Manoharbhai Shikshan Prasarak Mandal Armori's
MAHATMA GANDHI ARTS, SCIENCE &
LATE NASARUDDINBHAI PANJWANI COMMERCE
COLLEGE ARMORI
Dist. Gadchiroli (Maharashtra) 441 208
Affiliated to Gondwana University, Gadchiroli.
Re-accredited by NAAC 'A' with 3.24 CGPA

ANNUAL QUALITY ASSURANCE REPORT
(AQAR) 2023-24

CRITERION – VII
INSTITUTIONAL VALUES & BEST PRACTICES

METRIC NO: - 7.1.3.

METRIC NAME: - *Facilities in the Institution for the management of the following types of degradable and non-degradable waste*

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Certificate of Verification

The document herewith is a testimonial of the following specifics;

- AQAR 2023-24
- Criterion - **VII (Institutional Values & Best Practices)**
- Metric no. – **7.1.3**
- Metric Particular - Facilities in the Institution for the management of the following types of degradable and non-degradable waste.

It is affirmed that the attached document pertinent to the above cited specifics are duly verified and approved by the IQAC.

Criterion Head

IQAC Coordinator

IQAC-Co-ordinator

IQAC Chairperson

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CRITERION – VII

INSTITUTION VALUES & BEST PRACTICES

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Reports of Waste Management

PROJECT REPORT

On

“STUDY ON INNOVATIVE APPROACHES ON VERMICULTURE AND VERMICOMPOSTING IN COLLEGE CAMPUS”

Session 2023-24

Project Report Submitted

By

Students of B.Sc. I year

Guided

By

Dr. J. N. PAPADKAR (H.O.D.)
&
Prof. D.W. SAHARE

MAHATMA GANDHI ARTS, SCIENCE AND LATE N. P. COMMERCE COLLEGE ARMORI, DISTRICT- GADCHIROLI (MS) INDIA

(Zoology Batch-2023-2024)

INTRODUCTION

Vermiculture is basically the science of breeding and raising earthworms. It defines the thrilling potential for waste reduction, fertilizer production, as well as an assortment of possible uses for the future.

Vermicomposting is the process of producing organic fertilizer or the vermicomposting from bio-degradable materials with earthworms. Composting with worms avoids the needless disposalof vegetative food wastes and enjoys the benefits of high-quality compost.

The earthworm is one of nature's mile stone "soil scientists." Earthworms are liberated and cost-effective farm relief. The worms are accountable for a variety of elements including turning common soil into superior quality. They break down organic matter and when they eat, they leave behind castings that are an exceptionally valuable type of fertilizer.

Third Year Students of department of Zoology rationalize the methodologies as well as the laboratory findings undertaken on their innovative approach on Vermiculture and Vermicomposting.

Advantages of Vermiculture and Vermicomposting

Vermiculture and vermicomposting is one of the most valuable ecological endeavors we have engaged in as it caters not only environmental protection but also helped we acquire knowledge on its proper methodology.

Vermiculture is environment friendly since earthworms feed on anything that is biodegradable, vermicomposting then partially aids in the garbage disposal problems. No imported inputs required, worms are easily available and the materials for feeding are abundant in and around campus plants leaves wastes, grasses, and used papers. It is also highly profitable, both the worms and castings are used to garden, medicinal, and campus premises plants itself.

Vermicomposting does not have any adverse effect on soil, plant and environment. It improves soil aeration and texture thereby reducing soil compaction. It improves water retention capacity of soil because of its high organic matter content. It also promotes better root growth and nutrient absorption and improves nutrient status of soil, both macro-nutrients and micro-nutrients.

Precautions for Vermiculture and Vermicomposting

For vermiculture several precautions in doing such process: -

- To ensure that the culture would turn out successful and fruitful.

- From our hands-on experiences, vermicomposting pit should be protected from direct sun light so that the worm would survive. Direct heat possibly causes the worms to die.
- Spray water on the pit as when required to maintain moisture level because worms are fond of it.
- We should also protect the worms from ant, rat, bird and excessive rain.

METHODOLOGY

Vermiculture is the science of worm composting. Worms can eat their body weight each day in fruit and vegetable scraps, leaving castings as the byproduct. Worm castings are called worm compost.

Following methodology adopted during the study: -

a) **Clean-up and Preparation of Vermi Beds**: - Our B.Sc1st year Zoology group started the vermiculture project on August 01st, 2023 with the clean-up and preparation of the previouslybuilt vermiculture beds located near the auditorium, in campus. There are one vermi beds, 8 X 3 X 3 feet in size and made with bricks blocks.one small tank prepared for vermiwash. We have cleaned vermi bed and started to gather substrates.

b) **Substrate Application**: - After some days of gathering, we put the substrates to vermi beds on August12th 2023. We put a mixture of loam soil, cow dung, manure and partially decomposed leaves in the vermi bed; we put a mixture of cow dung manure, partially decomposed rice straw. The succeeding application made used of mixed and different substrates.

Before putting the substrate, we made sure that the materials are cut or break into smaller pieces. Finer materials could easily decompose. We also mixed the different media together well for the worms to easily digest these. We have moistened the materials and cover the vermi beds with roof and cover to initiate anaerobic decomposition. The substrates were kept in the beds for ten days before we put the vermi worms. It took 10 to 15 days to complete anaerobic decomposition and only then that they are ready for worm consumption.

c) **Introducing the Vermi Worms, Red wriggler (*Eisenia foetida*): -**After 10 days upon putting the substrates into the vermi beds, we introduce the vermi worms into the substrate on August 18. We used the Red wriggler (*Eisenia foetida*) in our vermicompost. Aerobic decomposition lasts for 7 – 14 days depending on the materials used and the ratio of the worms to the substrate. In our case, we have a total of 250 kilograms of substrate each bed enough to feed a one and half kilogram of worm for two weeks. Within the period, we moistened the substrate regularly to provide the right moisture (60 - 80%) for the vermi worms to grow and multiply.

d) Feeding the VermiWorms: - After introducing the red wrigglers, we fed the worms by placing garden wastes and also leave. After two weeks, the red wrigglers have eaten the food waste leaving behind worm casting or compost.

e) Harvesting of Vermicast: - Harvesting will commence 10 to 14 days or 2 weeks after stocking of worms. Prior to harvest, we refrained from watering the substrate for the last three days to ease the separation of castings from worms and likewise preventing the castings to become compact. On January 10, we had the first harvest of the vermicast or the worm manure; we actually harvested a total of 400 kilograms of organic fertilizer from the vermi bed which contains mixture of loam soil, cow dung manure and totally decomposed leaves.

f) Re-Applying Substrates: -After the harvest of the vermi cast, we applied substrates in the vermi beds anew and proceed the same procedure.

g) Re-introduction of the Vermi Worms, Red wriggler (*Eisenia foetida*): -The application of new substrates into the vermi beds require the re-introduction of the vermi worms or the red wrigglers (*Eisenia foetida*) for the continuity of the worm's culture and for their production of the vermi cast which are very good organic fertilizer. After introducing the worms into the substrates, we sprinkled it with water to keep the moisture on which worms can easily digest these substrates. And these steps will go over and over again until such time that the redwrigglers are cultured into a big number and vermicast are produced well that it can be used to gardening and handover to Botany department.

h) Using the Harvested Vermicast: - Our harvested vermicast or worm manure was used as organic fertilizer for garden plants, medicinal plants of campus The other sacks of organic fertilizers were stored for future use.

DATA AND ANALYSIS

The vermi worms used in the vermiculture and vermicomposting project came directly at the Mahatma Gandhi College, Armori, Department of Zoology. These vermi worms are identified as Red wrigglers or scientifically known as *Eisenia foetida*.

*Eisenia. foetida*is especially adapted to living in a decaying environment, especially ones such as rotting vegetables, manure and actual compost, which makes it a very good choice for vermicomposting. It does not burrow into soil, and is found in habitats where less competition for food and space for them required.

On the other hand, earthworm is one of nature's pinnacle "soil scientists." The basic body plan of an earthworm is a tube, the digestive system, within a tube, the muscular slimy, moist outer

body. The body is annular, formed of segments that are most specialized in the anterior. Most earthworms are decomposers feeding on undecayed leaf and other plant matter.

From the laboratory activity, we have observed that the vermin worms range from 1 cm to 8 cm. From the 1 kilogram introduced vermi worms, it increases 300 grams each harvest.

Vermicast. The vermicast is a good organic fertilizer and soil conditioner. It is produced by the decomposition of organic matter or agricultural wastes. High-quality vermicast can be produced by worms such as the red wrigglers (*E. foetida*). It contains humus with high levels of nutrients such as nitrogen, potassium, calcium, and magnesium.

The vermicast produced in the project was black and crumbly. It is rich in nutrients. It will be used in gardens, landscaping,in around college campus. The vermicompost itself is beneficial forthe land in many ways, including as a soil conditioner, a fertilizer, addition of vital humus or humic acids, and as a natural pesticide for soil.

Indeed, the use of red wriggler worms to produce vermicast has good potential for the production of organic fertilizer.

Substrates. The substrates, or media where the red wriggler worms exist, were ubiquitous in the community. We applied several substrates in the vermi beds in our several substrate treatments. We used substrates such as manure of livestock including dry cow dung; decomposed and partially decomposed plant wastes collected from garden plants of campus; and vermicast containing red wrigglers.

Manures of the cow contribute to the fertility of the soil by adding organic matter and nutrients, such as nitrogen, that are trapped by bacteria in the soil.

CONCLUSIONS

The Vermiculture and Vermicomposting activity is such a worthwhile and exciting venture. We have learned a lot specifically in the methodologies, benefits and significance of this activity. After almost three months, project delivery and execution, we can therefore conclude that:

1. Vermiculture is a substantial way of reducing wastes, producing fertilizers and maintaining the balance of the ecological environment;

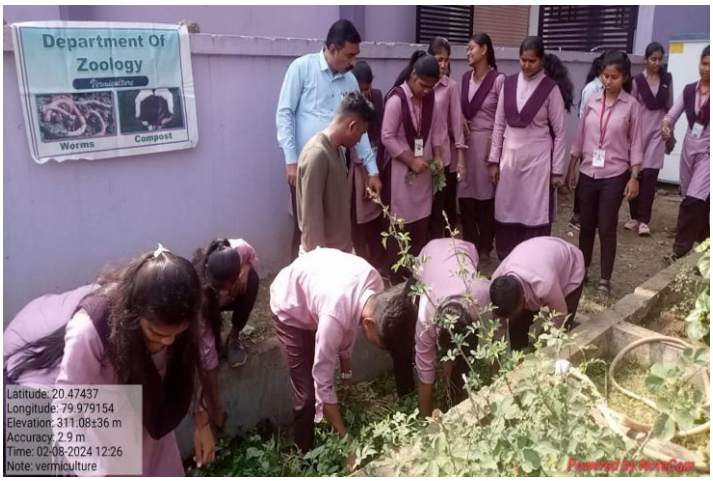
2. Vermicomposting can produce high-quality fertilizers which are better compared to other commercial fertilizers in the market;

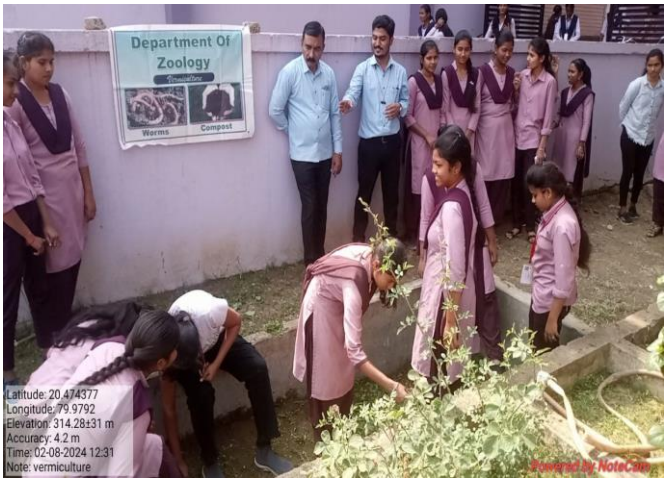
3. Vermiculture converts farm wastes into organic fertilizer, making it an environment-friendly technology;

4. Vermiculture increases crop yield and lessens dependence on chemical fertilizers thus mitigating climate change;

5. Vermiculture can be made into a livelihood program and become a source of extra income through selling the vermicast and also the vermi worms;

6. Taking worms out of their natural environment and placing them in the vermi beds creates a human responsibility. They are living creatures with their own unique needs, so it is important to create and maintain a healthy habitat for them to do their work. If you supply the right ingredients and care, your worms will thrive and make compost for you.





Use of vermicompost by Botany department: -

Vermicomposting is a low-technology, environmentally-friendly route used to treat organic waste. The resulting vermicompost has been shown to have several positive impacts on plant growth and health. This organic fertilizer is therefore increasingly considered in garden, agriculture and horticulture as a show's potential alternative to inorganic fertilizers.

In current Year Department of Botany use the vermicompost prepared by Zoology Department. Environmentally friendly vermicompost is a valuable resource as a soil fertilizer because it provides large amounts of macro- and micronutrients for plant growth and is a low- cost and substitute to mineral fertilizers. Vermicompost can be described as a compound mixture of earthworm faeces, and microorganisms, which when added as a supplementary to the soil increases plant growth, flowering, fruit production and accelerates the development of plant species and reduce the soil pollution.

Using Vermicompost in Potted plants and Herbal Garden.

1. Mix compost directly in with potting soil.
2. Put a layer of compost on top of the soil in Herbal Garden.

Department of Botany develop the Herbal Garden, plantation of ornamental plant and potted plants are prepared at the college campus and arrange different corner of the college campus withthe aim of improving greenery. Department of Botany and campus beautification committee taking care of it regularly by using vermicompost and spread the message to save trees, save environment and use the environmentally friend fertilizer.

Department of Chemistry

Report on Chemical Waste

1. Introduction

This report addresses the management, disposal, and safety measures associated with chemical waste generated in a chemistry laboratory. The management of chemical waste is critical to ensure environmental protection, the safety of laboratory personnel, and compliance with regulatory standards. Proper waste management practices reduce the risk of contamination, environmental damage, and health hazards.

2. Types of Chemical Waste

Chemical waste in the laboratory can be categorized based on its properties, chemical composition, and disposal requirements. The main types of chemical waste generated in a chemistry laboratory include:

- **Organic Waste:**
  - Solvents (e.g., ethanol, acetone, dichloromethane)
  - Oils and greases
  - Chemical reagents
  - Biological waste contaminated with organic chemicals
- **Inorganic Waste:**
  - Acids (e.g., sulfuric acid, hydrochloric acid, nitric acid)
  - Bases (e.g., sodium hydroxide, potassium hydroxide)
  - Heavy metals (e.g., lead, mercury, cadmium)
  - Salts (e.g., sodium chloride, sodium sulfate)
- **Hazardous Waste:**
  - Flammable substances
  - Toxic substances
  - Carcinogenic compounds
  - Reactive compounds (e.g., peroxides)
- **Non-Hazardous Waste:**
  - Non-toxic chemicals

- Used paper, plastics, and glassware

3. Sources of Chemical Waste

Chemical waste can be generated from various laboratory activities, such as:

- **Experiments and Reactions:** During chemical reactions, by-products and excess reagents often become waste.
- **Cleaning and Maintenance:** Cleaning glassware, equipment, and benches often involves the use of solvents and other chemicals.
- **Disposal of Unused Reagents:** Leftover chemicals from stock solutions, unused reagents, and expired chemicals contribute to waste.
- **Waste from Analytical Procedures:** Chemicals used for titrations, chromatography, spectroscopy, and other analytical techniques.

4. Hazardous Properties of Chemical Waste

Laboratories handle chemicals with varying degrees of hazard. These properties must be carefully considered during disposal:

- **Flammability:** Chemicals that are easily ignited, such as organic solvents, should be disposed of in fire-resistant containers and stored away from heat sources.
- **Toxicity:** Harmful chemicals can pose acute or chronic health risks. They must be disposed of properly to avoid contamination of the air, water, or soil.
- **Corrosivity:** Strong acids and bases that can cause severe damage to living tissue and materials need to be neutralized before disposal.
- **Reactivity:** Chemicals that are unstable or can react violently (e.g., peroxides) require special handling and disposal.

5. Waste Segregation and Labeling

Chemical waste should always be segregated based on its compatibility and hazard classification:

- **Organic Solvents:** Store in clearly labeled containers separate from aqueous or acidic waste.
- **Acidic and Basic Waste:** Store in separate containers to prevent neutralization or dangerous reactions.
- **Heavy Metals:** Use designated containers for disposal to prevent contamination.

Labeling is a critical step in waste segregation. Labels should include:

- The chemical name or formula

- Hazard symbols (e.g., corrosive, flammable, toxic)
- Date of accumulation
- Volume/weight of waste

6. Waste Disposal Procedures

The proper disposal of chemical waste is vital for environmental protection. The following general guidelines should be followed:

- **Collection and Storage:**
  - Waste should be stored in properly labeled, leak-proof, and corrosion-resistant containers.
  - The storage area should be well-ventilated, dry, and away from direct sunlight.
- **Disposal of Non-Hazardous Waste:**
  - Non-toxic chemicals may be disposed of in regular waste streams after ensuring they do not pose an environmental or health risk.
- **Disposal of Hazardous Waste:**
  - Hazardous chemical waste should be collected and sent to licensed disposal facilities that specialize in handling toxic and hazardous materials.
  - The disposal service should have a detailed waste management plan, and the laboratory should retain a waste manifest to ensure traceability.

7. Safety Precautions

Laboratory staff must follow stringent safety protocols when handling chemical waste. Some key measures include:

- **Personal Protective Equipment (PPE):** Ensure that gloves, goggles, lab coats, and face shields are worn while handling chemical waste.
- **Spill Containment:** Spills should be immediately contained and cleaned up following the laboratory's spill response procedures. Spill kits should be readily available.
- **Training:** Laboratory personnel should be trained in the proper procedures for handling, segregating, and disposing of chemical waste.
- **Ventilation:** Fume hoods and exhaust systems should be used when handling volatile or toxic chemicals.

8. Regulatory Compliance

Compliance with local, national, and international regulations is mandatory for safe chemical waste management. Some relevant regulations include:

- **Environmental Protection Agency (EPA):** In the United States, the EPA sets guidelines for hazardous waste disposal under the Resource Conservation and Recovery Act (RCRA).
- **Occupational Safety and Health Administration (OSHA):** OSHA provides regulations on the safe handling of chemicals in the laboratory.
- **Local Regulations:** Local government regulations may provide specific rules for waste disposal, including limitations on certain substances.

9. Conclusion

Chemical waste management is a critical component of laboratory safety and environmental protection. Laboratories must establish clear waste disposal protocols, ensure proper segregation and labeling, and ensure that hazardous waste is disposed of by licensed services. Regular training and adherence to safety standards are essential to mitigate the risks posed by chemical waste.

10. Recommendations

- Establish a chemical waste management policy in the laboratory.
- Ensure routine inspections of chemical waste storage areas.
- Provide training for all laboratory personnel on proper waste handling and disposal techniques.
- Conduct periodic audits to ensure regulatory compliance and improve safety measures.

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