M.Phil. and Ph.D. Paper III (Special) Recent Advances in Plant Physiology

Unit-I

| 1. Lipids- structural and storage lipids and their functions | (5) |
|--|-----|
|--|-----|

2. Amino acid biosynthesis and assimilation in plants (5)

Unit-II

- Secondary metabolites- Role of natural products in plant defense, pharmaceuticals and cosmetics (5)
 Development of transgenia plants for abiotic stress, tolerance
- 4. Development of transgenic plants for abiotic stress tolerance Phytoremediation Stress Proteins in plants- HSP, osmotin, PR, BSIPS, salt-, cold- and UV light- induced proteins (5)

Unit- III

| 5. | Organic and biodynamic farming- concept, principles, Best type | s of |
|----|--|------|
| | composite herbal preparations, Botanical biopesticides and their | |
| | applications | (5) |
| 6. | Free radicals and site, source and mechanism of free radical | |

(5)

Unit- IV

scavenging

| 7. | Hormonal regulation of plant growth and development, signal | |
|----|---|-----|
| | Transduction | (4) |
| 8. | Role of PGR in agriculture and horticulture | (3) |
| 9. | Status of Plant Physiology Research in India | (3) |

References:

- L. Taiz and E. Zeiger (2002) Plant Physiology (Second Edition) Simauer Associates Inc Publishers Sunderlands, Massachusetts
- H.W. Heldt (1997) Plant Biochemistry and Molecular Biology Oxford University Press
- W.G. Hopkins (1985) Introduction to Plant Physiology John Wiley and Sons, Inc. New York
- Methods in Enzymology Colowick and Caplan Academic Press, New York
- Coombs, Hall, Long and Scurlik (1985) Techniques in Bioproductivity and Photosynthesis, Pergmon Press, Oxford
- Hall, Sccurlik, Bolhar, NordenKamf, Leagood and Long (1993) Photosynthesis and production in a Changing Environment. A Field and Laboratory Manual, Chapman and Hall Publication
- Buchnan, B.B., Gruissem, W. and Jones, R.L.(2000) Biochemistry and Molecular Biology of Plants. I.K. International Pvt.Ltd., New Delhi, Mumbai, Bangalore

Journals

Annual Review of Plant Physiology and Molecular Biology Trends of Plant Sciences Plant Physiology Physiologia Plantarum Journal of Experimental Botany Indian Journal of Plant Physiology

M.phil. Paper III (Special) Recent Advances in Mycology and Plant Pathology

Unit-I

- 1. Current scenario of Mycology and Plant Pathology in India 02
- Role of Fungi in Biotechnology: Selection, Production formulation and Commercial use of fungi in biocontrol of plant diseases, insect and weeds. Ganomedicines.

Unit-II

- 3. Molecular techniques for Identification and classification of fungi 05
- 4. Seed pathology: Major seed borne plant pathogens of fungal, baterial and viral origin. Techniques involved in identification of seed borne pathogens.

Unit-III

 Recent concept of plant defence : Mechanism of sensing pathogenecity, Systemic Acquired Resistance(SAR), Biochemical defence, Regulation Of lignification in defence.

Unit-IV

- 6. fungal protoplast: Isolation, mycolytic enzymes, hyphal organization
 And protoplast formation, PEG induced and electrofusion of protoplast,
 Application and feature prospect of protoplst
 05
- 7. Chemical management of plant pathagens05
 - Reference:
 - Dennis, E.S.et al, 1992 plant Gene Research: Basic knowledge and
 - Application. Springer-verlage Wien Publ. New Yotk
 - Gengopadhyay, S 1984 Clinical plant pathology, Kalyani Publ. New Delhi
 - Nane Y.1 and Thapliyal 1979, fugicides in plant disease control. Oxford IBH, Publ. New Delhi.
 - Smith, J.E and D.R.Berry. 1978. The filamentous fungi. Vol-I Industrial mycology. Voll-II Development Mycologym, Edward Arnold Publ. London
 - Taiz, 1, and E.Zeiger. 1998. Plant physiology, sinquer Assoc inc. publ. New York.
 - Trehan. K.1994. Biotechnology, Wiely Eastern Lte, New Delhi.
 - Vaidya, J.G 1995 Biology of the fungi, Satyajeet Prakashan, Pune.
 - Vyas, S.C.1992. Hand Book of Systemic fungicides, Vol-I,II,III, Tata
 - Mc-Graw Hill New Delhi.

• Whipps, J.M. and R.D.Lumsden. 1989. Biotachnology of Fungi for Improving plant Groth. Cambridge Univ. Press, publ. New York.

Journals

Indian Phytopathology Annual Review of Plant pathology Index of Fungi Phytopathology Kavaka

M. Phil paper III (Special)

A Recent Adavances in plant Protection

Unit-I

| 1. A general over-view of Organization of plant Protection and | d Reserch | |
|---|---------------|--|
| in India | 04 | |
| 2. General instrucation for use and safe handing of pesticide. | 10 | |
| Unit-II | | |
| 3. Pest control strategies in India | 05 | |
| 4. Major diseases of important fruit corps | | |
| (Citrus, Pome, Mango, Banana, Grape, Guva, Starawberry, | , Ber | |
| Cocont) of Maharashtra and their control | 10 | |
| Unit-III | | |
| 5. Problems of pesticide residue Techniques used in analysis of | of pesticidal | |
| residue | 06 | |
| 6. Chemical manipulation of plant for disease resistance | 02 | |
| 7. Protection of grains, frits, vegetable folwers during transport | t and | |
| storage | 07 | |
| Unit-IV' | | |
| 8. The development of herbicide resistant crops | 07 | |
| 9. Chemical management of insect pests | 08 | |
| • Reference | | |
| • Annual Review of plant Physiology and Molecular Biology | y, 40.1989 | |
| • Chattopadhyay, S.B.1980, Principles and procedures of plant | | |
| protection Oxford IBH Publ, New Delhi | | |
| • Plant Protection Recommendations, Gov.of Maharashtra, 1985. | | |
| Deptt. of Agril. College, Pune | | |
| • Preservation of Post harvest food losses. FAo, Training manual. 1989. | | |
| • Singh, R.S.2000. Diseases of fruit crops, Oxford and IBH Publ, New | | |
| Delhi. | <i>,</i> | |

• Zha, L.Kplised Agricultural Entomology, New central Book Agence, Publ, Calcutta.

PAPER-III TAXONOMY, BIODIVERSITY AND CONSERVATION

Taxonomy and Biodiversity: The principles and practices of Taxonomy. The role of Taxonomy. Global biodiversity, measures of biodiversity, diversity indices, biodiversity values, use and importance of biodiversity, threatened biodiversity, major causes of biodiversity loss. Biodiversity of India. RET species. The role of Taxonomist in conservation. (10)

Variation,Biosystematics, population genetics and evolution: Key concepts in plant evolution. Developmental, experimental and genetic variations, breeding systems, apomixesm, population genetics, evolution (10)

Plant classifications: Phenetic methods, molecular systematics, cladastic methods, phylogenetic analysis, APG classification. Diagnostic features, systematic position and afficities of major groups of flowering plants recognized in APG classification: Basal angiosperms, Magnoliids, Monocots, Commelinids, Eudicots, Core Euasterids-II. (10)

Taxonomy and conservation: Needs, politics, Economics, issues, plant diversity. Biotechnology and biodiversity conservation, In-situ and ex-situ conservation. Climate change and Biodiversity. Biodiversity and Forest Acts. Environment Impact Assessment. Role of Botanical Gardens in plant conservation. Concept of Lead Botanical Gardens and Biodiversity Parks. National Programmes on plant conservation. (10)

Reference books:

Ray Samit and A.K.Ray (ed.) 2006. Biodiversity and Biotechnology. New Central Book Agenc(p.) Ltd. Kolkata; India.

Singh Gurucharan 2010. Plant systematic: An Integrated approach. Science publisher. USA.

Judd, W.S., Campbell, C.S., Kollogg, E.A., Stevens, P.F. and Donoghue M.J.2008.

Plant systematic: phylogenetic approach. Sircuier Associates, Inc.

Futuyma D.J. 2009. Evolution. Sinauer Associates, INC. Publishers, Sunderland. USA.

Groom, M.J., Meffe, G.K. and Carroll, C.R.2006. Principles of conservation biology.

Sircuier Associates, Inc.

Etelka leadlay and Stephen jury (ed.) 2006 Taxonomy and plant conservation.

Cambridge University press. UK.

David Briggs 2009. Plant microevolution and conservation in human influenced ecosystems. Cambridge University press. UK.

M.Phil/Pre. Ph.D Examination Paper III (Special) Recent Advance in Plant Ecology

Unit1:

- a) Phytogeography of Indian Subcontinent
- b) Ecology in a global Economy
 - Image of Ecology Economics
 - Globalization as a global opening concept of sustainable development

Unit2:

- a) Plant habitat relationship: Allelopathy
- b) Mechanism of self regulation in ecological systems.

Unit3:

- a) Understanding rarity and monitoring rare plants population. Use of IUCN guidelines.
- b) Population Size: Consevation Dilemm
 - Concept of minimum viable population size
 - Concept of maximum tolerance population size

Unit4:

- a) Restoration of degraded lands: Habitat restoration for afforestration with any suitable example
- b) Ecotoxicology with respect to contamination of food chains.. Ecofriendly approach, Bioremediation, Green products.

REFERENCES

- Braun Blanquest J. (1972). Plant Sociology
- **Davy, A.S. Hutchings, M.S. and Watkinson, A.R. (1988).** Plant populatin Ecology, 28th Symposium of the British Ecological Society.
- Greig Smith p. (1983). Quantitiative Plant Ecology
- Hanson, C.H. and Churchill, E.D.(1965). The Plants community
- Haywood, V.H.(1973). Taxonomy and Ecology
- Krebs, C.J.(1994). Ecology (IV edt.) the experimental ayalysis of Distribution and abundance, Hamper Collins.
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- **Osborne, P.L.(2000).** Tropical ecosystems and ecological concepts. Cambridge University Press.
- Robert, J. Reimold and Willim, H.Queen(1974). Ecology of Halophytes.
- Synge, H. (1981). The Biological aspects of rare plant conservations. John Wiley and Sons.
- Willis, A.D.(1973) Introduction to plant Ecology.
- Yoav Waisel (1972). Biology of halophytes.
- Brij Gopal,P.S.Patak,K.G.Saxena (1998). Ecology Today- an anthology of Contemporaty Ecological research. International Scientific publication

Journals:

Nature and Biosphere Nature, Environment and Pollution technology Ecology, Environment and conservation Indian Journal of Environment and Ecoplaning Journal of Tropical Ecology

PAPER III: RECENT ADVANCES IN MARINE BOTANY

UNIT I

Coastal Geomorphology : Coastal dunes, deltas, mangrove coast and beaches, coastal reefs, classification of Indian shorelines (3)

Clallification of marine plants: monera, protista and plantae (1)

Macroalgal communities: Psammophytes, Epiphytes, Drift seaweed sand blooms. Mangrove associates (3)

Coastal soils : physical and chemical properties of Indian coastal soils, Chacteristics of mangrove soils-texture, Ph, salinity, nutrients, organic matter etc. (4)

UNIT II

Light and marine plants : phycobilisomes in red and bluegreen algae, pigments and light harvesting, carbon fixation response to light quality, effect of UV B and ozone (4)

Temperature and marine plants : Effect on metabolism, heat and coldtolerance, Ice and marine plants, Global warming(3)

Osmoacclimation, Salinity and marine plants : Mangroves and global climate change (3)

UNIT III

Seaweeed mariculture : cultivation of *Porphyra, Laminaria, Undaria, Eucheuma* and others, domestication of seaweeds, seaweed biotechnology-current status and future prospects (7)

Seaweed productivity, carbon translocation and C3-C4 characteristics of Seaweeds (3)

UNIT IV

Coastal regulation zone notification : CRZ I, CRZ II, CRZ III, CRZ IV, Coastal bioshied concept and importance (5)

Present status of research in marine plants : Mangroves, Marine algae, Seagrasses, Salt marsh and Sand dune plants (5)

Reference Books :

| Seaweed Ecology and Physsiology. (2004) | C.S. Lobban and P.J. Harrison |
|---|-------------------------------|
| Marine Botany. | C.J. Dawes (1998) |
| The Biology of Mangroves | P.J. Hogaarth (2006) |
| The Botany of Mangroves | P.B. Tomlinson (1986) |
| Biodiversity of Mangrove Ecosystem | K.Kathiresan & S.Z. Qasim |
| Coastal Soils & their Management | A.K. Bandopadhyay (1997) |

Creeks. Estuaries & Mangroves. Pollution ans Conservation (2002) Proc. Natl. Seminar Thane.

M.Phil. / Pre-Ph.D.

Paper-III

' Recent Trends in Biotechnology '

UNIT-I: Techniques in Biotechnology

| 1) Application of Tissue culture and achievements in plant biotechnology | / 02 |
|--|------|
| 2) Techniques in biotechnology: | 05 |
| Molecular diagnostics- Immunological, DNA diagnostic systems, | |
| Moleculaar diagnostics of genetic diseases, Array based markers | |
| (SFPs, DArT) | 05 |
| Transgenic crops: Crop productivity and nutritional quality | 02 |
| UNIT-II: Molescular Biotechnology | |
| 1) Construction of synthetic vectors and their uses in r-DNA technology | 05 |
| 2) An over view of gene silencing and its applications | 03 |
| 3) DNA barcoding in plants | 02 |
| | |

UNIT-II: Biotechnology and Biosefty

| 1) Objectives, risk assessment, regulation, Biosefty during industrial | 06 |
|--|----|
| Production, Biosefty guidelines in India, Guidelines and regulation | |

 Biotechnology for environment: Bioenergy, Biofuel, Bioremediation 04 and Climate change

UNIT-IV : Genomics, Proteomics and Bioinformaticsd

1) Sequencing of whole genome, functional and comparative genomics 05

(Rice, Arabidopsis, Soyabean)

| 2) Proteomics and Proteome analysis | 02 |
|-------------------------------------|----|
| 2) Proteomics and Proteome analysis | 02 |

3) Bikoinformatics and data mining (Insilico Biology) 03

REFEREMCES:

1) Agarwal, S.K. (2007) Bioinformatics. APH Publishing Corporation, New Delhi. 240.p

2) **Glick, B.R. and Pasternak, J.J.** (1994) Molecular Biotechnology: Principles and Application of r- RNA Press, Washington.

3) **Gupta, P.K.** (2006) Cell and Molecular Biology, Third edition. Rastogi Publications, Meerut.

4) **Kumar, S. and Flading M.** (2005) Molecular Genetics and Breeding of Forest Trees. International Book Distributers, Lucknow. 436p.

5) Mandal, A.K. and Gibson, G.L. (2008) Forest Genetics and Tree Breeding. CBS Publishers and Distributers, New Delhi. 268p.

6) **Russell, P.** (2010) Genetics- A Moleculaar Approach, Third edition. Pearson Benjamin Cummings, San Francisco.828p.

7) **Sharma, Munjal and Shankar** (2008) A Textbook of Bioinformatics. Rastogi Publications, Meerut.

8) **Singh, B.D.**(2009) Biotechnology: Expanding Horizons,. Kalyani Publishers. 919p.

9) **Thangadurai, D., Song, W.T. and Song, Q.** (2007) Plant Stress and Biotechnology. 257p.

M.Phil/ Pre Ph. D Botany

Paper I

Research Methodology in Botany

Uint I

• Experimental design- Basic principles of experiment:

Experimental unit, sampling unit, Experimental error, replication, Generalization and randomization, control (3)

- Funadamentals of research- characteristics of research, classification of research (pure research, applied research, descriptive, experimental, historical etc.) (2)
- Research process- Steps and elements, selection, analysis and statement of the problem. Literature collection and citation, bibliography. Writing skills-Preparation of research report, presentations, writing grant proposals. (10)

Unit II

• Data analysis- variables, numerical, categorical (3)

Central measures (mean, medium, mode) (2)

Dispersion measures (range, standard deviation), probability co- (10) relation and regression, Binomial position and normal distribution, parametric and non parametric tests t-test, f-test, chi-square test, ANOVA.

UnitIII

 Microscopic Techniques : Light microscope: Resolving power and mangnification, Phase Microscope, Fluorescence Microscope, Confocal Microscope, Micromeatry.
 Election Microscope: Transmission and scanning techniques for E.M.
 Spectrophotometry: Electomagnetic spectum, construction of calorimeter and spectrophotometer, Applications.
 ANALYTICAL TECHNIQES-GC-MS, HPLC, FT-IR, MALDI, RQAMAN, ETC.

| Unit IV Algal cell culture- | Algal culture,Sea weed mariculture, | (3) |
|--------------------------------|-------------------------------------|-----|
| Fungal culture- | Fungal culture media | (2) |
| | Protoplast and apore culture | |
| Plant cel Cultere- | Cellular totipotency | (4) |
| | Cytodifferentiation | |
| | Somatic embryogenesis | |

Preservation techniques- Histochemical and cytochemical preservation (2)

Herbarium

Molecular biological Techniques- Gene amplification and PCR (4)

Molecular Probes, DNA fingerprinting

Reference Books:

P.N.. Arora and P.K. Malhan (1998). Biostatistics. Himalaya Publishing Bombay.

P.S.G. Kumar (2004). Research methods and statistical techniques B.R. publishing Academy, Udaypur,192.

G.B.N.Chainy, G.Mishra and P.K.Mohanty(2004) Basic Biostatistics. Kalyani publisher.

N.Gurumani (2006). Research Methodology for Biological Sciences. MJP publishing, Chennai.

C.R.Kothari(2004). Research Methodology- Methods and Techniques, New Age Publ. Wiely Easten, 1985.

Dawson, Catherina(2002). Practical Res. Methods. New Delhi. UBS Publ.

Kumar Ranjit(2005). Res. Methodology. A step by step Guide for Begianers. Singapore, Pearson Education.

M.Phil. Paper II: Recent Tredns in Botany

Unit I : VIRUSES, BACTERIA, ALGAAE AND FUNGI

Viruses, their structure, classification and viral plant diseses. Bacteria, Structure, recent classification and bacterial plant diseses. Algaephylogeny and classification, Phycocolloids. Fungi-recent classification and phylogeny, fungal biotechnology.

(15)

Unit II: BRYOPHYTES, PTERIDOPHYTES, GYMNOSPERMS AND PALAEOBOTANY

Evolutionary trends in gametophytes and sporophytes in Bryophytes. Evolutionary trends din Pteridophytes with respect to stele, sori, sporangia, gametophyte and recent trends in classification of pteridophytes. Gymnosperms and their distribution, evolutionary trends in sporophylls and gametophytes. Diagnostic features of major fossil group *viz.* Psilophytales, Sphenophyllales, Cycadofilicales, Bennettitales, Cordaitales.

(15)

Unit III: ANGIOSPERMS, BIODIVERSITY, ANATOMY, EMBRYOLOGY, PALYNOLOGY AND ETHNOBOTANY

Recent trends in classification of Angiosperms, taxonomy and conservation biology. Role of anatomy, embryology, plycology and ecology in taxonomy. Scope and interdisciplinan approach in Etdhnobotany. Role of tissue culture in Biodiversity and in conservation.

(15)

Unit IV : ECOLOGY, PHYSIOLOGY AND CYTOGENETICS

Systems ecology, Environmental softwares, Remote sensing, Environmental impact assessment, climate change and risk analysis. C3, C4 and CAM pathway of Carbon fixation. Genetic Engineering in crop plants, Gene transfer techniques, characterization of specific genes, Gene isolation methods, direct and indirect gene transfer methods. Production of transgenic for biotic and abiotic streses, quality improvement.