MAHARAJA GANGA SINGH UNIVERSITY
NH-15, Jaisalmer Road, Bikaner-33404

Diploma in Biopesticide Production

- **Eligibility:** 10+2 with science / Diploma / B.Sc. (Agriculture, Horticulture, Biotechnology, Microbiology, Botany) / Relevant background.
- **Duration: 1 Year (2 Semesters)**
- **Total Credits: 24**
- **Course Objectives**
  - To impart in-depth knowledge of different types of biopesticides (bacterial, fungal, viral, botanical, etc.)
  - To develop hands-on skills in large-scale production, formulation, and quality control.
  - To train in regulatory, safety, marketing, and application strategies.
  - To promote entrepreneurship in eco-friendly pest management products.
- **Course Outcomes**

Upon successful completion, learners will be able to:

- Identify and produce major microbial and botanical biopesticides
- Formulate, test, and apply biopesticide products effectively
- Start their own biopesticide production unit or work in biocontrol industries

❖ Structure of Programme

Paper Code	Paper Name	Lecture	Tutorial	Practical/ Field work/ Internship	Credits	Maximum Marks	Minimum Passing Marks (%)
Papers							
Semester-I							
DPBT 101	Introduction to Biopesticides	1	1	0	2	20	36 %
DPBT 102	Microbial Biopesticides	1	1	2	4	20	36 %
DPBT 103	Botanical Biopesticides	1	1	1	3	20	36 %
DPBT 104	Biopesticide Production Technology	1	1	1	3	20	36 %
Semester-II							
DPBT 201	Quality Control and Bioassay	0	1	1	2	20	36 %
DPBT 202	Application and Field Evaluation	1	1	0	2	20	36 %
DPBI 203	Internship/ Industrial Training	0	0	4	4	40	36 %
DPBPW/D 204	Project Work/ Dissertation*	0	0	4	4	40	36%
				Total Credits	**24**	**Grand Total = 200**	

* Project Work/ Dissertation shall be evaluated by an External Examiner

❖ **Course structure:**

Module 1 (DPBT 101**): Introduction to Biopesticides**

- History and evolution of pest management
- Concept, classification & types of biopesticides:
  i. Microbial (bacteria, fungi, viruses)
  ii. Botanical (plant-derived)
  iii. Semiochemicals (optional overview)
- Advantages over chemical pesticides

Module 2 (DPBT 102**): Microbial Biopesticides**

- Bacterial biopesticides: *Bacillus thuringiensis* (Bt)
- Fungal biopesticides: *Metarhizium anisopliae*, *Beauveria bassiana*
- Viral biopesticides: NPV for *Helicoverpa armigera*, *Spodoptera litura*

Practicals:

- Isolation and culture of Bt
- Spore count, crystal protein detection
- Mass multiplication of entomopathogenic fungi
- NPV OBs collection from cadavers

Module 3 (DPBT 103)**: Botanical Biopesticides**

- Neem-based biopesticides (Azadirachtin extraction)
- Other botanicals: Pyrethrum, garlic extract, pongamia oil
- Mode of action of botanical pesticides

Practicals:

- Preparation of neem seed kernel extract (NSKE)
- Extraction and quantification of Azadirachtin
- Formulation of simple plant-based biopesticide

Module 4 (DPBT 104)**: Biopesticide Production Technology**

- Infrastructure and fermentation technology
- Substrate selection and media optimization
- Formulation types: powder, liquid, oil-based
- Carriers, adjuvants, shelf-life enhancement
- Lab-scale and industrial production setup

Practicals:

- Submerged and solid-state fermentation (SSF)
- Formulation preparation (wettable powder, talc, oil suspension)
- Packaging and labeling for commercial use

Module 5 (DPBT 201)**: Quality Control and Bioassay**

- QC parameters: viable count, pH, moisture, spore concentration
- Bioassay methods (lab-based): leaf dip, diet incorporation
- Standards (FCO, BIS) and regulatory framework

Practicals:

- Spore viability and count
- LC50 determination via bioassay
- Use of microscopy and staining techniques (e.g., Schaeffer-Fulton)

Module 6 (DPBT 202)**: Application and Field Evaluation**

- Application techniques (spray, dust, soil)
- Dosage and compatibility with other inputs
- Safety, handling, and storage
- Farmer field demonstration

Field Activity:

- Field demonstration of fungal and bacterial biopesticide use
- Assessment of efficacy on target pests

Module 7 (DPBI 203**): Entrepreneurship & Industrial Training**

- Market potential and licensing procedures
- Business models and funding opportunities
- Industrial visit to biopesticide production unit
- Project planning for setting up a small unit

Module 8 (DPBPW/D 204**): Project work/ Dissertation:**

- Mini-project on producing a selected biopesticide from culture to packaging

❖ **Assessment and Certification**

- Viva and written exam
- Project report submission
- Certification

❖ **Suggested Learning Resources**

- "Biopesticides: Use and Delivery" – Franklin R. Hall & Julius J. Menn
- "Insect Pathology" – Fernando E. Vega
- "Handbook of Biopesticides" – Leo M.L. Nollet
- Manuals from ICAR, CIB&RC guidelines
- FAO training manuals on biopesticides
- Research articles and SOP booklets