



Anthesis



Volume 10: 2014 -2015

Botany: An Interdisciplinary Science



Annual Publication of Gargi College Botanical Society

**Department of Botany
Gargi College, Siri Fort Road
New Delhi-110049**

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Volume 10: 2014-2015

**Special Focus:
Botany: An Interdisciplinary Science**

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From the Principal's Desk

Dr. Shashi Tyagi



I am happy to learn that Gargi College Botanical Society which is called **Taru** is bringing out the next issue of its annual publication called **Anthesis**.

The theme for this year is '**Botany: An Interdisciplinary Science**'. Botany has so many branches such as bioinformatics, ethnobotany, paleobotany, plant physiology, plant molecular biology to list a few and each of these branches are inter-related. It is becoming very difficult to study them in isolation now days. Research in each branch is being conducted at the molecular level to have better understanding of the processes and the organism as a whole.

I am sure students have to say more about the topic. I am very much attached to my Botany students and believe me, nothing gives me more happiness and joy than my delighted students. I'm keenly looking forward to read this issue.

I congratulate the entire editorial team for their hard work. I wish good luck to all the students.

Dr. Shashi Tyagi
Principal (Officiating)

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From the Editor's Desk

Ayushi Gupta

Botany (Hons.) III year



Nature has always been a mystery. Every phenomenon that is occurring in nature is devised in such a way that everything is carried out sustainably and is balanced. Nature has its own way to deal with things. It has been providing every answer to almost every question posed by man since time immemorial. Scientists have been working to know the facts and disclose the things that are hidden in the lap of nature. The study of plants is vital because they underpin almost all animal life on Earth. Being botanists we try to unravel those interesting facts about nature and plants.

I am glad to say that Anthesis has successfully completed its long journey of ten glorifying years with the release of this issue. Anthesis serves as a platform for both students and teachers to express their views and write something on what interests them in science. This year also we have continued the norm of publishing the magazine in electronic form which is not only easily accessible but also eco- friendly. Publishing the magazine in electronic form is a small step towards conserving our mother earth by minimizing the wastage of papers and in turn trees.

This year our magazine focuses on Botany as an interdisciplinary science. Botany is a broad, multidisciplinary subject with inputs from most other areas of science and technology. All the disciplines of botany such as anatomy, physiology, ecology, plant genetics and biotechnology etc are so inter-related that one has to have a deep knowledge about every other discipline in order to study one, or conduct any research project.

This issue of Anthesis contains some of the very well written articles on topics like horticulture, forensic botany and agriculture which I am sure readers will definitely enjoy. Beside these, the magazine also has some general articles such as intro to flora and facts about trees which are very informative. Lavender is an economically important flower and is commercially used in manufacture of many cosmetic products. This year we have Lavender as our famous plant, reading about which will let the readers explore many other uses and facts about this plant.

Dr. M.S Swaminathan is one of the famous botanists of India who is renowned for his leading role in India's green revolution program. His vision transformed India from a

"begging bowl" to a "breadbasket". I am sure many of us would like to know more about him. Keeping this in mind we have an article written on Dr. M.S Swaminathan in this issue.

Under general section we have some interesting articles like "Ficus siblings" which is a story of rebirth and "What's in a name?" that describes the importance of common names and the information they provide. Through Anthesis students of our department have also expressed their views on issues like "Are we educated in real sense?"

The magazine also includes relevant photos among which most are self-clicked while some are taken from internet keeping in mind the copyright issues. In its next section it also covers all the departmental news along with the list of all the semester toppers and the executive committee of GCBS (Gargi College Botanical Society). This issue of Anthesis also focuses upon the achievements of Gargi alumni and their life after graduating from Gargi.

Anthesis is published as an e-Book. Hyperlinks are placed at the end of each article for convenience, with the help of which the readers can easily get back to the contents and read any article of their interest just by clicking on it.

At the end we have kept the fun section that includes poem, crossword puzzle and riddles which readers will definitely enjoy. Answers of the Crossword and riddles are hidden in the magazine itself. So what are you waiting for? Go, explore and have fun.

Now, I take this opportunity to pay my special thanks to our teacher advisor Dr. Gita Mathur who has been our constant guiding force throughout. It would have been impossible to come up with this issue without her support and valuable suggestions from time to time. Also, I would like to thank all the members of editorial board. This volume of Anthesis is a result of their efforts and dedicated work. I would like to give special thanks to our principal ma'am Dr. Shashi Tyagi for providing us an opportunity to publish this magazine. At last, I would like to thank all the teachers and students for their articles and contributions to this issue. Though every effort has been made to make this issue interesting for readers still we are looking forward to your response and valuable suggestions that will be definitely incorporated into the next issue.

Ayushi Gupta.

Editor (Anthesis Volume 10).

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Articles

Diamonds in My Backyard

T. Rajitha
Botany (Hons.), II year



Stepping out barefoot onto the lush carpet of grass, one can't help but be enthralled by the twinkling diamonds scattered all over the garden beds. Although the first light of dawn deceives one into believing that these tiny refracting droplets of water are in fact precious stones left behind by the garden fairy, you know these shiny gifts to be just a mirage as soon as you touch them. The diamond shatters into tiny droplets leaving just a touch of wet and a lot of curiosity behind. This article is an exploration of that curiosity.



Some of the questions that have been haunting me since experiencing this phenomenon are: where in the world do these water droplets on the plants come from in the absence of late night rains because I can bet they are not the tears of Greek goddess Ersa for sure and what causes them to bead up thus creating the illusion of a diamond when light strikes?

To answer the first question about origin of these water droplets there are two explanations which I have come across.

1. One reason for the existence of these water droplets is formation of **dew**. It happens when the humidity content in the atmosphere is very high and the temperature of exposed surfaces like that of leaves and grasses is comparatively low. This situation causes the water vapour in atmosphere to condense on the said exposed surface thus forming a droplet of water. Further this droplet of water is unable to evaporate for some time because of high humidity. This phenomenon happens usually in early morning and evening times.
2. The second reason has a much intimate connection with plants. This is the process of **guttation**. In this exudation of xylem sap takes place from the special pores (hydathodes) present on the vein endings of a leaf. The droplets appear at the edges or tips of the grass blades and plant leaves. This happens due to presence of excess water in the soil and high humidity in the air. Excess water in the soil causes accumulation of water in plants and thus high root pressure which pushes the xylem sap outwards. These droplets not only contain water but also some salt and mineral components which are left behind as white residue on the leaf after the droplet evaporates.

Now to solve the second question which is at the root of resolving this mystery of diamond illusion I had to bring out the botanist in me who delved a little deeper into the history of plant science. Turns out there were scientists who got equally fascinated with the beading phenomenon of water droplets on leaves and studied it in detail. German Botanist Barthlott was one of those scientists; in 1997 he discovered "lotus effect" in the leaves of *Nelumbo*. He gave super hydrophobic nature of leaf surface as the reason for beading of water droplets on the leaves. This super hydrophobic property provides the leaves self-cleaning ability. Since Barthlott explained this phenomenon for the first time in Lotus leaves he called it the "lotus effect". On further exploration of this self-cleaning property it was discovered that high water repellency on leaf surface is due to micro and nano structures.

To understand the nature of these nano structures let's take a look at the anatomy of a leaf. In a transverse section the leaf shows two peripheral epidermal layers, one central mesophyll layer and the outermost cuticle. The translucent extracellular waxy cuticle is the puppet master manipulating these water droplets into shiny refracting spheres.

Cuticle: The puppet master

1. Cuticle is chemically hydrophobic and non-reactive polymer with associated waxes. Cutan and cutin secreted by the epidermal cells are its main constituents apart from waxes.
2. This layer is further sub-divisible into three layers: Innermost cuticular layer, middle cuticle proper and the outer most epicuticular waxes.
 - a) Cuticular layer: It consists of cutin, wax and some carbohydrates.
 - b) Cuticle proper: In this layer cutin is found embedded in wax.
 - c) Epicuticular waxes: These are surface waxes.

Waxes accumulate on the cuticle surface as wax films or most commonly as wax crystals forming nano structures consisting of rods, tubes or plates. The chemical nature along with intricate pattern of epicuticular waxes provides super hydrophobicity to the leaf by decreasing the angle of contact between leaf surface and water droplets thus forming water beads.

This mind boggling phenomenon is not just for conning us into believing them to be diamonds but it has a very real and important function for plants. The presence of this cuticle layer prevents the leaves from desiccation due to excess water in case of plants like *Nelumbo* (Lotus) and also acts as the first line of defense against any attacking pathogens. In case of edges of leaves this is most probably because of guttation.

Interestingly, while trying to get the answer to my “diamonds' puzzle” I had to visit various disciplines like leaf anatomy, plant ecology, plant physiology, plant taxonomy and systematic botany.... even some physics. This makes this aptly suitable for the special focus of this issue of Anthesis.

So next time when walking barefoot under the dawn sky you come across this magical scenery of sparkling diamonds scattered across your greens don't get conned into thinking them to be some garden elf's gifts or some Greek goddess' tears because the science of it all is much more fascinating than the fantasy of some fairy garden world.

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Chemistry of Plant Life: At a Glance

Pratima Rao
Botany (Hons.) II year



Whenever the word chemistry is pronounced first things that come to my mind are chemicals, glass beakers, molecular formulae, chemical reactions and the microcosmic periodic table as I'm sure is the case with most science students. But chemistry is much broader and omnipresent discipline. The entire universe is governed by principles of chemistry. Every aspect of plant or animal life is governed by myriad of chemical reactions. In human beings, chemical reactions result in growth, tissue repairing, organ building and hormone regulation.

The most fascinating thing for me is that plants which we see in our colleges, schools and around us secrete special chemicals and have many life sustaining chemical reactions taking place inside them. These chemicals help in protection from herbivory. Actually plants are nature's great chemical factories producing a range of chemicals which are found in every part of the plant body and there are many chemical reactions which are responsible for their growth, respiration, photosynthesis, stomatal activity etc. Also chemicals can be extracted from the plants which help humans in various ways like yielding medicines, drugs, and flavoring foodstuffs to list a few. Principal chemical elements like carbon, oxygen, hydrogen, nitrogen, phosphorous, Sulphur are same for all the life forms of plants, animals, fungi, bacteria and even viruses, only the details of molecules into which they assemble are different.

Some of the important chemical reactions which take place in plants are discussed here.

- A. Photosynthesis is one of the most important and most famous chemical processes for the sustenance of this planet. In this process plants synthesize glucose by the action of sunlight. During photosynthesis chlorophyll converts photons, water and carbon dioxide into glucose and oxygen. The oxygen which plants release creates breathable atmosphere for animal life. Glucose which gets converted to starch provides food which sustains human beings.

- B. In the process of respiration, plants convert glucose and oxygen into ATP, the energy currency of the cell, which is used to fuel other chemical reactions. It is not a one-step reaction; in fact respiration involves multiple reactions taking place simultaneously to make it a success. Let's have a look at this reaction in detail:

Respiration involves four distinct chemical cycles:

1. Glycolysis: It is the process by which glucose is transformed to pyruvate.
 2. Transition reaction or pyruvate decarboxylation: In this acetyl CoA is formed with combination of pyruvate and coenzyme A.
 3. Krebs cycle: In this acetyl CoA is oxygenated and the electron transport chain is put into action thus completing the production of ATP.
- C. Stomatal activity (in which the stomata regulate water transport, cooling and respiration) is controlled largely by a chemical reaction involving potassium. When potassium is introduced to the guard cells around the stomata it causes them to swell and open. When there is less water in the environment, potassium is pumped out of the guard cells and the stomata close, conserving water inside the plant. It is observed that plants without potassium are less able to regulate their water levels.
- D. Besides these processes, plants have certain micro and macro nutrients which are responsible for plethora of reactions inside the plants. Micronutrients are required by plants in small quantities while macronutrients are required in large quantities. Elements like chlorine, boron, zinc, copper, nitrogen, oxygen, manganese, and calcium have some special role in the life of the plants.
1. Photosystem II and stomata function is controlled by chlorine.
 2. Iron is responsible for chlorophyll formation.
 3. Boron helps in the cross linking of pectin.
 4. Manganese helps in the activity of some enzymes.
 5. Zinc is involved in the synthesis of enzymes and chlorophyll.
 6. Molybdenum helps in nitrogen fixation and reduction of nitrates.
 7. Nickel acts as the enzymatic cofactor and helps in the metabolism of nitrogenous compounds.

Above mentioned are some of the micronutrients which are used by plants in small quantities. Apart from this, there are certain macronutrients which are responsible for major reactions taking place in the plants. Now let's take a look at some of the chemicals secreted by the plants which effect their surrounding environment.

- A. First of all "guttation", we have all heard this term in Botany classes. It is the process by which plants exude drops of water onto the surface of leaves. The guttation water contains organic and inorganic compounds mainly sugar, mineral nutrients, and potassium.

- B. All the plants produce chemical compounds for their normal metabolic activities. Some chemical compounds such as sugars and fats are found in all the plants while some chemical compounds are present in only some plants because they are specific, present either to deter predation or used to attract insects for pollination. For example, Opium poppy, *Digitalis purpurea*, Aloe vera, *Ocimum sanctum*. Alkaloids are a class of chemical compounds containing nitrogen ring. Alkaloids are produced by a variety of organisms in which plants are also included. These alkaloids are extracted from the plants and used in various ways. For example in medicines and drugs in which cocaine, morphine, psilocin to list a few are present. Polyphenols also known as phenols, these are the chemical compounds which contain a phenol ring. Examples include anthocyanins which gives purple color to grapes and pink colour to roses. The isoflavones and the phytoestrogens from soy and tannins which give the tea its astringency.
- C. Glycosides are another group of chemical compounds in which a sugar is bound to a non carbohydrate. And many plants store chemicals in the form of glycosides which are in the inactive form. These chemical compounds can be activated by enzyme hydrolysis which breaks the sugar part and makes the chemical available to be used. The glycosides are used as medications in animals and humans. For example - 1. Poisons are often bound to sugar molecules as a part of their elimination from the body. 2. Cyanoglycosides in cherry pits release toxins only when bitten by a herbivore. 3. Conifers are strong smelling plants and they have resins and terpenes which have protective function.
- D. Plants produce terpenes and terpenoids (when terpenes are modified chemically such as by oxidation or rearrangement of carbon skeleton the resulting compounds are terpenoids) which are the constituent of essential oils in various plants and flowers. Essential oils from various plant parts and flowers are widely used as natural flavor additives for food, fragrance in perfumery, in medicines etc.
1. Vitamin A is an example of a terpene.
 2. The fragrance of rose and lavender is due to monoterpenes.
 3. *Digitalis* spp. also produce chemical similar to cardiac glycosides, digitoxin and digoxin. These toxins exert their effects by inhibiting the ATPase activity of a complex of transmembrane proteins that form the sodium potassium ATPase pump Na^+/K^+ ATPase. Inhibition of the Na^+/K^+ ATPase in turn cause a rise not only in intracellular Na^+ , but also in calcium, which in turn results in increased force of myocardial muscle contractions.

Eg. *Aloe vera* which is a succulent plant contains phyto-chemicals such as acetylated mannans, polymannans, anthraquinone, c-glycosides, anthroves and other anthraquinones such as emodin and various lectins. Neem also has chemical compounds along with many fatty acids like oleic acid, stearic acid, palmitic acid, linoleic acid etc. The main chemical constituent found in neem is terpenoids. Like this, there are lots and lots of plants having chemicals. The compounds which are extracted from plants are treated chemically before being consumed by humans.

The above account gives us a glimpse of the chemistry of plant life.

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Flashlight on Facts: Plant Nomenclature

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During the year 2013 the Botanical Survey of India (BSI) has discovered twenty species of angiosperms new to science. BSI is the apex research organisation under the Ministry of Environment and Forests, Government of India for carrying out taxonomic and floristic studies on wild plant resources of the country through survey, documentation and conservation. Some of these species bear the name of the place where they occur, for example *Chrysosplenium arunachalense* (Saxifragaceae) is from Arunachal Pradesh, *Eragrostis minor* var. *rajasthanensis* (Poaceae) from Rajasthan and *Macrosolen andamanensis* (Loranthaceae) from Andamans.

Species may also be named after some famous personalities, for example *Isoetes panchananii* (after Panchanan Maheshwari), *Berberis darwinii* (after Charles Darwin), *Pinus roxburghii* (after William Roxburgh), *Blakea attenboroughii* and *Nepenthes attenboroughii* (after Sir David Attenborough). We can make a long list of such names.

Often genera too are named like this and it is a great honour for the person concerned. *Linnaea borealis* was named after Carl von Linnaeus and who does not know his name in the field of nomenclature. It is said that he named everything from buffalo to buttercup using his famous Binomial Nomenclature. However, the name for these Twin-flower plants was attributed by Linnaeus himself as it was one of his favourite plants. Linnaeus also named the genus *Bauhinia* to honour the two illustrious brothers, Caspar and Jean Bauhin. They introduced the Binary Nomenclature for plants much before the Binomial Nomenclature of Linnaeus. All the species of this genus are characterised by a notch at the apex of the simple leaf. Surgeon Dalberg sent a plant to Linnaeus from India and he named it *Dalbergia* to honour him.

Magnolia campbellii commemorates two persons -- Pierre Magnol, a French botanist and Archibald Campbell, a doctor in British India. Yet another genus *Tradescantia*

was named to honour John Tradescant the younger, an English botanist and gardener.

Genus *Welwitschia*, the two-leaved wonder is named after the Austrian botanist Friedrich Welwitsch, but the history of its naming was not straightforward. Welwitsch was the first to deliver an account of the species to Joseph Dalton Hooker of the Linnaean Society of London in 1859. He originally supplied a brief technical description and proposed calling it as genus *Tumboa* after its aboriginal name “tumbo”. However, shortly afterwards, Thomas Baines, an artist supplied the illustrations and some preserved specimen that were not in so good in condition. He also informed that “tumbo” was not the aboriginal name of the plant but only a commonly used term. So, Hooker decided to take the permission of Welwitsch and named the genus after his name. Later Welwitsch supplied some well-preserved material of the specimen and Hooker could study its affinities. Presently *Welwitschia mirabilis* is a monotypic genus (a single species in the genus) in its own family Welwitschiaceae in the Gymnosperm order Gnetales.

Most of these names were given many years back and by nomenclaturists of yesteryears. But what will you feel if you are informed that a whole new genus has been named very recently i.e. as late as February, 2015? And that is what has happened. A newly-identified plant species in the genus *Sirdavidia* is new addition to the plant world. Not only that, it is an endangered species too!

Before describing this new plant, I would like to enlighten you about another fact, that a single person has been honoured by both botanists and zoologists many a times. And that person is Sir David Attenborough. Many of us know about him but even then here is a short introduction of him. Do not mistake him with Richard Attenborough, a British actor! They are two brothers although!

Sir David Frederick Attenborough (born 8 May 1926) is an English broadcaster and naturalist.

He is best known for writing and presenting the nine Life series, in conjunction with the BBC Natural History Unit, which collectively form a comprehensive survey of animal and plant life on the planet. He is also a former senior manager at the BBC, having served as controller of BBC Two and director of programming for BBC Television in the 1960s and 1970s. He is the only person to have won BAFTAs for programmes in each of black and white, colour, HD, and 3D.

Attenborough is widely considered a national treasure in Britain, although he himself does not like the term. In 2002 he was named among the 100 Greatest Britons following a UK-wide vote. He is a younger brother of director, producer and actor Richard Attenborough.

Grasshoppers, shrimps, spiders, mammals, other animals as well as some plants have been named after him. Here is a short list:

Grasshopper or pygmy locust *Electrottix attenboroughi* was discovered frozen in amber from Dominican Republic in July 2014.

Ghost Shrimp *Ctenolocoides attenboroughi* was found in northwest Madagascar in 2008.

Goblin Spider, *Prethopalpus attenboroughi* found only on Horn Island off northern Queensland in Australia was described in 2012.

Trigonopteris attenboroughi is a species of flightless weevil found on Mount Bawang in the Indonesian province of West Kalimantan, named so in 2014.

Zaglossus attenboroughi from New Guinea, a mammal, identified in 2007 is called Sir David's long-beaked Echidna.

And there is a fossil Dinosaur too! *Attenborosaurus conybeari*, named in 1993, lived in Dorset, Europe during early Jurassic period (Sinemurian age).

Now we talk about plants:

Hieracium attenboroughianum, Hawkflower is a member of family Asteraceae. This wild flower is found only in the Brecon Beacons in south Wales, UK this nomenclature was provided in 2004.

Blakea attenboroughii, a member of family Melastomataceae was discovered in 2007 and named in 2009. It is an endemic plant from Ecuador.

Nepenthes attenboroughii of family Nepenthaceae is one of the largest pitcher plants of the world. Many pitcher plants trap not only insects but also rodents including mice and rats. This newly discovered species of *Nepenthes* is certainly large enough to catch such a large prey! It was discovered by Natural History Explorer Stewart McPherson during an excursion to Mount Victoria in the Philippines along with other two botanists Alastair Robinson and Volker Heinrich in June, 2007. The plant is endemic to this region and remained undiscovered till the 21st Century. It has been assessed as '*critically endangered*' by IUCN because of its restricted distribution and the plant hunters.

And now we talk about the most recently discovered new plant on this planet. The new plant has been named *Sirdavidia solannona* by a team of researchers in Gabon in central Africa. Four-fifths of central Africa is covered by rainforests. The researchers were surprised to come across a new endemic species and genus in a place that is considered well-known botanically as it is a renowned botanical hotspot.

This newly discovered plant species was found in the Kinguele dam in the monts de Cristal national park and in the Ivindo park. It is just amazing that this new plant has been found in the national parks that were well-explored by botanists. According to Dr Thomas Couvreur, the lead botanist of the research team, "in the tropical rainforests, no species is well-known. It just shows, in a region that we think is well-known you can still have very interesting discoveries". He took the opportunity to name this new plant after Sir Attenborough's name because he had such a wonderful and important influence in his own life as well as life of others. Sir David Attenborough said in this regard: "I know very well that such a decision is the greatest compliment that a biologist can pay to another and I am truly grateful."

The plant, a member of family Annonaceae, has a distinct shape, flowers have red petals and a large number of bright yellow stamens that appear arranged like a cone. There is much resemblance to the flowers of Solanaceae members. Hence, the specific epithet is *solannona*. Similar to Solanaceous flowers these too probably show buzz-pollination. In this type of pollination, when the bees hover around the flowers, the buzz of their wings causes the pollen to fall on the tummy of the bees. While visiting another flower they can thus, bring about pollination. This is just a theory at the moment but the team hope to confirm and then it would be a unique type of pollination in the Magnoliales in which the family Annonaceae is included.

Only three collections of this plant have been made so far. According to IUCN report, therefore it is assessed as "*endangered*". However, as these locations are well protected, being national parks, there may not be any important threat to this plant.

This write up will be incomplete if I do not inform you about two more new plants.

A new palm was discovered from Madagascar in 2006.

It is a giant palm and surprisingly could be viewed in Google earth. No botanist but the manager of a nearby cashew plantation, a French national, Xavier Metz and his family discovered this palm while on a family outing in 2006. They were so surprised to see such a massive palm in an unwarranted area that they photographed it. However, the plant did not flower by that time. The photographs were sent to the Kew Gardens, where it was identified by John Dransfield, a palm expert who worked on other palms of Madagascar also.

Dransfield named this new palm as *Tahina spectabilis* in 2008. Tahina is a Malagasy word which means "to be protected" or "blessed". Incidentally it is the name of the palm's discoverer's daughter, Anne-Tahina Metz and of course, 'spectabilis' is a Latin word that means "spectacular". *Tahina spectabilis* is a "*critically endangered*" species as it exists only in the remote northwest of the island and as few as 90 individuals were found growing.

It is a monotypic genus; flowers after almost 30 to 50 years. The stem tip grows into a large inflorescence that bursts into numerous branches of hundreds of tiny flowers.

However, after this spectacular sight, the plant dies as all the nutrients are used up in the process. The plant is therefore, monocarpic as the bamboos are.

Another new entry to the plant world is *Spigelia genuflexa* of family Loganiaceae in 2011. The plant was found growing in the backyard of a Russian botanist, Alex Popovkin. His 'house help' Jose Carlos Mendes Santos found this sweet little plant very interesting. He uprooted it very carefully and showed it to his employer. The master in turn planted it in a small pot, placed it on the window sill and photographed it. These photographs were shared with other botanists and it turned out to be a new species belonging to family Loganiaceae, to which belongs the large tree *Strychnos nux-vomica*!

This little plant, only about an inch high has a very distinguishing feature. It practices 'geocarpny'. Once the flowers are pollinated and the fruits start growing, they droop to the ground. They may even gently bury the seeds in the mosses growing at the base of the plant. Just as we see the peanut plant acting.

Spigelia genuflexa grows in residual stands of Atlantic forest in the Rio do Negro valley in Bahia state in Brazil. It is about 30 km from the Atlantic coast. It flowers during the rainy season, and almost disappears during the dry season. The specific epithet *genuflexa* is a reference to the plant's tendency to bend down after flowering and is from the Latin word 'genuflexus'. In the opinion of its discoverers, the plant should be listed as '*Data Deficient*' according to the IUCN Red List. It is one of the sixty species of the poorly studied Neotropical genus *Spigelia* and does not appear to be close to any other species of the genus.



Sir David Attenborough



Tahina spectabilis

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What's in a Name?

Ayushi Gupta

Botany (Hons.) III year



“What's in a name? That which we call a rose,
By any other name would smell as sweet.”

- (Shakespeare)

It is true! But sometimes names can be quite informative. Names can tell us a lot about a plant such as its shape, color, growing habit or its unique feature. A plant's scientific name is the key to finding out all sorts of information about that plant species, such as:

- Where does it grow?
- Does it have medicinal properties?
- Would it be a good crop species?
- Is it a weed?
- What are its relations?

However beside scientific names, local names also often reflect a broad spectrum of information given by indigenous people to plants in their local dialects on their understanding of plants. Many plants have their common name derived from historical facts about them, stage of development, their shape or color.

Common names of plants also have a strong connection to folklore and legend and there are some names that immediately conjure up a picture in our minds when we hear them. Here you will find list of some plants' common names, so have a look and discover the wonderful and fascinating world of plants for yourself.

Red- hot cat's tail or chenille is a common name of *Acalypha hispida*. This plant is named so because of the drooping red spikes of red or purple colour.

Century plant is believed to bloom after one hundred years; however, it actually takes about ten years to bloom. The scientific name of this plant is *Agave americana*.

Stars of Persia is a common name of *Allium christophii*. It produces starry lilac flowers hence are called as Stars of Persia.



Angel's trumpet or moonflower is a small tree that produces very fragrant flowers that hang on this tree like trumpets. So it is given the name Angel's trumpet. Its botanical name is *Brugmansia*.

Like its popular name, **Yesterday, Today and Tomorrow**, *Brunfelsia pauciflora* is an interesting plant. The name is so given because it produces violet- mauve flowers that fade into pale- mauve and then white on successive days.

Snow-in summer is a common name for *Cerastium tomentosum*. The plant produces tiny white flowers in summer and is a low growing plant that is usually grown as ground cover. When this plant flowers in summers, it seems like the ground is all covered with snow. Hence, is known as Snow- in summer plant.



Aruncus dioicus produces plumes of tiny white flowers. These plumes hang on the plant like a **goat's beard** thus giving the same name to the plant.



Bleeding hearts is a plant that produces heart shaped flowers that hang on long arching stems. The botanical name of this plant is *Dicentra spectabilis*.

Dracunculus vulgaris produces a really large and unusual flower that is why it is commonly known as **dragon lily**.

Four o' clock is a common name for *Mirabilis jalapa* because it opens its flowers in afternoon.

Ravenala is a tree that is often referred to as **traveller's tree** because it stores rain water in its leaf base which travelers in old times found very useful.

Lamb's tail is the name given to *Sedum morganianum* because of its trailing stems.

Canna indica is also called as **Indian shots**. The seeds of this plant are small, globular, black pellets, hard, and heavy enough to sink in water. They resemble shotgun pellets so this plant is known as Indian shots.

Lipstick palm or red sealing wax palm is a common name for *Cyrtostachys renda*. Although it is not the source of sealing wax, but because of its crown shafts and leaf sheaths having same color as that of the wax used to seal letters it is called so.



Spanish dagger is a common name for *Yucca gloriosa*. This plant has been named so due to its straight, very stiff and long leaves.

“**Firecracker flower**” refers to the seed pods of this plant, which are found after the flower has dried up, and tend to “explode” when near high humidity or rainfall. The scientific name of this flower is *Crossandra infundibuliformis*.



Peltophorum africanum , during spring time it may happen that water drips from the tree’s branches, caused by spittlebug *Ptyelus grossus*. These bugs derive their nourishment from this tree and while doing so they secrete pure water, which causes weeping effect. So this tree is commonly called as **weeping wattle**.

Bottlebrush is actually a plant whose flowers represent a bottle brush. Its scientific name is *Callistemon*



Elephant’s ear is a common name of *Alocasia macrorrhiza*. This plant produces huge yellow green leaves resembling the ear of an elephant.

These were some of the plants having interesting and fascinating common names but the list is endless. The common names of plants may not be as highfalutin as their botanical counterparts, but they are not altogether lacking in scholarly interest, as many have fascinating historical tales to tell.

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Wonders of Nature: Look-alikes

Kirti Sharma
Botany (Hons.) III year



Do you know that some foods resemble human organs?

One Swiss physician Paracelsus believed that nature marks each growth according to its curative benefit. He was a very prominent advocate of the **Doctrine of Signatures** which was based on the philosophy that natural objects resembling any part of human body possessed the power to cure any disease arising in the respective body parts. This doctrine of signatures was a prominent aspect of folk medicine prevalent in the ancient times. Mostly herbalists and wise women of the past were the ones who followed this doctrine and recommended herbal cures for variety of ailments. Apart from Paracelsus, a famous German philosopher Jakob Böhme and Botanist William Coles justified this concept in their writings.

Time period between late fifteenth to late sixteenth century saw a major rise in the popularity of Doctrine of Signatures as this belief garnered more and more written support from philosophers and physicians of that era. Reasoning like God's mystical work for the benefit of mortal beings and expression of plants magical powers was given to justify this concept. Paracelsus, a Physician and a Professor of Medicine not only preached but also cured many maladies of that time following this philosophy.

In the present day scenario this belief has been a major point of discussion in the scientific circles. There have been many articles debating the practical applications and scientific authenticity of the Doctrine. Where some people believe that this concept of allegory might have some scientific basis, others call it nothing but a fallacy which cropped up possibly from the frustrated minds of early folk who suffered from great maladies with no known cures.

Let's have a look at some of the examples to try and determine whether there is any basis behind this philosophy which was prevalent all over the world for such a long period of time and still continues to grab the attention of scientific community.

1. WALNUT (*Juglans nigra*)

Resemblance to: The two hemispheres of brain with detailed ridges and convolutions.

Belief: It is believed to be a cure against any head ailment and also increases intelligence when consumed regularly.

Scientific Reasoning: Studies found that walnut extract broke down the protein based plaques associated with Alzheimer's disease. It also contains omega-3 essential fatty acids plus it has been proven to have been effective in development of at least 30 neuro-transmitters.

2. TOMATO (*Lycopersicon esculentum*)

Resemblance: To shape and colour of the heart.

Belief: It is believed that it cures and reduces the risk of heart disease and several cancers.

Scientific reasoning: Studies found that lycopene consumption reduced the levels of breath and was shown to inhibit the activity of an essential enzyme involved in cholesterol synthesis. A small clinical study suggested a hypo-cholestromic effect, and the antioxidant properties of lycopene have been shown to reduce the risk of cardiac diseases.

3. A SLICED CARROT (*Daucus carota*)

Resemblance to: The human eye with striations and pupil like structure.

Belief: It is believed that carrot helps to protect the vision, especially night vision.

Scientific reasoning: Studies found that carrot gets its orange colour from a plant chemical called beta-carotene which gets converted into vitamin A. Vitamin A is essential for healthy vision. It is also called retinol and has a key role in fighting vision problems like cataracts, night blindness and muscular degeneration.

4. KIDNEY BEANS (*Phaseolus vulgaris*)

Resemblance to: The human kidney in shape.

Belief: It is believed to cure against any kidney ailments and provide nutrients that are helpful to human kidney.

Scientific reasoning: Studies found that kidney beans contain lots of soluble and insoluble fibers and are low in fat which enhance cardiovascular health and helps to keep body pressure low. It also helps to stabilize the blood sugar and cholesterol. Beans also provide wide range of amino acids and other important nutrients.

5. CHEESE

Resemblance to: To the internal structure of bones.

Belief: It is believed to be a cure against any risk of osteoporosis later in life.

Scientific reasoning: Studies found that dairy products such as cheese, yoghurt, ice creams and low fat milk are the rich source of calcium and vitamin D which is important for bones. Osteoporosis is a condition in which thinning bones become so fragile that they are prone to fracture. So for strong bones a diet rich in calcium and vitamin D is needed.

6. BROCCOLI (*Brassica oleracea*)

Resemblance to: The tiny green tips on a broccoli resemble hundreds of cancer cells.

Belief: It is believed to be a cure against cancer.

Scientific reasoning: Studies found that broccoli has a particularly powerful type of sulforaphane, which gives it particular cancer fighting properties. Sulforaphane inhibits histone deacetylase which plays an important role in determining whether certain genes - like tumor suppressor gene are expressed or not.

7. GRAPES (*Vitis vinifera*)

Resemblance to: The structure of alveoli.

Belief: It is believed that grapes reduce the risk of cancer and emphysema.

Scientific reasoning: Studies found that grapes are rich in antioxidant compounds called flavonoids. They are among the plant chemicals that have shown potential for curing heart diseases. Grape seeds contain a chemical called proanthocyanidin which is thought to reduce the severity of asthma triggered by allergy. It is also effective in inhibiting the growth of colorectal cancer cells.

8. SWEET POTATOES (*Ipomoea batatas*)

Resemblance to: The structure of pancreas.

Belief: It is believed to be beneficial for diabetics.

Scientific reasoning: Studies show that sweet potatoes contain vitamin A, C, and B6 and are an excellent source of dietary fibers, potassium and iron. A recent research in the college of agriculture and life sciences has confirmed that sweet potatoes are a low glycemic index food which could be beneficial for diabetics.

9. CELERY (*Apium graveolens*), FIELD MUSTARD (*Brassica rapa*)

Resemblance to: The structure of Bones.

Belief: It is believed to be a cure against any joint and bone ailment.

Scientific reasoning: - Studies show that they are rich in silicon and vitamin K. These foods specifically target bone strength. Bones are 23% sodium, if you don't have enough sodium in your diet the body absorbs it from the bones making them weak. These foods replenish the skeletal needs of the body.

10. ONIONS (*Allium cepa*)

Resemblance to: The body cell.

Belief: It is believed that onion support a healthy immune system and they even produce tears which wash the epithelial layers of the eyes.

Scientific reasoning: Onion contains high levels of vitamin C, numerous nutrients and phytochemicals, many of which offer potential benefits for our immune system. The trace mineral selenium, which helps reduce inflammation and stimulates immune function, is found in higher concentration in onions than in other vegetables and it also helps to initiate the immune response.

10. ROOT GINGER (*Zingiber officinale*)

Resemblance to: The structure of stomach.

Belief: It is believed to be a cure against stomach ailments, nausea and motion sickness.

Scientific reasoning: Studies show that ginger contains anti-inflammatory properties that help to increase the digestive juices and neutralizes the stomach acids to give relief from stomach pain. It also has strong antioxidants called gingerols and shogaols that decrease the free radicals production..

Taking a closer look at some of the examples, based on the philosophy of Doctrine of Signatures it seems that there is actually some scientific basis to this ancient belief that some people call as fallacy. And it needs more scientific research and in-depth study before being subjected to such intense criticism or even orthodox belief.

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Doctrine of Signature

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Forensic Botany: Plant Detectives

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and

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The term 'Forensic' comes from the Latin word 'forensis' which means 'of or for the forum'. Forensic Science is often defined as the application of scientific methods and techniques for the purpose of justice. It has been branched into various sub divisions namely forensic biology, forensic anthropology, forensic chemistry, forensic physics, forensic botany etc. Forensic botany is an

interdisciplinary area where the knowledge of botany is applied to solve the crime.

Plants have been used as both weapons and protector since the beginning of human existence. The role of plants as evidence for solving the criminal cases though is comparatively new. It was only during the 20th century that plants were used in solving criminal cases. The substantial use of wood evidence in the Lindbergh baby kidnapping case marked the birth of forensic botany. Though it could play a valuable role in criminal investigations, but forensic botany had been underused because of the lack of botanical knowledge among curators until recent times. Forensic botany is useful in the examination of gastric contents in homicide victims. If a victim has been moved from the location of death, plant analysis can determine whether plant remnants on the body are characteristic of the vegetation where the body was found or of some other location where the victim was killed amongst other derivations.

MAJOR SUBDISCIPLINES OF FORENSIC BOTANY

ECOLOGY

When we take plant ecology into account, it includes species richness of plants in a region, their effects upon environmental factors and interactions amongst and between plants and other organisms. Knowledge of ecology is useful for the forensic investigators in linking the victim at the crime scene with the suspects. A forensic ecologist must have an in depth knowledge not only about the structure of plants but also about their natural and semi natural habitat, biotic and abiotic component of the habitat, how one species affects the other, their possible and probable time of abundance, growth, structure and overall functions.

PALYNOLOGY

Palynology is the branch of botany that deals with the study of pollen grains, their shape, size, structure and origin. Forensic palynology involves the solving of criminal cases with the help of identification of pollen grains and spores found at the crime scene. Pollen grains being really small in size go unnoticed by the culprit and thus remain at the crime scene helping the investigator to solve the crime. Pollen grains also help in determining the exact location of the crime as certain plants are endemic to specific regions. They are not so obvious visual trace evidence during crime scene collection but are retained on clothing, embedded in carpets, pervasive in soil, etc. Forensically, it is known that the pollen grains which are common have less evidential value than those pollen grains which are not so common and belong to the species which is poorly developed.

Pollen and spore exine vary even at the species level. Their production is seasonal and geographically restricted so they are specific to a particular season and particular location. Pollen grains are important evidence because they decay slowly; so they can even be collected from the rocks which are millions of years old. Pollen also proves to be valuable for oil company archaeologists.

FORENSIC PLANT BIOTECHNOLOGY

Plant Biotechnology in recent few decades has emerged as an exciting area of plant sciences. Through this technology various biological manipulations and interpretations can be done. Techniques like DNA fingerprinting, DNA barcoding, Molecular markers are extensively used these days by investigators to solve the cases. In forensic botany it is mainly used for species identification endemism of the subject plant. Many parental controversy cases have been solved very easily by these methods.

BIOINFORMATICS

Forensic DNA and bioinformatics are inherently interdisciplinary and draw their techniques from statistics and computer science. These can provide information related to molecules which can be strong evidence for solving legal cases, bringing

together biology and law. Identification of plants and micro-flora reported at the crime scene can be re-sequenced using microarray and can be analyzed using bioinformatics standard techniques. During the investigation, objective is to match DNA recovered from crime scene and criminals. Bioinformatics tools and available database can be used to estimate and determine the probability of a particular genotype of importance. Forensic botany, though, not new but has emerged as an important discipline in solving the mysteries in crime after the recent advent in technologies. Advancement in molecular technology investigation with application of forensic botany has become more precise and accurate.

ANATOMY

Anatomical knowledge about species can be useful forensically, because a botanist can identify plant fragments found on the clothing of a victim, and can determine whether those plants came from the site in which the victim was found or from some other area.

DENDROCHRONOLOGY

The study of annual growth rings in trees is known as dendrochronology. These are formed due to gradual change in the radius of the xylem cells during dormancy period.

The counting of rings of a root is a best and popular method to determine when the dead body was buried in the ground. The ground becomes disrupted during this activity and it leads to initiation of new growth around the ground. So, by counting the no of rings in the new growth, a date, within a year can be acquired. With the help of wood morphological features, the dating of wooden objects can be done and by matching the wooden objects with the crime scene we can reach up to the culprit.

MOLECULAR BIOLOGY

Botanical samples may be too small or deteriorated to supply definitive morphological or histological features. In such cases, DNA technology may be used to identify the species. Useful loci include the nuclear ribosomal DNA internal transcribed spacer regions 18S, ITS1, and ITS2, and the chloroplast genes *rbcl*, *atpB*, and *ndhF* (Miller Coyle *et al.*, 2001). Plant material can be identified to species level with as little as a 1 mm fragment of dried tissue, 5 grains of fresh pollen, or 10 picograms of DNA.

Importance of Botanical evidence

Plant and its components play a vital role in forensic evidence. The rigid cell wall of plant made up of varying percentage of cellulose and lignin cannot degenerate easily and is even more difficult to be digested by animals.

Remains of plants are found almost everywhere. Plants provide macroscopic as well as microscopic evidence.

Macroscopic – such as pieces of wood, seeds, leaves, twigs, plant hairs etc.

Microscopic – air borne pollen and spores and algal cells in aquatic environment

Their morphological diversity provides us the information about the seasonal or geographical location, also if the body was buried, then about how long time, whether it was a murder, if any suspect was present when it took place etc.

Future of the forensic botany

Forensic botany is an advanced and growing field. But there are still many criminal investigators, medical examiners, attorneys who remain unaware of the botanical importance in forensic science. To solve the criminal cases forensic botanists also hire some private experience consultants and their suitability is checked by the experience and educational credentials.

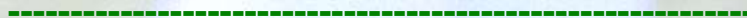
This is a very challenging and important option for the future for all those who would like to study law for post-graduation.

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Virus Induced Gene Silencing A Powerful Tool for Reverse Genetics

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Introduction:

Gene silencing is a phenomenon which is triggered by double stranded RNA (dsRNA) resulting into the sequence specific degradation of the RNA molecules therefore leading to silencing of gene expression (Susi et al., 2004).

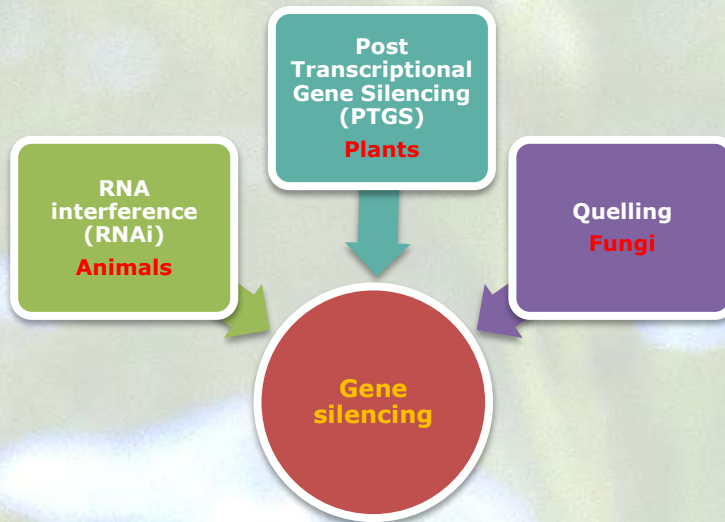
REVERSE GENETICS

• Reverse genetics is the approach that determines the function of a gene by analyzing the phenotypic effects of altered DNA sequences. It starts from genotype to reach a phenotype.

FORWARD GENETICS

• Forward genetics is the approach of determining the genetic basis responsible for a phenotype. This was initially done by generating mutants by using radiation, chemicals, or insertional mutagenesis. It starts from phenotype to reach the genotype.

The phenomenon of gene silencing, which has been found to be conserved across kingdoms, is also referred as RNA interference (RNAi) in animals, post-transcriptional gene silencing (PTGS) in plants and Quelling in fungi.



In gene silencing pathway the trigger dsRNA is “diced” by enzymes called Dicer into stable dsRNA intermediates of 21-23nt in length, the small interfering RNAs (siRNA, miRNAs, piRNAs). These small interfering RNAs are loaded into a multiprotein nuclease complex known as RNA induced silencing complex (RISC). The activated RISC then targets and cleaves mRNA using the incorporated siRNA strand as a sequence homology dependent guide (Tomari and Zamore, 2005).

GENE SILENCING PATHWAY

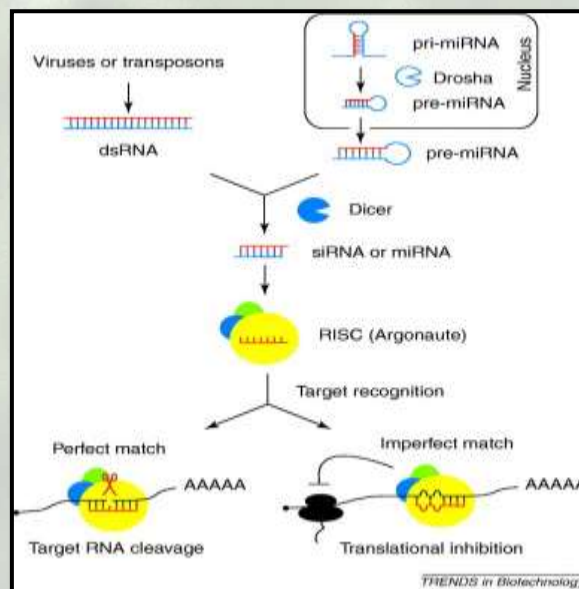
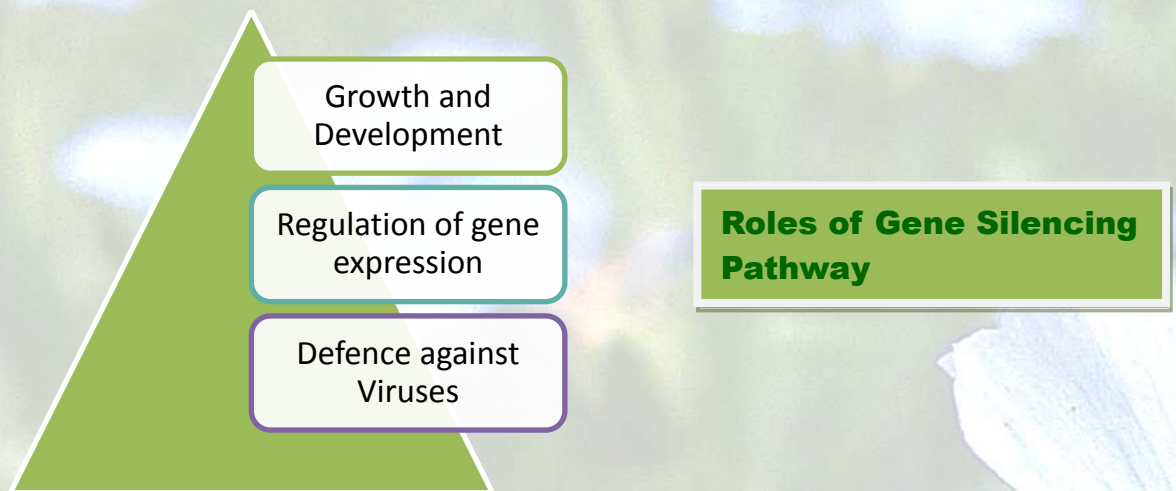


Figure 1: Pathway showing sequential steps of gene silencing (Ronald P. van Rij, Raul Andino, Trends in Biotechnology, Volume 24, Issue 4, April 2006, Pages 186–193)

This pathway plays important roles in several basic biological processes such as growth and development, cellular regulation, protection against invasive nucleic acid molecules, such as viruses and transposable elements (Ratcliffe *et al.*, 1999; Vance and Vaucheret, 2001).



One of the important functions of this pathway in plants is in defence against viruses. In response to viral attack on a plant dsRNA, which acts as the trigger for RNA silencing, are produced. These viral dsRNA induces the RNA-mediated gene silencing pathway which is directed against viral genes therefore resulting into the containment of the infection.

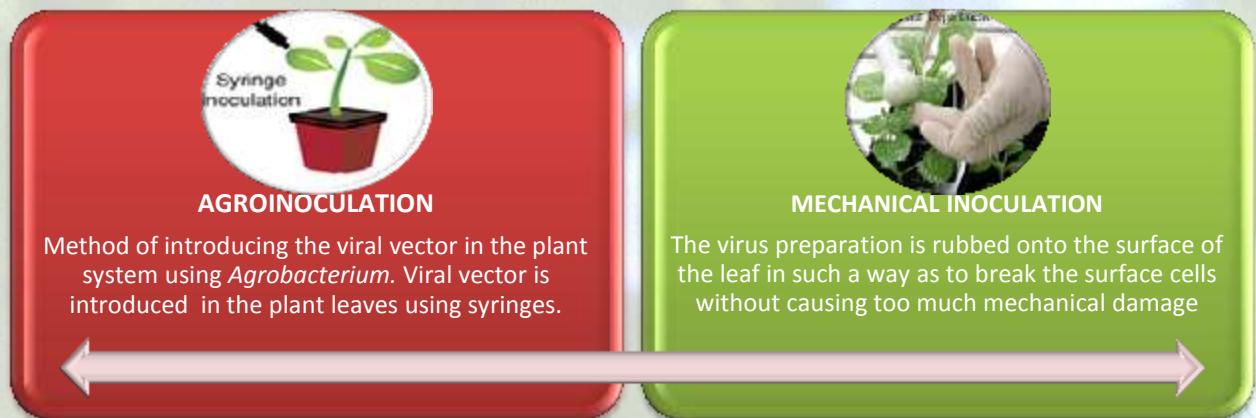
Virus Induced Gene Silencing (VIGS):

This natural defence response of plants against viruses has been adapted to develop into a powerful tool for reverse genetics known as Virus Induced Gene Silencing (VIGS).

VIGS is a newly emerging technology for transient and rapid gene silencing in plants using viral vectors thereby helping in gene function analysis (Purkayastha and Dasgupta, 2009). As a defence response against viral attack plants trigger the VIGS pathway whereby it degrades the viral genome via the RNA silencing pathway (Ding and Voinnet, 2006).

This natural defence response has been utilized to downregulate specific plant genes whose functions are to be analysed. To achieve this, a replicating viral vector

is prepared into which the desired endogenous plant gene is inserted. These modified viral vectors can be introduced into the plant by using technique such as *Agrobacterium* mediated agroinoculation, mechanical inoculation of *in vitro* transcripts or by biolistic delivery methods.



Methods of inoculation (www.agric.gov.mt)

When such a replicating viral vector is introduced into a plant, it triggers RNAi response against itself as well as the inserted plant gene. As a result the transcripts of the inserted plant genes are degraded by the specific enzymes of the gene silencing pathway. In the absence of the transcripts, the functions of the desired gene are interrupted leading to the development of unique phenotypic features. Such plants which display unique phenotypic features resulting from disruption of the function of specific plant genes, called as functional knockouts. These phenotypes hint towards the possible functions of the plant gene which are validated by further experimental studies.

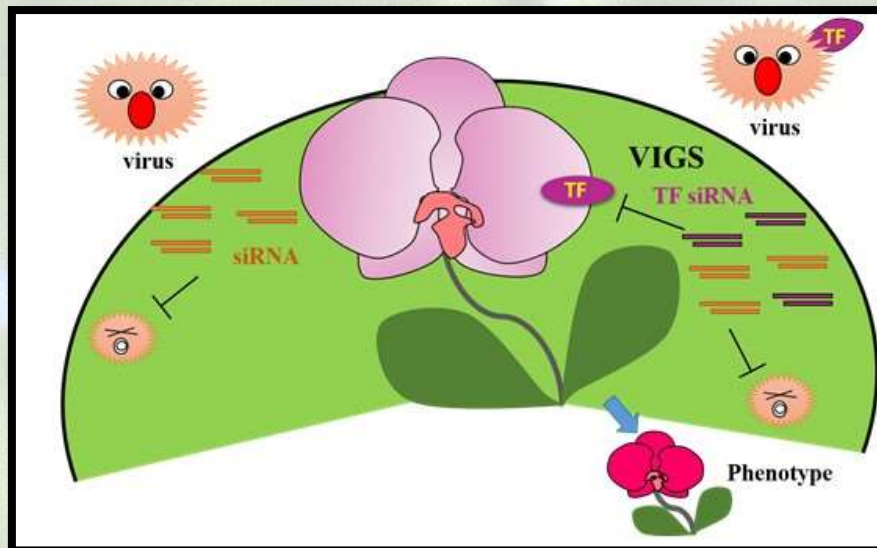


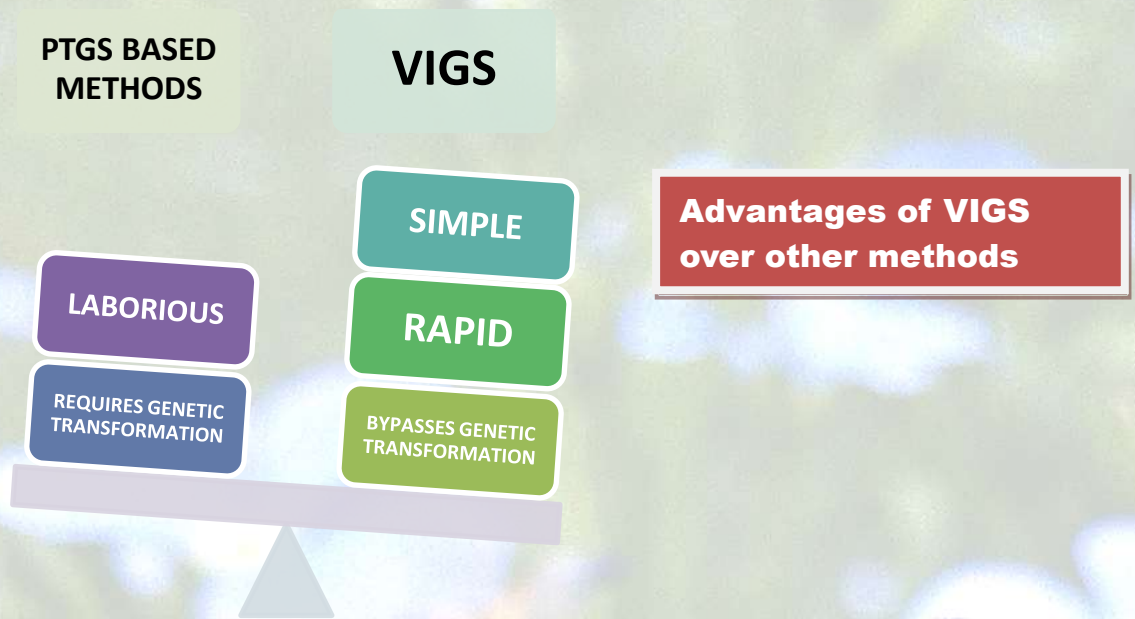
Figure 2: Steps involved in silencing of target gene using VIGS technology. TF: represents the target gene; Phenotype: mutant phenotype obtained after silencing of target gene. (Hsin-Hung Yeh, Agricultural biotechnology research center, <http://abrc.sinica.edu.tw/pi/?id=hyeh>)

Advantages of VIGS technology:

VIGS technology is being used as a method of choice for rapid silencing of plant genes in order to determine their function. This is mainly attributed to the advantages of VIGS over other available methods. PTGS-based methods require genetic transformation steps for creating “functional knock-down” for a plant gene which is very time consuming as well as laborious. In comparison to PTGS, generating functional knockout plants using VIGS is fairly simple and rapid which can be achieved within a matter of weeks without having to transform plants.

In addition, since this technique bypasses the transformation steps, this can also be utilized for functional analysis of those plant species which are recalcitrant to transformation or for which transformation protocols are not yet standardized. The methods that are used for introducing the replicating viral vector in plants are also very simple often involving agroinfiltration or biolistic inoculation of plants. This technique is also capable of giving quick results usually within two-three weeks of inoculation.

Another advantage of the VIGS technique is that it can be used to silence multiple members of a gene family by targeting any conserved region common to all.



Applications of VIGS technology:

In recent years the technology of VIGS has been used extensively for determining the functions of a large number of genes in plants involved in growth and development pathways, abiotic stress responses, defence response pathways etc. The first VIGS vector to be developed was based on an RNA virus, *Tobacco mosaic virus* (TMV). The gene encoding for the enzyme Phytoene desaturase (PDS), which develops a visible phenotype upon silencing, was selected for functional analysis using this TMV based VIGS vector.

PDS is an enzyme involved in the biosynthesis of carotenoids which are compounds that protect chlorophyll from photo-bleaching. Transcripts of recombinant TMV carrying a sequence encoding *pds* were produced *in vitro* and inoculated to *Nicotiana benthamiana* plants. Using TMV based VIGS vector successful silencing of *pds* could be achieved with the silenced plants displaying photo-bleaching of the leaves (Kumagai et al., 1995). The unique phenotype obtained after silencing of *pds* gene thus, corroborates with its function of protecting chlorophyll from photo-bleaching. Since then, many RNA and DNA viruses have been modified to develop VIGS vectors. In addition to *N. benthamiana*, the VIGS technique has been shown successfully on plants such as tomato, petunia, *Arabidopsis*, barley, rice etc.

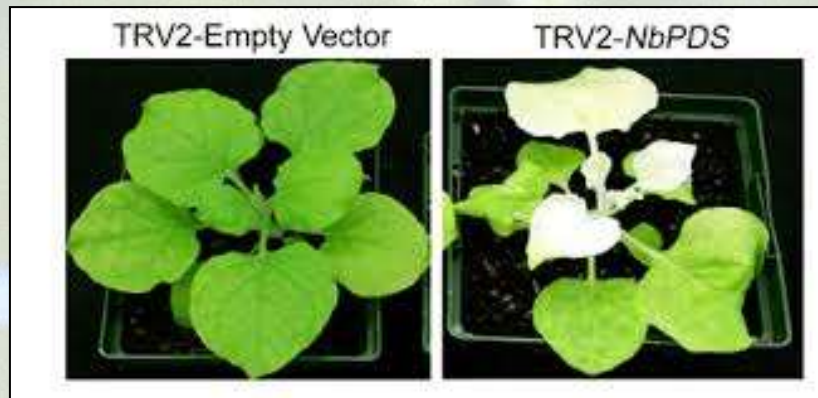
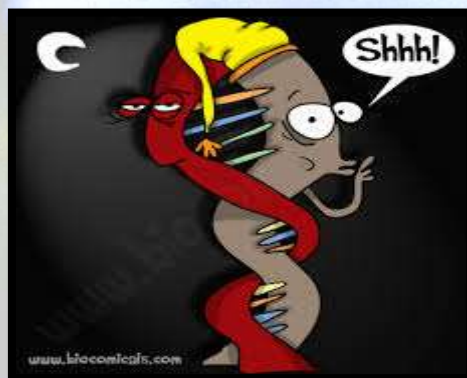


Figure 3: Phenotype obtained after silencing of PDS (*Phytoene desaturase*) gene using Tobacco rattle virus (TRV) based VIGS vector. Meenu Padmanabhan and Savithamma P. Dinesh-Kumar, Virus-Induced Gene Silencing as a Tool for Delivery of dsRNA into Plant (<https://www.scientificprotocols.org/protocols/virus-induced-gene-silencing-as-a-tool-for-delivery-of-dsrna-into-plants>)

A number of excellent VIGS vectors based on several viruses such as *African cassava mosaic virus*, *Bean pod mottle virus* etc has been developed for functional analysis of genes in case of dicot plants (Lu et al., 2003b; Burch-Smith et al., 2004). But only three viruses has been utilized successfully to be used as VIGS vectors in case of monocot plants; a vector based on *Barley stripe mosaic virus* for barley, wheat and maize (Holzberg et al., 2002), a vector based on *Brome mosaic virus* for rice, barley and maize (Ding et al., 2006) and, more recently, one based on *Rice tungro bacilliform virus* (RTBV) for rice (Purkayastha et al., 2010).

Virus-induced gene silencing (VIGS) is thus a powerful reverse genetics technique that exploits an RNA-mediated antiviral defense mechanism in plants. It is a method of gene knock down mediated by a replicating viral nucleic acid engineered to carry a host gene to be silenced. Methodological simplicity, robustness and speedy results make VIGS an ideal technique for high-throughput functional genomics.



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Some Interesting Trees

Himani Gupta

Botany (Hons.) II year



- **Who needs a compass?**

When lost, it is possible to use trees to assist you in navigation. In northern temperate climates, moss will grow on the northern side of the tree trunk, where it is shadier. Failing that, if a tree is cut down you can observe the rings of a tree to discover which direction north is. In the Northern hemisphere, the rings of growth in a tree trunk are slightly thicker on the southern side, which receives more light. The converse is true in the Southern hemisphere.

- **The oldest living thing on earth**

The oldest living organism on Earth is believed to be the “Pando” colony of Quaking Aspen (*Populus tremuloides*) in Utah, also known as the Trembling Giant. The colony of trees covers some 41.7 hectares (103 acres) and is estimated to weigh nearly 6,000,000 kilograms (6,600 tons), making it also the heaviest known organism. Being a clonal colony, all the tree trunks share identical genetic makeup. It is estimated that parts of the inter-connected root stock that links the colony together is older than 80,000 years!

- **Most dangerous tree**

A member of the spurge family, the world’s most dangerous tree is the manchineel (*Hippomane mancinella*) of the Florida Everglades and the Caribbean coast. The sap that its trunk exudes is so poisonous and acidic that a mere contact with human skin causes a breakout of blisters, and blindness can occur if it touches a person’s eye. Even standing under it in the rain is enough to cause blistering if the skin is wetted by raindrops containing any sap. In addition, a single bite of its small green apple-like fruit causes blistering and severe pain, and can prove fatal. And if one of these deadly trees is burned, the resulting smoke can cause blindness if it reaches a person’s eye.

- **Communicating trees**

Some trees can communicate with each other. When Willows (a type of deciduous trees found primarily in moist soils) are attacked by worms and caterpillars they emit a chemical that alerts other trees in the neighbouring region. The other trees then respond by pushing more tannin in their leaves which makes them difficult to be digested by insects.

- **Tree of life**

The Tree of Life in Bahrain is one of the world's loneliest trees. The mesquite tree sits at the highest point in the barren desert of Bahrain, hundreds of miles from any other tree and is thought to have tap roots reaching hundreds of feet down to aquifers. The exact age of the tree is unknown though it's generally believed to be more than 400 years old.



- **Chandelier tree**

The Chandelier Tree, also known as the drive-through tree, is a giant redwood located 175 miles north of San Francisco in US 101. The massive tree had the ignoble fate of having a tunnel carved through its base more than 60 years ago and is now the centerpiece of a 200-acre grove of redwoods. For \$3, you can drive your car through the tree — unless you are driving a Winnebago — and set up a picnic at its base.



- **Snow in summer**

Sometimes in summer you can find white cottony tufts floating in air. Feather light and soft white in texture, these tufts can be seen in abundance in open grasslands. They are aplenty and when they cover the ground, they resemble snowflakes from a distance. These fibrous tufts come from *Bombax ceiba* also known as 'silk cotton tree' or 'Semal'. The cottony tuft is actually the seed fiber that serves as parachute mechanism for seed dispersal, which enables the seed to float in air. In Hong Kong, during the flowering season, the Semal flowers are used to make a type of tea.



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Dendrology: The Wood Science

SwayangSiddha Nayak

B.Sc. Life Sciences (III year)



Wood is a porous and fibrous structural tissue found in the stems and roots of trees. An organic material, it is naturally composed of fibers (which are strong in tension) embedded in a lignin matrix which resists compression. Sometimes, wood is defined as the secondary xylem in the stems of trees. The Earth contains about one trillion tons of wood, which grows at a rate of 10 billion tons per year. Dendrology or xylology is the study of woody plants and their taxonomic classification.



People have used wood for many purposes, primarily as a fuel or as a construction material for making houses, tools, weapons, furniture, packaging, artworks, and paper. If you have been observant enough you would have wondered **why we see formation of knots**

in woody stems? What do the rings in a stem signify? Does a tree have an age limit? What gives a characteristic colour to the stems? What actually prevents stems from getting infected with insects?

Since all these facts have a significant scientific background let's unravel the logistics one by one!

Dendrochronology or **tree-ring dating** is the scientific method of dating, based on the analysis of patterns of **tree rings**, also known as **growth rings**. Each tree ring marks a line between the dark **late wood** that grew at the end of the previous year and the relatively pale **early wood** that grew at the start of this year. One annual ring is composed of a ring of early wood and a ring of late wood.



What Causes Variations in Tree Rings?

When conditions encourage growth, a tree adds extra tissue and produces a thick ring. In a discouraging year, growth is slowed and the tree produces a thin ring. Much of the variation in tree rings is due to variations year-to-year in:

- Higher spring time temperature: If spring starts early, the growing season is likely to be longer than usual, causing a tree to have a wider ring.
- Lower springtime temperature: A late spring is likely to shorten the growing season, causing a tree to have a narrower tree ring.
- Wider rings are produced during abundant rainfall. However different species of trees differ in their responses when exposed to same weather conditions. One might respond strongly to changes in overall rainfall, another might be more sensitive to the amount of rain during the late summer, and still another to a temperature change that alters the length of the growing season.
- Crowding from neighboring trees narrows the girth of the rings formed as can be seen if the rings are narrow on one side of a tree with wide rings on the other side, the tree was crowded on the side of the tree where the rings are narrower.
- Fire scars suggest that the tree was exposed to forest fires.

❖ Knots produced in the stems

Knots are basically imperfections in the wood that may cause loss of essential technical properties of the wood. Knots materially affect cracking and warping, ease in working, and cleavability of timber. They are defects which weaken timber and lower its value for structural purposes where strength is an important consideration. Knots are produced as a consequence of subsequent layer formation of newly developing limbs on the dead lower limbs of the stem. Stems with knots do not essentially defect the structural properties of timber and are often used as decorative items in households.

❖ The Characteristic coloration of wood

The characteristic coloration in the stems is due to the various deposits such as resins and other chemical substances in the heartwood which gives it a dramatic contrast from the sapwood. The blackest wood in the world is **Ebony** and the whitest being silver striped **Holly**. Abnormal discoloration of wood often denotes a diseased condition, indicating unsoundness. In **Western Hemlock**, the black check is the result of insect attacks. The reddish-brown streaks so common in **Hickory** and certain other woods are mostly the result of injury by birds. The discoloration is merely an indication of an injury, and in all probability does not affect the properties of the wood. Some rot producing fungi impart to wood



characteristic colors which thus become symptomatic of weakness; however an attractive effect known as “**Spalting**” produced by this process is often considered a desirable characteristic. Ordinary sap-staining is due to fungal growth, but does not necessarily produce a weakening effect.

❖ **Self-defense against attack by insects**

Often the woods are infested with insects like termites and other insects which derive their food from the wood. Therefore trees do not die of age but due to infection by wood eating insects which damage its conducting channels and hence disrupts its overall growth and functioning. Over the years, the trees have developed interesting mechanism to prevent this. The infected trees produce chemicals which when released into the air act as warning machinery for the unaffected trees to produce a lot of tannin as the taste of tannin irritates the insects and it is unlikely to infect it.

❖ Few more interesting facts:

- Trees mean rain. Every day, just one acre of maple trees release as much as 20,000 gallons of water into the air.



- Place trees in the right way near a property and they can cut air conditioning by 30%.

- All wood is biodegradable.

- The heaviest American wood is Lignum Vitae Holywood, particularly rich in Lignin.

- The mighty Giant Sequoia is thought by many to be the

biggest living organism in the world, although a 2,400 acre fungus mycelium in eastern Oregon – almost ten square kilometres of it – is a strong if less-visible contender.

- The world’s shortest tree is the dwarf willow, which lives in northerly and Arctic Tundra regions and rarely grows more than a couple of inches high.

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Editors' Box by Dr. Gita Mathur

Some food for thought:

- Why does a nail fit tightly in wood and not in metal or thermocole?
- What is plywood? How is plywood made?
- Why is plywood always made in odd number of plies: three ply, five ply, seven ply and so on?
- Why is Fevicol and not gum good for binding wood?
- Why is it easy to cut wood in one direction and difficult in another direction?



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Gymnosperms: Treasure Trove of Medicines

Akshama Singh
Botany(Hons.) I year



EARTH has been around for a while and in that time it has attained a system of EXISTENCE, i.e. existence via balance. It is the balance which we see between these ecosystems on earth. Flora components of the ecosystem have been enriching life on earth to a great extent from even before the term "science" was coined. Be it by providing the most essential element of our survival, the oxygen or the basic necessities like food and shelter. Apart from this, plants have also been important contributors in the field of medicine from ages unknown.

Gymnosperms, the naked seed bearing plants are ethno botanically important group of plants. Since the ancient times this group of plants has been exploited indiscriminately for wood, resin, aesthetics, food and also as a source of medicines. Conifers, Cycads, Gnetophytes and Ginkgo make up this group of amazingly robust plants. Although devoid of flowers these plants still bear seeds and show medicinal properties equivalent to that of any angiosperm. The Gymnosperms are widespread covering many latitudes and longitudes. Their diversity and the area of coverage is as astounding as their usage by indigenous tribes and modern medicine, be it the bark, leaves, seeds or the abundant secondary metabolites found in this group of plants. Many members of gymnosperm have shown great potential for medicinal uses. Most of the plant species of this group have been reported to provide effective remedy against arthritis, fever, diarrhea, diabetes, jaundice, backache, stomachache, ulcers, cold and even the most deadly disease like "cancer". Some of the species and their usage in herbal as well as modern medicine are mentioned below.

A. CANCER

- 1) *Taxus buccata* of Taxaceae contains an important medicinal derivative called TAXOL which is used for fighting against the deadly disease, Cancer. Now-a-days this tree is highly in demand because of the detection of TAXOL, in barks and leaves, which is an "anticancer compound". This discovery has raised its demand in the medical industries so much that the tree is vulnerable to get extinct.
- 2) Pine needle tea has strong anti-mutagenic, antioxidant and anti-proliferative properties, which help in preventing cancer producing cells. Along with that, they

also have anti-tumor effects on the body. Adding white tea to a diet that includes a wide variety of antioxidant-rich foods may assist in the prevention, occurrence or recurrence of some cancers.

B. RESPIRATORY DISORDERS-

- 1) History reveals the use of *Ephedra sinica* over centuries as a drug, ephedrine obtained from this plant is effectively used in the treatment of asthma and hay fever. Its seeds are also used as cooling medicine.
- 2) *Ephedra Gerardiana* tea made from around 6gms of dried herbage (which is obtained by boiling their stalks in water) is mainly used in the treatment of asthma, bronchitis and relieving bronchial spasm.
- 3) *Taxus wallichiana* has leaves with antiseptic and sedative properties. Its leaves are used in bronchitis, asthma and for indigestion.
- 4) The decoction of the bark of *Picea rubens* has been used in the treatment of lung and throat problems.
- 5) *Abies pindrow*, tincture of the dried leaves is useful in case of cough, asthma and chronic bronchitis.
- 6) A tincture prepared from the seeds of *Cycas revoluta* is used to relieve headache, giddiness and sore throat.

C. GASTROINTESTINAL TRACT DISEASE

- 1) *Cedrus deodara* bark is powdered and is used in treatment of pulmonary and urinary disorders and stones in kidney. Its oil has diaphoretic characters hence it is very useful in skin diseases and for ulcer treatment.
- 2) Microsporophylls of *Cycas circinalis* is used as anodynes.
- 3) Bark of *Abies pindrow* is astringent hence it is very useful in fever, diarrhea and dysentery.

D. ANTIDOTES TO POISONOUS BITES

- 1) *Pinus* wood and oleoresin is used in snake bite and scorpion sting.
- 2) The *Juniperus* berry is a great counter poison. It is excellent antidote. It is a powerful remedy against dropsy.

E. PAIN KILLERS

- 1) Microsporophyll of *Cycas circinalis* is used for making pain killing drugs.
- 2) A gum obtained from *Cycas rumphii* is effective in healing painful swelling with pus.

F. ETHNO BOTANICAL USES

- 1) Pine needle paste in combination with lime is used as a plaster for the treatment of fracture in domestic animals in the Kumaon hills.
- 2) *Picea glauca* cone infusion was used by Abnaki for urinary troubles. Eskimos used poultice of its resin for wounds and ate its cambium in the spring. A tea made from *Picea rubens* was used by Cherokee for colds and measles.

3) Pine needle tea is a centuries-old healing remedy for Native Americans. When European settlers came to the continent and were suffering from scurvy due to lack of vitamin C, the Native Americans introduced them to pine needle tea. Native Americans filled mattresses with pine needles to repel fleas and lice.

Pine needle tea is high in fat-soluble vitamin A, an antioxidant beta-carotene, which is needed for healthy vision (especially in low light situations), skin and hair regeneration, and red blood cell production.



The few medicinal applications of gymnosperms mentioned above shows only the glimpses of how crucial this group is for the human beings. These few examples alone convey the relevance of gymnosperms to medical field. Hence it is our responsibility and duty to protect them from getting exploited by our own demands, needs and greed.

NEVER LET THE CYCLE OF EXISTENCE AND BALANCE GET DISRUPTED!

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Ayurveda: As Relevant Now

Neha Jha

Botany(Hons.) III year



From the ancient times and till today, lot of diverse kind of natural resources that exists on earth has served not only the primary human needs but also for health care. The Indian subcontinent, with the history of one of the oldest civilizations harbors many traditional health care systems, ayurveda being one of them. The development of these health care systems was supported by the diversity in flora and fauna due the variation in geographical landscape.

'Ayurveda' is a Sanskrit word which means 'the scripture for longevity'. It is the ancient (about 3000 B.C) Indian system of health care and is prevalent in India and several South Asian countries. The knowledge of Ayurveda has been passed on through the generations via different historical scriptures like the sacred text that is the 'Vedas' and 'Samhitas' written by two of the greatest physicians of ancient India, Charaka and Shushrutha.

Ayurvedic treatment of a disease consists of salubrious use of drugs, diets and certain practices. Medicinal preparations in ayurveda are invariable complex mixtures based mainly on plant products. Therefore, ayurvedic medicines are mainly composed of herbal preparations which are occasionally combined with different compounds as supplements. According to some sources, up to 80 percent of people in India use some form of traditional medicine, a category which includes Ayurveda.



Ayurvedic Medicines

In Ayurvedic systems, mostly the herbs are used for medicinal purposes and they are classed as tonics and rejuvenators.

Around 1,250 plants are currently used in various Ayurvedic preparations. The most common used plant in Ayurveda are Ashwagandha (*Withania somnifera*), Brahmi (*Bacopa monnieri*), Jatamnsi (*Nardostachys jatamansi*), jyotishmati (*Celastrus paniculatus*), Mandukparni (*Centella asiatica*), Shankhapushpi (*Convolvulus pluricaulis*) and Vachi (*Acorus calamus*). The knowledge of Ayurveda and many Indian medicinal plants have come under scientific scrutiny since the middle of nineteenth century. Scientists across the globe are integrating this natural science with the modern ways of treatment since the traditional treatment does not have side effects. Isolation of the hypertensive alkaloids from the Sarpagandha plant (*Rouwolfia serpentina*) establishes the authenticity of Ayurveda since the plant was used for the treatment of hypertension, insomnia and insanity.

The Indian government supports research and teaching in Ayurveda through many channels at both the national and state levels, and helps to institutionalize traditional medicine so that it can be studied in major towns and cities.

However, lot of extensive botanical research is still required in this traditional medicinal system to establish many plants and herbs as potent medicine and this holds lot of scope in future.



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The Mushroom Story: Fresh Mushrooms, Nature's Hidden Treasure

Srishti Shekhar
Botany(Hons.) I year



Mushrooms are miniature pharmaceutical factories, and of the thousands of mushroom species in nature, our ancestors and modern scientists have identified several dozen that have a unique combination of talents that improve our health. Mushrooms are known for their richness of vegetable proteins, high content of amino acids ranging to be even higher than the amount present in eggs. They are the reservoir of minerals like Na, K, Ca, P, Fe and even folic acid. They are supposed to have a major role in weight management, improved nutrition, increased vitamin D levels through diet and improved immune system function. With every passing day some new miracles of mushrooms are unravelled, which make them more precious and in greater demand by people, and in turn has led to the establishment of an industry which deals with mushroom cultivation.

Most importantly the demand for mushroom is fast increasing in markets and a big gap exists between supply and demand, thus there is need to take advantage of this situation by encouraging its production which is a highly viable and not so tedious venture.

It was a great learning experience for me to witness mushroom cultivation and its procedure in a workshop conducted by the All India Kitchen Garden Association (A.I.K.G.A), which urged me to share my experience with everyone through this article.

Mushroom cultivation: It is the technique to develop the fruiting bodies of edible fungi. About a dozen fungi are cultivated in over 100 countries with an annual production of 2.2 million tonnes. Together they yield a major share of the total production. Mushroom farming consists of six steps, and although the divisions are somewhat arbitrary, these steps identify what is needed to form a production system.

The six steps are:

Phase.1: MAKING MUSHROOM COMPOST: Composting is initiated by mixing and wetting the ingredients as they are stacked in a rectangular pile with tight sides and a loose centre. Mostly barley or wheat straw and animal dung (horse and cow) is used as raw materials for composting. This is done mostly outdoors and a wharf, a compost turner for aeration and hydration of material, and a tractor-loader are used.

PHASE.2: FINISHING THE COMPOST: In this phase two important processes are included. First is pasteurization to kill the pests present in compost and second is the removal of ammonia formed during phase1, because it is lethal to the spawn (the mushroom seeding). The most important criteria of this phase are control of temperature and maintenance of ecological conditions to promote the growth of thermophilic organisms, which in turn help in degradation of the ammonia produced.

PHASE.3: SPAWNING: The compost is inoculated with mushroom spawn (mycelium). The mushroom arises from thin, thread like cells called mycelium and is itself the fruiting body and the spores are formed within a mushroom cap. Spawn is vegetatively propagated mycelium, and commercial mushroom farmers purchase this spawn from specialized spawn producers.

PHASE.4: CASING: It is the process of applying top dressing to the spawn infested compost. Clay foam, field soil, peat moss with ground limestone, or even spent compost can be used as casing material. Casing acts as a water reservoir and a place where rhizomorphs form. The casing should be pasteurized, uniformly spread, and should have high moisture absorbing and retaining capacity. This uniformity is to allow the mushrooms to develop at same rate. High moisture produces firm bodied mushrooms. The compost temperature is kept at 75 degree Celsius for five days for a good crop.

PHASE.5: PINNING: Mushroom initials develop after rhizomorphs are formed in the casing. The initials are extremely small but can be seen as outgrowths on a rhizomorph. These outgrowths continue to expand and grow larger through the button stage, and ultimately a button enlarges to a mushroom. Harvestable mushrooms appear 18 to 21 days after casing. These pins develop when the carbon dioxide content of room air is low and fresh air is introduced at a particular time, thus, the timing of fresh air introduction is very important and something learned only through experience.

PHASE.6: CROPPING: Cropping consists of 3-5 days of harvest cycle followed by a few days of zero crop. This cycle repeats itself in a rhythmic fashion, and harvesting can go on as long as mushrooms continue to form. Most mushroom farmers harvest for 35 to 42 days, although some harvest a crop for 60 days which can go for as long as 150 days. Air temperature during cropping should be held at 15 degree Celsius for good results. This temperature range is crucial to favour good crop, suppression of unwanted weeds, plants and pests. It takes approximately 15 weeks to complete

an entire production cycle, from the start of composting to the final steaming off after harvesting.

Final yield depends on how well a grower has monitored and controlled the temperature, humidity, pests and so on.

MUSHROOM CULTIVATION IN INDIA AND DELHI: Mushroom cultivation or mushroom farming is also increasing drastically in India. The all season growers are scattered all over the country. The large export oriented units (EOU) are located in Punjab (near Chandigarh), Dehradun, Gurgaon (near Delhi), Hyderabad, Madras, Ooty hills, Pune, Paonta Sahib and at Goa. These large units have the growing capacity in the range of 200 to 5000 tonnes.

Mushroom farming is even practised at a large scale in Delhi. There are many dedicated organisations like the Mushroom Research Development and Training Centre (MRDTC). MRDTC is a unit of DK Floriculture and is established by an Indian mushroom scientist Dr. B.L Dhār. This unit also organises training on cultivation of button and oyster mushrooms for students and other interested persons. Similar training is also provided at Usha Farm, Bijwasan, New Delhi.

There is a large scope in this profession because, as detailed above, the procedure is simple, high earning and returns can be had from low investment in space and raw materials, market demand is high, know-how is available and above all hands-on and demonstration training is at hand.

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Agriculture Redefined

Shreya Tripathi
Botany(Hons.) II year



Agriculture came into existence 12000 years ago, and since then it has undergone significant developments. The fertile crescent of western Asia, Egypt and India were sites of earliest planned sowing and harvesting of plants that had previously been gathered in the wild.

Agriculture occupies a lion's share of 70% in contributing to the economic infrastructure of India. Therefore, research in agriculture is a much needed entity. In today's era of urbanisation where human activities pose an apocalyptic threat to the very existence of our planet, practising sustainable agriculture becomes need of the hour. The basic approach required here is not just to meet the food demands of the burgeoning human population but also improvising the current plant systems to a more acclimatised level. Agricultural scientists today, have to deal with a myriad of problems like control of various diseases, pests, weeds etc. Discovery of new crop diseases continue to challenge the research intellectuals of the world.

Recently agricultural scientists have ventured into some quite interesting areas of research like:

1. Space Agriculture
2. Biodiesel fuel
3. Indoor Agriculture

Space Agriculture

The entire idea of space agriculture stems from the target of sustainable human existence on other planets such as Mars. Space agriculture technically refers to 'sustainable robotic agriculture.' A key variable in space is gravity. Planets (e.g. Mars, 1/3 g) and moons (e.g. Earth's moon, 1/6 g) differ from spacecraft orbiting the Earth (e.g. Space stations) or orbital transfer vehicles that are subject to microgravity. Future space farmers will have to adapt their practices to accommodate microgravity, high and low extremes in ambient temperatures, reduced atmospheric pressures, atmospheres containing high volatile organic carbon contents, and super-elevated CO₂ concentrations. The major problems that arise in this research is that of availability of air, water and energy. Additional water resources are required for autonomous food production. Plants as a natural system have the capability of converting black water into drinking water. Bio chemical processing and biological infiltration is essential for future space exploration programs.

Plants have the capability to absorb carbon dioxide from the air and release oxygen.

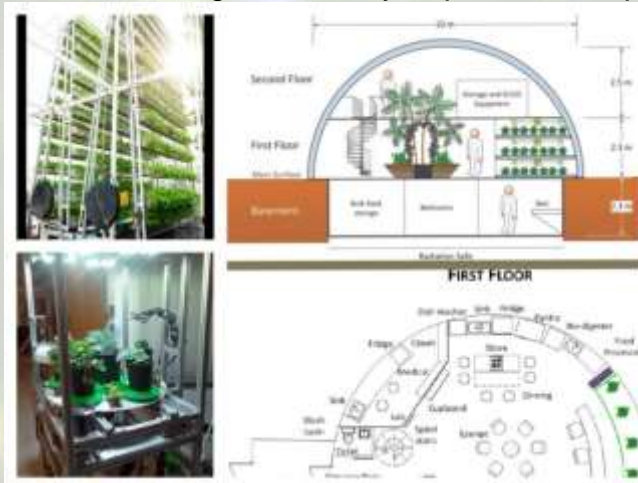
However in space, in addition to plants, machines are required to scrub carbon dioxide from the atmosphere. Regenerative carbon dioxide scrubbers require large amount of electricity and have high maintenance cost. In addition to this, a sustainable light source would be required for photosynthesis, water purification, food production and carbon dioxide scrubbing. This would require further increase in the launch mass of an exploration vessel or station equipment. Solar cell technology is being researched into, for this purpose.

Biodiesel fuel

Biodiesel is a domestically produced, renewable fuel that can be manufactured from vegetable oils, animal fats, or recycled restaurant grease for use in diesel vehicles. Biodiesel's physical properties are similar to those of petroleum diesel, but it is a cleaner-burning alternative. Biodiesel Fuel can be produced from a variety of natural crops including rapeseed, soya bean, mustard, flax, sunflower, canola, palm oil, hemp, *Jatropha* and waste vegetable oils.

Indoor agriculture (vertical farming)

Vertical farming is the practise of growing plants within a sky scraper greenhouse or vertically inclined surfaces. It is made possible by a combination of controlled environment agriculture, hydroponics, aeroponics, green house, phyto-remediation



and composting. It has advantages like increased crop production, protection from weather related problems, conservation of resources, production of organic crops and reduced harmful effect on human health.

In a 25,000 square foot building in Japan, indoor farming company Mirai has built a farm producing 10,000 heads of lettuce per day. Not only is the production staggering, but the farm uses 40%

less power, 80% less food waste, and 99% less water than outdoor fields while improving yields from around 50%-90%.

Synthetic biology could also open a world of possibilities for indoor farming.

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[The Future of Agriculture May Be Moving Indoors.html](#)

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The *Ficus* Siblings: A Story of Hope and Rebirth

Shreya Tripathi

Botany(Hons.) II Year



Some years back, a beautiful and grand ficus tree (*Ficus religiosa*) “Pipal” tree was a unique source of enlightenment for our college students. It was a part of the old seminar hall. It was a cynosure to the wisdom of unity and strength. The tree with its deep roots and branches that formed a comforting canopy was adored by all. Under its shade, one found compassion, love and serenity. The old ficus tree was proud of its existence. What could bring it more happiness than providing shade of love to the metamorphosing girls?

The ficus was the apple of eye of Dr. Gita Mathur, an extremely dedicated and passionate plant lover. She held the tree in high admiration. The ficus was her companion of all times and a source of joy too. Happiness prevailed in the atmosphere, when young girls were being nurtured under the tender touch of the ficus. It was a paradigm of motherly love.

Dr. Gita Mathur gained inspiration from the ficus and named the botany department's inter college festival after it. The festival symbolised unity, integrity and depth of thought, just like the deep rooted ficus. Every year the 'Ficus' fest was celebrated with great zeal. Each year a fresh batch of participants symbolised the new leaves of ficus. This was a metaphor of renewal and continuous change to prevent stagnation. But the good days didn't last long.

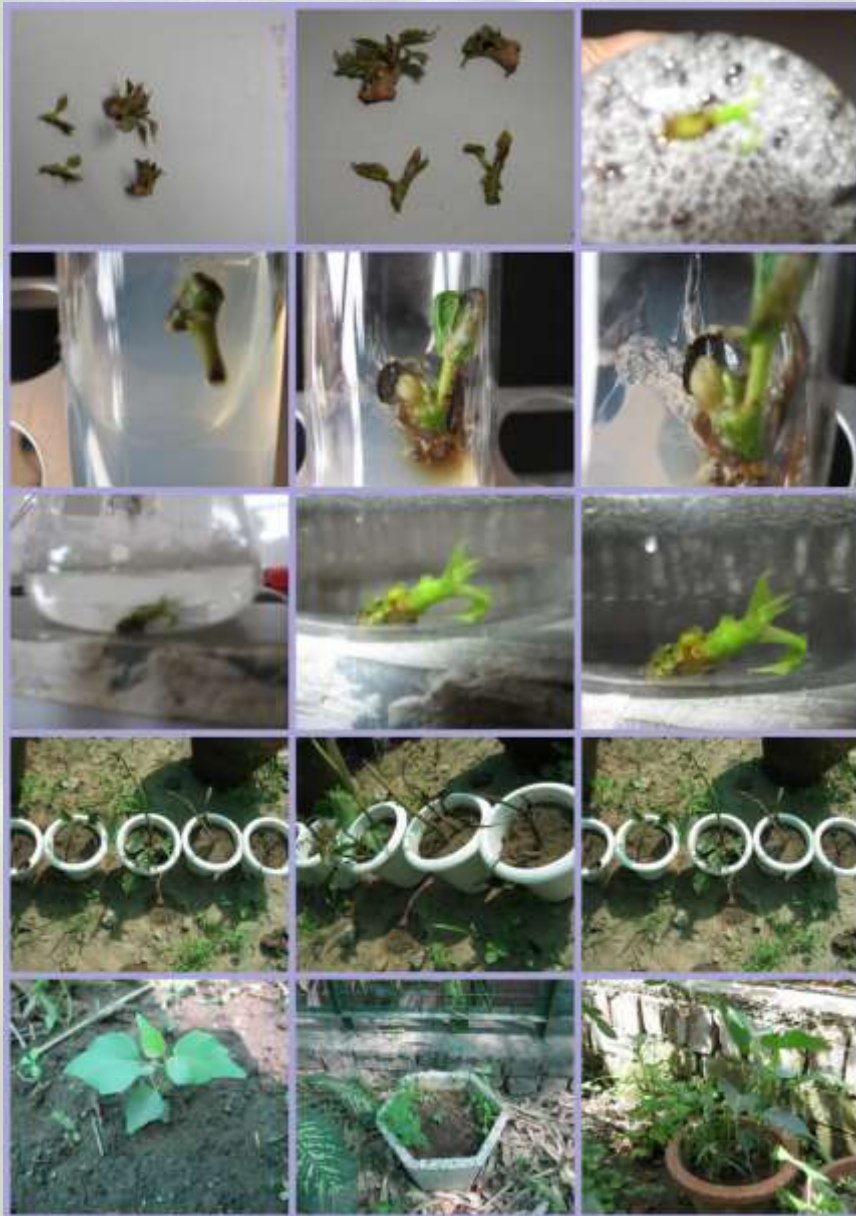
It was decided that the ficus would be cut down and a brand new seminar hall and auditorium complex would be erected in its place. The old must make way for the young, so this was inevitable. It was a big shock for all the botanists of Gargi who held the ficus near to their heart. Mathur ma'am was sad, she sat down under the tree and grieved with the ficus which was now spending its last days.

One silent night, the ficus was cut down and its rustling leaves became still forever. It was an unbearable loss for all. Mathur ma'am now stood watching the sacred landmark where the tall and humble ficus once stood. She visited the spot every day. To her surprise, she realised that the story was not over yet. What she saw, brought

back the sparkle in her eyes and a smile on her face. She saw young shoots sprouting out from the ground just where the ficus once stood. The ficus had left its



heirs. She carefully collected the young shoots, held the two shoots in her hands and in no time tissue cultured them. For hardening, she grew them in the sterile soil. And when the two were ready to face the world, she transferred them to the greenhouse situated in our botanical garden. And now they are, young ficus brothers who grow outside in our botanical garden. So this is the story of the birth of ficus siblings, a story of hope and dedication.



“Ficus” of botany department never died....it has survived for many more generations of students of Gargi botanists!

If we all develop such a caring attitude towards plants, wouldn't the world be a better place to live in. No trees would be harmed. Just visualise plants and human beings living harmoniously and sustainably. And I think that this is the only option left for us, if we've got to save ourselves from our self built demons of destruction which await us in near future.

Think about it.

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Student Research Projects

By students under the guidance of Botany Department Faculty
Gargi College

A.

- **Title:** To study the effect of oxytocin and kinetin on the shelf life of cut flowers.
- **Students involved:** Barkha Ravi, Kirti Sharma, Lalita Ranawat, Lata Kharayat and Meenu Singh.
- **Course:** Botany (Hons), III year
- **Scheme:** Star college scheme, DBT
- **Teacher supervisor:** Dr Renu Mundhra Soni and Dr Samira Chugh

Abstract

A study was conducted to investigate the effect of oxytocin and kinetin on the shelf life of cut flowers of *Calendula* and *Gladiolus*. Role of kinetin in increasing the shelf life of cut flowers has been reported before but the use of oxytocin in this field is a new finding. We found that kinetin and oxytocin (2%) solution is more efficient in maintaining flower longevity in *Calendula* than kinetin or oxytocin alone, whereas in *Gladiolus* the shelf life was increased when kept in kinetin solution only. On treating the inflorescence of *Calendula officinalis* and *Gladiolus*, shelf life was increased from 2-3 and 3-4 days to 6-7 and 7-8 days respectively.

B.

- **Title:** Effect of Salinity Stress on the Growth and Germination Pattern of Rice Seedlings
- **Students involved:** Gayatri Tripathi, Jyoti Dhingra
- **Course:** Botany (Hons) II year
- **Scheme:** Gargi Pathfinder
- **Teacher Supervisor:** Dr. Garima Malik

Abstract

Soil salinity is one of the abiotic stresses that are main cause of reduction in yields and productivity of most major crops. In the present study, we demonstrated that *Oryza sativa* var. PB1 is a salt-susceptible cultivar. We observed that the expression of P5CS (Pyrroline-5 Carboxylate Synthetase) and P5CR (Pyrroline-5 Carboxylate Reductase) genes were up regulated with increase in the salinity concentration. This might indicate that there is a positive correlation between the proline content and plant salt stress tolerance.

C.

- **Title:** To prepare a DNA bank of plants with medicinal properties found in the vicinity of college campus.

- **Students involved:** SwayangSiddha Nayak, Tisha Thomas, Tammineni Rajitha and Tammineni Ramya
- **Course:** Life Science, III year and Botany (Hons), II year
- **Teacher Supervisors:** Dr. Aparajita Mohanty and Dr. Jasmeet Kaur Abbat
- **Scheme:** Star College Scheme, DBT

Abstract

Total DNA was extracted from 21 species of various medicinal plants found in the vicinity of college premises using CTAB method. *Ocimum sanctum*, *Euphorbia cyathophora*, *Asparagus*, *Murraya koenigii*, *Cannabis sativa* are some of the species. Purpose: The methodology of extraction of DNA is very time consuming, thus these DNA banks can be used for further research purpose on the medicinal plants of specific interest. Multiple copies of this DNA can be created using the technique of PCR for further experiments like Recombinant DNA Technology.

D.

- **Title:** Effect of different growth regulators on growth of *Brassica campestris* (mustard) and *Fagopyrum esculentum* (buckwheat) seedlings using Tissue Culture Technique
- **Students involved:** Mahima Uttreja, Simran Kaur, Sunaina Hotumalani, Varsha Gupta
- **Course:** Life Science, III year
- **Teacher supervisors:** Dr. Renu Mundhara Soni & Dr. Vera Y. Kapai
- **Scheme:** Star College Scheme, DBT

Abstract

A study was conducted to investigate the effect of different growth regulators on seed germination and growth of mustard and buckwheat seedlings. *Brassica campestris* and *Fagopyrum esculentum* was used for the present study. In our study, we used different plant growth regulators like Auxin and Kinetin and a comparative study was conducted using mammalian hormone oxytocin. The results indicated, oxytocin shows similar results as that of auxin. Like auxin, oxytocin showed same effects on percentage seed germination, hypocotyl length and root length and in future it shows a hope to be used as its substitute.

E.

- **Title:** Whole genome structural, phylogenetic and expression analysis of tubulin related genes in rice.
- **Students involved:** Tammineni Ramya, Tammineni Rajitha, Sonia, Sonia Sharma, Neha Bharti
- **Course:** Botany (Hons), II year
- **Scheme:** Star College Scheme, DBT
- **Teacher Supervisor:** Dr. Priyanka Deveshwar

Abstract

The objective of this project was to find phylogenetic relationship of tubulin proteins over the genera in the course of evolution. Further, identify and do a detailed analysis of protein structure and expression of tubulin related genes in rice. The in silico analyses of the whole genome gave a bird's eye view of the tubulin related genes found in rice. 26 tubulin related genes were found in rice. Few of these genes even displayed differential expression under stress conditions. Many specifically expressed genes were identified which were specific to either reproductive stages or vegetative stages. Thus this data can be used to further study stress management in rice plants.

F.

- **Title:** Sequencing and bioinformatics analyses of an intergenic region of chloroplast genome: A step towards development of new potential DNA barcode for angiosperms
- **Students involved:** Tammineni Ramya, Tammineni Rajitha
- **Course:** Botany (Hons), II year
- **Scheme:** Gargi College Path Finder
- **Teacher Supervisor:** Dr. Jasmeet Kaur
- **Award Won:** Gargi Pathfinder Awards

Abstract

In this study we assessed the trnD-trnT region of chloroplast genome for procuring a new potential DNA barcode sequence for angiosperms. Total DNA was extracted from the plant samples followed by PCR amplification of trnD-trnT region. Next the amplicon was sequenced and bioinformatic analysis of the obtained sequences was done. We observed that this trnD-trnT region had the power to discriminate between different families and between two species belonging to the same genus as well. Thus trnD-trnT region we found out possessed universality and good resolving power, all ideal qualities for a region to be considered a potential DNA barcode.

G.

- **Title**
Enabling technologies for pine needles from disastrous waste (forest fire) to multitude of application: energy, capacity building employment and environmental benefits for Himalayan region.
- **Students Involved:** Karuna Nagpal, Priyanka Rawat, Garima Grover, Pooja, Aishwarya Iyengar, Sayari Dasgupta, Bhawna Bharadwaj, Sonia Munjal, Shreya Chopra, Vaibhavi Sobti
- **Course:** Botany (Hons.), III year and Physics (Hons.) III Year
- **Teacher Supervisor:** Dr. Geeta Mehta, Dr. Indu Dutta, Dr. Vandana Luthra
- **Scheme:** Innovation Project
- **Award Won:** Best Innovative Idea, Antardhwani'15

Abstract

The evergreen trees of *Pinus* are found extensively in the Himalayan region of Indian subcontinent. The dried out pine needles which fall from these trees are responsible for many problems in the region. Decrease in vegetative productivity and fires from the dried out needles are some of the common problems we came across during our survey in the Almora district of Uttarakhand. Thus, we wanted to explore the allelopathic effect of pine needles and utilize these needles in a way to reduce the harm caused to floristic diversity of Himalayan region. We chose the needles of *Pinus roxburghii* for our study and conducted some experiments to determine the allelochemicals and biological parameters that resulted in inhibitory effects. Based on the proof of allelopathic effect of Pine needle extract we have come to the conclusion that it can be used as an organic weedicide. Also, high lignin and holocellulose content in the Pine needles motivated us to explore paper-making process from the pulp of these needles and we were successful in making a paper which can be coloured and used for decorative purposes as well as teaching aides.

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My Introduction to Floral World

Leena Arora
Botany (Hons.), III year



Curiosity is the mother of experimentation.
Experimentation is home for discovery
& discovery runs parallel to finding yourself.

Gargi is a name that needs no recognition in terms of academic excellence. Well studying Botany was just a matter of chance which later became a passion. The enthusiasm and curiosity developed with daily visits to the botanical gardens. Keenness to look out for plants taught in class made me understand this plant world and to be friend with them. Gargi's veteran space gave me ground to develop my thoughts, and perception. My journey as a needleless boat finally got its direction

through Gargi. February is the month turning Gargi into a blooming ground of blissful flowers filling in the feeling of ecstasy, and joy to all eyes looking at it. These flowers also trapped me in their beauty and made me eager to know them. The gaze turned into eagerness of knowing them and looking out for their names was the primary step. I started spending hours finding names of the flowers.

“Flowers... are a proud assertion that a ray of beauty out values all the utilities of the world.”

~Ralph Waldo Emerson, 1844

A compilation of a few that I looked upon and was fortunate enough to know them are given below.

1. ***Dorotheanthus bellidiformis***
Family: *Aizoaceae*
Common name: Ice Plant, Mesembryanthemum (Mid Day Flower)
2. ***Tropaeolum majus***
Family: *Tropaeolaceae*
Common name: Nasturtium
3. ***Lobularia maritima***
Family: *Brassicaceae*
Common name: Sweet Alyssum, Lobularia
4. ***Lupinus nanus***
Family: *Fabaceae*
Common name: Sky Lupin
5. ***Alcea rosea***
Family: *Malvaceae*
Common name: Hollyhock
6. ***Dianthus barbatus***
Family: *Caryophyllaceae*
Common name: Sweet William
7. ***Dianthus chinensis***
Family: *Caryophyllaceae*
Common name: China Pink, Dianthus
8. ***Eschscholzia californica***
Family: *Papaveraceae*
Common name: Californian poppy

- 
9. ***Gladiolus dalenii / natalensis***
Family: *Iridaceae*
Common name: Gladiolus, Natal lily
10. ***Dahlia sp.***
Family: *Asteraceae*
Common name: Dahlia
11. ***Viola spp.***
Family: *Violaceae*
Common name: Violet
12. ***Chrysanthemum frutescens***
Family: *Asteraceae*.
Common name: Marguerite Daisy
13. ***Centaurea cyanus***
Family: *Asteraceae*
Common name: Cornflower
14. ***Bracteantha bracteata***
Family: *Asteraceae*
Common name: Paper daisy, Strawflower
15. ***Gerbera jamesonii***
Family: *Asteraceae*
Common name: Gerber daisy
16. ***Verbena hybrida***
Family: *Verbenaceae*
Common name: Verbena, Barbena
17. ***Pericallis x hybrid***
Family: *Asteraceae*
Common name: Cineria
18. ***Osteospermum ecklonis***
Family: *Asteraceae*
Common name: Deep Purple African Daisy
19. ***Gazania rigens***
Family: *Asteraceae*
Common name: Gazania
20. ***Antirrhinum majus***
Family: *Scrophulariaceae*
Common name: Dog flower, Snapdragon

21. *Phlox paniculata*

Family: *Polemoniaceae*

Common name: Garden Phlox

22. *Salvia splendens*

Family: *Lamiaceae*

Common name: Scarlet Sage, Red Salvia

23. *Petunia hybrida*

Family: *Solanaceae*

Common name: Petunia

24. *Calendula officinalis*

Family: *Asteraceae*

Common name: Calendula, English Marigold



***“I couldn’t recall most of it at first,
But at this moment couldn’t even resist most of it being inside me.”***



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Flamboyant Miracles: Blooms

T. Ramya
Botany(Hons.) II year



Ranunculus
Buttercup



Rosa
Rose



Matthiola
Stock



Melastoma
Indian-rhododendron



Verbena
Garden verbena



Begonia
Begonia



Lilium
Asiatic lily



Callistephus chinensis
China aster



Freesia
Freesia



Dianthus
Carnation



Dahlia
Double dahlia



Narcissus
Daffodil



Calendula
Pot marigold



Brassica
Mustard



Salvia
Scarlet sage



Gladiolus
Natal lily

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Career Options in Horticulture

Monika Singh

Botany(Hons.) III year



Horticulture is a science and an art of gardening which deals with the cultivation of vegetables, fruits, herbs, shrubs, bushes, ornamental trees, gardens and orchards plantation and also cultivation of flowers. To become a successful horticulturist, one has to have knowledge about decorative plants, medicinal plants, fruit yielding trees, flower bearing plants as well as weather and soil conditions, plants diseases and their treatments. The horticulture sector constituted nearly 20 per cent of agricultural GDP and contributes 4 per cent in the national economy.

There are many career options available in this field some of which are:-

- Agricultural engineering - It deals with conservation of soil, water, agricultural machines and farm structure. Engineering graduates can venture in this field.
- Agro-industry sector- This sector revolves around dairy processing, meat packaging, grain processing, pesticides, fats and oils.
- There are good opportunities for science graduates in estates and tea gardens.
- Agriculture management - Students having knowledge of both agriculture as well as of management are the need of this industry. Students having biology background can have bright career in this field.
- Landscape horticulture- It deals with the production, marketing and maintenance of landscape plants.

- Inspection - One can become an inspector of fresh and processed fruits and vegetables for government as well as private agencies. This sector also offers good job opportunities.
- Research - One can do research work in this growing field.
- Teaching- is another option that one can go for.

Beside these career options students can also go into the 3 major branches of horticulture:-



Floriculture is a branch of horticulture which deals with the cultivation of ornamental as well as flowering plants for sale, making perfumes and cosmetics. Floriculture is the sun shine of India as it offers excellent self-employment and good remuneration for small and marginal farmers. Floriculturists are specialised in planning and designing of exterior or interior landscapes for parks, campuses, shopping malls etc. Florists gain knowledge of growing cut flowers, bedding plants and potted plants right from the production to post harvest management.

Olericulture is the branch of horticulture that deals with the study of vegetables. It has vast scope in India and people who indulge in vegetable cultivation are known as olericulturist. It has scope in seed industry, research institutes and universities. These personnel are more required presently in private sector as the vegetable growers have good future especially in seed industry.

Pomology is a branch of horticulture which deals with cultivation of fruits. It is one of the most interesting and important area of research. Pomologists can be employed by the government, colleges, universities, and agricultural organizations. To be a pomologist minimum a bachelor's degree in a relevant field is required. Pomologist's future in the industries, ICAR, State agricultural Universities and in other organizations is bright.

Horticulture is important and upcoming sector in Karnataka. It is serving as the best alternative for agricultural land use to the farmers as it ensures profit. The scope of

horticulture in India is increasing with time. Today, horticulturists are hired in government as well as private sector. Due to its significance, there are ample job opportunities in India as well as abroad. Horticulture institutes and colleges, vegetable farms, fruit orchards, etc always look for skilled horticulturists. Horticulturists are also employed in luxury resorts.

At present there are about 32 agricultural Universities in our country where horticultural education and research is being carried out apart from deemed Universities.

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Students' Opinions

Will I Be Educated?

Anindya Tripathi

Botany(Hons.) III year



"The whole purpose of education is to turn mirrors into windows"-

Sydney J Harries.

With this enlightening quote, I begin my journey through yet another volume of Anthesis, the most potent voice to my opinion apart from Theatre (another non-conventional way of reaching out to masses). The theme for this year, "Botany: an interdisciplinary science" forced me to introspect about the fruitfulness (botanical pun intended) of these three years of my graduation which are hopefully about to conclude in a few months. Yes I will be a graduate but the question that arises in my mind is: WILL I BE EDUCATED?

Now you all must ask that what sort of ridiculous question is this. Aren't we all educated? We have a 'degree', we can read and write and we all belong to the elitist group of 'Science students', who by conventional social thinking are supposed to be the most qualified, intelligent and belong to a 'super class' amongst all those seeking the ultimate higher goal of 'education'. So let us first understand that what education actually means and what meaning have we given to it.

According to Margaret Mead, education is where *"our children must be taught how to think, not what to think."* This quote sums up the entire thought that I want to convey because even the premier institutions like the Delhi University are churning out nothing but mere machines with no thought process or practical knowledge instead of "educated" human beings. The most ancient of our texts, the religious scriptures were nothing but pieces of fables and philosophy that at those times taught us to

'question' our beliefs and notions and develop an individual school of thought. That was the golden era for us where many advancements were made not only in the field of science and technology but many other fields like literature, theatre etc. but sadly now in those very same lands of such great scholars we have a generation of 'graduates' that are just interested in obtaining a degree so that they can get a decently earning job.

As science students it is my personal opinion that we with all our analytical qualities and practical knowledge can prove to be a better asset to our society and yet we get restricted to only being the scientists of the term 'social scientists'. It is because the heavy workload and overwhelming syllabus that has to be completed within that given academic time frame. The situation minimizes the possibilities of finding multiple intelligence in a person. We have fallen victims to a system of rote learning and incessant, mind draining syllabus that has little practical application unless pursued at higher levels of research, which only 1 out of 100 can attain. The whole purpose of education has shifted from learning and providing services to finding a job and earning money. The intention of education is to mentally, physically, and emotionally benefit the person by putting them in a better place than they were previously in before. But what all our education system is doing is to overburden us with information and facts forgetting the fact that cramming facts is not at all equivalent to gaining knowledge. It's saddening to see the death of the practical and learning part of science which was the first reason behind many others like me opting for it.

These three years in a prestigious college like Gargi, where the extracurricular activities were really appreciated made me inculcate many life lessons, but education needs to be more holistic in terms of growth and overall development. The system on one hand teaches us to clear the entrances but never equips us with the other nuances like clearing interviews and facing board of knowledgeable people with confidence. As I mentioned earlier our 'quest for education' is nothing but a mad run to clear exams.

The reason why we science students are considered fit for choosing any discipline apart from the very fundamental is because we are considered capable of imbibing any discipline and that is exactly NOT happening at our institutes. Our creativities are being labeled as 'waste of time', our urge to push the boundaries of this discipline further is being sidelined, because the shackles of narrow thinking has plagued its way into the minds of those in charge with imparting a generation its future. Why else are we not learning about the capitalist threat to our education which has made it a factory to churn out the 'products' that only have 'information' (not knowledge) and cannot distinguish between the rights and wrongs of the advancements they do?

Be it the psychological approval of Monsanto, celebration of FYUP, the politicization of studies in such a matter that promotes the brain drain and the slow diminishing of

the basic principles of democracy, Right to expression. There is a need to question and Introspection. Dissent which was once the basic pillar in the building of a society has slowly been replaced by mute submission and any voice that is different to the one at authority is being snuffed out.

I believe in the fact that change starts from within.

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Being a Botanist

Deepika Sharma

Botany(Hons.) II year



It is Monday today 12:30 pm by my watch and genetics lecture is just over. This lecture has left me startled as to how the phenotype of leaf of 4'O clock plant is the function of chloroplast or cytoplasmic genome of ovule regardless of the nuclear genome of ovule or the pollen source. Such are the interesting things that we study and discover in botany classes every day.

My journey with botany started in 2013. It is almost two years now and I'm having a good time. In these years I realised that nature is amazing. There is much more behind it than what we could actually see. Earlier I would overlook so many things that would be right in front of me like those flowers of *Eucalyptus*, arrangement of leaves in *Bauhinia*, etc. I didn't know that the beautiful sunflower blossoms are not a flower rather a whole inflorescence. And that clove is nothing but a dried flower bud. It seems that botany has just given me new glasses to look at things around.

Working in the labs is quite an experience. I got myself bruised on several occasions while cutting T.S. and L.S., got those stubborn stains of Safranin on my dresses. Albeit, the most interesting part of working in labs is that I get to unleash that microscopic barrier between us and nature. I still remember my first practical class. We were to make onion peel okay ok... *Allium cepa* peel. I could barely see anything

in my slide. And trust me I prepared close to 20 slides. I didn't know what went wrong. Just then I realised that I was not focusing my microscope. I would simply put my slide and without focusing it I was expecting to see those cells!

So what is the trait of being a botanist? Yes knowing all those botanical names. Henceforth, I started looking out for the names of common flora and botanical names of fruits and veggies. Then there was no stopping. No one was spared friends, family, and neighbours. I would flaunt the nomenclature in front of all the non-botanists. Ask my family who knows it when I say "A *Pyrus malus* a day keeps the doctor away" or on a hot scorching day when I request my mom to make me a *Citrus limon* squash or during extremely freezing December evenings when I want *Coffea arabica*. Even the grass in the lawn has its very own botanical name: *Cynodon dactylon*. What more you can even undercover your chocolates too. Just start calling it *Theobroma cacao*. It works!

But knowing scientific names of flora is not enough. There is so much more to it. The other day someone mocked me by calling me a gardener. For many this is only about learning how to upkeep the plant in the lawn and botany is just a fancy name to it. Many of my pals took it very seriously and always have this concern about what after graduation? But life after graduation can really be out of ordinary.

Sherlock Holmes series has always been very captivating. Have you ever thought of solving those mysterious criminal cases? Was that a loud yes? So then did you know that a pollen grain is enough to send a convict behind the bars? Whenever an area covered with plants is cleared say for a purpose of grave site, then due to plant succession process after sometime plants re-grow there. By analysing the soil conditions and plant growth one can estimate about the time of death at such sites. An example of this is the post mortem dating of a skeleton found in a field by determining the age of the plant growing in the eye socket of the skull. This is how forensic botany works; solving criminal cases by studying plant material.

Another interesting field is Plant anthropology also known as Ethnobotany. Many major botanical gardens and preserves, such as the National Tropical Garden in Hawaii and London's Royal Botanical Gardens, are managed and staffed by Ethnobotanists. Careers at these well-known institutions offer opportunities to raise public interest in and awareness of the relationships between plants and human beings. Herbal supplement manufacturers also need professional Ethnobotanists to work on research and development teams, and to oversee nurseries that grow plants for commercial use. Also, the purchase and importation of botanical products is carefully monitored, and Ethnobotanists are needed to help develop and enforce regulations.

Or even a better option of becoming doctor where one can treat diseased plants. Plant pathologists; doctors of plants. They are the ones who preserve the

environment, help grow healthy crops, crop management, invent new ways to control plant diseases.

If you are travelling buff, you can go out on funded expeditions to the site. Become a Paleobotanist. They look for plants trapped in rocks, or impressions of plants stamped on lava flows or mud. Each specimen is carefully documented and later studied.

There are a lot of fascinating options and many doors are open. Alas! In our society the bland stereotype which has been going round is that education is only worth it if it can make you a doctor, an engineer or an IAS. Passion to learn and discover is fading. I may not turn into a billionaire later in my life but I won't regret that I studied Botany. Don't get swayed away when people tell you that you are a gardener. Follow your passion.

1:30 pm ECA is over. It's time for another lecture. Time to learn something new.

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Go Break Those Boundaries!!!

T. Rajitha
Botany(Hons.) II year



Botany: Is it just a story of some seed living deep underground, waiting for the right moment to taste outside world? Is it the journey of some seedling from two leaved fickle weakling to a hardy tree? Or is it three years of love-hate relationship between the young energetic minds and dusty old books of Vashishta, Gurucharan Singh, Johri and Maheshwari to name a few?

Hearing Prof. Gadagkar speak at the inaugural function of Science Setu at National Institute of Immunology made me see the "walls" I'm building around myself with each step I take towards building my career. And I'm sure in the present scenario there are many more students out there like me who although started in the business of learning but somehow ended up in the business of construction. The first brick of these walls was laid just after our tenth boards when we chose science. Then the walls grew coming to the point where we trapped ourselves by choosing Botany. That point onwards each hour spent inside the four walls of the classroom just enforced the foundation of these walls.

Now what are these walls I keep referring to? These walls are the bounds we keep building around our imaginations. Limiting them first to the theories and long study hours instead of learning, then we start forgetting to apply the knowledge we are taking in at such a speed. We go through books faster than a hungry dog goes through its food but we are retaining none of it and most importantly we are not enjoying the process of learning. We are building walls limiting ourselves to a specific narrow field of thought. It's not the dusty old books or the field of botany that's restricted. It's us who like blind people feel around, touch just the tail of an elephant and think it to be "the elephant".

Botany encompasses the whole world. It takes us through a journey of introduction at first. The green things which somehow even after being an intrinsic part of our daily life successfully get neglected, Botany makes us aware of their existence first and then gets us started on the journey of knowing them intimately.

Agriculture, horticulture, traditional culture of a region, genetics, forensics, economy of a country nothing is untouched by this vast field. But the need of the hour is not to restrict ourselves instead open up and explore fields like chemistry, physics, zoology,

microbiology, statistics, human society, culture, economy, religion and even sketching through the eyes of a botanist. The options are limitless. There are no boundaries between the disciplines of science and neither are there any boundaries between the scientific and non-scientific fields in today's inquisitive and curious world.

This is just the right time, now and here, to break those boundaries and explore the excess world is offering. First step towards this endeavour is to know one's chosen field. Supplement the classroom teaching with explorations of your own. Go into the field, get your hands dirty, and experience the nature breathing all around you. Spend those summer holidays interning in laboratories. Spend those evenings in a garden. Observe, explore, ask questions, and take out time to actually learn and not just study. Go break those boundaries!!! Fall in love with the subject!!!

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Famous Plant:
Lavender: The Sweet Overtones

SwayangSiddha Nayak
B.Sc. Life Sciences (III year)



Lavendula, commonly known as lavender is a species of flowering plant in the mint family, Lamiaceae and is the national flower of Portugal. It includes 39 known species. Most of them are cultivated extensively in temperate climates as ornamental plants. They are also added to culinary delicacies and used for extraction of essential oils. It is the cultivated species ***Lavandula angustifolia*** which is commonly referred to as lavender. The genus grows as annual or short lived herbaceous



perennial plants, shrubs and subshrubs. Leaf shape is diverse and may be simple in some commonly cultivated species; in others they are pinnately toothed. A class of famous hybrids L. angustifolia and L. latifolia are known for their big flowers but produce poor quality essential oils and a less sweet fragrance.

It is native to the old world and is found in Canary Islands, Southwest Asia, Southern Europe, Northern and Eastern Africa and even in some parts of Southeast of India

The cultivated forms are planted in gardens worldwide, occasionally found well beyond their natural range. Lavenders flourish best in dry,

well drained, sandy or gravel soils in full sun.

All types of Lavender need little or no fertilizers and good air circulation. Organic mulches can trap around plants absorbing moisture encouraging root rot.

Diverse utilization of Lavender:

Today, Lavender is commercially exploited as a herbal filler inside sachets used to freshen the linens. Lavender flowers are placed among stored items of clothing to give a fresh fragrance. Dried lavender flowers have become recently popular for wedding confetti. Lavender is also popular in scented water and sachet.

It is well known that the plant has antiseptic and anti-inflammatory properties. The extracts are commonly used for making bath products. It has been used as a holy herb since ancient times. The essential oils extracted can be used in balms, salves, perfumes, cosmetics and tropical applicants. These oils can be used in salads and dressings. The nectar from flowers extracted by bees that yields high quality of honey. These flowers may also be used in cake decorations and can be paired with goat cheese, lavender scones and marshmallows.



Medicinal uses:

- It is used extensively in aromatherapy. Infusions are believed to soothe insect bites, headaches and repel insects like moths.

- It is even believed to cure toothaches, acne, nausea, vomiting, stomach ache and remedy to loss of appetite.

- **Agitation.** Evidence suggests that lavender aromatherapy improves agitation in people with Alzheimer's disease, while other evidence shows no effect.
- **Constipation.** Early research shows that massaging a combination of lavender, lemon, rosemary, and cypress oils onto the stomach might improve symptoms of constipation.
- **Colic.** Results from a small research study show that massaging a combination of lavender and almond oils onto an infant's belly for 5-15 minutes at the onset of colic reduces crying time.
- **Menstrual pain.** Lavender oil massages might reduce pain associated with menstruation in young women.
- **Depression.** There are conflicting results regarding the effects of lavender oil aromatherapy for treating depression. Some research suggests that lavender oil aromatherapy massage does not improve depression in cancer patients. Other research shows that it might improve mood in women experiencing depression after childbirth (post-partum depression). Early research suggests that taking lavender oil orally for 6 weeks might improve depression in people. Tincture of lavender appears to be slightly less effective than the medication imipramine (Tofranil) for treating depression, but taking the two in combination might improve the antidepressant effects of imipramine.
- **Sleeplessness (insomnia).** Research suggests that using lavender oil in a vaporizer overnight, or on a gauze pad left beside the bed, helped some people with mild insomnia sleep better.
- **Lice.** Early research suggests that applying a combination of lavender and tea tree oil to the skin helps kill lice eggs and reduce the number of live lice.
- **Ear infections.** Administering ear drops containing lavender and other herbal extracts improves ear pain in people with ear infections.
- **High blood pressure.** An essential oil mixture of lavender, lemon, and ylang ylang as aromatherapy reduces blood pressure in people.
- **General psychological well-being.** Some research suggests that adding 3 mL of a 20% lavender oil and 80% grapeseed oil mixture to daily baths produces small improvements in mood, compared with baths containing grapeseed oil alone. However, other research suggests that adding lavender

oil to aromatherapy massage does not improve well-being or quality of life in cancer patients.

- **Wound healing.** Early research suggests that using lavender oil as aromatherapy during bandage changes reduced pain in people with vascular wounds. However it is unclear whether the plant alone can be an effective remedy.
- **Migraine.** Research suggests that rubbing 2 or 3 drops of lavender oil on the upper lip, so that the vapor is inhaled, might reduce migraine pain and nausea, and help stop the headache spreading.

Recent research substantially proves that Lavender evidently may cure neuronal disorders as well.

Studies also suggest that the plant chemically secretes compounds which highly interact with medications and cause added effect of the particular medication which may even lead to life threatening situations. Few examples are as following:

- **Chloral Hydrate**

Chloral hydrate causes sleepiness and drowsiness. Lavender seems to increase the effects of chloral hydrate. Taking lavender along with chloral hydrate might cause too much sleepiness.

- **Medications for high blood pressure (Antihypertensive drugs)**

Lavender might decrease blood pressure in some people. Taking lavender along with medications used for lowering high blood pressure might cause your blood pressure to go too low. Do not take too much lavender if you are taking medications for high blood pressure.

Some medications for high blood pressure include captopril (Capoten), enalapril (Vasotec), losartan (Cozaar), valsartan (Diovan), diltiazem (Cardizem), Amlodipine (Norvasc), hydrochlorothiazide (Hydrodiuril), furosemide (Lasix), and many others.

- **Sedative medications (Barbiturates)**

Lavender might cause sleepiness and drowsiness. Medications that cause sleepiness are called sedatives. Taking lavender along with sedative medications might cause too much sleepiness.

Some sedative medications include amobarbital (Amytal), butabarbital (Butisol), mephobarbital (Mebaral), pentobarbital (Nembutal), phenobarbital (Luminal), secobarbital (Seconal), and others.

- **Sedative medications (CNS depressants)**

Lavender might cause sleepiness and drowsiness. Medications that cause sleepiness are called sedatives. Taking lavender along with sedative medications might cause too much sleepiness.

Some sedative medications include clonazepam (Klonopin), lorazepam (Ativan), phenobarbital (Donnatal), zolpidem (Ambien), and others.

It has also been seen that this plant successfully interacts with various herbs and supplements as well. However, no such interaction has yet been studied with food items.

According to National Institute of Health, Lavender is not recommended during pregnancy or while breast feeding because of lack of knowledge of its effects during such conditions of hormonal surge.

A study published in 2007, on the use of lavender was related to signs of gynecomastia in prepubescent boys. Estrogen and anti-androgenic activities in cell culture in Lavender oil media paved way to such conclusions.

However these conclusions were rebutted suggesting that the reports of cautions are apparently premature as such endocrine disrupts can also be related to medications, oral contraceptives, use of marijuana and other drugs amongst several other causes.

It has also been associated with cytotoxicity to human cells *in vitro*. These claims were also disposed off by famous aroma therapists Robert Tisserand.

Against all odds, today the commercial value of lavender is fast rising and for that matter you never know the next time you visit a supermarket you might just catch an eye open a lavender flavored chocolate bar!!!!

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- <http://www.nlm.nih.gov/medlineplus/>
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- <http://www.drugs.com/>

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Famous Botanist: Professor M.S. Swaminathan

Shreya Tripathi

Botany (Hons.) II Year



Mankombu Sambasivan Swaminathan (born on 7 August, 1925) is an Indian geneticist and an international administrator, renowned for his leading role in India's "green revolution," a program under which high-yielding varieties of wheat and rice were planted in the fields of poor farmers.

Swaminathan is known as "Indian father of green revolution" for his leadership and success in introducing and further developing high-yielding varieties of wheat in India. He is the founder and chairman of the M.S Swaminathan research foundation. His stated vision is to get rid of hunger and poverty from the world.

His professional career began in 1949. During the period from 1949-55, he undertook research on potato, wheat, rice and jute genetics, after which he worked on Mexican dwarf wheat varieties. Besides serving as the principal secretary in the ministry of agriculture, government of India, his contributions include establishment of the National Bureau of plant, animal and fish genetic resources of India and The International Plant Genetic Resources Institute.

Prof. M.S. Swaminathan has served as director of The Indian Agricultural Research Institute, New Delhi (1966-72) And director general of the Indian Council of Agricultural Research and Secretary to the Government of India, Department of Agricultural Research and Education (1972-79).

As a young scientist at the Indian Agricultural Research Institute in the 1960s, Dr. Swaminathan learned of Dr. Borlaug's newly developed Mexican dwarf wheat variety and invited Dr. Borlaug to India. The two scientists worked side by side to develop wheat varieties that would yield higher levels of grain as well as develop stalk structures strong enough to support the increased biomass. In addition to this scientific breakthrough, Dr. Swaminathan also innovated methods to teach Indian farmers how to effectively increase production by employing a combination of the high-yielding wheat varieties, fertilizers, and more efficient farming techniques.

Dr. Swaminathan's vision transformed India from a "begging bowl" to a "breadbasket" almost overnight, bringing the total crop yield of wheat from 12 million tons to 23 million tons in four crop seasons and ending India's reliance on grain imports. He later worked with former Prime Minister Indira Gandhi to establish agricultural policies and programs that would maintain long-term self-sufficiency across the country.

In 2002, Dr. Swaminathan was elected President of the Nobel Peace Prize-winning Pugwash Conferences, which brings global leaders and thinkers together with the goals of reducing the danger of armed conflict and cooperatively solving global problems. He is the first citizen of a developing country to hold this post. Also in 2002, Dr. Swaminathan joined that year's World Food Prize Laureate, Dr. Pedro Sanchez, as a Hunger Task Force coordinator for the United Nations Millennium Project, which in early 2005 developed clear targets and a practical plan for reducing poverty, hunger, disease, illiteracy, environmental degradation, and discrimination against women, to achieve over the next decade. Dr. Swaminathan has published over 650 papers in international journals and several books, including:

- Building a National Food Security System Science
- Integrated Rural Development Science and Sustainable Food Security
- From Green to Evergreen Revolution
- Indian Agriculture; Performance and Challenges
- Towards an Era of Bio-happiness
- Biodiversity and food
- Health and Livelihood Security

On the occasion of the presentation of world food prize Swaminathan in October 1987, Javier Perez de Cuellar, Secretary General of the United Nations, wrote: "Dr. Swaminathan is a living legend. His contributions to Agricultural Science have made an indelible mark on food production in India and elsewhere in the developing world. By any standards, he will go into the annals of history as a world scientist of rare distinction." Swaminathan has been described by the United Nations environmental Program as "The Father of Economic Ecology." He was one of three from India included in Time magazine's 1999 list of the "20 most influential Asian people of the 20th century," the other two being Mahatma Gandhi and Rabindranath Tagore.

He currently holds the UNESCO - Cousteau Chain in Eco technology at the M. S. Swaminathan Research Foundation in Chennai, India. He is the chairman of the National Commission on Agriculture, Food and Nutrition Security of India (National Commission on Farmers). He is currently spearheading a movement to bridge the Digital divide called, "Mission 2007: Every Village a Knowledge Centre"

References:

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<http://www.wisdomtimes.com/blog/dr-m-s-swaminathan-the-agricultural-genius/>
<http://en.wikipedia.org/wiki/M.S.Swaminathan>

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Photo Gallery

Leaves and Flowers



Photos by: Kirti Sharma

My Floral Friends



Photos by: Nikita Loharuka

Verbena: Different Hues



Photos by: T. Ramya

Shades of *Ranunculus*



Photos by: T. Ramya

Crossword Answers

Biochemistry, Dendrology, Anatomy, Cytology, Ecology, Palynology, Paleobotany, Economic Botany, Pomology, Forestry, Ethnobotany, Horticulture, Agronomy, Bryology, Phenology, Systematics, Physiology, Orchidology, Pharming, Arboriculture.

Cacti: The Spiny Beauties



Photos by: T. Ramya

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DEPARTMENTAL NEWS

Semester Toppers

Result	Current class	Result of	Position in class	Photograph
Shreyashi Malik	B.Sc(H) Botany I Year	B.Sc(H) Botany I Year Semester I	I	
Aishwarya	B.Sc(H) Botany I Year	B.Sc(H) Botany I Year Semester I	II	
Shreya Tripathi	B.Sc(H) Botany II Year	B.Sc(H) Botany I Year Semester II	I	
Sneh Kunwar	B.Sc(H) Botany II Year	B.Sc(H) Botany I Year Semester II	II	

Shreya Tripathi	B.Sc(H) Botany II Year	B.Sc(H) Botany II Year Semester III	I	
Sneh Kunwar	B.Sc(H) Botany II Year	B.Sc(H) Botany II Year Semester III	II	
Sanchi Bhimrajka	B.Sc(H) Botany III Year	B.Sc(H) Botany II Year Semester IV	I	
Pooja Jangir	B.Sc(H) Botany III Year	B.Sc(H) Botany II Year Semester IV	II	

Ayushi Gupta	B.Sc(H) Botany III Year	B.Sc(H) Botany III Year Semester V	I	
Sanchi Bhimrajka	B.Sc(H) Botany III Year	B.Sc(H) Botany III Year Semester V	II	
Prachi Sharma	Alumni	B.Sc(H) Botany III Year Semester VI	I	
Charu Singh	Alumni	B.Sc(H) Botany III Year Semester VI	II	

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Gargi College Botanical Society: Taru

Inauguration of TARU 2014-2015

Sneh Kunwar
And
Anukriti Bajpai
Botany (Hons.) II year.



The inauguration of Gargi College Botany Society 'Taru', is one of the most awaited, esteemed events held in our department. It is held with great sense of pride and achievement every year. This eagerly awaited, momentous and dignified ceremony for the year 2014-15 took place on 9th September 2014.

Professor J.P. Khurana, Head of the Department of Plant Molecular Biology, University of Delhi, South Campus, was the distinguished Chief Guest, who honored the occasion by his presence. The ceremony was embraced by the presence of Dr. Shashi Tyagi, our Principal and Dr. Kiran Prabha, Teacher in Charge, Botany Department. The function was also witnessed by the respected staff members and students of Botany Department.

Our honored Chief Guest, Professor Khurana accompanied by Dr. Shashi Tyagi and Dr. Kiran Prabha initiated the event by lightening the ceremonial lamp. The entrance of the hall was beautifully decorated by the students with a rangoli. Everyone from botany department including teachers and students gathered in the Seminar Hall, the venue of the celebration, where Professor Khurana was welcomed with a huge round of applause. A splendid and elegant prayer dance by Lekha, a 2nd year student, invoking the blessings of Goddess Saraswati followed immediately. The dance was greatly appreciated by all.

The Chief Guest Professor Khurana, Dr. Shashi Tyagi, Dr. Kiran Prabha were then presented potted plants as a token of gratitude by the union members. What followed next was the thought provoking address by Dr. Shashi Tyagi, leaving everyone motivated. Thereafter, Professor Khurana addressed the gathering. His research interests are in the area of photoreception and hormone signalling in the model plant *Arabidopsis*. He has also worked on the isolation and characterization of *Arabidopsis* mutants defective in sensing blue light for regulating phototropism. His group has characterized cryptochromes from mustard and rice.

He delivered the lecture on phytochrome, cryptochrome and phototropins; Domain structure and phytochemical properties of phytochrome and various approaches to Identify light signaling compounds, mechanism of phytochrome action and the organization of representative phytochromes. It was an interactive learning session. In the end of his lecture he wished us all for success and inspired the students. The

audience took keen interest throughout the lecture and the entire Seminar Hall reverberated with a round of applause at its end. The inauguration of GCBS also signifies the custom of formally investing the Union with authority and responsibility. The newly elected Union Members were then presented with batches and recognized as the members of GCBS executive committee.

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Executive Committee of TARU: Gargi College Botanical Society (2014-2015)

Post	Name	Year	
President	 Barkha Ravi	III year	
Secretary	 Sneh Kunwar	II year	
Treasurer	 Anukriti Bajpai		
Executives	 Kirti Sharma	 Ayushi Gupta	III year
	 Varsha Sharma	 Ankita Sharma	II year
	 Srishti Shekhar	 Akshama Singh	I year
	 Priyanka Saluja	 Nikita Loharuka	

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Gargi College Botanical Society (2014-2015)

Annual Report

Taru President – Barkha Ravi

Botany (Hons.) III year



Gargi College Botanical Society (G.C.B.S) was established in the year 1994. It is named as 'TARU' which means tree. This year we had the inauguration of our society on 9th September, 2014. ANTHESIS which means the opening of a flower is our departmental annual e-magazine. This year 10th volume of Anthesis is published with a theme "Botany, an interdisciplinary science".

On the day of inauguration of G.C.B.S we were honoured to have prof. J.P.Khurana from the department of plant molecular biology, University of Delhi, South campus to deliver a lecture on phytochrome, cryptochrome and phototropin. G.C.B.S had also conducted a work shop on I.C.T enhanced e-learning resources and methodologies during summer vacations organised by our teacher Dr. Gita Mathur.

The teacher's day was also celebrated with great fun and frolic where students of our department organized a surprise for teachers that included the event in which teachers distributed the gifts among orphan kids of BUTTERFLY N.G.O. This year we were also a part of an event that is SWACH BHARAT ABHIYAN held on 2nd of October where active participation of student and teachers was evident.

G.C.B.S believes in bringing best out of the students. For this, every year several competitions like poster making, quiz, salad making, and scientific rangoli are

organized where students not only of our department but also from other departments mark their active participation.

In sports also students brought laurels to the department by winning 23 gold medals and around 30 silver medals altogether. We got 2nd position in March past competition held on annual sports meet this year.

On 4th march, 2015 we organized a lecture by Dr. Rajendra Gupta on “DNA of words” which was an interesting, informative and interactive session.



Photos by: Dr. Gita Mathur



Photos by: Aditi Baidya



Photos by: Dr. Gita Mathur



Photos by: Dr. Gita Mathur

A Glance at Our Department's Achievers.

First Year Students:

Bushra won the 2nd prize in Best Out Of Waste competition conducted by the Eco Club.

3rd prize was bagged by **Priyanka Singh** of our department in the same competition. We won prizes in slogan writing competition also.

Drishti won 2nd prize in inter-college slogan writing competition of Gandhi Fest.

Mohini got 1st prize in poetry competition held at IIT Delhi.

In Sports, **Srishti Shekhar** and her team won the 1st prize in relay race, SPIN'15.

Second Year Students:

Anupriya Rana - Hindi debater, got 1st prize in national debate held in Ambedkar College, Best speaker award in NSUI (manthan) at Miranda House, Best interjector (NSUI), 2nd prize in presentation at TERI University, 3rd prize in group discussion at SGTB Khalsa, 3rd prize in word game at Antaragini (IIT Kanpur), 1st prize in slogan writing competition at SGTB Khalsa, Best speaker award at Lekhika sangh, 2nd and 3rd prize at national debate competition at Satyawati and Bheem Rao Ambedkar College respectively.

Aditi Baidya - Came 1st in online photography competition (School of Planning and Architecture, Delhi) Sepia 2014 and (Jesus & Mary College) Montage 2014, 3rd in online photography competition (Women Development Cell (Hindu College).

Kanika - Won 1st prize in Best out of waste competition conducted by Eco Club.

Lekha - Got 3rd prize in Poster making competition on Swachh Bharat.

Sneh Kunwar - Stood first in Collage making competition.

Swasti Verma - Got 2nd prize in Group dance performance in Pulse'15(AIIMS.)

Surbhi Nautiyal - Stood 1st in Collage making competition.

Srishti Negi - As a part of western dance society Enliven won 1st prize in K.R.Mangalam, 1st in G.D.Goenka and 3rd in Gargi College.

T.Ramya - Won 2nd prize in inter-college science quiz in Scintillations'15.

In sports:

Anupriya Rana - Brought a bronze medal in National atheletic games.

Sneh Kunwar - won a gold medal in 50 m race at Annual Sports meet of our college, silver medal in long jump and gold medal in 4x50m relay.

Laxmi Gurjar - came 3rd in intercollege ball badminton, got 4thrank in intercollege atheletic games.

PoonamM, Varsha Sharma, Shivani Verma, Neetu Chaudhary - Came 1st in Langdi competition.

Sonu Yadav - Came 2nd in Dogdeball and Gallery.

This year students from our department (**T.Rajitha and T.Ramya**) won the **Pathfinder award**.

Third Year Students:

Anupama Sabu - Won 1st prize in English Debating in NDIM, Maitreyi College, SRCC, Gargi, Kirori Mal College and NSIT, she came 1st in group discussion at Kamla Nehru College and Bhagat Singh College, 1st in monoacting at Dayal Singh College and she also won the trophy for Business presentation at TERI University.

Neha Singh - Got 1st prize in Rangoli and Poster making competition at Miranda House, Gargi and Shaheed Bhagat Singh College.

Anjali Mehra - As a part of singing society Samrajini she won prizes in 16 different colleges.

Garima Grover - Secured 2nd position in slogan writing in Scintillations'13.

Anindya Tripathi - Got Priyadarshani Award for Excellence in extracurricular activities by the University of Delhi.

In sports:

Barkha Ravi and Lata won the gold medal in relay race.

Barkha Ravi, Lata, Meenu, Neha Singh, Sanjana Rajoura and Priya Singh got the gold medal in intra college stream Sports Olympiad.

Barkha Ravi, Meenu Singh, Neha Singh, Lata, Kirti Sharma, Lalita, and Arti won silver medal for Dogde ball, Chase her and Pitthugram.



Kratika Khanna - Won the gold medal at Delhi State Judo Championship, Silver medal at Junior National Kurash Championship along with a silver medal and a bronze medal in intercollege judo competition.

Barkha Ravi and Lata Kharayat - Got 1st prize in Salad making competition conducted by G.C.B.S.



Department of Botany contingent won 2nd place in March past competition.

Our awards and achievements prove that our department not only excels in studies but also in extracurricular activities. G.C.B.S is just not a society but a platform for young budding aspirants to bloom.

Our congratulations to all the winners!!

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Summer Seminar cum Workshop

eResources and ICT Enhanced Learning Methodologies for Biologists

June 10th & 11th, 2014

Department of Botany, Gargi College

A report by workshop organizer and coordinator

Dr. Gita Mathur

A summer Seminar cum Workshop was organized by the Department of Botany, Gargi College on eResources and ICT Enhanced Learning Methodologies for Biologists on June 10th & 11th, 2014. The programme started with lighting of the lamp by the invited guest, Dr. G. Mahesh; Dr. Shashi Tyagi, Principal, Gargi College; Dr. Gita Mathur, workshop coordinator, and student representatives of B. Sc. Botany honours second and third year. This was followed by Saraswati Vandana by students. The Principal welcomed the guests with flowering potted plants and talked about the Star College grant and related activities organised by the college for students.

Technical session was started by Dr. G. Mahesh who gave an illustrated account on the topic “eResources for Biological Sciences”. Dr. G. Mahesh is Coordinator, NKRC, Principal Scientist and Head, E-Resources & Services, NISCAIR, New Delhi – 110067.

Other invited speakers were:

Ms. Seema Sirpal, Senior System Programmer, (DUCC) Delhi University Computer Centre. University of Delhi, and Dr. Neena Priyanka, Advisory Data Specialist at Pitney Bowes Software, India

The salient features of the summer seminar cum workshop were as listed below:

Presentations:

- eResources for Biological Sciences
- ICT Enhanced and Blended learning for Botanists
- Concepts of Environmental Management
- eLearning Scenario for Delhi University students
- Social Media and their Impact on Education
- New Learning Methodologies for Students
- Looking Ahead: Preparing for the Future

Interactive Sessions:

- Determining carbon footprint
- Screening of Photo collections on:
 - Freezing Dry Deserts of Leh and Kailash Mansarovar
 - Giant Redwoods of California
 - Cleaning of Dal Lake
 - Virtual life cycle of *Equisetum*
 - Botanical crosswords

Slide Show and Videos:

- MAB (Man and Biosphere Programme)
- Videos on Life Processes, Plant Survival and Biotic Interactions.

The number of students who participated was total 40; 30 from second year and 10 from third year. Ten faculty members and four invited speakers were involved.



Photos by: Dr. Gita Mathur

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A Day for Teachers



Photos by: Aditi Baidya and Leena Arora

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Gargi 'Swachh Abhyaan': Botany Department

Joint efforts of Students, Teachers and Lab staff



Photos by: Dr. Gita Mathur

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"Scintillations 2015": A Report

Swayang Siddha Nayak

B.Sc. Life Sciences, (III year)



Science festivals are organised in a hope that every young mind discovers its hidden potential to not only think beyond the horizon but execute those thoughts to the best of ability. Each year our institution, Gargi College plays host to one such festival the "Scintillations". All the science departments of our college collaborated and organized some really successful events that witnessed showcase of outstanding talents amongst students. The event was organized on the 24th and 25th of February. On the 24th the commemoration of the event started with the lighting of the lamp as a symbol of prosperity and good luck and lectures by eminent speakers. **Mr. S.K. Bramachari** gave a talk on "Are Life Scientists trying to become God?" A very interesting and thought provoking theme indeed. The second speech was given by **Dr. Sujata Mohanty** on "A Scientist can look like me!" a very inspirational theme that can uplift the spirits of the young in this fast pacing life full of pressure.



Following this the Chemistry department had organized a paper presentation competition which saw a lot of students from various colleges participating enthusiastically. What could be a better platform to present ones involvement in science and research than a poster presentation! It indeed was successfully organized by the collaborative efforts of the life science department and the department of physics of our college. There were ten participating teams which presented posters on their projects and gladly it was the group from Physics honours (III year) of our college that impressed the judges with their theme and exhaustive presentation. This was followed by several other interesting competitions, one of them being the very famous AD MAD competition organized by the microbiology

department consisting of 14 teams including four from other colleges of Delhi University.

The Following day was all the more eventful with **Professor V.S.Chauhan** giving a lecture on “Science and Society”. The Department of Zoology hosted a debate competition on “Should we be afraid of advanced robots living among us in the near future.” There were at least 11 teams which participated and were tested on their diction, presentation and content related to the theme by esteemed judges from our college. A fun event was yet again organized by the life science department “Zenith”, The Scientific Tambola which the competing teams thoroughly enjoyed.

Scientific Rangoli Competition was organized by Botany Department



Photos by: Dr. Gita Mathur

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Reverie: Gargi Annual Cultural Fest

Shreoshi Das

B.Sc. Life Sciences (III year)



'Mind blowing' Yes, that's the word that describes REVERIE 2015 perfectly. From the very beginning me and my friends were super excited for the fest as this was the first time we were attending it. I was a little more excited as being a part of HUES, The Fine Arts Society of Gargi College; I had to do the decorations, banners and canvases along with the team. So we started our preparations weeks before Reverie. As the days drew nearer everyone was gearing up for the fest. Finally the day came and Reverie'15 saw students turning up from various colleges. The zeal and zest could be well estimated by the energies that resonated from every individual who attended the fest. The Dramatics societies, Dance societies, Music societies, Fine arts societies of different colleges in Delhi University participated in various competitions organized by the respective societies of our college which brought about the best in the individuals and surprised many with their unflagging spirits.

The main highlight from the past few years has been the street plays that portray the social stigmas and atrocities in the society. This year too it lived up to people's expectations which showcased dramas by probably the best artistes in D.U. The very eventful Choreo Night witnessed some nail-biting performances by the choreo societies of the various participating colleges. The main attraction for the following day was the comedy night by **Kanan Gill** and **Kenny Sebastian**. The show's popularity could be well judged by the countless heads standing in the queue to experience a never forgetting laughter session for them. The following night **Anushka Manchanda** rocked the star night with her electrifying performance not only singing to the tunes of her latest Bollywood hits but reprising the old melodies as well. Nevertheless, the stalls put up for the event to cater to the demands of our young college mates, be it the jewelry sections to the sinful delights of pastries and cakes, walla! No one was left hungry for sure. And no one can of course forget those awestruck moments while riding on the Columbus! I thoroughly enjoyed the fest and am looking forward to Reverie'16!



Photos by: Dr. Gita Mathur

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Antardhwani: The Voice Within

DU Festival and Flower Show

**Tammineni Rajitha
Botany (Hons.) II year**



Antardhwani, this intuitively named cultural festival started by the current Vice-Chancellor of University of Delhi, Dr. Dinesh Singh gives the dynamic college going youth three whole days and a multifaceted platform for creative expression of their inner voice. This opportunity is utilized by hundreds of students to express quite eloquently and gracefully, their budding talents, their revolutionary ideas and their innovative minds.

At Antardhwani'15 from February 20 to 22 the students who have already heard their inner calling, expressed it in plethora of ways. From street plays happening at three corners of the venue to classical performances on the stage, from college stalls covering the perimeter of the stadium ground to innovation projects' stalls, every nook and corner of the venue was bursting with youthful energy and ambition. This year's theme "Meeting the challenges of India" was taken on with equal vigour by the college stalls who recounted their endeavours over the course of last year regarding social issues like women empowerment, cleanliness and environmental issues as well apart from the presentation of their extra-curricular and curricular achievements. The Gargi College stall, with the help of many handmade and printed posters displayed the achievements and activities undertaken by the illustrious departments and cultural societies during the last academic session. Also highlighted at the Gargi College stall, were undergraduate research projects performed by the young ladies of Gargi under the mentoring of their lecturers.

Keeping with the theme of "Meeting the Challenges of India" few interesting stalls were set up at the festival. These stalls were all about dealing with the challenge of declining green cover under the stress of rapidly increasing urban areas. One of the stalls set up by Sajeevfresh displayed their innovative idea of using cow manure for making pots and designing eco-friendly mini-gardens to accommodate them in the urban set up of corporate offices, schools and college buildings. Another stall was

selling varieties of seasonal flower seeds and vegetable seeds at low cost to ignite love for the green saviors in the hearts of people by encouraging them to grow gardens in their backyards. One stall set up by the students elucidated various medicinal plants and their uses in the traditional medicine.

This year though all the stalls and performances were marvelous but I have to say these stalls stole the show for me. The only thing which topped them is the flower show held right in the middle of the venue. Aptly present in middle the showy, fragrant individuals of the plant kingdom were centre of attention at Antardhwani for all three days. If one spends even a few minutes traversing through the few inches of paths left in between the potted arrangements the understated beauty of *Nigella damascena* reverberates in the mind's eye for days. Although the flamboyant Lilies and the friendly carnations catch the eye at first look, it's the mild yet intoxicating fragrance of Jasmine that traps you. The golden beauty of *Calendula* and the competing marigold makes you look twice. And the scarlet Begonias make you sombre. While the bright pink and purple Asters lighten up the mood the narcissistic daffodil can't help but attract our whole attention. In this abundance of floral perfume and colour there were some thorny members resting patiently nearby. While some cacti dared to flower some just rejoiced in showing off their spiny symmetry. This floral journey however is not completed without at least once having the glimpse of Rose garden outside Viceroy Lodge. Filled with roses of every colour imaginable this garden with restricted entry and exclusive place in the centre surrounded by Pansies justifies the position of rose as queen of the flowers. If you are one of those who haven't been able to yet decipher the voice within or haven't got the inner calling this mesmerizing place under the warm sun, amid the floral abundance is where you as a botany student could definitely hear the murmur of that elusive inner voice starting up.

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Presidents of Gargi College Botanical Society

No. of Years old	YEARS	NAME	ADVISOR / S	TIC
Started	1994-95	Kusum Yadav	G Mathur	AC
1	1995-96	Nandini Das	G Mathur	AC
2	1996-97	Saloni Mathur	UP & GMe	LS
3	1997-98	Sarika Upadhyaya	UP & GMe	LS
4	1998-99	Ragini Rai	ST & DJ	KK
5	1999-2000	Sagarika Sarkar	ST & DJ	KK
6	2000-2001	Pinky Aggarwal	KP & AC	ST
7	2001-2002	Ishani Sinha	KP & SD	ST
8	2002-2003	Nidhi Gupta	PM & SD	UP
9	2003-2004	Swati Chugh	BB & SD	UP
10	2004-2005	Neethi V. Rao	GMa & GMe	GMa
11	2005-2006	Neena Priyanka	GMa & GMe	GMa
12	2006-2007	Madhulika & Urvashi Bhatia	KP	KP
13	2007-2008	Bhavya Khullar	GMe & AM	GMe
14	2008-2009	Yashika Sharma	AM & PK	GMe
15	2009-2010	Neha Singh	KP & SV	KP
16	2010-2011	Rashmi Sanchita	PP & LJ	AM
17	2011-2012	Nikita Singhal	IS & PP	AM
18	2012-2013	Nikita Dalal	RMS & JK	LJ
19	2013-2014	Neha Tanwar	UP & RMS	UP
20	2014-2015	Barkha Ravi	KP, LJ & RMS	KP & LJ

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Department of Botany
Faculty



(August 17, 1932 to February 3, 2012)

DR. CHHAYA BISWAS
Founder of
The Department of Botany, Gargi College

Superannuated in 1993 as
Principal, Gargi College



Dr. Shashi Tyagi is now Principal (Officiating) of Gargi College.





**Dr. Geeta Mehta receiving the award for “Excellence in Teaching”
From the Vice Chancellor Prof. Dinesh Singh**



**Dr. Garima Malik received her Ph.D. degree at the convocation
held on 26.03.2015**

**Title of thesis: "Understanding the role of DNA methylation in
regulating gene expression during development in Rice (*Oryza
sativa*) and *Physcomitrella patens*"**

Degree awarded on 01.09.2014



Superannuated	Current Faculty:Permanent
Dr. Chhaya Biswas	Dr. Shashi Tyagi
Dr. Pushpa Markandan	Dr. Usha Prasad
Dr. Ahalya Chintamani	Dr. Gita Mathur
Dr. Bharati Bhattacharyya	Dr. Kiran Prabha
Dr. Lalita Sehgal	Dr. Geeta Mehta
Dr. Krishna Kumar	Dr. Aparajita Mohanty
	Dr. Priyanka Pandey
	Dr. Leisan Judith
	Current Faculty: Odd Semester
Voluntary Retirement	Dr. Jasmeet Kaur Abat
Dr. Kavita Walia	Dr. Renu Mundhara Soni
Dr. Asha Juneja	Dr. Samira Chugh
Dr. Deepa Jethwani	Dr. Sachi Aggarwal
Dr. Shweta Vandana	Dr. Priyanka Deveshwar
	Dr. Vera Kapai
	Dr. Garima Malik
	Dr. Preeti kaur
	Dr. Shweta Sharma
	Current Faculty: Even Semester
	Dr. Jasmeet Kaur Abat
	Dr. Renu Mundhara Soni
	Dr. Shachi Aggarwal
	Dr. Vera Kapai
	Dr. Samira Chugh
	Dr. Garima Malik
	Dr. Preeti Kaur
	Dr. Rashmi Panwar
	Dr. Monika Heikrujam
	Dr. Shweta Sharma
	Dr. Manisha Sharma

Laboratory Staff



Superannuated	Current
Mr. H.S. Sawhney	Mr. D.D. Sharma
Mr. Kapileshwar Pandey	Mrs. M.D. Sharma
Mr. P.D. Raturi	Mrs. Shashi Bala
Mr. J.S. Negi	Mr. Ashok Kumar Rana
Mr. Vishwanathan S.	Mrs. Rajni
Mr. Liaquat Ali	Mr. Arun Kumar
Mr. H.C. Dhirwal	Mr. Pancham Singh
	Mr. Vijay Kumar Pandey
	Mr. Deepak Kumar
	Ms. Preeti
	Museum Curator: Mr. Ganga Singh

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Alumni of Botany Department, Gargi College

Deeksha Bisht

Gold Medal For topping M.Sc. Environmental Management, GGSIPU



Unforgettable moments of my life are when I was studying in the Gargi College, Delhi University. This is the stepping stone of my future. I came here as an empty box but after three years I was filled with joy and understanding.

Botany department of Gargi College is just awesome and very helpful. This department is provided us with a base for learning. The people whom I met here are very valuable to me. I just enjoyed while studying in this department. This department is very supportive including teachers and lab staff. Teachers of this department are very encouraging and inspiring. I am very thankful to respected Gita Mathur Mam, Geeta Mehta Mam, Shashi Tyagi Mam, Usha Prasad Mam, Priyanka Kapoor Mam, Kiran Prabha Mam. This was the best phase of my life.

Moreover, after joining this department, I realized what true friendship is! Here I made some amazing friends especially my best friend. I have to thank Gargi College for providing me not only with the best teachers but also a lifetime friendship of Kimi Bhuyan, Shilpi Choudhary, Deepanjali, Neha Joshi & many others which I will forever cherish. Gargi is not just a College for me, it was a special part of my life where I enjoyed every moments.

Whatever I have learnt here is with me. After completing my Graduation from this college, I pursued M.Sc. in Environment Management from Guru Gobind Singh University (GGSIPU). I topped in university examination and got the gold medal for the same by Hon'ble Vice President of India, Shri M. Hamid Ansari in presence of Hon'ble Chief Minister, Govt. of NCT of Delhi, Shri Arvind Kejriwal and Hon'ble Deputy Chief Minister & Minister of Higher Education, Govt. of NCT of Delhi, Shri Manish Sisodia at 10th Convocation of GGSIPU.



I achieve it because of precious experience & knowledge, which I got at Gargi. I am again very grateful to this department for providing me a chance to express my feelings.



Shubhangi Jain
Research Scholar
Department of Botany
Delhi University

GARGI ROCKS

What I remember about Gargi College? It's tough to pen down. When I go back down the memory lane, it seems I remember everything and a part of it has stayed in my heart. Right from Phycology classes, Mycology practicals, operon models, amazing Genetics lectures, our super fun Economic Botany theory and practical classes, Practicals with Bryophytes were super rocking; Our ecology practicals were also very interesting, the fun experiments we used to do with our ma'am!

Our Botany department festival **Ficus**, each moment was enjoyable from volunteering for various competitions to participating in quiz and losing in first round, the salad dressing competition, Botanical rangoli making, card making, skit on botanical processes, everything seems so fresh in my mind.

The trip to Dalhousie is unforgettable. With all my friends it was super fun and at the same time a great learning experience. We were taught how along with altitude vegetation varies, why the roof tops were yellow (*Cedrus* pollen shower) and I realized seeing Dr. Gita Mathur ma'am how much fun it is clicking photographs and enjoying this beautiful nature mother earth has given us!! This excursion taught us how to work in groups, sharing, caring, learning and discussing.

Now we have a group called Gargi rockerzz on whatsapp created by Yashika Sharma to catch up on each other in our busy lives. I love all my friends Meghna, Sulakshna, Kavita, Saakshi, Suman, Chinky, Deepa, Komal, Pritha, Drishya, Shailaja, Arpita, Sneha, Priyadarshini, Aditi, Ambika, Madhvi, Mani, Kaanan. Not to forget the tasty muffins, chatting at Nescafe and canteen, the elections, the library system all rocked in GARGI.

I am adding here my photograph with eminent botanist Professor Govindji and another one in which I am wearing the lab-coat of Professor Emerson (brought to our laboratory in DU by Professor Govindji). I am honoured to have these precious photos and am sharing with you all.



In the end from the bottom of my heart I want to thank all the teachers from Botany department, Chemistry department, Zoology department and English department who taught us and gave such precious moments to cherish lifelong!!

Shubhangi

Dr. Uma Muthurajan 1990

(M. Uma Maheshwari)



I think this was a party for Suhasini, I am the one in extremem right in the red kurta

I am currently in Colorado State University working as a Research Scientist. I went on to do M.Sc. Biotechnology at University of Pune after graduating from Gargi (in 1990). Then did Ph.D. at IIT Madras (where I met my husband), worked for a year in a company at Delhi before joining Dr. Karolin Luger's lab in 2000, and I've been here ever since. We have two girls 10 and 8.

The best memories of Gargi are sitting outside in the garden at lunch time gossiping with friends and feeding the friendly squirrels! I loved the practical classes we had and remember enjoying them thoroughly. I remember going on field trip to Yamuna banks and to Mussoorie to collect plant samples for the herbarium. The excitement of finding and identifying a sample was my favourite. I also loved to memorize the scientific names of common household things and annoying my brothers by using those at home!



Our class

Thanks to you and the other lecturers I am still passionate about Botany even though I am not working on anything Botanical right now (except cooking maybe).

I would love to receive an electronic copy of the newsletter to see how much my beloved college has changed.



On Gargi rooftop

Uma



This is our family now, my husband, Dr. Venugopal me, Shuvani Pujan (2nd grade) and Padmanab G (4th grade).



We were the proud winners of two Botanical Quizzes that year!



Sports Day, we won the volley ball game played reluctantly!



This garden used to be one of my favourite hangouts!

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Botanical Fun Pages

Botanical Quiz

GCBS Quiz questions: Compiled by Botany Faculty

Q1. Who is called Father of Genetics?

A. Mendel B. Linnaeus C. Hugo de Vries

Q2. Clove is obtained from

A. Root B. Fruit C. Flower buds

Q3. Reduction division is also known as

A. Meiosis B. Mitosis C. Amitosis

Q4. What is the type of tomato fruit?

A. Pome B. Berry C. Drupe

Q5. Tallest living tree is

A. *Sequoia* B. Eucalyptus C. Palm tree

Q6. Botanical name of Monkey puzzle tree is

A. *Araucaria* B. *Cedrus* C. *Pinus*

Q7. What is the Botanical name of Indian Ginseng?

A. *Withania somniferum* B. *Solanum nigrum* C. *Datura stramonium*

Q8. Part from which liquorice or mulethi is obtained is

A. Roots B. Bark C. Stem

Q9. Which one is an Amphibian of the Plant Kingdom

A. Irish moss B. Club moss C. Reindeer moss D. Peat moss

Q10. Flame of the forest

A. *Butea monosperma* B. *Daltonia regia* C. *Calliandra*

Q11. Drink of Gods

A. *Theobroma cacao* B. *Camellia sinensis* C. *Coffea Arabica*

Q12. Lucky bamboo

A. *Dracaena* B. *Daffnibacia* C. *Bambusa bambos*

Q13. Agar-agar is obtained from

A. *Gellidium* B. *Chara* C. *Aloe vera*

Q14: Palynology is the study of

A. Fossils B. Pictures C. Pollen

Q15: Curry leaves which make your sambhar so special are the leaves of which plant

A. *Moringa* B. *Murraya* C. *Morus alba*

Q16: Which of these has variegated leaves

A. *Lathyrus* B. *Coleus* C. *Cuscuta*

Q17: Bisexual flowers which never open in their life time are called

A. Polygamous B. Gamopetalous C. Cleistogamous

Q18. A flower is brightly coloured, scented and secretes nectar, it is probably

A. An insectivorous plant B. Insect pollinated C. Anemophilous

Q19. The “daffodils” of William Wordsworth’s famous poem are

A. *Narcissus* B. *Ranunculus* C. *Lilium*

Q20. *Mesembryanthemum crystallinum* is

A. A very nice plant B. An ice plant C. A spice plant

Q21. An example of an aggregate fruit is

A. Pineapple B. Fig C. Strawberry

Q22. Kranz anatomy is present in

A. C2 Plants B. C3 Plants C. C4 Plants

Q23. Cheiropterophly is seen in

A. *Kigellia pinnata* B. *Bombax ceba* C. *Butea monosperma*

Q24. Which plant growth regulator would you use to spray on grapes to get elongated fruits?

A. Auxin B. Cytokinin C. Gibberellins

Q25. Apical dominance is due to

A. Auxin B. Ethylene C. Cytokinin

Q26. Which hormone helps overcome apical dominance?

A. Cytokinin B. Ethylene C. ABA

Q27. The lagging strand of DNA in a replication fork has

A. Kyoto fragment B. Okazaki fragment C. Ikebana fragment

Q28: The protest that contributed to the Irish potato famine was

A. An oomycete B. A basidiomycete C. An ascomycete

Q29. Jute is obtained from *Corchorus* sp. This is

A. Xylem fiber B. Phloem fiber C. Surface fiber D. All of the above

Q30. Darwin’s favorite plant mentioned in his book “The power of movement in Plants” also called the dancing/telegraph plant

A. *Desmodium gyrans* B. *Mimosa pudica* C. *Snowdonia Hawkweed*

Q31. Which one of the following is the living fossil?

A. *Ginkgo bioloba* B. *Kigella africana* C. *Ephedra*

Q32. Japanese flower arrangement is

A. Monokama B. Tokyo arrangement C. Ikebana

Q33. An inflorescence which gives the appearance of a single flower found in most *Euphorbia* sp.

A. Capitulum B. Schizocarp C. Cyathium

Q34. An inflorescence which gives the appearance of a single flower found in Asteraceae members.

A. Capitulum B. Caruncle C. Operculum

Q35: Casparian strips are present in the _____ of the root.

A. Pericycle B. Cortex C. Endodermis

Q36. In maize, the food is stored in

A. Endosperm B. Aleurone layer C. Cotyledons D. Scutellum

Q37. Litmus which is used for the detection of acids or alkalis is obtained from

A. An algae B. Fungi C. Lichens D. All of these

Q38. One of the plants introduced from new world to the old world is

A. Potato B. Wheat C. Rice D. Sugarcane

Q39. Pyrethrum (an insecticide) is obtained from

A. Roots of date palm tree B. Mesocarp of coconut C. Flower of *Chrysanthemum*
D. Leaf bases of *Areca* nut palm

Q40. The medicinally most important part of *Rauwolfia serpentine*

A. Root B. Rhizome C. Aerial stem D. All of these

Q41. Which part of coconut produces coir

A. Seed coat B. Epicarp C. Mesocarp D. Pericarp

Q42. Epidermal seed fibres are obtained from

A. Cotton B. Coconut C. *Crotalaria juncea* D. None of these

Q43. Which one of the following is a pseudocereal?

A. *Zea mays* B. *Oryza sativa* C. *Triticum aestivum* D. *Fagopyrum esculentum*

Q44. Saffron is produced from

A. Roots of *Indigofera* B. Petals of *Rosa* C. Stamens of *Hibiscus* D. Style and stigma of *Crocus*

Q45. The distinguishing character of imparipinnate leaf is that

A. Leaflets are large B. Rachis is terminated by an unpaired odd leaflet C. All leaflets are in pairs

Q46. Eyes of a potato tuber are

A. Axillary buds B. Lenticels C. Adventitious roots

Q47. The root in a mangrove tree is

A. Respiratory B. Fibrous C. Tuberous

Q48. The roots become fleshy due to storage of food in

A. *Tecoma* B. *Delphinium* C. *Dahlia*

Q49. One of the following is the source of rubber

A. *Hevea brasiliensis* B. *Tectona grandis* C. *Cedrus deodara* D. *Michelia champaca*

Q50. Castor oil is obtained from

A. *Sesamum indicum* B. *Linum* spp. C. *Brassica campestris* D. *Ricinus communis*

Q51. The chicory powder which is mixed with coffee powder is obtained from

A. Seeds B. Leaves C. Roots D. Stems

Q52. Organelle also called as suicide bags

Q53. Name influenza virus strain that cause Swine flu.

Q54. Full form of IUCN

Q55. Botanical name of neem is

Q56. Sugarcane belongs to which family?

Q57. Powerhouse of the cell

Q58. Full form of IARI

Q59. Scholar's tree

Q60. Which plant is called *Drosophila* of plant Kingdom?

Q61. Plant part used in *Cinnamon*

Q62. What is the full form of CFC?

Q63. 4'O clock Plant is

Q64. What are called Biological Scissors?

Q65. Which plant is infected by the virus TMV?

Q66. Which is the start codon?

GCBS Quiz Answers

1. Mendel 2. Flower buds 3. Meiosis 4. Berry 5. *Sequoia* 6. *Araucaria* 7. *Withania somniferum* 8. Roots
9. Peat moss 10. *Butea monosperma* 11. *Theobroma cacao* 12. *Dracaena* 13. Gellidium 14. Pollen 15.
Murraya 16. Coleus 17. Cleistogamous 18. Insect pollinated 19. *Narcissus* 20. An ice plant 21.
Strawberry 22. C4 Plants 23. *Kigellia pinnata* 24. Gibberellins 25. Auxin 26. Cytokinin 27. Okazaki
fragment 28. An oomycete 29. *Desmodium gyrans* 30. Phloem fiber 31. *Ginkgo biloba* 32. Ikebana 33.
Cyathium 34. Capitulum 35. Endodermis 36. Endosperm 37. Lichens 38. Potato 39. Flower of
Chrysanthemum 40. Root 41. Mesocarp 42. Cotton 43. *Fagopyrum esculentum* 44. Style and stigma of
Crocus 45. Rachis is terminated by an unpaired odd leaflet 46. Axillary buds 47. Respiratory 48. Dalhia
49. *Hevea brasiliensis* 50. *Ricinus communis* 51. Roots 52. Lysosomes 53. H1N1 54. *International
Union for Conservation of Nature* 55. *Azadiracta indica* 56. Poaceae 57. Mitochondria 58. Indian
Agriculture Research Institute 59. *Alstonia scholaris* 60. *Arabidopsis* 61. Bark 62. Chloroflorocarbons 63.
Mirabilis jalapa 64. Restriction enzymes 65. Tobacco 66. AUG, methionine

Crossword Puzzle

Ayushi Gupta

Botany (Hons) III year



Find out the names of twenty disciplines of Botany from the crossword given below.

A	R	G	L	N	B	I	O	C	H	E	M	I	S	T	R	Y	F	E	B	F	R	Z
S	G	E	K	Y	X	A	H	N	R	L	K	R	J	D	N	J	N	Y	D	A	F	A
R	H	J	K	Q	W	Q	B	M	Y	K	Q	D	S	X	V	R	H	J	M	T	D	N
T	N	D	E	N	D	R	O	L	O	G	Y	W	Q	J	W	E	J	E	G	V	J	A
J	P	E	S	H	A	G	R	H	J	T	K	Y	K	T	K	T	K	E	P	A	B	T
H	H	E	T	A	H	J	T	J	S	C	M	P	Y	N	W	H	L	K	H	R	E	O
P	A	L	E	O	B	O	T	A	N	Y	J	H	D	R	R	N	N	H	Y	V	Y	M
A	R	A	B	K	A	R	A	A	A	U	Y	E	S	T	F	O	R	E	S	T	R	Y
L	M	Y	F	B	N	H	R	T	T	L	K	N	G	E	Q	B	Z	W	I	F	N	O
Y	I	J	G	K	R	M	T	J	R	J	R	O	J	T	M	O	C	G	O	G	G	R
N	N	T	J	R	Y	H	J	C	Y	T	O	L	O	G	Y	T	V	R	L	C	R	C
O	G	J	D	R	J	M	K	E	C	O	L	O	G	Y	E	A	B	A	O	B	H	H
L	Y	E	J	W	S	R	T	L	J	P	I	G	A	C	R	N	F	R	G	F	R	I
O	J	A	R	J	J	E	L	K	K	L	W	Y	D	F	B	Y	R	F	Y	T	M	D
G	D	B	H	O	R	T	I	C	U	L	T	U	R	E	N	T	J	H	M	T	H	O
Y	T	Q	E	T	Y	J	J	U	G	W	D	G	M	H	J	J	T	E	T	R	T	L
T	J	A	V	W	Q	S	Y	S	T	E	M	A	T	I	C	S	W	S	R	N	E	O
S	Z	A	F	E	G	Q	E	H	T	A	S	G	H	W	L	G	W	F	E	M	G	G
J	G	Q	A	G	R	O	N	O	M	Y	B	T	B	R	Y	O	L	O	G	Y	H	Y
T	J	T	S	K	U	U	J	T	U	S	E	U	M	G	T	H	A	N	J	H	B	W
Q	H	B	D	W	F	G	B	R	S	A	F	D	E	S	P	O	M	O	L	O	G	Y
U	R	E	C	O	N	O	M	I	C	B	O	T	A	N	Y	B	E	B	S	A	G	T

[Click here to check your answers](#)

Poem
Bouquet of Feelings

Sonu Yadav
Botany (Hons.) II year



Rose,

With a smell so splendid
You make any human sway.
Have thorns,
Filled with love,
After death or in life
In grief or in joy,
Your wonder stays,
Gives the gift of life
Even to a soul
Not worth redeeming.



Sunflowers,

See them under clear sky
Sun-kissed in sunlight
Powerful enough,
To wipe away sadness.
Like a yellow orchestra,
Like a melody you can see,
And feel and experience.



Oh Lily,

The way,
Morning comes bursting
Out of clouds of darkness,
For sun to kiss
Floating on water,
So pure, no sins can drown you
Or growing in a garden
So shimmering,
Resonating an angelic sight.



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Farewell to Seniors

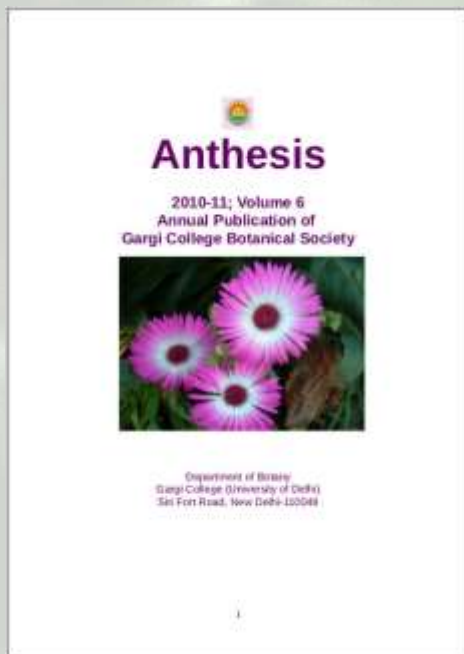
18 April 2014



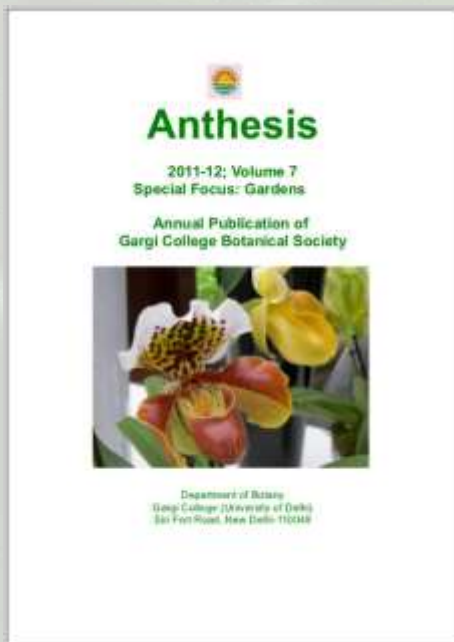


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GCBS e-Anthesis Volume 6 (2010-11)



GCBS e-Anthesis Volume 7 (2011-12) Special Focus: Gardens



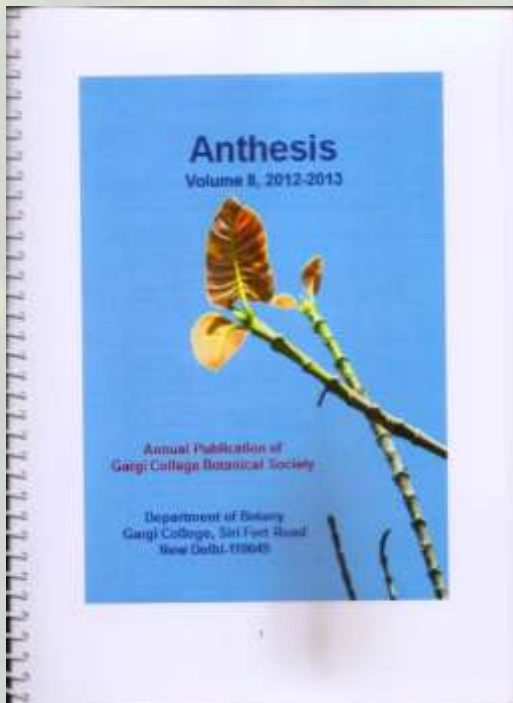
ANTHESIS 2011-2012
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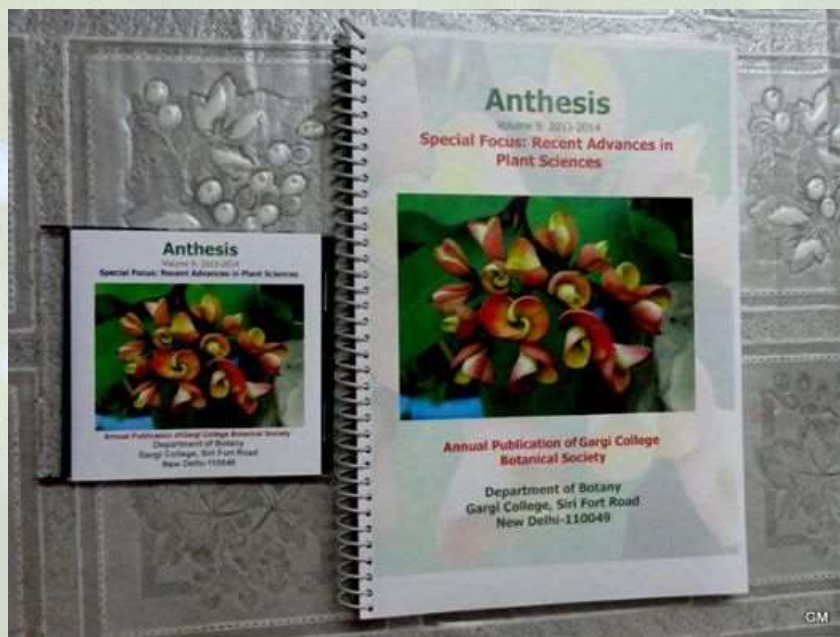
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Special Focus: Plant Curios**



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Special Focus: Recent Advances in Plant Sciences



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