EVOLUTIONARY TRENDS AMONG SPERMATOPHYTES

Bot-319A & Bot-320L Credit Hours 3(2+1)

THEORY

Introduction to the course:

The course aims to present the major groups of spermatophytes to explore their morphology, anatomy and evolution.

Course Objectives:

The main objective of the course is

1. To provide an adequate knowledge of spermatophytes and their evolutionary importance with special emphasis on vegetative and reproductive biology.

Course Detail:

1. **Origin and Evolution of Seed Habit including evidences from Palynology.**
2. **Seed Ferns**: General Characters and Phylogenetic importance of
   2.1.*Calamopitales*
   2.2.*Lyginopteridales*
   2.3.*Medullosales*
   2.4.*Glossopteridales*
   2.5.*Caytoniales*
   Selected Palynomorph genera representing above mentioned Seed Fern orders and their Morphographic description.
3. **Gymnosperms**: Origin of Gymnosperms, Phylogeny and Classification of
   3.1.*Bennettitales*
   3.2.*Ginkgoales*
   3.3.*Cycadales*

3.4.*Coniferales*
3.5.*Gnetales.*
Selected Palynomorph genera representing above mentioned Gymnosperm orders and their Morphographic description.

4. **Angiosperms**:
   4.1.Life cycle of an Angiosperm
   4.2.Flower: Definition, different parts of a generalized flower.
   4.3.Morphological nature of flower, Different types of placentation and their inter-relationship.
   4.4.Origin of Angiosperms
   4.5.Embryology: Structure of stamen, microsporogenesis and structure of pollen. Structure of an ovule, megasporogenesis. Different types of embryo sacs. Nature of endospermic tissue.
   4.6.Selected palynomorphs genera representing above mentioned Lycopsida orders and their Morphographic description.

Practicals:

1. Section cutting, staining and permanent / temporary mounting of the representative specimens mentioned in the theory portion (Gymnosperms and Angiosperms).
2. Identification and study of some stereoscopic sections of woods of Gymnosperms and Angiosperms.
3. Isolation of palynomorphs through maceration from samples of Mesozoic and Paleozoic rocks of Pakistan.
4. Study of different types of Placentation in different flowers.
5. Study of different types of Embryo Sacs in Angiosperms.
6. Field Study Tour (mandatory) to the Lesser / Higher Himalayas to collect and identify Vascular Cryptogams as given in the syllabus. Rock samples from various stratigraphically measured geological Formations shall be collected to isolate Palynomorphs of Seed Ferns, Gymnosperms and Angiosperms mentioned in the theory section. Detailed Field Report will be submitted by each pupil at the time of practical examination carrying separate marks apart from Practical Note Book.
7. Free hand drawings (or Camera Lucida) of isolated and properly identified palynomorphs along with the brief morphological description.

Teaching-learning Strategies

1. Lectures
2. Group Discussion
3. Laboratory work
4. Seminar/ Workshop

Learning Outcome:

Students will be able to:

1. Explain when seed plants first appeared and when gymnosperms became the dominant plant group
2. Describe the two major innovations that allowed seed plants to reproduce in the absence of water
3. Describe the significance of angiosperms bearing both flowers and fruit

Assessment Strategies:

1. Lecture Based Examination (Objective and Subjective)
2. Assignments
3. Class discussion
4. Quiz
6. Tests

Recommended Readings:

1. Beck. C.B. Origin and Evolution of Gymnosperms. Columbia University Press, New York.
2. Beck. C.B. Origin and Evolution of Angiosperms. Columbia University Press, New York
3. Chamberlain, C.J. (Latest Edition). Gymnosperms structure and Evolution. Dover Publications Inc. 480 pp.
4. Foster, S. and Gifford, E.M. (1971). Comparative Morphology of Vascular Plants, W.H. Freeman, New York. 751 pp.
5. Niklas, K. J. (2016). Plant Evolution: an introduction to the history of life. Chicago; London: The University of Chicago Press, 2016. 566 pp.
6. Sporne, K.R. (Latest Edition). The morphology of Gymnosperms. Hutchinson University Library.
7. Taylor, E. L., Taylor T. N. and Krings, M. (2009). Biology and Evolution of Fossil plants. Princeten Hall, New York. 1252 pp.
8. Traverse (2007). Paleopalynology. Unwin Hyman Ltd. 813 pp.

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