

ADD ON COURSE 2022-23		
BIO-FERTILIZERS AND GROWTH REGULATORS		
Duration: 35 Hours	Department of Botany	Course code: BT-BGR
<p>Course Description: This course provides an in-depth understanding of bio-fertilizers, growth regulators, and their applications in agriculture. Students will learn about the principles, types, and modes of action of bio-fertilizers and growth regulators. Topics include microbial inoculants, nitrogen fixation, phosphorus solubilisation, plant growth-promoting substances, and their role in sustainable agriculture. Through lectures, laboratory sessions, and field visits, students will gain practical knowledge and skills in the use of bio-fertilizers and growth regulators for crop production.</p>		
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Understand the concept and importance of bio-fertilizers and growth regulators. 2. Learn about different types of bio-fertilizers and their microbial agents. 3. Explore the modes of action of bio-fertilizers in nutrient cycling and soil fertility improvement. 4. Understand the role of growth regulators in plant growth and development. 5. Gain knowledge of the application methods and dosage of bio-fertilizers and growth regulators. 6. Evaluate the potential benefits and limitations of using bio-fertilizers and growth regulators in crop production. 7. Apply knowledge and skills learned to solve practical problems in agriculture 		
Module 1:		07 Hours
<p>Introduction to Bio-Fertilizers and Growth Regulators</p> <ul style="list-style-type: none"> • Definition and significance of bio-fertilizers and growth regulators • Role in sustainable agriculture and environmental conservation • Regulatory frameworks and certification standards <p>Nitrogen-Fixing Bio-Fertilizers</p> <ul style="list-style-type: none"> • Biological nitrogen fixation and nitrogen cycle • Types of nitrogen-fixing bacteria and their symbiotic associations • Role of Rhizobium, Azotobacter, and Azospirillum in nitrogen fixation <p>Phosphorus-Solubilizing Bio-Fertilizers</p> <ul style="list-style-type: none"> • Phosphorus cycle in soil and plant nutrition • Phosphate-solubilizing microorganisms (PSMs) • Mechanisms of phosphorus solubilisation and plant uptake 		
Module 2:		07 Hours
<p>Potassium- and Micronutrient-Solubilizing Bio-Fertilizers</p> <ul style="list-style-type: none"> • Role of potassium and micronutrients in plant growth and development • Microbial agents involved in potassium and micronutrient solubilisation • Benefits and limitations of using solubilizing bio-fertilizers <p>Plant Growth-Promoting Substances (PGPS)</p> <ul style="list-style-type: none"> • Types of PGPS (e.g., auxins, cytokinins, gibberellins) • Mode of action and physiological effects on plant growth • Application methods and dosage of PGPS in agriculture 		



Biocontrol Agents and Disease Suppressors	
<ul style="list-style-type: none"> • Role of biocontrol agents in plant disease management • Mechanisms of action against plant pathogens • Integration of biocontrol agents with bio-fertilizers for disease suppression 	
Module 3:	08 Hours
Application Methods and Dosage	
<ul style="list-style-type: none"> • Seed inoculation and soil application techniques • Foliar spray and drip irrigation methods • Dosage calculation and application timing considerations 	
Field Visits and Demonstrations	
<ul style="list-style-type: none"> • Visit to agricultural research stations or bio-fertilizer production facilities • Demonstration of bio-fertilizer application methods in the field 	
Environmental and Ecological Impacts	
<ul style="list-style-type: none"> • Environmental benefits and risks of bio-fertilizers and growth regulators • Impact on soil health, biodiversity, and ecosystem services • Strategies for mitigating potential negative impacts 	
Module 4:	08 Hours
Case Studies in Bio-Fertilizer Applications	
<ul style="list-style-type: none"> • Success stories and case studies of bio-fertilizer adoption • Lessons learned and best practices in bio-fertilizer usage • Challenges and opportunities for scaling up bio-fertilizer adoption 	
Regulatory Compliance and Certification	
<ul style="list-style-type: none"> • Regulatory requirements for bio-fertilizer production and marketing • Certification standards and quality control measures • Role of government agencies and industry associations in regulation 	
Future Directions and Emerging Trends	
<ul style="list-style-type: none"> • Innovations in bio-fertilizer and growth regulator research • Role of biotechnology and genetic engineering in bio-fertilizer development • Potential applications in climate-smart agriculture and sustainable intensification 	
Textbook:	
"Bio-Fertilizers and Organic Farming" by Yadvinder Singh and H.P.S. Makkar	
References:	
1. "Microbial Inoculants in Sustainable Agricultural Productivity: Vol. 2: Functional Applications" edited by Dhananjaya Pratap Singh and Harikesh Bahadur Singh	
2. "Plant Growth Regulators in Agriculture and Horticulture: Their Role and Commercial Uses" edited by Amarjit Basra	
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