B.Sc. II Year **Semester – IV**

BBO -S401
SEC-2 BIOFERTILIZERS

MM : 100 Sessional : 30
Time : 3 hrs ESE : 70
L Credit Pass Marks : 40
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Total Hours: 60

Learning objectives:

- To understand the beneficial plant-microbes interaction and their role as biofertilizer.
- To understand the symbiotic and non-symbiotic nitrogen fixation.

Learning outcomes:

At the end of course students will be able to

- Explain the role of microorganisms in nitrogen fixation, phosphate solubilisation and other beneficial roles.
- Cultivate cyanobacteria in laboratory by different methods
- Take decisions for carrier point of views in research, industries and academia entrepreneurships.

UNIT–I **(16 Lectures)**

Biofertilizers; General account of the microbes used as biofertilizers for various crop plants and their advantages over chemical fertilizers. Symbiotic Nitrogen fixers: *Rhizobium* - Isolation, characteristics, types, Inoculum production and Mass cultivation; Field applications; Carrier materials.

UNIT-II **(10 Lectures)**

Non - symbiotic nitrogen fixers; Free living *Azospirillum*, *Azotobacter*- isolation, characteristics, mass inoculum, production and field application.

UNIT–III **(10 Lectures)**

Phosphate solubilizers; Phosphate solubilizing microbes - isolation, characterization, mass inoculum production, field applications.

UNIT–IV **(10 Lectures)**

Mycorrhizal biofertilizers: Importance of mycorrhizal inoculum, types of mycorrhizae and associated plants, Inoculum production and mass production of VAM; field applications of Ectomycorrhizae and VAM.

UNIT –V **(14 Lectures)**

Cynobacteria: *Nostoc/ Anabaena*; cultivation methods (tray and pit methods); applications in field Azolla: isolation, characterization, mass multiplication, role in rice cultivation, crop response, field Application

Suggested Reading

1. Dubey R.C. and Maheshwari, D.K. *A Textbook of Microbiology*. 3rd ed., S. Chand & Co, Ram Nagar, New Delhi, p. 1034. ISBN 81-219-2620-3
2. N.S. SubbhaRao, Soil Microbiology, Science Publishers.
3. M.K.Rai, Handbook of Microbial Fertilizers, Internation Book Distributing Co.
4. Dubey, R.C. *Advanced Biotechnology*. S. Chand & Co. P Ltd, New Delhi, p. 1161; ISBN: 81:219-4290-X.
5. Rangaswami,G. Agriculture Microbiolgy, Prentice Hall Indian Learning Ltd
6. Dubey, R.C. and Maheshwari, D.K. *Practical Microbiology*. 2nd Ed., S. Chand & Co. P Ltd, New Delhi, p. 413. ISBN: 81:219-2559-2 .
7. Fritsch, R. E. 1977. Structure and Reproduction of Algae, Cambridge University Press, London.
8. Singh, R. P. 2007. Microbial Taxonomy and Culture Techniques, Kalyani Publication, New Delhi.

27/5/2022