PROJECT REPORT

ON

"EARTHWORM PROJECT FOR SUSTAINAABLE AGRICULTURE"

2021-22

PREPARED BY

DEPARTMENT OF BOTANY

PATTAMUNDAI COLLEGE

PATTAMUNDAI

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REPORT

A project was undertaken by +3 3rd year students of Department of Botany on "Earthworm project for sustainable Agriculture" under the guidance of Dr. Anjali Kumari Dash, HOD Botany for the academic year 2021-22. 15 numbers of students have been participated in this project work. They have worked for 3 months to complete this project. They prepared vermicompost by using cow dung, decomposing vegetables, food waste and bedding materials with the help of earthworm in a tank by maintaining the temperature of the tank 22^0C to 25^0C with 82-85% moisture content. They have taken two same sized healthy plants of Kalanchoe pinnata, Tagetes patula and Andrographis paniculata for their experiment and applied vermicompost to one plant of each species and kept for observation for about 15 days. After 15 days it was observed that the plants with vermicompost had better growth than the plants without vermicompost.

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Abstract

Vermicompost restores microbial population which includes nitrogen fixers, phosphorous solubilizer etc. It provides major and micronutrients to the plants. It also improves soil texture and water holding capacity of the soil.

We 15 students of our botany department started preparing vermicompost by using cow dung, decomposing vegetables, food waste and bedding materials with the help earthworm, in a tank. Temperature of the tank was $22^{\cdot C}$-$25^{\cdot C}$ with 82-85% of moisture content. It took 3 months to convert it in a usable form. Then we took two same sized healthy plant of *Kalanchoe Pinnata, Tagetes patula, Andrographis paniculata* and then the prepared vermicompost was applied to one plant of each species. Each plant was left for 15 days. Then it was observed that the plants in which the vermicompost was applied had a noticeable growth in shoot and root as well.

INTRODUCTION

The study area is located near the Pattamundai town. Pattamundai is located at 20.57°N 86.57°E & 22 km from the Bay of Bengal in the Utkal Plains, at an elevation of 6 m from sea level. Pattamundai is a flat, low-lying delta region in the Lower Mahanadi River basin. The Brahmani river divides it from the Aul block. The Pattamundai Canal running from Cuttack to Alva Lock (80.5 km) constructed by the East India Company during the mid 19th century,is a major irrigation canal passing through the city. The river Brahmani is passing by the side of this municipality. The soil with high organic matter 5-15 % formed in temperate and cool humid region and low (1-3 %) in soil arid and semi-arid zones. The average rain-fall in the year was recorded 100-170 cm. while temperature between 20°C-38 °C. During winter, temperature was 10°C-25°C

The college was established in the year 1970 at by the collective efforts of the people of the locality who wanted higher education to come to their door steps.

This college is the 2nd largest college of the district upholds the purpose for which it was founded away back in the late sixties. This college is affiliated to Utkal university which is the premier university of Odisha provides the scope to the students to

pursue their dreams and become successful in life .This college offers higher secondary and undergraduate course in Science, Commerce and Arts. As per the National assessment and accreditation council it holds 'B' grade.

This college has excellent infrastructure, security and facilities. College provide us sports , cultural activities and everything .This college is known for its educational facilities like smart class rooms ,seminar hall ,advance lab , library etc.

In this local area, farmers are using chemical Fertilizer which is affecting useful organism and decreasing soil texture and overall soil quality of field. So we 15 students of our department decide to make a project on vermicompost under the guidance of Dr. Anjali Kumari Dash (HOD of Botany department) and to promote bio fertilizer in local areas for both commercial and environmental benefits. Apart from this in our college canteen and hostel vegetable and food wastes are available. Cow dung is easily available in local areas and all other requirements are easily available so it brings our attraction towards this project.

The vermicompost is a word which is used for the final product (humus-like material) of composting procedure of organic waste materials by earthworms. Many organic wastes have been converted into worm manure (vermicompost) by different

species of earthworms which include cow manure, leaves, paper waste, sheep-goat manure, rice waste, vegetable waste.Vermicomposting process employing earthworms is increasingly being used for conversion of both municipal and industrial wastes to vermicast with reduced metals content. Vermicompost is described as a perfect soil amendment and more eco-friendly as compared to chemical fertilizers.

Compositing is one of the feasible means for converting bio-degradable solid wastes into beneficial organic soil amendments for supporting environment friendly agricultural production system. Many beneficial organisms and microorganisms act as chemical decomposer in the process of formation of stable organic end product during compositing. Among them, decomposers like earthworm play significant role in stimulating the process of compositing. It enhances the nutrient value while fastening the process of stable organic end-product formation .This process of involvement of earthworms in preparing enriched compost is called vermicomposting .It is one of the simplest methods to recycle agricultural wastes and to produce quality compost .Earthworm acts physically an aerator, crusher, and mixer, chemically a degrader and a biological stimulator in the process of decomposition .Earthworms consume biomass and excrete it in

a digest form called as worms cast or worm manure .worm casts are popularly called as black gold .They are rich in essential plant nutrients ,plant growth promoting substances ,beneficial soil micro flora and having properties of inhibiting pathogenic microbes . As a results , the organic end products produced by the use of earthworms i.e vermicompost also inherits most of the beneficial properties of black gold .Vermicompost acts as an organic soil amendment improves three dimensional soil health i.e physical ,chemical and biological properties. The earthworm's underground burrows modify soil hydro-thermal and aeration regimes by making the soil more porous thus allowing free movement of air infiltration of water into deeper soil layers for better profile moisture recharge and root water uptake processes .Vermicompost is becoming popular as one the major component of the organic farming system because of its high nutritive value in addition to an important organic soil amendment.

Vermicompost contains earthworm cocoons and increases the population and activity of earthworm in the soil .It is free form pathogens, toxic element, weed seed etc. It minimizes the incidence of pests and diseases .It enhances the decomposition of organic matter in the soil. It contains valuable

vitamins, enzymes, and hormones like auxin, gibberellins, etc. It does not have foul odour unlike manures and decaying organic wastes.

General waste management strategies for organic residues ,such as composting and vermicomposting have been implemented in some developed and developing countries to solve the problem of organic wastes .

Vermicomposting can produce high quality fertilizers which are better as compared to other commercial fertilizers in the market so every farmers need to use vermicompost instead of other chemical fertilizer.

It can be made into a livelihood program and become a source of extra income through selling the vermicompost and also the vermi worms. its use can reduce the economic cost and leads to organic products which fetches higher price in the market .

REVIEW OF LITERRATURE

1. Michigan biology teacher Mary Arlene Appelhof arrived at idea of home vermicomposting .In 1972 she realized she wanted to continue composting in winter month despite living in a Northern climate. Her book 'Worms Eat My Garbage' is still held as seminal reading in the field of vermicomposting.
2. Sultan Ahmed Ismail (born on 9 Oct 1951) is an Indian soil biologist and ecologist .His work has centered on technique for regulating biodegradable wastes into fertilizer using local varieties of earthworm and soil bioremediation.
3. Choudhary and Suresh Kumar (2013)showed that application of vermicompost can increase the production of potential of cow pea (Vigna unguiculata)in acid soil by improving water retention at field capacity ,permanent wilting point ,bulk density ,and availability of nitrogen ,phosphorous, and potassium there by increasing growth and yield attributes of cow pea.
4. Rekha et al. (2018)recorded that C. annum treated with 50% vermicompost showed significant growth than the plant growth enhances viz. Gibberllic acid and indole

acetic acid treated plants. Significant improvement in all the parameters like length of shoots,length of internodes ,number of leaves and number of branches was observed in plants at the end of 3rd,4th,and 5th weeks of treatment.The findings clearly indicate that vermicompost can be exploited as a potential biofertilizer.

5. Manivannan et al .(2009) found that application of vermicompost @5 tonnes/ha gave significantly higher result than the application of inorganic fertilizers @20:80:40 kg ha-1 in French bean (Phaseolus vulgaris) in terms of growth,yield (1.6 times) and quality (protein,1.05 times) and sugar (1.01 times) content in seed of bean.Vermicompost application also improve the physical,chemical and biological properties of clay loam and sandy loam soils of Sivapuri, Chidambaram, Tamilnadu .
6. Rajkhowa and his coworker (2017) reported that integrated use 50% RDF+ VC 2.5 ha-1 ,+lime 4 q ha-1 ,under the hilly ecosystem of NE India ,resulted in significantly higher yield of green gram (10 q ha-1) and improved the soil organic carbon (2.5%), bacteria and fungi population and available N, P2O5 and K2O compared to the sole application of recommended dose of fertilizer.

Materials and Methodology

Materials:

- Water
- Cow dung
- Soil or sand
- Earth worm
- Kitchen wastages(college hostel)
- Dry leaves from field
- A large concrete bin
- Gunny bags
- Dry straw from paddy fields

Methodology:

1. To prepared compost a concrete tank was used.
2. The size of tank depends upon the availability of raw materials.
3. The collected biomass was placed under concrete tank. Under the sunlight for about 8-12 days.
4. Then cow dung was prepared for quick decomposition.
5. 2-3 inch layer soil or sand was added at the bottom of concrete tank.

6. Then fine bedding was prepared by adding decomposed cow dung and leaves the wastes collected from the hostel kitchen. They are distributed on the sand layer.
7. These materials were added in to the tank up to a depth 0.5-1.0 fit.
8. After adding the all bio wastage earthworm species were released over the mixture and the compost was covered with dry straw and gunny bags.
9. Water was sprinkled to maintain moisture.
   The tank to prevent the entry of ants, lizards, mouse, snakes etc.
   10. The compost was protected from rainwater and direct sunlight.

11. The compost was checked frequently to avoid from over heating and proper moisture and temperature was maintained.

12.We taken the 3 species of plant *Kalanchoe Pinnata,Tagetes patula and Andrographis paniculata*

13. Two plants from each three species was planted,one is with vermicompost and another was without vermicompost.

14. The growth of plants was checked frequently.

Five phages of vermicomposting

1. Collection of waste material.
2. Pre – digestion.
3. Earth worm pit preparation and compositing
4. Harvesting of vermicompost and Earthworm.
5. Packing and storing of vermicompost.

We used some precautions in the process of making vermicompost .

1. The collected waste materials was processed for shredding, mechanical separation, of the metal, glass, and ceramics and it should be stored in proper places.
2. Pre-digestion of organic waste was done at least 20-25 days by heaping the material along with cow dung slurry and regular watering. This process partially digests the material and fit for earthworm consumption. Addition of higher quantities of acid rich substances such as citrus wastes was avoided.

3. The vermicompost heap was not overloaded, in order to avoid high temperature that adversely affects earthworm's population.
4. Organic materials free from stones, glass pipes, plastics, ceramic tube etc. was used.
5. Temperature was maintained at $30^{\circ}C$ by upturning and staking and regular sprinkling of water.
6. Moisture was maintained at about 60% by proper drainage and aeration and by sprinkling of water.
7. The pit should be a bit inclined towards the hole at the bottom of the pit or tube to drain out the excess water. Make sure to have a drainage channel around the heap to avoid stagnation of water.
8. The compost material was turned upside down giving some days gap without disturbing the basal layer.
9. The organic materials were protected from pests and diseases.
10. The earthworms were protected from predators like ants, birds and lizards.
11. A thatched roof was provided to protect the vermicomposting unit from direct sunlight and rain.

RESULT and DISCUSSION:

1. After the 24 days,around 4000-5000 new worms were generated and the entire raw materials was turned into the vermicompost.

2. When this vermicompost was applied to plants,it promoted the growth of stem and root .

3. The plant to which vermicompost was applied was healthier than the other one.

4. It helps to increase the soil texture and overall soil quality.

5. When vermicompost was applied to one plant of each species, then the growth in stem length was observed.

6. The observation is shown below in the table:

SL NO.	Name of the plants	Without vermicompost	With vermicompost
1	*Kalanchoe pinnata*	16 cm.	19.5 cm.
2	*Tagetes patula*	18 cm.	24.2 cm.
3	*Andrographis paniculata*	11 cm.	14 cm.

On the basis of experiment , We concluded that vermicomost increases the fertility and water holding capacity of the soil.

which helps in better plant growth , germination and crop yield. It is an environment friendly way of reducing wastes , producing fertilizers and maintaining the balance of ecological environment .Farmers can take up vermicompost production which is a good source of macro and micro nutrients ,also several enzymes and growth regulators ,above all it will also maintain soil organic matter .

RECOMMENDATION

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 3 months .From that span of time , we recommend that , vermicomposting can produce high quality fertilizers which are better compared to other commercial fertilizers in the market so every farmers need to use vermicompost instead of harmful chemical fertilizers . It can be made into a livelihood program and become a source of extra income through selling the vermicast and also the vermiworms . It's use can reduce the economic cost and leads to organic products which fetches higher price in the market.


Kalanchoe pinnat
Family- Crassulace

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2	Bikasha Nanda Eswani	Bikasha BS(B) 19-023	B. Eswani
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Signature of Supervisor


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