

# Role of Fertilizers in Sustainable Development

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**Abstract**— India is second largest populated country in the world. Infrastructural development is an important parameter for the growth & development of any country. Hence day by day limited land will be available for construction. There is need to see the probability to use forming land for infrastructural development. Today's farmer is using chemical fertilizer for farming to enhance the yield of crops. Chemical fertilizer reduces soils fertility and it also contaminated ground water table. Vermicompost is the product of the composting process using earthworm to get biocompost from college biowaste. Recycling of campus biowaste is necessary it reduces campus waste. It makes our campus clean as well as contribute in sustainable development. Vermicompost will enrich the soil and its fertility. Vermicompost also leads to decrease the environmental problems. Vermicompost is a very important biofertilizer produced through the artificial cultivation of worms i.e. Vermiculture. Vermicompost is enriched with all beneficial soil bacteria and also contain many of the essential plant nutrients like N, P, K and micronutrients. Vermicomposting is the process of production of compost by breeding earthworms, resulting in homogeneous and stabilized humus used as manure and significantly increased the amount of N, P, K and C concentration in compost. Earthworms are terrestrial worms well adopted for burrowing life. They depend on soil for all of their activities hence they are called geobionts. Worms in the process of feeding on waste caused bio-oxidation by relentless turning, fragmentation and aeration of water by devouring resulting in homogeneous and stabilized humus like product. The fine granular peat-like end product, vermicompost is reported to contain elevated levels of nitrogen, phosphorous, potassium and organic carbon (NPKC) in available form, micro-nutrients, micro flora, enzymes, and growth regulation. As a result of the different processes involved in the producing of compost and vermicompost, they exhibit different physical and chemical characteristics that affect soil properties and plant growth in diverse ways. Chemical fertilizers are good for crop yield but in long run they create varioud harmful impact on environment particularly on water table and soil.

**Keywords:** Environment, Soil, Vermicompost etc

## I. INTRODUCTION

Sustainable development is necessary in this fast paced world. We give emphasises on three R policy. It is reduce, reuse and recycle of waste to prevent pollution. One of the important contemporary environmental problems in urban areas is huge generation of solid waste (SW). Rapid urbanization and booming population is leading to generation of massive amount of waste. In urban areas, solid waste is generated by domestic households, commercial enterprises, health care and institutional activities as well as on the streets. Solid waste is the use and left over materials comprising of household garbage including kitchen waste, street sweepings,

sanitation residues. Urban population growth and economic development are considered vital for solid waste generation, as these factors not only accelerate consumption rates but also increase its generation. The growth of solid waste generation has outpaced the growth of population in recent years, because of changed in living standard of people with increasing income levels, changing lifestyles, food habits and consumption patterns with mind set of 'use and throw' of products. Solid waste management is one among the basic essential services provided by municipal authorities to keep urban centers clean, and there is need to develop appropriate solid waste management system in order to prevent future environmental health problems.

Composted materials are gaining acceptance as organic fertilizers in sustainable agriculture, and there has been a considerable increase in research dedicated to the study of the effects of compost like materials on soil properties and plant growth.

Vermicompost is a nutrient, microbiological-active organic impediment that results from the aseractions between earthworm and microorganism during the breakdown of organic matter. It is a stabilized, finely divided peat like material with a low C:N ratio, high porosity and high water holding capacity in which most nutrients are present in forms that are readily taken up by plants.

As a result of the different processes involved in the producing of compost and vermicompost, they exhibit different physical and chemical characteristics that affect soil properties and plant growth in diverse ways. Vermicomposting generally converts organic matter to a more uniform size, which gives the final substrate a characteristic earthy appearance, whereas the material resulting from composting usually has a more heterogeneous appearance.

## II. EXPERIMENTAL PROCEDURE

### A. Innovation & Invention is Necessary in College Campus to Make It More Clean and Green Environment

Vermicomposting is the process of production of compost by breeding earthworms, resulting in homogeneous and stabilized humus used as manure and significantly increased the amount of N, P, K and C concentration in compost. Earthworms are important veriresouses having simple, cylindrical, coelenterate and segmented body characterized by presence of setae. Earthworms are terrestrial worms well adopted for burrowing life. They depend on soil for all of their activities hence they are called geobionts. Worms in the process of feeding on waste caused bio-oxidation by relentless turning, fragmentation and aeration of water by devouring resulting in homogeneous and stabilized humus like product. The fine granular peat-like end product, vermicompost is reported to contain elevated levels of nitrogen, phosphorous, potassium and organic carbon

(NPKC) in available form, micro-nutrients, micro flora, enzymes, and growth regulation

The important role of earthworm in eco system is in nutrient recycling, particularly nitrogen. Thus, the affect the physicochemical properties of soil. By using variety of earthworms waste can be converted into compost. We can use vegetable waste, domestic waste, paper, agro industrial waste, bio gas digester, effluent, sewage sludge and other industrial waste. Vermicomposting can be also employed for plant based residues those containing high quality of cellulose, hemicellulose, ligning, starch, etc. One kg earthworms can consume one kg of organic material in a day. They secrete castings (vermicompost) which are rich in Ca, Mg, K, N. Micro-organisms ( bacteria, fungi, actinomycetes and protozoa) hormones, enzymes and vitamins and certain micronutrients needed for plant growth. The casts of earthworms promote growth of many important micro organisms like nitrogen fixers and phosphate and nitrogen solulisers. In general, in the presence of casts and earthworms these micro-organisms multiply faster. Earthworms secrete mucus and some fluids and In this way maintain pH of surrounding between 6.5 to 7.5 which is favorable for soil, micro, flora. The temperature, pH, organic matter, moisture available in organic matter and partial size and C:N ratio are the major environmental factors which directly affect the growth and and activities o9f earthworm. Fluctuation is seen in moisture content, temperature, etc. In this condition the earthworm's growth, reproduction, respiration shows variation. In unfavorable condition they remain calm and show very negligible activities. Vermicomposting not only provides nutritional elements but shows ability to control certain diseases in plants. Management of waste is essential and there are many methods to carry out but the most simple and cheap method is vermicomposting. Hence, it was used for the waste management, In the present work using "EISENIA FETIDA" earthworm.

#### B. Procedure for Vermicompost

- Sprinkle some water to make this layer wet.
- After 3 to 4 weeks you will see loose, soil like material.
- Remove the material from the box, dry it in the sun.
- We have observed both the fertilizers vermicompost and chemical for the germination of plants, and the observations are given below;

| DAYS    | HEIGHT                              |
|---------|-------------------------------------|
| 10 Days | Vermicompost: 5cm, Synthetic: 7cm   |
| 20 Days | Vermicompost: 5cm, Synthetic: 7cm   |
| 30 Days | Vermicompost: 5cm, Synthetic: 7cm   |
| 40 Days | Vermicompost: 9cm, Synthetic: 17cm  |
| 50 Days | Vermicompost: 15cm, Synthetic: 23cm |
| 60 Days | Vermicompost: 15cm, Synthetic: 40cm |
| 70 Days | Vermicompost: 17cm, Synthetic: 46cm |

Table 1.1:

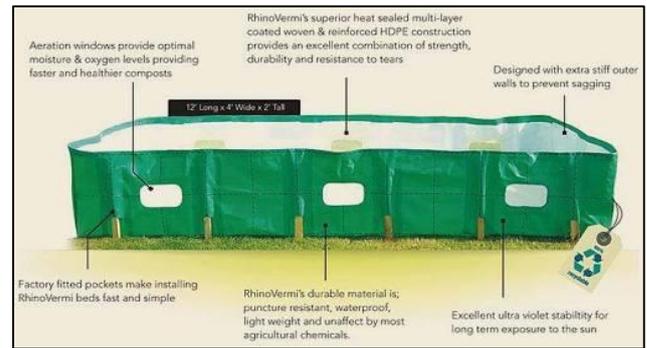


Fig. 1: Vermicompost Bed

#### C. Benefit of NPK for the plant:

Nitrogen helps in plant growth and development. It also positively affects the quality of leaves, seeds and fruits. Finally, Nitrogen is a crucial component of chlorophyll, which not only gives the plants their green color but also helps out in photosynthesis

Phosphorus, on the other hand, plays a significant role in the development of plant oils, sugars and starch. During the process of photosynthesis, it is phosphorus that aids in the transformation of solar energy into chemical energy. Also, phosphorus not only encourages the growth of roots and blooming but also helps plants to withstand stress.

Potassium fertilizer is the third cog that completes the NPK trio. It is essential to plant growth and is greatly active during the process of photosynthesis. It is responsible for producing good quality fruits as well. Potassium builds up a store of protein in the plant and also helps prevent diseases and increases plant immunity

#### D. Tips on how to use NPK fertilizer

Before you use any fertilizer, you need to check your soil type, check its pH level and analysis the various results. Proper precaution and care should be taken for Addition of various fertilizers in plant

### III. RESULT AND DISCUSSION

After analysis the value of Carbon, nitrogen, Phosphorus & potassium is mentioned in table 1.2. C, N, K, & P values are better in chemical fertilizer than vermicompost. They play an important role in plant growth as reported in table no 1.1

Application of chemical fertilizers in the crop field contributes greatly to the deterioration of the environment, loss of soil fertility, less agricultural productivity and soil degradation. The price of chemical fertilizers is very high and sometimes it is not available in the market as well for which the farmers sometimes fail to apply these fertilizers to the crop field in time. In addition to that, application of Vermicompost may reduce the environmental pollution that is caused while manufacturing the chemical fertilizers in the industry. It is a well-known fact that organic fertilizers supply nutrients to the plants in adequate amount for optimum growth of plant and may increase the uptake of nutrients, assimilation capacity and the hormonal activity. Vermicompost could be used as an excellent amendment for main fields and nursery beds and has been reported to be useful in raising nursery species plants. Vermicompost could release nutrients slowly and steadily into the system and

enables the plants to absorb these nutrients over time. Edwards reported that vermicompost could promote early and vigorous growth of seedlings. Vermicompost has been found to effectively enhance the root formation, elongation of stem and production of bio- mass .The objective of the present study was to compare the response of different doses of cow manure vermicompost and inorganic fertilizer on the growth and fruits of tomato plant.

Scientists of different agricultural fields agreed that plant growth and development are strictly dependent on biological fertility factors. Earthworms may stimulate microbial activities and metabolcot and also influence microbial populations.

Therefore, the use of vermicompost constitutes an important alternative source of fertilizer that has environmental benefits, productivity and crop quality.

| PARAMETERS     | CHEMICAL       | VERMICOMPOST   |
|----------------|----------------|----------------|
| Nitrogen       | 514.3 kg/hect  | 263.4 kg/hect  |
| Potassium      | 470.40 kg/hect | 456.96 kg/hect |
| Phosphorus     | 44.35 kg/hect  | 43.55 kg/hect  |
| Organic Carbon | 2.29 %         | 1.97 %         |

Table 1.2: Analysis of Vermicompost & Chemical Fertilizer

#### IV. CONCLUSION

Therefore, the use of vermicompost constitutes an important alternative source of fertilizer that has environmental benefits, productivity and crop quality as well as npared to inorganic fertilizer. vermicomposting generally converts organic matter to a more uniform size, which gives the final substrate a characteristic earthy appearance, whereas the material resulting from composting usually has a more heterogeneous appearance. Vermicompost is increases biological function of soil.

Application of chemical fertilizers in the crop field contributes greatly to the deterioration of the environment, loss of soil fertility, less agricultural productivity and soil degradation. Experiment is carried out in clay soil.

Chemical fertilizers enhances binding capacity of soil hence this property is good for construction.

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