

EFFECT OF VERMICOMPOST ON PLANT GROWTH

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Abstract: Environmental degradation is a major threat confronting the world, and the rampant use of chemical fertilizers contributes largely to the deterioration of the environment. In nature's laboratory there are a number of organisms (micro and macro) that have the ability to convert organic waste into valuable resources containing plant nutrients. In this project we use the micro-organisms and earthworms are important biological organisms helping nature to maintain nutrient flows from one system to another and also minimize environmental degradation. Vermi-composting is the process of producing organic fertilizer or the vermi-compost 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 pinnacle "soil scientists". They break down organic matter and when they eat, they leave behind castings that are an exceptionally valuable type of fertilizer. In this report a simple biotechnological process using earthworms, could provide a solution to tackle the problem of safe disposal of organic waste.

KEYWORDS: vermi-composting, nutrient, fertilizer, composting.

1. INTRODUCTION:

The industrial revolution followed by the urbanization in the temperature countries, concentrated people in very high density and added new sources of wastes. These wastes are normally solid and result in landscape pollution. Solid waste management is an obligatory function of urban local bodies in India. Due to the population explosion huge quantities of S W are being released in to the environment. It is estimated that every human being released 500 – 1000 g of SW per day. Lack of financial resource, institution weakness, and improper choice of tech & public and pathy towards solid waste manager have made this service far from satisfactory.

1.1 MATERIAL COLLECTION:

The materials needed to start a vermi-composting system are simple and inexpensive. The materials needed are:

- a worm bin,
- bedding,
- water,

- worms, and
- food scraps

A suitable bin can be constructed of untreated, non aromatic wood, or plastic container to be purchased (e.g. a Rubbermaid tub). A wooden box is better if you will keep the worms outdoors, because it will keep the worms cooler in the summer and warmer in the winter. If a plastic container is used, it should be thoroughly washed and rinsed before the worms and bedding are added. Store the worm bin where the temperature remains between 14° and 25°C.

Other suitable materials include shredded paper (such as black-and-white newspapers, paper bags, computer paper, or cardboard); composted animal manure (cow, horse, or rabbit); shredded, decaying leaves.

It is important to get the type of worms that will thrive in a worm bin. Only red worms or red wigglers which are "composting worms" should be used (do not use night crawlers or other types of worms).

Feed your worms any non-meat, non-dairy organic waste such as vegetables, fruits, eggshells, tea bags, coffee grounds, paper, coffee filters, and shredded garden waste. Worms especially like bananas, cantaloupe, watermelon, and pumpkin.

1.2 WORM BIN SETUP:

The materials required for worm bin setup are,

- Broken brick
- Clay
- Coco- peat with sand
- Dry cow dung
- Partially Decomposed leaves
- Decomposed vegetables
- Plastic container – 25 liter
- Plastic bag (for covering purpose)
- Earth worms
- Bend
- Water



Figure 1: Materials Collection

Steps Involved,

First the materials used for the vermi- composting is to be collected. Then plastic container and the concrete tank are thoroughly clean by using the water. The plastic container and the concrete tank is consist with a hole at it bottom. The bend or a pipe is used for extract water. Next the broken brick are laid at the bottom of the bin. Then the clay is laid above the broken brick layer and the coco- pith is laid which is mixed with the sand. The cow dung is added to the bin which is in dry form. The fresh cow dung is not suited for the worm bin because it generated the heat which is harmful to the worms. Then the partially decomposed leaves or garden refuge is added which equalize the C/N ratio of the bin. After that the food scraps i.e., decomposed vegetable wastes are added to the bin. The vegetables or the food scraps are chopping into small pieces and they are leave for 1 week for decomposing. Fresh vegetables are not eaten by the worms. The required amount of water is added to the bin to decompose the organic matters present in the bin. The bin is now left for 5 days. The worms are collected.

From the worm farm and the earth warms are left into the bin.



Figure 2: Red Worms or Red Wigglers

Water is sprinkled on the worm bin for required amount. Over water or deficiency of water leads to the worms to escape the bin or death of worm.

Leave the bin for 45 days. The vermi-compost is made by the worms. The vermin-compost is the waste coming out from the worms which is high in humic acid and the humic acid is used for the plant growth. After 45 days water sprinkling is stopped for 5 days. At that time the earthworms are wend at the bottom of bin. The vermi-compost present above the bin is collected and sieve the vermi-compost for the elimination of the unwanted matter presented in the vermi-compost or the vermi-compost is directly apply to the plant. At the period of vermi-composting the water extract from the worm- bin is also collected. This water extract is called vermi-compost leachate, which also have much amount of micro nutrients which is used for the plant growth. We used both vermi-compost and the leachate water for the growth of plant.



Figure 3: Worm Bin Setup

1.3 RESULT AND DISCUSSION:

In this project we make the vermi-compost and apply it for the plant “Abelmoschus Esculentus” ie, commonly known as ladies finger or “okra”. We made the vermi-compost in 45 days and the nutrient composition of the vermicompost and the vermicompost leachate and also the growth of plant with or without applying the vermicompost are discussed below.

We plant the abelmoschus esculentus in the month of february and the various stages of the plant is shown below: After 10 days we plant it for separate container. We use three type of container such as,

- Ordinary soil
- Garden compost applying soil
- Vermicompost applying soil



Figure 4: Different types of soil

We apply the compost in the soil for 5 days later. During the compost applying the plants growing are given below. The plant is growing well when vermi-compost is applying. The leaves are very big compared to another plants and they are very greenish in colour. They are bright in looking. The plant growth is considerably increase by applying the vermi-compost. We also get a good result for applying the vermi-compost. Plant which is plant in ordinary soil has grown is 13 cm but the plant which is plant in vermi-compost applying soil has grown is 15.5 cm in 5 days. After 10 days it reaches 21.5 cm. It is considerably high compared to ordinary soil. After 15 days it reaches 25.5 cm and also one bud is flowering and after 2 days it makes a ladies finger which is 2 cm in length.

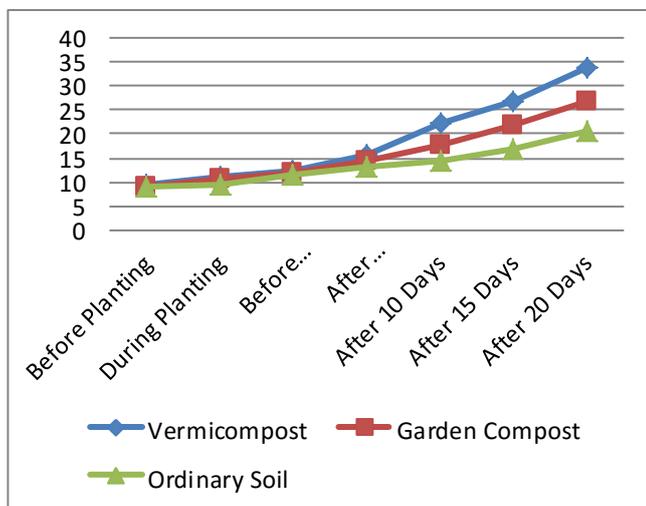


Chart 1: Plant growth

1.3.1 NUTRIENT CONTENT OF VERMI-COMPOST:

Table 1:

Nutrient Content in Vermi-Compost and Garden Compost		
Nutrient content	Vermi-Compost	Garden-Compost
Calcium Carbonate	Nil	Nil
Electrical Conductivity	0.48 dSm-1	0.52 dSm-1
pH	7.1	6.8

Nitrogen	80 kg/acre	66 kg/acre
Phosphorus	50 kg/acre	50 kg/acre
Potassium	488.25 kg/acre	280 kg/acre
Iron	8.00 NC	4.97 NC
Manganese	3.03 ppm	2.44 ppm
Zinc	3.81 ppm	7.42 ppm
Copper	1.49 ppm	0.85 ppm

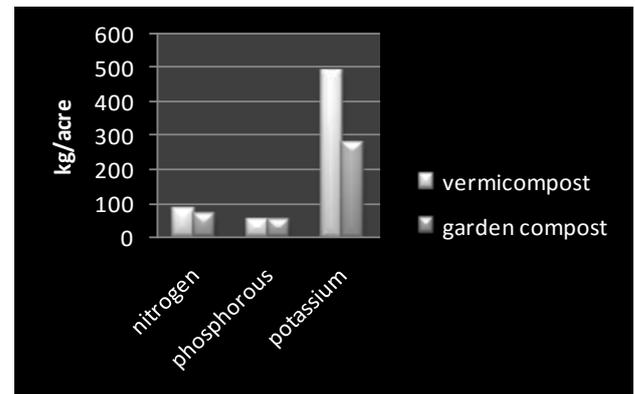


Chart 2: Nitrogen, Phosphorus, Potassium composition

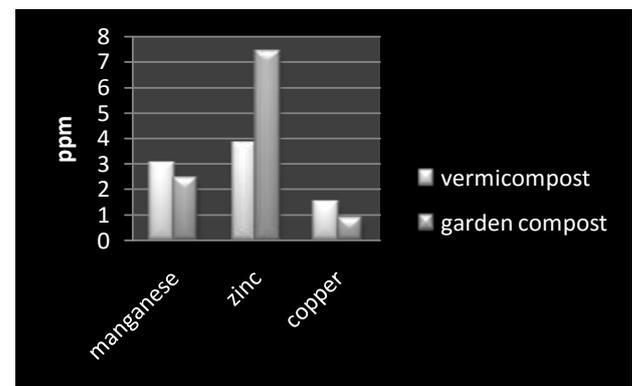


Chart 3: Manganese, Zinc, Copper Composition

3. CONCLUSION:

Organic fertilizer plays an important role in world wide agricultural lands. Nowadays many people like to produce the organic vegetables. In world around, every human being produce the organic waste is 500-1000g/day. So, the safe deposit of the organic waste is also taken into account. In this project we use the organic waste to make the vermi-compost by using the earthworms. The earth worms are also called as "farmer's friend". We use the earth worms to convert the organic waste into effective organic fertilizer. In this vermi-compost contain more amount of micro and macro nutrient compared to other composting methods. We use this vermi-compost for the plant and also we use ordinary soil and garden compost for the plant growth. We

get good result in vermi-compost applying plant than other plants. It produces flower and the fruit before 5 days from the ordinary and garden compost applying plant. The vermi-compost applying plant height is 7 cm more than ordinary plant and the leaves are look like bright green in colour and it is big compared to ordinary and garden compost applying plant. The main aim of the project is the effective utilization of the organic waste. In this project the utilization of organic waste is done by the worms and also solves the organic fertilizer problem.

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