

Paper 13-BTHT 405: PLANT DEVELOPMENT AND ANATOMY

THEORY

Marks: 100

Unit 1: Plant Sporophyte:

(Ch 16 Taiz & Zeiger)

A bipolar structure; Onset of polarity; Cytodifferentiation and organogenesis during embryonic development; physiological and genetic aspects.

Unit 2: Introduction and scope of Plant Anatomy

(Ch 1 Fahn) (2 Periods)

Applications in systematics, forensics and pharmacognosy.

Unit 3: Tissues and Cell Walls

(Ch 1 Dickinson) (12 Periods)

Classification and structure of tissues; cytodifferentiation of tracheary elements and sieve elements; pits and plasmodesmata; wall ingrowths and transfer cells; adcrustation and incrustation; ergastic substances.

Unit 4: Stem

(Ch 11 Fahn) (8 Periods)

Organization of shoot apex (apical cell theory, histogen theory, tunica corpus theory, plastochrone); shoot chimeras; types of vascular bundles; primary phloem and primary xylem; terminal, lateral and adventitious buds; primary thickening meristem.

Unit 5: Leaf

(Ch 12 Fahn) (6 Periods)

Development of leaf, histology of C₃ and C₄ leaves; stomatal complex and diversity of stomata, scale leaves.

Unit 6: Root

(Ch 13 Fahn) (7 Periods)

Organization of root apex (apical cell theory, histogen theory, korper-kappe theory); quiescent centre; root cap; primary root tissue: rhizodermis, cortex, endodermis, exodermis, metacutinization, lateral root apices; secondary growth in roots.

Unit 7: Vascular Cambium

(Ch 14 Fahn) (6 Periods)

Structure and function; concept of cambial zone; cambial derivatives; seasonal activity of cambium and unusual cambial activity.

Unit 8: Secondary Growth

(Ch 4 Dickinson) (6 Periods)

Axially and radially oriented xylary and phloic elements, cyclic aspects, juvenile adult and reaction woods; sap wood and heart wood; Phloem as a dynamic tissue.

Unit 9: Periderm

(Ch 4 Dickinson) (4 Periods)

Development and composition of periderm, rhytidome and lenticels.

Unit 10: Adaptive and Protective Systems

(Ch 8 Dickinson) (5 Periods)

Epidermal tissue system (cuticle, epicuticular waxes, trichomes); Anatomical adaptations in stems, leaves and roots of xerophytes, hydrophytes and halophytes.

Unit 11: Secretory and Excretory System

(4 periods)

Hydathodes, salt glands, nectaries; cavities, lithocysts and laticifers. (Ch 11 Dickinson)

BTHP 405: PLANT DEVELOPMENT AND ANATOMY

PRACTICALS

Marks: 50

1. Familiarization with techniques: double staining, maceration, peel mount, clearing.
2. Study of anatomical details through permanent slides/temporary stain mounts/macerations/Museum specimens with the help of suitable examples.
3. Apical meristem of root and shoot, vascular cambium and intercalary meristem.
4. Distribution and types of parenchyma, collenchyma and sclerenchyma.
5. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres; xylem parenchyma.
6. Wood: ring porous; diffuse porous; tyloses; heart-and sapwood.
7. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.
8. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular.
9. Root: monocot, dicot, origin of lateral roots; secondary growth; anomalous root structure.
10. Stem: monocot, dicot - primary and secondary growth; periderm; lenticel; abnormal secondary growth in dicots and monocots;
11. Leaf: isobilateral, dorsiventral, C₄ leaves (Kranz anatomy); venation patterns.
12. Adaptive Anatomy: xerophytes, hydrophytes, parasites and epiphytes.
13. Secretory tissues: ducts and cavities, lithocytes and laticifers.

SUGGESTED READINGS

1. Dickinson, W.C. 2000 Integrative Plant Anatomy. Harcourt Academic Press, USA.
2. Fahn, A. 1974 Plant Anatomy. Pergmon Press, USA and UK.
3. Mauseth, J.D. 1988 Plant Anatomy. The Benjamin/Cummings Publisher, USA.
4. Esau, K. 1977 Anatomy of Seed Plants. Wiley Publishers.
5. Taiz, L. & Zeiger, E. 2006 Plant Physiology. (4th edition) Sinauer Associates, Inc. Sunderland, M.A.

Paper 14-BTHT 406: PLANT ECOLOGY AND PHYTOGEOGRAPHY

THEORY

Marks: 100

Unit 1: Introduction to the Biosphere

(Odum) (2 Periods)

Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.

Unit 2: Soil

(Odum)(8 Periods)

Importance, origin, formation, composition; physical, chemical and biological components; soil profile; role of climate in soil development.

Unit 3: Water

(Odum) (4 Periods)

Importance; states of water in the environment; atmospheric moisture; precipitation types; water in soil, water table, water bodies: aquifers, water shed.

Unit 4: The Atmosphere

(Odum) (5 Periods)

Composition and stratification; radiation flux; role of electromagnetic radiations, UV, visible spectrum; variations in temperature; wind as a factor.

Unit 5: The Living World

(Odum) (2 Periods)

Biotic component of environment; types of biotic interactions.

Unit 6: Fire

(Odum) (1 Period)

As an ecological factor.

Unit 7: Levels of Organisation

(Odum) (3 Periods)

Individual, population, community; concepts of autecology, synecology; concept of biological diversity; habitat and ecological niche.

Unit 8: Population Ecology

(Chapter 8,9, pp 122-165, Singh et al.) (3 Periods)

Distribution and characteristics of population; population dynamics; Ecological Speciation. **Unit 9:**

Plant Communities

(Chapter 11, pp 166- 219, Singh et al.) (5 Periods)

Community characters (analytical and synthetic), ecotone and edge effect; methods of studying vegetation; dynamics of communities; plant succession, processes, types; primary and secondary succession; climax concepts.

Unit 10: Ecosystems

(Chapter 13, pp 238-252, Singh et al.) (8 Periods)

Structure, biotic and the abiotic components; processes within ecosystem; trophic organization, basic source of energy, autotrophy, heterotrophy, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.

Unit 11: Functional aspects of Ecosystem (Chapter 12, 14- 17, Singh et al.) (10 Periods)

Energy flow; principles, grazing and detritus food chains, models of energy flow; ecosystem productivity, measurement of productivity; ecological efficiencies and concept of energy subsidy; biogeochemical cycles; dynamics: hydrologic cycle; gaseous cycles, sedimentary cycles.

Unit 12: Diversity of Ecosystems and Biomes (Chapter 18, Singh et al.) (4 Periods)

Aquatic: fresh water (lotic and lentic), marine (pelagic and benthic), estuarine; major terrestrial biomes: tundra, temperate and tropical.

Unit 13: Phytogeography (5 Periods)

Principles of phytogeography; endemism; hotspots; phytogeographical divisions of India: vegetation of Delhi.

BTHP 406: PLANT ECOLOGY AND PHYTOGEOGRAPHY

PRACTICALS

Marks: 50

1. Study of following microclimatic variables in different habitats: soil and air temperature, wind velocity, relative humidity, rainfall and light intensity.
2. Permeability (percolation; total capacity as well as rate of movement) of different soil samples.
3. Saturation capacity and field capacity of different soil samples and rapid test for texture of soils.
4. Density and porosity and rate of infiltration of water in undisturbed soils.
5. pH and rapid field tests of soils for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency.
6. Soil organic matter in different soil samples by titration method.
7. Determination of minimal area of quadrat size by species area curve method.
8. Quantitative analysis of herbaceous vegetation for frequency; density and abundance.
9. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.
10. Morphological adaptations of hydrophytes and xerophytes.

SUGGESTED READINGS

1. Singh, J.S., Singh, S.P. and Gupta, S. (2006) Ecology Environment and Resource Conservation. Anamaya Publications, New Delhi
2. Wilkinson, D.M. (2007). Fundamental Processes in Ecology. An Earth System Approach. Oxford.
3. Daubenmier, R.F. (1970). Plants and Environment: A text book of Plant Autoecology, Wiley Eastern Private Limited
4. Daubenmier, R.F. (1970), Plant Communities, Wiley Eastern Private Limited
5. Odum, E. (2008) Ecology. Oxford and IBH Publisher.
6. Sharma, P.D. (2010) Ecology and Environment, (8th Ed.) Rastogi Publications, Meerut.

Paper 15-CBHT 402: CELL BIOLOGY-II

THEORY

Marks: 100

Unit 1. The Plasma Membrane

(Ch 13 Cooper *et al.*)

Structure; Transport of small molecules, Endocytosis

Unit 2. Cell Wall, the Extracellular Matrix and Cell Interactions

(Ch 14 Cooper *et al.*)

Bacterial and Eukaryotic Cell Wall; the extracellular matrix and cell matrix interactions; cell-cell interactions.

Unit 3. Cell Signaling

(Ch 15 Cooper *et al.*)

Signaling molecules and their receptor; functions of cell surface receptors; Intracellular signal transduction pathway; signaling networks.

Unit 4. The Cell Cycle

(Ch 16 Cooper *et al.*)

Eukaryotic Cell Cycle, Regulation of Cell cycle progression, Events of Mitotic Phase, Meiosis and Fertilization.

Unit 5. Cell Death and Cell Renewal

(Ch 17 Cooper *et al.*)

Programmed Cell Death, Stem Cells and Maintenance of adult tissues, Embryonic Stem Cells and Therapeutic cloning.

Unit 6. Cancer

(Ch 18 Cooper *et al.*)

Development and Causes of Cancer, Tumor Viruses, Oncogenes, Tumor Suppressor genes, Cancer Treatment- molecular approach.

CBHP 402: CELL BIOLOGY-II

PRACTICALS

Marks: 50

1. To demonstrate the presence of mitochondria in striated muscle cells/ cheek epithelial cell using vital stain Janus Green B.
2. Study of polyploidy in Onion root tip by colchicine treatment.
3. Preparations of temporary mount of Grasshopper testis / onion flower bud anthers and study the different stages of Meiosis.
4. Study of mitosis and meiosis from permanent slides.
5. Identification and study of cancer cells- Slides/Photomicrographs.

SUGGESTED BOOKS

1. Karp, G. 2010 Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006 Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Cooper, G.M. and Hausman, R.E. 2009 The Cell: A Molecular Approach. 5th edition. ASM Press & Sunderland, Washington, D.C.; Sinauer Associates, MA.
4. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.

Paper 16-MBHT 402: MOLECULAR BIOLOGY-II

THEORY

Marks: 100

Unit 1. Mechanism of Transcription

(Ch 12 Watson/ Ch 21 Becker)

RNA Polymerase and the transcription unit

Transcription in Prokaryotes

Transcription in Eukaryotes

Unit 2. RNA Modifications

(Ch 13 Watson)

Split genes, concept of introns and exons, removal of Introns, spliceosome machinery, splicing pathways, alternative splicing, exon shuffling, RNA editing, and mRNA transport.

Unit 3. Translation (Prokaryotes and Eukaryotes) DeRobertis)

(Ch 14 Watson/ Ch 22 Becker/ Ch 21

Assembly line of polypeptide synthesis - ribosome structure and assembly, various steps in protein synthesis. Charging of tRNA, aminoacyl tRNA synthetases. Proteins involved in initiation, elongation and termination of polypeptides. Fidelity of translation. Inhibitors of protein synthesis.

Regulation of translation

Translation-dependent regulation of mRNA and Protein Stability.

Unit 4. Transcription Regulation in Prokaryotes

(Ch 16 Watson)

Principles of transcriptional regulation, regulation at initiation with examples from *lac* and *trp* operons

Unit 5. Transcription Regulation in Eukaryotes

(Ch 17 Watson)

Conserved mechanism of regulation, Eukaryotic activators, Signal integration, combinatorial control, transcriptional repressors, signal transduction and control of transcriptional regulator, Gene Silencing

Unit 6. Regulatory RNAs

(Ch 18 Watson)

Riboswitches, RNA interference, miRNA, siRNA, Regulatory RNA and X-inactivation

MBHP 402: MOLECULAR BIOLOGY-II

PRACTICALS

Marks: 50

1. Preparation of culture medium (LB) for *E.coli* (both solid and liquid) and raise culture of *E.coli*.
2. Demonstration of antibiotic resistance. (Culture of *E.coli* containing plasmid (pUC 18/19) in LB medium with/without antibiotic pressure and interpretation of results).
3. Isolation and quantitative estimation of salmon sperm / calf thymus DNA using colorimeter (Diphenylamine reagent) or spectrophotometer (A260 measurement).
4. To perform Ames test in *Salmonella* / *E.coli* to study mutagenicity.

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1. Karp, G. 2010 Cell and Molecular Biology: Concepts and Experiments. 6th edition. John Wiley & Sons. Inc.
2. De Robertis, E.D.P. and De Robertis, E.M.F. 2006 Cell and Molecular Biology. 8th edition. Lippincott Williams and Wilkins, Philadelphia.
3. Becker, W.M., Kleinsmith, L.J., Hardin. J. and Bertoni, G. P. 2009 The World of the Cell. 7th edition. Pearson Benjamin Cummings Publishing, San Francisco.
4. Watson, J. D., Baker T.A., Bell, S. P., Gann, A., Levine, M., and Losick, R., 2008 Molecular Biology of the Gene (6th edition.). Cold Spring Harbour Lab. Press, Pearson Pub.