

### Suggested Readings

- Bradshaw, A.D. and Chadwick, M.J. 1980. *The Restoration of Land*. Blackwell Scientific Publications, Oxford.
- Singh, A. and Ward, O.P. (Eds.). *Applied Bioremediation and Phytoremediation*. Springer. 2004.
- Abrol, I.P. and Dhruva Narayan, V.V. (Eds.). *Technologies for Wasteland Development*. ICAR, New Delhi. 1998.
- Owen, S.O. and Chiras, D.D. 1990. *Natural Resource Conservation: An Ecological Approach*. Macmillan USA; 5th edition.
- url: [www.iucn.org](http://www.iucn.org) for Global Biodiversity.

### SKILL COURSES IN BOTANY

#### Bot-SC-1- INTELLECTUAL PROPERTY RIGHTS

1. Introduction, Historical perspectives and Forms of IPR.
2. Concept related to Patent: Requirements, procedure, duration.
3. Revocation of patent, Infringement and Litigation with case studies on patent.
4. Fundamentals of Copy Rights, Trade Marks and Industrial Designs.
5. Basics of Geographical Indications; Trade Secrets and Traditional Knowledge.
6. Protection of Plant Varieties (Plant Breeders Rights and Farmer's Right).
7. IPR and Biodiversity (CBD; Protection in biotechnology, protection of other biological materials).
8. Introduction to the leading International Agreements concerning Intellectual Property Rights: WTO (GATT, TRIPS), WIPO, Madrid Protocol, Berne Convention, Paris Convention.
9. Indian Legislations for the protection of various types of Intellectual Properties.
10. Management and Valuation of Intellectual Property.

#### Suggested Readings:

- Acharya, NK. 2001. Text book on Intellectual Property Rights. Asia Law House.
- Arthur RP and Micheal HD. 2000. Intellectual Property: Patents, Trademarks and Copyright in a nutshell. West Group Publishers.
- Das, HK. 2010. Text book of Biotechnology 4<sup>th</sup> edition. Willey India.
- Erbisch FH & Maredia K. 1998. Intellectual Property Rights in Agricultural Biotechnology. CABL.
- Ganguli P. 2001. Intellectual Property Rights: Unleashing Knowledge Economy. McGraw-Hill.
- Intellectual Property Rights: Key to New Wealth Generation. 2001. NRDC & Aesthetic Technologies.
- Saha R. (Ed.). 2006. Intellectual Property Rights in NAM and Other Developing Countries: A Compendium on Law and Policies. Daya Publ. House.
- Singh, BD. 2010. Biotechnology: Expanding horizons. Kalyani Publishers.
- Wadhera BL. 2007. Law Relating to Intellectual Property. Universal Law Publishing.
- Wattal, J. 1997. Intellectual Property Right. Oxford Publication House.

#### Bot-SC- 2- AGROTECHNIQUES FOR DESERT PLANTS

1. Introduction and WHO guidelines on Good Agricultural and Collection Practices (GACPs)
2. Propagation material(s) and techniques
3. Seed biology and germination behaviour
4. Nursery and field techniques of important desert medicinal plants
5. Harvest management
6. Storage techniques
7. Disease management

#### Laboratory/Field Exercises

1. Morphological features of desert plant seeds
2. To estimate viability and germination behavior of medicinal plant germplasms
3. Techniques for raising of nursery and transplanting in field conditions
4. To demonstrate techniques for storage of germplasm
5. To evaluate important symptoms of disease causing pathogens.

#### Suggested Readings

- Agro-techniques of selected medicinal plants, Vol. I, Department of AYUSH, New Delhi, 2008

- Chadha, K.L. and Gupta, R. *Advances in Horticulture*, Vol. 11, Medicinal and Aromatic Plants, Malhotra Publishing House, New Delhi, 1995.
- 50 Years of Crop Research in India, ICAR, New Delhi, 1996.
- Prospects of Medicinal Plants, NBPGR, New Delhi, 1998.
- The Wealth of India. A Dictionary of Indian Raw Materials and Industrial Products, New Delhi. Raw Materials I-XII, Revised Vol. I-III (1985-1992) Supplement (2000), CSIR, New Delhi.

### Bot-SC- 3- DATA ANALYSIS AND PRESENTATION

1. Sampling techniques
2. Central tendency – Mean, Median, Mode, Variance, Normalized Variance, Standard Error, Coefficient of Variance
3. Analysis of Variance
4. Correlation
5. Regression
6. Tables and Graphs
7. Preparation of Power Point Presentation

### Laboratory/Field Exercises

1. Basic operations in MS-Excel
2. Computation of Central tendency quantifiers in MS-Excel
3. Computational techniques for ANOVA in MS-Excel
4. Computational techniques for Correlation in MS-Excel
5. Computational techniques for regression in MS-Excel
6. Techniques for table preparation in MS-Excel
7. Hands on exercises for Power point presentation

### Suggested Readings

- Gomez, A. Kwanchai and Gomez, A. Arturo. 1984. *Statistical Procedures for Agricultural Research* (second Edition), John Wiley & Sons, New York
- Mishra, B.N. and Mishra M.K. 1989. *Introductory Practical Biostatistics*. NayaPrakash Publication, Calcutta.
- Panse, V.G. and Sukhatme, P.V. 1989. *Statistical Methods for Agricultural Workers*. Indian Council of Agricultural Research, New Delhi.
- Quinn, P. Gerry and Keough, J. Michael. 2002. *Experimental Design and Data Analysis for Biologists*. Cambridge University Press Cambridge, UK .
- Rao, Sundar P.S.S. and Richard, J. 2011. *Introduction to Biostatistics and Research Methods*. (4<sup>th</sup> Ed), PHI Learning Pvt. Ltd., New Delhi.
- Williams, Brain. 1993. *Biostatistics- Concepts and Applications for Biologist*. Chapman & Hall, London

### Bot-SC- 4-BIOINFORMATICS

1. Introduction to Bioinformatics and its applications
2. Bioinformatics databases
3. Database searching
4. Sequence Alignments and Visualization
5. Structural Bioinformatics
6. Genomics: Genome Annotation, Genome Assembly, Structural and Functional Genomics.
7. Comparative Genomics
8. Metabolomics
9. Chemoinformatics
10. Molecular phylogeny and evolution
11. Biodiversity informatics

### Laboratory Exercises

1. Demonstration of Molecular Biology Laboratory equipments
2. Demonstration of various Next-generation sequencing technologies
3. Introduction of National Center for Biotechnology Information (NCBI) and biological databases
4. Analysis of sequences using BIOEDIT software.
5. Assembly of sequences using GENETOOL software
6. Similarity search using the Blast and interpretation of the results.



7. Multiple Sequence alignment using ClustalW
8. Phylogenetic analysis using MEGA.
9. Submission of nucleotide sequences at NCBI-GenBank using Sequin

#### Bot-SC- 5-MICROPROPAGATION

1. Basic layout of Micropropagation laboratory and Green House
2. Basic Concepts of Micropropagation
3. Tools and Techniques of Micropropagation: LAFB, Autoclave, Filter Sterilization
4. Medium composition and Preparation
5. Basic concept of Aseptic Culture establishment
6. Hardening and Acclimatization

#### Laboratory Exercises

1. Selection of explants, surface sterilization and inoculation to initiate cultures of tobacco/cereals/legumes.
2. Studies on effects of plant growth regulators on cell, tissue and organ culture.
3. Experiments on rejuvenation and multiple shoot induction from mature nodal shoot segments of trees/horticultural/floricultural crops.
4. Encapsulation of somatic embryos/buds using alginate.
5. Experiments on root induction from cultured shoots.

#### Suggested Reading

- Bhojwani, S. S. 1990. *Plant Tissue Culture: Applications and Limitations*. Elsevier Science Publishers, New York, USA.
- Bhojwani, S. S. and Razdan, M. K. 1996. *Plant Tissue Culture: Theory and Practice* (a revised edition). Elsevier Science Publishers, New York, USA.
- Vasil, I. K. and Thorpe, T. A. 1994. *Plant Cell and Tissue Culture*. Kluwer Academic Publishers, The Netherlands
- Woung-Young, S. and Bhojwani, S. S. 1999. *Morphogenesis in Tissue Cultures* (ed.). Kluwer Academic Publishers.

#### Bot-SC- 6- VALUE ADDITION FOR BIORESOURCES

1. Introduction and bioresource profile
2. Need for identifying real true value of the bio-resources
3. Wild and domestic bioresources
4. Thar desert resources with special reference to forest, energy (solar and wind) and minerals
5. Energy and petro plants
6. Air-layering technique
7. Concept of Harvest Index
8. Economics (Benefit: Cost ratio)

#### Laboratory/Field Exercises

1. Methods for bio-resources valuation
2. General idea for desert bioresources with special reference to solar and wind energy plantation
3. Identification of petro plants of desert
4. To perform air layering experiment
5. To calculate Harvest Index
6. To calculate economics of desert plants

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- Agro-techniques of selected medicinal plants, Vol. I, Department of AYUSH, New Delhi, 2008
- Handbook of Horticulture, ICAR, 2001
- 50 Years of Crop Research in India, ICAR, New Delhi, 1996.
- Prospects of Medicinal Plants, NBPGR, New Delhi, 1998.
- The Wealth of India. A Dictionary of Indian Raw Materials and Industrial Products, New Delhi. Raw Materials I-XII, Revised Vol. I-III (1985-1992) Supplement (2000), CSIR, New Delhi.
- Recent Progress in Medicinal Plants, Volume 9 : Plant Bioactives in Traditional Medicine, (eds.) D.K. Majumdar, J.N. Govil, V.K. Singh & R.K. Sharma, Studium Press, LLC, USA, 2005