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 3.02 CGPA

SELF STUDY REPORT (SSR)

2016-17 to 2020-21

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.*

Web: - mgcollegearmori.ac.in
e-mail: - mgcollege.armori@gmail.com
Phone: - 07137-266558

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*

CONTENT

Repot of Waste Management

PROJECT REPORT

On

"STUDY ON INNOVATIVE APPROACHES ON VERMICULTURE AND VERMICOMPOSTING IN COLLEGE CAMPUS"

Project Report Submitted

By

Students of B.Sc. III

Guided

By

Dr. J. N. PAPADKAR (H.O.D.)

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

(Zoology Batch-2021-2022)

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 disposal of 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.Sc third year Zoology group started the vermiculture project on November 25th, 2021 with the clean-up and preparation of the previously built 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 August28th 2018. 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 September 25, we had the first harvest of the vermicast or the worm manure; we actually harvested a total of 340 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 red wrigglers 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 for the 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.


Department Of Zoology
Worms
Latitude: 20.474387
Longitude: 79.979174
Elevation: 215.95±18 m
Accuracy: 10.6 m
Time: 25-11-2021 12:11
Note: vermiculture
Powered by NoteCam


Department Of Zoology
Worms
Latitude: 20.474329
Longitude: 79.97903
Elevation: 203.98±40 m
Accuracy: 18.8 m
Time: 25-11-2021 12:13
Note: vermiculture
Powered by NoteCam


Latitude: 20.474335
Longitude: 79.979181
Elevation: 176.08±49 m
Accuracy: 25.0 m
Time: 25-11-2021 12:15
Note: vermiculture
Powered by NoteCam


Latitude: 20.474387
Longitude: 79.979205
Elevation: 173.97±43 m
Accuracy: 27.4 m
Time: 25-11-2021 12:18
Note: vermiculture
Powered by NoteCam


Latitude: 20.474357
Longitude: 79.979137
Elevation: 172.87±37 m
Accuracy: 20.0 m
Time: 25-11-2021 12:15
Note: vermiculture
Powered by NoteCam


Latitude: 20.47433
Longitude: 79.979208
Elevation: 192.57±63 m
Accuracy: 24.9 m
Time: 25-11-2021 12:20
Note: vermiculture
Powered by NoteCam

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 with the 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.

Laboratory Chemical Waste Management

Report Department of Chemistry

Proper chemical management is necessary to protect the health and safety of the college and surrounding communities and the environment. There are federal and state regulations that require all generators of chemical waste receive training and follow proper waste management and disposal procedures. These regulations have severe monetary and civil penalties associated with them. In the chemistry laboratory following s are the examples of chemical waste include, but are not limited to:

- Organic solvent
- Inorganic solvent Unused and surplus reagent grade chemicals
- Intermediates and by-products generated from educational experiments
- Anything contaminated by chemicals
- Used oil of all types
- Mercury containing items
- Pesticides
- Finely divided powders
- Contaminated syringes, needles, razor blades, pipette tips
- Equipment and apparatus containing hazardous waste
- Uncured Resins (Phenolic, Epoxy, Styrene, etc....)
- Dye and glazes

The chemical waste generated during the daily practices is collected and disposal process is followed according to the standard. Wastes is categories into solid and liquid and collected separately. The solid waste collected in suitable container and labeled as solid waste and Liquid

waste collected separately and labeled as liquid waste. Solid waste is disposed of by underground burning in remote area with highly percussions.

Liquid waste in the lab separated according to their pH i.e., acids, bases and neutral liquid waste are separated into separate container if the quantity and concentration of solvent is high. In some cases, if the quantity and concentration of solvent is very low in such case, we dispose the liquid waste directly through basin with running tap water.

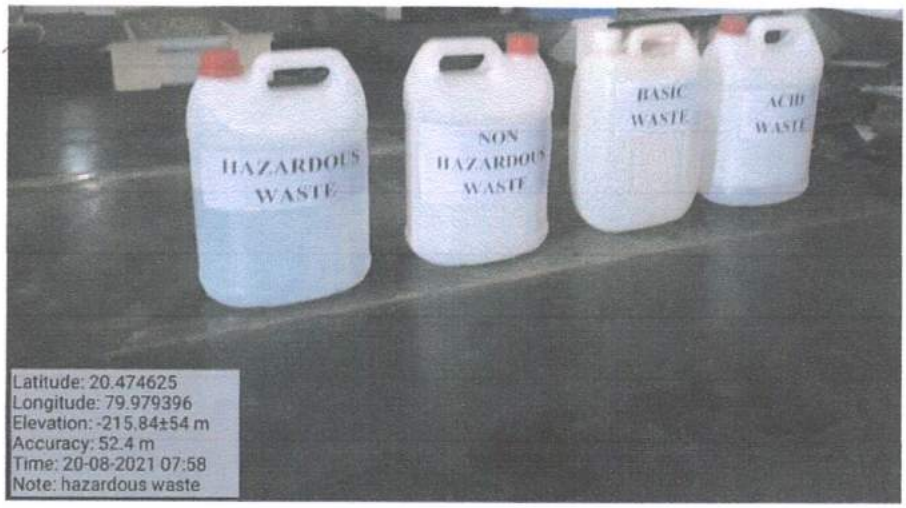

Photo: Liquid waste storage

Most of apparatus are used in chemistry laboratory id made up by glass that why broken glass pieces containing chemical are found in large amount in dustbin. We separated the broken glass pieces into separate container and disposed in to regular garbage

Conclusion:

Proper chemical waste management protects the health and safety of everyone and prevents or minimizes pollution. All generators of chemical waste should do their best to minimize the amounts or chemical waste they generate and recycle whenever possible.

Head of Chemistry Department
(Prof. S. M. Sontakke)

Principal
Mahatma Gandhi Arts, Science & Late N. P. Commerce College, Armori, Dist - Gadchiroli

PROJECT REPORT

On

"STUDY ON INNOVATIVE APPROACHES ON VERMICULTURE AND VERMICOMPOSTING IN COLLEGE CAMPUS"

Project Report Submitted

By

Students of B.Sc. II

Guided

By

Dr. J. N. PAPADKAR (H.O.D.)

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

(Zoology Batch-2020-2021)

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 disposal of 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.

Principal
Mahatma Gandhi Arts, Science & Late N. P. Commerce College, Armori, Dist - Gadchiroli

- 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 Preparationof Vermi Beds**:- Our B.Sc third year Zoology group started the vermiculture project on February 15th, 2021 with the clean-up and preparation of the previously built 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 August28th 2018. 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.

Principal
Mahatma Gandhi Arts, Science & Late

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 September 25, we had the first harvest of the vermicast or the worm manure; we actually harvested a total of 340 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 red wrigglers 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

lesse 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

Principal
Mahatma Gandhi Arts, Science & Late College,

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 for the 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.

Principal
Mahatma Gandhi Arts,
Science & Late
N P Commerce College,
Armori Dist - Gadchiroli

Principal
Mahatma Gandhi Arts,
Science & Late
N P Commerce College,
Armori, Dist - Gadchiroli

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 shows 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 77 potted plants are prepared at the college campus and arrange different corner of the college campus with the 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.

Principal
Mahatma Gandhi Arts,
Science & Late
N. P. Commerce College,
Armori, Dist - Gadchiroli

Arts, Science & late N.P. Commerce College Armori

PROJECT REPORT

On

"STUDY ON INNOVATIVE APPROACHES ON VERMICULTURE AND VERMICOMPOSTING IN COLLEGE CAMPUS"

Project Report Submitted

By

Students of B.Sc. II

Guided

By

Dr. J. N. PAPADKAR (H.O.D.)

Dr. R. N. CHAVHAN

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

(Zoology Batch-2018-2019)

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 disposal of 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.

M.G. Art's, Science & late N.P. Commerce College Armori

PRINCIPAL
M. G. Arts, Science &
Late N. P. Commerce College
ARMORI, Dist. Gadchiroli

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 Preparationof Vermi Beds**:- Our B.Sc third year Zoology group started the vermiculture project on August 20th , 2018 with the clean-up and preparation of the previously built 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 August28th 2018. 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

Science & late N.P. Cur...

Principal

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 September 25, we had the first harvest of the vermicast or the worm manure; we actually harvested a total of 340 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 red wrigglers 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.

M.G. Arts, Science & late N.P. Commerce College Armori

PRINCIPAL
M. G. Arts, Science &
Late N. P. Commerce College
ARMORI, Dist. Gadchiroli

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

lesse 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 for the 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.

M.G. Arts, Science & late N.P. Commerce

Principal
Mahatma Gandhi Arts,
Science & Late

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.

M.G. Art's, Science & late N.P. Commerce College ★ Armori ★

PRINCIPAL
M. G. Arts, Science &
Late N. P. Commerce College
ARMORI, Dist. Gadchiroli

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 shows 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 77 potted plants are prepared at the college campus and arrange different corner of the college campus with the 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.

M.G. Arts, Science & late N.P. Commerce College Armori

Principal
Mahatma Gandhi Arts,
Science & Late
N P. Commerce College,
Armori

PROJECT REPORT

On

"STUDY ON INNOVATIVE APPROACHES ON VERMICULTURE AND VERMICOMPOSTING IN COLLEGE CAMPUS"

Project Report Submitted

By

Students of B.Sc. II

Guided

By

Dr. J. N. PAPADKAR (H.O.D.)

Dr. R. N. CHAVHAN

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

(Zoology Batch-2017-2018)

INTRODUCTION

INTRODUCTION

Aristotle has said, **"Earthworms are intestines of the earth."**Only in the twentieth century has the truth in this statement been verified and found correct.Darwin was another one to state: **"No other creature has contributed to building of earth as earthworm."**

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 disposal of 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

PRINCIPAL
M. G. Arts, Science & Late N. P. Commerce College
ARMORI, Dist. Gadchiroli

Precautions for Vermiculture and Vermicomposting

For vermiculturesseveral 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 Preparationof Vermi Beds**:- Our B.Sc third year Zoology group started the vermiculture project on August 1st, 2017 with the clean-up and preparation of the previously built 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 August8th. 2018. 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 (*Eiseniafoetida*)**:-After 10 days upon putting the substrates into the vermi beds, we introduce the vermi worms into the

Science & late N.P. Commerce
Principal

substrate on August 18. We used the Red wriggler (*Eiseniafoetida*) 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 200 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 September 4, we had the first harvest of the vermicast or the worm manure; we actually harvested a total of 825 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-introducition of the Vermi Worms, Red wriggler (*Eiseniafoetida*):-**The application of new substrates into the vermi beds require the re-introduction of the vermi worms or the red wrigglers (*Eiseniafoetida*) 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 red wrigglers 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.

M.G. Arts, Science & late N.P. Commerce College Armori

Principal
Mahatma Gandhi Arts,
Science & Late
N. P. Commerce College,
Armori, Dist - Gadchiroli

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 *Eiseniafoetida*.

These worms are known under various common names, including red worms, brandling worms and tiger worms. These are a species of earthworm adapted to decaying organic material. They thrive in rotting vegetation, compost, and manure. They are rarely found in soil and are used for vermicomposting. They are native to Europe, but have been introduced to every other continent occasionally threatening native species.

When roughly handled, red wrigglers exude a pungent liquid, most probably as a chemical self-defense. This is presumably a defense. Like other earthworms, *E. foetida*are hermaphroditic. However, two worms are still required for reproduction. The two worms join atclitellums and exchange sperms. Both worms then, rather than laying eggs directly, secrete cocoons that contain several eggs. These cocoons are lemon-shaped and begin as pale yellow when first laid, and become more brownish as four to six worms mature. These cocoons are clearly visible to the naked eye.

*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

lesse 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 400 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.

Principal
Mahatma Gandhi Arts

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 for the 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.

Another substrate we used is the rice hulls; these are the hard protecting coverings of grains of rice. Rice hulls are organic material and can be composted. However, their high lignin content can make this a slow process. Sometimes earthworms are used to accelerate the process. Using vermicomposting techniques, the hulls can be converted to fertilizer. We likewise used shredded moist newspapers which can give sufficient moisture for the red wrigglers to survive and be able to replicate its number.

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;

Principal
Mahatma Gandhi Arts,
Science & Late

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.

RECOMMENDATIONS

Vermiculture is a way of composting using earthworms to speed up the process. We, in the group, have engaged ourselves in our unique way of innovative vermiculture and vermicomposting activity for almost three months. From that span of time, we recommend that:

1. Sufficient time should be allotted for the project in order to maintain it towards its sustainable development;

2. Better location for the project should be identified for easy supervision and monitoring;

3. Appropriate roofing materials should be used in establishing the beds' roofings to prevent excessive rain in penetrating the culture beds that can possibly kill the vermi worms;

4. Proper ventilation in the vermi beds should be provided, this can be done through proper roofing because partially closed vermi beds might hinder the worms to access oxygen which they need for them to replicate;

5. Schedule of the project-in-charge of the day should be systematically planned and designated so that the project will be monitored regularly to prevent circumstances that might destruct or hinder the progress of the project.

From these given recommendations, we look forward that the upcoming activity similar to this, would be more organized and systematic in its planning, more appropriate in execution and successful in its evaluation.

Arts, Science & late N.P. Commerce College Armori

PRINCIPAL
M. G. Arts, Science &
Late N. P. Commerce College
ARMORI, Dist. Gadchiroli

Principal
Mahatma Gandhi Arts,
Science & Late
N. P. Commerce College,
Armori, Dist - Gadchiroli

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 shows 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 77 potted plants are prepared at the college campus and arrange different corner of the college campus with the 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.

Principal
Mahatma Gandhi Arts,
Science & Late
N. P. Commerce College,
Armori, Dist - Gadchiroli

Students adding compost to potted plants

Students adding compost to potted plants

M.G. Art's Science & late N.P. Commerce College Armori

PRINCIPAL
M. G. Arts, Science &
Late N. P. Commerce College
ARMORI, Dist. Gadchiroli