

**e-NEWS LETTER**

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**Gujarat University Botanicals Society (GUBS)**



**Department of Botany  
Gujarat University  
Ahmedabad -380009  
India**

# ANKUR

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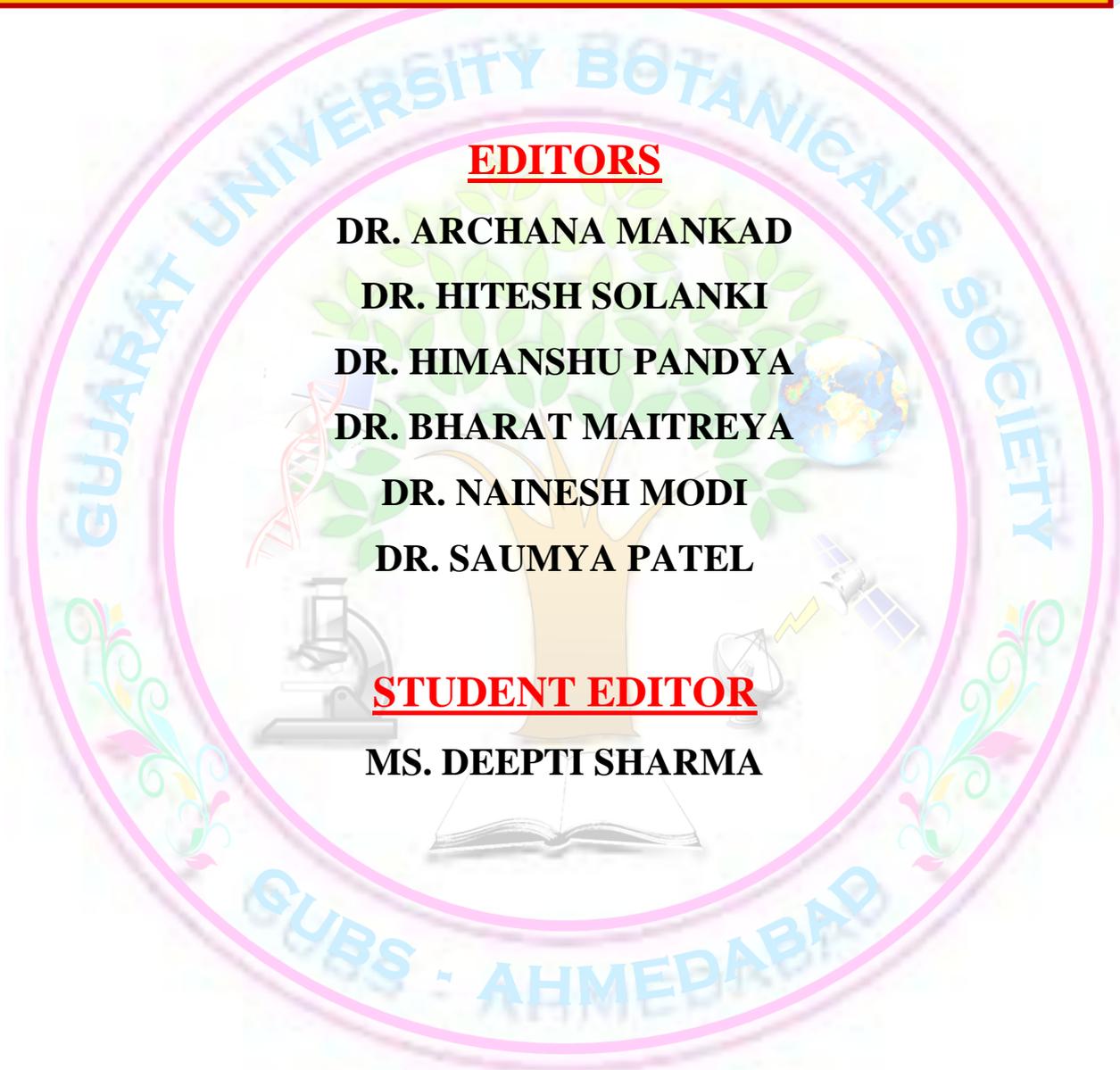
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## *ANKUR*

*.....Sprouting of thoughts*

*Ankur is symbol of new beginning towards growth. And Ankur is here to introduce budding writers. It would represent interesting articles in Botany, Bioinformatics and Climate Change Impacts Management. Each seed has the innate potential to grow - blossom, and display its magnificence after its dormancy has been broken. Same way this news letter would provide a platform to young researchers to share news and views, promote awareness about the subjects and generate interest in related issues. Ankur would be taken care of by a team of dedicated Student Editors who would select and edit articles for online publication.*

*We wish Team Ankur all the best for this endeavour.*





### ***FROM EDITOR'S DESK....***

*Ankur is now five years old. This newsletter is intended to be published twice in a year. The growth and development of Ankur is a reflection of the growth and progress of the students of the department. This news letter will serve to reinforce and allow increased awareness, improved interaction and integration among all of us.*

*The journey began four years ago and now Ankur has blossomed and is spreading the fragrance to everyone around with the message that plants can also improve our health. In this issue, we focus on green innovation.*

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Dr. Nainesh Modi

Dr. Saumya Patel

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## **PATRON'S MESSAGE.....**

*Ankur provides an educative and informative interface for the members. It gives an opportunity to share significant and salient relevant information to the readers. This issue focusses on Green Innovations. As the thrust of research evolves, the dynamic science emerges as a foundation to newer technologies that are now shaping various aspects of our lives. Be it healthcare or environment protection, technology has provided solutions to the challenges emerging as a result of development.*

Dr. Archana Mankad

Patron-GUBS

Head, Department of Botany,

Gujarat University

Ahmedabad-380009, India

## VERTICAL FARMING

**Dr. ARCHANA MANKAD**



As the population grows, space declines and the environment becomes increasingly unfriendly toward plants, new methods of farming will be required. Vertical farming, which involves going upward rather than outward, offers great promise in that area.

Vertical farming is the practice of producing food and medicine in vertically stacked layers, vertically inclined surfaces and/or integrated in other structures (such as in a skyscraper, used warehouse, or shipping container). The modern ideas of vertical farming use indoor farming techniques and controlled-environment agriculture (CEA) technology, where all environmental factors can be controlled. These facilities utilize artificial control of light, environmental control (humidity, temperature, gases...) and fertigation. Some vertical farms use techniques similar to greenhouses, where natural sunlight can be augmented with artificial lighting and metal reflectors.

For example, the Vertical Harvest farm in Jackson, Wyoming, is a three-story, 30x150 hydroponic greenhouse. Amazingly, despite it's small size, it can produce 37,000 pounds of green, 4,400 pounds of herbs and 44,000 pounds of tomatoes. When you compare this level of production to standard farms, which require hundreds of acres for similar yields, it's no surprise that this is where things are headed. Additionally, these vertical greenhouses protect the plants from the weather, allowing farming to occur in places where it normally isn't possible. As cities and populations continue to expand, this kind of unique, small footprint solution will become increasingly essential.

Problems of a vertical farm- Economics, Energy use and Pollution

Advantages of a vertical farm - Increased cost production, Protection from weather related problems, Conservation of resources, Halting mass extinction, Impacts on human health, Poverty / destitution and culture, Urbangrowth, Energy sustainability

<https://www.ecowatch.com/7-green-innovations-that-are-changing-the-way-we-do-business>

[https://en.wikipedia.org/wiki/Vertical\\_farming](https://en.wikipedia.org/wiki/Vertical_farming)



## CONSERVATION AND PROTECTION BY GREEN CUSTOM

Dr. BHARAT MAITREYA

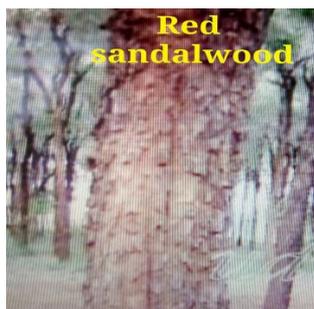
India, with its rich environment heritage and developing nation status is particularly susceptible to theft of its natural resources and vulnerable to dumping of its natural resources and vulnerable to dumping of hazardous wastes. DRI (Directorate of revenue Intelligence recognizes its responsibility as custom enforcement agency of Indian to co-ordinate and lead the GREEN CUSTOM INITIATIVE – activities of combat environment crime, carried out by custom and Border Security officers in pursuance of domestic environment laws and related multilateral environmental agreements.

National and International crime syndicates earn billions of US dollar from hazardous waste smuggling and dumping. Exploiting and trafficking protected natural resources.

Illegal trade in environmentally sensitive ODS (Ozone depleting substance), Toxic chemicals, Hazardous waste, endangered species and hazardous wastes. It causes negative impact to environment and harmful to human health.

Green custom initiative by environment agreement, based on convention of the control of Trans boundary movements of hazardous wastes and their disposal, Cartagena protocol and bio safety, trade in endangered species of wild flora and fauna (CITES), Stockholm convention on persistent organic pollutant. Flora and Fauna are environmentally sensitive goods. Its covered under CITES and Wildlife protection Act. Indian customs implements CITES through custom act, 1962. Foreign trade Act, 1992. And Wildlife protection act. CITES of wild flora and fauna is an International agreements, Aim of it's to ensure that international trade in specimen of wild animals and plants does not threaten their survival. It's protecting more than 30000 species of animals and plants. Whether they are live or dried herbs. The trade of vast array of wildlife products including food products wooden musical instruments, timbers medicines etc. India has nearly 6.5% of world's known wildlife species. The government of India constituted the wildlife crime control bureau in June; 2007. Some prominent flora regularly smuggled and are often inner-directed by Indian customs.

Red sanders (*Pterocarpus santalinus*) is high valued fragrant timber is endemic to southern part of India. It is also known as red sandalwood in great demands in China and Japan used for medicine, furniture's and carving. It is listing in Appendix II of CITES. It is most common items detected by DRI. Saffron: spice derived from the flower of *Crocus sativus*. Exports of its seeds and corms are restricted and export is permitted under license. Agar wood (*Aquilaria* sp.) is known as used in the perfume industry. Its export is banned.



## **BIODEGRADABLE POLYMERS: A REBIRTH OF PLASTIC**

**DEEPTI SHARMA**

Our whole world seems to be wrapped in Plastic. Plastic have become an integral part of our lives. But over the time, the amount of petroleum used to make plastic does contribute to depletion of fossil fuels. However traditional plastic is proving to be a major environmental problem because once it is discarded in landfills and oceans, it takes centuries to degrade as plastic are non-degradable. Another issue is that Conventional plastic are manufactured from non-renewable resources (such as crude oil, natural gas, coal etc.).

In an effort to overcome these issues, an apparent solution being explored was 'Biodegradable Plastic'. The term Biodegradable plastic is a plastic which can be broken down biologically into organic substances by the activities of living organisms like fungi, bacteria or other microorganisms which can completely metabolize them to carbon-dioxide and water. Biodegradable plastic are produced by renewable sources like cellulose, starch, polylactic acid etc, thereby reducing green house gas emissions. And study also reveals that Biodegradable plastic are Eco-friendly as it is completely degraded within a short period of time. Biodegradable plastic are the beginning to be accepted in many countries. These biodegradable plastics are thought to help the environment by reducing waste issues. As the government and many organizations are working to save the environment, there is a definite advantage to making biodegradable plastic more of a reality.

Biodegradable plastic is one of the most innovative products being developed in the packaging industries. The advancement of biopolymers technology has sky rocketed in recent years and there are growing signs that the public shows a high amount of curiosity in the product. With the variety of biodegradable plastic available in the near future, there will be a place for them in current age of plastics.



*(Shellie Berkesch, 2005)*

## ACCEPTANCE OF HERBAL MEDICINE IN TODAY'S TIME BASED ON PHYTOCHEMICAL EVIDENCE

ANCY J. FERNANDES

Plants by virtue of its composition store a plethora of chemicals with medicinal utility. Natural products like plants, animals and minerals have been the single most productive source of leads for drug development. Many compounds have been isolated from natural sources that undergo clinical and pre-clinical studies for various properties. Majority of the lead compounds have been reportedly derived from plants. Though the drugs from natural sources have been used since ages they have been neglected as far as scientific records for their efficacy and safety are concerned. The reason may be the complex nature of phyto-constituents that are present.

Very few pharmaceutical companies are involved in drug discovery. Screening from natural sources. It may be due to high cost involved in isolation and identification of pure compounds difficulty in collection, the complex nature of plants and absence of clear cut regulatory guidelines for natural products. The main focus have been herbal formulations but the matter for concern is efficacy and safety that will remain.

In the conventional drug discovery process a single pure active constituent is isolated, purified and standardized. Multi-constituent herbal formulation can be standardized with newer techniques like DNA fingerprinting, HPLC and LC-MS. The development of herbal drugs requires careful collection and authentication of the plant, phytochemical evaluation and standardization. The newer approaches to drug discovery process from natural sources is the utilization of molecular biology techniques in order to screen many plant extracts for obtaining pure compound database.

The use of herbal drug extracts in a number of ailments, have been failed to get to the prescription level by the physicians. Standardization of herbal medicines is the process of definite qualitative and quantitative value that carry an assurance of quality, efficacy, safety and reproducibility. Herbal drug development and standardization is an amalgamation of classical approach of Ayurvedic therapeutics, reverse pharmacological approach, technical standards for complete product cycle, chemi-informatics, herbal qualitative structure activity relationship (QSAR) and pharmacophore as well as post launch market analysis.

There is a trend globally towards holistic health, integrative science, drug discovery and therapeutics to form a real discovery engine resulting in building up knowledge and experience of pharmaceutical companies, researchers and the commoners to respect the folk use of medicinal plants.

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Raman Chawla (2013) Integrated herbal drug development and standardization- An approach for overcoming the challenges of herbal drug industry *International Conference and exhibition on traditional and alternative medicine* 2(10): 254

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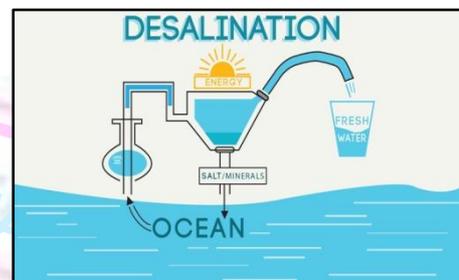
## DESALINATION

NIKITA P. SAPRA

Hardware or software innovation that is related to green products or processes, including the innovation in technologies that are involved in energy-saving, pollution-prevention, waste recycling, green product designs, or corporate environmental management (Chan *et al.*, 2006).

### Desalination

Desalination refers to the process by which pure water is recovered from saline water using different forms of energy. Saline water is classified as either brackish water or seawater depending on the salinity and water source. Desalination produces two streams - freshwater and a more concentrated stream (brine). The two main commercial desalination technologies are those based on 1. Thermal and 2. Membrane processes.

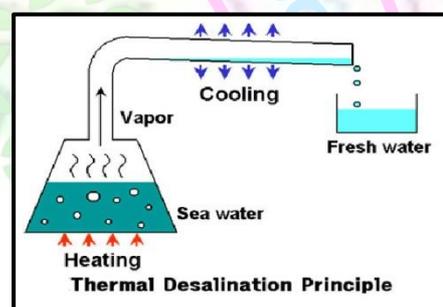


### Thermal Desalination

Thermal processes, except freezing, mimic the natural process of producing rain. Saline water is heated, producing water vapour that in turn condenses to form distilled water. These processes include:

1. Multi-stage flash (MSF) 2. Multiple-effect distillation (MED) 3. Vapor compression (VC) 4. Low temperature evaporation (LTE).

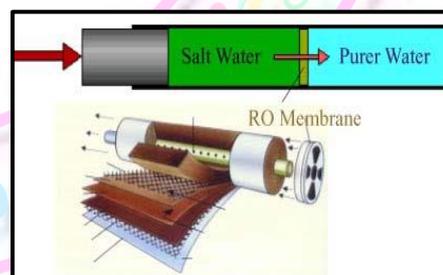
In all these processes, condensing steam is used to supply the latent heat needed to vaporize the water. Owing to their high-energy requirements, thermal processes are normally used for seawater desalination. Thermal processes are capable of producing high purity water and suited for industrial process applications. Thermal processes account for 55% of the total production and their unit capacities are higher compared to membrane processes.



### Membrane desalination

Reverse osmosis is a predominant form of membrane desalination. For thermal desalination, the most commonly adopted technologies are Multi-Stage Flash evaporation (MSF) Multi-Effect Distillation (MED). RO is currently the most widely used method for desalination.

Reverse osmosis is a desalination process with the use of semi-permeable membranes which allow the passage of water molecules but not the dissolved salts. In an RO process, seawater is firstly pre-treated to remove suspended solids. Sufficient pressure is then applied with the use of high pressure pumps to force water passing through the semi-permeable membranes, leaving the dissolved salts behind. Desalinated water then undergoes post-treatment, such as pH adjustment and disinfection, to make it suitable for drinking.



### References:

1. Banat, F. (2007) Economic and technical assessment of desalination technologies.
2. Chan Kai M. A., Shaw Rebecca M., Cameron David R., Underwood Emma C., Daily Gretchen C. (2006) Conservation Planning for Ecosystem Services. *PLoS Biology* 4(11).

## A DIGITAL PLUNGE TOWARDS NEW OPPORTUNITIES

PUJAN NAINESH PANDYA

India, the land of infinite possibilities, is reputed worldwide for its rich and ever flourishing land resources that provide a right kind of platform for production of varied agri-products. The challenging task for Indian Agrigarians ahead is production of an ample quantity of quality products to meet need of its ever increasing population, along with adjusting to the unavoidable seasonal shifts. The use of organic fertilizers not only helps in maintaining a natural balance but, also ensures that the fertility of the soil is maintained for a longer term by ensuring both the maintenance of the level of organic matter along with a manifold increase in productivity of the concerned crop. The concept has its origin in Howard's work. The basic objective of organic farming revolves around the three ideal principles primarily emphasizing on the social, environmental and economic sustainability.

It is astounding to find that the traces of organic farming dates back to the Vedic origin. In ancient India, the kisans possessed an unmatched knowledge of crop rotation, soil maintenance and proper seed selection for the concerned crops. Their rituals provided its evidence. During the marriage ceremonies of their sons/daughters, the exchange of high quality and high yield seeds from one farmer to the other belonging to diverse areas of India was practiced as a custom. This ritual was one of its kinds that not only helped in crop diversification throughout the country but on the whole ensured a substantial increase in crop yield. This led to effective crop diversification by balancing between both the quality and the quantity. Sadly, such ancient creative customs are deemed as obsolete in changing times without presenting substantial evidence in this regards.

The first green revolution in the 1960s, successfully rescued India from the impending starvation phase by revolutionizing agricultural practices which saw adoption an increased use of grains, pesticides, fertilizers, rotational crop growing techniques, and irrigational practices that suited specific crop requirements according to the geographical area. Off lately, there is a lagging period wherein a 3% lag has been observed in the agricultural growth that also saw an increase in suicides committed by farmers. But on the brighter side the demand has doubled, forecasted to be around 450 million tones. The *In silico* Innovations in computing, data science and technology will equip us with a creative pursuit for the research in agri-industry. In the coming years, embracing the new technological and the biological innovations in the Agricultural and energy sectors would further help India and the world in reaching their sustainable agriculture Goals. The digitally enabled seeds and water management techniques would further help farmers in increasing crop yields. Most importantly, the digital supply chain management from the Kisans to the consumers would be an icing on the cake for the farmers and the consumers. This Digital Arena is giving the green signals for an impending digitized Green Revolution, wherein the data is meant to be the gold and its outcomes in platinum

### **References:**

Yadav S. K., Subhash Babu et al., A Review of Organic Farming for Sustainable Agriculture in Northern India, International Journal of Agronomy, Volume 2013, Article ID:718145

<http://www.financialexpress.com/industry/technology/what-is-digital-green-revolution-mukesh-ambani-lists-5-ways-data-is-the-new-soil/956549/>.

## ROLE OF FUNGI IN SOLID WASTE MANAGEMENT

SUHANI GIRISH PAREKH

The increasing urbanization and industrialization has direct impact on urban waste. Solid waste management is an important factor of environment hygiene and needs to be integrated with total environmental planning. A huge amount of municipal solid waste gets collected everyday but its proper disposal that too without causing harm to the environment has always been a challenge. Incineration and landfills are the most common practice carried out to dispose these wastes. These method releases harmful gases in the environment. Biodegradation is termed as natural process of recycling. Fungi play an important role in biodegradation as some findings have suggested that they are more active in carbon assimilation than bacteria and actinomycetes. Fungi release degrading enzymes depending on the types of substrates available to them. When they act on a polymer, they convert it into its subsequent dimers and monomers. These gets released into the environment in the form of CO<sub>2</sub> and water. According to some researches that have been done, it has been showed that many fungal species are excellent degraders of various waste materials. Here are some examples of fungal species that have been found to degrade particular type of waste. *Aspergillus sps.* and *Trichoderma sps* showed highest cellulose degradation ability. White rot fungi produce lignolytic enzymes that degrade lignin like substances. *Aspergillus niger* and *Phanerochaete chrysosporium* produce cellulase from waste paper, cotton waste and baggase. *Aspergillus oryzae* produce plastic degrading enzyme that degrades plastics. Some fungi produce protease from sugar mill waste which can be used in leather industry. Mangrove soil posses several fungi which are capable of degrading polythene and plastics. Arbuscular mycorrhizal fungi reduce the uptake of heavy metals like cadminum from soil. *Aureobasidium pullulan* produce pullulan from agro industrial waste which is a homopolysaccharide and has many uses. Many of the fungi imperfecti have capability of pesticide degradation. Some fungi have oil degradation capacity. Thus fungi play an important role in composting also and are useful decomposers and biodegraders. The fungi *Apergillus* and *Phaenerochaete chrysosporium* have been shown to have maximum capability of degradation of solid waste. Thus bioremediation is the best way of recycling but there are some risk factors that should be taken care off. Also these species require some specific growth requirements which should be made available. The researches has been done in laboratory conditions only but field experiments are to yet to be undertaken on large scale. But otherwise Fungi are excellent biodegraders and play an important role to reduce pollution from the environment. In this age of development, if a way or method of disposing the solid waste is possible that also without causing any harm to the environment, fungal biodegradation of solid waste can be a possible solution to the big problem throughout the globe.

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## ARTIFICIAL GLACIARS SAVE WATER FOR LADAKH

**HETAL BHALAKIYA**

Indian farmers have been at the receiving end due to the uncertainties of nature. Global warming has wreaked havoc causing unseasonal rains and hailstorms in many parts of the country. Even the remote and high-altitude region such as Ladakh has not escaped this adversity. It receives an annual average rainfall of 50mm. Hence, water is a rare commodity there. An idea germinated in the mind of a civil engineer belonging to the region turned this adversity into opportunity. Chewang Norphel built an 'artificial glacier' by using unseasonal melting of natural glaciers and preserved water, which addressed scarcity and saved crops. Constructing dams and reservoirs involves heavy capital investment and environmental costs. Ladakh is located on the western edge of the beautiful Tibetan plateau. The average annual rainfall is scanty. Generally, these glaciers melt during April and May. However, due to climatic changes, they have started melting in June. This has put crops in peril as the sowing season starts in April and May. Melting of glaciers in June has disturbed the natural crop cycle. Since there is no water available for cultivation during April-May, 80% of the farmers faced losses. Chewang Norphel wanted to end Ladakhi farmers' plight. He had served in the government for over 36 years as a civil engineer. He found a solution to the problem by devising the technique of artificially freezing the melted glacier water called the "Artificial Glacier". The idea of artificial glaciers struck his mind when he saw a small stream of water freezing under the shade of a poplar tree, as water kept flowing in the sunshine. The main reason for this phenomenon to occur, he observed, was the water that flowed through the shady area was moving slowly, whereas it was not that slow in the sunny part. This made him realize that if the flow of water is decreased in a shady area, it would freeze. Norphel calculated that a natural glacier containing about 1 million cubic feet (about 7.5 million gallons) of water could be used to create an artificial glacier capable of irrigating about 380 acres of land. Cooper claims the amount of water stored in an artificial glacier is tiny as compared to the flow rate of the Indus River, where most of the glacial melt ultimately ends up dumping in the Arabian Sea. These artificial glaciers have no downstream effect as most of the water is utilized to grow crops. Water would flow unused out to the Arabian Sea during October and November. In conclusion, green innovation is a product of environmental concerns. Our environment is very important and without it then we cease to exist.

References: <http://www.thebetterindia.com/chewang-norphel>

## **BIODIESEL: AS ENVIRONMENT FRIENDLY BIOFUEL WITH IT'S APPLICATIONS AND LIMITATIONS**

**DHRUV PANDYA**

Biofuel that is made from natural elements such as plants, vegetables and reusable materials. This type of fuel is better for atmosphere because, unlike the other fuels, it does not give off harmful chemicals which can influence the environment negatively. The technical definition of biodiesel is "The mono alkyl esters of long fatty acid derived from renewable lipid feedstock such as vegetable oils or animal fats, for used in compression ignition engines." The popularity of biodiesel fuel is constantly increasing as people search out alternative energy resources. Benefits of biodiesels are; it can be produced from renewable, domestic resources, it is energy efficient (The total fossil fuel energy efficiency of biodiesel is 320% vs. 83% for petroleum diesel), it can be used directly most in diesel engines, it can reduce global warming and tailpipe emissions, it is nontoxic and biodegradable. Biodiesel having fewer aromatic hydrocarbons: benzofluorathene; 56% reduction, benzopyrenes 71% reduction. Biodiesel having different applications like it can be used on road vehicles; partially every diesel engine powered vehicles on road (Millions of miles were logged on biodiesel in European countries). Natural fuel can be used for off road construction, mining and farm or industrial machinery. Biodiesel can be used in marine engines safely. Marine use is especially attractive due to the elimination of any possibility for contamination of waterways. With natural gas prices rising high biodiesel can be substituted easily for natural gas with minor changes necessary to the burner train. With many states now mandating hybrid electric vehicles (including the fuel cell hybrid), biodiesel will make excellent reforming fuel. Biodiesel can be used as industrial solvents and high VOC containing petroleum solvents. With new power generation capacity coming online, the natural biodiesel makes an attractive choice to meet the regulations. Many stationary applications are permitted requiring exhaust emission control system, which work well with biodiesel but will not with diesel fuel. Natural biodiesel can also be used as lubricity agents in many applications. It is especially useful in marine applications where water contamination with petroleum lubricity agents can create problems. Biodiesel also having some limitations like: it does not offer a large scalable solution to replace gas oil, the negative environmental effects of biodiesel are deforestation and loss of biodiversity. Food shortage is also one negative effect cause by biodiesel. It is not suitable for high capacity engines.



## LESSONS FROM NATURE

Dr. ARCHANA MANKAD



Like a tree we each must find a place to grow and branch out. Trees are firmly rooted at least most of them are and those who are not, get uprooted which small storms. Trees stand the testimony of time. They bear the onslaught of not only nature but also bear the problems arising due to development. When the roots are deep there is no reason to fear the winds. But that's not the only thing that matters. Roots get established in good soil. On rocky surface roots do not go deep and plants get easily uprooted. Roots perform a very significant function of not only anchoring the plant to the soil but they also assist in absorbing water and minerals which are of utmost importance to the plants.

**Our Values are the roots of our character.** They define our personality. Nothing can deter a personality who has deep values of humanity, love, truth and peace. Human Values help us in identifying the right from the wrong. They are helpful in treating people in a society respectfully. Our values are what we inherit as family values and what we as a person imbibe and practice. Strong personalities have strong values and they can stand tall inspite of all odds. Values may be moral, ethical, professional, social, aesthetic and psychological. Human Values are in fact universal. Let us uphold these human values not only to earn respect but also be a role model for generations to come.



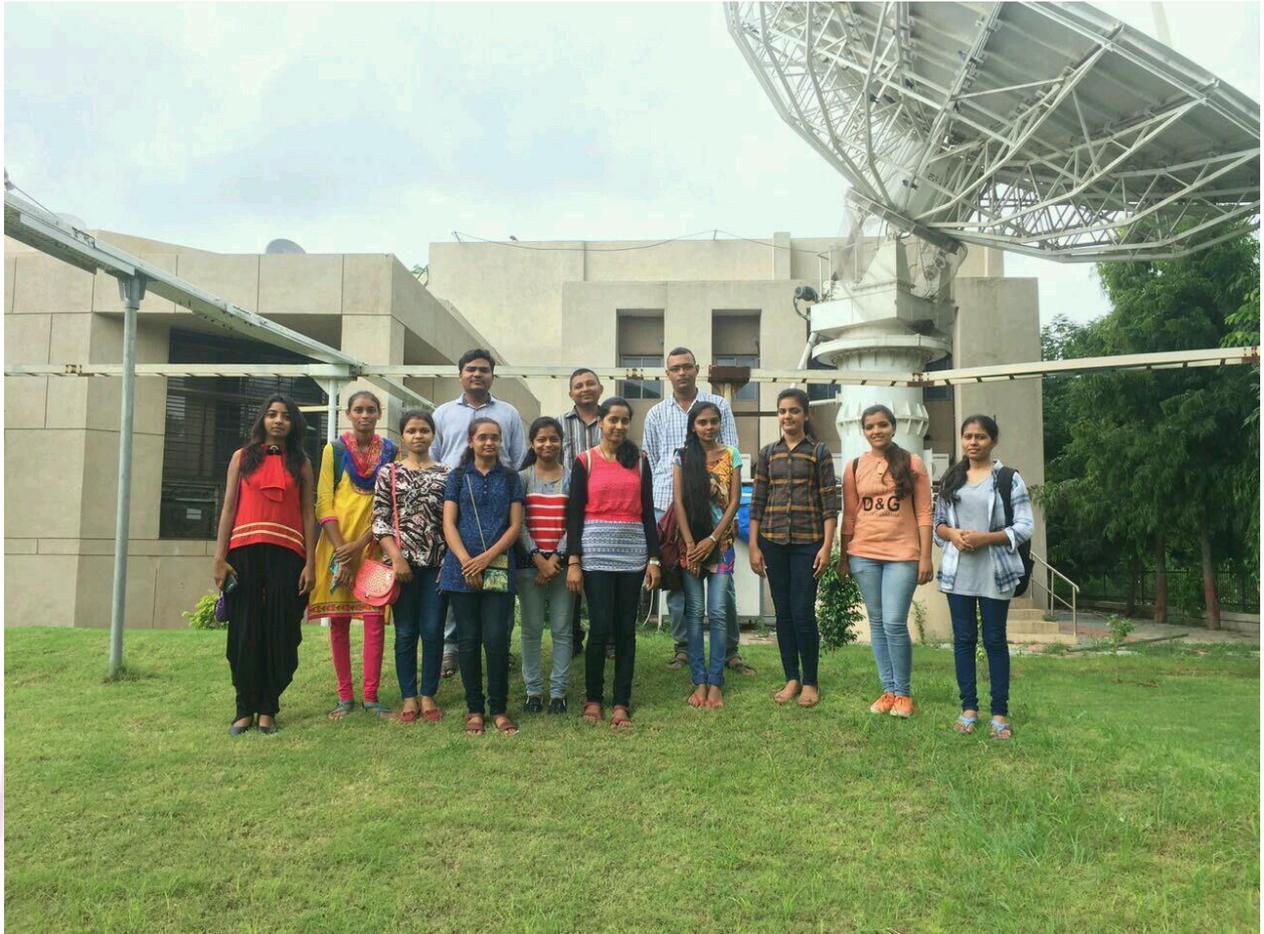
## GLIMPSES OF ACTIVITIES OF GUJARAT UNIVERSITY BOTANICAL SOCIETY

The students of M Sc Climate Change Impacts Management visited **Gujarat Pollution Control Board(GPCB)** on Monday, 17<sup>th</sup> July 2017. GPCB - Gujarat Pollution Control Board, was constituted by Government of Gujarat on 15th October, 1974 in accordance with the provision of the Water Act, 1974. The GPCB continued its efforts towards environment related better pollution control and improved management. Several critical issues in the field of environment are being tackled by the Board through its existing Regional Offices located at Ahmedabad, Vadodara, Bharuch, Surat, Vapi, Rajkot, Jamnagar, Godhra, Mehsana, Bhavnagar, Bhuj, Nadiad and Junagadh. The GPCB, Head Office, Gandhinagar has been registered by the BIS- Bureau of Indian Standards, Delhi under the Quality Management Systems in accordance with IS/ISO 9001:2000. It is important to pursue Research and Development with a view to improve and ensure effectiveness in the performance of pollution control activities. Various projects have been undertaken with the co-operation of the World Bank and international financial institutions. These projects include development and expansion of laboratories, training of the personnel and establishing laboratory instruments and equipment. In addition to this, GPCB also identifies Bio-indicators and Toxicity of Water Bodies under the CPCB project. The students had a unique opportunity to visit the state of the art laboratory and witness some of the demonstrations in progress.

The students of Climate change visited **Gujarat Environment Management Institute (GEMI)** on Friday 21<sup>st</sup> July -2017. It is an autonomous Institute of Government of Gujarat. It is an ISO 9001:2008 & ISO 14001:2004 Certified Institute. It is also an OHSAS 18001:2007 Certified Institute. The Institute is known for its proactive strategy on all fronts, set up in 1999. While the broad mandate given to the Institute was to provide all kind of environment solutions required to ensure sustainable development, research aimed at gauging the impact of various human, economical & industrial activities on the environment and developing standards for prevention of such impacts was the main task assigned to the organization. The Institute has now developed a full-fledged laboratory which includes testing of Air, Water, Wastewater, Microbiology and Soil. The Laboratory has been recognized under the Environment Protection Act, 1986. The Laboratory has also been recognized by Government of Gujarat as “State Laboratory” under the Air (Protection and control of pollution) Act, 1981 and Water (Prevention and Control of Pollution) Act, 1974. The Institute has been handling many Governments and Private projects. The revamped Institute has been now contributing to the environmental action based on awareness about the environment issues.



The students of Climate change visited **Bhaskaracharya Institute for space applications and Geoinformatics (BISAG)** on Friday 14<sup>th</sup> July -2017. It is situated on the outskirts of Gandhinagar and is a state of the art institute, being the center for geoinformatics application it focusses on R&D using remote sensing and data analysis. It generates data for the government, students and researchers. It also houses the famous educational studios where educational programmes for schools and colleges are recorded. The group was accompanied by Mr. Pathik Bhatt, Research Scholar from Climate change. Dr. M.H.Kaluburne led the group through an informative presentation highlighting the activities of BISAG. It included awareness of remote sensing, geographic information system (GIS), Global Navigation Satellite System (GNSS). BISAG has been developing various kinds of software depending on the need of information and promotes training to young learners for the use of those software for social welfare. The various objectives of BISAG include-Visualization, Governance, Services, Developing and Planning, Decision making etc. Remote sensing has many applications not only in agriculture, forestry, climatology fisheries, coastal zone management etc but also in health, urban planning, landuse and degradation. The visit was planned to orient the semester III students towards the thrust areas of research so that they can identify their interest and pursue their dissertations in the next semester.



The first lady of Japan, **H E Mrs. Akie Abe** visited **Gujarat University** on Thursday, 14<sup>th</sup> September 2017 in the morning. The students of the department had a unique opportunity to interact with the first lady of Japan, Mrs. Akie Abe. The delegation with Mrs. Abe arrived at the University in the morning and was greeted and welcomed warmly by Prof. Himanshu Pandya, Vice Chancellor, Gujarat University, Registrar, Dr. P.M. Patel, Deans, Directors, Senate members and other officials of the University. The team included people from the embassy, security personnel, interpreters and other officials with Mrs. Abe. The excitement in the air was being captured by photographers and media persons. The team was led to the chamber of Vice Chancellor and was given exclusive memoirs as a token of respect and apropos the occasion. **The students from Climate Change Impacts Management were among the selected students who got the unique opportunity to meet Mrs. Abe in the Syndicate room.** The other students that were selected to be part of the group were from Department of Environment Science, Department of Social Work, and Startups from GUSEC. The students were accompanied by Prof. Rajasi Clerk, Prof. Hitesh Solanki, Prof. Rakesh Rawal and Prof. Archana Mankad alongwith officials from GUSEC. The question answer session was coordinated by an interpreter who very effectively facilitated the communication for the group. There were questions related to climate change, emissions, Japanese culture, heritage, values and overall life in Japan which led to enterprising exchanges in a very light vein. Prof. Himanshu Pandya explained and justified the University's priorities to support startups and various other initiatives taken up in the larger interest of the students and hence the university. A Technology and Heritage Preservation Interpretation center (THIC) is also proposed for facilitating mutual academic exchanges between the two countries. The First lady expressed satisfaction

and gratitude in the whole experience and extended her best wishes to the students and staff of the University. The students were truly elated and felt proud to be amongst the VVIPs even if it was for some time.



Prof. Himanshu Pandya, Vice-Chancellor, Gujarat University welcoming Mrs. Akie Abe, First Lady of Japan.

Prof. Himanshu Pandya, gifting memoirs to Mrs. Akie Abe, First Lady of Japan.





Sharing a light moment



Students of Climate Change Impacts Management interacting with Mrs. Akie Abe



The august gathering



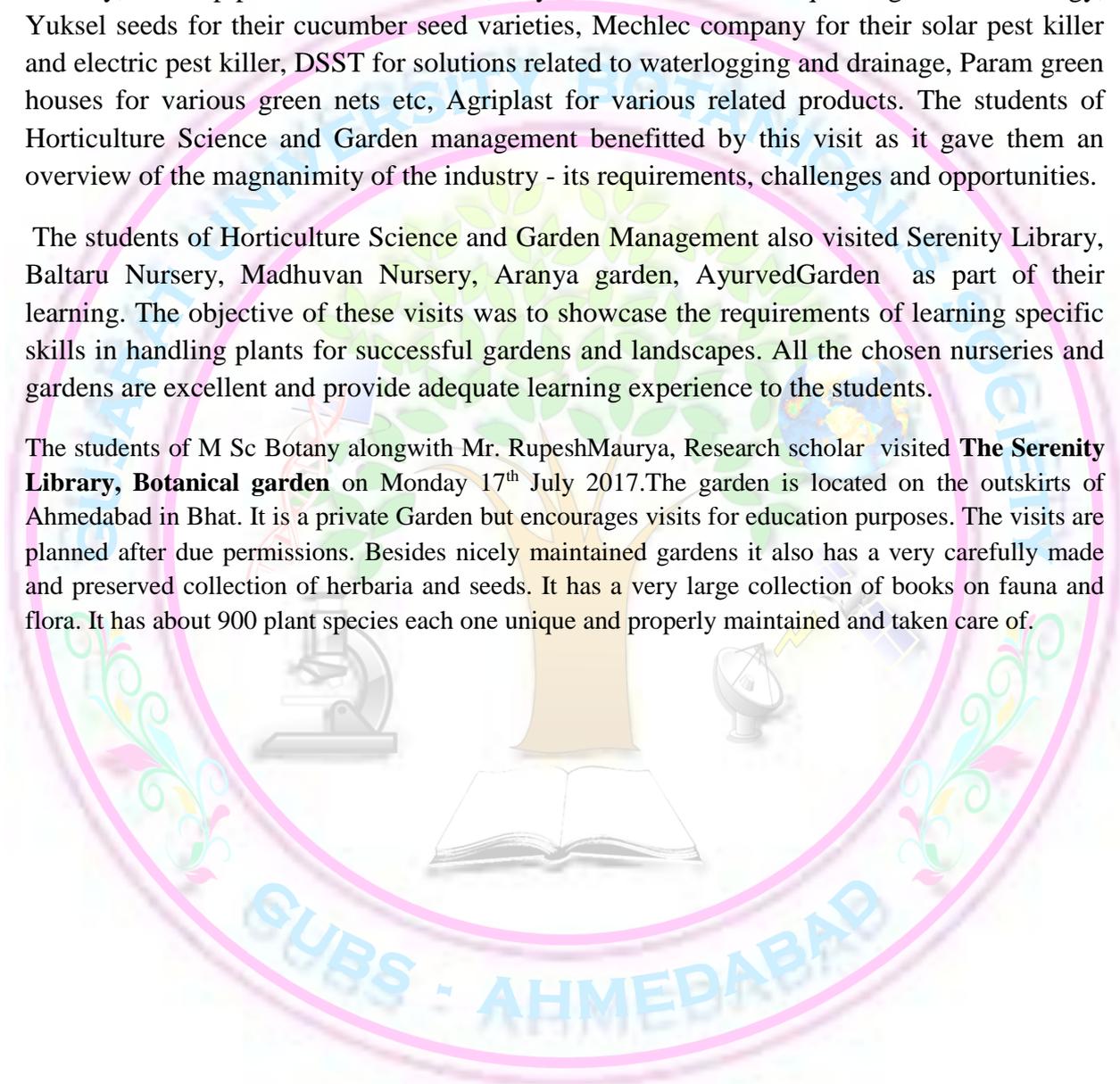
The memorable moment

The students of M Sc. Horticulture Science and Garden Management visited the Agriasia fair during 1-3<sup>rd</sup> September 2017 on Agriculture technology held at Mahatma Mandir, Gandhinagar. It was one of the leading International Agricultural events and aims at showcasing international agricultural technologies. An exhibition that attracts not only Government officials from various allied ministries but also decision makers, trainers, practitioners, researchers, students and public from all over the globe. Companies and

Organizations participated with their products or services for awareness and outreach to relevant groups. The thrust had been on agroecology, machinery, processing of agricultural produce, fertilizers and chemicals, floriculture, green house, irrigation technologies, livestock and dairy farming, plasticulture, post harvest treatment, renewable energy, marketing and export, nurseries, seed companies, turnkey projects, rural development, plant propagation materials and methods, transfer of technology, hardware and software etc. it was interesting to note a few promising exhibits e.g., seedless lemons by Dr. Hitendra Patel from Baltaru Nursery, Astral pipes with heat sensors, Jaiyo India with their unique irrigation technology, Yuksel seeds for their cucumber seed varieties, Mechlec company for their solar pest killer and electric pest killer, DSST for solutions related to waterlogging and drainage, Param green houses for various green nets etc, Agriplast for various related products. The students of Horticulture Science and Garden management benefitted by this visit as it gave them an overview of the magnanimity of the industry - its requirements, challenges and opportunities.

The students of Horticulture Science and Garden Management also visited Serenity Library, Baltaru Nursery, Madhuvan Nursery, Aranya garden, AyurvedGarden as part of their learning. The objective of these visits was to showcase the requirements of learning specific skills in handling plants for successful gardens and landscapes. All the chosen nurseries and gardens are excellent and provide adequate learning experience to the students.

The students of M Sc Botany alongwith Mr. RupeshMaurya, Research scholar visited **The Serenity Library, Botanical garden** on Monday 17<sup>th</sup> July 2017. The garden is located on the outskirts of Ahmedabad in Bhat. It is a private Garden but encourages visits for education purposes. The visits are planned after due permissions. Besides nicely maintained gardens it also has a very carefully made and preserved collection of herbaria and seeds. It has a very large collection of books on fauna and flora. It has about 900 plant species each one unique and properly maintained and taken care of.





The students and staff of the department visited the **Dantiwada Agricultural University** for a study tour from 9-10 October 2017. The group was led by Dr. Saumya Patel, Assistant Professor, Ms. Drishti Bhatt & Dr. Manisha Pandey. They reached Dantiwada in the morning by bus.



### **Sardar Krishinagar Dantiwada University**

A quick introduction was followed by the **first lecture on Biotechnological aspects to improve crops and plants in plant breeding.** The Professor of Biotechnology Department took the first lecture about how we can improve the crops and plants using Biotechnology and Plant Breeding methods. He explained the importance of Plant Breeding and why is it necessary for the humans. To get high yield and quality products, plant breeding is done. He described the plants used for plant breeding. Many ongoing researches are undertaken on castor, pomegranates, banana, and potato using plant tissue culture for improving plant's yield and its resistance from insects, pests and weeds. This was followed by a visit to the Biotechnology laboratory where the students were shown various equipments used in the experiments like centrifuge, spectrophotometer, PCR, RT-PCR, electroporation unit, leaf area meter equipment, Plant Tissue culture facility. The visit to the Botanical garden net house etc was very informative. Another lecture on GC-MS and soil testing was delivered by the distinguished faculty. The lectures were truly informative.



Lecture in the conference room

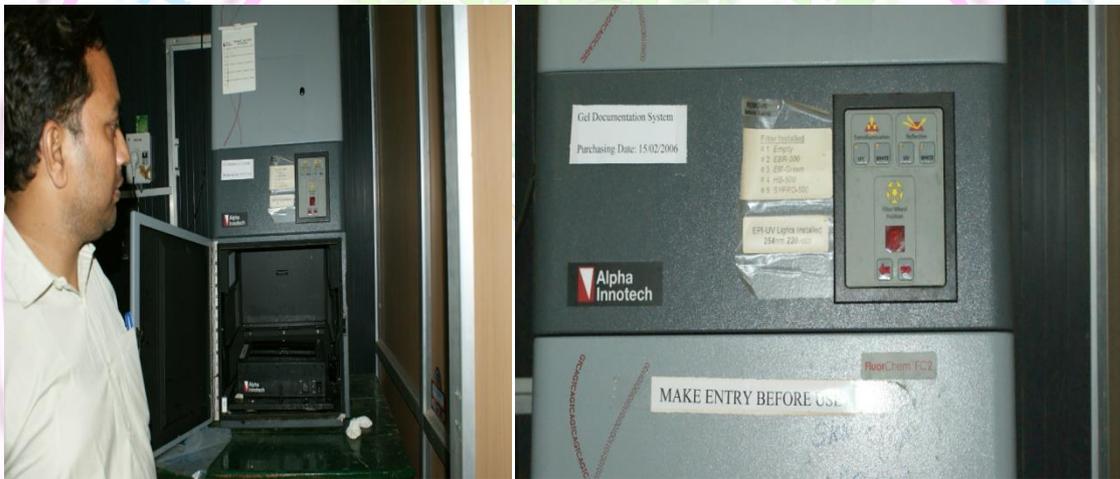


## **BIOTECHNOLOGY LABORATORY**

**Biotechnological instruments which they use for improving crops and plant's quality.**

### **CENTRIFUGE**

A **centrifuge** is a piece of equipment that puts an object in rotation around a fixed axis (spins it in a circle), applying a potentially strong force perpendicular to the axis of spin (outward). The centrifuge works using the sedimentation principle, where the centripetal acceleration causes denser substances and particles to move outward in the radial direction. At the same time, objects that are less dense are displaced and move to the center. In a laboratory centrifuge that uses sample tubes, the radial acceleration causes denser particles to settle to the bottom of the tube, while low-density substances rise to the top.



**Biotechnology Laboratory**



**Plant Tissue Culture Laboratory**



### Micropropagation of pomegranate

### Micropropagation of banana

The Botanical garden had wide variety of plants. The botanical garden was divided into parts according to the types of plants grown there:

- Trees section
- Herbs and shrubs section
- Climbers
- Plantation crops

There were total 180 different species of plants.





### GREEN HOUSE

Green house was situated inside the botanical garden. Green house was divided into four parts. The green house was well equipped with pad and fan system is used to as a coolant for providing low temperature to the plants. The pomegranates and potato plants which were grown through plant tissue culture were kept inside the green house. The net house had overhead sprinklers which are used to lower the temperature when the temperature rises. The net house had cotton plants which were infected by mealybugs. There were two varieties of mungbean- GM3 and GM4. Tissue cultured pomegranates and banana were also there.

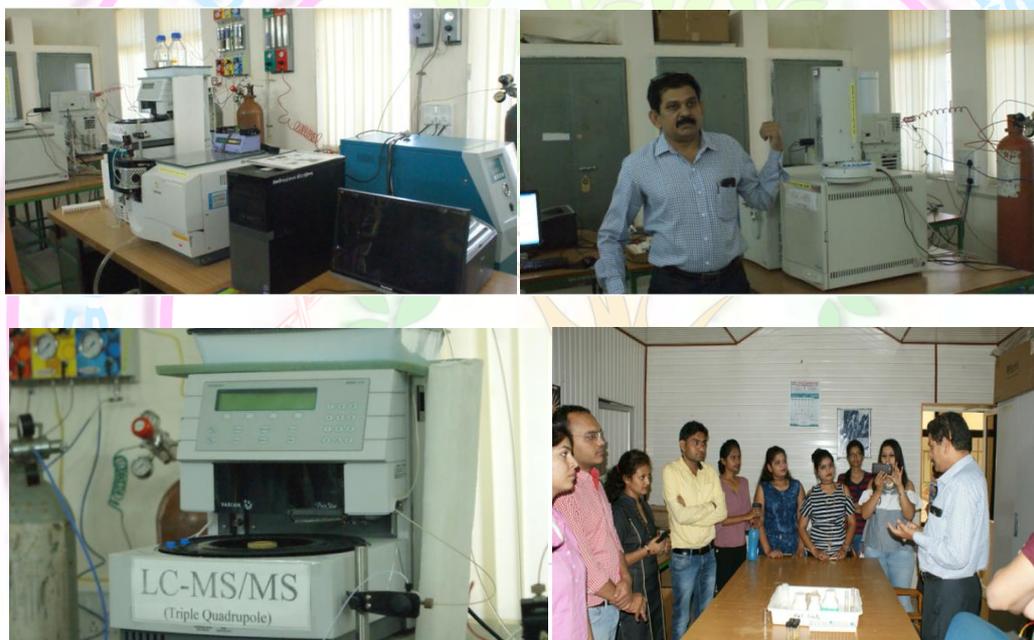
The horticultural garden was extended to a large area. They have grown many ornamental plants there. The garden was also an example of landscape. There was pathway which was surrounded by ornamentals and flowering plants as hedges. There was forest like camouflage of trees of Chiku, jamun, manilkara, mango. Following them, a contour was there. On the contour there was a pathway of lawn, grass and hedges of *Tecomastans*, roses, Christmas plant, which gives them beautiful view. On the top of the contour, there was a gazebo. On the pathway of contour, there was underground sprinkler system for watering.

Then the visit to the Central Instrumentation Laboratory was arranged.



### Central instrumental laboratory

Different instruments at genetics laboratory, which helps in soil testing.



They showed us different instruments used for testing the soil sample. They issue soil health cards to the farmers there. Some instruments shown there were Near infrared reflector spectrometer, Stockstohm oil extraction unit, *pH meter*, *triple quadrupole* etc. Overall it was a fine learning experience.



The staff and M Sc Botany Sem III students of the department went to **Pachmarhi ( M.P.) and Satpura forest range area** for a Botanical Excursion during from 05<sup>th</sup> – 11<sup>th</sup> October, 2017. Botanical excursion is highly essential for studying vegetation and its pattern in natural condition .. It gives knowledge about forest vegetation pattern and distribution of habits in different habitat .Prof. Dr. Bharat Maitreya and Dr. Nainesh R. Modi accompanied the students.



Satpura forest range  
caves

Forest area visit

View from Pandav

Pachmarhi is a hill station in Madhya Pradesh state, situated at a height of 1067 metre and known as SatpurakiRani. The town is not very large and most of its area is under Cantonment Board. It is a popular tourist retreat. Pachmarhi and surrounding forest area have rich and rare flora- fauna. It is a biosphere reserve. There are some beautiful waterfalls which support a rich diversity of cryptogams and phanerogames. Pachmarhi is connected through rail –nearest railway station being Pipariya and road.



Little fall

Duchess Fall

RajatPrapat

Pachmarhi and surrounding satpura forest range area is known for its Natural water falls namely Rajatprapat, Bee fall, Duchess fall, Apsaraviharfalls,down falls and little falls. It is also known for religious places like, Chhotamahadev, Badamahadev, Jatashankar, Chauragadh, Guptmahadev, Dhoot akhilesh, Pandav caves. In addition there are many natural picturesque places like Dhoopgadh, Reechhgadh, green valley, Handikho, Badizeel, lovers point etc.

Botanical study tour was arranged for the study of vegetation in forest area of Pachmarhi and surrounding satpura forest range. The students had a comfortable journey and accommodation. The students visited the various forest area with official permission. The help of local plant identifiers and forest guide was very timely and much needed. All the students spent a lot of time at various waterfalls and forest area studying the lower plants in their natural habitat. Due to Forest department

restrictions the collection of plant material from the forest is banned, so the rich diversity of plants was only studied on the spot and photography was done.

Pachmadhi forest area have rich diversity of Bryophytes, Pteridophytes and Angiosperms. The observed species of bryophytes are: *Targionia*, *Riccardia*, *Notothylus*, *Plagiochasm*, *Fimbriaria*, *Polytricum* etc. in their natural condition nearby waterfalls and water bodies.



Field excursion in forest area

The observed species of pteridophytes : *Psilotumnudum* , *Lycopodium* , *Selaginella sp.* *Isoetespanchanani*, *Ophioglossumnudicaule*, *Botrychiumdaucifolium*, *Angiopterisevecta*, *Osmundaregalis*, *Lygodiumflaxuosum* , *Dicranopterislinearis*, *Cyatheagigantea*, *Alsophilaglabra* , *Nephrolepisacuta* , *Leucosterigapulchera*, *Goniopterisprolifera*, *Dryopteriscochleata*, *Polybotreaappendiculata* , *Actinopterisdichotoma*, *Adiantumcapillus*, *Cheilanthes tenuifolia*, *Pteriserecta*, *Gymnopteriscontaminans* , *Thamnopteris* , *Polypodiumgracilis*, *Tectaria sp. etc.*,



*Psilotumnudum* *Dryopteris sp.* *Drosera sp.*

*Floscopascandens*

There are many plant species of Angiosperms growing in wild and some cultivated. Vegetation found was very diverse in habit. The observed plant species of angiosperms in Tropical dry deciduous forest: *Tectonagrandis*, *Anogeissuslatifolia*, *Terminalia alata*, *Pterocarpus marsupium*, *Shorearobusta*, *Diospyrosmelanoxylon*, *Adina cordifolia*, *Sterculiaurens*, *Buchnanialanzan*, *Flacourtiaindica*, *Saccopetalumtomentosum*, *Chloroxylonswietenia*, *Hardwickiabinata*, *Boswelliaserrata*, *Soymidafebrifuga*, *Mallotusphilippenseis etc.*, *Strobilanthes* , *Aampelocissus*, *Clematis sp.*, *Phragmiteskarka*, *Woodfordiafruiticosa*, *Wrightiatinctoria* , *Abutilon persicum*, *Corchorusaestuens*, *Eulaliopsisbinata*, *Helicteresisora*, *Hibiscus subdariffa*, *Soymidafebrifuga*, *Triumfettarhomboidea*, *Urenalobata* , *Caseariaelliptica*, *Gardenia turgida*, *Xeromphisspinoisa*, *Milletiaextensa* , *Cymbopogon martini*, *Argemonemexicana*, *Caseariagraveolens*, *Celastruspaniculata*, *Putranjivaroxburghii*, *Schleicheraoleosa*, *Semicarpusanacardium*, *Eucalyptus sp.*, *Kydiacalcina*, *Cymbopogonmartini*, *Vetiveriazizynoides* , *Dioscoreabulbifera*, *Cyperus spp.*, *Gymnemasylvestris*, *Eulopiaherbacea*, *Securinegaleucopyrus* , *Thysanolaena maxima*, *Litseaaglutinosa*, *Semicarpusnacardium*, its found that *Lantana camara*, *Partheniumhysterophorus*, *Ageratum conyzoides*, *Elephantopusscaber etc.* have encroached upon many localities of the forest and eradicated other local species. *Eulopiaherbacea* , *Berberisasiatica* , *Droseraindica* , *Droseraburmanii* , *Begonia malabarica* , *Utriculariaexoleta* and *Nervilliaaragoan*

The staff and students from the department visited the **Science Express** on 5th September 2017 at Khodiyar Station. The excitement of this unique visit was palpable and all were interested in this unique way of communication. The displays and the content on board were truly informative and generated a lot of awareness. There were many visitors for the train including school and college students.

In the year 2015, for the eighth phase, Science Express was redesigned on the theme 'Climate Change' and it ran on the Indian Rail Tracks as '**Science Express Climate Action Special (SECAS)**'. Looking at the unprecedented response which SECAS received during its journey, DST in collaboration with MoEFCC and DBT, Govt. of India, decided to run the ninth phase of Science Express once again as on the theme 'Climate Change' as SECAS II. The ninth phase of the **Science Express as SECAS II was scheduled to run from 17 Feb. to 08 Sept. 2017**, over 19000 km during which it was exhibited at 68 stations across India. SECAS focuses on Climate Change and Science & Technology. The exhibition conveyed a message about Climate Change and was also a good opportunity to generate dialogue and discussion. The SECAS II was a unique collaborative initiative of Department of Science & Technology (DST), Ministry of Environment, Forest & Climate Change (MoEFCC), Department of Biotechnology (DBT), Ministry of Railways, Govt. of India; Wildlife Institute of India (WII) and Vikram A Sarabhai Community Science Centre (VASCSC).

The state-of-the-art exhibition on board the SECAS aimed to create awareness among various sections of society as to how climate change can be combated through mitigation and adaptation. Of the 16 coaches of SECAS, exhibition in 8 coaches developed by MoEFCC, is exclusively devoted to information, case studies and material related to various aspects of Climate change, the underlying science, impacts, adaptation activities, mitigation solutions and policy approaches in a manner that is easy to understand and interesting for not just school students but also the masses. In rest of the rake, there are exhibits and activities put up by DBT and DST.

The broad theme covered in each exhibition coach is as follows:

- **Coach 1:** Understanding Climate Change - Insights in the climate as a system, the greenhouse gas effect and the underlying reasons for climate change with key message that the current change in the climate is due to human activities.
- **Coach 2:** Impact of Climate Change - How temperature rise, monsoon variations, sea level rise are predicted to affect vital sectors like water, agriculture, forests and biodiversity, and human health and ways to reduce these.
- **Coach 3 & 4:** Adaptation - Concepts of adaptation and examples from day to day life, adaptation strategies and stories from field. Adaptation options in urban and rural contexts and the adaptation actions India is taking.
- **Coach 5 & 6:** Mitigation - Concept and definition with examples, emphasis on restoring balance, enhancing sinks and reducing emission through Renewable Energy (RE) technologies. Various programmes implemented by India and low carbon strategies and ambitious goal to increase RE footprint.
- **Coach 7:** International Negotiations for Climate Change - Introduction to UNFCCC, IPCC and internationally agreed action & targets. Explaining concept of equity and common but differential responsibility, Kyoto protocol & other key outcomes of major COP, Paris Agreement, etc.

- **Coach 8:** Positive Actions - What can one do at school, on roads, at home and in offices and focus on concept of lifestyle choices with the key message 'Increase your Handprint. Decrease your Footprint'.
- **Coach 9 & 10:** Exhibition put up by the Department of Biotechnology (DBT), Govt of India, covering themes like Biotechnology for bio-resources and nature conservation with emphasis on Tiger Conservation and Chemical Ecology and India's research and development initiatives in field of Biotechnology.
- **Coach 11:** Exhibition put up by the National Innovation Foundation (NIF) showcasing select innovations, demonstrating the ingenuity of common people and an innovative project which uses augmented reality techniques. Also, exhibition on themes like Innovations in S&T, Science Education, Technological solutions for societal development, etc.
- **Coach 12:** A Kids Zone is set up for children from Std. 5 and below to participate in fun-filled activities, games and puzzles in science, mathematics and environment.
- **Coach 13:** The Joy of Science (JOS) Hands-on Lab in this coach is a space where students from Std. 6-10 can perform experiments and activities to understand concepts in environment, science and mathematics in an interesting manner. A training facility is also set up for orientation of teachers here.
- Solar panels have been installed on the rooftop of Science Express coaches 11-13, as a collaborative effort of DST and CEL, for harnessing solar energy. In all the visit was truly memorable and the M Sc Climate Change Impacts Management students gained a lot of information and appreciated this novel initiative of the Government towards the key issue affecting all of us .i.e., Climate Change.

The Gujarat University Botanicals Society (GUBS) for year 2017-2018 were formally inaugurated by our honorable Vice Chancellor Dr. Himanshu Pandya on 21<sup>st</sup> September 2017. The new team GUBS, under the guidance and support of Dr. Bharat Maitreya, staff-in-charge, for the year 2017-18, would coordinate various curricular, co-curricular and extra-curricular activities. Dr. Himanshu Pandya inspired the students with his words of wisdom and the new team GUBS was coronated with the badges by our Vice Chancellor. The inaugural function was accompanied with icebreaking and a formal welcome of the new students in Botany, Bioinformatics, Climate Change Impact Management and Horticulture. The office bearers for 2017-18 are as follows:

<b>PATRON</b>	<b>Dr. Archana Mankad, Head of Department</b>
<b>Staff-in-charge</b>	Dr. Bharat Maitreya
<b>President</b>	Ms. Deepti Sharma, Ph.D
<b>Vice-President</b>	Ms. Sanjukta Rajhans, M.Sc. Sem III, Botany
<b>Secretary</b>	Ms. Pooja Sharma, M.Sc Sem I, Botany
<b>Jt. Secretary</b>	Ms. Nandan Dixit, M.Sc Sem III, Bioinformatics
<b>Jt. Secretary</b>	Ms. Prachi Talasania, M.Sc Sem III, CCIM
<b>Treasurer</b>	Mr. Dhruv Pandya, M.Phil, Botany

Besides these captains from semester I and III of BOT, BIN and CCIM form a team of leaders to coordinate various activities of GUBS.

The GUBS activities was started with the Garba and competition for various categories like Best dress(boys & girls), Best garba(boys & girls), Best pair, Aarti thalli were held on that day. Then other activities like Melody Mind, Pass on with Music, Musical Chair.



Innovative lecture on IPCC and Climate Change by Mr. Shwetal Shah



Garba celebrations



Students with Terrarium



**Beautiful Terrariums**

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**GUBS - AHMEDABAD**