrice a day for 3-6 months.

The leaves juice is used for same complaints as the juice of the whole plant. A paste fresh leaves is applied over insect bites. The fresh leaf juice with a little opium is applied to primary syphilitic & sores. In hemorrhage, oral application of the 3-4 ml of leaves decoction is useful. In fever, oral application of 5-6 of decoction prepared from the leaves of the plant. For anorexia, 2-3 ml of leaves extract is given orally along with black salt two times a day for a week. In amenorrhea, decoction of the leaves is given in empty stomach twice a day for a month⁴.

KONARRIYA (FOETID CASSIA)

Chemical Constituents: The whole plant contains anthraglucosides that on hydrolysis yield emodin and glucose, chrysophanol and rhein. The seeds yield a fatty oil consisting of oleic, linoleic, palmitic and lignoceric acid and sitosterol⁵.

Properties: Leaves & seeds are acrid, thermogenic, laxative, depurative, antiperiodic, anthelmintic, anthelmintic, liver tonic, ophthalmic, expectorant and cardiotoxic⁶.

Medical Importance: The leaves are antiperiodic, aperients and alterative. They are generally given to children having intestinal disorders. Their decoction

is mild laxative in doses of two ounces. Especially for children having fever while teething. The decoction of leaves is laxative. The leaves and the seeds are use in skin diseases. Leaves are use for itching ring worm, malignant ulcers, tumors, leprosy fever, laxative, purgative, jaundice intestinal in children and malaria. Leaf decoction is given in case of swelling of the body parts. The leaves paste make with cards is applied over the affected parts. To relieve boils, leaves are crushed and tied over the affected part it relieves and heals and the wound quickly. The seeds are used as a substitute for coffee. The powder of the seeds is used in asthma. The powder is mixed with jaggery(2-3 years old) and about 7 small balls are prepared. One ball is taken every day with water up to 7 days. Seed powder mixed in nimbus Juice is effective against ring worm. Seeds are a tonic, but they are particularly used externally in skin diseases. They contain chrysophanic acid and so have the same uses in skin diseases. Decoction of fruit is used in headache, arthritis and herpes. For normal and painless delivery root powder (10 g) is fixed in the cotton cloth and dipped in Til (*Sesamum indicum*) oil. The cloth is then inserted in vagina.

DISCUSSION

India lives in villages with 72.90% of her population and 98% her total geographical area. India is blessed with an enormous diversity of medicinal and aromatic herbal plants for harnessing good health for all. Over the last decade more and more people have turned to herb instead of or in addition to their doctor to help or prevent disease. We can think of several reasons why. For one thing, some people have lost faith in mainstream medicine especially if it has failed them and if herbal product manufacturers offer hope of cure. And many people think any natural treatment is inherently safer or better than one produced in a lab high tech manufacturing facility. The present disciplines of medicinal science in India like Ayurveda, Unani, Homeopathy and Allopathy are enriched with the herbal resources of nearly 80% sps and generic diversity of the plants in course of time. The health

awareness and fear of the side effects of allopathic medicines are the main causes for diversion in herbal plants increasing day by day in the global perspective. Now a day the majority of rural people who are poor and can't afford allopathic drug depended on it. Much morden-day medicines are directly or indirectly derived from plant sources, so it would be foolish to conclude that plants offer no further potential for the treatment or cure of major diseases. World wide, the botanical pharmacopoeia contains tens of thousand of plants used for medicinal purposes. Indigenous medicines are relatively inexpensive; they are available and are usually really accepted by the people. Presently in India about 1800 brands of herbal medicines are used by allopathic doctors and 500 by veterinary doctors and all allopathic drugs manufacturers like Gufic, Ranbaxy, Frankovian, Himalaya Drugs etc. are also manufacturing herbal product. Herbs are on many of conscious folks in their regular diets. People prefer green herbs not only because of low fatty oil contain for good health but also to maintain and restore their vibrant beauty. I also say, herbs are a boon for every creature living on this planet called "Earth". Man has been using herbs for thousand of years. Herbs play a major role in beauty aids and therapies as well. According to tribal in Central and Western Central India, 'there is not a single herb that is useless'. It is indeed true; there has not been a single civilization on earth that has not included herbs as medicines in its historical record.

CONCLUSION

Since time immemorial medicinal plant & their uses have been a part of our social life & prove to be powerful allies various health problems. These medicinal plants are affordable, eco-friendly and having less or no side effects as compared to synthetic drugs and even can be grown in house hold kitchen garden. The real wealth of nation is health of people. So every one should use the plant & enjoy long, healthy life. If we believe on the recent report of the WHO which states the human body will become immune against all the antibiotics up to 2020. In this situation only herbal only drugs would be the only avenues for curing different diseases.

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SEARCH ENGINES: INFORMATION RETRIEVAL ON THE WEB

Suruchi Chawla

Information on the web is huge and search engines are used for Information Retrieval on the Web. Information Retrieval deals with the representation, storage and organization of data. Search engines are an application of Information Retrieval on the web. The user search query issued for web search retrieves a large collection of web documents out of which very few are relevant. Google search engine has been used widely for web information retrieval. The major challenge in the field of Information retrieval is to increase the number of relevant documents and satisfy the information need of the user. This article explains the generic architecture of search engines, working of search engines and challenges in the field of Web Information Retrieval.

INTRODUCTION

Web Information Retrieval is used for retrieval of information relevant to the user search query. Information on the web is diverse in content and catering to the different information need of users is a big challenge. In current scenario, the users use search query of average size two to three keyword for web search. The search engines use the keywords of user query to search in their repository of web documents to retrieve the relevant documents and presented to the user. The search results are presented in order of their ranks such that relevant documents are ranked higher than those with low relevance. Google Search engine has been widely used by web users for searching. It is found that user has to sift through the large collection of search results out of which few are relevant. The biggest challenge in the field of Web Information Retrieval is to increase the number of relevant documents for a given search query and satisfy the information need of the user effectively^{8,9,1,4}.

SEARCH ENGINES

Search engines are an application of Information Retrieval on the Web. Information Retrieval deals with the representation, storage and access to Information on the web. The generic architecture of search engine is shown below in

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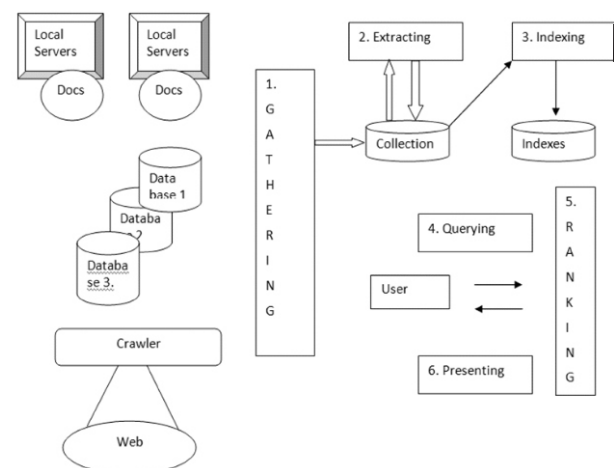


Fig.1. Shows the Generic Search Engine Architecture⁶.

Fig 1.^{5,6,10} The search engines gather the content of web documents using crawler, the crawler is software that performs the crawling for extracting the content of web documents and store it in local repository. The indexer performs the indexing to create the index of crawled documents for fast look up of documents for retrieval. The user search query is processed using query processor to generate the set of keywords which are look up in index to select the documents which contain most of the keywords of search query. The selected documents are ranked in accordance to their relevance to search query and presented to user.

CRAWLING

The crawler uses the list of document addresses (URLs) of web pages and retrieves them from the web. Crawler proceeds by taking the first URL of web page and fetches its content from the web. The web page which has been fetched is scanned for unseen links and put at the end of list for further processing. Thus process of fetching the content of URLs from the web and retrieving of the unseen URLs continues till there are no more URLs to be fetched. The page contents which have been crawled are saved for indexing. The crawling process is done on hundreds of distributed crawling machines⁶.

INDEXING

Indexing generates the table which records the term and document data. The indexing process is done in two phases. In Phase I, the content of documents is scanned to identify the key terms and for each keyterm, the document number and its position is stored in table. In Phase II, the table containing the keyterm and document number is inverted to generate the inverted file structure.

QUERY PROCESSING

The user search query is composed of set of keywords and average size is 2 to 3 keywords. In Query processing, the set of documents containing all terms of query are retrieved and presented to the user. The entire procedure involved in query processing is as follows, the terms of search query are searched in index and the list of documents containing those terms are collected. The documents common to all list is retrieved and presented according to their score to users.

There are number of search engines like AltaVista, Excite, Infoseek, Lycos, Inktomi, Northern Light, Yahoo!, and AOL. In 1999 Google search engine was started. In 2002 and 2003, Yahoo! acquired Inktomi search and search technology was built by Overture which owned AltaVista and AlltheWeb. In 2001 Teoma search was acquired by Ask.com (formally called Ask Jeeves) for providing search and question answering. Microsoft has gradually built its own engine: MSN search, Windows Live Search, Live Search, and Bing¹¹.

The keyword based search engines are AltaVista, Excite, and Northern Light. Besides keyword based search engines Ask Jeeves simulates an interview, DirectHit rank web pages based on their popularity and Yahoo search is based on categories¹².

In study conducted it is found that google and yahoo web search services appears to be of same quality when considering more than seven search results. Google is the most popular search engine used by users due to large number of relevant document description. It is the selection of relevant part of document for description which makes Google different from other search engines¹³.

Ask.com outperforms the genuine German search engine, Seekport, as well as Microsoft's MSN. It is found that Google outperforms Lycos and Altavista. The results show that all search engines shows overall low precision. A study was conducted and it is shown that none of tested search engines receives a good overall relevance score. Implementations of most of the search engines are not available in the public domain but there are some search engines like AltaVista, Harvest, and Google which has been described and explained as follows^{12,13,14,15}.

AltaVista's software architecture is divided into parts first part contains user interface and query engine. the second part contains crawler and the indexer. In Harvest search engine there are two main elements : gatherers and brokers. The job of gatherers is to collect and extract indexing information from one or more Web servers. Brokers receive information from gatherers or other brokers to update their indices¹².

GOOGLE SEARCH ENGINE

The design of the Google search engine allows it to index the gigantic data on the web. The index and data structures are stored optimally for quick access. The user input query to search engines retrieves a large collection of documents based on index file. Google uses the Page Rank algorithm which utilizes the link structure of the web to calculate the quality ranking of web page and anchor text for improving

the precision of search results. The Page Rank algorithm is based on the assumption that a surfer gets bored on a given web page and requests another random page. The Page Rank of a page A $PR(A)$ is given as follows in eq 1:

$$PR(A) = (1-d) + d \left(\frac{PR(Y_1)}{C(Y_1)} + \dots + \frac{PR(Y_n)}{C(Y_n)} \right) \quad (1)$$

Assuming that page A has n pages $Y_1 \dots Y_n$ pointing to it and d is damping factor which is the probability of random surfer to get bored on a given page and request another random page.

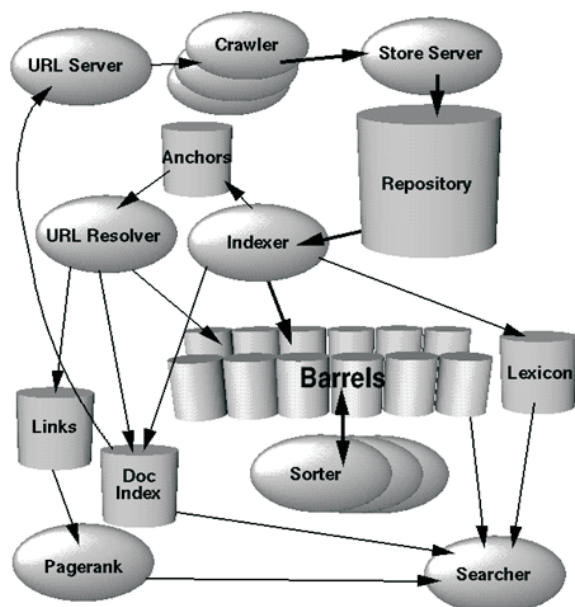


Fig.3. Shows the Google Search Engine Architecture².

The value of d lies in $[0,1]$ and $C(P)$ is number of outlinks of page P. The Google search engine architecture is shown in Fig 3. In Google, distributed crawlers are used for web crawling. Documents are indexed and uncompressed, generating a partially sorted forward index and an inverted index. Documents are retrieved using the inverted index and the lexicon. Selected documents are ranked using the Page Rank method².

CHALLENGES

In the survey, it is found that users on average use two to three keywords for web search and¹⁷ there is a vocabulary gap between user queries and keywords used in documents. Due to small query size and vocabulary gap, the relevance of search results decreases. The challenges to search engines for effective information retrieval are like web spamming, cloaking. It is shown that for 85% of the queries, only the first search result web page is examined. Thus, the first web page displays 10 search results, so the entire web user traffic is towards those webpages which are ranked in the top 10 search results. Thus, some web authors deliberately manipulate their placement in the ranking order of various search engines, commonly called as search engine spam. The author creates links on the web pages with the objective that users will find the related content relevant. But there is an exception called as link exchange program in which authors agree to reciprocally link in order to improve their connectivity and rankings, and advertisement links. Research is going on in the field of information retrieval in order to increase the effectiveness of search engines for better satisfying the information need of the user^{3,7,16}.

CONCLUSION

Search engines are used for Information Retrieval on the web. The crawler, indexer, and query processor are the main components of search engines. Crawlers perform the crawling of web documents, and their content is extracted for storage in the repository. The indexer performs the indexing and generates the inverted file structure using the content of crawled documents. During web search, the user query is processed and searched in the index to select the documents for retrieval. The retrieved documents are ranked in order of relevance to the query and presented to the user. The big challenge for effective information retrieval is to infer the intent of the user's web search and satisfy the information need of the user.

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BIZZARE ROLE OF SALICYLIC ACID IN PLANTS

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Salicylic acid obtained from Willow plant was traditionally used to relieve pains. Since last few decades their functional role in plants particularly, in thermogenesis, *in vivo* and *in vitro* growth and morphogenesis, abiotic stress tolerance and plant disease resistance has been demonstrated. Its role as plant growth hormone has been established beyond doubt.

INTRODUCTION

'Aspirin' is the most popular drug commonly used to reduce pains, inflammation and fever besides its prophylactic use to lower the possibility of heart attack/ stroke and variety of cancers. The drug with above trade name was derived from an acid¹⁶-salicylic acid²⁰ by its acetylation by Felix Hoffman working with Bayer Pharmaceutical Company in USA. Historically salicylates have been in use for more than two centuries. Traditionally, in ancient times in Rome, Asia and new world, the American Indians and Greek used bark of Willow (*Salix*) trees as folk medicine to relieve pain. Efforts were made by group of French and German scientists to identify and characterize the active ingredient in Willow bark. Johann A. Buchner (1828) in Munich succeeded in isolation of a purified substance then called as 'salicin' which was glycoside of salicyl alcohol. The name salicylic acid (SA) derived from the Latin name *Salix* for willow tree, was given by Raffaele Piria in 1838. The first commercial production of synthetic SA began in Germany in 1874.

SA is a phenolic compound synthesized throughout the plant kingdom *via* the phenylpropanoid pathway. Research efforts during past few years have focused on this molecule to elucidate its role in plant physiology. SA also known as *Ortho*-hydroxybenzoic acid like any other benzoic acid, is formed by side chain degradation of cinnamic acids, which are important intermediates in the

shikimic acid pathway. Traditionally, plant phenolics were considered to be relatively less important or waste products. However, they received much attention in last few decades for their functional role in lignin biosynthesis, allelopathic interaction,

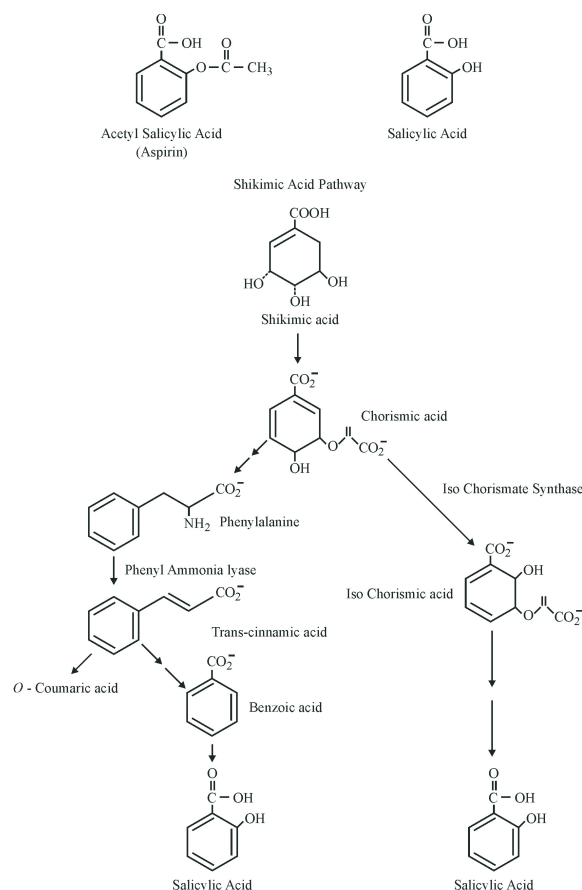


Fig. 1. Suggested Pathways of Salicylic Acid Biosynthesis in Plants

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regulation of plant responses to abiotic stimuli and plant disease resistance against various phytopathogens. SA in particular, has been found involved in seed germination, seedling establishment, cell growth, respiration, stomatal closure, senescence-associated response to abiotic stresses, basal thermotolerance, nodulation in legumes and fruit yield. SA is a key signal molecule in regulating thermogenesis and disease resistance. Recent studies suggest its role in plant tissue culture and somatic embryogenesis. Its role as plant hormone has been established beyond doubt. A recent survey of SA content in the leaves and reproductive structures of 34 plant species confirmed its ubiquitous distribution in plants¹.

Biosynthesis of SA in plant has been a subject of much controversy and debate. Biochemical studies suggest that SA is synthesized from phenylalanine with benzoic acid as an immediate precursor (Fig.1). Recent studies however, indicate that >90% of SA is synthesized from iso-chorismate (Fig.1). Isotope feeding experiments conducted with several plant species suggest that plants synthesize SA from cinnamic acid produced by the activity of phenylammonia lyase (PAL)². A brief summary of plant responses to SA has been described.

(A) THERMOGENESIS

Thermogenicity is a unique property of certain plant species which generate heat in the inflorescences during blooming³. It was first described by Lamarck, however it was also reported in for the genus *Arum*^{4,5}. Subsequently, such phenomenon was reported in male reproductive structures of cycads and flowers or inflorescences of some angiospermic species belonging to families Annonaceae, Araceae, Aristolochiaceae, Cyclanthaceae, Nymphaeaceae and Palmae. Studies have revealed that thermogenesis is associated with an increase in the alternative (cyanide insensitive) respiratory electron transport system, which is unique to mitochondria of plants, fungi and some protists. The increase in use of this pathway leads to consumption of oxygen in the inflorescence of *Arum* lilies generating heat as high as that of a humming bird in flight. In one of the *Arum* lilies-Voodoo lily,

the temperature of appendix (upper part of spadix) increases by 14⁰C above the ambient temperature on the day of blooming^{6,7}. The heat causes release of foul-smelling amines and indoles attracting insect pollinators. It was suggested that this high metabolic activity is triggered by 'Calorigen' a water-soluble substance produced in male (staminate) flower primordia located just below the appendix. The 'Calorigen', which evaded characterization for long was finally identified as salicylic acid. It has been found that a day prior to blooming in 'Voodoo lily' the levels of salicylic acid increase by 100-folds (Ca. 1.0 µg/g of fresh weight)^{8,2}. The increased levels of SA returned to normal (pre-blooming) after the thermogenic period was over. The thermogenic response could also be induced by external application of SA to the sections of immature appendix proving the role of SA in thermogenic reactions. Such increases duplicated the temperature increases produced by the crude 'Calorigen' extract both in magnitude and timing, indicating that SA is 'Calorigen'. Further, it has been clearly established that both 'Calorigen' and SA induced alternative oxidase gene and alternative oxidase protein eliciting such responses in thermogenic plants. Increasing number of reports on the induction of flowering by SA have led to believe that endogenous SA may play vital role in flowering of plants even in those which are not overtly thermogenic.

(B) IN VIVO PLANT GROWTH AND DEVELOPMENT

The physiological functions of SA have been known to us for more than two decades now. One of the earliest report suggested the role of SA in growth and flowering in *Spirodela polyrrhiza*⁹. The stimulatory role of SA on flowering was subsequently demonstrated in other plant species. SA is now considered to be an important signal molecule involved in several physiological phenomena in plants². Its role as a plant hormone is now well established. Enhancement of stem elongation and flower bud regeneration by SA has been reported. Although, a large number of plant hormones are involved in seed germination, the role of SA in seed germination has been controversial as it can inhibit or

enhance germination. It is suggested that SA concentration plays an important role in this event. In a separate study it has been observed that in the presence of SA the *Arabidopsis* seed germination increased up to 80% under normal conditions as against 50% under salt stress conditions¹⁰. This is perhaps due to reduction in oxidative damage affected by SA application. Proteomic analyses have shown that two super oxide dismutases (SODs) are induced by SA which might contribute to enhanced antioxidant capacity¹¹. More recently, it has been suggested that SA regulates the photosynthetic activity in plants by affecting leaf and chloroplast structure, stomatal closure and by altering the chlorophyll and carotenoid contents. Effect of SA on RuBisCO and carbonic anhydrase has also been reported. The physiological effects of SA on photosynthesis are also dependent upon its concentration and plant species. High SA concentrations (1-5 mM) have been reported to reduce photosynthetic rate and RuBisCO activity in barley and reduced chlorophyll contents in cowpea, wheat and *Arabidopsis*. The diminishing photosynthetic activity at high SA concentrations has been attributed to alterations in leaf anatomy, thylakoid structure and light-induced reactions linked to them. In contrast, a lower concentration of SA (10 μ M) registered improved net CO₂ assimilation in mustard seedlings, up-regulation of photosynthesis related metabolites and enzymes was also observed. Phototolerance and light acclimation are highly regulated by levels of SA in plants. Increase in SA levels in *Arabidopsis* plants grown under high light intensity (e.g. 450 μ mole m⁻² s⁻¹) as compared to low light intensity (100 μ mole m⁻² s⁻¹) has been registered. The regulation of light acclimation might be due to integration of multiple pathways preceded by SA accumulation. Regulation of stomatal opening and closing and role of various factors have been studied in detail. Recent evidence suggests that SA plays an important role in stomatal closure affecting photosynthesis. Application of 0.4

mM SA induced rapid stomatal closure and reduction in stomatal gas exchange in *Arabidopsis*¹². SA has been reported to influence respiration by induction of alternative respiration pathway dependent on expression of AOX gene. SA may also control electron transport and oxidative phosphorylation in plant mitochondria. Stimulation of flowering by treatment with SA in many genera of Lemnaceae family, including long day (LD), short day (SD) and photoperiod-insensitive types has been reported. A transcription factor linking SA and flowering was recently reported in sunflower¹³. Senescence is an important physiological phenomenon in plants characterized by a decline in photosynthetic activity and increased ROS levels due to loss of antioxidant capacity. These events seem to be regulated by SA. In senescent leaves of *Arabidopsis*, SA levels increased by about 4-fold at the mid-senescent stage. Detailed gene analysis of senescence in *Arabidopsis* leaves has revealed involvement of SA signaling pathway. In a separate study SA has been found to inhibit K⁺ ion absorption in plants. The degree of inhibition was both concentration and pH dependent. It has been suggested that under proper conditions of pH and concentration, SA could significantly influence mineral absorption in plants in the field. SA has been shown to inhibit ethylene biosynthesis. Such inhibition by SA may be due to blocking of conversion of 1-aminocyclopropane-1-carboxylic acid to ethylene. Interaction studies with SA and polycationic polyamines suggest that by affecting the PA catabolism SA can contribute to plant abiotic stress tolerance. Induction of polyamine biosynthesis in tomato plants by long term pre-treatment with SA at low concentration has been reported. Regulation of gravitropism, inhibition of fruit ripening and tuberization by SA has also been reported. There are number of other physiological processes in plants which might be partially or fully influenced by SA. Although it is not clear as to how SA mediates these responses, however, its role in growth and development is undisputed.

(C) REGENERATION OF PLANTS THROUGH TISSUE CULTURE

Like any other plant hormone, incorporation of SA in the tissue culture media has been tested in many cases. SA has been reported to improve somatic embryogenesis in *Coffea arabica*¹⁴, *Astragalus adsurgens*¹⁵ and *Avena nuda*¹⁶. Exogenous supply of SA in tissue culture media also improved *in vitro* regeneration in *Hibiscus acetocella* and *H. moschentos*. Further, SA evoked beneficial effects on shoot multiplication, root formation and elongation. In another experiment, SA has been shown to promote viability of gel matrix encapsulated shoot buds of sunflower derived from *in vitro* cultures. Alginate encapsulated shoot buds under influence of SA registered 59% survival even after 90 days of storage under low temperature (4°C) conditions as compared to 18% in sucrose supplemented alginate matrix. Promotory role of SA in callus growth, shoot development, rooting and hardening of *in vitro* derived plantlets of *Ziziphus spina-christi* has also been reported. SA stimulated carrot somatic embryogenesis up to certain level while its higher concentration caused inhibition. It has been presumed that elevated levels of ethylene in SA treated cultures adversely affected embryogenesis and somatic embryo maturation in carrot callus cultures. This is in contrast with the other observations where accumulation of SA caused ethylene inhibition.

(D) ABIOTIC STRESS TOLERANCE

The term "abiotic stress" includes many stresses caused by environmental conditions such as drought, salinity, UV and extreme temperatures. Plants have developed suitable strategies to defend against these stresses. These include increase in reactive oxygen species (ROS) and cytosolic Ca²⁺ as well as activation of kinase cascades. Accumulation of ROS, though undesirable, has been shown to have a role in priming plants for enhanced stress resistance. However, excess ROS can lead to cell death and perturbed development. Significant increase in the concentration of SA under stress conditions has been reported. There are increasing

evidences suggesting involvement of SA in response to abiotic stresses such as ozone, salt and osmotic, UV-B, drought, herbicide, heat, cold and metal stress^{17,18}. There are contradictory reports regarding the role of SA in plant resistances to abiotic stress. SA at its different concentrations has shown different responses. The same pre-treatment with exogenous SA may result in opposite responses in different plant species. Surprisingly, the same SA concentration can promote resistance to one kind of stress while decreases resistance to another stress. Nevertheless, it illustrates that different stresses can either be dependent or independent of SA action. It is generally believed that SA concentration in the range of 0.1 mM to 0.5 mM confers tolerance against abiotic stresses. SA concentrations more than 1.0 mM tend to cause oxidative bursts and cell death. It is now well known that accumulation of SA is usually accompanied with ROS. Correspondingly, SA signal and oxidative signal largely overlap. In the transmission of SA/ROS signal, Mitogen activated protein kinases (MAPK) are involved. *Arabidopsis thaliana* encodes 10 MAPK KKKK, 80 MAPK KKK, 10 MAPK K and 23 MAPK, which form complex signaling networks with synergistic and antagonistic links¹⁹.

Plant defenses are orchestrated by reprogramming of gene expression, much of it through regulation of transcription. An intercellular signal transduction network of SA and ROS under abiotic stress condition has been proposed.

(E) DISEASE RESISTANCE

Plants are in perpetual conflict with pathogens and have evolved several strategies of defense to combat invasion. Molecular interaction between cell surfaces and host plants and of pathogen plays an important role in regulation and progression of pathogenesis and disease resistance. On the one hand the host plant has to be able to detect or recognize a potential pathogen as foreign or "non-self" and to use this initial act of recognition to trigger a range of induced resistance mechanism. How does the plant detect the vast majority of potential pathogens in its environment as "non-self" remained a mystery until

recently. It is well known that the plants do not have immune system similar to that found in animals. However, they have evolved a bewildering array of complex mechanism to defend themselves against pathogens. Some of them are pre-formed or constitutive while others are inducible after attack by the pathogens. Inducible responses include production of antimicrobial compounds, enhanced strengthening of cell walls, and the production of various proteins. Host defense involves an integrated response that protects plant from invasion of pathogen locally and in the entire system. The host response to infection is determined by genetic traits in both the host and pathogen. Interaction between host and pathogen triggers a cascade of molecular events leading to hypersensitive reactions in host cells or induction of systemic acquired resistance. Systemic acquired resistance is a unique defense response of plants infected with necrotizing pathogens such as fungi, bacteria and viruses. Interestingly, the resistance extends to plant tissues distant from the initial site of infection which can persist for a prolonged period protecting host from broad spectrum of pathogens. It has been suggested that such response is the result of a coordinated expression of a set of genes (SAR genes) coding for PR proteins. Recent studies have revealed that soon after infection, before the onset of resistance in host plants, SA accumulates in appreciable quantities. The pathogen-induced SAR response could be mimicked by exogenous application of SA which confirmed that SA has a definitive role in SAR response. Currently, it is believed that the host defense response is the result of interaction between the product of host resistance gene and its cognate pathogen-encoded effector protein. More recently this interaction has been termed as 'Effector Triggered Immunity (ETI). One of the most visible manifestations of ETI is the hypersensitive response (HR), in which necrotic lesions develop at the site(s) of pathogen entry. ETI is usually associated with the accumulation of reactive oxygen species (ROS) and the activation of diverse groups of defense-related genes, including those encoding several families of

pathogenesis-related (PR) proteins. A few hours to several days after HR development, the uninoculated portions of the plant often display increased levels of PR gene expression and the development of SAR, a long-lasting, broad-based resistance to infection by a wide variety of pathogens. Systemic acquired resistance implies the production by the plant of one or several translocated signals that are involved in the activation of resistance mechanisms in uninfected parts. The role of SA in disease resistance was first suggested by²⁰, who demonstrated that injecting leaves of resistant tobacco with SA or Aspirin stimulated pathogenesis related protein (PR proteins) accumulation and enhanced resistance to tobacco mosaic virus (TMV) infection. Subsequently, it became established that SA was the actual defense signal. In a study with TMV resistant tobacco it was revealed that the SA levels increased by more than 20-fold in the inoculated leaves and over 5-fold in the systemic leaves. Such enhanced levels were associated with PR gene expression. In an another study increased levels of SA in the range of 10- to 100- fold was observed in the phloem exudates of cucumber inoculated with tobacco necrosis virus, *Colletotrichum lagenarium* or *Pseudomonas syringae* and these increases preceded SAR development²¹. The signaling role of SA was further substantiated by the fact that high temperature growth conditions suppressed both HR and SAR, PR expression and SA accumulation in TMV-resistant-tobacco. In spite of our current understanding about the role of SA in acquired resistance still it is not clear as to how the components of SAR signal cooperate with SA to induce systemic resistance in plants. Full understanding of the mechanism of plant defense will require coordinated approaches involving genetics, biochemistry molecular biology and tools of genomics and bioinformatics. Mutations leading to either reduced SA production and impaired SA metabolism will throw more light to understand this complex phenomenon. Moreover, evolving high throughput method for SA quantification holds the potential of isolating additional mutants related to

SA-mediated defense signaling. Significant progress has been made in understanding the SA- mediated defense signaling network. Genes regulating SA biosynthesis, conjugation, accumulation, signaling and cross talks with majority of plant growth regulators have been characterized.

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STUDIES ON RECOVERY OF COAL BED METHANE AND ITS POSSIBLE UTILIZATION IN POWER GENERATION SYSTEMS

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Coal Bed Methane (CBM) gas is becoming one of the most accepted non-conventional clean energy resources. Commercial viability aspect of Coal Bed Methane is much attractive because of minimum investment during exploration as well as in development and production phases. A case study has been carried out at the CBM Block site in the south-eastern side of Jharia coal field in Dhanbad district, Jharkhand, India. In this paper studies have also been done with the qualitative analysis of ingredients and parameters of Coal Bed Methane exploited from wells and to assess the potential of CBM reservoir for energy security of India with due safeguards for environment. With growing demand and rising oil and gas prices, the economically producible CBM may now be attractive supplementary to liquid petroleum-derived fuels for electric power generation, furnaces and automobiles etc. The oil and gas industries have already entered into CBM projects to develop CBM block because of its growing recognition in diversified energy sources.

INTRODUCTION

Coal Bed Methane can play a vital role for national economic development. India has a high Coal Bed Methane reserves estimating total of 2600 BCM spread over in 11 states and recoverable CBM reserves of about 280.34 BCM have been established by different operators as on 01.01.2014¹. Over the last couple of decades the conventional energy sources have been diversified and gas markets continue to expand rapidly. The potential and important strategic roles of natural gas have been discussed² for the purpose of sustainable energy supply as well as in future global energy development. As per ONGC's report on CBM the first CBM flow in India is from a well drilled in Jharia coal field, Jharkhand in the year 1997. CBM resource potential of the Gondwana Barapukuria coal basin, Dinajpur, the first coal mine of Bangladesh has been assessed providing few useful data³. In a report⁴ the finding costs of CBM have been found lower than for conventional natural gas, 10 countries including India are encouraging the oil and gas industries for

development of CBM blocks and exploring of enhanced Methane gas in the countries. Recently, a modified coal-methane co-exploitation model to achieve enhanced coal mine methane recovery has been proposed, which may subsequently improve mining safety and reduce coal mine methane emission. A study report⁶ has primarily focused on potentiality of coal beds as CBM reservoir for future enhanced CBM recovery from Barakar coal seams, Jharia coal field located in Jharkhand state, India. The other case study⁷ has been done with only the real time drilling data gathered from directional wells in CBM Block of Raniganj coal field, West Bengal. The statistical approach⁸, based on the analysis of data of 27 wells from CBM Blok area in the central part of Jharia coalfield, Jharkhand, has evolved some new empirical equations for assessment of CBM potential of coal seams. CBM can be ideal fuel for co-generation Power plants to bring in higher operational efficiency with lower capital investment for mine dump truck is a part of a successful demonstration project⁹ of title "Coal Bed Methane Recovery and Commercial Utilization Project" at Sudamidih and Moonidih mines of Jharia coal field.

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The present work highlights CBM recovery and production, composition of CBM gas and analytical test data of produced water from the wells under studies. In this paper studies have also been done for utilization of CBM fuel towards generation of power.

CBM VS. CMM

Both Coal Bed Methane (CBM) and Coal Mine Methane (CMM) are rich in methane with little content of other hydrocarbons.

Recovery of both CBM and CMM is associated with liberation of mostly pure methane gas which is consumed as main fuel source for energy generation. In the context of gas production, they are distinct from one another.

CBM production is done in non-mining areas of coal field and involves drilling of wells for the purpose of coal gas recovery using production techniques. The production of CBM gas precedes coal mining, and is a form of de-gassing a coal seam prior to mining.

On other hand, CMM production involves the recovery of coal gas from active underground coal mines. De-gassing of active underground coal mines is done principally for the purpose of mine safety and to ensure economic level of mine productivity and also production rates.

The production of the first one is more commercially viable and environmental friendly than the second.

CBM RECOVERY AND PRODUCTION

Development of methane resources has attracted attention in the recent years as an alternate clean energy source in many parts of the world. Methane is a remarkable clean fuel when burnt, and its combustion produces no SO₂ or other particulates except CO₂ only with full combustion. Coal Bed Methane gas is found in most coal deposits. It is generated during coalification process, the water within the coal cleats (natural fractures) keeps the methane adsorbed onto the coal bed under huge pressure. To initiate and maintain gas flow removing

of water from well is required to be done continuously which gets adsorbed on coal at higher pressure. Under most circumstances, CBM consists of mainly pure methane with traces of other hydrocarbons and also contains other gases like carbon dioxide and nitrogen. CBM remain sorbed (adsorbed and absorbed both) with formation water in coal seam. As water is being drawn out from formation, which is known as depressurization, slowly methane starts flowing out by the mechanism of desorption as well as diffusion and brought to surface normally through vertical wells. To recover CBM gas, initially drilling and casing of well is required to develop production well. The depths of coal seams are determined considering several operational factors for efficient and cost effective drilling. The drilling team draws a detailed plan for drill-boring, selection of drill rigs, design the drilling well along with its casing. Geophysical logging follows at each stage of completion of drilling followed by casing of the well and thereafter cementation. The casing up to desired depth is cemented in single stage with the use of low weight cement slurry with sufficient compressive strength. CBM is a low pressure gas and it needs artificial lift for enhanced production. Figure1 shows a typical CBM well with proper vertical drilling and casing for enhanced production of gas. In Jharia coal field, all four wells were drilled ranging from 400m to 1200m of vertical depth.

Upon reaching the well head, the gas and water are separated and piped to a small metering facility where the production volume from each well is recorded. The CBM collected from a number of wells flows through compressor units and gas pipeline networks to a central unit. De-watering is the process of removing water from a coal seam in the vicinity of a producing CBM well. The water in CBM well is pumped to the surface and as a result the adsorbed Methane is released by reduction of pressure due to De-watering. To maximize gas production from a CBM well pumping is done continuously to minimize bottom hole pressure so that gas can easily

flow through the well. Water production will be high when multiple coal seams are taken for production. The volume of produced water will depend on the number and properties of coal seams and their adjacent strata. Initially a submersible PC pump and thereafter SRP located at the well-head remove the entrapped water causing lower the reservoir pressure along a coal seam, draws the gas out of the coal and allows it to flow into the well bore. The maximum well capacity was 5000SCM/day, but the average production flow rate of CBM gas from wells was maintained from 500SCM/day to 600SCM/day. The average economic productive life of a CBM well is usually 10-15 years.

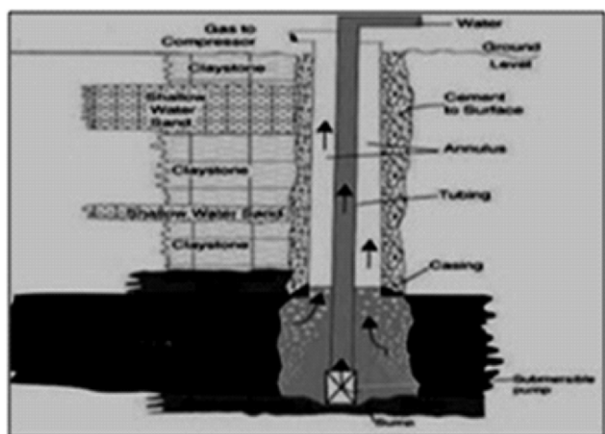


Fig.1. A typical CBM well with vertical drilling.

It is important to be knowledgeable to analyze the current production profile of a working CBM well with an ideal production profile as shown in figure 2 before commencing a commercially viable operation.

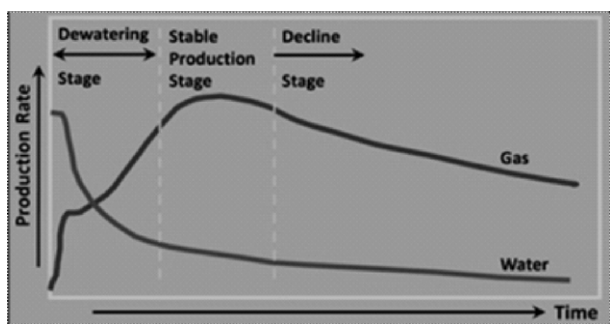


Fig. 2. Ideal production profile for a CBM well

CBM WELL PROJECT JUSTIFICATION

Recovery of the CBM liberates pure methane gas, a clean-burning fossil fuel, which is much more environmental friendly as compared to burning of coal and fuel oil. The CBM, also a highly potent GH gas, if not recovered before opening a coal mine would otherwise be released to the atmosphere with the mine ventilation air, contributing to global warming. Drilling of wells for the CBM is a benign operation with extremely low risk of mine blowout and also mining hazards. The extraction of CBM will reduce lot of ventilation cost as well as electrical installation. The proper planning and execution of the CBM production projects can bring to a country state of art technology, and such projects may surely be a front runner in generating useful data on CBM recovery and enhanced production also. Much of the research effort till today has been led by government agencies in India. This may build up confidence in private and public investors in India.

COMPOSITION OF SAMPLE CBM

The composition of produced sample CBM as collected from the wells has been analyzed for determining the concentration of combustible gas content in it. The result shows a very high percentage of methane and no traces of ash and sulphur compounds. The details are furnished in Table1 and 2:

CBM wells Jharia	Average range of combustible gas content			
	CH ₄ (%)	C ₂ H ₆ (%)	C ₃ H ₈ (%)	C ₄ H ₁₀ (%)
Jh#1	94.00	0.90	0.05	Traces
Jh#2	to	to	to	
Jh#3	98.00	1.50	0.08	
Jh#4				

Table 1. Combustible gas content in CBM

CBM wells Jharia	Average range of other gas content			
	CO ₂ (%)	N ₂ (%)	O ₂ (%)	H ₂ S, SO ₂ (%)
Jh#1	0.07	Traces	0.02	No Trace
Jh#2	to			
Jh#3	0.30		0.05	
Jh#4				

Table 2. Other gas content in CBM

Density of CBM gas collected from wells varies from 0.62kg/SCM to 0.64kg/SCM. CBM is a remarkably clean-burning fuel having higher calorific value of approximately 8500kcal/SCM.

ANALYTICAL TEST OF PRODUCED WATER

Produced water chemistry is a critical concern for the CBM industry because produced water must be disposed off safely and economically without causing any adverse impact to the environment. The analytical test results of the sample produced water collected periodically from wells are furnished in Table 3 and 4:

CBM wells Jharia	Average values of various parameters					
	pH	TDS (mg/L)	TSS (mg/L)	DP (mg/L)	TH	COD (mg/L)
Jh#1						
Jh#2	7.2	1500	18	0.10	70	13.20
Jh#3	to	to	to	to	to	to
Jh#4	8.4	2800	45	0.40	122	74.50

Table 3. Average values of parameters of produced water collected from CBM wells.

CBM wells Jharia	Average values of mineral content (mg/L)					
	Na ⁺	Ca ²⁺	Mg ²⁺	SO ₄ ²⁻	Cl ⁻	CN ⁻
Jh#1						
Jh#2	1510	13.50	14.30	5.60	120	No
Jh#3	to	to	to	to	to	Trace
Jh#4	2005	18.50	40.50	10.80	280	

Table 4. Average values of mineral content in produced water collected from CBM wells.

Based on test reports of produced water samples from four CBM wells within prescribed limits of Indian Standard specification¹⁰ for surface disposal of water and on the investigation of survival of fish after 72 hours, the produced water is suitable for discharge and beneficial use.

SAMPLE TEST JUSTIFICATION

Testing composition of any type of natural gas

sample can ensure whether the gas compound is more or less 100% clean-burning fossil fuel. It can ensure whether the sample fuel gas is much more environmental friendly as compared to burning of coal and fuel oil. Composition testing of the sample fuel gas is a primary step to calculate an approximate calorific value of the sample CBM gas. On the other hand, Produced water chemistry is a critical concern for the CBM industry because produced water must be disposed off safely and economically without causing any adverse impact to the environment. In compliance to BIS specification of IS: 10500, 1992, the analytical testing of produced water is much essential to take decision for water treatment before its disposal.

POWER GENERATION BY CBM GAS

Power generation solutions from a few kilowatts to more than 20 MW using non-conventional CBM gas-fired distributed energy resources technologies can be possible to overcome the energy crisis situation in developing country like India. Usage of CBM gas offers four valued advantages - clean fuel, reliability, economy, and compactness. Gas power solutions from CBM can be used for co-generation or for continuous power supply at CBM Block site and adjoining localities.

There are so many fuel gas based high potential technologies used for electric power generation and combined heat and power applications. The emerging Gas Power technologies utilizing CBM gas are - Reciprocating IC engines (SI with gas and CI with dual-fuel configuration), small industrial gas turbines (1 MW to 40 MW), small steam turbines, Fuel cells and Furnaces. CBM gas based power generation technologies provide opportunities for greater local control of electricity delivery and consumption. They are also able for boosting efficiency and lowering emissions. Such gas based technologies are playing an increasingly important role in the nation's energy portfolio, providing a portion or all of the power needs to a wide variety of users. The customers who are owner of the small-

scale units, on-site power generators, can consume CBM fuel directly or operated by a third party.

The gas-fired power generation technology has different potential applications including base-load power, peaking power where on-site generation is used to reduce the demand charges imposed by the electric utility, back-up power, remote power, provision of both electricity and thermal needs to the site. The collected CBM gas can be transported through pipelines to the power room where is to be supplied to dual-fuel (Diesel 30% and Gas 70%) based electric generators or 100% gas-based generators installed at a site. As a result, the cost of power generation would consequently be reduced considerably.

Such proper utilizing of CBM can stop flaring of fuel gas (shown in figure 3) in environment.



Fig. 3. Wastage of Energy source: CBM gas flaring.

SOCIO-ECONOMIC AND ENVIRONMENTAL IMPACTS

Energy generated from CBM not only meets huge energy demand in the localities, but commercial production of the gas also provides a good number of social and environmental benefits such as employment of people, improvement of the quality of living of the local rural people, conservation of conventional fuels leading to reduction in petroleum imports, saving in subsidies on petroleum fuels and electricity, and stabilization of Power National Grid. Produced water can be used for agriculture and fishery. Combustion of CBM produces very low emissions of CO_2 , CO , SO_2 , NO_x

and no discharge of ash in atmosphere. CBM has the potential to benefit humanity and sustainable us of it can protect the planet and generate economic and social impact.

CONCLUSION

The CBM provides a clean source of energy which is much more cost effective and environmental friendly as compared to burning of coal and oil fuels. The produced gas can be utilized for continuous running of gas based electric generators.

Water produced from CBM wells of Jharia coal field can be disposed for safe use of agriculture and fishery in adjoining localities after minimal treatment.

Ready market in vicinity of the wells and Prospective consumers are Steel, Power and Refractory industries in Bokaro district, Jharkhand. So, needs immediate development of CBM block areas of Jharia coal field with more number of higher producible wells.

Positive returns can be possible at competitive gas selling price in current Indian market with implementing new technological innovations by the operators for commercial production of gas from wells as well as safe handling and speedy transportation of gas in liquid state at normal temperature to supply to consumer ends.

ABBREVIATIONS AND SYMBOLS

BCM: Billion Cubic Metre, CBM: Coal Bed Methane, CI: Compressed Ignition, CMM: Coal Mine Methane, CN: Cyanide, COD: Chemical oxygen demand, DP: Dissolved Phosphate, IC: Internal Combustion, IS: Indian Standard, Jh#1toJh#4: Jharia wells, kcal: kilocalorie, KVA: Kilo Volt Ampere, MW: Megawatt, ONGC: Oil & Natural Gas Commission, PC: Progressive Cavity, pH: potential of Hydrogen, SCM: Standard Cubic Metre, SI: Spark Ignition, SRP: Succor Rod Pump, TDS: Total dissolved solids, TH: Total hardness, TSS: Total suspended solids, UNDP: United Nations Development Program, CH_4 : Methane, C_2H_6 : Ethane, C_3H_8 : Propane, C_4H_{10} : Butane, CO: Carbon

Monoxide, H₂S: Hydrogen Sulphide, SO₂: Sulphur Dioxide, SO₄: Sulphate, NO_x: Nitrogen Oxides.

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FORENSIC SCIENCE: PRINCIPLES, APPLICATIONS AND TECHNOLOGIES

P. V. S. Kishore

Forensic science is a multidisciplinary science used for the purpose of the law where scientific procedures are applied to solve legal problems of theft, assault, rape, accident, poisoning, medical/surgical negligence, suicide attempt, suicide or murder, animal abuse and cruelty etc. Many potential applications of forensic science exist. The key principle is to identify traces of substances transferred through every contact. It provides impartial scientific evidence that establishes links between crime scenes and suspects. As technology infiltrates every aspect of our lives, solving crimes has become almost futuristic in its advances. From retinal scanning to trace evidence chemistry, actual forensic technologies are very advanced at helping to solve crimes. It is also used for humanitarian purposes to clarify the fate of missing persons. Although forensic science has greatly enhanced the investigator's ability to solve crimes, it has limitations and must be scrutinized in and out of the courtroom to avoid the occurrence of wrongful convictions. Lawyers, judges, officials, and the public, need to know what forensic science can /cannot do. The net of law, however, is spread so wide that no sinner from its sweep may hide.

INTRODUCTION

The word forensic means a form of legal evidence 'of or before the forum' and it is a synonym for legal / related to courts. The ancient world lacked standardized forensic practices, which aided criminals in escaping punishment. The use of torture to force confessions had to be curtailed with a simultaneous increase in the use of logic and procedures in criminal investigations. Forensic science developed for the purpose of the law where scientific procedures are applied to solve legal problems. It is a multidisciplinary subject, involving chemistry, biology, physics, geology, psychology, social science and virtually all fields of science and technology. It involves the collection of information about the physical characteristics, chemical composition and occurrence of materials of forensic interest. It looks at the scientific association between such samples, based on their origins, manufacture, packaging and distribution characteristics^{1,2}.

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It provides impartial scientific evidence for use in the courts of law, e.g. in a criminal investigation and trial. Proof of criminal charges initially depended mainly on eyewitnesses and other subjective means. With scientific advances, objective evidence has taken on a greater role in criminal trials. Governments rely increasingly on science to help enforce a growing number of regulations to resolve disputes, to assess blame and establish responsibility, and to enhance public safety. Lawyers, judges, officials, and the public, need to know what forensic science can /cannot do^{2,3}.

PRINCIPLES

One of the key principles of forensic science is to identify traces of substances transferred through every contact. In a typical criminal investigation, the crime scene investigators will gather material evidence from the crime scene, victim and / or suspect. Forensic scientists will examine these materials to provide scientific evidence to assist in the investigation and court proceedings, and thus work closely with the police. Senior forensic scientists, who usually specialise in one or more of

the key forensic disciplines, may be required to attend crime scenes or give evidence in court as impartial expert witnesses on many occasions^{1,4}.

- | In a case where half of all currency notes were estimated to be contaminated with detectable traces of cocaine it was established that minutes traces of cocaine were transferred from hand-to-banknote and from banknote-to-banknote and so on. This principle enables forensic scientists to establish links between crime scenes and suspects.
- | Gas Chromatography combined with Mass Spectroscopy (GM-MS) to identify seized drugs (as little as million-millionth of a gram).
- | DNA profiling to help identify a murder suspect from a bloodstain found at the crime scene / useful in resolving paternity and immigration disputes.
- | Cells from the saliva extracted from a cigarette butt or a piece of chewing gum left near the crime scene by criminals can provide enough DNA to obtain a DNA profile of the individual, thereby linking them to the crime scene.
- | Sticky sweet wrappers left near the crime scene by criminals act as 'magnets' to hairs and fibres, and sometimes enable forensic scientists to match those found at the crime scene with those found on the suspect's person or clothing.
- | Bullet identification and comparison in killings using ballistics by measuring bullet calibres and matching them with a suspected murder weapon.
- | Anthropometry technique as an identification system based on physical measurements assisted with Crime-scene photography.
- | Toxicology examination / arsenic detection (as little as one-fiftieth of a milligram) in suspected poisoning cases.
- | Laser Raman spectroscopy to identify microscopic paint fragments.
- | Bare foot prints and palm prints are unique to the individual in just the same way as fingerprints are. Failure to recognise this

simple fact cost a young burglar a two-year prison sentence. Before entering the premises he had removed his shoes and socks, placing the socks over his hands so as not to leave any latent fingerprints at the scene. Instead he left a nice clear set of incriminating latent footprints and he was caught⁵.

- | Trace evidence such as shoe and tyre impressions, and handwriting analysis, known as questioned document examination.

APPLICATIONS

Many potential applications of forensic science exist^{1,2,3,4}. Most forensic scientists will examine the evidence objectively and render an opinion based upon the evidence. The expert's opinion may support the investigator's case; however, the investigator should also be prepared to hear that the evidence does not support the investigator's case. In any case, the scientific analysis of physical evidence can be helpful to the investigator. It may provide the objective proof needed to support the case or if it disputes the investigator's case, it might lead the investigator to an alternate solution of the case.

- | Criminalistics is the application of various sciences to answer questions relating to examination and comparison of biological evidence, trace evidence, impression evidence, controlled substances, ballistics, firearm and tool mark examination, in criminal investigations.
- | Forensic intelligence process starts with the collection of data and ends with the integration of results within into the analysis of crimes under investigation.
- | Dactyloscopy (study of fingerprints) and Podiatry (study of feet footprint or footwear).
- | Blood Spatter Analysis is the scientific examination of blood spatter patterns found at a crime scene to reconstruct the events of the crime.
- | Digital forensics is the application of proven scientific methods and techniques in order to recover data from electronic / digital media.

Mobile device forensics is the scientific examination and evaluation of evidence found in mobile phones, e.g. Call History and Deleted SMS, and includes SIM Card Forensics.

Forensic Interviews are conducted using the science of professionally using expertise to conduct a variety of investigative interviews with victims, witnesses, suspects or other sources to determine the facts regarding suspicions, allegations or specific incidents in either public or private sector settings.

Forensic video analysis is the scientific examination, comparison and evaluation of video in legal matters.

Animal Crime Scene Analysis with a focus on the recognition, documentation, and preservation of various types of physical evidence involving animal abuse, cruelty, neglect, and death.

Wildlife Forensic Science applies a range of scientific disciplines to legal cases involving non-human biological evidence, to solve crimes such as poaching, animal abuse, and trade in endangered species.

Trace evidence analysis is the analysis and comparison of trace evidence including glass, paint, fibres and hair (e.g., using micro-spectrophotometry).

Computational forensics concerns the development of algorithms and software.

Art forensics authentication methods are used to detect and identify forgery, faking and copying of art works, e.g. paintings.

Other potential applications of forensic science are document examination, toxicology, psychology, psychiatry, serological investigation, , anthropology, archaeology, pathology, botany, chemistry, geophysics, entomology, geology, linguistics, engineering, limnology, meteorology, optometry, seismology, accounting, astronomy, aerial photography⁴.

FORENSIC SCIENCE AND HUMANITARIAN WORK

The International Committee of the Red Cross (ICRC) uses forensic science for humanitarian purposes to clarify the fate of missing persons after armed conflict, disasters or migration, and is one of the services related to Restoring Family Links and Missing Persons. Knowing what has happened to a missing relative can often make it easier to proceed with the grieving process and move on with life for families of missing persons².

TECHNOLOGIES

As technology infiltrates every aspect of our lives, solving crimes has become almost futuristic in its advances. From retinal scanning to trace evidence chemistry, actual forensic technologies are very advanced at helping to solve crimes. Forensic science techniques used today have become common knowledge. In fact, there are a number of incredibly new forensic technologies that we probably never knew existed. These “cutting-edge” technologies with more than 80% reliability have become accepted techniques⁴.

Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS) : When broken glass is involved in a crime, putting together even tiny pieces can be a key to finding important clues like the direction of bullets, the force of impact or the type of weapon used in a crime. Through its highly sensitive isotopic recognition ability, the LA-ICP-MS machine breaks glass samples of almost any size down to their atomic structure. Then, forensic scientists are able to match even the smallest shard of glass found on clothing to a glass sample from a crime scene.

Alternative Light Photography : This is one of the coolest tools to help see damage even before it is visible on the skin, although there are many tools to help make these calls quickly and accurately. A camera such as the

Omnichrome uses blue light and orange filters to clearly show bruising below the skin's surface. Being able to quickly ascertain how much physical damage a patient has suffered can be the difference between life and death.

High-Speed Ballistics Photography : It uses high-speed cameras in order to understand how bullet holes, gunshot wounds and glass shatters are created. Anyone, from a crime scene investigator to a firearms examiner, can operate a high-speed camera without any additional education or training. Identifying and matching the bullet trajectories, impact marks and exit wounds must be done by an expert.

Video Spectral Comparator 2000 : For crime scene investigators and forensic scientists, this is one of the most valuable forensic technologies available anywhere. With this machine, scientists and investigators can look at a piece of paper and see obscured or hidden writing, determine quality of paper and origin and "lift" indented writing. It is sometimes possible to complete these analyses even after a piece of paper has been so damaged by water or fire that it looks unintelligible to the naked eye.

Digital Surveillance For Xbox (XFT Device) : Most people don't consider a gaming system a potential place for hiding illicit data, which is why criminals have come to use them so much. In one of the most ground-breaking forensic technologies for digital forensic specialists, the XFT is being developed to allow authorities visual access to hidden files on the Xbox hard drive. The XFT is also set up to record access sessions to be replayed in real time during court hearings.

3D Forensic Facial Reconstruction : Although this forensic technology is not considered the most reliable, it is definitely one of the most interesting available to forensic pathologists, forensic anthropologists and forensic

scientists. In this technique, 3D facial reconstruction software takes a real-life human remains and extrapolates a possible physical appearance.

DNA Sequencer : Most people are familiar with the importance of DNA testing in the forensic science lab. Still, most people don't know exactly what DNA sequencers are and how they may be used. Most forensic scientists and crime lab technicians use what's called DNA profiling to identify criminals and victims using trace evidence like hair or skin samples. In cases where those samples are highly degraded, however, they often turn to the more powerful DNA sequencer, which allows them to analyze old bones or teeth to determine the specific ordering of a person's DNA nucleobases, and generate a "read" or a unique DNA pattern that can help identify that person as a possible suspect or criminal.

Forensic Carbon-14 Dating : Carbon dating has long been used to identify the age of unknown remains for anthropological and archaeological findings. Since the amount of radiocarbon (which is calculated in a Carbon-14 dating) has increased and decreased to distinct levels over the past 50 years, it is now possible to use this technique to identify forensic remains using this same tool.

Magnetic Fingerprinting and Automated Fingerprint Identification (AFIS)^{5,6} : With these forensic technologies, crime scene investigators, forensic scientists and police officers can quickly and easily compare a fingerprint at a crime scene with an extensive virtual database. In addition, the incorporation of magnetic fingerprinting dust and no-touch wandings allows investigators to get a perfect impression of fingerprints at a crime scene without contamination.

Link Analysis Software for Forensic Accountants : This software combines observations of unusual digital financial

transactions, customer profiling and statistics to generate probabilities of illegal behaviour. When a forensic accountant is trying to track illicit funds through a sea of paperwork, link analysis software is an invaluable tool to help highlight strange [financial](#) activity.

CONCLUSION

Forensic science applies medical knowledge in judicial proceedings to authenticate or disprove a criminal charge of theft, assault, rape, accident, poisoning, medical / surgical negligence, suicide attempt, suicide or murder brought against an individual and helps to prove the innocence or guilt of an accused. An inquest by a forensic scientist using medical, scientific and legal knowledge into the circumstances and cause of death, in cases of sudden, suspicious or unnatural deaths with / without injuries in police custody / police firing / jail / mental hospital / exhumation, with / without hearsay / circumstantial evidence helps in crime detection⁷. It relies upon chemical and physical methods of analysis to create "fingerprints" or "signatures" of people. Chemical fingerprinting techniques and sample association methods are generally far more effective in excluding an association than establishing a connection between samples. To confirm an association, all points of comparison must be identical, which usually requires exhaustive analysis and a thorough understanding of the sample. To show that samples are different, it's enough to establish a single point of dissimilarity.

Forensic evidence provides impartial scientific evidence that establishes links between crime scenes and suspects. As technology infiltrates every aspect of our lives, solving crimes has become almost futuristic in its advances. From retinal scanning to trace evidence chemistry, actual forensic technologies are very advanced at helping to solve crimes. However, it is not uniquely immune from the risk of manipulation. Although forensic science has greatly enhanced the investigator's ability to solve

crimes, it has limitations and must be scrutinized in and out of the courtroom to avoid the occurrence of wrongful convictions. The net of law, however, is spread so wide that no sinner from its sweep may hide⁷.

The term "forensic medicine" was used to encompass all aspects of forensic work of a medical nature. In the past, this term was often used interchangeably with "forensic pathology." Forensic pathology, however, refers to the branch of forensic medicine which deals with death investigations. Nowadays, the term "clinical forensic medicine" is applied to the branch of forensic medicine involving the living. Veterinary forensics is an emerging branch of veterinary medicine to prevent animal abuse and cruelty. Veterinarians have an array of duties within veterinary forensic science, as animal law is a quickly growing field and is essential to a social policy around the world with legal themes that occur throughout the unique relationship between humans and animals⁸.

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FISH OIL AND THEIR SIGNIFICANCE TO HUMAN HEALTH

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In recent times, seafood is gaining more focus on account of its richness in omega-3 fatty acids. Numerous investigations carried out reveal the health benefits of omega-3 fatty acids as a nutritional supplement against various life threatening diseases like cardiovascular diseases, cancers, skin diseases and many inflammatory diseases etc. They also play a significant role for the proper growth and development of the foetus. National and International health authorities have set up recommendations of daily fish oil intake due to the immense health potential it carries and it is necessary to create an awareness in the society on its importance, as the modern world has become a hub of various lifestyle diseases.

INTRODUCTION

Life has become fast and convenient on account of the latest developments in technology but at the same time it has welcomed various health hazards also. Life style diseases are mainly associated with poor eating habits like the consumption of junk and processed foods rich in saturated fat, dietary deficiencies, over consumption of certain foods etc. Other reasons causing health risks include lack of physical activity, work stress, disturbed biological cycle and other factors which affect human beings of all generation. In this context it is of paramount importance to choose appropriate food which provides healthy balanced nutrition.

Fish is considered as a cheap source of many essential nutrients especially fat and protein and hence is of value in human diet. It is highly recommended in the human diet due to its richness in two main fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). These two fatty acids are polyunsaturated fatty acids and are classified as omega-3 fatty acids. The main sources of these omega-3 PUFA rich oils are the meat of fatty fish such as sardine, herring, mackerel, menhaden, salmon, the liver of cod and the blubber of marine mammals such as seals and whales.

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Table 1: Marine sources rich in omega-3 fatty acids (g/100g meat)¹.

Marine Sources	Omega-3 fatty acids (EPA and DHA) (g/100g fish meat)
Sardine/Herring	1.5-2.4
Salmon	1.3-2.2
Spanish Mackerel, Atlantic and Pacific	1.3-2.0
Halibut	0.7-1.3
Tuna	0.3 -1.3
Sword Fish	1.14
Green Shell/lipped mussels	1.12
Tile fish	1.06
Shark	0.98

Fish lipids/oil consists of triglycerides, phospholipids, fatty acids, wax esters, sterols, other minor compounds like glyceryl esters, glycolipids, hydrocarbons like squalene, sulpholipids etc. Phospholipids and sterols are structural components in cell membrane while other lipids act as energy stores and are important for maintaining buoyancy. The fatty acid compositions of fish lipids are more complex with mainly monounsaturated fatty acids (MUFA) along with polyunsaturated fatty acids (PUFA) and some saturated fatty acids in different proportions. PUFAs are mainly contributed by omega-6 and omega-3 fatty acids with former being

high in fresh water fishes and the latter being the major contributors in marine fishes. The omega-3 fatty acids which are important in human nutrition are α -linolenic acid (18:3 ALA), Eicosa pentaenoic acid (20:5 EPA) and Docosahexaenoic acid (22:6 DHA). The term omega-3 has been derived as the first double bond appear at the third carbon-carbon chain from methyl end.

The oil of some species of sharks especially deep sea sharks have high squalene content of about 90% and it has many pharmaceutical as well as cosmetic applications. Central Institute of Fisheries technology (ICAR-CIFT) has developed methods of extraction, isolation and purification of squalene and obtained a yield of about 80% pure squalene from *Centrophorus* sp. ICAR-CIFT has also developed the technology for extraction of Poly Unsaturated Fatty Acids (PUFA) from fish oil, thus making a very important contribution towards nutritional security².

Omega-3 fatty acids are used as dietary supplements in the liquid or capsule form. Different forms like omega-3 concentrated oils, shark liver oil and cod liver oil are readily available in the market under different brands. The liver oils are often consumed not only due to their richness in omega-3 components but also associated vitamins like A and D. The significance of these oils has created a wide market demand and hence they are used for fortifying bakery products, dairy products such as milk, yogurt and juice, infant formulas etc.

FISH OIL FOR HEALTH

Omega-3 fatty acids are dietary fibres having an array of health benefits. They are essential for various metabolic processes, form structural component to the cell membrane, essential for foetal development and is found abundant in brain and retina. Recent investigations conducted on omega-3 fatty acids has gained more recognition to seafood on account of the health benefit they provide and this is regarded to be one of the most promising development in human nutrition. EPA and DHA are precursors for several metabolites which are potential mediators beneficial for the prevention and treatment of numerous diseases. Studies revealed the

role of long chain omega-3 PUFAs in the treatment of cardiovascular diseases, hypertension, diabetes, arthritis, depression, migraines, skin diseases like psoriasis, eczema and other inflammatory and autoimmune disorders as well as cancer³.

Omega-3 fatty acids and cardiovascular disease

Cardiovascular disease (CVD) refers to the health disorder associated with heart and related circulatory system. It is a prominent disease in the modern world and is mainly associated with the intake of fat rich in saturated and trans components. Chronic inflammation is thought to be the cause of many chronic diseases, including CVDs. CVDs are associated with the narrowing of large arteries with atheromatous plaques, or the total occlusion of coronary arteries (thrombosis) caused by atheromatous blockages leading to myocardial tissue necrosis. Both conditions reduce the heart's ability to pump blood and can result in either chronic or sudden heart failure. It is becoming apparent that regular consumption of fatty fish or fish oil lowers the rate of incidence and death from cardiovascular disease. The cardioprotective effects of n-3 fatty acids is the combined effect of increased heart rate variability, reduced atheroma development and decreased platelet aggregation. In simple terms, omega-3 fatty acids decrease the platelet aggregation leading to a modest prolongation of bleeding time. Apart from these benefits, omega-3 fatty acid intake results in changes in blood lipid levels. It was observed to reduce the serum triglyceride concentration by 30% with associated increase in HDL (Good Cholesterol). This HDL increase reduces the risk of heart diseases^{4,5}. USFDA had given a qualified health claim status to EPA and DHA on coronary heart disease due to the curative effect they provide. The American Heart Association recommends one gram of EPA/DHA per day for patients with coronary heart disease⁶.

Omega-3 fatty acids and cancer

Cancer is one of the most threatening lifestyle disease having wide spread occurrence irrespective of the generation. Several studies have reported possible anticancer effect of omega-3 fatty

acids particularly in breast, colon and prostate cancer. Omega-3 fatty acids were found to reduce the tumour growth as well as slowed histopathological progression. Experimental and epidemiological studies suggested anti-tumour effects of n-3 fatty acids during the initiation and post initiation stages of colon carcinoma. Studies carried out in Sweden showed an inverse association between fatty fish consumption and prostate cancer. Similarly studies conducted in American population also revealed that long-term consumption of fish meat and omega-3 fatty acids slowed down the progression of prostate cancer. Few epidemiological studies assessed on the effect of dietary n-3 fatty acids and breast cancer showed their protective effects against breast cancer risk by inhibiting breast carcinoma development by influencing the biochemical events that follow tumour initiation⁷.

Omega-3 fatty acids and inflammatory diseases

EPA and DHA have anti-inflammatory effect and a role in oxidative stress and to improve cellular function through changes in gene expression. Inflammatory Bowel Disease (IBD) is a general term for chronic inflammatory disease of the GI tract which includes ulcerative colitis and Crohn disease. Crohn's disease can affect the small intestine and large intestine, mouth, oesophagus, stomach and the anus whereas ulcerative colitis primarily affects the colon and the rectum. Studies using animal models provide strong evidence for the protective effects of omega-3 fatty acids against induced IBD. Similarly individuals having lower intake of omega-6/omega-3 ratios were 21% less likely to suffer from Crohn disease.

In vitro and human studies suggest that omega-3 fatty acids serve as effective therapeutic agents for the management of inflammatory arthritic diseases. Comparative studies carried out between population having different fish oil consumption pattern revealed that diet rich in fish oil have an improvement in the number of tender joints when examined physically while some reports revealed improvement in Ritchie Articular Index (measure of joint tenderness) and in morning stiffness⁸.

Omega-3 fatty acids in mental health and neural function

Human nervous system has the highest lipid content compared to all other tissues excluding adipose tissue. 50-60% of the total dry weight of adult human is lipid and one third being omega-3 PUFAs; mostly DHA. Incorporation of DHA into graving neurons is a prerequisite for synaptogenesis. The Canadian Government has reported that DHA have a biological role supporting the normal development of brain, eyes and nerves. Omega-3 PUFAs are known to have membrane-enhancing capabilities in brain cells which are explained to be due to the major role played by them in fortification of the myelin sheaths and are also found beneficial in repairing brain damage by promoting neuronal growth⁴.

Epidemiological and clinical studies suggest inverse relation between omega-3 PUFA consumption and depression. Change of traditional seafoods to processed foods increases decline in mental health characterized by increased depression. A population survey carried out in the adults of Finland revealed that depression is more prevalent among infrequent fish consumers. Since depression is linked to proinflammatory cytokines, beneficial effect of omega-3 PUFAs may be through modulation of proinflammatory eicosanoid and cytokine production.

Omega-3 fatty acids for foetal development

Supplementing with EPA and DHA in the diet during pregnancy is associated with multiple benefits for the foetal development. Deficiency of DHA during prenatal development increases likelihood of diminished visual activity, cerebellar dysfunction, cognitive impairment and neurological disorders. As per US Department of Health and Human Service Dietary Guidelines (2010) it is recommended that pregnant and breastfeeding mothers should consume about 8-12 ounce of seafood per week from a variety of seafood source which accounts to nearly 300-900 mg EPA and DHA per day. This is found to be essential for the growth and development of the foetus. Omega-3

supplementation during pregnancy is also associated with longer gestation period and increase in concentration of EPA and DHA in foetal tissue. This is very important as prematurity is the cause of various infant diseases and can even lead to death. Some other reports suggest that mothers using omega-3 fatty acid rich diets during pregnancy and breast feeding may protect their children against allergies which may be due to the fact that fish oil supplementation leads to decreased levels of body cell associated with inflammation and immune responses⁹.

Omega-3 fatty acids as skin care

Dietary consumption of fish oils rich in omega-3 fatty acids are known to adjust the balance of lipid inflammatory mediators thereby important in the treatment of inflammatory skin disorders. Excessive exposure to UV light is associated with many undesirable skin alterations. Increased exposure to sunlight also increases the likelihood of nonmelanoma skin cancer. Studies have shown that dietary supplementation with omega-3 PUFAs provides photo protection by being effective against UV-irradiation induced damage¹⁰.

Psoriasis is a common skin disorder characterized by epidermal hyperproliferation and cutaneous inflammation. Severity varies from small localized area to whole body. Researches carried out suggested that an increase in the dietary intake of fish oil and a reduction in the intake of foods rich in arachidonic acid (omega-6 fatty acid) would be beneficial treatment to counteract the exaggerated inflammation in psoriasis.

Recommended Daily Intake of EPA and DHA

To create awareness to the modern population on the importance of omega-3 fatty acids, guidelines have been established concerning their recommended daily intake. WHO and North Atlantic Treaty Organization together with a number of

countries viz., Canada, Sweden, UK, Australia and Japan have made dietary recommendation for omega-3 fatty acids as 0.3-0.5 g/day of EPA and DHA¹. United States have recommended a daily intake of 0.65g per day for EPA and DHA whereas British Nutrition Foundation Task Force advised a daily intake of 0.5-1.0g of long chain omega-3 PUFAS which they suggest can be achieved through the consumption of an intake equivalent to 1-2 portions of oily fish per week.

CONCLUSION

Present life style demands more attention towards health foods on account of the aggravating health problems being generated. The ill effects of chronic diseases like cardiovascular diseases, inflammatory conditions etc can be reduced by regular consumption of seafoods which are rich sources of omega-3 fatty acids like EPA and DHA. Hence more awareness on the importance of this healthy diet needs to be created for the betterment of the society.

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HOW TO MANAGE AQUACULTURE AND HORTICULTURE TOGETHER? AQUAPONICS APPROACH

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Aquaponic is a technology developed during the 1960's which aims to reuse the nitrogenous wastes released by fishes grown in aquaculture systems to grow crop plants. Aquaponic plants have yielded the same as equivalent to the production of conventional hydroponic systems and are being practiced widely these days.

INTRODUCTION

Aquaponics is being practiced since the mid of 19th century. In recent years, they are gaining more attention as they involve one method of Recirculating Aquaculture Systems (RAS), that is they reuse the nitrogenous wastes released by fishes raised in aquaculture as nitrogenous source to grow crop plants by bioremediation of nutrient waste from aquaculture production in a controlled environment with a balanced ecosystem of fish, bacteria and plants¹.

The fishes are fed with nutrients and the wastes released by the fish are rich in minerals, nutrients and ammonia. Excess of ammonia released by the fish by itself is highly toxic to the fish if they are not removed periodically. More earlier the separation of fish feces, Biological Oxygen Demand (BOD) load in RAS is decreased, leading to enhanced nitrification performance². The nitrogen cycle, allows the conversion of ammonia to nitrates, Nitrosomonas convert the ammonia to nitrite, Nitrobacter further converts it to nitrate, which can be assimilated by the plants for growth. Floating raft, Nutrient Film Technique (NFT) and the bench bed hydroponic systems are also commonly practiced in aquaponics.

FLOATING RAFT SYSTEM

Rafts mostly made using polystyrene with holes for seedlings/pots set are floated slightly above

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water in tanks made from any non-toxic plastic such as Low Density Poly Ethylene (LDPE). Air-stones are kept in water tanks to maintain the oxygen level for enhanced nutrient uptake by roots as well as providing oxygen for the nitrifying bacteria which convert ammonia and nitrite to nitrate in aquaponic systems. The fish waste product is used as a fertilizer for the plants by using bacteria that feed off the waste as substrate. After the absorption of nitrates by plants from the ammonia converted by bacteria, the water is transported again to the fish tank in which the fish add more ammonia to it and the cycle is continued. The water loss due to evaporation and transpiration by the plants is to be combatted. This system has been widely used for leaf vegetables¹.

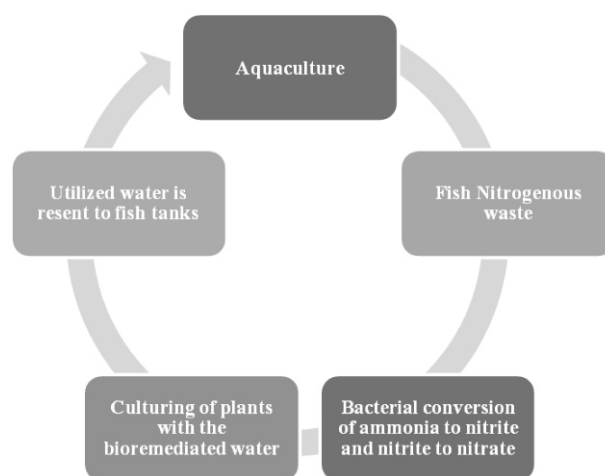


Fig. 1. An outline of Aquaponics System

NUTRIENT FILM TECHNIQUE (NFT)

The NFT systems mostly with small trough volume are used to grow leafy vegetables like lettuce. Large root system plants like tomato, cucumber, pepper and mint are grown within a large trough space provided with a good water flow unit³.

BENCH BED HYDROPONIC SYSTEMS

Bench bed can be used to cultivate a variety of plants that either need a lot of water or well-drained soils. These systems are widely used to produce plants such as strawberry and few cash crops.

TYPES OF FISH THAT CAN BE GROWN IN AQUAPONIC SYSTEM

Numerous fish species can be reared in an aquaponics system such as tilapia, goldfish, trout, koi, bluegill or catfish. They can be chosen based on the set up size that is to be maintained and the environment temperature. Tilapia is by far the preferred fish for aquaponic systems, especially in the tropics and sub-tropics^{4,5}. This is because it is extremely easy to breed, adapts well to high density, is tolerant of low oxygen concentrations (and therefore less susceptible to temporary power failure of system blockage) and tolerant of high nutrient concentrations. Flesh quality is also generally good.

TYPES OF PLANTS THAT CAN BE GROWN IN AQUAPONIC SYSTEM

The plants that are commonly used in an aquaponic system are lettuce, cabbage, bell peppers, tomatoes, okra and leafiest green vegetable. Even plants such as roses or ivy for their appearance, fragrance and ornamental fish species such as golden fish, koi in the aquaculture tank, can be made as a symbiotic ecosystem in households for decoration. It is also to be noted that the plants grown should be in an order that they shall be harvested at regular intervals so the ammonia conversion can be maintained in both the tanks⁶.

ADVANTAGES

1. Usage of waste water efficiently.
2. Soil less growth of plants.
3. Maximum nutrient utilization.
4. Complex nature of the organic aquaponic nutrient solution

5. Income is generated through aquaculture as well as horticulture.

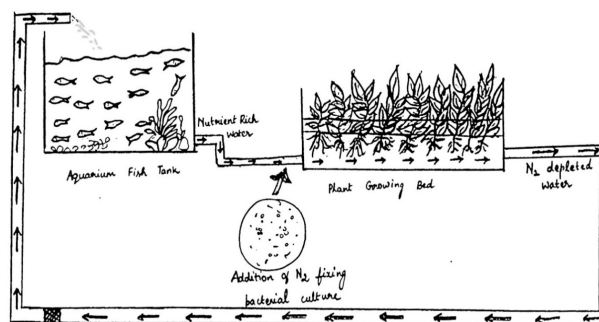


Fig. 2. Schematic representation of Aquaculture and Horticulture in an Aquaponics system.

LIMITATIONS

1. Maintenance of optimal water parameters and temperature as it varies from fishes and plants.
2. Oxygen level management in fish and plant tanks.
3. Constraints on optimization and economies of scale, disease management.
4. Energy costs.
5. Management costs and demands.
6. Limited range of suitable fish species.

CONCLUSION

To date there are hundreds of small-scale aquaponics initiatives and few larger semi-commercial operations. Thus aquaponics combines both fish and crop production in a possible way by converting nitrogenous fish wastes to nutrients for plant resources with the help of bacteria.

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KNOW THY INSTITUTIONS

NATIONAL CENTRE FOR DISEASE INFORMATICS AND RESEARCH, BANGALORE

The National Cancer Registry Programme (NCRP) was commenced by the Indian Council of Medical Research (ICMR) with a network of cancer registries across the country in December 1981. The main objectives of this Programme were:

1. To generate reliable data on the magnitude and patterns of cancer.
2. Undertake epidemiological studies based on results of registry data.
3. Help in designing, planning, monitoring and evaluation of cancer control activities under the National Cancer Control Programme (NCCP).
4. Develop training programmes in cancer registration and epidemiology.

With these objectives three Population Based Cancer Registries (PBCRs) at Bangalore, Chennai and Mumbai and three Hospital Based Cancer Registries (HBCRs) at Chandigarh, Dibrugarh and Thiruvananthapuram were commenced from 1 January 1982. The PBCRs have gradually expanded over the years and as of now there are 23 PBCRs under the NCRP network.

The NCRP is a long term activity of the ICMR and the office and the office of the NCRP is located in Bangalore. It is assisted by a Steering Committee and a Monitoring Committee that meets periodically to oversee and guide its functioning. A review meeting is held annually where the Principal Investigators and staff of the registries present results and participate in the discussions. The meeting is preceded by a workshop.

Cancer registration in India is active and staff of all registries visit hospitals, pathology laboratories and all other sources of registration of cancer cases on a routine basis. Death certificates are also scrutinized

from the municipal corporation units and information collected on all cases where cancer is mentioned on the death certificates.

The information that is collected on a core form that is computer ready is subsequently entered in to a computer. Over the years, the registries and the office of the NCRP have used modern advances in electronic information technology to not only enter the data but also help in specific activities that involves checking of the data, verification of duplicates and matching mortality and incidence records. Electronic processing of data is now being tried out in some registries. Data quality and completeness of coverage is a prime requisite for good cancer registration. This is ensured to the best possible extent by the NCRP.

The main broad and overall objective of the centre is to sustain and develop a national research data-base on cancer, diabetes, CVD and stroke through recent advances in electronic information technology with a national collaborative network, so as to undertake aetiological, epidemiological, clinical and control research in these areas.

BROAD MISSION STATEMENTS

1. Plans, directs, develops, supports, coordinates and evaluates a national programme of cancer surveillance (electronic or otherwise) involving the collection and analysis of reliable data on magnitude and patterns of cancer so as to answer key questions about cancer incidence and mortality in different demographic and population settings.
2. Plans, facilitates and supports programmes of surveillance (electronic or otherwise) of other diseases (diabetes, CVD, stroke) involving the

collection and analysis of reliable data on magnitude and patterns so as to answer key questions about disease incidence and mortality in different demographic and population settings.

3. Designs, undertakes and implements multi-registry/centric collaborative aetiologic research studies in-keeping with recent advances in epidemiological research.
4. Evolves, coordinates and evaluates a national standardised programme on patterns of patient care and survival in different anatomical sites of cancer.
5. Plans and facilitates programmes on patterns of patient care and survival in diabetes, CVD and stroke;
6. Develops human resources in use of disease data base and informatics for research with focus on multi-disciplinary approach – field, clinic, laboratory using the tool of electronic information technology; and, in the process help stimulate cross training and inter and multi-disciplinary research.
7. Will actively seek public-private partnership to fulfill any of the objectives and/or mission statements stated above and/or specific function statements outlined below.

RESEARCH FOCUS

Primary focus: A nationwide data-base has already been established for cancer through the National Cancer Registry Programme and the Cancer Atlas Project. Therefore, the primary focus of research of the centre would be to undertake:

- a) epidemiological cancer research with laboratory component where relevant and important;
- b) patterns of care and survival studies on selected sites of cancer;
- c) cancer control research.

Secondary Focus: Facilitate and coordinate research activities by collaborating centres towards epidemiological and clinical studies in diabetes, CVD and stroke.

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CONFERENCES / MEETINGS / SYMPOSIA / SEMINARS

Sixth International Library and Information Professionals Summit (i-LIPS 2017) on Dynamics of Library for Excellence in Electronic Revolution, April 6-7, 2017, Mohali, India.

Topics:

- 1) **Re- envision of Library Spaces in Changing Perspective**
 - | Designing of Library Spaces as “Learning Commons”
 - | Library Spaces and services: User requirement in new generation
 - | Dramatic Redesigns of Existing Spaces
 - | Maker spaces and Maker Movement in Library Spaces
 - | Digital Resources: Preservation, Management and Cultivation
 - | Digital Collections: Redefining Policies, Negotiation Skills, Best Practices in License Agreement
 - | Digital Repositories: Development, Preservation and Challenges
- 2) **Collection Development and Management in Electronic Age**
 - | Best Policies and Practices: Learning Lessons in Collection Development
 - | Digital Library Consortia: Challenges and Future Perspectives
 - | Digital Paradigm: Access, Ownership and Control
- 3) **Emerging & Innovative Technology Applications in Libraries**
 - | Research Trends in Library and Information Science
 - | Technology Disaster and Recovery Planning Management
 - | Mobile, Web and Semantic Technology Application in Libraries
 - | Search Strategies, Techniques in Intelligent Information Retrieval
 - | Library Security Tools, Technologies, and implementations
 - | Open Access: New trends in publishing Scholarly Communication
 - | Research Tools, Techniques and Methodologies
 - | Social media, Cloud computing applications in libraries
 - | Content Management System
 - | Research Data Management
 - | Discovery and Remote access Tools & Services in Libraries
 - | Plagiarism tools, IPR and Copyright & Copy left in the Digital Age
 - | Open Access Publishing : Creative Common License
 - | Open Source software application in Libraries
 - | Digital Rights Management
 - | Analytics / Big Data opportunities for library professionals
 - | E-Learning - Altmetrics, User case studies in Digital Age
 - | Library Outreach, Marketing and Advocacy in digital age

- 4) Human Resource Development and Management in Digital Age**
- | Skill Development and Competency Management
 - | Digital Governance: Role of Libraries
 - | Modern Librarianship and Ethics
 - | Role of Librarian and Libraries in Institutional Rankings
 - | Challenges in Managing Modern Libraries
 - | Performance Measurement and Competitiveness
 - | Ownership, Partnership and Collaborations of Libraries in digital environment
 - | Electronic Vs Print and Online Book Stores Vs Traditional Book Shops

Contact :

Dr. P. Visakhi, Organizing Secretary, Indian Institute of Science Education and Research (IISER) Mohali, Sector-81, Knowledge City, SAS Nagar, Manuli(P.O.) Mohali, (Chandigarh), Punjab-140306, Phone: 0172-2240208(Direct), Mobile: 0-9779981971, E-mail: visakhi@iisermohali.ac.in, website: [http://www.slp.org.in / lips2017](http://www.slp.org.in/lips2017)

9th International Congress of Cardiovascular Disease Congress, April 2017, Dubai, UAE.

Topics:

- | Sudden Cardiac death from Prevention to Intervention

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 UAE Office: UAE-Dubai / Business Bay / Al Manara Tower - Floor 29 / Office 2902, Tel/Fax: +971 55 9727 666, E-mail: uae@ccg-eg.org / website: www.ccg-eg.org

21st International Conference on Circuits, Systems, Communications and Computers (CSCC 2017), Agia Pelagia Beach, Crete Island, Greece, July14-17, 2017.

Topics:

- | Circuits and Systems
- | Communications
- | Signal Processing
- | Computers

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25th Annual International Conference on Composites or Nano Engineering, ICCE-25, July 16-22, 2017, Rome, Italy.

Topics:

- | 3D Printing
- | Electrospinning Fibers
- | Nano Sensors
- | Cryogenics
- | All areas of Materials Science
- | All areas of Engineering Science
- | Physics of Solids
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- | Timoshenko-Style Mechanics
- | Computational Materials
- | Fluid-Structures interactions
- | FGM
- | General Applications
- | Harsh Environments
- | Hybrid Materials
- | Infrastructures Composites
- | Magnetic- Electronics-Optics Materials
- | Manufacturing
- | Mathematical Modeling
- | Metallurgy
- | Multi- functional Materials
- | Nanomaterials
- | Nano-mechanics
- | Natural Fibers
- | Oxides
- | Offshore Mechanics
- | Physics-Chemistry-Biology of Composites
- | Polymers
- | Sandwich Constructions
- | Smart Materials & Sensors

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S & T ACROSS THE WORLD

MOLTEN 'JET STREAM' DISCOVERED DEEP INSIDE EARTH

A band of molten iron is churning slowly deep inside Earth, much in the same way as a jet stream, a new study finds.

Scientists discovered the so-called molten jet stream while analyzing data from a trio of European satellites, called Swarm. The satellites launched in 2013 with the goal of studying Earth's magnetic field. In this case, Swarm's observations helped create a view akin to an X-ray of the planet, the researchers said.

"The European Space Agency's Swarm satellites are providing our sharpest X-ray image yet of the core," the study's lead researcher, Phil Livermore, an associate professor in the School of Earth and Environment at the University of Leeds in England, said in a statement. "We've not only seen this jet stream clearly for the first time, but we understand why it's there." Earth's core is buried under about 1,900 miles (3,000 kilometers) of rock, so scientists study it indirectly by measuring the planet's magnetic field. For instance, changes in the magnetic field suggested that liquid iron in the outer core moves faster in the Northern Hemisphere, largely beneath Alaska and Siberia, the researchers said.

New Swarm data has helped clarify Earth's inner workings. For example, the changes in the magnetic field are actually being caused by the molten jet stream, which moves about 25 miles (40 km) per year, currently in a westward direction, the researchers found.

That speed is three times faster than normal outer-core speeds, and hundreds of thousands of times faster than the rate at which Earth's tectonic plates move, they noted.

Swarm's data also allowed the researchers to pinpoint the jet stream's location: It flows along a boundary between two different regions in the core,

the researchers found. This movement is likely caused when liquid in the core flows toward the boundary from both sides, and then is squeezed out sideways, they said. "Of course, you need a force to move the liquid toward the boundary," said study co-author Rainer Hollerbach, a professor of theoretical fluid dynamics at the School of Mathematics at the University of Leeds. "This could be provided by buoyancy, or perhaps more likely from changes in the magnetic field within the core."

This discovery is Swarm's first deep-Earth finding, and researchers hope that another is on the horizon. For now, the satellites are still circling the planet, measuring and untangling magnetic signals from the core, mantle, crust, oceans, ionosphere (an energetic part of the atmosphere about 50 miles, or 80 km, above the ground that has electrically charged particles) and magnetosphere (the magnetic field surrounding Earth), they said.

"Further surprises are likely," said study co-author Rune Floberghagen, the European Space Agency's Swarm mission manager. "The magnetic field is forever changing, and this could even make the jet stream switch direction."

(Nature Geoscience. Dec. 19, 2016)

FORGET SELFIE STICKS: THIS DRONE CAPTURES PHOTOS AND VIDEOS IN MID AIR

Instead of extending your arm or using a selfie stick to snap shots of you and your crew, you could use a new pocket-size drone — dubbed the "AirSelfie" — to help you remotely capture aerial photos and videos.

The AirSelfie is the brainchild of Italian entrepreneur Edoardo Stroppiana, who came up with the idea in 2014. "AirSelfie is specifically designed and produced for people who used to think drone cameras are extremely complicated to use — too expensive and bulky," Stroppiana said.

The AirSelfie is equipped with a 5-megapixel camera that can shoot full high-definition (HD) 1080p video, as well as a 4GB microSD card. Using the AirSelfie,

people, groups and companies can take pictures of themselves, their backgrounds and their projects from distances, heights and angles that they never could using their arms or a stick, Stroppiana said.

The drone's four rotors help it fly up to 65 feet (20 meters) in the air. The flying camera measures only about 3.72 by 2.65 by 0.42 inches (9.45 by 6.73 by 1.07 centimeters) — "smaller than a smartphone," Stroppiana said — and weighs 1.83 ounces (52 grams).

The drone uses sonar to measure its altitude and keeps itself stable with the help of a tiny extra camera to monitor its surroundings for signs of jitter. It is also equipped with gyroscopes, barometers and geomagnetic sensors that help it navigate as it flies, said AirSelfie Holdings Ltd. in London, the company that Stroppiana co-founded in 2016 to manufacture the drone.

The AirSelfie is controlled via a free iOS or Android app. The app can make the drone take off; adjust its height and direction; let it hover autonomously; and help users take an HD aerial shot or video with just a push of a button. Users can also activate a 10-second timer, giving people enough time to hide their phones so they don't appear in the picture or video. The drone can take up to eight consecutive shots, the company said.

The AirSelfie uses Wi-Fi to send photos and videos wirelessly to smartphones. The app also allows users to post photos and videos taken with the drone immediately on social media.

After snapping photos, the drone can return to its departure point automatically with the touch of a button. Users can also guide the AirSelfie back manually, and its manufacturers said it is safe for the drone to land on a person's open hand, or even for people to grab the drone while it is still hovering in midair.

The company said it developed a fully functioning prototype in August. On Nov. 17, the company launched a Kickstarter campaign to make the AirSelfie available via preorder, and it met its \$47,714 goal in less than three days. The campaign,

which is scheduled to end Dec. 24, has raised more than \$500,000 from more than 2,300 backers. In addition, the company has received \$3 million from private angel investors in the United States, the United Kingdom, Germany and China, Stroppiana said.

The first preordered drones are scheduled for delivery in March. The drone is expected to hit the market in 2017.

SPIRALS IN DUST AROUND YOUNG STARS MAY BETRAY PRESENCE OF MASSIVE PLANETS

A team of astronomers is proposing that huge spiral patterns seen around some newborn stars, merely a few million years old (about one percent our sun's age), may be evidence for the presence of giant unseen planets. This idea not only opens the door to a new method of planet detection, but also could offer a look into the early formative years of planet birth.

Though astronomers have cataloged thousands of planets orbiting other stars, the very earliest stages of planet formation are elusive because nascent planets are born and embedded inside vast, pancake-shaped disks of dust and gas encircling newborn stars, known as circumstellar disks.

The conclusion that planets may betray their presence by modifying circumstellar disks on large scales is based on detailed computer modeling of how gas-and-dust disks evolve around newborn stars, which was conducted by two NASA Hubble Fellows, Ruobing Dong of Lawrence Berkeley National Laboratory, and Zhaohuan Zhu of Princeton University. Their research was published in the Aug. 5 edition of *The Astrophysical Journal Letters*.

"It's difficult to see suspected planets inside a bright disk surrounding a young star. Based on this study, we are convinced that planets can gravitationally excite structures in the disk. So if you can identify features in a disk and convince yourself those features are created by an underlying planet that you cannot see, this would be a smoking gun of forming planets," Dong said.

Identifying large-scale features produced by planets offers another method of planet detection that is quite different from all other techniques presently used. This approach can help astronomers find currently-forming planets, and address when, how, and where planets form.

Gaps and rings seen in other circumstellar disks suggest invisible planets embedded in the disk. However gaps, presumably swept clean by a planet's gravity, often do not help show location of the planet. Also, because multiple planets together may open a single common gap, it's very challenging to estimate their number and masses.

Ground-based telescopes have photographed two large-scale spiral arms around two young stars, SAO 206462 and MWC 758. A few other nearby stars also show smaller spiral-like features. "How they are created has been a big mystery until now. Scientists had a hard time explaining these features," Dong said. If the disks were very massive, they would have enough self-gravity to become unstable and set up wave-like patterns. But the disks around SAO 206462 and MWC 758 are probably just a few percent of the central star's mass and therefore are not gravitationally unstable.

The team generated computer simulations of the dynamics of a disk and how the star's radiation propagates through a disk with embedded planets. This modeling created spiral structures that very closely resemble observations. The mutual gravitational interaction between the disk and the planet creates regions where the density of gas and dust increases, like traffic backing up on a crowded

expressway. The differential rotation of the disk around the star smears these over-dense regions into spiral waves. Although it had been speculated that planets can produce spiral arms, we now think we know how.

"Simulations also suggest that these spiral arms have rich information about the unseen planet, revealing not only its position but also its mass," Zhu said. The simulations show that if there were no planet present, the disk would look smooth. To make the grand-scale spiral arms seen in the SAO 206462 and MWC 758 systems, the unseen planet would have to be bulky, at least 10 times the mass of Jupiter, the largest planet in our solar system.

The first planet orbiting a normal star was identified in 1995. Thanks to ground-based telescopes and NASA's Kepler mission, a few thousand exoplanets have been cataloged to date. But because the planets are in mature systems, many millions or a few billion years old, they offer little direct clues as to how they formed.

"There are many theories about how planets form but very little work based on direct observational evidence confirming these theories," Dong said. "If you see signs of a planet in a disk right now, it tells you when, where, and how planets form."

Astronomers will use the upcoming NASA James Webb Space Telescope to probe circumstellar disks and look for features, as simulated by the modeling, and will then try to directly observe the predicted planet causing the density waves.

(Source : <http://www.sciencedaily.com/releases/2015/10/151029185549.htm>)



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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 रुचि हैं।

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

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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 रूप में बिना वोट डालने की क्षमता में सीमित कर दिया जाएगा। सत्र सदस्यको ₹ 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 है। 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 है।
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 है, उसे वार्षिक सदस्यता शुल्क ₹ 100/- मात्र देने पड़ेंगे अपना नाम छात्र सदस्य के रूप 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 व्यवसायबैठकों में भाग लेने की योग्यता प्राप्त नहीं है।
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 है। 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 रूप 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 है, 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 एक साथ ₹ 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 एक साथ ₹ 50,000/- (विदेशियों के लिए U.S. \$ 25,000) मात्र दें, सदा के लिए इस संस्था के संस्थान दाता बन सकते हैं, जिसे वह एक व्यक्ति को नामांकित करके उसे अपने संस्थान के प्रतिनिधि के रूप 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.

* भर्ती शुल्क ₹ 50/- सिर्फ एक नये वार्षिक सदस्य के लिए ज़रूरी है। यह सत्र सदस्य/आजीवन सदस्य/ संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रूरी 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, बशर्ते 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 सभी वर्गों के सदस्यों द्वारा भाग लेने के लिए अपनी-अपनी सदस्यता पत्र को लाना जरूरी 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 Form 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

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 में 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

5. भू-पद्धति विज्ञान/Earth System Sciences
6. अभियन्ता विज्ञान/Engineering Sciences
7. पर्यावरण विज्ञान/Environmental Sciences
8. सूचना और संचारण विज्ञान और प्रौद्योगिकी (जिसमें कंप्यूटर विज्ञान भी सम्मिलित है)/Information and Communication Science & Technology (including Computer Sciences)
9. भौतिक विज्ञान/Materials Science
10. गणित विज्ञान (जिसमें सांख्यिकीय सम्मिलित है)/Mathematical Sciences (including Statistics)
11. चिकित्सा शास्त्र (जिसमें शरीर विज्ञान भी सम्मिलित है)/Medical Sciences (including Physiology)
12. नया जीवविज्ञान (जिसमें जीव रसायन, जीव भौतिकी और आणविक जीवविज्ञान और जीव-प्रौद्योगिकी भी सम्मिलित है)/New Biology (including Bio-Chemistry, Biophysics & Molecular Biology and Biotechnology)
13. भौतिकीय विज्ञान/Physical Sciences
14. वनस्पति विज्ञान/Plant Sciences

(कृपया टंकित करें या ब्लॉक अक्षरों में भरें/Please type or fill up in Block Letters)

नाम/Name (ब्लॉक अक्षरों में/in Block Letters) :

श्री/सुश्री/श्री/श्रीमती/डॉ॰/प्रो॰/Mr./Ms./Shri/Shrimati/Dr./Prof (कृपया टिक करें)/(Please tick)

कुलनाम/Surname

प्रथम नाम/First Name

मध्य नाम/Middle Name

शैक्षणिक योग्यता/Academic Qualifications :

(अंतिम शैक्षणिक योग्यता प्रमाण-पत्र अंक-सूची का स्वतः सत्यापित जिराक्स प्रति संलग्न करना है / Self attested xerox copy of last educational certificate/marksheet must be attached)

पदनाम/Designation

सम्पर्क का पता/Address of communication :

(राज्य, शहर/नगर और पिन कोड सहित/including state, city/town and pin code)

दूरभाष संख्या/मोबाईल संख्या और ई-मेल/Phone No./Mobile Number & E-mail :

स्थायी पता/Permanent Address :

टिप्पणी (अगर कोई)/Comments (if any)

दिनांक/Date :

भवदीय/Yours Faithfully

हस्ताक्षर/Signature

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 ज़रूरी है। यह सदस्य/आजीवन सदस्य/संस्थान सदस्य/छात्र सदस्य/दाता के लिए ज़रूरी 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 विधिवत 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.