VSPM Academy of Higher Education

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Department of Zoology

Name of the Certificate course: **Vermicomposting**

Aims and objectives:

- To increase human livelihood opportunities
- To increase the soil quality of the farm
- It makes way for utilization of available organic wastes to produce the rich source of organic manure of high quality, which is superior to other types of organic manures in its physico-chemical and biological properties.
- The programme provides job opportunities for the unskilled labor force.

Introduction

Earthworms have been on the Earth for over 20 million years. In this time they have faithfully done their part to keep the cycle of life continuously moving. Their purpose is simple but very important. They are nature's way of recycling organic nutrients from dead tissues back to living organisms. Many have recognized the value of these worms. Ancient civilizations, including Greece and Egypt valued the role earthworms played in soil. The Egyptian Pharaoh, Cleopatra said, Earthworms are sacred. She recognized the important role the worms played in fertilizing the Nile Valley croplands after annual floods. Charles Darwin was intrigued by the worms and studied them for 39 years. Referring to an earthworm, Darwin said, it may be doubted whether there are many other animals in the world which have played so important a part in the history of the world. The earthworm is a natural resource of fertility and life. (1) Earthworms live in the soil and feed on decaying organic material. After digestion, the undigested material moves through the alimentary canal of the earthworm, a thin layer of oil is deposited on the castings. This layer erodes over a period of 2 months. So although the plant nutrients are immediately available, they are slowly released to last longer. The process in the alimentary canal of the earthworm transforms organic waste to natural fertilizer. The chemical changes that organic wastes undergo include deodorizing and neutralizing. This

means that the pH of the castings is 7 (neutral) and the castings are odorless. The worm castings also contain bacteria, so the process is continued in the soil, and microbiological activity is promoted.

(2) *Vermicomposting* is the process of turning organic debris into worm castings. (3) The worm castings are very important to the fertility of the soil. The castings contain high amounts of nitrogen, potassium, phosphorus, calcium, and magnesium. Castings contain: 5 times the available nitrogen, 7 times the available potash, and 1 times more calcium than found in good topsoil. (4) Several researchers have demonstrated that earthworm castings have excellent aeration, porosity, structure, drainage, and moisture-holding capacity. (5) The content of the earthworm castings, along with the natural tillage by the worms burrowing action, enhances the permeability of water in the soil. Worm castings can hold close to nine times their weight in water. (6) Vermiconversion,or using earthworms to convert waste into soil additives, has been done on a relatively small scale for some time. (7) A recommended rate of vermicompost application is 15-20 percent.

Vermicomposting is done on small and large scales. In the 1996 Summer Olympics in Sydney, Australia, the Australians used worms to take care of their tons and tons of waste. They then found that waste produced by the worms was could be very beneficial to their plants and soil. (8) People in the U.S. have commercial vermicomposting facilities, where they raise worms and sell the castings that the worms produce. Then there are just people who own farms or even small gardens, and they may put earthworms into their compost heap, and then use that for fertilizer.

The objectives of this project were:

1) To determine the optimal vermicompost/soil admixture for growth of *Pelargonium hortorum*.

2) To compare the growth of geraniums in the optimal vermicompost/soil admixture to those grown in standard potting soil supplemented with chemical fertilizer. After library research, it was believed that geranium growth would vary among different vermicompost/soil admixtures, and that optimal vermicompost/soil admixture would produce better plant growth than chemical fertilizer. Therefore, the null hypotheses were: i) There would be no significant differences among geranium growth in different vermicompost/soil admixtures; and ii) There would be no significant differences in geranium growth between the optimal vermicompost/soil admixture and those supplemented with chemical fertilizer.

Admixture, Plant Growth, and Measurement Procedure

Vermicompost was obtained from a commercial vermicomposting facility, which composts mostly paper products. The geranium seeds were obtained from a plant nursery. Calculations were done to determine 5%, 15%, and 30% vermicompost/soil admixture masses and an electronic balance was used to measure the soil and compost for mixing. For each admixture ten pots were filled; the control group contained only soil, and ten pots were filled with soil mixed with chemical fertilizer. Small amounts of the planting medium from each group were set aside for testing. Geranium seeds were planted and allowed to grow for three weeks before transplanting. One geranium plant was planted in each pot. The plants were watered daily and observed for five weeks .Plant height and widths were measured each week. Measurements were made on three leaf midribs on every plant weekly, and the average of the three was recorded. When the growing term was ended, the geraniums were pulled from the soil. The above-ground shoots were separated from the below-ground roots and allowed to dry for one day. An electronic balance was used to find the mass in grams of the shoot and root sections of each plant.

Soil Analysis Procedure

Each of the vermicompost/soil admixture set ups control, 5%, 15%, 30%, and chemical fertilizer added were tested using a Hach Soil Test Kit before plant growth. Determination of soil pH was done using the aqueous soil extraction method and a Pocket Pal pH electrode. Filtered extract from a Mehlich 2 Extraction for soil was used for phosphorus analysis (PhosVer 3 Method) and potassium analysis (Turbidimetric Tetrophenylborate Method).A calcium sulfate extraction for soil provided filtered extract for determination of nitrate-nitrogen by the Cadmium Reduction Method.

PRODUCTION OF VERMICOMPOST

Organic solid waste management by employing earthworms has multifarious role to play in a developing country like India. Firstly, it makes way for utilization of available organic wastes to produce the rich source of organic manure of high quality, which is superior to other types of organic manures in its physico-chemical and biological properties. Secondly, the manure is produced in a shorter duration of time of six weeks and is a fully matured, homogenous matter. Thirdly, the programme provides job opportunities for

the unskilled labour force. Finally, it is the best way of safe guarding the environment. Vermicompost (compost produced by the activity of selected species of earthworms) has been adjudged as the best source of organic amendments to soil. Using vermicompost can fulfill the requirements for organically grown products.

Title of course: Certificate course in biofertlizers: Vermicomposting

Objective:

- To inculcate concepts of biofertilizers like vermicomposting.
- To understand techniques in Vermicomposting.
- To increase employability of the students.
- To improve the soil quality by promoting the biofertilizers.

Duration of course **: 4 5 H r s**

Course structure **:**

1) **Paper I** **:** Theory
2) **Paper II** **:** Practical

Eligibility for admission **:** H.S.C. or equivalent qualification

Skeleton of the course:

Sr.No	Paper	Name of subject	Teaching hours	Maximum marks alloted			Passing		
				External	Internal	Total	External	Internal	Total
	Paper I	Theory	15	80	20	100	32	08	40
	Paper II	Practical	30	80	20	100	32	08	40

Head

Department of Zoology

Mahavidyalaya

Principal

Syllabus

Certificate course in biofertlizers: Vermicomposting

Paper I- Theory

Unit-1

1.1 Vermicomposting : Introduction and Scope

1.2 Types of Earthworm and Classification Epigeic, Endogeic, Diageic

1.3 Life history of Earthworms (Earthworm Species *Eisenia foetida*)

Unit-2

2.1 Objectives of Vermicompost

2.2 Vermicompost Production : Establishment of Vermicomposting and Vermiwash

2.3 Different Methods of Vermicomposting: Small and large scale Bed method

2.4 Harvesting the Compost

2.5 Storing and packing of vermicompost

Unit-3

3.1 Precautions while Vermicomposting

3.2 Physico- chemical analysis of vermicompost:

3.3 Physical Parameters of vermicompost

3.4 Nutrient content of vermicompost and their role in agriculture

3.5 Benefits of vermicompost

3.6 Pests and diseases of Earthworm

Certificate course in biofertlizers: Vermicomposting Paper II- Practical

- Scientific classification of Earthworm
- Study of external morphology of Earhworm- *Eisenia foetida*
- Study of habit and habitat of Earhworm- *Eisenia foetida*
- Study of Digestive system of earthworm
- Study of Reproduction of earthworm
- Establishment of vermicomposting unit Pit method
- Establishment of vermicomposting unit Bed method
- Establishment of vermiwash unit
- Vermicompost production, harvesting and packaging.
- Study of cocoon and vermicast
- Study of Pests and diseases of Earthworms

References

- The Textbook of Vermicompost, Vermiwash and Biopesticides : Keshav singh and et al
  Publisher: Biotech Books
- The Book Hand Book Of Biofertilizers & Vermiculture
  Publisher: Engineers India Research Institute
- Handbook of Organic Farming and Organic Foods With VermicompostingNeem
  Publisher: Engineers India Research Institute

- Text Book of Applied Zoology: Vermiculture, Apiculture, Sericulture, Lac Culture, Agricultural Pests and their Controls: Pradip Jabde
  Publisher: Discovery Publishing House

- The Worm Farmer's Handbook Mid- to Large-Scale Vermicomposting for Farms, Businesses, Municipalities, Schools, and Institutions :Rhonda Sherman
  Publisher: Chelsea Green Publishing
- Vermiculture Technology: Earthworms, Organic Wastes, and EnvironmentalManagement:
  Clive A. Edwards, Norman Q. Arancon, Rhonda L. ShermanPublisher**:** CRC Press 2010
- Commercial Vermiculture: How to Build a Thriving Business in Redworms:PeterBogdanov
- Applied Zoology:N Arumugam , T Murugan , R Ram Prabhu ,J Johnson Rajeshwar.Publisher: Saras Publication
- Worm Farming: Setup A Sustainable Vermiculture Earthworm Composting Ranch: BrianGrant
  Publisher: Sparrow Publications.