

Jankidevi Bajaj College of Science, Wardha
Semester Pattern Syllabus
FOR B Sc. BOTANY
Session 2018-19

Semester – III

Angiosperms Taxonomy, Cell Biology, Plant Breeding and Plant Microtechnique
(60 Hours)

Unit I Origin, Systematics and Biodiversity **(10)**

- 1.1 Origin of Angiosperms (Benettitalean theory) & Phylogeny
- 1.2 Angiosperm Floras, Herbaria, keys (Indented and Bracketed), Valid publication
- 1.3 Modern tools in Taxonomy in relation to Morphology, Anatomy and Cytology
- 1.4 Concept and significance of Biodiversity

Unit II Classification and Study of Families **(10)**

- 2.1 Classification of Angiosperms: Natural, Artificial and Phylogenetic systems.
- 2.2 Systems: Bentham & Hooker and Engler & Prantl (with merits and demerits),
- 2.3 Dicotyledons : Malvaceae, Fabaceae (Papilionoideae, Caesalpinioideae, Mimosoideae) Asteraceae, Asclepiadaceae, Euphorbiaceae
- 2.4 Monocotyledons : Liliaceae, Poaceae

Unit III Cell Biology I **(10)**

- 3.1 Typical plant cell - Prokaryotic and Eukaryotic
- 3.2 Ultrastructure & functions of: Cell wall & Cell Membrane (Fluid mosaic model)
- 3.3 Ultrastructure & functions of: Nucleus & Endoplasmic reticulum (RER and SER)
- 3.4 Ultrastructure & functions of: Golgi complex, Ribosomes, lysosomes, Peroxisomes, Mitochondria & Chloroplasts

Unit IV Cell Biology II **(10)**

- 4.1 Chromosome structure: Morphology (chromatid, chromomere, centromere, telomere, secondary constriction, satellite, karyotype)

- 4.2 Sex Chromosomes in plants: XY type in *Melandrium*
4.3 Cell division in plants: Mitosis, Meiosis and its significance.

Unit V Plant Breeding

(10)

5.1 Plant Breeding- Definition and objectives

5.2 Hybridization (emasculation, bagging, crossing, labelling)

5.3 Colonial selection, Heterosis (Definition and scope)

5.4 Biostatistics - Mean, Mode, Median, Standard deviation, Standard error, Students t-test

Unit VI Plant Micro-techniques

(10)

(a) Staining Plant Materials

- 6.1 Staining procedures, classification and chemistry of stains. Staining equipment.
6.2 Reactive dyes and fluorochromes (including genetically engineered protein labeling with GFP and other tags).
6.3 Cytogenetic techniques with squashed and smeared plant materials.

(b) Methods to study plant cell / Tissue Structure

- 6.4 Whole mounts, peel mounts, clearing, maceration and sectioning;
6.5 Tissue preparation: living vs fixed, physical vs chemical fixation, coagulating fixatives, no coagulant fixatives; tissue dehydration using graded solvent series;
6.6 Paraffin and plastic infiltration; Preparation of thin and ultrathin sections.

List of Practicals

Study of Families covered in the theory portion.

Study of fossil Angiosperms micropreparation and specimens: *Saharianthus*, *Enigmocarpon*

Study of Cell organelles with the help of photographs/ Slides

Study of mitosis in plant material

Study of meiosis in plant material

Study of hybridization (Emasculation, bagging crossing & labeling)

To calculate Mean, Mode, Median, standard error from the given data (At least 10 problems to be solved)

To calculate the study of t-value from the given data (At least 10 problems to be solved)

* To prepare different laboratory stains.

To study different staining equipments.

To study procedure for staining different plant materials.

To study methods of fixation preservation and clearing.

To study the methods of paraffin and plastic infiltration.

To study maceration and sectioning of infiltrated materials.

Botanical Excursions (Two short or One long out of the state is compulsory).

Suggested Readings:

Bhojwani, S. S. and Bhatnagar, S. P. 2000. The Embryology of Angiosperms. Vikas Publishing House, Delhi.

Hartman, H. T. and Kestler D.E. 1976. Plant Propagation :Principles and Practices, 3rd Edn. Prentice- Hall of India Pvt. Ltd. New Delhi.

Proctor, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Son, London.

Jeffrey, C. 1983. An Introduction of plant Taxonomy. Cambridge University Press, Cambridge, London.

Radford, A.E. 1986 Fundamentals of plant systematic. Harper And Row, New York.

Ugemuge, N. R. 1986. Flora of Nagpur District. Shree Prakashan, Nagpur.

Dutta, S. C. 1989. Systematic Botany. Wiley Eastern Co. Naik, V. N.- Taxonomy of Angiosperm.

Ruzin, S.E. (1999). Plant microtechnique and microscopy. Oxford University Press, New York, U.S.A.

**Semester III
Practical Examination
Question Paper**

Time : 5 hrs

Marks : 30

- Q. 1) Describe in technical language the given Angiospermic material [A]. Classify & Identify the Family giving reason **06**
- Q. 2) Write floral formula and Draw Floral Diagram of the given flower [B] **03**
- Q. 3) Prepare semi-permanent squash /smear of given material [C] & Identify the stage of cell division **05**
- Q. 4) To solve the given problem of biostatistics **04**
- 5) Spotting: **06**
- D. Fossil angiosperm E. Cytology F. Cell organells (photocopy)
- G. Taxonomy H. Plant Microtechnique I. Plant Cell/Tissue structure
- Q. 6) Viva-voce **03**
- Q. 7) Practical Record & Excursion Report **03**

Semester – IV
Anatomy, Embryology, Genetics, Molecular Biology & Plant Analytical techniques
(60 Hours)

Unit I Anatomy (10)

- 1.1 Meristems: Types, Apical cell , tunica-carpus & Newman theory
- 1.2 Primary structure of stem and root in dicot (Sunflower) & monocot (*Maize*)
- 1.3 Types of vascular bundles in dicots and monocots;
- 1.4 Secondary growth (Sunflower stem) & anomalous growth in *Bignonia* and *Dracena* stem.
- 1.5 Anatomy of leaf: Dicot (*Nerium*), monocot (*Maize*).

Unit II Embryology (10)

- 2.1 Pollination: Types and adaptation, significance
- 2.2 Microsporogenesis, male gametophyte,
- 2.3 Megasporogenesis :Types of ovules, female gametophyte (*Polygonum* type)
- 2.4 Double fertilization and triple fusion, endosperms and its types,
- 2.5 Structure of dicot (*Onagrad*) and monocot embryo.

Unit- III Genetics I (10)

- 3.1 Interaction of genes: Incomplete dominance (1:2:1 ratio in *Mirabilis jalapa*); Complementary (9:7 ratio) and Dominant epistasis (12:3:1 ratio)
- 3.2 Linkage: Definition, Theory of linkage (Coupling and Repulsion theory), types (complete and incomplete), significance
- 3.3 Extra-nuclear Genome- Mitochondrial DNA and Chloroplast DNA

Unit- IV Genetics II (10)

- 4.1 Crossing over: Definition, theories (Breakage and reunion), significance
- 4.2 Variation in chromosome number: Polyploidy (auto- and allo-), aneuploidy (nullisomics, monosomics, trisomics and tetrasomics), significance.
- 4.3 Structural changes in chromosome: deficiency, duplication, inversion translocation & their significance.
- 4.4 Concept of gene; Structure of eukaryotic gene, overlapping gene

Unit- V Molecular Biology (10)

5.1 DNAPackaging – Nucleosome ; DNA damage and repair: Photoreactivation, excision

repair. Satellite and repetitive DNA,

5.2 Gene expression in prokaryotes: Transcription and translation; Regulation of gene expression (Lac operon model).

5.3 Mutation: Types, Mutagens, Applications of induced mutations in crop improvement.

5.4 Transposable element in plants (AC-DS system)

Unit VI: Plant Analytical techniques

(10)

(a) Analytical Pharmacognosy

6.1 Drug adulteration - types, methods of drug evaluation

6.2 Biological testing of herbal drugs - Phytochemical screening tests for secondary metabolites (alkaloids, flavonoids, steroids, triterpenoids, phenolic compounds).

(b) Herbal Cosmetics & Medicines

6.3 Methods of Herbal extraction:- Maceration, digestion, Decoction, extracts and tinctures

6.4 Herbal Preparations: Churna, Asava, Arishta Products & uses of Aloe, Amla, Adathoda, Neem, Rose, Turmeric & Ginger.

List of Practicals-

Study of simple tissue, complex tissue and secretory tissue from permanent slides

Study of types of vascular bundles

Study of internal structure of dicot and monocot root using hand section and prepare temporary mounts -Sunflower, Maize

Study of internal structure of dicot and monocot stem using hand section and prepare temporary mounts -Sunflower, Maize.

Study the growth ring in woods-Teak wood

Study of internal structure of secondary growth and anomalous secondary growth using hand section and prepare permanent micropreparations - *Bignonia* stem and *Dracena* stem.

Study of internal structure of leaves- *Nerium*, Maize

Study of types of ovules, stamens anther structure, pollen grains, adaptations for pollination,

To calculate the percent pollen germination in the given specimen

To prove the Mendel's law of segregation with the help of coloured beads.

To prove the Mendel's law of independent assortment with the help of coloured beads.

From the given data workout the type of gene interaction in the given cross.

*To study different methods of identification of drug adulteration.

To study the methods of biological testing of herbal drugs.

To study the screening tests for secondary metabolites.

Identification of useful herbal plants.

To study different methods of herbal extractions.

To prepare different products. (Churna, Asava, Arishta)

Botanical Excursions (One short tour is compulsory).

Suggested Readings:

Cutter, E. G. 1971. Plant Anatomy Experiment and Interpretation. Part II. Organs. Edward Arnold, London.

Esau, K. 1979 Anatomy of seed Plants, 2nd Edn. John Wiley and Sons New

York Fahh, A. Plant Anatomy, 2nd Edn. Pergamon Press, Oxford.

Alberts, B. D. Bray, J Lewis, M. Raff K, Roberts, and J. D. Watson [1999] Molecular Biology of the Cell (Garland Publishing Co. Inc. N.Y.)

Gardner, E. J., M. J Simmond, and D. P. Snustadt(1991) :Principles of Genetics, 8'h ed (John Wiley and Sons, Inc N. Y.)

Gupta, P.K.[1999] : A Text Book of cell and Molecular Biology (Rastogi Publications, Meerut India)

Hawkms, J. D. [1991] : Gene Structure and Expression 2nd ed (Cambridge University Press Cambridge U.K.)

Kleinsmith, L. J and V. M. Kish [1995] : Principles of cell and Molecular Biology, 2"d ed. Harper Collins college pubs.

Snustad, D. P. and M. J. Simmons [2000] : Principles of Genetics (John Wiley and sons, USA) Freifelder, D [1990] : Essentials of Molecular Biology (Narosa Publishing House, New Delhi, Madras)

Watson, J. D. Hopkins, Roberts, Steitz, Weiner [1987U Molecular Biology of Gene. Benjamin Cummings Pub. Co. Sherman)

Cooper, G. M. [1997] : The Cell" A Molecular Approach (Oxford Univ. Press)

Kumar, H. D. [1991] : A text book of Cytology, Genetics and Evolution[1991] : A Text Book Cytology, Genetics and Evolution (Kalyani Publisher, New Delhi)

Lewin, G. [2000] : Gene VII (John Wiley and Sons, N. Y.)

Lodish, H. A. Berk, S. L. Zipursky, P Matudaira , D. Baltimore and Jm Damell [2000] :Molecular cell Biology (W. H. Freeman and Co. N. Y.)

Russel, P. J. [1998] : Genetics (The Benjamin/ Cummings publishing Con. Inc. USA

Kumar, H. D. [1991] : A text book of Cytology, Genetics and Evolution[1991] : A Text Book Cytology, Genetics and Evolution (Kalyani Publisher, New Delhi)

Karp, G [1961: Cell and Molecular Biology- Concepts and Experiments (John Wiley and Sons Inc.)

Gupta PK (2007) Genetics: Classical to Modern. Rastogi Publications, Meerut

Vyas SP and Mehta A (2011) Cell and Molecular Biology. CBS Publ. and Dist. Pvt. Ltd., New Delhi

Glossary of Indian medicinal plants, R.N.Chopra, S.L.Nayar and I.C.Chopra, 1956. C.S.I.R, New Delhi.

The indigenous drugs of India, Kanny, Lall, Dey and Raj Bahadur, 1984. International Book Distributors.

Herbal plants and Drugs Agnes Arber, 1999. Mangal Deep Publications.

Ayurvedic drugs and their plant source. V.V. Sivarajan and Balachandran Indra 1994. Oxford IBH publishing Co.

Ayurveda and Aromatherapy. Miller, Light and Miller, Bryan, 1998. Banarsidass, Delhi.

Principles of Ayurveda, Anne Green, 2000. Thomsons, London.

Pharmacognosy, Dr.C.K.Kokate et al. 1999. Nirali Prakashan.

Semester IV
Practical Examination
Question Paper
Time : 5 hrs
Marks : 30

- Q. 1) Prepare temporary mount of the given material [A](Root/Leaf)& Identify giving diagnostic character **03**
- Q. 2) Prepare double stained permanent mounts of the given material [Stem] [B] & Identify giving diagnostic character **06**
- Q. 3) Calculate percent germination in the given pollen grains [C] **02**
- Q. 4) To prove Mendel's Law of Inheritance through coloured beads [D] **04**
- Q. 5) To work out the type of gene interaction in the given cross from the given data. **03**
- Q. 6) Spotting: **06**
E- Tissue F- Root anatomy
G-Stem anatomy H-Embryology
I. Analytical pharmacognosy J. Herbal cosmetics & Medicines
- Q. 7) Viva-voce **03**
- Q. 8) Practical record and excursion report **03**