Bot.Sp-07 SOIL AND AGRICULTURAL MICROBIOLOGY Credit Hours 3(2+1)

Introduction of the Course

This course is designed to provide essential knowledge about soil structure and composition and learning about soil biodiversity with reference to the bacterial community present in the soil. It will help the students to have knowledge about Soil Microflora and its effects on Soil Composition and Information about Agriculture Soils in Pakistan.

Course Objectives

1. To enable the students to understand the mutual interaction of soil microflora and its types.
2. To enable the students to learn about the beneficial role played by the soil microflora in improving the soil fertility with respect to agricultural sector.

Contents

1. Elements of soil formation.
2. Soil microbial population and their advantages and disadvantages.
3. Role of microorganisms in mineral transformations with emphasis on carbon and nitrogen transformations.
4. Introduction to soil ecology
5. Plant microbe interactions and microbe-microbe interactions and their impact on soil fertility.
6. Problems of salinity and water logging and the methods of their reclamations. Microbial activities in saline soil.
7. Interaction between plants and their beneficial and harmful symbionts.

Practicals:

1. Study of role of microbes in soil structure and improvement.
2. Symbiotic and antagonistic effects of microbes soil/crop.
3. Improvement by microbes in the saline and water-logged soils.
4. Use of *Azospirillum* and *Azospirillum* as natural fertilizers.

Learning Outcome:

1. This course can help the students to identify Symbiotic and antagonistic effects of microbes.
2. After completion of this course, students will be able to describe role of microbes in soil structure and improvement.

Assessment Strategies:

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

Recommended Readings.

1. Berthelin, J., Bollag, J.M., Page, A.L., Huang, P.M., McGill, W.B. and Huang, P.M. (1995). *Environmental Impacts of Soil Component Interactions: Natural and Anthropogenic Organics.* Vol.1, Lewis Publishers.
2. Bottomley, P. J., Angle, J. S., & Weaver, R. W. (Eds.). (2018). *Methods of soil analysis, Part 2: Microbiological and biochemical properties* (Vol. 12). John Wiley & Sons.
3. Charles, J., Delecluse, A., Lerou, N. and Roux, C.N. (2000). *Entomopathogenic Bacteria: From Laboratory to Field Application* (1st Ed.), Kluwer Academic Publishers.
4. De Oliveira, A. (Ed.). (2018). *Sustainability of Agroecosystems*. BoD–Books on Demand.
5. Glick, B.R., Patten, C.L., Holguin, G. and Penrose, D.M. (1999). *Biochemical and Genetic Mechanisms Used by Plant Growth Promoting Bacteria.* Imperial College Press.
6. Newman, D. J., Cragg, G. M., & Grothaus, P. (Eds.). (2017). *Chemical Biology of Natural Products*. CRC Press.

7. Parray, J. A., Mahmoud, A. H. A. E., & Sayyed, R. (Eds.). (2021). *Soil Bioremediation: An Approach Towards Sustainable Technology*. John Wiley & Sons.
8. Rao, N.S.S. and Dommergues, Y.R. (2001). *Microbial Interactions in Agriculture and Forestry.* (2nd Ed.), Science Publishers
9. Soriano, M. C. H. (Ed.). (2014). *Environmental risk assessment of soil contamination*. BoD–Books on Demand.
10. Stirling, G., Hayden, H., Pattison, T., & Stirling, M. (2016). *Soil health, soil biology, soilborne diseases and sustainable agriculture: A guide*. Csiro Publishing.
11. Tate III, R. L. (2020). *Soil microbiology*. John Wiley & Sons.
12. Wang, K., Estrella, A.H. and Montagu, M.V. (2004): *Transformation of Plants and Soil Microorganisms (Plant and Microbial Biotechnology Research).* No.3, Cambridge University Press.

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