جامعة الملك سعود
King Saud University

Practical Note Book

BOT 222
Principles of Flowering Plants Taxonomy

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Lab Activity No 01
Title of the Activity- **Difference in Leaf Venation: Dicot vs Monocot**

Learning Objectives

- To differentiate between dicot and monocot leaves based on their venation patterns.
- To understand the structure and arrangement of veins in leaves.
- To identify key features of venation in monocot and dicot leaves.

Aim

To study and differentiate between monocot and dicot leaves based on their venation.

Apparatus

- Fresh monocot and dicot leaves (e.g., maize leaf for monocot, peepal leaf for dicot)
- Magnifying glass
- Needle
- Glass slide
- Forceps
- Petri dish
- Water
- Blotting paper

Theory

Venation refers to the arrangement of veins in the leaf blade. Based on the type of venation:

1. **Monocot Leaves**: They exhibit parallel venation, where veins run parallel to each other.
2. **Dicot Leaves**: They exhibit reticulate venation, where veins form a net-like pattern. This characteristic is a distinguishing feature between monocots and dicots.

Diagram

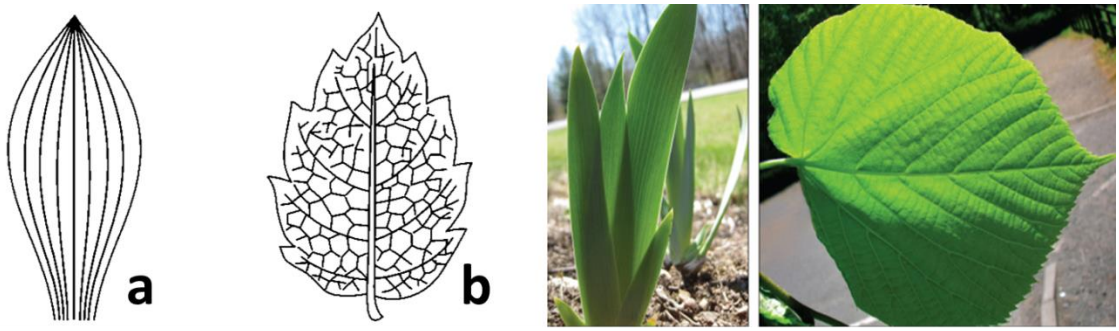


Figure 1. a. Parallel venation (Monocot), b. Reticulate venation (Dicot)

Procedure

1. Take a fresh monocot leaf (e.g., maize) and a dicot leaf (e.g., peepal).
2. Observe the leaves under a magnifying glass to study the venation pattern.
3. Note the arrangement of veins:
    - Check if the veins are running parallel (monocot).
    - Check if the veins form a network (dicot).
4. Record your observations in a table.

Observations Table

Parameter	**Monocot Leaf**	**Dicot Leaf**
Venation Pattern	Parallel venation	Reticulate venation
Example Leaf	Maize leaf	Peepal leaf
Thickness of Veins	Uniform	Uneven (thicker veins)

Result

- The venation pattern in monocot leaves is parallel.
- The venation pattern in dicot leaves is reticulate.

Conclusion

Monocot leaves can be distinguished from dicot leaves based on their venation patterns. Monocots exhibit parallel venation, while dicots exhibit reticulate venation.

Precautions

1. Use fresh leaves for clear observations.
2. Handle the magnifying glass and needle carefully to avoid damage to leaves or injury.
3. Ensure proper lighting for better visualization.
4. Avoid overlapping of leaves while observing under the magnifying glass.

Lab Activity No 02
Title of the Activity- **Vegetative and Reproductive Parts of Plants**

Learning Objectives

- To identify the vegetative and reproductive parts of plants.
- To understand the role of each part in plant growth and reproduction.
- To differentiate between vegetative (root, stem, leaves) and reproductive (flower, fruit, seeds) parts of plants.

Aim

To study and differentiate the vegetative and reproductive parts of a plant.

Apparatus

- Fresh plant specimen with flowers and fruits (e.g., hibiscus, mustard, or tomato plant).
- Scalpel or blade
- Magnifying glass
- Petri dish
- Needle
- Forceps
- Glass slides

Theory

Plants are composed of:

1. **Vegetative Parts**: Non-reproductive parts that help in the growth and survival of the plant, including:
    - Roots: Anchor the plant and absorb water/nutrients.
    - Stem: Supports the plant and transports nutrients.
    - Leaves: Conduct photosynthesis.
2. **Reproductive Parts**: Responsible for reproduction and include:
    - Flowers: Contain reproductive organs.
    - Fruits: Develop from fertilized ovary and enclose seeds.
    - Seeds: Germinate to form a new plant.

Diagram

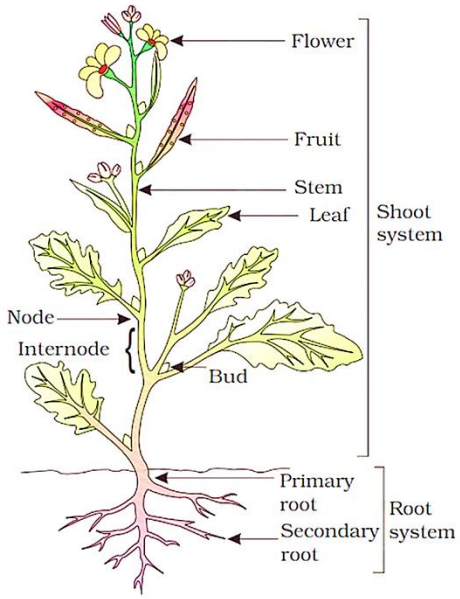


Figure 2. Vegetative parts of a plant

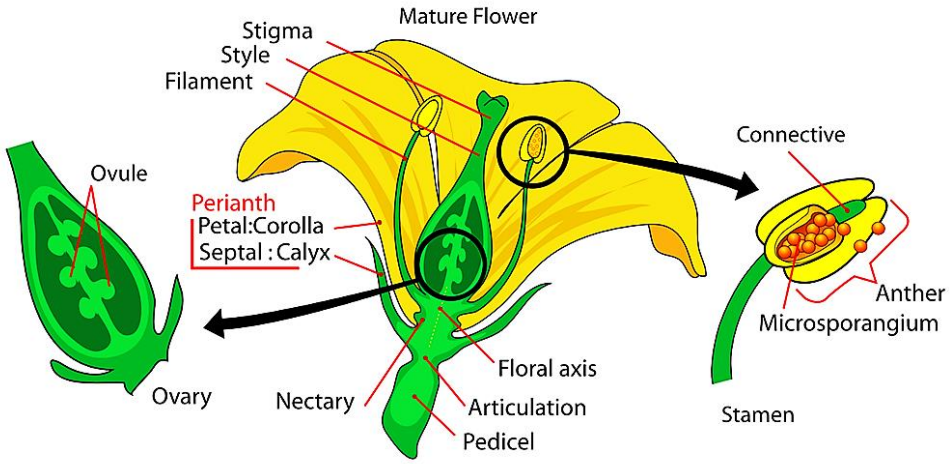


Figure 3. Reproductive parts of a flower

Procedure

1. Take a fresh plant specimen with visible flowers and fruits.
2. Observe and identify the vegetative parts: roots, stem, and leaves.
3. Observe and identify the reproductive parts: flowers, fruits, and seeds.
4. Carefully dissect the flower using a scalpel to study its reproductive organs (stamen and pistil).
5. Record observations in a tabular format.

Observations Table

Plant Part	Vegetative/ Reproductive	Function	Observation
Roots	Vegetative	Absorbs water and nutrients	Present/Absent
Stem	Vegetative	Supports plant and transports	Present/Absent
Leaves	Vegetative	Photosynthesis	Present/Absent
Flowers	Reproductive	Contains reproductive organs	Present/Absent
Fruits	Reproductive	Protects seeds	Present/Absent

Seeds	Reproductive	Germination to form new plants	Present/Absent

Result

- Vegetative parts of the plant include roots, stems, and leaves.
- Reproductive parts of the plant include flowers, fruits, and seeds.

Conclusion

Plants have both vegetative and reproductive parts. Vegetative parts support growth, while reproductive parts enable reproduction.

Precautions

1. Handle the scalpel and forceps carefully to avoid injury.
2. Use fresh specimens for clear observations.
3. Dissect the flower gently to avoid damaging its reproductive organs.
4. Ensure proper lighting for clear visualization of plant parts.

Lab Activity No 03
Title of the Activity- **Leaves and its modifications**

Learning Objectives

- To study the structure of leaves and identify their types and modifications.
- To understand the various modifications of leaves and their functions.
- To correlate leaf modifications with their adaptive significance in plants.

Aim

To study leaves their structure, types, and modifications.

Apparatus

- Fresh leaves of different plants (e.g., peepal, cactus, pea, onion, etc.)
- Magnifying glass
- Scalpel or blade
- Needle
- Glass slides
- Petri dish
- Forceps

Theory

Leaves are the primary photosynthetic organs of plants. They exhibit variations and modifications to perform specific functions.

Parts of a Leaf:

1. **Lamina**: The flat, green part of the leaf.
2. **Petiole**: The stalk attaching the leaf to the stem.
3. **Veins**: Transport water, nutrients, and food.

Types of Modifications:

1. **Storage**: Leaves store food or water (e.g., onion, aloe vera).
2. **Tendrils**: Help in climbing (e.g., pea).
3. **Spines**: Reduce water loss and provide protection (e.g., cactus).
4. **Reproductive**: Leaves produce new plants (e.g., Bryophyllum).
5. **Insectivorous**: Trap insects for nutrients (e.g., pitcher plant, Venus flytrap).

Diagram

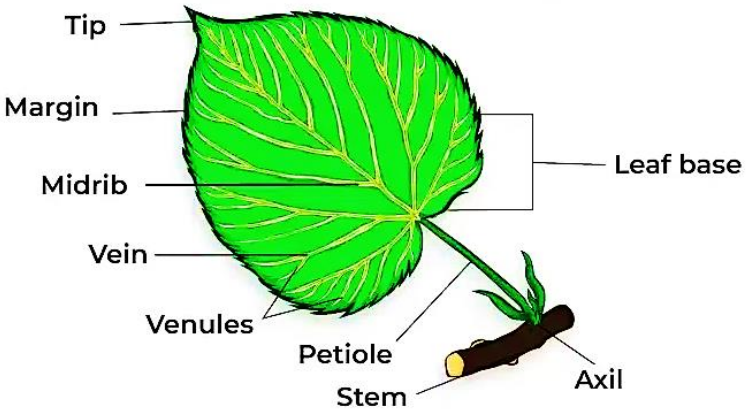


Figure 4. Parts of a Leaf

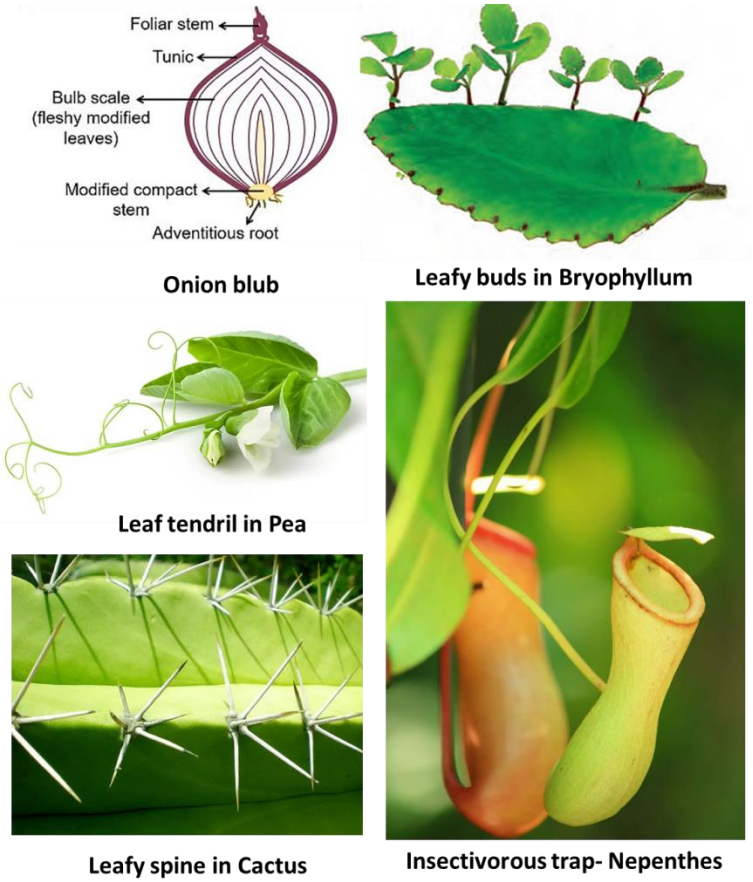


Figure 5. Types of modification in leaves

Procedure

1. Collect leaves from different plants with visible modifications.
2. Observe a typical leaf and identify its parts (lamina, petiole, veins).
3. Examine leaves with modifications:
    - **Storage leaves** (e.g., onion).
    - **Tendrils** (e.g., pea plant).
    - **Spines** (e.g., cactus).
    - **Reproductive leaves** (e.g., Bryophyllum).
    - **Insectivorous leaves** (e.g., pitcher plant).
4. Record observations in a table.

Observations Table

Type of Leaf	Modification	Function	Example
Normal Leaf	No modification	Photosynthesis	Peepal
Storage Leaf	Thick and fleshy	Stores food/water	Onion, Aloe vera
Leaf Tendril	Coiled structure	Helps in climbing	Pea
Spine	Reduced leaf	Reduces water loss, protection	Cactus
Reproductive Leaf	Buds on margins	Reproduces new plants	Bryophyllum
Insectivorous Leaf	Pitcher-shaped/traps	Traps insects for nutrients	Pitcher plant, Venus flytrap

Result

- The structure of a typical leaf consists of lamina, petiole, and veins.
- Leaves exhibit modifications for specialized functions such as storage, climbing, protection, reproduction, and insect trapping.

Conclusion

Leaves are adapted and modified to perform various functions in response to the plant's environment and survival needs.

Precautions

1. Handle the scalpel and other tools carefully to avoid injury.
2. Use fresh and properly identified specimens.
3. Observe the leaves under good lighting for clarity.
4. Avoid damaging delicate structures like tendrils and insectivorous leaves during handling.

Lab Activity No 04
Title of the Activity- **Herbarium method: Plant collecting, Preservation**

Learning Objectives

- To learn the techniques of plant collection and identification.
- To understand the steps involved in the preparation of a herbarium sheet.
- To study the importance of herbarium in taxonomy and plant research.

Aim

To collect, preserve, and prepare a herbarium sheet of a plant specimen.

Apparatus

- Plant press or heavy books
- Blotting paper or newspaper sheets
- Scissors or pruning shears
- Forceps
- Magnifying glass
- Glue or adhesive tape
- Herbarium sheet (standard size: 42 × 29 cm)
- Labels for specimen details
- Field notebook
- Pencil or pen

Theory

A **herbarium** is a collection of preserved plant specimens used for scientific study. Specimens are dried, mounted on sheets, and labeled with essential information such as plant name, collection

location, and date.
Key steps include:

1. **Plant Collection**: Collect healthy and representative samples with flowers, fruits, and leaves.
2. **Preservation**: Properly dry the collected plant material to prevent decay.
3. **Mounting**: Attach the dried specimen to a herbarium sheet for storage and reference.

Procedure

Step 1: Plant Collection

1. Choose a healthy plant specimen with flowers, leaves, and fruits (if possible).
2. Note the plant's location, habitat, and any unique features in a field notebook.
3. Use scissors or pruning shears to cut the specimen, ensuring it fits the herbarium sheet.

Step 2: Plant Pressing

1. Place the specimen between sheets of blotting paper or newspaper.
2. Arrange the plant parts (e.g., leaves, flowers) flat to display key features.
3. Place the sheets in a plant press or under heavy books.

Step 3: Drying

1. Change the blotting paper daily to prevent moisture buildup.
2. Continue drying for 7–10 days or until the specimen is fully dehydrated and crisp.

Step 4: Mounting

1. Take a standard herbarium sheet and arrange the dried specimen on it.
2. Secure the specimen using glue, adhesive tape, or sewing threads.
3. Avoid overlapping of plant parts for better visibility.

Step 5: Labeling

1. Attach a label at the bottom-right corner of the sheet.
2. Include the following details:
    - Botanical name
    - Common name
    - Family
    - Collection date
    - Location
    - Collector's name

Diagram

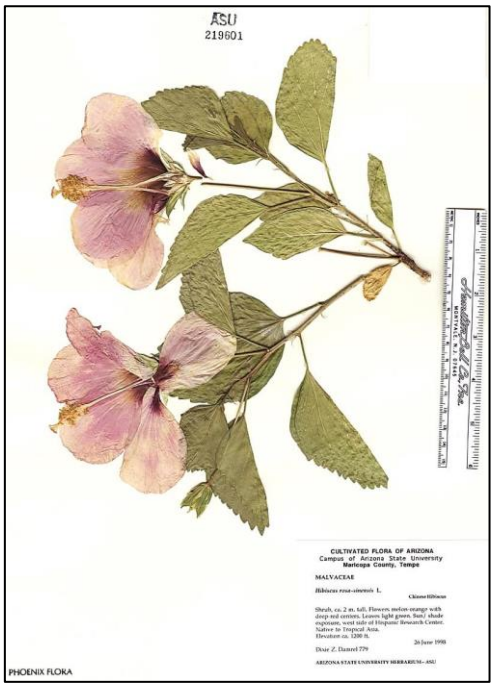


Figure 6. Herbarium sheets with label

Observations Table

Parameter	Details
Plant Name	(e.g., Hibiscus rosa-sinensis)
Common Name	(e.g., China Rose)
Family	(e.g., Malvaceae)
Location	(e.g., Botanical Garden, XYZ City)
Habitat	(e.g., Garden, roadside, forest)
Date of Collection	(e.g., 13th January 2025)
Collector's Name	(e.g., [Your Name])

Result

- The collected plant specimen was successfully dried, preserved, and mounted on a herbarium sheet.
- Essential details about the plant were documented for future reference.

Conclusion

The herbarium method is an effective technique for plant collection and preservation. It aids in plant identification, classification, and research.

Precautions

1. Collect plant specimens responsibly without damaging the environment.
2. Avoid collecting endangered or protected species.
3. Ensure complete drying to prevent fungal growth.
4. Handle delicate plant parts like flowers and leaves with care.
5. Use standardized labels for accurate documentation.

Lab Activity No 05
Title of the Activity- **Herbarium: Herbarium visit**

Learning Objectives

- To understand the concept and purpose of a herbarium.

- To learn how herbarium specimens are cataloged and maintained.
- To observe various plant specimens and their documentation in a professional herbarium.
- To recognize the role of herbarium in taxonomy, research, and conservation.

Aim

To visit a herbarium and study its organization, maintenance, and significance.

Apparatus

- Field notebook
- Pen or pencil
- Camera (if allowed)
- Identification guide (optional)

Theory

A **herbarium** is a scientific facility that preserves plant specimens for study and reference. Herbarium sheets contain dried plant specimens mounted on a sheet, along with detailed labels. Functions of a herbarium include:

1. **Taxonomy**: Provides reference materials for plant classification.
2. **Research**: Supports studies on plant diversity, evolution, and conservation.
3. **Education**: Helps students and researchers learn about plant specimens.

Famous herbariums worldwide include:

- Royal Botanic Gardens, Kew (England)
- National Herbarium of India, Kolkata
- Harvard University Herbaria (USA)

Procedure for Visit

1. **Preparation for the Visit**:
    - Contact the herbarium to schedule a visit.
    - Learn about the herbarium's history and significance before visiting.
2. **During the Visit**:
    - Observe the storage method for herbarium sheets (e.g., cabinets, boxes).
    - Study how the specimens are labeled with details like plant name, family, location, and collector.
    - Explore various collections, such as regional flora, medicinal plants, or rare and endangered species.
    - Interact with herbarium staff to understand cataloging and digitization methods.
3. **Documentation**:
    - Note the key steps in specimen preservation and cataloging.
    - Record examples of unique specimens.
    - Observe any ongoing research or conservation projects.
4. **After the Visit**:
    - Summarize your observations.
    - Discuss the importance of herbariums in plant science.

Observations Table

Aspect Observed	Details
Name of Herbarium	(e.g., National Herbarium of India)
Location	(e.g., Botanical Survey of India, Kolkata)
Number of Specimens	(e.g., 3 million specimens)
Notable Collections	(e.g., Medicinal plants, Endangered species)
Preservation Methods	(e.g., Drying, pressing, mounting)
Cataloging System	(e.g., Alphabetical, digital records)

Result

- The visit provided insights into the organization and functioning of a herbarium.
- Observed how plant specimens are preserved, labeled, and used for scientific research.

Conclusion

Herbaria play a vital role in documenting plant diversity and supporting research in botany and conservation. Visiting a herbarium offers a valuable learning experience for understanding taxonomy and plant preservation.

Precautions

1. Follow herbarium rules and guidelines during the visit.
2. Handle specimens carefully if allowed.
3. Avoid causing damage to preserved specimens or equipment.
4. Take notes and photographs only where permitted.

Lab Activity No 06
Title of the Activity- **Local Flora**

Learning Objectives

- To study and document the plant species found in the local area.
- To identify the characteristics and uses of local flora.
- To understand the ecological significance of local plant species.

Aim

To identify and study the local flora, their classification, and ecological roles.

Apparatus

- Field notebook
- Pen or pencil
- Plant identification guide or app
- Magnifying glass
- Camera (optional, for photographing specimens)

Theory

Local Flora refers to the naturally occurring plant species in a specific geographical area. Understanding local flora is essential for:

1. **Ecological Balance**: Plants contribute to the ecosystem by producing oxygen, supporting wildlife, and maintaining soil health.
2. **Cultural and Medicinal Uses**: Many local plants have traditional and medicinal significance.
3. **Conservation**: Identifying and protecting local flora helps conserve biodiversity.

Plant species can be classified into the following groups:

1. **Herbs**: Small, non-woody plants (e.g., Tulsi, Mint).
2. **Shrubs**: Medium-sized, woody plants (e.g., Hibiscus).
3. **Trees**: Large, woody plants (e.g., Neem, Banyan).
4. **Climbers and Creepers**: Plants that climb or spread across the ground (e.g., Money plant, Pumpkin).

Diagram

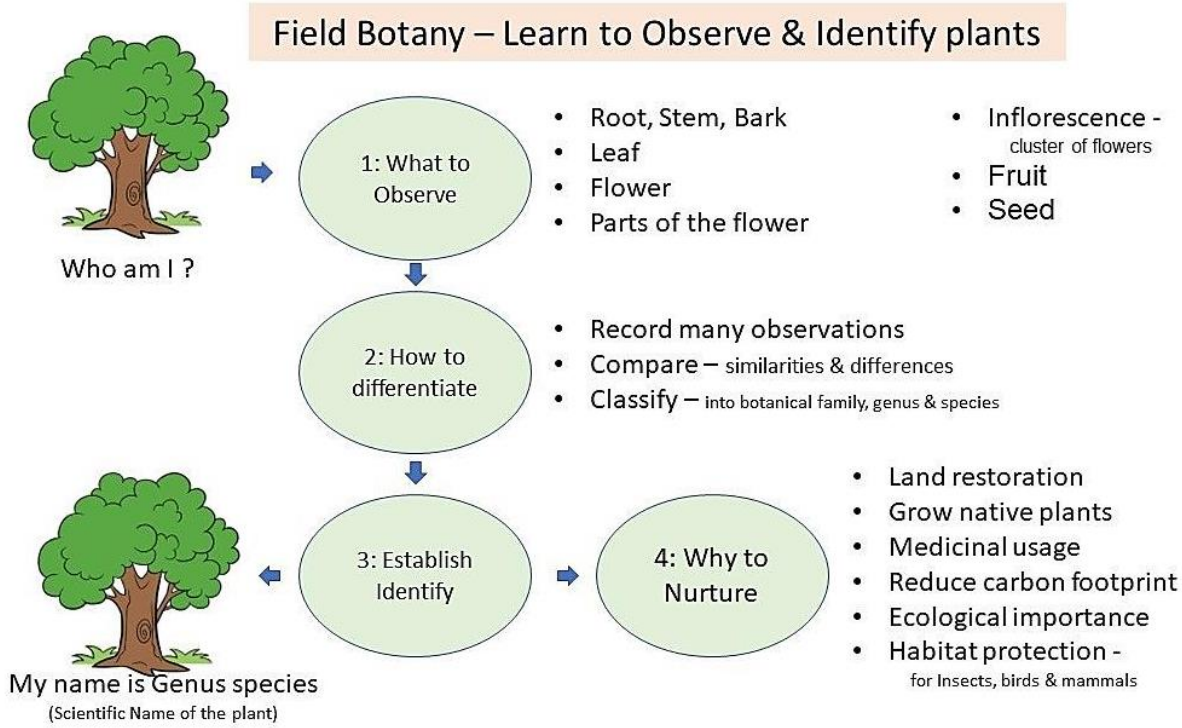


Figure 7. Learn to observe and identify

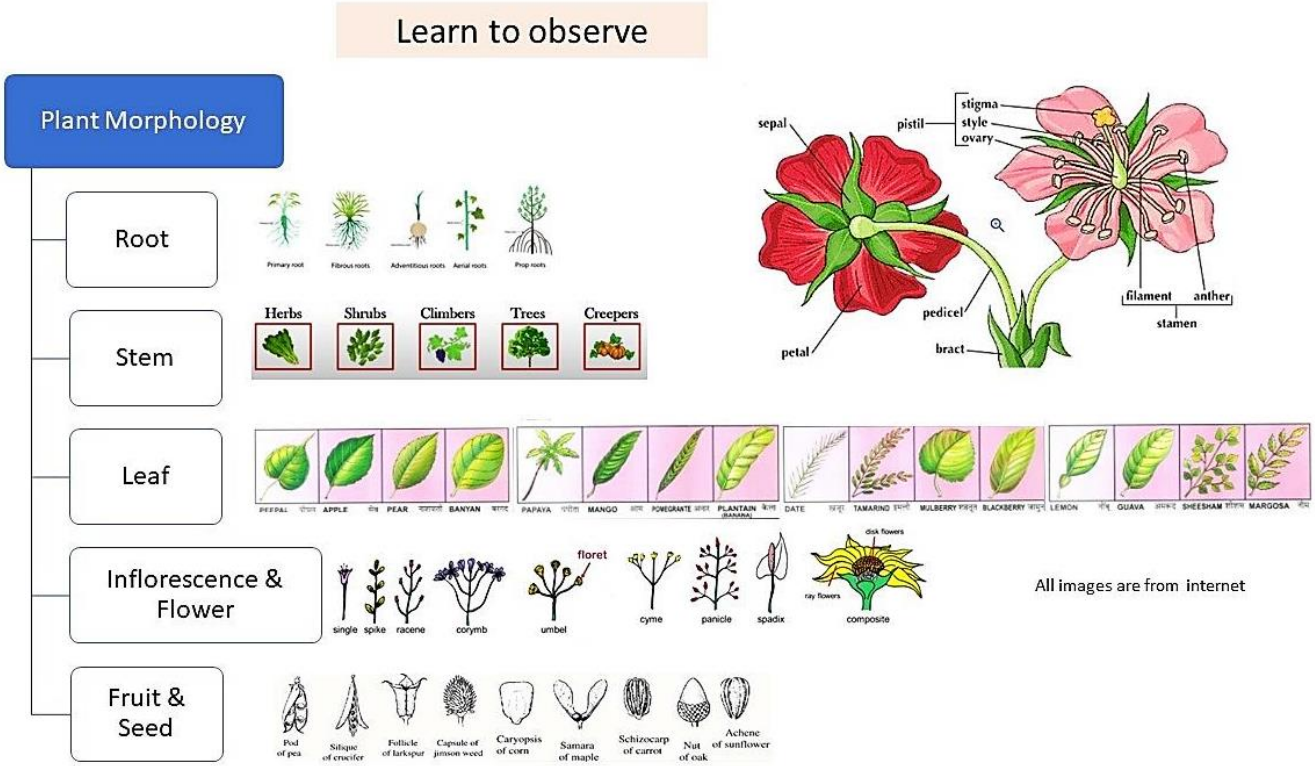


Figure 8. Learn to observe morphological characters and describe

Procedure

1. **Selection of Area**: Choose a local area such as a garden, park, or forest for the study.
2. **Observation**: Walk through the area and observe the plants.
3. **Identification**: Use a plant identification guide or app to identify plant species.
4. **Documentation**: Note down the following details for each plant:
    - Scientific name
    - Common name

- Family
- Habitat (e.g., terrestrial, aquatic)
- Morphological features (e.g., type of leaves, flowers, etc.)
- Uses (e.g., medicinal, ornamental)

5. **Photography**: Take photographs of plants for reference (if permitted).

Observations Table

Scientific Name	Common Name	Family	Habitat	Uses
Azadirachta indica	Neem	Meliaceae	Terrestrial	Medicinal, insect repellent
Hibiscus rosa-sinensis	China Rose	Malvaceae	Terrestrial	Ornamental, medicinal
Ficus religiosa	Peepal	Moraceae	Terrestrial	Sacred, oxygen production
Mentha spicata	Mint	Lamiaceae	Terrestrial	Culinary, medicinal

Result

- The study helped identify and classify various plant species in the local area.
- Observations highlighted the ecological and economic importance of local flora.

Conclusion

Local flora is diverse and plays a vital role in maintaining the ecological balance. Understanding the local plant species can promote conservation and sustainable use of natural resources.

Precautions

1. Avoid damaging plants during observation and collection.
2. Take notes accurately for proper identification.
3. Follow local guidelines and avoid entering restricted areas.
4. Use ethical methods when collecting plant samples (if allowed).

Lab Activity No 07
Title of the Activity- **Floral parts (Hibiscus)**

Learning Objectives

- To study the structure and arrangement of floral parts in the flower of Hibiscus.
- To identify the function and significance of each floral part.
- To understand the floral morphology of a complete, bisexual flower.

Aim

To study the structure of the flower of Hibiscus rosa-sinensis and identify its floral parts.

Apparatus

- Fresh Hibiscus flowers
- Scalpel or blade
- Magnifying glass
- Needle
- Forceps
- Glass slides

Theory

The **Hibiscus rosa-sinensis** (China Rose) is a complete, bisexual flower with the following floral parts:

1. **Calyx**: The outermost whorl of green sepals that protect the flower in the bud stage.
2. **Corolla**: The second whorl of colorful petals that attract pollinators.

3. **Androecium**: The male reproductive structure consisting of stamens (filament + anther).
4. **Gynoecium**: The female reproductive structure, consisting of carpels (stigma, style, and ovary).

The flower exhibits the following features:

- **Actinomorphic**: Radially symmetrical.
- **Hypogynous**: The ovary is superior, and other floral parts are attached below it.
- **Aestivation**: Twisted arrangement of petals.

Procedure

1. Take a fresh Hibiscus flower and observe its external features.
2. Gently remove the sepals to study the **calyx**.
3. Carefully remove the petals to examine the **corolla**.
4. Identify the **androecium** by observing the staminal tube, filaments, and anthers.
5. Locate the **gynoecium** and note the stigma, style, and ovary.
6. Using a scalpel, make a longitudinal section (L.S.) of the flower to observe the arrangement of floral parts.

Observations Table

Floral Part	**Number**	**Description**	**Function**
Calyx (Sepals)	5	Green, leaf-like structures	Protects the bud
Corolla (Petals)	5	Brightly colored, twisted aestivation	Attracts pollinators
Androecium (Stamens)	Numerous	Staminal tube formed by filaments; anthers produce pollen	Male reproductive organ
Gynoecium (Carpels)	1 (5 fused)	Superior ovary, long style, and 5-lobed stigma	Female reproductive organ

Diagram

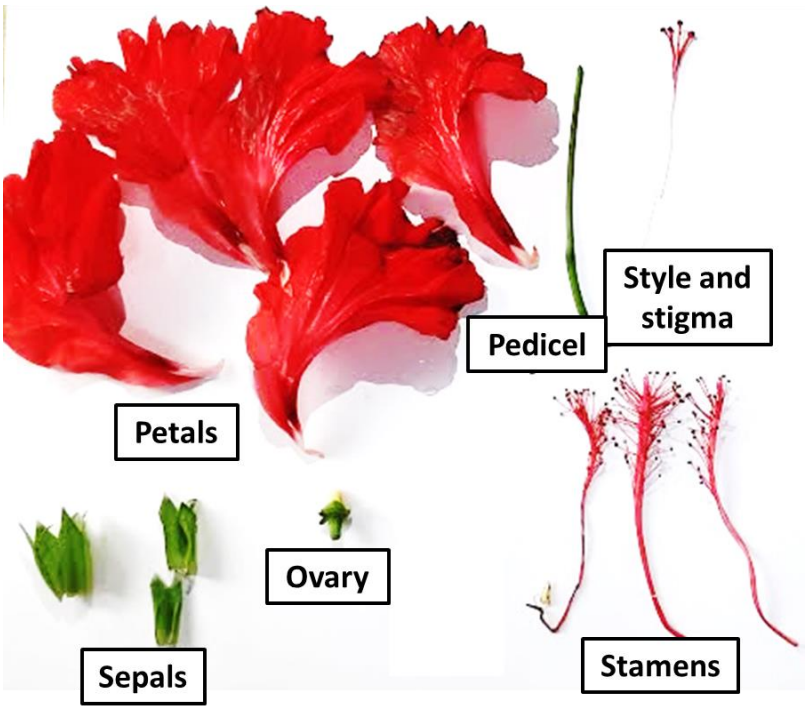


Figure 8. Flower of Hibiscus and its dissected parts

Result

- The flower of Hibiscus has all four floral whorls: calyx, corolla, androecium, and gynoecium.
- It is a complete, bisexual, actinomorphic, and hypogynous flower.

Conclusion

The floral structure of Hibiscus is designed for effective pollination. It possesses distinct and specialized floral parts that perform reproductive and protective functions.

Precautions

1. Handle the flower carefully to avoid damaging delicate parts.
2. Use tools like scalpel and forceps with caution.
3. Observe floral parts under good lighting for clarity.

4. Ensure accurate labeling of the floral diagram.

Lab Activity No 08
Title of the Activity- **Unisexual (dates) and Bisexual Flower (Hibiscus)**

Learning Objectives

- To understand the difference between unisexual and bisexual flowers.
- To study the structure and reproductive parts of unisexual (date) and bisexual (Hibiscus) flowers.
- To compare the roles of unisexual and bisexual flowers in plant reproduction.

Aim

To study the floral structure of unisexual flowers (Date) and bisexual flowers (Hibiscus).

Apparatus

- Fresh date flowers (male and female)
- Fresh Hibiscus flowers
- Scalpel or blade
- Magnifying glass
- Needle
- Forceps
- Glass slides

Theory

Unisexual Flowers

Unisexual flowers have either male (androecium) or female (gynoecium) reproductive structures, but not both.

- Example: **Date palm (Phoenix dactylifera)**
    - **Male flower**: Contains stamens only.
    - **Female flower**: Contains carpels only.
    - Cross-pollination is necessary for reproduction.

Bisexual Flowers

Bisexual flowers have both male (androecium) and female (gynoecium) reproductive structures in the same flower.

- Example: **Hibiscus rosa-sinensis**
    - Facilitates self-pollination and cross-pollination.

Diagram

1. **Male and female flowers of the date palm.**
2. **Longitudinal section (L.S.) of a Hibiscus flower showing all floral parts.**

Procedure

Unisexual Flower (Date Palm)

1. Take male and female flowers of the date palm.
2. Observe the male flower to locate the androecium (stamens).
3. Observe the female flower to locate the gynoecium (carpels).
4. Compare the structures of male and female flowers.

Bisexual Flower (Hibiscus)

1. Take a fresh Hibiscus flower.
2. Observe the external features, including sepals and petals.
3. Identify the androecium (stamens) and gynoecium (carpels) within the same flower.
4. Make a longitudinal section (L.S.) of the flower to study the arrangement of floral parts.

Female flowers and Male flowers

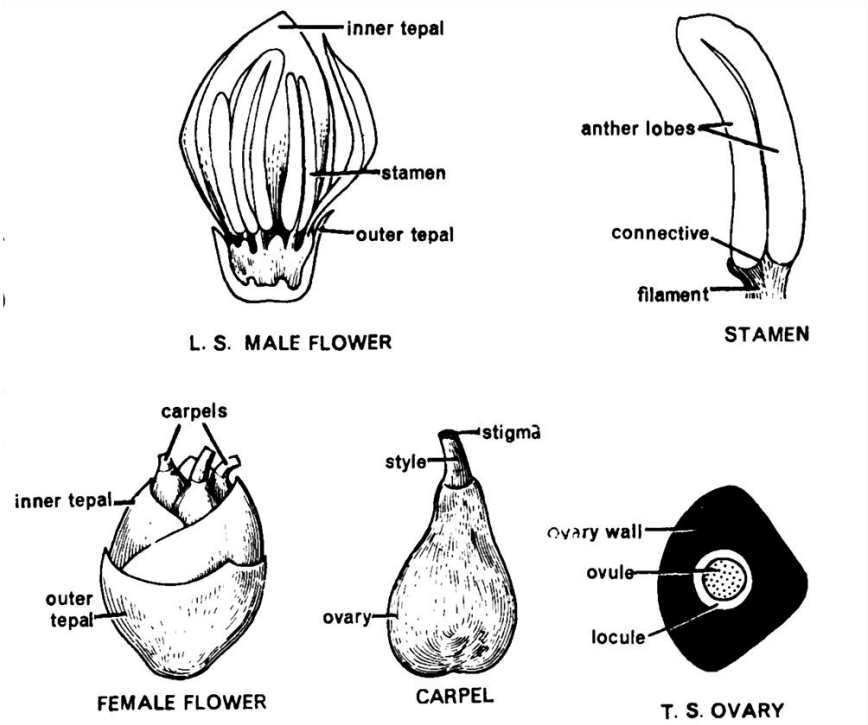


Figure 9. Male and female flowers of the date palm.

Observations Table

Type of Flower	Example	Floral Parts Present	Reproductive Organs	Pollination Type
Unisexual (Male)	Date Palm (Male)	Sepals, petals, stamens	Androecium (Stamens)	Cross-pollination
Unisexual (Female)	Date Palm (Female)	Sepals, petals, carpels	Gynoecium (Carpels)	Cross-pollination
Bisexual	Hibiscus rosa-sinensis	Sepals, petals, stamens, carpels	Both androecium & gynoecium	Self or cross-pollination

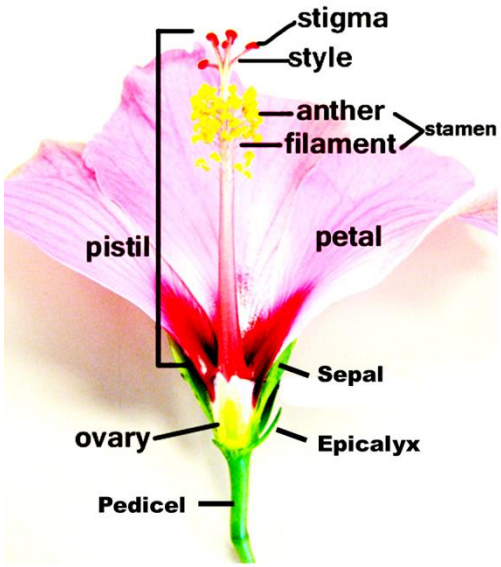


Figure 9. Longitudinal section (L.S.) of a Hibiscus flower showing all floral parts.

Result

- Unisexual flowers like those of the date palm have only one type of reproductive structure (male or female).
- Bisexual flowers like Hibiscus have both male and female reproductive structures in the same flower.

Conclusion

Unisexual flowers promote cross-pollination, increasing genetic diversity. Bisexual flowers allow for both self-pollination and cross-pollination, ensuring reproductive success under various conditions.

Precautions

1. Handle delicate floral parts with care.
2. Use appropriate tools for dissection to avoid damaging the specimens.
3. Observe floral structures under good lighting for clarity.
4. Ensure accurate labeling of the diagrams.

Lab Activity No 09
Title of the Activity- **Inflorescence composite**

Learning Objectives

- To study the structure and types of composite inflorescences.
- To understand the organization of flowers in a composite inflorescence.
- To identify the role of composite inflorescences in plant reproduction.

Aim

To study the composite inflorescence and identify its structure and types.

Apparatus

- Fresh specimens of composite inflorescence (e.g., sunflower, marigold).
- Magnifying glass or dissecting microscope.
- Scalpel or blade.
- Forceps.

- Glass slides.

Theory

Composite Inflorescence is a type of inflorescence in which multiple flowers (called florets) are arranged on a common receptacle, appearing as a single flower. It is characteristic of plants in the family **Asteraceae (Compositae)**.

Types of Florets in Composite Inflorescence

1. **Ray Florets**: Peripheral, strap-shaped flowers, often sterile or female.
2. **Disk Florets**: Central, tubular flowers, usually bisexual or male.

Types of Composite Inflorescence

1. **Capitulum (Head)**: Florets are sessile and arranged on a flat or convex receptacle (e.g., sunflower, marigold).
2. **Hypanthodium**: A cup-like receptacle enclosing florets, as in fig.

Diagram

1. Labeled diagram of the composite inflorescence of a sunflower showing ray and disk florets.
2. Cross-section of a capitulum.

Procedure

1. Take a fresh specimen of a sunflower or marigold.
2. Observe the external structure of the inflorescence and note its appearance as a single flower.
3. Using a scalpel, gently separate the **ray florets** from the periphery and examine their structure.
4. Observe the **disk florets** from the center and note their tubular structure.
5. Examine the receptacle where florets are attached.
6. Sketch and label the parts observed.

Observations Table

Plant Name	Type of Inflorescence	Type of Florets	Floral Arrangement	Significance
Sunflower	Capitulum	Ray and disk florets	Ray florets on the periphery; disk florets in the center	Pollination, composite reproduction
Marigold	Capitulum	Ray and disk florets	Similar to sunflower	Ornamental and ecological roles

Result

- The composite inflorescence is made up of multiple florets arranged on a common receptacle, mimicking a single flower.
- Both ray and disk florets contribute to pollination and reproduction.

Conclusion

Composite inflorescences, such as those in sunflower and marigold, enhance pollination efficiency by mimicking a large single flower and attracting pollinators.

Precautions

1. Handle the inflorescence carefully to avoid damaging delicate florets.
2. Use tools like forceps and scalpel cautiously during dissection.
3. Observe under proper lighting for clarity of structures.
4. Ensure accurate labeling in diagrams and observations.

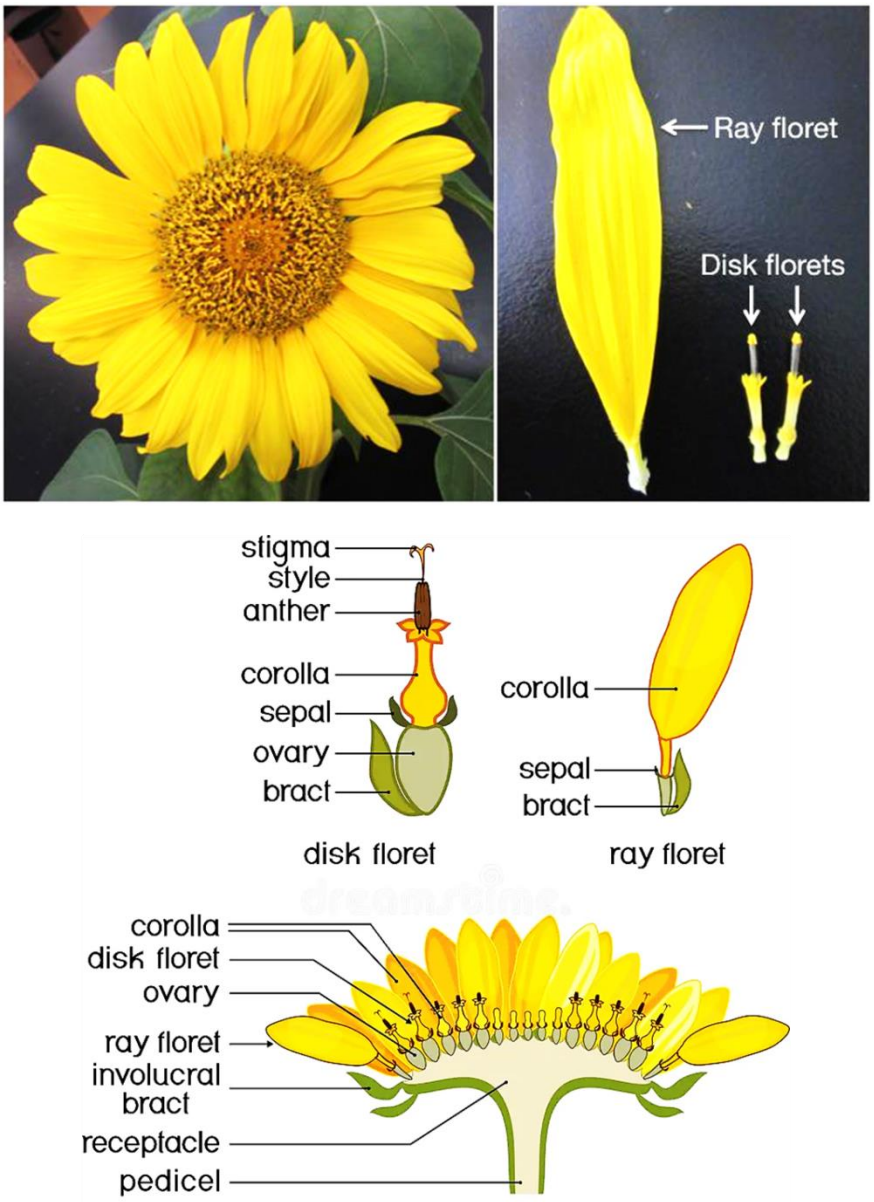


Figure 10. Sunflower showing ray and disk florets with cross section

Lab Activity No 10
Title of the Activity- **Identifying five Plant Families in the field: Composite, Lamiaceae, Euphorbiaceae, Malvaceae, Poaceae**

Learning Objectives:

1. To identify and differentiate between five common plant families in the field: Composite, Lamiaceae, Euphorbiaceae, Malvaceae, and Poaceae.
2. To observe and record key morphological features of plants belonging to these families.
3. To understand the ecological importance and uses of plants from each of these families.
4. To classify plants into their respective families based on observable characteristics.

Aim:

To identify and examine the key characteristics of five plant families (Composite, Lamiaceae, Euphorbiaceae, Malvaceae, Poaceae) found in the field.

Apparatus:

1. Field notebook and pencil for observation and recording.
2. Plant identification guides or keys.
3. Magnifying glass (optional) for examining smaller plant features.
4. Digital camera or smartphone (optional) for photographing plants.
5. Ruler or measuring tape to measure plant size.

Theory:
Plant families are groups of related plants that share common morphological characteristics. By studying the plants' physical traits, such as leaf arrangement, flower structure, and seed types, we can classify plants into their respective families. The five plant families we focus on have distinctive characteristics that can be used to differentiate them:

1. **Composite (Asteraceae)**: Known for their inflorescence that appears like a single flower but is actually a cluster of many small flowers (capitulum).
2. **Lamiaceae**: Characterized by aromatic herbs with square stems and opposite leaves, often with a strong, fragrant smell.
3. **Euphorbiaceae**: Includes a wide variety of plants with milky sap and simple, alternate leaves.
4. **Malvaceae**: Often characterized by large, showy flowers with five petals and palmately lobed leaves.
5. **Poaceae (Grass family)**: Known for long, narrow leaves and jointed stems, with spikelets (small clusters of flowers) that form inflorescences.

Diagram:
You may include the following diagrams:

1. A diagram of a composite flower showing the capitulum structure.
2. A diagram of a typical leaf and flower of Lamiaceae.
3. A diagram showing the milky sap of Euphorbiaceae and the typical leaf arrangement.
4. A Malvaceae flower and its characteristic petals and leaf structure.
5. A Poaceae grass inflorescence and the jointed stem.

Procedure:

1. Select a location with a variety of plant species in the field.
2. Identify plants that are likely to belong to one of the five families: Composite, Lamiaceae, Euphorbiaceae, Malvaceae, or Poaceae.
3. For each plant, observe and record key characteristics such as leaf shape, flower structure, stem type, and overall plant shape.
4. Use a plant identification key or guide to confirm the family of the plant.
5. Take photographs of the plants for reference if necessary.
6. Record detailed descriptions of each plant, including any notable features that align with the characteristics of the families mentioned above.

Observations Table:

Plant Name	**Family**	**Leaf Shape/Arrangement**	**Flower Structure**	**Notable Features**	**Ecological Use or Significance**
Example 1	Composite	Lanceolate, Alternate	Capitulum	Small flowers	Attracts pollinators
Example 2	Lamiaceae	Opposite, Ovate	Zygomorphic	Aromatic	Culinary/herbal use
Example 3	Euphorbiaceae	Simple, Alternate	Cyathium	Milky sap	Used for medicinal purposes
Example 4	Malvaceae	Palmately lobed	Hibiscus-like	Large flowers	Ornamental, medicinal use

Example 5	Poaceae	Long, Narrow, Alternate	Spikelet	Jointed stems	Important for livestock feed

Result:
Upon completing the fieldwork, the plants will be identified according to their families. For each family, the distinct characteristics of the plants will be noted, demonstrating the variability within and between the plant families.

Conclusion:
The exercise successfully demonstrates how to identify plants in the field based on their morphological traits. Understanding the differences between these plant families allows for a deeper appreciation of plant biodiversity and their ecological roles. By applying the key features of each family, we can classify plants correctly and understand their potential uses in various industries, including medicine, agriculture, and landscaping.

Precautions:
1. Be cautious of toxic plants, especially from families like Euphorbiaceae, which may contain sap that can irritate the skin.
2. Avoid touching plants with thorns or spines to prevent injury.
3. Always wear gloves when handling plants that may cause skin irritation.
4. Be mindful of the environment and avoid disturbing natural habitats or endangered species.
5. Ensure accurate identification by consulting a reliable guide or expert if uncertain about plant characteristics.

Multiple-Choice Questions (MCQs)

1. What is the primary difference between monocot and dicot leaves based on venation?

- A) Monocot leaves have reticulate venation.
- B) Dicot leaves have parallel venation.
- C) Monocot leaves have parallel venation, while dicot leaves have reticulate venation.
- D) Dicot leaves have no veins.

Answer: C) Monocot leaves have parallel venation, while dicot leaves have reticulate venation.

2. Which of the following is a vegetative part of the plant?

- A) Flower
- B) Seed
- C) Leaf
- D) Fruit

Answer: C) Leaf

3. Which part of the leaf is responsible for transporting water, nutrients, and food?

- A) Lamina
- B) Petiole
- C) Veins
- D) Stipules

Answer: C) Veins

4. In which of the following types of leaves do we find modifications for storing food or water?

- A) Tendrils
- B) Storage leaves
- C) Spines
- D) Insectivorous leaves

Answer: B) Storage leaves

5. Which part of a plant helps it to climb and provides support?

- A) Stem
- B) Leaf
- C) Tendril
- D) Root

Answer: C) Tendril

6. Which of the following is NOT a reproductive part of the plant?

- A) Flower
- B) Fruit
- C) Seed
- D) Stem

Answer: D) Stem

7. What is the purpose of a herbarium?

- A) To store food for plants.
- B) To preserve plant specimens for research.
- C) To collect water samples from plants.
- D) To study soil types.

Answer: B) To preserve plant specimens for research.

8. What is the key feature of monocot leaves in terms of venation?

- A) Veins form a network.
- B) Veins are arranged in a parallel pattern.
- C) Veins form a circular pattern.
- D) There are no veins.

Answer: B) Veins are arranged in a parallel pattern.

9. Which of the following types of leaves is modified to trap insects for nutrients?

- A) Storage leaves
- B) Tendrils
- C) Spines
- D) Insectivorous leaves

Answer: D) Insectivorous leaves

10. During the herbarium preparation, what is used to preserve the collected plant material?

- A) Plant press and blotting paper
- B) Water
- C) Fertilizer
- D) Sunlight

Answer: A) Plant press and blotting paper

11. **Which plant family is characterized by its inflorescence that appears like a single flower but is a cluster of many small flowers?**

a) Lamiaceae
b) Euphorbiaceae
c) Composite
d) Poaceae
Answer: c) Composite

12. **What is the term for flowers that have both male and female reproductive structures?**

a) Unisexual
b) Bisexual
c) Dioecious
d) Monoecious
Answer: b) Bisexual

13. **Which plant family is known for its milky sap?**
a) Malvaceae
b) Euphorbiaceae
c) Poaceae
d) Composite
Answer: b) Euphorbiaceae

14. **In Hibiscus, which floral part is responsible for attracting pollinators?**
a) Sepals
b) Petals
c) Stigma
d) Ovary
Answer: b) Petals

15. **Which type of plant has a square stem and is often aromatic?**
a) Composite
b) Euphorbiaceae
c) Lamiaceae
d) Poaceae
Answer: c) Lamiaceae

16. **What is the superior position of the ovary in a flower called?**
a) Epigynous
b) Perigynous
c) Hypogynous
d) Actinomorphic
Answer: c) Hypogynous

17. **Which of the following is an example of a unisexual flower?**
a) Hibiscus
b) Sunflower
c) Date palm
d) Marigold
Answer: c) Date palm

18. **What is the main function of ray florets in composite inflorescence?**
a) Reproduction
b) Protection
c) Attracting pollinators
d) Photosynthesis
Answer: c) Attracting pollinators

19. **Which plant family is characterized by long, narrow leaves and jointed stems?**
a) Composite

b) Poaceae
c) Euphorbiaceae
d) Malvaceae
Answer: b) Poaceae

20. **What type of aestivation is observed in the petals of Hibiscus flowers?**
a) Valvate
b) Twisted
c) Imbricate
d) Open
Answer: b) Twisted

Fill-in-the-blank questions

1. The arrangement of veins in a leaf is known as _____.
Answer: venation

2. Monocot leaves typically exhibit _____ venation, where veins run parallel to each other.
Answer: parallel

3. The primary function of the _____ part of a plant is to absorb water and nutrients from the soil.
Answer: root

4. _____ leaves help in reducing water loss and providing protection to the plant.
Answer: Spines

5. The main function of the _____ is to support the plant and transport nutrients and water.
Answer: stem

6. A _____ is a plant modification that helps in climbing.
Answer: tendril

7. _____ leaves produce new plants from buds formed on their margins.
Answer: Reproductive

8. The process of drying and pressing plant specimens for preservation in a herbarium is called _____.
Answer: plant pressing

9. The reproductive organs of a flower are the _____ and the _____.
Answer: stamen, pistil

10. The _____ part of the plant is responsible for photosynthesis.
Answer: leaf

11. **The outermost whorl of a flower, which protects it in the bud stage, is called the _____.**
Answer: Calyx

12. **The family _____ is known for its inflorescence that mimics a single flower, such as in sunflowers.**
Answer: Composite

13. **The term _____ refers to flowers that contain both male and female reproductive organs.**
Answer: Bisexual

14. **Plants in the family _____ often have milky sap and simple, alternate leaves.**
Answer: Euphorbiaceae

15. **The _____ is the colorful part of the flower that attracts pollinators.**
Answer: Corolla

16. **In Hibiscus, the floral arrangement where the ovary is superior is termed _____.**
Answer: Hypogynous

17. **The reproductive structure of male flowers is called the _____.**
Answer: Androecium

18. **The family _____ is known for its square stems and aromatic herbs like mint.**
Answer: Lamiaceae

19. **In the family Poaceae, the flowers are arranged in clusters called _____.**
Answer: Spikelets

20. **The type of aestivation where petals are twisted is observed in the flower of _____.**
Answer: Hibiscus

True/false questions

1. Monocot leaves exhibit reticulate venation.

- **Answer:** False
  (Monocot leaves exhibit parallel venation.)

2. The petiole of a leaf attaches it to the stem.

- **Answer:** True

3. In dicot leaves, veins run parallel to each other.

- **Answer:** False
  (In dicot leaves, veins form a network, called reticulate venation.)

4. The stem of a plant helps in photosynthesis.

- **Answer:** False
  (Photosynthesis primarily occurs in the leaves, not the stem.)

5. Reproductive parts of a plant include the root, stem, and leaves.

- **Answer:** False
  (Reproductive parts include flowers, fruits, and seeds.)

6. Herbarium sheets are used to preserve and document plant specimens for research.

- **Answer:** True

7. Tendrils are modifications of leaves that help in climbing.

- **Answer:** True

8. Cactus leaves are modified into spines to reduce water loss and provide protection.

- **Answer:** True

9. Storage leaves are primarily responsible for trapping insects for nutrients.

- **Answer:** False
  (Insectivorous leaves trap insects, not storage leaves.)

10. The roots of a plant are primarily responsible for the reproduction process.

- **Answer:** False
  (The reproductive process is carried out by the flowers, fruits, and seeds.)

11. Hibiscus is an example of a unisexual flower.
Answer: False

12. The calyx is made up of green, leaf-like structures called sepals.
Answer: True

13. The family Poaceae is known for having jointed stems and narrow leaves.
Answer: True

14. Composite inflorescence is characteristic of the family Malvaceae.
Answer: False

15. In a hypogynous flower, the ovary is superior to other floral parts.
Answer: True

16. Ray florets in a sunflower are typically sterile or female.
Answer: True

17. The androecium in a flower consists of the stigma, style, and ovary.
Answer: False

18. The twisted aestivation of petals is a characteristic of Hibiscus flowers.
Answer: True

19. Euphorbiaceae plants often have aromatic leaves and square stems.
Answer: False

20. Unisexual flowers contain both male and female reproductive organs in the same flower.
Answer: False

Short-answer questions

1. What is venation in plants?

- **Answer:** Venation refers to the arrangement of veins in a leaf.

2. What type of venation do monocot leaves exhibit?

- **Answer:** Monocot leaves exhibit parallel venation.

3. Name the vegetative parts of a plant.

- **Answer:** The vegetative parts of a plant are the roots, stem, and leaves.

4. What is the function of the stem in plants?

- **Answer:** The stem supports the plant and transports water, nutrients, and food.

5. What type of leaf modification helps in climbing?

- **Answer:** Tendrils help in climbing.

6. What part of the plant is responsible for absorbing water and nutrients?

- **Answer:** The root is responsible for absorbing water and nutrients.

7. Why do cactus leaves modify into spines?

- **Answer:** Cactus leaves modify into spines to reduce water loss and provide protection.

8. What is the primary function of the leaf in a plant?

- **Answer:** The primary function of the leaf is photosynthesis.

9. What is a herbarium used for?

- **Answer:** A herbarium is used to preserve and document plant specimens for research.

10. What is the role of the flower in a plant?

- **Answer:** The flower is responsible for reproduction in the plant, containing reproductive organs like the stamen and pistil.

11. What is the primary function of the calyx in a flower?
Answer: To protect the flower in the bud stage.

12. Name two examples of plants from the family Poaceae.
Answer: Wheat and rice.
13. What type of aestivation is observed in the petals of Hibiscus flowers?
Answer: Twisted aestivation.

14. What is the difference between ray florets and disk florets in a sunflower?
Answer: Ray florets are peripheral and often sterile or female, while disk florets are central and usually bisexual.

15. What type of inflorescence is characteristic of the family Composite?
Answer: Capitulum.

16. Which floral part is responsible for producing pollen in a flower?
Answer: Anther (part of the androecium).

17. What is the main identifying feature of plants in the family Lamiaceae?
Answer: Square stems and aromatic leaves.

18. Name one unisexual flower and its family.
Answer: Date palm; family Arecaceae.

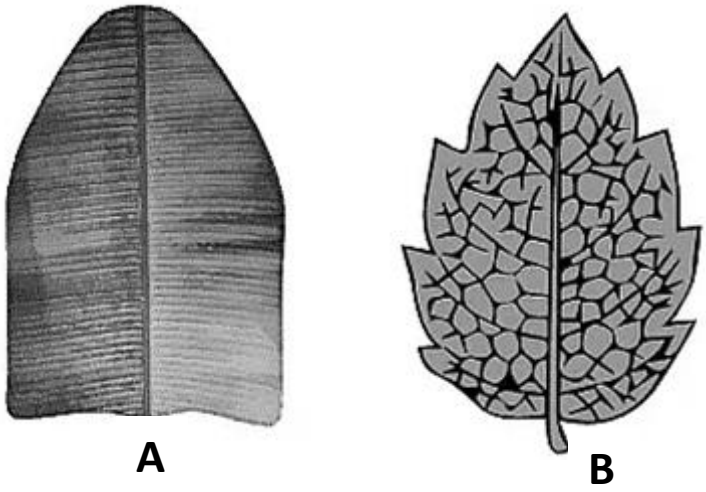
19. What type of floral symmetry does Hibiscus exhibit?
Answer: Actinomorphic (radially symmetrical).

20. Why is it important to study local flora?
Answer: To understand ecological balance, cultural and medicinal uses, and for biodiversity conservation.

Figure-Based Questions

Question 1:

Identify the venation pattern shown in the two leaves below:



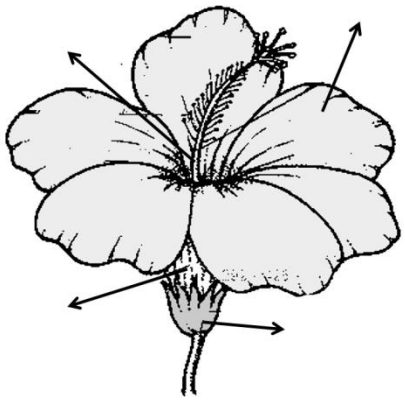
Answer:

- **Figure A**: Parallel venation (Monocot leaf, e.g., maize).
- **Figure B**: Reticulate venation (Dicot leaf, e.g., peepal).

Question 2:

Label the following parts of a flower from the given figure:

- Petal
- Sepal
- Stamen
- Pistil

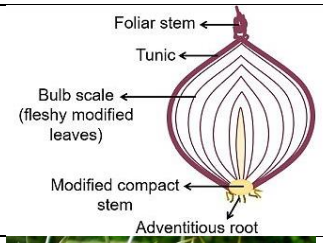
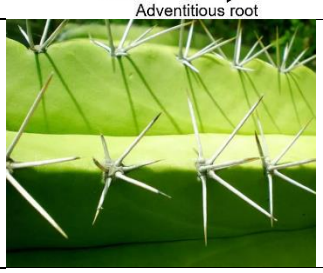


Answer:

- Petal: Colorful part attracting pollinators.
- Sepal: Green outer covering protecting the bud.
- Stamen: Male reproductive part containing anther and filament.
- Pistil: Female reproductive part containing stigma, style, and ovary.

Question 3:
Match the leaf modification with its function as shown in the figure:

- **A:** Leaf Tendril
- **B:** Spine
- **C:** Storage Leaf

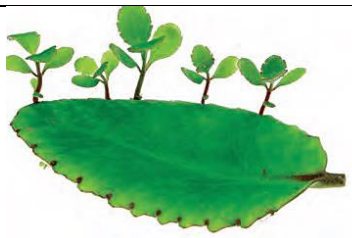
Storage Leaf	
Leaf Tendril	
Spine	

Answer:

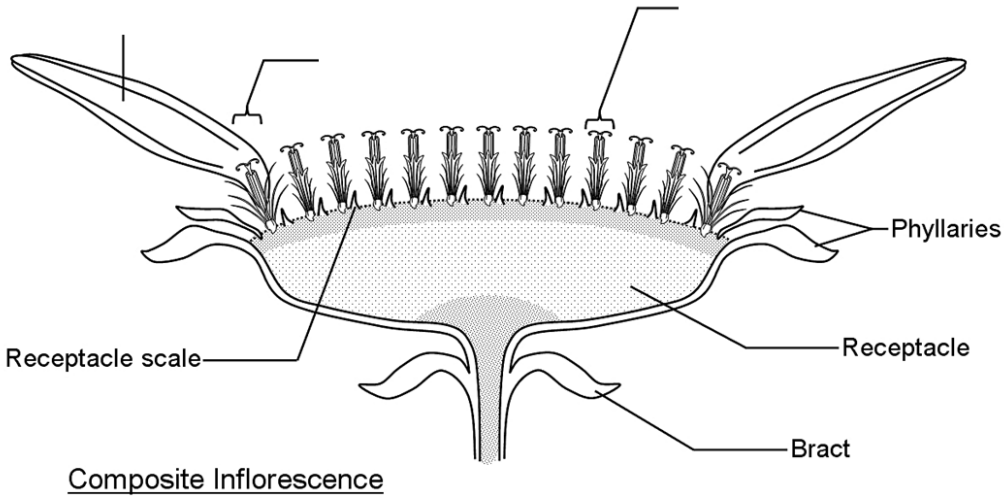
- **A (Leaf Tendril):** Helps in climbing (e.g., pea plant).
- **B (Spine):** Protects and reduces water loss (e.g., cactus).
- **C (Storage Leaf):** Stores food or water (e.g., onion).

Question 4:
Match the leaf modification with its function as shown in the figure:

- **A:** leafy buds
- **B:** Leaf Tendril
- **C:** Insectivores

leafy buds	
Leaf Tendril	
Insectivores	

Question 5. What are the two types of florets visible in the diagram, and where are they located?



Answer: Ray florets are on the periphery, and disk florets are in the center.