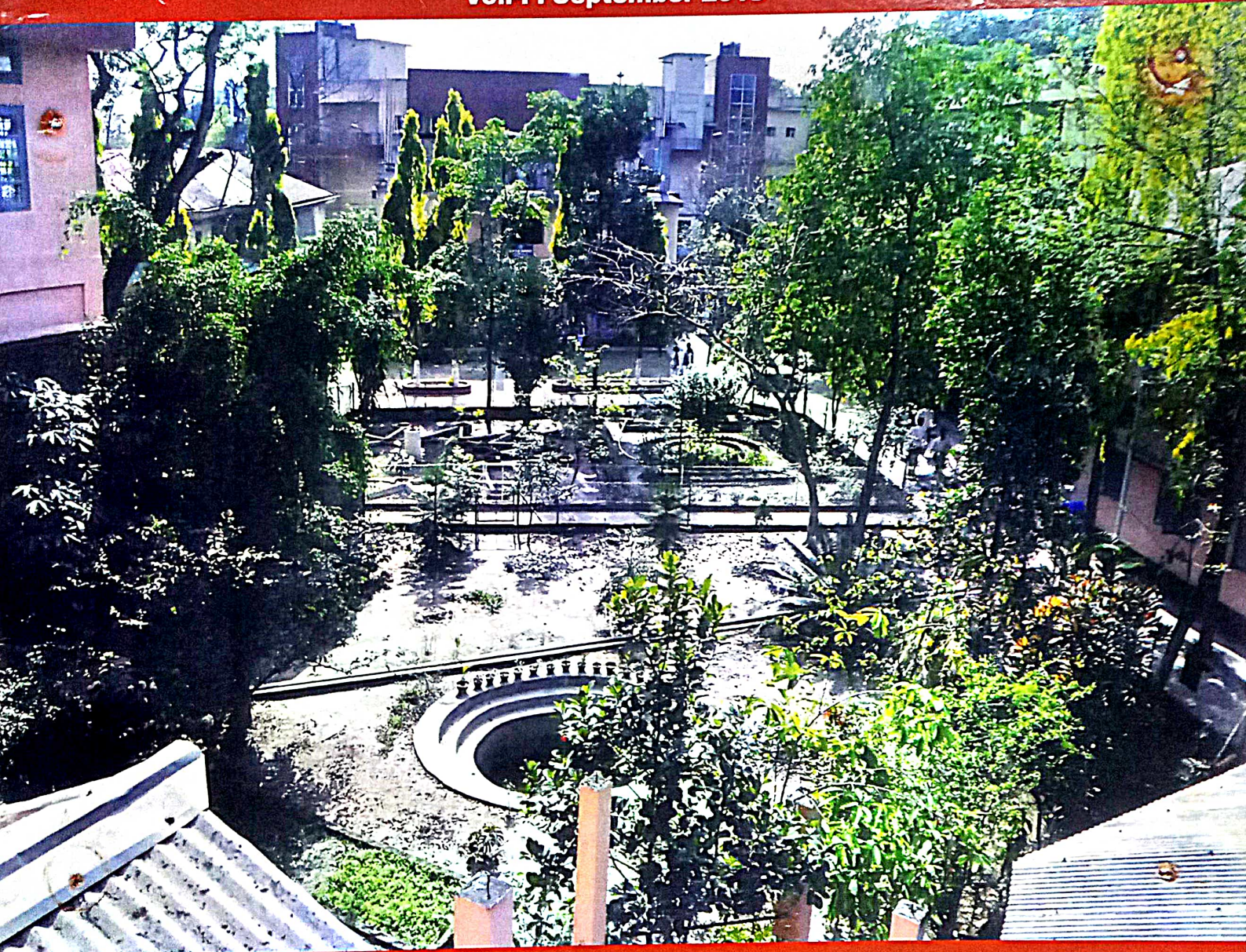




# BATABRIKKHA

বটবৃক্ষ

Annual News Bulletin, Department of Botany  
Vol.-I : September 2018



Department of Botany  
Guwahati College  
Guwahati-781021

## GOODWILL MESSAGE FROM PRINCIPAL



It is a pleasure to write a note of appreciation on "Batabrikkha" published by the Department of Botany, Guwahati College. This Annual News Bulletin is a reflection of the rich flora that surrounds our beautiful region. We have all along been maintaining a sound green campus in the College with various natural trees and also three beautiful gardens with a variety of plantations including medicinal and aromatic plants. Added to that we have also constructed one Nakshatra Garden having 27 different plantations.

I hope the Department of Botany will continue to do well in the future since they have been shifted to a new Academic Block having the latest laboratory and classroom facilities.

With Best Wishes

Dr. Pranab Sandilya  
Principal  
Guwahati College

## HOD'S COLUMN

Botany Department of Guwahati College is one of the oldest Departments of Science Stream. The department, established in the year 1984, started with two years H.S. classes. Later on from 1987 undergraduate classes were started. From 1st April of 1992 Department was under Deficit System of Grant -in -aid by Higher Education Govt of Assam.

The Department started Major Course from the year 1995 with only six numbers of students. The first batch of major students completed their course (passed out) in 1998 with a hundred percent success rate. Till then the story of success has been continuing and students have come out with flying colours. Till this year more than 60 numbers of students have obtained First Class in the final examination.

The Department has a very good Departmental Library comprising of Text Books, Reference Books and Journals and their number is about six hundreds.

To provide exposure to the potentiality and talents of students, the Department has a hand written wall Magazine "Aparajita" and every year it is released by students on the day of popular talk by the distinguished personalities. The Department has a very beautiful and well planed "Botanical Garden" with a number of Medicinal, Herbal, Exotic, Rare and Aesthetic flora in the Garden. Inside the Garden there is a spiritual garden 'Nakshatra Garden', where according to the names of twenty seven Nakshatra , twenty seven plants are also planted.

Waste management programme was initiated by the Department on the occasion of Golden Jubilee of the College and it was inaugurated on 12th August, 2013 the day of inauguration of "Golden Jubilee Function" to take the waste product of Bio-debris by the utilization of available organic residue and inorganic waste.

Department of Botany has now completed 23 glorious years of Major Course and in this occasion, an initiation has been taken to release the first volume of Departmental News Bulletin " Batabrikkha" to reflect the growth . activities of the Department as well as to discover new scientific research in the field of Biological Sciences.



Dr. Mrinal Kumar Das  
HOD  
Department of Botany

# MUSHROOM CULTIVATION : EMPOWERING WOMEN

Dr Mina Phukan Borthakur  
Senior Principal Scientist,  
CSIR –North East Institute of Science & Technology,  
Jorhat-785006, Assam

Today almost every aspect of human life is influenced by science. Various technologies developed by science have made life more comfortable and thus it can be considered as a blessing for self, family, society and nation too.

Mushroom cultivation being an economical and easily adaptable novel technology, women from all sections, rural to urban, educated to illiterate, can prove to be competent by adapting this technology for commercial purpose. It is not only a source of nutritional supplement but can also prove to be economically beneficial for the women of weaker sections. As Agriculture is the livelihood of majority of the rural population of N.E. India, where over more than 90% of the cultivators are small and marginal farmer, women can also play a vital role by doing mushroom cultivation along with agriculture

Mushroom technology can help in empowering women mainly by two ways, either by cultivation of mushroom or by setting up of spawn production units, which are very much interlinked. But for commercial production of mushroom, non availability of spawn is considered as the major constraint. Roughly it can be estimated that to grow 1-2 quintal of mushroom per day in a cluster of village, 1-2 spawn production unit is required to continue supply of seeds to the growers.

Unlike mushroom cultivation, setting up of spawn unit involves cost and requires skilled personals. Moreover other major constraints also include irregular supply of electricity and unavailability of some needful equipment. However, now a day's government encourages mushroom growers by providing soft loans and also there are many educational institutes which provide free training to the interested one for popularization of mushroom cultivation. Required equipments are also easily available with established commercial firms. Thus to increase the mushroom production among the rural masses as well as commercial urban growers, well established spawn production units along with consultancy service personnel are very much essential.

*Agaricus bisporus*, button mushrooms grew successfully in India for the first time at Solan in mid sixties and till date button mushroom is considered as the most commonly cultivated mushroom and has a high demand among consumers. The cultivation of button mushroom in North Eastern India is suitable only in the hilly regions where the temperature is between 13-19 °C. However commercially viable *Oyster mushroom (Pleurotus species)*, viz. *P. ostreatus*, *P. djamor*, *P. euos*, *P. florida*, *P. flabellatus*, *P. comucopiae* etc. can grow very easily in many places of North East India. This Oyster mushroom can grow in the temperature range of 20-30° C with high relative humidity more than 85 per cent.

Being a rural development technology, raw materials for mushroom cultivation such as bamboo shade, paddy straw and fire wood are easily available in the rural areas. During pick season (autumn to winter), 12-15 compact bags can be easily hanged in a bamboo shade of minimum 15 ft length and 20 ft breadth. Within a period of 40 days, about 15-18 kgs of fresh mushroom can be harvested from these bags and a suitable return can be expected by selling the harvested product in nearby cities.

Spawn making requires full time work and management. The most important requirement of an adequate spawn production facility is cleanliness. The best and easiest way for producing oyster mushroom spawn is by collecting a culture from an established source such as, a culture collection, a research laboratory, or possibly another spawn producer unit. Though Rye, milo (grain sorghum), and millet are all used commonly for making spawn, but in case of North East India, easily available paddy grain can be used successfully. After inoculation of mycelium, within 15-20 days the spawn packets become ready for preparation of compact bags. Generally one packet of spawn contains 300grams of paddy grains from which 3 no's of compact bags can be prepared very easily. Cost of this type of spawn may be calculated approx. Rs. 90-100/ Kg.

Hence utilization of this technology in a proper manner results in very high returns for the entrepreneurs round the year thus helps in empowering the women's too. □



Immobilization of biomolecules is a long-standing research issue with demands driven by market as well as by the excitement of scientific understandings of related biophysical and biochemical processes. It is among the most fascinating and promising fields of multidisciplinary research where a synergistic effort of biologists, chemists, material scientists and physicists plays key role in growing the field ceaselessly. Fixing on a suitable substrate facilitates the use of a biomolecule for development of high-performance bio electronic devices. These preparations have direct implications in medical diagnostics, proteomics and in bio fuel cell development [1-3].

## IMMOBILIZATION OF BIOMOLECULES

Dr Arup Ratan Pal

Institute of Advanced Study in Science and Technology  
Paschim Boragaon, Guwahati -781035, India

Preparation of a functionalized surface is the most important step towards immobilization of a biomolecule. There are different mechanisms available for immobilization such as physical adsorption, bio-affinity, encapsulation, photo immobilization and covalent bonding [2]. Among these, Covalent bond formation is the most effective one for immobilization as far as the stability of the biomolecules is concerned. For covalent immobilization the surface should contain a functional group which forms a covalent bond with aside group of the biomolecule to be immobilized. In some cases a linker is required to facilitate this process.

Several methods are available till date to functionalize a substrate for immobilization of biomolecules. This includes conventional chemical processes, Langmuir Blodgett films and plasma based fictionalization / deposition [3, 4]. Different types of low pressure as well as atmospheric pressure plasma processes are therefore functionalization and ex-situ as well as in-situ immobilization of biomolecules.

### Plasma based techniques of material preparation

Growing environmental concern demands that the process of deposition of a material or functionalization of a substrate should be environment friendly. Plasma based processes are gaining importance as these processes comes under this category. Moreover, with a plasma process the deposition or functionalization can be achieved in a significantly reduced number of steps. Cold plasma processes are the suitable ones for development of a platform for biomolecule immobilization [3, 5-7]. Cold plasma may be generated in low pressure as well as in atmospheric pressure environment.

### Low pressure plasma process

Low temperature plasma mostly generated by glow discharge at low pressure range of 0.1 – 10 Pa, is useful in variety of applications e.g. deposition of thin films by plasma enhanced physical vapour deposition, plasma enhanced chemical vapour deposition and direct functionalization of a substrate in a reactive plasma environment.

Radiofrequency and pulsed plasma deposition for synthesis of polymers have been carried out since last two decades and polymer films deposited by plasma polymerization have emerged as potential material for fabrication of bio-electronic devices.

### Atmospheric pressure plasma process

Low pressure plasma processes are widely being used for development of surfaces for immobilization of biomolecules. However, low pressure plasma devices are generally complicated and expensive due to requirement of a vacuum system. Moreover, low pressure processes are not suitable for direct in-situ immobilization of biomolecules. Due to these difficulties involved in low pressure plasma processes, atmospheric pressure plasmas are gaining importance.

A single step process for functionalization and immobilization makes the process more user-friendly. A recent research demonstrates that a mild atmospheric plasma polymerization process may be a potential candidate for simple, plasma-assisted strategy for the immobilization of biomolecules like enzymes in plasma-polymerized pyrrole and acetylene coatings [6, 7]. A single-step protein immobilization is possible with a homogeneous protein distribution in the coating when fluorescent proteins and an organic coating precursor are simultaneously introduced into a dielectric barrier discharge. Single molecule fluorescence, enzyme activity and bio-recognition experiments demonstrate that protein integrity remains unaffected after plasma assisted immobilization.

Plasma processes being environment friendly, the relevant technology could be highly competent one for immobilization of biomolecules. Particularly, atmospheric pressure non-equilibrium plasma shows the greatest potential. It gives a cheaper way of preparation of a platform for immobilization for varieties of applications including development of DNA microarrays for detection of gene mutations. Moreover, by this process one can achieve immobilization in single step where substrate functionalization and immobilization of biomolecule takes place simultaneously. In some instances conducting polymers or conducting polymer based composites are used for development of biosensors. Atmospheric pressure plasma synthesized conducting polymer films with good surface functionality and stability could be useful for immobilization of biomolecules for development of next generation bio-electronic devices.

### References

- [1] Sheldon RA (2007) EnzymeImmobilization: The Quest for Optimum Performance. *AdvSynth Catal* 349:1289-1307
- [2] Rusmini F, Zhong Z, Feijen J (2007) Protein immobilization-strategies for protein biochips. *Biomacromolecules* 8 :1775-1789
- [3] Gogoi D, Barman T, Choudhury B, Khan M, Chaudhari Y, Dehingia M, Pal AR, Bailung H, Chutia J (2014) Immobilization of trypsin on plasma prepared Ag/PPAni nanocomposite film for efficient digestion of protein, *Materials Science and Engineering C* 43 : 237-242
- [4] Kong F, Hu YF (2012) Biomolecule immobilization techniques for bioactive paper fabrication. *Anal Bioanal Chem* 403:7-13 □

# Nutraceuticals for Health Promotion

Today, this is a well known fact that consumption of plant based foods like fruits, green vegetables, pulses, marine algae etc. can be treated as the medicine for health benefit and disease

Risk reduction. Earlier the father of Western medicine Hippocrates quoted as "Let food be thy medicine and medicine be thy food!" The world's wisdom on health is captured in this prophetic pronouncement which reflects the critical importance of food and lifestyle on one's health. This ancient understanding is being reintroduced today as "nutraceuticals".

The term "nutraceuticals" was coined by Stephen L. De Felice, MD, in 1989. The word is a portmanteau of "nutrition" and "pharmaceutical" and refers to extracts of foods claimed to have a medicinal effect on human health. The nutraceutical revolution began in the early 1980s, sparked off when the actual or potential clinical benefits of calcium, fiber and fish oil were supported by clinical studies published in distinguished medical journals. Nutraceuticals are found as natural products from the (a) food industry, (b) the herbal and dietary supplements, (c) pharmaceutical industry and the (d) newly emerged bioengineered microorganisms, agro-products or active biomolecules. It may range from isolated nutrients, herbal products, dietary supplements and diets to genetically engineered "custom" foods and processed products such as cereals, soups and beverages.

It is very imperative that the nutrients found in many foods, fruits and vegetables are responsible for the well documented health benefits. For example, lutein and zeaxanthin prevent cataract and macular degeneration; beta-carotene and lycopene protect the skin from ultraviolet radiation damage; lutein and lycopene may benefit cardiovascular health, and lycopene may help prevent prostate cancer. Because of these and other marked health benefits of these, it must be taken regularly and to reduce the risk factors like high cholesterol, high blood pressure and diabetes.

Chemically, the nutraceuticals may be classified as isoprenoid derivatives (terpenoids, carotenoids, saponins, tocotrienols, tocopherols, terpenes), phenolic compounds (coumarins, tannins, lignins, anthocyanins, isoflavones, flavonones, flavanoids), carbohydrate derivatives (ascorbic acid, oligosaccharides, non-starch polysaccharides), fatty acid and structural lipids (n-3 PUFA, CLA, MUFA, sphingolipids, lecithins), amino acid derivatives (amino acids, allyl-S compounds, capsaicoids, isothiocyanates, indols, folate, choline), microbes (probiotics, prebiotics) and minerals (Ca, Zn, Cu, K, Se).

Besides the phytochemicals and minerals, the concept of microbes (probiotics & prebiotics) as nutraceuticals is interesting. Probiotics are bacteria that help maintain the natural balance of microflora in the intestines. The normal human digestive tract contains about 400 types of probiotic bacteria that reduce the growth of harmful bacteria and promote a healthy digestive system. Experiments into the

**Dr. Bula Choudhury**

Guwahati Biotech Park, Technology Complex,  
IIT Guwahati, Guwahati-39

benefits of probiotic therapies suggest a range of potentially beneficial medicinal uses for probiotics. Recent research on the molecular biology and genomics of *Lactobacillus* has focused on the interaction with the immune system, anti-cancer potential, and potential as a biotherapeutic agent in cases of antibiotic-associated diarrhoea, travellers diarrhea, paediatric diarrhoea, inflammatory bowel disease and irritable bowel syndrome etc. whereas the prebiotics are the non digestible food fibers which stimulate the growth and activity of certain bacteria in the intestines. The microorganisms must be alive, present in high numbers (generally more than one billion per daily ingested dose), with scientifically established human health benefits as confirmed by legitimate research groups and published in peer-reviewed biomedical journals.

Wide variety of Nutraceuticals is available in the market today which may consider as the traditional and nontraditional one. Traditional nutraceuticals are simply natural whole foods with new information with their potential health qualities. Many fruits, vegetables, grain, fishes dairy and meat products contain several natural components that deliver benefits beyond basic nutrition, such as lycopene in tomatoes, curcumin in turmeric, capsaicin in green chilies, omega -3 fatty acids in fish, antioxidants in tea etc. whereas orange juice fortified with calcium, cereals with added vitamins, flour with added folic acid are nontraditional nutraceuticals. Examples of nutraceuticals currently available in the market are: Fortified Cereals with vitamins and minerals; Energy drinks such as Tropicana, Minute Maid Pulp, Frooti; Protein powders like Protinex (Dumex), GRD (Zydus), B. Protein (British Biologicals); Probiotics like YAKULT which contains 6.5 million live *Lactobacillus casei* Shirota strain in a 65ml bottle, Sports products like Glucon-D (Heinz), Glucose D (Dabur); Vitamin and Mineral supplements; Foods to reduce cholesterol level as Abcor by Nutri-pharma which claims to reduce cholesterol by 15-20% in 4 months etc.

Since the passage of the U.S. Dietary Supplement Health and Education Act of 1994, there has been an explosion of the activities on various kinds of Nutraceuticals. Nutraceuticals are a multi-billion dollar industry, rivaling the pharmaceutical industry. Global market for nutraceuticals is growing day by day and it reaches \$176.7 billion in 2013, a compound annual growth rate (CAGR) of 7.4%. The nutraceutical industry in the US is about \$86 billion. This figure is slightly higher in Europe and, in Japan, represents approximately a quarter of the \$6 billion total annual food sales. 47% of the Japanese population consume Nutraceuticals. There is a huge market potential since the sector is growing at Compounded Annual Growth Rate (CAGR) of 18%, though India's share in global market is minimal at 0.9%. Many new entrepreneurs and pharmaceutical companies have entered the nutraceuticals field with the intention of

improving their bottom line. Increasing numbers of consumers are also turning to nutraceuticals to improve their health and prevent chronic diseases. Pharmaceutical and biotech companies, which commit major resources to the discovery of nutraceuticals include Monsanto, American-Home Products, Dupont, Abbott Laboratories, Warner-Lambert, Johnson & Johnson, Novartis, Metabolex, Genzyme Transgenic, PPL Therapeutics, Interneuron, Samilabs, Pioneer enterprise etc.

The governmental administration of food and drugs in many countries such as the United States of America (<http://www.cfsan.fda.gov/list.html>), Canada ([http://www.hc-sc.gc.ca/index\\_e.html](http://www.hc-sc.gc.ca/index_e.html)), European Union (<http://www.emea.eu.int>), China (<http://www.sfda.gov.cn/cmsweb/webportal>), and India (<http://mohfw.nic.in/>), have strict regulations on food and drugs in terms of manufacturing, servicing, and marketing, and usage. But not all has a complete regulation on nutraceuticals and phytonutrients as well as their therapies. Many countries are making corresponding laws or complementary regulations or addressing issues with new explanations.

Unlike pharmaceutical products, nutraceutical products do not need any clinical test or verification for foods in preventing diseases in the past. As nutraceuticals are basically food, the beneficial effects of nutraceuticals can only be the health claims and not medicinal claims. There were multiple laws and regulations covering the foods in India, but there was no single law that could have significantly regulated Nutraceuticals. In India the most

common forms of nutraceuticals are available as traditional Indian Ayurvedic Medicines. There are no strict pharmaceutical regulations on Ayurvedic and nutraceutical health products in India also. However, the Indian government passed Food Safety and Standard Act (FSSA), 2006 to integrate and streamline the many regulations covering nutraceuticals, foods and dietary supplements.

Nutraceutical is a growing health care industry in India also. It is playing important role in developments of future therapeutics but it depends on control of purity, efficacy and safety. These products are an outcome of collaborative research effort of pharma, food and chemistry. As health-care industry is growing in India, growth of nutraceutical is also increasing because people want to treat their disease by improving their health with the help of "Fast Moving Healthcare Goods". India is a significant player in this industry because it has extensive markets and facilities like rich bio-diversity, world-class R & D facilities, resources, qualified human, and varied raw materials that provides an edge over other competitors. North-Eastern part of India is on the 6th position among the 25 biodiversity hot spots in the world. This rich biodiversity also offers unique opportunities for the development of new novel Nutraceuticals from this region. Consumers are turning massively towards food supplements to improve their wellbeing. They consider prevention and treatment with Nutraceuticals as a powerful instrument in maintaining health and to act against acute and chronic diseases, thereby promoting optimal health, longevity and quality of life. □

## Mushrooms - An Unexplored Treasure

Manalee Paul  
Guest Faculty  
Department of Botany

Along with plants fungi also form an important part of the botanical studies. One member of the kingdom Fungi- the Macrofungi or Mushroom is particularly interesting. When we speak of the term mushroom, generally beautiful and brightly coloured toadstools come to our mind but along with aesthetic beauty mushrooms have a plethora of nutritional and medicinal benefits. According to fossil records, mushrooms have existed since the Lower Cretaceous Period, long before human beings evolved in this planet. Since time immemorial mushrooms have been prized as an important source of food as well as source of drugs. The fruiting bodies of mushrooms were in use for thousands of years perhaps due to their nutritional potential. Many of them are of medicinal importance and represent unlimited source of secondary metabolites of high medicinal value while a large number of biologically active molecules are identified in many species of mushrooms throughout the world. They are of great interest to the scientists due to their utility in food industry, in medicine industry and also their role in biodegradation. Many mushrooms also contain many psychoactive compounds which have hallucinogenic effect. This property is yet to be explored fully, though studies have been done on the use of these mushrooms for medicinal purpose. They are highly nutritive and low-calorie food, an excellent source of protein, vitamins and minerals. The high protein, fibre and mineral content along with low content of lipids and carbohydrates make mushrooms an ideal food for diabetic and overweight individuals. They also

have a wide range of medicinal benefits including antimicrobial and antitumor properties. The first mention of macrofungi dates back to 3000 BC in the famous ancient medical treatise Charaka Samhita where macrofungi have been referred to as food and medicine. They were highly prized by the ancient Greeks and Romans as well and certain edible mushrooms like Truffles were highly prized among the aristocrats. Chinese medicine is famous for the use of mushrooms like *Ganoderma lucidum* (Lingzhi Mushroom), *Fomes fomentarius* (Tinder Conk Mushroom) etc. Though they have been widely used in the Oriental countries like China and Japan from ancient times, their use in India is very sparse. This may be partly due to the various taboos associated with them. Though mushroom consumption is not so high in India in comparison to other countries yet some of them are commercially cultivated. Some mushrooms commercially cultivated in India are *Agaricus bisporus* (Button Mushroom), *Pleurotus ostreatus* (Oyster Mushroom), *Volvariella volvacea* (Paddy Straw Mushroom), *Calocybe indica* (Milky Mushroom), *Lentinus edodes* (Shiitake Mushroom). Along with these various other wild edible mushrooms like *Auricularia auricula-judae*, *Schizophyllum commune*, *Morchella esculenta* etc. are regularly collected and eaten by mushroom enthusiasts. However, one must have proper knowledge about mushrooms before collecting and consuming any wild variety because many of them are toxic and may prove to be lethal. Mushrooms hold an immense potential as food item and as a cheap source of high quality protein.

# BIOCENTRISM : AN ANCIENT CONCEPT WITH MODERN VIEW

Biocentrism (Greek: bio, "life"; and kentron, "center"), in a political and ecological sense, which extends inherent value to all living things. Biocentrism, a very common and ancient view that existed in majority of religious practices according to which each and every organism including we the human beings are the creation of "GOD" and the value of life for all organisms are the same. In literature, Biocentrism means life in centre and ethically it extends inherent value to non-human species. Advocates of biocentrism often promote preservation of biodiversity, animal rights, and environmental protection along with equal respect to all living individuals. Bio centrists believe that all species have innate value, and humans are not "superior" to other species in a moral or ethical sense. In general the term "biocentrism" encompasses all environmental ethics that extend the moral respect and value from human beings to all living things in nature. In modern light of knowledge, Bio centric ethics stress on rethinking of the relationship between humans and nature. According to this view, "nature does not exist simply to be used or consumed by humans, but that humans are simply one species amongst many, and that because we are part of an ecosystem, any actions which negatively affect the living systems of which we are a part adversely affect us as well".

Modern biocentric view in the scientific endorsement was re-established in the works of Charles Darwin especially in his book *On the Origin of Species* (1859), where through the laws of evolution, he supported that humans are not actually some special kind of organism, but simply a species like all others and have same value in natural evolution or simply in nature. In recent times, Bio centric ethics includes Albert Schweitzer's ethics of "Reverence for Life", Peter Singer's ethics of "Animal Liberation" and Paul Taylor ethics of "Biocentric Egalitarianism". Modern Biocentric ethics differs from classical and traditional ethical thinking as it focuses on attitudes and character rather than strict moral values. Schweitzer's "reverence for life" principle was a forerunner of modern bio centric ethics. It denies any distinction between "high and low" or "valuable and less valuable" life forms. Biocentrism is most frequently associated with the work of Taylor and his book "Respect for Nature: A Theory of Environmental Ethics (1986)". Taylor convey that biocentrism is an "attitude of respect for nature"

## Difference between biocentric and ecocentric ethics

Although they are similar in many ways, biocentrism and egocentrism are two distinct ethical viewpoints. Biocentrism is "a kind of ethics of individualism" in that it emphasizes the value, rights, and survival of individual organic beings. Ego-centrism, on the other hand, takes a more holistic approach, giving moral priority to species and ecosystems rather than the individuals that compose them.

## Biocentrism in religion

In Hinduism: Hinduism contains many elements of biocentrism. In Hinduism, humans have no special authority over other creatures, and all living things have souls ('atman'). Brahman (God) is the "efficient cause" and Prakrti (nature), is the "material cause" of the universe. However, Brahman and Prakrti are not considered truly divided: "They are one in the same, or perhaps better stated, they are the one in the many and the many in the one."

Dr. Bhaswati Kakati

Department of Botany, D.H.S.K.College, Dibrugarh, Assam

In Buddhism: Buddha teachings encourage people "to live simply, to cherish tranquility, to appreciate the natural cycle of life." Buddhism emphasizes that everything in the universe affects everything else. "Nature is an ecosystem in which trees affect climate, the soil, and the animals, just as the climate affects the trees, the soil, and the animals and so on. The ocean, the sky, the air are all interrelated, and interdependent—water is life and air is life."

In Islam: In Islam, bio centric ethics stem from the belief that all of creation belongs to Allah (God), not humans, and to assume that non-human animals and plants exist merely to benefit humankind leads to environmental destruction and misuse. As all living organisms exist to praise God, human destruction of other living things prevents the earth's natural and subtle means of praising God. The Qu'ran acknowledges that humans are not the only all-important creatures and emphasizes a respect for nature.

Although this holistic approach is more ecocentric than bio centric, it is also bio centric as it maintains that all living things are important and that humans are not above other creatures or nature. Buddhism teaches that "once we treat nature as our friend, to cherish it, then we can see the need to change from the attitude of dominating nature to an attitude of working with nature—we are an intrinsic part of all existence rather than seeing ourselves as in control of it."

## Biocentrism in law

In modern societies, the idea of biocentrism and the values that it promotes are greatly praised and it gradually finding its position in law. The first country to include rights of nature in its constitution is Ecuador (Article 71, 2008 Constitution of Ecuador). The article states that "Nature has the right to integral respect for its existence and for the maintenance and regeneration of its life cycles, structure, functions and evolutionary processes". In recent years, cities in Maine, Pennsylvania, New Hampshire and Virginia have adopted laws that protect the rights of nature.

## Criticism

Biocentrism has faced criticism for a number of reasons. Some of this criticism grows out of the concern that biocentrism is an anti-human concept. Another type of criticism focuses on the contradictions of biocentrism as it emphasises equal importance to all individual and humans are not regarded as special. According to Richard Watson if this is true then, "Human ways-human culture-and human actions are as natural as are the ways in which any other species of animals behaves" and thereby crimes and chaos will definitely rules. Watson also claims that the extinction of species is "Nature's way" and that human's just speedup the process by their unjudicial works and by exploiting the rest of nature. Therefore, he suggests that in reality to overcome the unwished situation, "humans should reduce their destructive behaviour in relation to other species is not because we are equals, but because the destruction of other species will also result in our own destruction".

## Sources :

1. Taylor, Paul (1986). *Respect for Nature: A Theory of Environmental Ethics*. Princeton University Press. p. 99.
2. Encyclopædia Britannica. 2009. Retrieved 13 March 2009. □

# Triticale (X Triticosecale)

Dr. Smita Rani Barua Deka  
Associate Professor, Department of Botany  
Guwahati College

Triticale, the common name given to all wheat – rye hybrids; which is a composition of high yield quality of wheat and disease tolerance and unique nutritional composition of rye. It is an important contribution to food science. Triticale is the first man-made cereal grain crop resulting from the hybridization of wheat (*Triticum*) and rye (*Secale*). It has a high yield and rich protein content. It helps to control diabetes, to reduce digestion problems, boost heart health, increase healing and metabolic rate, improve energy level, protect infants in womb, increase circulation and contributes to strong bones. It is a rich source of manganese, iron, zinc, calcium and potassium and essential vitamins.

The objective of triticale production is to combine in it the productivity, quality and uniformity of wheat with hardness, disease resistance, seed size and nutritional quality of rye. Therefore it is very important to know the effect of rye chromosomes on durum wheat.

By various genetic means, the nutritional quality and food value of several plants has been upgraded. The synthesis of new wheat-rye amphidiploid is a mean of introducing genetic diversity in the breeding population. The hexaploid (6x) and octaploid (8x) can be produced using additional lines which carry a set of alien chromosome. Some tetraploid triticales have chromosomal stability and fertility but agronomically poor, may be used for improvement of hexaploid triticales. According to earlier breeding program of crossing hexaploid and tetraploid triticales, the process where successful if 6x triticales used as female parents, which leads to the production of secondary tetraploid triticale.

The triticale strains have many good attributes. Different varieties have different good properties. The author got an opportunity to work on four different varieties of triticale and study the effect of rye univalent on kernel setting and pollen

viability using giemsa banding technique. The four varieties are Rosner, Rahum, Mapache and TL-419. The variety Mapache shows high lodging resistance to *Septoria tritici*. Rahum variety is good among most of the high yielding lines. The work was undertaken with a view to find out the correlation between the number of rye univalents per cell with percent pollen sterility, mean kernels per spike and mean kernels per spikelet in these four strains.

The rye chromosomes can be identified by the presence of large blocks of heterochromatin at the telomeric end. This heterochromatin blocks can be darkly stained using giemsa stain. Giemsa is a mixture of several dyes. For the identification of rye univalent chromosomes, giemsa banding technique has been used in the four selected triticale varieties.

In the meiosis of hexaploid triticales, the chromosomes show visible differences in the degree of condensation. The meiotic instability and cytological irregularities may be due to the differences in replication cycle of wheat and rye chromosomes.

The disadvantages of commercial utilization arises due to meiotic instability, partial sterility, poor baking quality, shriveled kernels, late maturity, luxuriant growth etc. Triticale pollens are less viable than rye and wheat pollens. Meiotic abnormalities adversely influence on the pollen viability and seed setting. With a view to understand the cause of poor seed setting and kernel shriveling, some efforts were made to study the effect of different rye chromosome on wheat. The presence of rye chromosomes has been considered as a major source of meiotic irregularities. This destabilizing role of rye chromosomes has been attributed to the presence of heterochromatins. The developing lines without rye telomeric heterochromatin has been suggested as a measure to overcome this problem. □

## GENOME EDITING USING CRISPR-CAS9 TECHNOLOGY

What is Genome editing?

Genome editing is a group of technologies that give scientists the ability to change an organism's DNA. These technologies allow genetic material to be added, removed, or altered at particular locations in the genome.

Why do we need Genome editing technology?

Genome editing is of great interest in the prevention and treatment of human diseases. Currently, most research on genome editing is done to understand diseases using cells and animal models. It is being explored in research on a wide variety of diseases, including single-gene disorders such as cystic fibrosis, hemophilia, and sickle cell disease.

About CRISPR-CAS9 :

CRISPR-Cas9, which is short for Clustered Regularly Interspaced Short Palindromic Repeats and CRISPR-associated protein 9 (Cas9). The CRISPR-Cas9 system has generated a lot of excitement in the scientific community because it is faster, cheaper, more accurate, and more efficient than other existing genome editing methods.

CRISPR-Cas9 was adapted from a naturally occurring genome editing system in bacteria. The bacteria capture snippets of DNA from invading viruses and use them to create

Ananya Phukan

Guest Faculty, Department of Botany  
Guwahati College

DNA segments known as CRISPR arrays. The CRISPR arrays allow the bacteria to "remember" the viruses (or closely related ones). If the viruses attack again, the bacteria produce RNA segments from the CRISPR arrays to target the viruses' DNA. The bacteria then use Cas9 or a similar enzyme to cut the DNA apart, which disables the virus.

Future Prospects of Genome editing using CRISPR-Cas9 :  
Achieving the impossible :

Ending disease like HIV-AIDS, Cancer, Genetic diseases like Colour Blindness, Hemophilia, Huntington's disease, Sickle-cell anemia, Nyhan syndrome, Retinitis pigmentosa, Tay-Sachs disease, Stone man syndrome, Cystic fibrosis, Trisomy 18, Muscular dystrophy, Type I tyrosinemia  
Designer Babies – creation of modified humans by editing genes at embryonic stage.

Eternal Youth – few researches are conducted on the possibility of reversing aging using CRISPR-Cas9 technology.

Ethical issues : Balance of risks and benefits, Ecological disequilibrium □



# ROLE OF GRAVITY COMPONENTS ON THE FORMATION OF ADVENTITIOUS ROOTS ON STEM CUTTINGS

Mrinal Kumar Das  
HOD  
Department of Botany

Vegetative methods of propagation are practiced in plants to raise offspring's which are true to type and possess desired characters of the parent plants. This method helps in rapid multiplication of many plants from a single individual and production of fruits much higher in these plants than those raised from seeds.

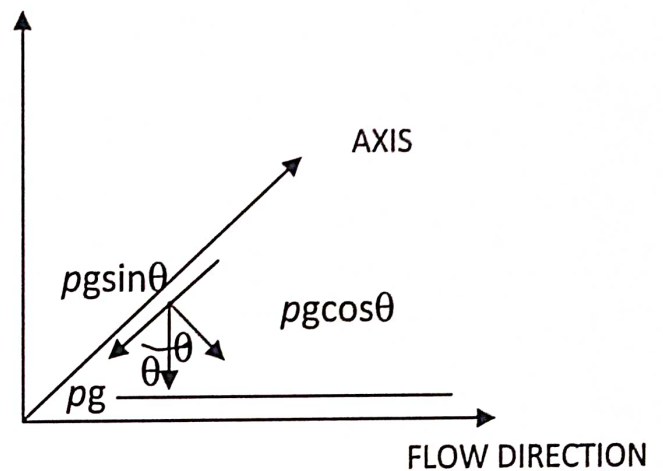
For successful propagation various factors which are present inside and outside the plant from where cuttings are made are very important for propagation. Age of the plants selected for vegetative propagation is an important factor. Cuttings, generally taken from juvenile trees root better than those taken from older these (Morgan et. al. 1980).

The importance of growth substances on various growth processes including propagation of stem cuttings have been established (Audus, 1960). Treatment of cuttings with Indole acetic acid (IAA), Indole butyric acid (IBA) and kinetin (Kn) have improved rooting percentage and also stimulate initiation of adventitious roots (sarma, 1992).

Gravity has a role to play in the basipetal transport of auxins, which are responsible for initiation of roots on stem cuttings (Lyon 1965 & Sack 1991). Response to gravitational stimulation by geosensitive plant organs is dependent on both magnitude and direction components of the gravity force (Dedolph et. al, 1965, Larsen, 1973)

To understand the complex phenomenon of root initiation on the effect of biophysical factors like the components of gravity on the initiation of adventitious roots on stem cuttings, they have to place at different inclination and their post development.

The hormones responsible for initiation and growth of roots are produced at the extreme tip or the apical bud, which flow basipetally and function at a distance behind the extreme tip. Gravity plays a direct and significant role on the basipetal transport of these hormones. Therefore, the rate of flow of phytohormones synthesized at the apex and their to the meristematic region situated at the base decides to a great extent the time of root initiation a root growth. The flow rates of hormones depends solely on the action of gravity in general but when the cuttings are subjected to various angles, the gravity gets resolved into 2 components, viz.  $pg\sin\theta$  and  $pg\cos\theta$  where  $\theta$  is the angle of inclination. The values of  $pg\sin\theta$  and  $pg\cos\theta$  are dependent upon the inclination of the cuttings and thereby control the rate of flow of root hormone to the base.



The initiation and growth of roots are very much influenced by the gravity components has been evident by the number of roots occupying that lower side of the cuttings placed at 00, 22.50, 450 and 67.50 inclinations. These have been observed in stem cuttings of *Chrysanthemum coecineum* and *Camellia assamica* L plants. At 450 inclination initiation of adventitious roots takes less time in comparison to other inclinations.

It emerges that production of adventitious roots on stem cuttings is a very complex process in a biological system where a set of different factors work side by side, in addition to the physiological and bio-chemical factors, bio-physical factors like gravity components play a major role in rooting process when cuttings are cultured in inclined positions.

## REFERENCE

- Audus, L.J. (1960). Plant growth substances, Leonard Hill Ltd. London.
- Bachelard, E.P. and stowe, B.B. (1993). In vegetative propagation of plants. Edited by K.K. Nanda and V.K. Kochhar, Kalyani Publishers, New Delhi (1991).
- Bardley, D.M., Rickards, C.R. and Thomas, N.S.T. (1979). Plasma Lipid analysis by thin layer chromatography with flame ionization detection and quantitation cin. *Chim. Acta*, 92: 293-302.
- Basu, R.N. and Pal, S.R. (1966). Proc. All India symp. Hort., Calcutta, p- 45.
- Bjarke, V. (1978). A relationship between length of basis and adventitious root formation in pea cuttings. *Physiol. Plant.* 42:146-150.
- Borthakur, D. (1959). Breeding Asian filed crops with special reference to crops of India. Oxford and IBH Publishing Co., New Delhi, Bombay, Calcutta. □

# Medicinal Plants and their uses

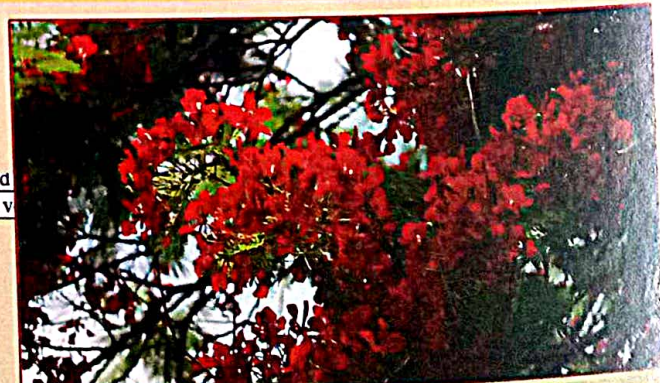
Manash Baruah  
Guest Faculty  
Department Of Botany

Traditional medicines especially the folk herbal medicines have recently been receiving heightened interest the world over. Such age-old healthcare systems have been developed in different corners of the world where they are living in close interaction with the nature. The relationship between plants and people is studied in ethno-botany, a field focusing on the study of the indigenous knowledge on how plants are observed, used and managed. Indigenous knowledge refers to the knowledge, rules, standards, skills and mental sets generated by and kept in custody of local people in a particular area. The knowledge of the use of medicinal plants and the procedures applied to their preparation was transmitted from generation to generation, after years of experiences, careful observations and trial and blunder experiments; and this study focuses on the medicinal plants and the associated ethno-medicinal knowledge but this knowledge is in danger because transmission between older and younger generation is not always assured.

Plant resources possess and preserve cultural heritages, biological information and indigenous knowledge on plant identity and utility. The ethno-botanical literature highlights that both saving plant species and documenting and preserving indigenous knowledge associated with them are fundamental urgent concerns.

The traditional healers are having a commendable knowledge of the medicinal values of plants that grow around them. This knowledge of people is now fast disappearing due to modernization and the tendency among younger generation to discard their traditional life style. The traditional process is also losing its popularity due to scarcity or non-availability of such plants, which is caused by multifarious human activities coupled with natural calamities like droughts and overgrazing. Hence, documenting traditional medicinal plants and the related traditional medical knowledge is important in order to facilitate the discovery of new sources of drugs and promote sustainable use of natural resources. □

Sl. No.	Botanical Name	Local Name	Family	Medicinal use
1.	<i>Achranthes aspera</i> L.	Hatisur	Amaranthaceae	In the treatment of fistula, obesity, tumours etc.
2.	<i>Adhatoda vasica</i> (L.) Nees.	BasakTita	Acanthaceae	Asthma, cough, ever, stomach ache, malaria etc.
3.	<i>Aegle marmelos</i> (L.) Corr.	Bel	Rutaceae	In diarrhoea, dysentery, leaves have anti diabetic effect
4.	<i>Alocasia indica</i> (Roxb.) Schott	Kachu	Arecaceae	Useful in piles, habitual constipation, inflammations, rheumatism, leprosy, jaundice, diseases of spleen.
5.	<i>Andrographis paniculata</i> (Burm f.) Wall, Nees	Kaalmegh	Acanthaceae	Used for liver complaints and fever, anti-inflammatory
6.	<i>Aristolochia indica</i> L.	Belikol, Chohu	Aristolochiaceae	Stimulant and tonic, use for Leucoderma, for relieving impotency, reducing itching. Used to relieve snake bites and coughs.
7.	<i>Artocarpus heterophyllus</i> Lam.	Kathal	Moraceae	Fruit, useful for curing fever, boils and skin diseases, curing wounds, treating dysopia, ophthalmities and pharyngitis
8.	<i>Azadirachta indica</i> A. Juss	Mahanim	Meliaceae	Skin treatment, insecticide, pollution control.
9.	<i>Bacopa monnieri</i> L.	Brahmi	Scrophulariaceae	Improving memory, epilepsy
10.	<i>Bauhinia acuminata</i> L.	Kachan	Fabaceae	Use for piles, diarrhoea& dysentery, leprosy.
11.	<i>Bauhinia purpurea</i> (L.) Benth.	Rongakanchan	Fabaceae	In the treatment of piles, diarrhoea& dysentery, boils and abscesses, infections, pain, diabetes, jaundice, leprosy and cough.
12.	<i>Boerhavia diffusa</i> L. nom.cons.	Ponownua	Nyctanginaceae	Herbal medicine for pain relief and other uses. The leaves are used as vegetables
13.	<i>Butea monosperma</i> (Lam.) Taub.	Palas	Fabaceae	Useful herb to treat diarrhea, dysentery and sore throat. The leaves of this tree helps reduce blood sugar and cure diabetes.
14.	<i>Calotropis procera</i> L.	Akan	Apocynaceae	Used as inhalation therapy, smoke from the bark is inhaled for coughs, asthma, and to cause sweating.
15.	<i>Cardiospermum helicacabum</i> L.	Kapalphuta	Sapindaceae	Used in the treatment of rheumatism, nervous diseases, snake bite
16.	<i>Centella asiatica</i> (L.) Urban	Manimuni	Apiaceae	Used in the treatment of rheumatism, nervous diseases.
17.	<i>Cenopodium album</i> L.	Jilmilsak	Amaranthaceae	Use in anthelmintic, antiphlogisticanti rheumatic



# DEPARTMENTAL ACTIVITIES

Felicitation of 1st Batch of Major Students (1998)



# BOTANY MAJOR STUDENTS



1<sup>st</sup> Semester 2018



3<sup>rd</sup> Semester 2018



5<sup>th</sup> Semester 2018



*BATABRIKKHA : An Annual News Bullatein, Department of Botany, Guwahati College,  
Published by Dept. of Botany, Guwahati College, September 2018*