Bot.Sp-17 MYCORRHIZAE IN AGRICULTURE Credit Hours: 3(2+1)

THEORY:

Introduction of the Course:

This course provides concepts about Mycorrhizae in Plant Soil System. It also describes role of AM Fungi in Soil and their Conservation.

Course Objectives:

The course is designed:

1. To provide an adequate knowledge about basic concepts of different fungal groups and their relationships with plant roots.
2. To give an insight into Arbuscular mycorrhizae and soil microbial interaction.

Contents:

1. **Mycorrhizae and Crop Productivity:** The AM Plants and Cultural and environment Effects.
2. **Role of AM Fungi in Soil and their Conservation.**
3. **Arbuscular mycorrhizae and soil microbial interaction:**
   - **3.1.**Introduction.
   - **3.2.**The Mycorrhizosphere.
   - **3.3.**Microbial effects on VA Mycorrhiza Formation.
   - **3.4.**Biological Nitrogen Fixation.
   - **3.5.**Implications in Sustainable Agriculture.
4. **Arbuscular Mycorrhizae and Cultural Stresses:**
   - **4.1.**Cropping Sequence.
   - **4.2.**Crop Breeding.
   - **4.3.**Pesticides, Fertilizers, Tillage Effects.
   - **4.4.**Inoculation with AM fungi.
5. **Arbuscular Mycorrhizae and Environmental Stresses:**
   - **5.1.**Introduction.
   - **5.2.**Soil Nutrients.
   - **5.3.**Water and Aeration.
   - **5.4.**Soil Structure.
   - **5.5.**Hydrogen Ion Activity.
   - **5.6.**Salt (Osmotic) Stress.
   - **5.7.**Heavy Metals.
   - **5.8.**Biotic Factors.

Practicals:

1. Study of VA Mycorrhizal associations. Clearing and staining of Mycorrhizal roots, sample storage and slide preparation.
2. Estimation of root length and colonization by Mycorrhizal fungi.
3. Bioassay Measurements of Mycorrhizal inoculum in soil.
4. Isolation and identification of glomalean fungi from field and other soils.
5. Synthesis of Mycorrhiza from spore inoculum and from root inoculum.
6. Assessment of plant growth response to Mycorrhizal infection in some seasonal crops.

Teaching-learning Strategies

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

Learning Outcome:

1. Students are expected to get familiarized with the morphological and systematic knowledge about different fungal groups and their relationships with plant roots.
2. They will be able to describe, apply and integrate the basic concepts of Mycorrhizae and Crop Productivity.

Assessment Strategies:

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

Recommended Readings:

1. Khan, A. G. (2006). *Laboratory Manual of Mycology and Plant Pathology.* HEC Pakistan.
2. Podila, G. P. and Varma, A. (2005). *Basic Research and Application of Mycorrhizae.* K. International (Pvt) Ltd. New Delhi.
3. Sanders, F. E., Mosse, B. and Tinker, P.B. (2004). *Endomycorrhizae*. Academic Press, N.Y.
4. Smith, S. E. and Read, D. J. (2008). *Mycorrhizal Symbiosis.* Academic Press, London, N.Y.
5. Allen, M.F. (1992). *Mycorrhizal Functioning. An Integrative Plant Fungal Process*. Chapman and Hall Inc., New York, London.
6. Brundrett, M., Bougher, N., Dell, B., Grove, T. and Malajczuk, N. (1996). *Working with Mycorrhizas in Forestry and Agriculture.* ACIAR Monograph 32. Canberra, Australia.
7. Brundrett, M., Melville, L. and Peterson, L. (1994). *Practical Methods in Mycorrhiza Research.* Mycologue Publications.
8. Bethlenfalvay, G. J. and Linderman, R.G. (1992). *Mycorrhizae in Sustainable Agriculture.* ASA Special Publication No.54.
9. Powell, L.I. and Bagyaraj, D. J. (1984).*VA Mycorrhiza.* CCRC Press Inc.

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