

BOARD OF STUDIES IN M.Sc. BOTANY
2022-2023

DEPARTMENT OF BOTANY

SYLLABUS FOR M.Sc. BOTANY



PITHAPUR RAJAH'S GOVERNMENT COLLEGE
Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, Kakinada Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – II,
PAPER CODE: 201: PRINCIPLES OF GENETICS

UNIT –I

Mendelism principles of genetics, test cross, back cross, T-test, Chi-square test

Gene interaction – Epistasis, supplementary, complementary, duplicating genes

Multiple allelism – pseudoalleles, phenocopies, pleiotropism, penetrance and expressivity

UNIT—II

Non-mendelian genetics – linkage – complete, incomplete and its significance

Crossing-over, stern experiment, cytological evidence

Theories on crossing over, significance, gene mapping, 2-point test cross, 3-point test cross

Tetrad analysis in Neurospora.

LOD –score analysis

UNIT—III

Sex linked, sex limited, sex influenced inheritance

Recombination and its molecular mechanism; role of rec A, B,C,D enzymes; Holiday's model

Mutations – types – molecular basis; site-directed mutagenesis – DNA damage and repair mechanisms; examples of inherited defects in DNA repair.

Multigene families and their organization and significance; Transposable elements in Prokaryotes and eukaryotes, Mechanism of transposition; significance of transposable elements

UNIT-IV

Fine structure of gene, gene concept- one gene one enzyme all concepts.

Maternal inheritance – distinction between nuclear and cytoplasmic types of inheritances- distinction.

Genetics of mitochondria and cytoplasmic characters; Male sterility; types and significance

Mapping in bacteria and phages – methods using conjugation, transformation and transduction

SUGGESTED LABORATORY EXERCISES

1. Observation of types of chlorophyll mutants.
2. Problems in Mendelian Genetics, Gene interactions and Epistasis, Probability laws and Chi-Square test
3. Chromosome Mapping and Tetrad analysis

SUGGESTED READINGS & TEXT BOOKS

1. William K, Cummings S, Spencer MR and Charlotte A. 2013. Essentials of Genetics. Pearson Books, Delhi.
2. Griffiths, A.J.F., Miller, H.T., Suzuki, Lewontin, Gelbart Intd. Genetic analysis, H.F. Freeman and Co.
3. Hartl, D.L. and Jones, E.W. 1998. Genetics: Principles and Analysis (4th edition) Jones and Bartlett Publishers, Massachusetts, USA.
4. Karp, G. 1999. Cells and Molecular Biology: concepts and Experiments. Hohn Wiley & Sons Inc. USA.
5. Lewin, B. 2000. Gene VII. Oxford University Press, New York, USA.
6. Lewis, R. 1997. Human Genetics: Concepts and Applications, WCB Mc Graw Hill, USA.
7. Malacinski, G.M. and Freifelder, D. 1998. Essentials of Molecular Biology (3rd edition). Jones and Bartlet Publishers Inc. London.
8. Russel PJ. 2009. Genetics–A Molecular Approach. 3rd Edition. Pearson Benjamin Cummings, San Francisco, USA.
9. Snustad, D.P. and Simons, M.J., 2000. Principles of Genetics John Wiley and Sons Inc., USA.
10. Brooker R. 2008. Genetics, Analysis and Principles. 3rd edition. McGraw Hill Science.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – II,
PAPER CODE: 202: PRINCIPLES AND PRACTICES IN PLANT TISSUE CULTURE
TECHNOLOGY

UNIT – I

Concept Totipotency, Totipotency/pluripotency; Differentiation, dedifferentiation, redifferentiation

Tools used in tissue culture

Sterilization methods –Physical and chemical

Media components – composition

Explants – types

UNIT-II

Organ culture

Vegetative culture: Root, Stem, Leaf and Meristem

Reproductive culture: Embryo, Endosperm, Ovule, Pollen, Anther and

Callus culture

Regeneration – Biochemical & molecular aspects of tissue culture

Organogenesis and adventive embryo genesis

UNIT—III

Methods of androgenic & gynogenic haploid and di haploid production and applications in agriculture

Embryo rescue technique

Cell culture: establishment, plating efficiency, induction & selection of mutants.

UNIT-IV

Production of secondary metabolites

Somatic hybridization: Protoplast culture technology

Application of plant tissue culture, clonal propagation, artificial seeds and its applications,

Soma clonal variations and its applications,

SUGGESTED LABORATORY EXERCISES

1. General out lay of PTC laboratory
2. Preparation of media
3. Callus induction – Carrot
4. Clonal propagation through meristem cultures
5. Embryo culture – Ground nut
6. Anther culture – Datura/ Tobacco
7. Establishment of cell cultures and determination of growth pattern
8. Determination of Plating efficiencies of cell culture
9. Protoplast isolation and culture
10. Protoplast fusion
11. Observation of different developmental stages of somatic embryo in embryogenic callus
12. Artificial seed preparation

SUGGESTED READINGS & TEXT BOOKS

1. Vasil IK and Thorpe TA. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers, Dordrecht, Netherlands.
2. Kalyan Kumar De. 1997. Plant Tissue Culture. NCB Agency, Kolkata.
3. Pullaiah, T. 2009. Plant Tissue Culture. Scientific Publishers, Jodhpur.
4. Razdan, M.K. 2003. An Introduction to Plant Tissue Culture. Oxford & IBH, New Delhi
5. Bhojwani, S.S. and Razdan, M.K. 1996. Plant tissue culture: Theory and Practice (a revised edition) Elsevier Science Publishers, New York, USA
6. Bhojwani, S.S. 1990. Plant Tissue Culture: Applications and Limitations. Elsevier Science Publishers, New York, USA.
7. Callow, J.A. Ford-Lloyd, B.V. and Newbury, H.J. 1997. Biotechnology and Plant Genetic Resources: Conservation and use. CAB International, UK, Oxon
8. Collin, H.A. and Edwards, S. 1998. Plant Cell Culture, Bio scientific Publishers, Oxford, UK
9. Jain, S.M. Sopory, S.K. and Velleux, R.E. 1996. In Vitro Haploid production in Higher Plants, Volumes 1-5. Fundamental aspects and Methods Kluwer Publishers, Dordrecht, the Netherlands.
10. Kartha, K.K. 1985. Cryopreservation of Plant Cells and Organs CRC Press, Boca Roton, Florida, USA
11. Raghavan, V. 1986. Embryogenesis in Angiosperms: A Developmental and Experimental Study. Cambridge University Press, New York, USA
12. Raghavan, V. 1997. Molecular Biology of Flowering plants, Cambridge University press, New York, USA
13. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue Culture. Kluwer Academic Publishers. The Netherlands

UNIT—I

Taxonomy versus Biosystematics, taxonomic hierarchy.

Principles used in assessing relationship delimitation of taxa and attribution of rank

Species concept, Binominal nomenclature, ICBN rules, Herbarium techniques

Famous botanical gardens in India

UNIT—II

Different systems of classification: Artificial, Natural and Phylogenetic,

Cladistics in taxonomy, merits and demerits in classification

1) Hutchinson 2) Takhtajan 3) Cronquist 4) Thorne 5) Dalhlgren

Comparative account of APG-I to APG-IV

UNIT-III

Evolutionary tendencies in following orders—

1) Ranales 2) Rosales 3) Centrospermales 4) Tubiflorae 5) Ambelliferae 6) Helembiales

7) Liliflorae 8) Glumiflorae

UNIT-IV

Origin and evolution of Angiosperms

Embryology in relation to taxonomy

Palynology in taxonomy, microanatomy and cytology

Phytochemistry in taxonomy

SUGGESTED LABORATORY EXERCISES

Taxonomy of Angiosperms & Plant Resources Utilization and Diversity

1. Description of a Taxa /Species from representative and locally available families
2. Description of various species of a genus: Preparation of key character at genus level
3. Preparation of key characters and use of keys at family level
4. Field trips: Compilation of field notes and preparation of herbarium wild or cultivated
5. Training in using floras and herbaria for identification of specimens wild and cultivated
6. Taxonomic description of the following cultivated Crops
 1. Food crops : Rice, Maize
 2. Pluses : Red gram, Black gram
 3. Fiber crops : Cotton, Sun hemp
 4. Oil yielding : Groundnut, Castor, Brassica
 5. Medicinal & Aromatic : Catheranthus, Eucalyptus

SUGGESTED READINGS & TEXT BOOKS

Taxonomy of Angiosperms

1. Cole, A.J. 1969. Numerical Taxonomy, Academic Pree, London
2. Davis, P.H. and Heywood, V.H. 1973. Principles of Angiosperms Taxonomy. Robert E Kreiger Pub. Co., New York
3. Harrison, H.J. 1971. New concepts in Flowering Plant Taxonomy, Hieman Educational Books Ltd., London
4. Simpson MG. 2006. Plant Systematics. Elsevier Academic Press, California, USA
5. Heywood, V.H. and Moore, D.M. 1984. Current concepts in Plant Taxonomy, Academic Press, London
6. Nordenstam BEI, Lazily G and Kassas M. 2000. Plant systematic for 2nd Century. Portland Press Ltd., London.
7. Jones, S.B. Jr. and Luchsinger, A.E. 1986. Plant Systematics (2 nd Edition) McGraw Hill Book Co., New York
8. Angiosperm Phylogeny Group website. 2012. consult www.apgweb.
9. Heywood, V.H., RK Brummitt, A. Culham, O. Seberg 2007. Flowering Plant Families of the World. Firefly books Ltd. New York.
10. Judd, W. S, Christopher S. Campbell, Elizabeth A. Kellogg, Peter F. Stevens, and Michael J.Donoghue. 2007. Plant Systematics: A Phylogenetic Approach, 3rd ed. Sinauer.
11. Lawrence, G.H.M 1951. Taxonomy of vascular plants. McMillan, New York.

Plant Resources Utilization and Diversity

1. Baker, H.G. 1978. Plants and Civilization (3rd Edition) C.A. Wadsworth, Belmont
Chrispeels, M.J. and Sadava, D. 1977. Plants, Food and People. W.H. Freeman and Co., San Francisco
2. Cinway, G. 1999. The Doubly Green Revolution. Food for All in the 21st Century, Penguin Books.
3. Council of Scientific & Industrial Research 1986. The useful plants of India. Publications and Information Directorate. CSIR, New Delhi

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
M.Sc. – BOTANY, SEMESTER – II
PAPER CODE: 204: PLANT DEVELOPMENT AND REPRODUCTION

UNIT –I

Definition of meristems and permanent tissues, classification and characteristics of different meristematic tissues

Simple tissues: Parenchyma, Collenchyma, Sclerenchyma

Complex tissues: Xylem and Phloem

Special tissues

Tissue systems in plants: Epidermal, Ground, Vascular tissue systems

Organization of the Shoot apical meristem (SAM) and Root apical meristem (RAM),

UNIT-II

Cambium: Structure, cell types and development of vascular cambium, Cork cambium - structure of its derivatives; bark. Anomalous secondary growth in dicot and monocot stems

Vascular tissue development: development and structure of primary xylem, primary phloem, secondary xylem and secondary phloem

UNIT—III:

Male gametophyte: Structure of anther; Microsporogenesis; Types and role of tapetum; pollen development, Sperm dimorphism; Pollen embryo sacs.

Female Gametophyte: Types of Ovule, development of Ovule, Megasporogenesis,

UNIT—IV

Types of Embryo sacs, Organization of Embryo sac; ultra-structure of the embryo sac cells.

Pollination, Pollen-pistil interaction: Structure of pistil; pollen-stigma interactions; self-incompatibility, different methods to overcome self-incompatibility

SUGGESTED LABORATORY EXERCISES

1. Microscopic studies of leaf anatomy: Nerium, Maize observation of trichomes, glands.
Study of C_3 and C_4 plant anatomy
2. Study of Stomatal types and determination of Stomatal frequency and Stomatal Index
3. Study of wood anatomy, macerations and sections, T.S., T.L.S. and R.L.S
4. Study of anomalous growth of stems: Aristolochia, Achyranthes, Bignonia, Boerhaavia, Leptodenia and Dracaena

Reproduction

1. Study of microsporogenesis and gametogenesis in anthers
2. Tests for pollen viability using stains and in vitro germination
3. Slide preparation of Embryo sac
4. Slide preparation of nuclear and cellular endosperm
5. Tests for Seed viability

SUGGESTED READINGS & TEXT BOOKS

Plant Development

1. Bailey, J.D. and Black, M. 1994. Seeds: Physiology of development and Germination, Plenum Press, New York.
2. Fahn, A. 1982. Plant Anatomy. (3rd edition). Pergamon Press, Oxford
3. Fosket, D.E. 1994. Plant Growth and Development. A Molecular approach. Academic Press, San Diego
4. Howell, S.H. 1998. Molecular Genetics of Plant Development Cambridge University Press
5. Lyndon, R.F. 1990. Plant Development. The Cellular Basis. Uni Hyman, London
6. Mauseth, J.D. 1988. Plant Anatomy. Benjamin Cummings. California
7. Pullaiah, T., Naidu, K.C., Lakshminarayana, K and Hanumantha Rao, B. 2007. Plant Development. Regency Publications, New Delhi
8. Salisbury, F.B. and Ross, C.W. 1992. Plant Physiology (4th edition) Wordsworth Publishing, Belmont, California
9. Steeves, T.A. and Sussex, I.M. 1989. Patterns in Plant Development (2nd edition), Cambridge University Press, Cambridge
10. Waisel, Y., Eshel, A. and Kafkaki, V. (eds) 1996. Plant Roots: The Hidden Hall (2nd edition). Marcel Dekker, New York

Reproduction

1. Johri, B.M 1984. Embryology of Angiosperms springer-Verlag. Berlin
2. Johri, B.M. 1981. Experimental embryology of vascular plants. Springer Verlag, Berlin
3. Maheshwari, P. 1980. An introduction to the Embryology of Angiosperms, Tata, maccrawin
4. Bhojwani, S.S and Bhatnagar, S.P. 2000. The Embryology of Angiosperms (4th revised and enlarged edition) Vikas Publishing House, New Delhi

5. Leins, P., Tucker, S.C. and Endress. P.K. 1988. Aspects of Floral Development. J. Cramer, Germany
6. Procter, M. and Yeo, P. 1973. The Pollination of Flowers. William Collins Sons, London
7. Pulliah, T., Lakshminarayana, K and Hanumantha Rao, B., 2008. Plant Reproduction, Scientific Publishers, Jodhpur, India
8. Raghavan, V. 1997. Molecular Embryology of Flowering Plants. Cambridge University Press, Cambridge
9. Raghavan, V. 1999. Developmental Biology of Flowering Plants. Springer – Verlag, New York
10. Sedgely, M. and Griffin, A.R. 1989. Sexual Reproduction of Tree Crops, Academic Press, London
11. Shivanna, K.R. and Swahney, V.K. (Eds.) 1997. Pollen Biotechnology for Crop Production and Improvement. Cambridge University Press, Cambridge
12. Shivanna, K.R. and Rangaswamy, N.S. 1992. Pollen Biology, A Laboratory Manual. Springer-Verlag, Berlin
13. Shivanna, K.R. and Johri, B.M.1985. The Angiosperm Pollen Structure and Function, Wiley Eastern Ltd., New Delhi
14. The Plant Cell. Special Issue on Reproductive Biology of plants, Vol.5 (10) 1993. The American Society of Plant Physiologists, Rockville, Maryland, USA