Department of Botany

Government Degree College, Baramulla (Autonomous)

Semester 4th **Course: Major/Minor**

Subject: Botany

Course Title: Plant Physiology **Course Code:** BOTC3422M

Credit: Theory: 04; Practical: 02 **Contact Hours: (64 T + 64 P)**

Course Objectives:

The course has been meticulously designed to acquaint and enlighten the students about the key concepts of Plant Physiology, focusing on various functional aspects of plant processes to understand different topics. Special emphasis has been given to the uptake and translocation of water and nutrients, phototropism, and the role of plant growth regulators and photoreceptors.

Learning Outcomes:

At the end of the course, students should have the ability to explain the processes of water, solute, and sugar transport in plants, disorders occurring in mineral deficiency, sugar translocation, and the importance of plant hormones.

UNIT 1: PLANT-WATER RELATIONS AND TRANSPORT **(16 Hours)**

Water and life: Physical and chemical properties of water, Water Potential and its components. Water absorption by roots, pathways of water movement, symplast, apoplast, trans-membrane pathways, Diffusion, osmosis, Imbibition, absorption (SPAC),

Ascent of sap: Vital force Theory, Root Pressure theory, Theory of Capillarity, Cohesion-Tension Theory.

Transpiration: factors affecting transpiration, anti-transpirants, importance of transpiration, guttation, Mechanism of opening and closing of stomata.

UNIT II: MINERAL NUTRITION AND TRANSLOCATION **(16 Hours)**

Mineral Nutrition: Soil as a nutrient reservoir; Essential macronutrients and micronutrients: Role, deficiency and toxicity; Criteria of essentiality of elements; transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, Uniport, co-transport, symport, antiport

Translocation in the phloem: Pressure-Flow Model; Phloem loading and unloading; Source-sink relationship.

UNIT III: PLANT GROWTH REGULATORS **(16 Hours)**

Chemical control of growth and morphogenesis, Hormonal effects on growth and development,

Hormones: Discovery, chemical nature (basic structure) and physiological roles of Auxins, Gibberellins, Cytokinin, Abscisic acid and Ethylene.

Dormancy: Seed and bud dormancy; hormonal regulation.

UNIT IV: PHYSIOLOGY OF FLOWERING **(16 Hours)**

Photoperiodism: Short-day, Long-day and Day-neutral plants, flowering stimulus, florigen concept, vernalization.

Flowering Plants: Annuals, biennials and perennials, Senescence - mechanism and role, Leaf abscission.

Phytochromes: Discovery, role and mechanism of action.

Cryptochromes: discovery, chemical nature, role in photomorphogenesis, mode of action.

Growth: phases and kinetics.

Laboratory Course

1. Determination of osmotic potential of plant cell sap by plasmolytic method.
2. Determination of water potential of given tissue (potato tuber) by weight method.
3. Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.
4. Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of mesophyte and xerophyte.
5. To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).
6. To study the phenomenon of seed germination (effect of light).

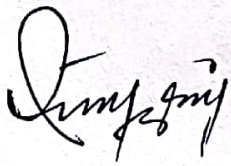
Demonstration experiments

7. To study the induction of amylase activity in germinating barley grains.
8. Bolting.
9. Effect of auxins on rooting.
10. Suction due to transpiration.
11. Respiration in roots.

Suggested Readings

1. Introduction to Plant Physiology by Hopkins, W.G. and Huner, A. (2008) John Wiley and Sons. U.S.A. 4th Edition.
2. Plant Physiology and Development by Taiz, L., Zeiger, E., Miller, I.M. and Murphy, A (2015). Sinauer Associates Inc. USA. 6th Edition.

3. Experiments in Plant Physiology-A Laboratory Manual by Bajracharya D. (1999) Narosa Publishing House, New Delhi.
4. Plant Physiology and Biochemistry and Biotechnology, by Shrivastava, H.S. and Shankar, N. (2019 Rastogi Publications, Shivaji Road, Meerut India.
5. A textbook of Plant Physiology by Verma, V (2007) Emkay Publications, Swami Dayanand Marg, New Delhi
6. Plant Physiology and Metabolism by Arora, B.B. (2018) Modern Publishers
7. Fundamentals of Plant Physiology by Jain, V.K. (2011) S. Chand Publications, 7361, Ram Nagar, New Delhi



Department of Botany

Government Degree College, Baramulla (Autonomous)

Semester 4th **Course: Major/Minor**

Subject: Botany

Course Title: Economic Botany **Course Code:** BOTC1422M

Credit: Theory: 04; Practical: 02 **Contact Hours: (64 T + 64 P)**

Course Objectives

The course has been designed to describe the centers of origin, domestication, morphological attributes, cultivation, nutritional attributes; breeding and improvement of important crop plants. Topics of those crop plants have been prescribed, which are known to be useful or those which may have potential uses but have so far remained underutilized. The course also encompasses the importance of major spice crops used in India along with their description and uses. It explains the morphology, processing and uses of non-alcoholic beverages-tea and coffee. Morphological description and uses of major oil yielding (cotton and jute) crops of India are also included. Laboratory work includes demonstrations and practical experiments about useful crop plants. Field exercises will include trips to local farms and orchards that feature economically important plants.

Learning Outcomes

At the end of the course, students will explore the scientific research of plants and the relationship between plants and people. The students will understand the origins of agriculture, and the utility of important crop plants, spices, herbal medicines and important plant resources such as wood, rubber, latex, tannins, dyes, fibers, resins, oils and waxes.

Unit 1: Origin of Cultivated Plants **(16 Hours)**

Concept of Centres of Origin of Plants, major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.

Unit 2: Cereals, Legumes and Woods **(16 Hours)**

Origin, morphology and uses of *Triticum aestivum* (Wheat), *Zea mays* (Maize) *Oryza sativa* (Rice), *Glycine max* (Soy bean), *Pisum sativum* (Pea), *Pinus* sp., *Cedrussp* sp., *Populus* sp.

Unit 3: Sources of Sugars, Starch and Oils **(16 Hours)**

Morphology, processing and uses of *Saccharum officinarum* (sugarcane), *Beta vulgaris* (Beetroot), *Solanum tuberosum* (Potato) *Brassica campestris* (Mustard) and *Arachis hypogaea* (peanut), *Rosa* sp., *Lavendula* sp.

Unit 4: Spices, Drugs, Beverages and Fibres **(16 Hours)**

Listing of important spices, their family and part used. Economic importance with special reference to *Foeniculum vulgare* (fennel), *Crocus sativus* (saffron), and *Capsicum annum* (chillies)

Important drug yieliding plants in Kashmir, Morphology and uses of *Digitalis* sp., *Papaver* sp., and *Cannabis* sp.

Morphology, processing & uses of *Camellia sinensis* (Tea) and *Coffea arabica* (coffee), *Gossypium* sp. (Cotton)

Laboratory Course (2 Credits)

1. **Cereals:** Wheat (habit sketch, L. S/T.S. grain, Rice (habit sketch, study of paddy and grain).
2. **Legumes:** Soybean, Groundnut, (habit, fruit, seed structure).
3. **Sources of sugars and starches:** Potato and Beet root (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains).
4. **Spices**: Fennel and saffron (habit and sections).
5. **Sources of oils and fats:** Mustard–plant specimen, seeds; tests for fats in crushed seeds
6. **Essential oil-yielding plants:** Habit sketch of *Rosa* sp.
7. **Drug-yielding plants:** Specimens of *Digitalis* sp., *Papaver* sp. and *Cannabis* sp.
8. **Woods:** *Pinus* sp. and *Cedrus* sp: Specimen, Section of young stem.
9. **Botanical Trip**

Suggested Readings

1. Economic Botany in Tropics, by Kochhar, S.L. (2012) 4th Edn.,MacMillan & Co., New Delhi, India.

2. Economic Botany: Principles & Practices by Wickens, G.E. (2006) 3rd Edn., Kluwer Academic Publishers, The Netherlands.

3. Economic Botany by Panday., B.P. (1999) 5th Edn., S.Chand & Company, New Delhi

4. Ecology and Utilisation of Plants by P.D. Sharma (2023) 13th Edn., Rastogi Publications, Meerut

5. Economic Botany by O.P.Sharma, (2006) 1st Edn., Tata Mcgraw-Hill Publishing Company Limited, New Delhi

6. Economic Botany by S. Sen (2016) 1st Edn, New Central Book Agency Limited, Calcutta.

7. A Text Book of Modern Economic Botany by Sambamurthy, A.V.S.S. and Subrahmanyam, N.S., (2008) 1ST Edn., CBS Publishers and Distributers.

Department of Botany

Government Degree College Baramulla (Autonomous)

SEMESTER – 4th **COURSE: MAJOR**

SUBJECT: BOTANY

Course Title: Plant Pathology **Course Code:** BOTC2422M

(CREDITS (4+2): Theory– 04, Practicals -02) Contact Hours: 64(T) + 64(L)

Part 1: Theory = (4 Credits)

Course Objectives:

To develop an insight into disease resistance mechanism in plants.
To learn about parasitism and pathogenicity in relation to plant disease.
To gain the knowledge of symptomatology of different plant diseases caused by Fungi, Bacteria, Viruses, Mollicutes and Nematodes.
To study the biological, physiological and chemical methods of control/ management of plant diseases.

Learning Outcomes: *At the end of the course, you should be in a position to explain the causal organisms/ entities responsible for various plant diseases, the visible symptoms and the nature of the disease produced, including the extent of economic losses incurred and the various management strategies adopted to control the crop diseases.*

Unit I

The concept of diseases in plants; Environmental factors affecting the development of plant disease; Infection, colonization and symptom development. Parasitism and Pathogenicity. Enzymes and toxins in relation to plant disease. Mechanism of resistance; Phytoalexins.

Unit II

Disease Symptoms, etiology and control of important fungal diseases (Apple scab, powdery mildews of grapes, downy mildew of vegetables, early and late blight of potato, paddy blast, apple rot, damping off of vegetables).

Unit III

Symptomology and control of diseases with special reference to Viral (TMV, sugarcane mosaic virus, cauliflower mosaic virus), Bacterial (bacterial crown gall of ornamentals, fire blight of apples, citrus canker) and Nematodal (root knot) infections.

Unit IV

General principles of plant quarantine; Cultural, biological, physical and chemical methods of plant disease control. Disease control by immunizing or improving resistance of the host; integrated disease management.

Practicals/Tutorials (2 Credits)

1. Presentations on different Plant Diseases in Kashmir

2. Review of Literature of important crop diseases

3. Visit to various centers of plant research of Kashmir.

Suggested Readings

1) Plant Pathology by E. J. Butler and S.G. Jones: Mac Millan & Co Ltd., London, 5th Edn.,(2005)

2) Plant Pathology by G.N. Agrios: Elsevier, 6th Edn., (2006)

3) Plant Pathology by R.S. Singh. Oxford & IBH Publishing Co. Pvt Ltd New Delhi. 5th Edn., (2017)

4) Plant Diseases by R.S. Mehrotra. McGraw Hill Education, 2nd Edn., (2013).,

5) Plant Pathology by B.P. Pandey S.Chand. 5th Edn., (2017).