SEMESTER IV

Complementary course 4 Code: BO4CMT04

ANATOMY AND APPLIED BOTANY

(Theory 54 hrs; Practical 36 hrs; Credits 3 + 1)

Objectives:

- Understand different types of plant tissues.
- Understand the internal structure of different plant organs with reference to their functions.
- Understand the process of normal and anomalous secondary thickening in plants.
- Know the morphological and anatomical adaptations of plants growing in different habitats.
- Understand how botanical knowledge could be applied for crop improvement.

PLANT ANATOMY (27 hrs)

Module 1: Cells and tissues (9 hrs)

Gross structure of primary and secondary cell walls; structure and function of plasmodesmata; non-living inclusions - cystolith, raphides; Tissues – meristematic and permanent, types of meristems; simple and complex tissues, secretory tissues (nectaries, hydathodes, mucilage ducts and lactiferous tissue).

Module 2: Anatomy of plant organs (12 hrs)

Primary structure of stem and root in dicots and monocots; anatomy of monocot and dicot leaf. Secondary thickening in dicot stem and dicot root, heart wood and sap wood; tyloses; hard wood and soft wood; growth rings, dendrochronology. Anomalous secondary thickening in *Bignonia*.

Module 3: Ecological anatomy (6 hrs)

Study of the morphological and anatomical adaptations of the following groups: Hydrophytes – *Nymphaea*, Hydrilla; Xerophytes – *Nerium;* Epiphytes - *Vanda*.

APPLIED BOTANY: Plant breeding, Horticulture and Micropropagation (27 hrs)

Module 4: Plant breeding (12 hrs)

Objectives of plant breeding, methods of plant improvement - plant introduction, acclimatization, plant quarantine; selection - mass selection, pureline selection and clonal selection; hybridization - intervarietal, interspecific and intergeneric; procedure of hybridization.

Module 5: Artificial vegetative propagation methods (5 hrs)

Propagation of plants through cutting, layering - air layering; budding T and patch budding; grafting - tongue and splice grafting. Role of cambium in budding and grafting.

Module 6: Plant tissue culture (10 hrs)

Principles of tissue culture, micropropagation - different steps - selection of explants, culture media – general composition and preparation; sterilization of media and explants; callus. Regeneration of plants: organogenesis, somatic embryogenesis; artificial seeds. Applications of plant tissue culture.

PRACTICAL (36 hrs)

1. Primary structure of stem and root of dicots and monocots; Dicot stem - Centella; Monocot stem – Bamboo, grass, asparagus; Dicot root - Tinospora; Monocot root - Colocasia, Musa.
2. Structure of dicot stem and dicot root after secondary thickening; Stem - Vernonia, Eupatorium; Root - Tinospora, Papaya.

3. Anomalous secondary thickening in *Bignonia.*
4. Anatomical adaptations of Hydrophytes - *Nymphaea* petiole, *Hydrilla* stem; Xerophytes - *Nerium* Leaf; Epiphytes - Velamen root of *Vanda*.
5. Emasculation of pea or *Caesalpinia* flower.
6. Demonstrate T and patch budding.
7. Demonstration of tissue culture techniques: culture media, surface sterilization and inoculation of explants.
8. Identification of non living inclusions - cystolith, raphides.

REFERENCES

1. Christopher E P, 1958. *Introductory Horticulture*. McGraw – Hill, New York.
2. Esau K, 1965. Plant Anatomy. Wiley, New York.
3. Fahn A, 1985. *Plant Anatomy*. Pergamon Press, Oxford.
4. Hartman H T, D E Kester, 1991. *Plant Propagation: Principles and Practices*. Prentice Hall of India, New Delhi.
5. Kumar N, 1994. *Introduction to Horticulture*. Rajalakshmi Publications, Nagercoil.
6. Pandey B P, 1984. *Plant Anatomy*. S Chand and Company, New Delhi.
7. Vasishta V C, 1978. *Plant Anatomy*. S Nagin and Company, Jalandhar.

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