ANKUR

Plant Identification

e-NEWS LETTER

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ANKUR

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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 newsletter 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 endeavor.
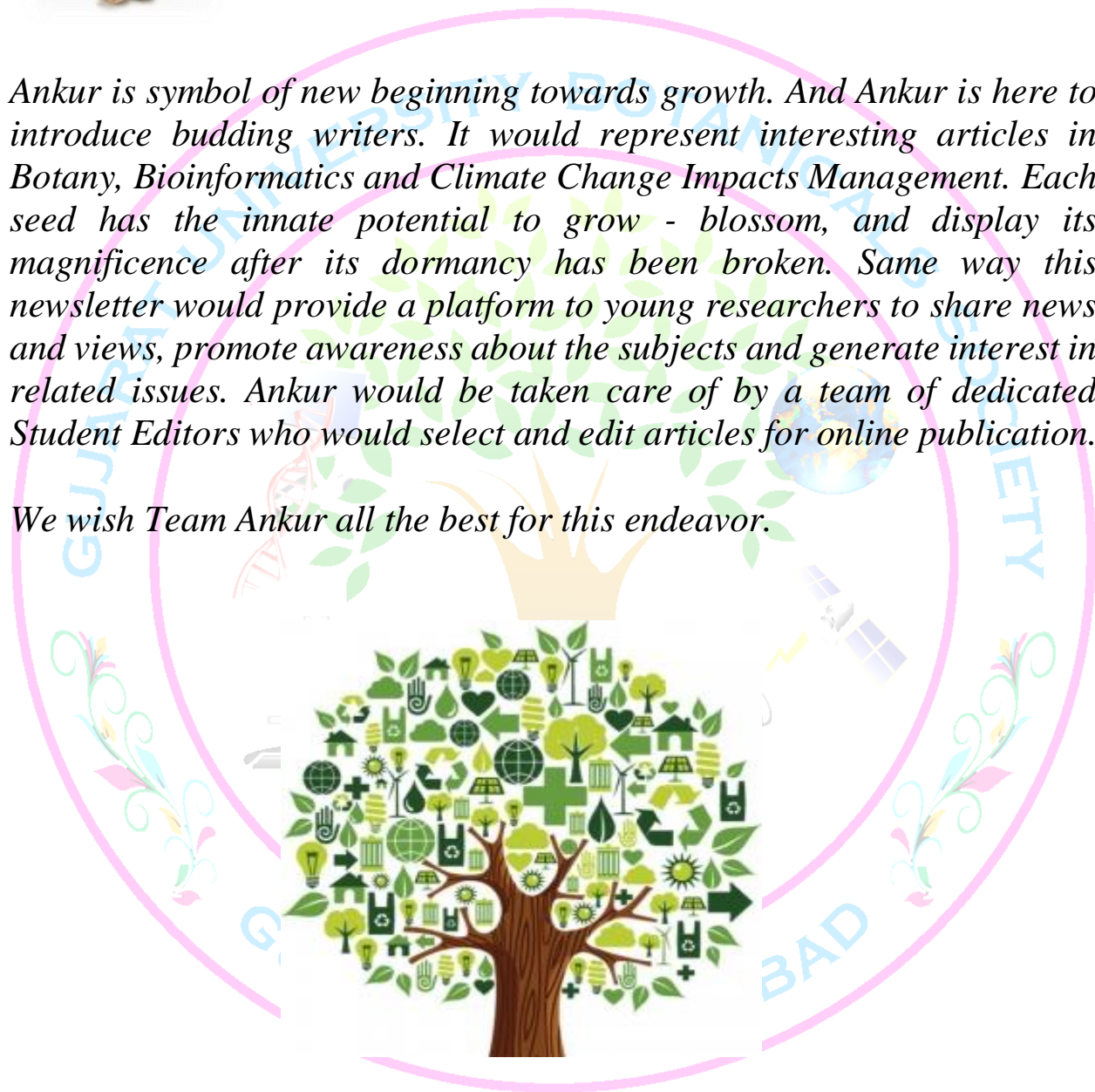
FROM EDITOR'S DESK….

Ankur is now seven years old. This newsletter is intended to be published twice in a year. The growth and development of Ankur reflects the growth and progress of the students of the department. This newsletter will serve to reinforce and allow increased awareness, improved interaction and integration among all of us. *The journey began six years ago and now Ankur has blossomed and is spreading the fragrance to everyone around with the message that plants are significant and valuable. In this issue, we focus on Plant Identification.*

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PATRON'S MESSAGE

Identification of plants results in their nomenclature and further its utilization depends on the realization of their immense potential. Today the pace of development has taken a massive leap with the advent of newer technologies. This has led to issues of correct identification particularly of unknown and wild plants which have not been explored much. Many plants are medicinal and their correct identification is very crucial. Several conventional and novel methods can be used to identify plants.

This issue of Ankur focusses on **Plant Identification** and shares the expanse of knowledge in this area of study.
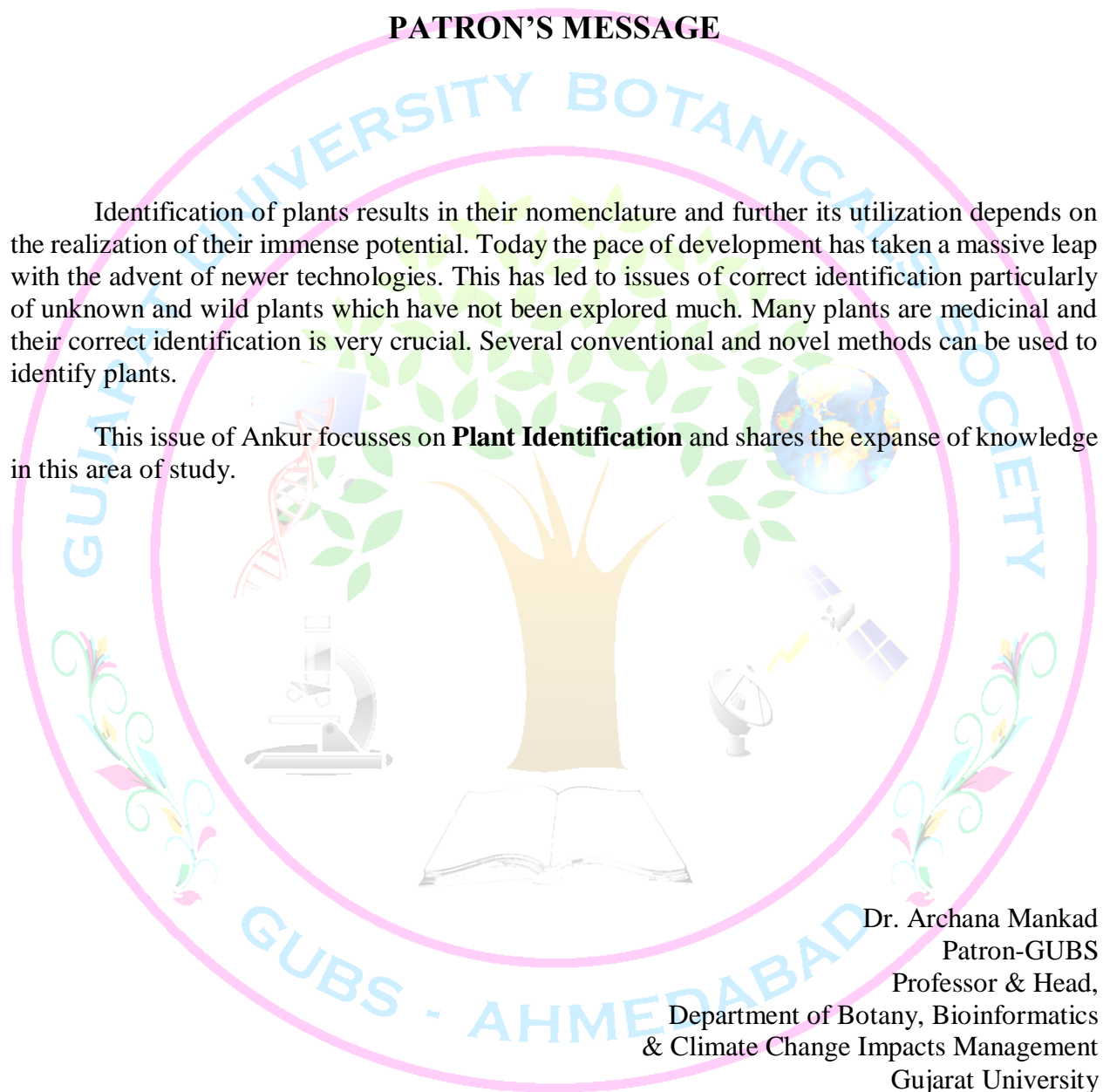
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PLANT IDENTIFICATION APPS

DR. ARCHANA MANKAD

Plant identification involves studying the various features of the plant and finding its taxonomic name from floras. Such Scientific identification is a must while quoting the plant for ease of understanding by the botanists all over the world. Generally, keys used for identification involve technical terms. An amateur plant grower may not be in a position to take advantage of such technical keys. That is the reason for the development of numerous nontechnical keys, databases, or just online applications. Once identified, an unknown plant gets its due care and significance in the garden.

Here is a list of some of the online plant identification apps that can be helpful.

Flower checker- This app uses real botanists to identify unknown plants. This app involves involvement of experts and one plant identification costs 1US D.

NatureGate- helps identify plants, birds, fishes and butterflies using databases. It does not need internet and is free.

Google Goggles-works with user taking photographs and based on that suggesting relevant information

PlantSnapp- helps identify the photograph and provides planting tips

Plantifier-helps identify unknown plants

LikeThat Garden- is an app from Apple and helps identify plants from its photographs

Leafsnap-helps in identifying tree species from the leaves

iPflanzen – requires the user to detail out shape / colour of leaves fruits etc.

Garden answers – instantly identifies over 20,000 plants, gives accurate information and also identifies pests and diseases

Garden Compass Plant/ Disease identifier-helps identify plants and their disease using photographs

PlantNet - is an image sharing and retrieval app and helps in identification from photographs.

Researchers, particularly taxonomists in India have also developed keys like flowersofindia.net to identify local plants just by keying in one or more characters that are visible and can be described using technical terminology. Identification is the first and most important step towards studying plants.

References:

https://theplantguide.net/2017/08/23/best-plant-identification-apps/

IS PLANT IDENTIFICATION REALLY WORTH TAKING EFFORTS?

SWETA PATEL AND DR. HITESH SOLANKI

Plant identification is a process of matching specimen plant to a known plant or taxon using several techniques. Plant identification can be done by different methods like, with the help of morphological characteristics, Plant keys, floras, herbariums, DNA barcoding, and by the computational techniques. Though many methods are developed and also easy to use but, plant identification by means of morphological characters remained as a top rated method. It is also better for beginners who don't have any idea about advanced techniques. Thus one can identify any plant by different means but is it really matters? Is it worth taking efforts? YES, the plant identification can be worth only when one has any goal for it. How he/she is going to utilize it. Importance of plant identification is totally based on anyone's goal. If you are a ecologist, you will identify plants as a community producer. If you are a naturalist, you will identify plants as natural valuable resources. If you are agriculturist, you will identify plants as a source of income etc. Thus, plant identification is the way of knowing that how you can manipulate the plants and use it.

Plant identification is important in many ways. It leads to the utilization of the plant resources around us. We can use it only when we know them. "Know your plants and know how to manipulate them". In agriculture, true identification of plants is essential in plant improvement and plant breeding programme. Agriculturist also use plant identification methods to produce pest-resistant varieties and in weed control. The horticulturist identifies plants to select the appropriate plants for specific locations. Its knowledge also helps in managing and maintaining ornamental and agricultural plants. In herbal product industries, plant identification becomes necessity. For example, everyone knows that Amla is good for hairs but if you fail to identify it that will be of no use. In conservation ecology identification is useful as it will help us to decide what conserve and up to what extent. We can utilize any plant's properties only after its proper identification otherwise it will be hazardous. Thus, with the help of identification one can utilize and manage plant resources.

And, seeing all these benefits of plant identification we can definitely say that 'Plant identification is worth taking efforts'.

References:

1. https://en.wikipedia.org/wiki/Plant_identification
2. https://www.noble.org/news/publications/ag-news-and-views/2001/may/plant-identification-is-it-worth-the-effort/
3. Lillian Teague (2017) Horticulture and plant identification.

# PLANT IDENTIFICATION BY MORPHOLOGICAL CHARACTERS

DR. NAINESH MODI

Plants can be identified by observing certain distinguishing morphological characteristics. Some plants are closely related, which is shown by the similarity of their flower structures. These plants are placed into a specific plant family. An herbaceous example of a family that is based on similarity of flower parts would be Asteraceae, the aster family, of which marigolds and zinnias are members. An example of a woody plant family would be Aceraceae to which maples belong. Within each family there are members that are more closely related than others. This relationship is demonstrated by the similarity of basic morphological traits like leaf shape or arrangement. These plants are placed in a group called a Genus. Maples belong to the genus Acer while marigolds are placed in the genus Tagetes. Members of a plant genus are again subdivided, according to their similar morphological characteristics, into a grouping called a species. For example, each different type of maple belongs to a different species.

The Binomial Plant Classification System, which we have just described, gives each plant a scientific name using the genus and species.

Examples: *Acer saccharinum*: Silver Maple, *Acer platanoides*: Norway Maple, *Tagetes erecta*: African Marigold, *Tagetes patula*: French Marigold.

In order to successfully identify woody plants, it is necessary for an individual to have a keen awareness (working knowledge) of taxonomic terminology and concise mental pictures of leaf, bud, stem, flower and fruit morphology.

References:

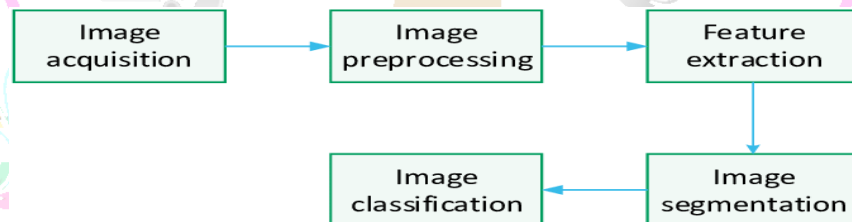https://nature.mdc.mo.gov/discover-nature/field-guide/eastern-redbud
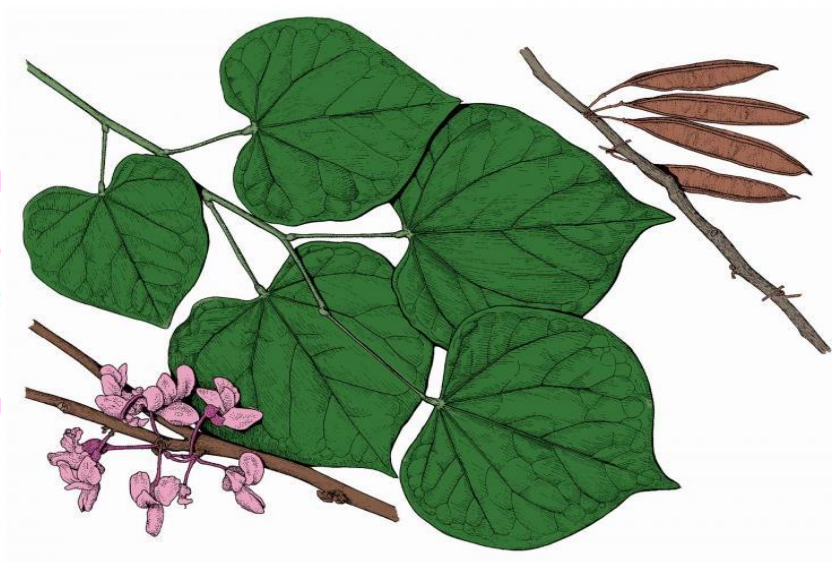
PLANT IDENTIFICATION BY COMPUTER VISION

VIBHA BHINGRADIYA

The identification of plants by conventional keys is complex, time consuming, and due to the use of specific botanical terms frustrating for non-experts. This creates a hard to overcome hurdle for novices interested in acquiring species knowledge. Today, there is an increasing interest in automating the process of species identification. The availability and ubiquity of relevant technologies, such as, digital cameras and mobile devices, the remote access to databases, new techniques in image processing and pattern recognition let the idea of automated species identification become reality.

The plant identification system can be used to identify leaf of medicinal plant and house plant. There are two main features of plant identification by computer,

- ➢ **Feature extraction:** Feature extraction is low level vision that providing information for later higher level analysis. It is an essential step in computer vision, performed either separately or jointly with learning process: pre-processing and feature construction are followed by feature selection. Feature selection is to select the best subset from the input space. Its ultimate goal is to select the optimal features subset that can achieve the highest accuracy results. In the system, there are three features used for plant recognition i.e. morphology, texture, and shape.

- ➢ **Feature Classification:** For the plant spices identification, several classification algorithms are used, for example Probabilistic Neural Network (PNN), Radial Basis Function Neural Network (RBFNN), and Support Vector Machine (SVM). There are different inputs and output devices are present in this feature example for P1\TN consist of four layer namely input layer, pattern layer, summation layer, and decision/output layer. This all features are used for any plant spices classification.
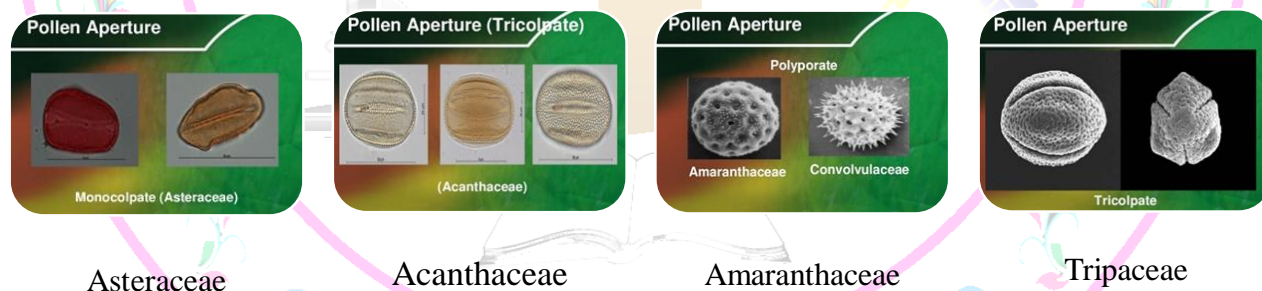
Image acquisition → Image preprocessing → Feature extraction → Image segmentation → Image classification

References:

https://pdfs.semanticscholar.org
https://link.springer.com

PALYNOLOGY FOR PLANT IDENTIFICATION

DHRUV PANDYA

Palynology is the study of pollen. Each and every plant species having different types of pollens. We can also study both the forms of pollen living and fossil forms. It can be used for the plant identification in taxonomy, it is known as palynological taxonomic evidence. Palynology is also useful in Archaeology, Forensic science and allergy studies. This palynological study can be helpful to find and identify different types of ancient plants in Paleopalynological study. There are many pollen characteristics which can be used to identify the plant species on the basis of pollengrain like pollen nucleus no., Pollen storage product, Pollen unit, Pollen polarity, Pollen aperture, Pollen size, Pollen shape, Pollen sculpturing, Pollen wall structure etc. Pollen units can be monad, dyad, tetrad, polyyad, pollinium etc. On the basis of aperturegiven families are classified on the basis of Vashishta classification method. We can also use some another characteristic like odour like *Alstonia* pollen there is special on the basis of that we can identified then plant species. There are so many plants in which only that specific pollen is found like in *Calotropis* pollinia is found same way pollinia is also found in Orchids. Shape can be different of each and every pollen like oval, spherical, ovate, rough, winged like in *Pinus*.

Asteraceae   Acanthaceae   Amaranthaceae   Tripaceae

References:

https://www.researchgate.net/publication/248398702_Identification_Characterization_and_Palynology_of_High-Valued_Medicinal_Plants.

https://www.academia.edu/22369221/Identification_Characterization_and_Palynology_of_High-Valued_Medicinal_Plants

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3691918/

https://www.hindawi.com/journals/tswj/2013/283484/

DNA BARCODING: MOLECULAR TOOL FOR PLANT IDENTIFICATION

MILAN S. VALA

Identification of species based on nucleotide diversity of short DNA segments is called DNA Barcoding. In this process, small DNA fragments of unique nucleotide sequences are used as specific reference collections to identify specimens. The most important thing of DNA barcoding is the generate online libraries of barcode sequences for all known species which act as standard to which DNA barcodes of any identified or unidentified specimens can be matched. DNA barcoding is useful as a accurately species identification for conserve and utilize plants. These identification tool means DNA barcoding is dependent on the creation of high quality reference databases of sequences. In the DNA barcoding, obtained genetic sequences which are used for create phylogenetic trees which are also important in phylogenetic community ecology.

For the species identification across the tree of life DNA barcoding is useful. For the taxonomy users, DNA barcoding play role for identify regulated species, invasive species and endangered species and test the identify and also purify of botanical products includes commercial herbal medicines and dietary supplements. Some steps or workflow are included in plant DNA barcoding selected plant tissue samples, preparation of herbarium, DNA extraction, sequencing, data editing and generate DNA barcode, create barcode library for the taxonomic identification, species discovery and ecological applications.

Main 2 steps are important for DNA barcoding for the plant identification:

1) Create the DNA library of DNA barcoding for known species
2) Match the unknown or unidentified sample DNA barcode sequence towards the DNA barcode library.

DNA barcoding process is very rapid and accurate technique. From the standard region of genome, the short DNA sequence is generated it's called marker. Various types of markers are available its depend on different species such as CO1 cytochrome c oxidase 1 for animals, for plants *rbcL* and *matK* and for fungus Internal Transcribed Spacer (*ITS*). It have many uses in different fields including agriculture, sustaining natural resources, protecting endangered species, water quality preserving natural resources, identification of medicinal plants.

References:

Vijayan, K., & Tsou, C. H. (2010). DNA barcoding in plants: taxonomy in a new perspective. Current Science, 1530-1541.

de Vere, N., Rich, T. C., Trinder, S. A., & Long, C. (2015). DNA barcoding for plants. In Plant Genotyping. Humana Press, New York, NY, 101-118.

Kress, W. J. (2017). Plant DNA barcodes: Applications today and in the future. Journal of systematics and evolution, 55(4), 291-307.

Sarvananda, L. (2018). Short introduction of DNA barcoding, *International Journal of Research*, 5(4), 673-686.

PLANT IDENTIFICATION USING DIFFERENT KEYS

KALPA OZA
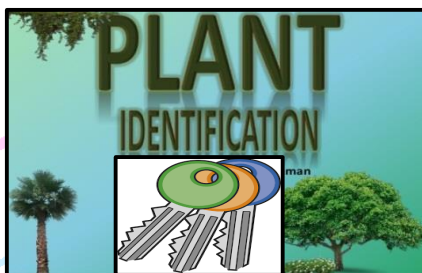
MEANING OF IDENTIFICATION KEY- identification of plants is the process of matching a specimen plant to a known it uses various methods. A key is a tool, which when properly constructed and used, enables a user to identify a plant.

TYPE OF IDENTIFICATION KEYS- Different type of key and various formats are used in plant identification, such as single-access also called dichotomonous or sequential keys and multi-access or polyclaves and interactive keys like; body punched card keys, edge punched card keys and tubular keys.

SINGLE ACCESS KEYS- A Single access keys (Dichotomous key = di- two, chtomy- forked) is a tool for identifying unknown plant to various taxonomic level eg. Species, genus, family, etc. single access key is the most commonly used in plant identification were probably first published by Jean Baptiste Lamarck in 1778. Various styles are available like; linked style, nested styles, graphical style. It is also known as branching key. In this key the sequence and structure of identification steps are fixed by the author of the key. On each and every point in the decision process, multiple alternative is offered, each loading to a result or a further choice.

MULTI ACCESS KEY- A multi access key is identification keys which solve the problem of the more traditional single-access keys of requiring a fixed sequence of identification steps. If the details for a given identification steps in a single-access key is not available, several potential leads must be followed and identification becomes increasingly difficult. This problem is solved with multi-access keys which allow free choice of identification steps.

References:

1. Types of identification keys, From Key to Nature Handbook
2. Zafar Shahdad Khan, Module on IDENTIFICATION KEYS, Consortium for Educational Communication.
3. http://www.biologydiscussion.com
4. https://encrypted-tbn0.gstatic.com/images?q=tbn:ANd9GcSdlSlEMfZXOFc6umF_kKlWXkUCxj3g_QJpGbccgI7sopwMvtARvA&s
5. https://image.slidesharecdn.com/maya-plantid-180224083735/95/100-plus-plants-identification-in-malaysia-1-638.jpg?cb=1519461619

ROLE OF FLORAS IN PLANT IDENTIFICATION

SWATI JAYSWAL
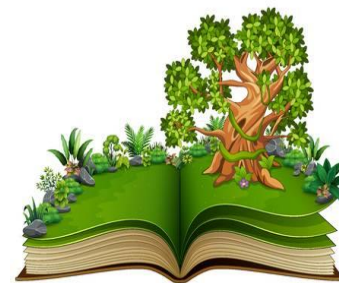
Flora is a kind of literature which includes systemic account of plants of a particular geographical region and helps in plant identification by providing keys and descriptions. It also serves other data like vernacular name or local name, botanical name, distribution and description of a particular plant. It is the most important tool for identification of species. It contains list of plants of the particular region or area. Flora plays an important role as important document for university teachers, students of botany and agriculture. It is also used for biodiversity assessment and management, forest management, ecosystem and land management. Flora plays a vital role in the development of botanical garden and park. Now-a-days pharmaceutical and Ayurvedic companies and seed companies use medicinal or drug plants. So, flora may be helpful for them too. It also helps in planning a city, village or town. In recent years we can observe the loss of biodiversity at certain level. So, it works as important tool for assessment of rare and endangered species and vegetation study etc. It also helps in evaluation of phytogeographical pattern.

Now-a-days an e-flora is used for plant identification. It is an online resource which provides descriptions, identification keys and distribution etc. of particular plant. In compare to flora, e-flora is easily accessible because it is not in the form of hard copy. So, we don't have to carry it with us all the time.

References:

https://us.123rf.com/450wm/dualororua/dualororua1808/dualororua180800156/106881065-stock-vector-open-book-with-animals-cartoon-on-the-trees.jpg?ver=6 (Retrieved on 7th Nov, 2019)

http://www.biologydiscussion.com/animals-2/taxonomy/flora-meaning-utility-and-monograph-systematic-botany/34715

https://msu.edu/course/bot/418/monographs.html

HERBARIUM AND ITS USES FOR PLANT IDENTIFICATION

NANCY R. KUMBHANI

A number of taxonomical aids have been developed for identification, naming and classification of various specimens. Many procedures and techniques have also been established to store and preserve the information of specimens for future study. Herbarium is store house of plant specimens collected from different localities. These specimens are preserved on appropriate sheets in a specific manner which includes collection, pressing, drying, poisoning, mounting, labeling and arrangement according to some accepted method of classification that facilitates examination of all of the material of a particular taxon. The identified plant ideally includes all parts including roots, flowers and fruits, strobili, etc. one of the largest herbaria in the world is kept at the Royal Botanical Garden Kew England and has collected an estimated 7 Million specimens.

The aim of an herbarium is to accumulate all possible information in one place about the habits, habitats, variations and uses of all the plant, where its grew, when it was collected and by whom. Herbarium is an important source of data which is used by researchers in many plant-related sciences and is most often used for taxonomic research. This includes identification (how they are recognized), nomenclature (the naming of specimens to avoid the problem of ambiguity), classification (grouping of plants with similar properties), distribution (where it grows), ecology (the kind of habitat), and use (useful properties). They are funded by national or local governments, universities, private institutions, research organizations, scientific societies, or individuals, and differ vastly in size and main function. Making an herbarium is the only economical way in which examples of many different kinds of plants, growing naturally in many different places, differing in their environmental requirements, and going through their life cycles at different rates, can be brought together at one time and in one place so that a student can compare simultaneously many different plants at any given stage of their life cycle. There are many different type of herbaria according to what kind of specimens store within the house which includes the International(Specimens from all over the world), national(Specimens from specific country), local(Specimen from small area of specific region),regional(specimens from specific region of that country), teaching or academic(Specimens which deposited by students), private(specimen kept by individual such as farm or private nature reserve), research(Voucher Specimens like medicinal plants, or from some specific family or water plant or bryophytes).So, Herbarium provides necessary information for identifying and verifying newly collected plant specimens, research facilities to the students for scientific research, complete idea of vegetation and the place of origin of plants and ecological data and plant uses also may be obtained from it.

References:

Victor, j., Koekemoer, M., Fish, L., Smithies, S. and Mossmer, M., 2004. Herbarium essentials. The Southern African herbarium user manual.

DeWolf, G.P., 1968. Notes on making an herbarium. *Arnoldia*, *28*(8/9), pp.69-111.

DIGITAL MORPHOMETRIC- A NEW APPROACH FOR THE IDENTIFICATION OF PLANTS

SANJUKTA RAJHANS

In this technological era, there has been development and application of numerous novel methods in every field of science. This has made works trouble-free. Plants being one of the vital parts of life on the earth have attracted relevant technologies towards them. The identification of plants is the most significant part of plant study. The traditional methods for identification are still practiced and will continue. But, the development of digital cameras and portable computers have made the identification process fast and simple. Morphometrics is the study of shape. Digital morphometrics is an influential device for assessing shapes of various plant parts.

Most specifically leaves are studied as they are present on plants almost throughout the year. Other parts such as flowers and fruits are available only for a specific time in a year. There are 3 main aspects of the leaf analysis [1] 2-Dimensional outline shape of the leaf, [2] The structure of the vein networks and [3] The characters of the leaf margin. There are several approaches for the analysis of the leaf shape such as.

1) Fourier Analysis- using (EFD's) Elliptic Fourier Descriptors, which analyzes the leaf shape using a spatial domain.
2) Shape Features- analyze the outline of a shape.
3) Contour Signatures- is a categorization of values calculated at points taken around a leaf's outline.
4) Fractional Dimensions- real numbers used to represent how completely a shape fills the dimensional space to which it belongs [2].

With a combination of neural network approach, fluorescent light bank, artificial and manually obtained vein images, the structure of vein networks or venation patterns are studied. The characters of leaf margin are studied using the combination of all the methods that are listed above. Other approaches that are used in digital morphometrics are- 3D imaging, digital microscope imaging, modeling using algorithms, etc. [1].

References:

J. S. Cope, D. Corney, J. Y. Clark, P. Remagnino, P. Wilkin, Plant Species Identification Using Digital Morphometrics: A Review. Expert Systems with Applications (2012) 39: 7562-7573.

A. R. Backes and O. M. Bruno, Plant Leaf Identification Using Multi-Scale Fractional Dimension. International Conference on Image Analysis and Processing *Berlin/ Heidelberg Springer* (2009) 143-150.

TECHNOLOGY AIDED PLANT IDENTIFICATION – Fast and Furious

MADHAVI SINGH

Plants plays an important role in human life since ages, human uses plants almost in every field which results in constantly pressure on environment. It has been steadily increased throughout the last few decades. Some specific part of world is particularly rich in biodiversity and civil society which is slowly migrating towards greener life demands an appropriate biological knowledge for quality of life. Not only for human but some plant species are also important for protecting biodiversity. Unfortunately, plants recognition/identification skills of people are still limited. Identifying plants by conventional methods is complex, time consuming and required specific botanical terms which may be frustrating for common people or non – experts. However, this skill can be improved with the aid of information technology. Recently, a number of works have been dedicated to plant information collection, plant information management and plant recognition. However, the developed systems are far from user requirement. Today, there is an increasing interest in automating the process of species identification. The availability and ubiquity of relevant technologies, such as, digital cameras and mobile devices, the remote access to databases, new techniques in image processing and pattern recognition let the idea of automated species identification become reality.

There are different apps and devices for plant identification, these apps and devices helps to identify the plant species by flower, leaf and makes a non – expert an expert. Some of the best plant identification apps are listed below:

1. Plant Net
2. Naturalist
3. Plant snap
4. Picture This
5. Flower Checker
6. Garden Compass

References:

1. https://youhadmeatgardening.com/best-plant-identification-app/
2. https://www.semanticscholar.org/paper/Plant-Species-Identification-Using-Computer-Vision-W%C3%A4ldchen-M%C3%A4der/b323aa63247c6a1f3076bee55e49188a09d6c6ab
3. https://www.semanticscholar.org/paper/Plant-Identification-Methodologies-usingMachine-SkandaH-Karanth/a4bc50f8887485f307846c88189b60bd5685fac3
4. Image source- [https://encryptedtbn0.gstatic.com/images?q=tbn%3AANd9GcTrvHkwj1j5Abv7rvG7w8pjaGWEbmYXADOFwNFBbVwglikJFpYc retrieved on 5th DEC 2019]

LESSONS FROM NATURE

DR ARCHANA MANKAD

Remember the smell of earth after the first rain? As a child we were perplexed by it and wanted to share our excitement but what do we call that smell?

It's called **Petrichor**, from the greek *petra* (stone) and *ichor* (the blood of greek gods and goddesses). The term was coined by two Australian researchers in 1964.

Everything every phenomenon every living being has a name. A name is its identity. A name defines its importance. Some names are suggestive of the character like *echinatus* is spiny in nature and *Aster* is star-like, or place of origin like *indica* from India. A unique name is always in demand. Names of personalities, places, seasons, each and everything has a meaning has a significance. Our names are our pride. They depict our lineage.

GUJARAT UNIVERSITY, a name that rings in our hearts emotions of respect and gratitude completes 70 glorious years this year. A name that stands tall among all other names, is our alma mater and we are proud of our University.
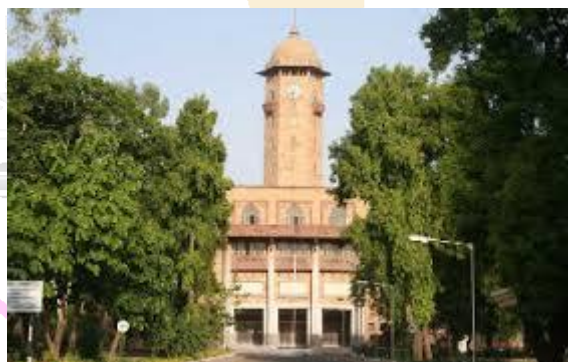

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GLIMPSES OF ACTIVITIES OF GUJARAT UNIVERSITY BOTANICAL SOCIETY

Department of Botany, Bioinformatics & Climate Change Impacts Management

The Inauguration of Gujarat University Botanical Society was held on Friday, 5th July 2019. It marks the beginning of the activities of GUBS. Honourable Vice Chancellor, Gujarat University, Prof. Himanshu Pandya was busy but conveyed his blessings for the GUBS events for the year 2019-20. All faculty members were present along with many invited guests. The programme started with a recap of last year's events in the form of a video show. Dr. Hitesh Solanki as Professor- In- Charge welcomed all and gave a quick overview of GUBS activities. Archana Ma'am coronated the Office Bearers with badges. The incoming new students were also welcomed. The programme ended with Vote of Thanks by Secretary GUBS, Ms. Aanal Maitreya. The Master of Ceremonies was Ms. Kavya Tanna from Climate Change Impacts Management. Everyone enjoyed piping hot Pizza, Chips and soft drinks. The informal introduction followed with creative games and ice breaking session planned for the freshers by the seniors.

The Gujarat University Botanical Society (GUBS) organized a Seminar on **HEALING HERBS-2019** in association with Gujarat Medicinal Plant Board (GMPB), Government of Gujarat on Friday 12th July 2019 at The Department of Botany, Bioinformatics & Climate Change Impacts Management.

The Inaugural Programme began with the University song. Dr. Jagdish Bhavsar, Honourable Pro Vice Chancellor Gujarat University presided over the function. Dr. Archana Mankad welcomed

the guests and the participants. Dr. Jagdish Prasad, Chief Excecutive Officer, GMPB was the Guest of Honour. The Guests were welcomed by Prof. Hitesh Solanki, Professor-in-charge, GUBS. Dr. Jagdish Prasad gave a very focused appraisal of the mandate and activities of GMPB. He invited researches to be part of GMPB research team by focusing on the challenges to popularize the use of medicinal plants. Dr. Jagdish Bhavsar motivated the participants and emphasized on the need to grow more trees to make Gujarat University a Green Campus. Dr. Hitesh Solanki proposed the formal vote of thanks.

The students of the department had compiled posters, paintings and quotations in the form of a very creative exhibition on the theme **SWADESHI** to celebrate **150 years of Mahatma** which was appreciated by all.

The day began with a quick registration and piping hot methi gota with usual accompaniments and Tea-Coffee as breakfast. The Venue was abuzz with enthusiastic UG participants from colleges and M Sc students from Botany, Horticulture Science, Climate Change as well as research scholars. Invited Guests included officers from GMPB, colleagues from colleges, scientist from Indian Plasma Research Center and members of board of studies- botany board. Prof. Minoo Parabia gave an exhaustive presentation highlighting the need and demand of quality plant raw materials being used by pharmacies. Shri S. N. Tyagi explained the challenges and opportunities of the supply of medicinal plants. The lectures gave an opportunity to young researches to identify priority areas for research and innovation. Dr. A. P. Singh also delivered a talk emphasizing the need to study medicinal plants. All participants enjoyed piping hot lunch. The afternoon session witnessed enthusiastic poster presentation by UG-PG students and research scholars in the two themes of the seminar. The best received Young Scientist Award during Valedictory Function.

The students of the department also made creative posters on the theme 150 years of Mahatma. It was appreciated by all.

The Gujarat University Botanical Society (GUBS) organized a Seminar on **CONSERVING BIODIVERSITY-** on Thursday 18th July 2019 at the Department of Botany, Bioinformatics & Climate Change Impacts Management. Dr. Qaid Johar, Associate Professor, Department of Zoology and Dr. Bhaskar Punjani, Principal, Science College, Talod were invited as Distinguished Speakers for the seminar. The students from Department of zoology also actively participated in the event.

GUBS organized **CAPACITY BUILDING in Green Startup, CAPACITY BUILDING in Entrepreneurship and CAPACITY BUILDING in Climate communication** for the members. All three programs were planned parallel during 12-13th August 2019. A brief Inaugural session was organized to welcome the distinguished resource persons formally. The participants got a hands on experience to learn the selected programme. All registered participants received certificate of participation.

The students of Horticulture Science and garden Management alongwith Dr. Pratiksha Patel, Swati Jaiswal and Milan Vala visited **Madhuvan nursery** located near Chiloda. A Nursery is more

like a botanical garden that boasts of being home to a number of varieties of fruit bearing trees, ornamental plants and trees some other different species of plants. It provides for hands on experience of identifying and appreciating the concerns of growing plants. The   nursey was well maintained and had lush green plants, abundant flora, and was a delight for all.

The students of Horticulture Science and garden Management alongwith   Dr. Pratiksha Patel, Swati Jaiswal and Milan Vala visited the **Hydroponics unit** by Ms. Nikita Vadsaria at Odhav. The visit was infact a hands on learning where the students experienced growing and handling lettuce and many other exotic vegetables through Hydroponics. The Ebb and Flow system & Deep water flow system in Hydroponics was demonstrated.

The students of Horticulture Science and garden Management alongwith   Dr. Pratiksha Patel, Swati Jaiswal and Milan Vala visited **Bal-Taru Nursery** & Van-chetna Kendra. Bal Taru nursery is 3 Km from Chiloda, Near Gandhinagar on NH 8. It is owned by Lemino Agro India Pvt ltd.

Company. Here they Imported 4 seed less lemon plant from Israel which were multiplied   by Grafting and Tissue culture. The advantage of these plants is that they take only one year for production after planting.

The students of Horticulture Science and garden Management alongwith   Dr. Pratiksha Patel, Swati Jaiswaland Milan Vala visited   **Van-chetna kendra,** Sector-30 Gandhinagar. It has a large nursery mainly of trees to be grown in urban forestry.

The students of **Climate Change Impacts Management** visited   Department of Earth Science, Geography and Geoinformatics at Gujarat University. Dr. Dhara Rajput and Dr. Nirmal Desai accompanied students and the visit was coordinated by   Dr. Shital Shukla, Head- Department of Earth Science, Geography and Geoinformatics at Gujarat University. A very informative lecture was delivered by Mr. Ajoy Das, where in students learnt cartography and ways to interpret maps.

The students of **Climate Change Impacts Management** participated in the Conference on Climate Change at Ahmedabad Management Association, Ahmedabad.

The students of **Climate Change Impacts Management** visited **Gujarat Environment Management Institute (GEMI).** Gujarat Environment Management Institute (GEMI) is an Autonomous Institute set up under the aegis of Forest and Department, Government of Gujarat vide Government Resolution on 1st February, 1999. The visit was coordinated by Dr. Nitasha Khatri. The students got a chance to observe high end and advanced Lab equipment used for environmental monitoring.

The students of **Climate Change Impacts Management** visited the sophisticated labs at **Gujarat Pollution Control Board (GPCB)** Gandhinagar. Dr. Dhara Rajput and Dr. Nirmal Desai accompanied the students and the visit was coordinated by Mr. Bharat Prajapati at GPCB. Gujarat Pollution Control Board focusses on the Pollution Control and the protection of the environmental quality, bring about all round improvement in the quality of the environment in the State by effective implementation of the laws and control of pollution at source to the maximum extent possible with due regard to technological achievement and economic viability as well as sensitivity of the receiving environment. This function is being fulfilled through laying down the disposal standards as well as gaseous emission standards, Identifications of sites and development of

procedures and methods for the disposal of hazardous wastes. GPCB has several ongoing projects and the students got a bird's eye view of the same as well as and lab instruments in detail.

The students of **Climate Change Impacts Management** with Dr. Dhara Rajput visited the **Meteorological Centre** of Ahmedabad. Here the students were introduced to all weather station instruments, weather predictions and weather forecasting by Scientists, Shri. K. C. Kancha and field staff.

ISRO celebrated the Birth Centenary of Dr. Vikram Sarabhai in the form of a one day seminar at Convention Center, Gujarat University. The students of **Climate Change Impacts Management** with Dr. Dhara Rajput actively participated in the same.

The students of **Climate Change Impacts Management** with Dr. Dhara Rajput visited   **Brook and Bloom, Victoria Garden, Ellis Bridge, Ahmedabad**. Students were addressed by Mr. Yash Bhatt about the products which are completely made from solid waste.

The members of GUBS celebrated Garba with the usual fervour and zeal.

GUBS organized a workshop on Food and Nutrition. The VLCC team conducted the session and explained the need to take care of nutrition of all.