EDO UNIVERSITY IYAMHO

Department of Plant Biology and Biotechnology

PBB 122 Introduction to Plant Form and Functions

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Lectures: Monday, 1pm – 3pm, LT1, phone: (+234) 7084059346

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Description: This course is intended to give the students a thorough knowledge of biological techniques and tools for modern research and methodology. This course covers advanced research methodologies such as use of microscopy, AAS and microtome, how to prepare slides and use the microscope and understand the concept of micrometry.

Prerequisites: Students should be familiar with the handling of the microscope and its parts and have a strong knowledge on the use of coarse and fine tuner and focus of the magnification lens for adequate viewing. using dynamic, pointer-based data structures either in C or C++ programming languages. Students should also be familiar with the basic concept of which equipment to use for a specific experiment.

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Assignments: I expect to have 3 individual assignments and 2 group presentation throughout the course in addition to a Mid-Term Test and a Final Exam. Home works are due at the beginning of the class on the due date. Home works are organized and structured as preparation for the midterm and final exam, and are meant to be a studying material for both exams. There will also be practical aspect in the laboratory. The goal of these practicals are to give the students experimental knowledge of research methodology and practical observation of cells and it content.

Grading: We will assign 5% of this class grade to home works, 10% for the practical and presentation, 15% for the mid-term test and 70% for the final exam. The Final exam is comprehensive.

Textbook: The recommended textbook for this class are as stated:

Title: *Botany for degree student*

Authors: Dutta, A.C.

Publisher: Oxford University press

Year: 2005

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Lectures: Below is a description of the contents. Students should be familiar with the anatomy and physiology of plants and know the five general classes of hormones We may change the order to accommodate the materials you need for the projects.

Introduction

Plant Anatomy and Physiology

This will be taught in the following areas:

1. The shoot system (Leaves, Stems, fruits and flowers)
2. Root system

The Shoot system

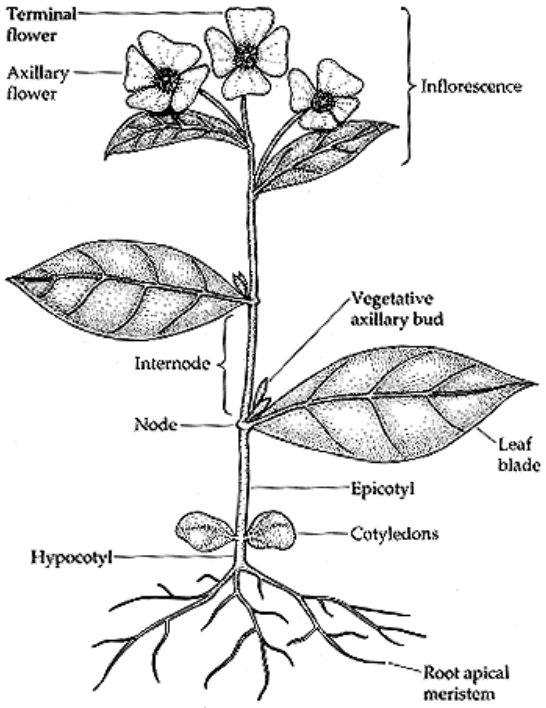


Diagram showing the four basic part of the plant

Leaves

Functions

1. Make food through photosynthesis
2. Site of gas exchange
3. Respiration
4. Photosynthesis
5. Store food

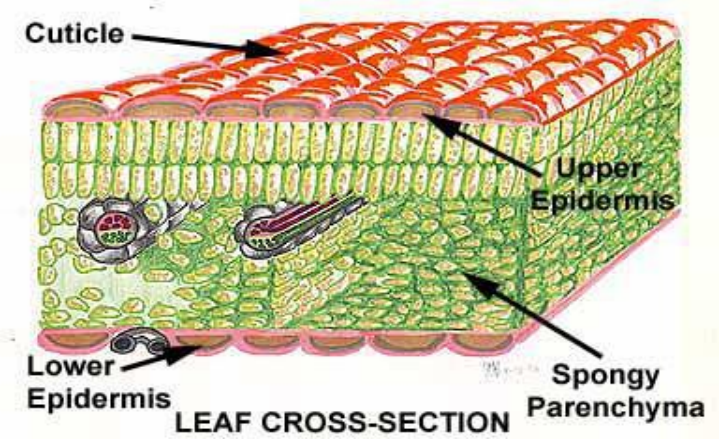
Tissues of the Leaf (Epidermis)

1. Cuticle
2. Stomata
3. Guard Cells
4. Tissues of the Leaf (Mesophyll Layer)

Palisade mesophyll

1. Primary site of photosynthesis
2. Spongy mesophyll
3. Contains air & chloroplasts
4. Site of photosynthesis and gas exchange

Vascular Bundles

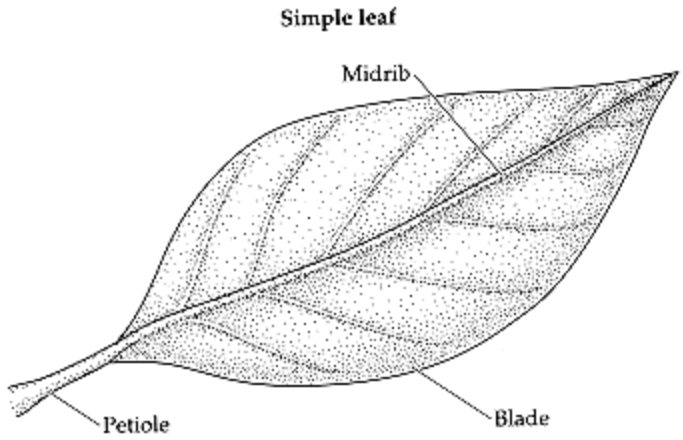


External Parts of the Leaf

Petiole

1. Leaf stalk or part that connects the leaf to the stem.
2. Blade
3. The large, flat part of a leaf.

4. Midrib
5. The large center vein.



A diagram of a simple leaf

Students will also learn the following

1. **Leaf form**
2. **Leaf margins**
3. **Leaf tips**
4. **Leaf bases**
5. **Leaf arrangements**

Hormones

There are five general classes of hormones: auxins, cytokinins, gibberellins, ethylene, and abscisic acid.

1. **Auxins**

An auxin, **indole-3-acetic acid (IAA)**, was the first plant hormone identified. It is manufactured primarily in the shoot tips (in leaf primordia and young leaves), in embryos, and in parts of developing flowers and seeds. Its transport from cell to cell through the parenchyma surrounding the vascular tissues requires the expenditure of ATP energy. IAA moves in one direction only—that is, the movement is polar and, in this case, downward. Such downward movement in *shoots* is said to be **basipetal** movement, and in *roots* it is **acropetal**.

2. **Cytokinins**

Named because of their discovered role in cell division (cytokinesis), the cytokinins have a molecular structure similar to adenine. Naturally occurring **zeatin**, isolated first from corn (*Zea mays)*, is the most active of the cytokinins. Cytokinins are found in sites of active cell division in plants—for example, in root tips, seeds, fruits, and leaves. They are transported in the xylem and work in the presence of auxin to promote cell division. Differing cytokinin:auxin ratios change the nature of organogenesis. If kinetin is high and auxin low, shoots are formed; if kinetin is low

and auxin high, roots are formed. Lateral bud development, which is retarded by auxin, is promoted by cytokinins. Cytokinins also delay the senescence of leaves and promote the expansion of cotyledons.

3. Gibberellins

The gibberellins are widespread throughout the plant kingdom, and more than 75 have been isolated, to date. Rather than giving each a specific name, the compounds are numbered—for example, **GA1, GA2**, and so on. **Gibberellic acid three (GA3**) is the most widespread and most thoroughly studied. The gibberellins are especially abundant in seeds and young shoots where they control stem elongation by stimulating both cell division *and* elongation (auxin stimulates only cell elongation). The gibberellins are carried by the xylem and phloem. Numerous effects have been cataloged that involve about 15 or fewer of the gibberellic acids. The greater number with no known effects apparently are precursors to the active ones.

Experimentation with GA3 sprayed on genetically dwarf plants stimulates elongation of the dwarf plants to normal heights. Normal-height plants sprayed with GA3 become giants.

4. Ethylene

Ethylene is a simple gaseous hydrocarbon produced from an amino acid and appears in most plant tissues in large amounts when they are stressed. It diffuses from its site of origin into the air and affects surrounding plants as well. Large amounts ordinarily are produced by roots, senescing flowers, ripening fruits, and the apical meristem of shoots. Auxin increases ethylene production, as does ethylene itself—small amounts of ethylene initiate copious production of still more. Ethylene stimulates the ripening of fruit and initiates abscission of fruits and leaves. In monoecious plants (those with separate male and female flowers borne on the same plant), gibberellins and ethylene concentrations determine the sex of the flowers: Flower buds exposed to high concentrations of ethylene produce carpellate flowers, while gibberellins induce staminate ones.

5. Abscisic acid

Abscisic acid (ABA), despite its name, does not initiate abscission, although in the 1960s when it was named botanists thought that it did. It is synthesized in plastids from carotenoids and diffuses in all directions through vascular tissues and parenchyma. Its principal effect is inhibition of cell growth. ABA increases in developing seeds and promotes dormancy. If leaves experience water stress, ABA amounts increase immediately, causing the stomata to close.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