

General Botany

Lecture (1)

Introduction to G. Botany

- Botany Definition
- History of botany
- **Characteristics of organisms plant**
 1. Morphology
 2. Anatomy
 3. Taxonomy (Cryptogams (Non-Flowering Plants): 2. Spermatophyta (Seed Plants) 3. Gymnosperms (Naked Seed Plants) 4. Angiosperms (Flowering Plants); Monocots and Dicots.
 4. Cytology
 5. Embryology
 6. Genetics
 7. Evolution
 8. . Paleontology
 9. . Physiology
 10. Ecology
- Scopes of botany1-Economic botany, Forestry , Horticulture Plant Pathology, Plant breeding, Pharmacognosy.

Both Groups (1 +2)

Botany

Botany: also called **plant science(s)**, **plant biology** or **phytology**, is the science of plant life and a branch of biology. The term "botany" comes from the Ancient Greek word *botane*, referring to "plants", "pasture", "grass", or "fodder";

A person engaged in the study of botany is called a **botanist**. **The science which treats** of the structure of plants, the functions of their parts, their places of growth, their classification, and the terms which are employed in their description and denomination.

The study of botany, or plant biology, encompasses the origin, diversity, structure, and internal processes of plants as well as their relationships with other organisms and with the nonliving physical environment.

Botany is one of the main divisions of biology, the science of life.

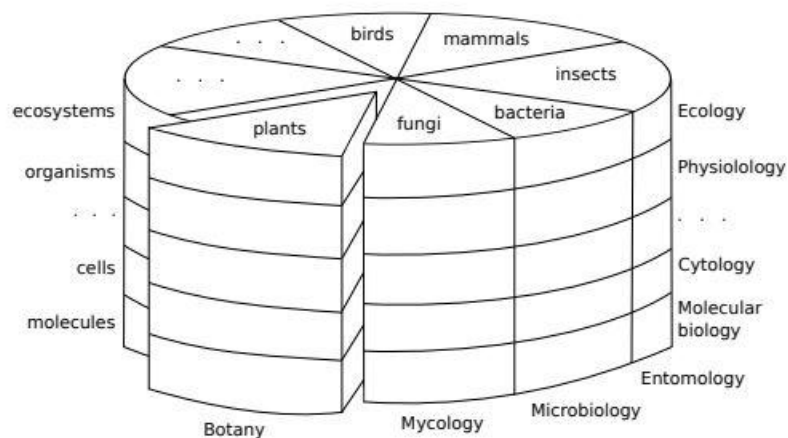


Fig (1): Layered pie of biology: levels of organization (left), taxonomic groups (top), "slice" sciences (bottom) and "layer" sciences (right).

Special characteristics of plants

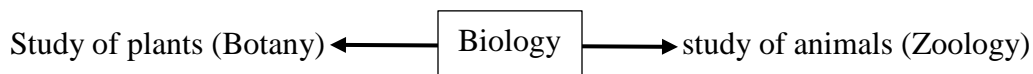
- 1- All are multicellular, non-motile, autotrophic eukaryotes. Locomotion: Generally plants are fixed, Plants generally are rooted in one place but the animals are locomotors and they go from one place to other place in search of food
- 2- Their cell walls are made from cellulose.
- 3- Plants carry out photosynthesis using chlorophyll a and b. Plants make their foods from very simple substances such as CO₂ and water in the presence of light and thus are autotrophic. But animals depend on food on plants and other animals and take ready-made food.
- 4- Plants store their carbohydrates as starch.

- 5- Some plants have vascular tissue (tracheophytes) pterophyte.
- 6- - Plants have **indeterminate** growth. While animals reach a certain size and stop growing, plant cells in their **meristematic tissues** retain the ability to divide and grow throughout the life of the plant.
- 7- Although lacking the **nervous systems of animals**, plants react and adapt to environmental stimuli (with dramatic and surprising speed in some instances); they also produce secondary metabolites, chemical compounds not directly needed for survival, which deter other plants, fungi, and animals from attacking or consuming the plants.

Why should we care about the study of plants?

- 1- **Food** : People derive food from the plants Cereals such as Wheat, rice, have played major role in feeding human beings.
- 2- Plants comprise about 98% of the earth's biomass.
- 3- Plants are primarily responsible for creating our **oxygen**-rich atmosphere via the light reactions of photosynthesis.
- 4- **Air purification**: Our factories, vehicles pollute the air with CO₂. Besides this all animals exhale CO₂. Thus, all the environment around us becomes polluted with CO₂. But plants-stand guard against this menace and during the process of food making Photosynthesis this CO₂ is used and equal amount of O₂ is released into the environment. Thus, the trees are big sources of purification.
- 5- Plants are the earth's main **autotrophs** and **fixers** of carbon and nitrogen.
- 6- Plants provide the **habitat** and **food** upon which almost all other living things.
- 7- Plants are responsible for most of the products on which you rely to survive (vegetable, clothing, medicines, spices, perfumes, dyes).
- 8- **Aesthetic value**: enhance the **beauty** of the place. And the man gets a pleasure by their association in their vicinity
- 9- The potential of biofuels (ethanol produced from food crops).Fuel : From the stone age, wood was used as fuel. Petroleum is also a product of the plants of past ages.

† Some of the important branches of Biology are listed below:



Basics of Botanical Fields:

- 1- Morphology:** The study of the external feature of the living organisms.
- 2- Anatomy:** The internal structures of different parts of living organisms are studied under Anatomy.
- 3- Taxonomy or Systematic Botany:** It deals with naming and classifying of plants into different groups or sup groups according to their resemblances and relationships with one another.

A. Cryptogams (Non-Flowering Plants):

In our gardens we find lichens and mosses, which are green plants, but have no true roots, no leaves and no flowers. Many of us grow ferns in our gardens. They are green plants with true leaves and roots, but no flowers. Finally, there is the flowering or seed-bearing plants, which make up the vast majority of plants on earth. These are the plants that we wish to discuss.

B. Spermatophyta (Seed Plants):

The seed plants are those which produce seeds, each containing an embryo (a minute, inactive plant) that germinates (begins to grow) under favorable conditions. Seed bearing plants have true leaves, stems, roots and vascular tissue (Tracheophyta). They consist of two classes: Gymnospermae and Angiospermae

a. Gymnosperms (Naked Seed Plants):

All gymnosperms are woody, perennial, and with few exceptions evergreen. The reproductive organs are borne in structures called cones. Their leaves may be fern-like, scale-like, strap-shaped, or needle shaped. This group is represented primarily by cone bearing trees (conifers) and palm-like plants called cycads. Members of this group are *Cupressus* (cypress), *Cycada* (cycads), *Ginkgo*, (pine) *Pinus* and *Cedrars*.

b. Angiosperms (Flowering Plants):

The angiosperms include those groups which have flowers and bear their seeds in fruits (A seed plant having ovules enclosed in an ovary and exhibiting double fertilization). They are divided into two main groups (Classes): Monocotyledoneae (Monocots) and Dicotyledoneae (Dicots). These Classes are determined by the number of cotyledons or “seed leaves” found in the seed. The green plants include the land plants, the land plants are inclusive of the vascular plants, the latter being united by the evolution of an independent sporophyte and xylem and phloem vascular conductive tissue. The vascular plants are inclusive of the seed plants, which are united by the evolution of wood and seeds. Finally, seed plants include the angiosperms, united by the evolution of the flower, including carpels and stamens, and by a number of other specialized features.

d'. MONOCOTS:

1. **Have one seed leaf.**
2. Xylem and phloem are paired in bundles and are dispersed throughout the stem.
3. The floral parts are usually in multiples of three.
4. The leaves often have parallel veins.

d''. DICOTS:

1. **Have two seed leaves.**
2. The ring of phloem is near the bark and the xylem forms the inner ring.
3. The floral parts are usually in multiples of four or five.
4. The leaves are usually net veined.

3. **Cytology:** The study of the cell and its various inclusions is covered in this branch. It mainly deals with the behavior of the nucleus during cell division.
4. **Embryology:** It is the study of early developments of plants from fertilized egg, Structure of the embryo and its development are studied under this branch.
5. **Genetics:** This science is concerned with the mode of transmission of the hereditary characteristics from one generation to the other, which obviously means the study and behavior of genes in different generations.
6. **Evolution:** It is the science which deals with the origin of the living beings and their gradual changes.
7. **Paleontology:** Study of fossil plants and animals are covered in this branch.
8. **Physiology:** Various functional aspects of plants and animals like metabolism, nutrition, growth, movement and respiration etc. are covered within this branch.
9. **Ecology** the study of how plants interact with their environments

†Scopes of Botany:

If we examine our daily life critically, we will conclude that we are dependent on plants practically for all our necessities of life. In fact, survival of man and animals on this universe would have been impossible without the green plants. The plants are producers of food while the animals and the human beings are the consumers.

On the basis of practical application of Botany, we can study this subject under a number of heads like: -

1- Economic botany: This field of Botany deals with the utilization of plant resources. We get different types of cereals, Oils, timber, Rubber, Spices, Medicines and Vitamins from plants or plant parts.

2- Agriculture: Is the industry that furnished our food and many raw materials, such as fibers, wood, cork, rubber, gums, resins, essential oils, many kinds of oils, waxes, animal products, improved methods of farming with irrigation, agronomic techniques and crop management are covered within agriculture.

3- Forestry: Forest wealth is important economically as well as from the point of view of maintaining ecological balance and keeping the environment clean. It provides food and protection of a large number of animals. Development of forests is covered within this branch.

4- Horticulture: This field is concerned with the development and propagation of good varieties of fruits, vegetable and ornamental plants.

5- Plant Pathology: This discipline deals with the plant diseases and their control with the help of chemicals and by using disease resistance varieties.

6- Plant breeding: Importance of plant breeding has increased considerably in modern agriculture. This field of Botany is concerned with the production and development of new high yielding and disease resistant varieties of various crop plants.

7- Pharmacognosy: This branch of Botany is concerned with used of plants and plant parts in drug industry.