

**Bachelor of Science (Hons.) in Applied Life Sciences with  
Agrochemicals and Pest Management  
SEMESTER-V**

**BOTANY COMPONENT - DSC**

**DISCIPLINE SPECIFIC CORE COURSE (DSC 05)**

**Credit distribution, Eligibility and Pre-requisites of the Course**

Course title & Code	Credits	Credit distribution of the core course			Eligibility criteria	Pre-requisite of the course (If any)
		Lecture	Tutorial	Practical/ Practice		
<b>Physiology and Biochemistry in Plant Development ALS BOT DSC 05</b>	<b>4</b>	<b>2</b>	<b>0</b>	<b>2</b>	<b>Class 12<sup>th</sup> Pass with Science</b>	<b>NIL</b>

**Learning Objectives:**

The learning objectives of this course are as follows:

- to understand the fundamental concepts of plant physiology and metabolism.
- to identify the role of water, minerals, hormones, and light in plant growth and development.
- to understand the basic biochemical mechanisms and mineral nutrition of plants.
- to identify the criteria for the essentiality of elements.
- to understand the role of hormones in plant growth and development.
- to examine the commercial applications of growth regulators.
- to understand the physiology of flowering and senescence.
- to understand the mechanisms of photosynthesis and respiration.
- to examine the biological nitrogen fixation in plants.

## **Learning Outcomes:**

By studying this course, students will be able to:

- comprehend the physiological processes that occur in plants, including the role of water, minerals, hormones, and light in plant growth and development.
- acquaint the basic biochemical mechanisms of plants, including photosynthesis, respiration, nitrogen metabolism, and chemical regulation of growth and development.
- comprehend the process of biological nitrogen fixation, reproductive physiology and senescence of plants.
- develop practical skills in plant physiology and metabolism.

### **Unit 1: Plant-water relations**

**(3 Hours)**

Water potential and its components, pathway of water movement, ascent of sap, transpiration and its significance, factors affecting transpiration, root pressure and guttation.

### **Unit 2: Mineral Nutrition**

**(3 Hours)**

Essential elements, Macro- and micronutrients, Criteria for essentiality of elements, Methods of studying mineral requirement (Hydroponics, Aeroponics)

### **Unit 3: Translocation in Phloem**

**(3 Hours)**

Composition of phloem sap, girdling experiments, Pressure Flow Model, phloem loading and unloading.

### **Unit 3: Chemical Regulation of Growth and Development**

**(3 Hours)**

Role of hormones in plant growth and development, Commercial applications of growth regulators, Growth retardant and its usefulness

### **Unit 4: Reproductive Physiology and Senescence**

**(3 Hours)**

Photo-periodism and flowering response, Photo-perception and critical photoperiod, Phytochrome and its role in flowering, Vernalization and senescence.

#### **Unit 5: Photosynthesis**

**(7 Hours)**

Historical contributions of Blackman, Emerson, and Hill, Photosynthetic pigments (chlorophyll-a and b, xanthophyll, carotene), Photosystem I and II, reaction center, antenna molecules, Electron transport and mechanism of ATP synthesis, C<sub>3</sub> pathway, C<sub>4</sub> and CAM plants (in brief, no pathways), Photorespiration.

#### **Unit 6: Respiration**

**(5 Hours)**

Glycolysis, Anaerobic respiration, TCA cycle, Oxidative phosphorylation, Glyoxylate cycle, RQ

#### **Unit 7: Nitrogen Metabolism**

**(3 Hours)**

Biological nitrogen fixation - nodulation in detail, Nitrate and ammonia assimilation.

#### **PRACTICAL**

**(60 Hours)**

1. To determine the osmotic potential of plant cell sap by plasmolytic method.
2. Calculate stomatal index and stomatal frequency of a mesophyte and a xerophyte.
3. Study Hill's reaction.
4. To study the effect of the environmental factor light on transpiration by excised twig.
5. Study the effect of light intensity on O<sub>2</sub> evolution in photosynthesis.
6. Compare the rate of respiration in any two parts of a plant.
7. To study the activity of catalase and the effect of pH and heavy metals.
8. Demonstrate the effect of auxin on rooting.
9. Demonstration of Bolting.
10. Demonstration of root respiration.

11. Demonstration of suction due to transpiration
12. A field visit to Hydroponics and Aeroponics facilities.

**Essential/ Recommended readings:**

1. Hopkins, W. G., Huner, N. P. A. (2009) *Introduction to Plant Physiology*, 4<sup>th</sup> edition. New Delhi, Delhi: Wiley India Pvt. Ltd
2. Taiz, L., Zeiger, E., Moller, I. M., Murphy, A. (2018) *Plant Physiology and Development International* 6<sup>th</sup> edition. New York, NY: Oxford University Press, Sinauer Associates.
3. Kochhar, S.L., Kaur, S. and Gujral, S.K. (2020) *Plant Physiology: Theory and Applications*. New Delhi, Delhi: Foundation Books, imprint of Cambridge University Press India Pvt, Ltd.

**Suggestive readings:**

1. Bajracharya, D. (1999) *Experiments in Plant Physiology: A Laboratory Manual*. New Delhi, Delhi: Narosa Publishing House.
2. Bhatla S.C. and Lal, M.A. (2018) *Plant Physiology, Development and Metabolism*, Springer.
3. Salisbury F.B. and Ross C.W. (1992) *Plant Physiology*, 4<sup>th</sup> edition, Wadsworth Publishing Company, California.

**Note:** Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.