Bioinoculants for Agriculture and Sustainable Development

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course
		Lecture	Tutorial	Practical/ Practice		
Bioinoculants for Agriculture and Sustainable Development	**2**	**0**	**0**	**2**	**Class XII**	**NA**

Learning Objectives

The Learning Objectives of this course are as follows:

- To make students aware of the role of microorganisms in sustainable development and remediation.
- To develop their own biofertilizers and other kinds of bio-inoculants for use in agriculture and environment.
- Skill development in initiating a bioinoculant-based low cost startup.

Learning outcomes

After studying this course, the students will be:

- Able to identify the role of microbes in sustainable development and how microbes can be used in remediation of damaged environments.
- Skilled in isolating microorganisms from a variety of different sites. Will learn Selection, purification and preservation of useful cultures.
- Skilled in formulating bioinoculants and test its efficacy.

SYLLABUS

Practical **60 hours**

Unit 1: Introduction and scope of bioinoculants **20 hours**

Biofertilizers: success story – biofertilizer production under ICAR - How Biofertilizers for Corn Went Commercial. Biopesticides: success story of using biopesticides for nematode management in horticultural crops. Bioinoculants as a solution to the problem of parali (stubble) burning: case study of "PUSA Decomposer". Bioinoculants for reforestation. Bioinoculants for the reclamation of waste lands having alkaline, acidic, heavy metal-contaminated soils. Bioinoculants for clearance of oil spills. Mycorrhizal inoculants. Some important commercially available bioinoculants.

Unit 2: Isolation of microorganisms for the preparation of bioinoculants **28 hours**

Isolation of phosphate solubilizers, free-living nitrogen fixers, heavy metal-accumulating microbes, alkalophiles, acidophiles from suitable soil samples. Observation of colony

morphology and microscopic structure of selected microbes and preservation of these cultures in slants and glycerol stocks.

Unit 3: Formulation of bioinoculant using selected microbes (student group project)
12 hours

Culturing of selected microbes from those isolated, and formulating them into a bioinoculant. Preparation of workflow for evaluating efficacy in potted plants and in fields, for determining shelf life, and stability.

Essential/Recommended readings

1. Microbiology: A Lab Manual by J. G. Cappuccino and C. T. Welson. 12th edition.
2. Pearson. 2020.
3. Bio-inoculants as prospective inputs for achieving sustainability: Indian Story by C. Gupta et al. Economic Affairs. Vol. 65, No. 1, pp. 31-41. 2020.
4. Bioinoculants for bioremediation applications and disease resistance: Innovative Perspectives by T. Chaudhary and P. Shukla. Indian J Microbiol. 59 (2): 129–136. 2019.
5. Remediation of metalliferous soils through the heavy metal resistant plant growth promoting bacteria: paradigms and prospects by M. Ahemad. Arabian Journal of Chemistry, 12 (7);1365-1377. 2019.
6. Laboratory manual of Microbiology and Biotechnology by K.R. Aneja. 2nd edition. Scientific International Pvt. Ltd., Delhi. 2018.
7. Online resource: https://www.jaivikkheti.in/DMS/Waste-Decomposer%20Book-Eng.pdf
8. Online resource: https://www.iihr.res.in/success-story-using-biopesticides-nematode-management-horticultural-crops.
9. Biofertilizer Production under ICAR All India Network Project on Soil Biodiversity Biofertilizers DOI: 10.13140/RG.2.2.26840.42244
10. Online resource: https://blog.teamtrade.cz/the-story-of-how-biofertilizers-for-corn-went-commercial-part-one/
11. Online resource: https://en.wikipedia.org/wiki/Microbial_inoculant

Examination scheme and mode:

Evaluation scheme and mode will be as per the guidelines notified by the University of Delhi.