Lecture (4) +(5)

Plant Taxonomy

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Plant classification is a branch of botany that focuses on organizing plants into groups based on their shared characteristics. It helps in identifying species, studying their diversity, and understanding their evolutionary relationships, making the study of plants easier and more scientific.

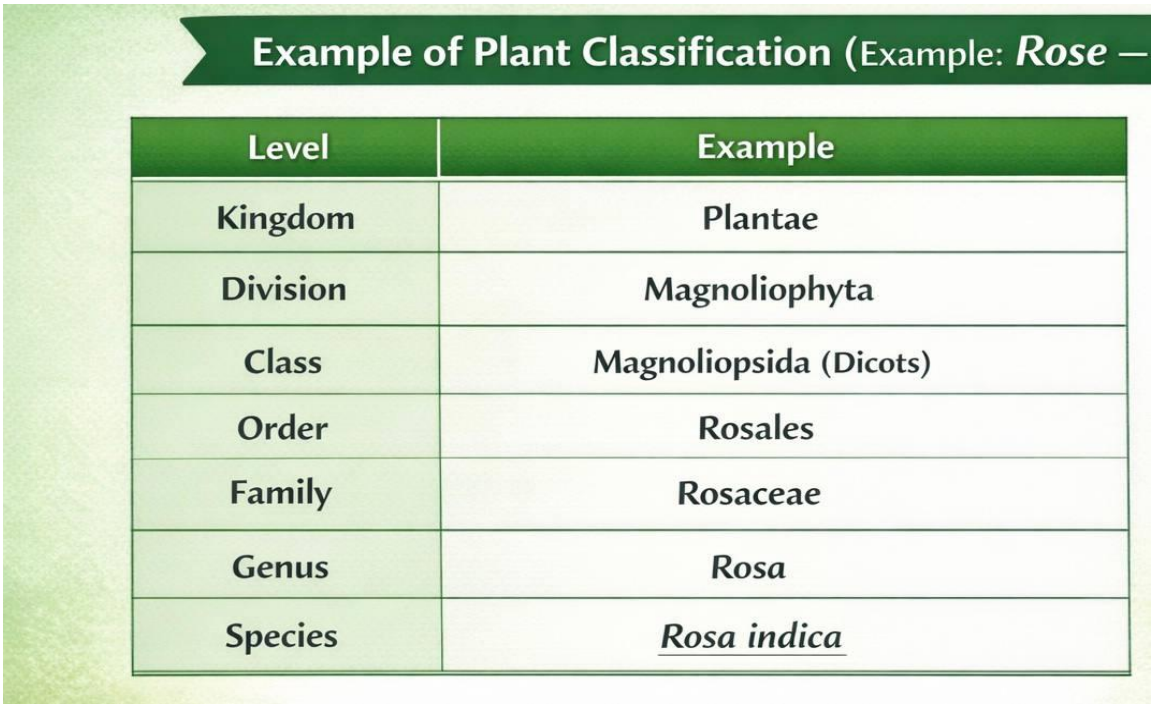
Objectives of Plant Taxonomy

- **Identification**: Recognizing and determining the names of unknown plants.
- **Nomenclature**: Assigning standardized names to plants following specific rules.
- **Classification**: Grouping plants into categories based on their shared characteristics and evolutionary relationships.
- **Documentation**: Creating a record of plant species, including their descriptions and distributions.

Taxonomic Levels of Plants”

1. **Kingdom**: The highest level of classification
2. **Division (Phylum)**: Major groups within the kingdom.

3. **Class**: Subgroups within a division.
4. **Order**: Groups within a class.
5. **Family**: Related genera grouped together.
6. **Genus**: A group of closely related species.
7. **Species**: The most specific level, representing individual plants that can interbreed.



Example of Plant Classification (Example: *Rose* –

Level	Example
Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida (Dicots)
Order	Rosales
Family	Rosaceae
Genus	*Rosa*
Species	*Rosa indica*

Scientific Naming: Binomial Nomenclature

Scientific naming, also known as binomial nomenclature, is a universal system used to name living organisms. This system was developed by the Swedish scientist Carl Linnaeus in the 18th century to avoid confusion caused by different common names used in various regions.

In binomial nomenclature, each organism is given a scientific name consisting of two Latin words. The first word is the genus name, which is written with a capital letter, while the

second word is the species name, written in lowercase. Both words are written in italics, for example: *Mangifera indica*.

Scientific naming is important because it provides a standardized and internationally accepted name for each species. It helps scientists accurately identify organisms, study their relationships, and communicate clearly across the world. This system plays a vital role in plant taxonomy, biodiversity studies, agriculture, and biological research.

Principles of Modern Classification

Modern classification of living organisms is based on scientific principles that aim to group organisms according to their natural and evolutionary relationships, rather than relying only on external appearance. It depends on morphological, anatomical, and physiological characteristics, as well as genetic and molecular evidence such as DNA analysis, which provides accurate information about evolutionary relationships.

Homology is an important concept in modern classification and refers to similarity in origin and structure, even if the function is different, indicating a common evolutionary ancestor. In contrast, **analogy** refers to similarity in function or appearance but with different origin and structure, and it does not indicate true evolutionary relationship.

Modern classification mainly relies on homology rather than analogy to achieve a natural and accurate classification system.

Leaf Tissue

The leaf is a specialized organ for photosynthesis, gas exchange, and water regulation, composed of several tissues:

1. Epidermal Tissue

• Upper Epidermis: Single cell layer with waxy cuticle to prevent water loss; transparent for light.

• Lower Epidermis: Contains stomata with guard cells for gas exchange; thin cuticle.

2. Mesophyll Tissue

• Palisade Mesophyll: Tightly packed cells with many chloroplasts; main site of photosynthesis.

• Spongy Mesophyll: Loosely arranged cells with air spaces for gas exchange and some photosynthesis.

3. Vascular Tissue

• Forms veins:

• Xylem: Transports water and minerals.

• Phloem: Transports sugars.

4. Specialized Features

• Stomata: Gas exchange and transpiration regulation.

• Cuticle: Waterproof layer protecting against dehydration and pathogens.

Functions: Photosynthesis, gas exchange, water transport, sugar distribution.

Stem Tissue

The stem connects roots to leaves and supports growth, transport, storage, and reproduction.

Functions

1. Support: Holds leaves, flowers, fruits for sunlight exposure.

2. Transport:

• Xylem: Moves water and minerals upward.

• Phloem: Moves sugars to other parts.

3. Storage: Some stems (tubers) store water/nutrients.

4. Growth: Apical and lateral meristems allow increase in length and girth.

5. Reproduction: Vegetative methods (runners, rhizomes, bulbs).

Structure

1. Dermal Tissue: Epidermis, cuticle, stomata, trichomes.

2. Ground Tissue: Cortex (parenchyma), pith (storage), collenchyma (flexible support), sclerenchyma (rigid support).

3. Vascular Tissue: Xylem and phloem in bundles (ring in dicots, scattered in monocots).

4. Meristematic Tissue: Apical (length) and lateral (girth) meristems.

Stem Modifications

• Storage: Tubers, corms.

• Support: Tendrils for climbing.

• Protection: Thorns.

• Photosynthesis: Flattened stems in cacti.

• Vegetative Reproduction: Runners, rhizomes.