



SYLLABUS FOR UNDERGRADUATE PROGRAMME

VERMICULTURE & VERMICOMPOSTING

(Skill Enhancement Course)

[Semester I, II & III]

Under National Education Policy – 2020
(Effective from the Academic Session 2023-2024)

MAHARAJA BIR BIKRAM UNIVERSITY
AGARTALA, TRIPURA: 799004

UG PROGRAM AS PER NEP 2020
VERMICULTURE & VERMICOMPOSTING

Course 1 - Fundamentals of Vermiculture and Vermicomposting
(SEM 1)

Unit-1: Biology of Earthworm:

Systematic position, Basic body structure of earthworm: General body plan, Prostomium, Peristomium, Metamerism, Cuticle, Setae, Different body pores, Clitellum, Digestive system of earthworms with special emphasis to gizzard, Life cycle and reproduction.

Unit-2: Earthworm Ecology:

Distribution & Ecological categories: Epigeic, Endogeic and Anecic earthworms and their special characters, Food habit and ecological niche. Ecological requirements: moisture, temperature, pH, organic matter etc, Ecosystem services i.e. role played by earthworms in soil ecosystem with special reference to **four R's** of recycling (reduce, reuse, recycle and restore).

Unit-3: Reproduction:

Life Cycle of composting worms, Hermaphroditism, Copulation and cocoon formation, Cocoon structure, Incubation period of cocoon in vermicomposting earthworms, Fecundity in surface dwelling (epigeic) and soil dwelling (endogeic and anecic) earthworms.

Unit-4: Basic Concepts of Vermiculture & Vermicomposting:

Definition, History of vermiculture & Vermicomposting, Difference between vermiculture and vermicomposting, Selective features of earthworms for vermiculture and vermicomposting, Method of vermiculture of phytophagous and geophagous earthworm, Utility of vermiculture: Source of protein (Vermiprotein) for pisciculture, poultry farming, piggery etc., application in vermicomposting. Use of vermicompost with special reference to organic farming.

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Course 2 - Basics of Vermitechnology (SEM 2)

Unit 1: Introduction to Vermicomposting:

History of vermicomposting in India. Definition, Habitat of vermicomposting earthworms, Scientific names and distinctiveness of native and exotic vermicomposting earthworms (Native Indian earthworms. *Perionyx excavatus*, *Perionyx ceylanesis*, European earthworms: *Eisenia fetida*, *Eisenia andrei*, South African earthworm: *Eudriluseugeniae*. Selection criteria for composting worms, rearing methods of composting worms and parameters like temperature, moisture, pH etc, Cocoons and their maintenance.

Unit-2: Principle & Process of vermicomposting:

Components and steps of the vermicomposting Process: Principle of vermicomposting: Aerobic decomposition and role of detritivore fauna and symbiotic microflora and endo-enzymes of earthworm gut with special reference to thermophilic, psychrophilic and mesophilic phases. Methods of vermicomposting: (a) Low-cost floor beds/ Heap method (b) Tank Method for largescale production. Appropriate species of earthworms with suitable population characteristics, Substrate of vermicomposting: Ideal substrates and its characters for vermicomposting, Pre-composting of substrates and its importance, Preparation of vermibeads / vermireactors with appropriate substrates under Indian condition. Tools and equipments used in vermicomposting.

Unit-3: Management and harvesting of vermicompost:

Optimization of vermicomposting process through management of different environmental factors like- Temperature, pH and Moisture content, periodic aeration through turning the substrate etc. Care and Precautions during vermicomposting process and common enemies of earthworms and their management. Identification of compost maturity: Time, Mass reduction, odour, C:N Ratio, Oxidation-reduction potential, BOD etc. Methods of harvesting mature compost and storage with special reference to the shelf life.

Unit-4: Products of vermicomposting and its uses:

Physical, chemical and biological properties of vermicompost. Benefits of using vermicompost for production of different cash crops over conventional chemical fertilizers. Limitations of use of vermicompost in organic agriculture. Products of vermicomposting: Earthworm biomass (vermiprotein), Vermiwash and their application in different agricultural sectors for promoting organic agriculture and aquaculture.

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Course 3 - Vermiculture & Vermicompost Production & Beyond
(SEM 3)

Unit-1: The Economics and budgetary analysis of vermicompost production at farm level and cost benefit analysis / Laboratory grade Composting method for preparation of Vermicompost from kitchen waste/ other organic waste: Demonstration in Laboratory & students will practice in their house hold for preparation of vermicompost and submit sample prepared by their own.

Unit-2: Use of Prepared vermicompost in horticulture and floriculture beds (Activity by students in concerned department / home with evidence of photographs / short video clips/ Preparation of vermiprotein as feed for poultry and Fish meal.

Unit-3: Enemies of earthworms, sickness and worm's enemies; frequent problems – prevention and fixation / Value addition of conventional vermicompost with further additions of PGPRs and further enhancement of shelf life / Preparation of fortified or enriched vermicompost/ Preparation and maintenance of earthworm cultures.

Unit-4: Demonstration of large scale production of vermicompost through Industry/ Field visits and submission of **Project report**.

Suggested Readings:

1. Chaudhuri, P.S. (2005). Vermiculture and vermicomposting as biotechnology for conversion of organic wastes into animal protein and organic fertilizer. *Asian Jr. of Microbiol. Biotech. Env. Sc.*, 7(3):359-37A.
2. Chaudhuri, P.S. (2006). Kenchor Jeevan Baichitra: KenchoProjukti. *Jyan BichitraPrakashani*, Tripura, ISBN: 81-8266-088-2, 128 pages.
3. Das, M.C. QAD. Charles Darrvin's Plough. Tools for Vermitechnology. *I K International Publishing House*, ISBN: 978-93-81 141-27, 182 pages.
4. Ismail, S.A. (1997). Vermicology - The Biology of Earthworms. *OrientLongman*, 92 pages.
5. Kals, R.D. (1998). Earthworms: Cinderella of organic farming. *Prism Books Pvt. Ltd.*, Bangalore
6. Chattopadhyay G.N. (2012). Use of vermicomposting biotechnology for recycling organic wastes in agriculture. *International Journal of Recycling of Organic Waste in Agriculture*. Vol-1 (8) pp- 01-08
7. Paul, N., Giri, U & Roy, G. (2019). Composting. Intech open, 19 pages DOI: <http://dx.doi.org/10.5772/intechopen.88753>