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Nutrient analysis of different types of vermicomposts and their impact on nursery grown seeds and seedlings

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Abstract

Impact of two types of vermicomposts on the nursery grown seeds and seedlings have been studied. Seven parameters were taken into consideration were organic matter, calcium, magnesium, pH, potassium, phosphorus and nitrogen. The comparative nutrient value and the impact of two types of vermicomposts on various seeds and seedlings were studied.The values of all the parameters analysed were more for the vermicompost produced from the cowdung than the vermicomposts of municipal solid wastes.Seeds of *Eucalyptus, Acer* and *Anthocephalus* and seedlings of *Leucaena leucoeephala* and *Cassia fistula* were taken to observe the impact of vermicomposts. Overall study revealed the better germination percentile and growth of these seeds and seedlings when the vermicompost of cow dung was used. It was inferred that the vermicompost of cow dung is more nutrient rich than the vermicompost of municipal solid waste.

Keywords:- *Vermicompost, Germination percentile, Municipal solid waste, Cowdung*

Introduction

Soil (Latin "Solumn") is a floor natural product formed from weathered rock by action of climate on living organism. Chemical fertilizers primarily boost up the growth and yield of crop by nutrient supply but its continuous use leaves, plenty of detrimental effects on soil by disturbing natural composition of soil nutrients, soil flora and fauna. Vermicomposting appears to be the most promising as high value biofertilizer which not only increases the plant growth and productivity by nutrient supply but also is cost effective and pollution free. The biodegradation of organic matter like rural waste, household garbage, cow dung, sewage sludge by earthworm activity is called vermicomposting. Vermicompost is a mixture of worm casting, organic material, live earthworms, cocoons and other microbes (Singh *et al*., 2004). Vermicompost is a highly valued soil conditioner. Vermicompost is a rich source of macro and micronutrients, vitamins, enzymes, antibiotics and immobilized microflora (Kale *et al*.,1982). Composting worms also tolerate a wide range of environmental conditions, which helps in adaptability.The most suitable earthworm species for vermicomposting is *Eisenia foetida* because of its rapid growth rate, reproductive substrate in nature (Kaushik and Gerg 2003). An important feature is that during the processing of the waste (manure) by earthworms, many of the nutrients they contain are changed to the forms which are more readily taken up by plants, such as nitrate nitrogen, exchangeable phosphorus and soluble potassium, calcium and magnesium. Worm worked soil is relatively water-stable and will resist soil compaction and run off due to rains (Prabha *et al*., 2005). Thus the objective of the present study was to access the nutrients content of two types of vermicomposts and their impact on nursery grown seeds and seedlings.

Materials and Method

In the present study two types of vermicomposts were taken and analysed for nutrients. First sample of vermicompost was produced from the cow dung and second sample was produced from the municipal solid waste. The samples were taken in plastic bags and brought to the laboratory for the analysis of the given

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parameters. Organic matter, calcium, magnesium, pH, potassium, total kjeldahl nitrogen, phosphorus. All the experiments were held in between the first week of January to the last week of February. The selected site is vermicomposting unit at Ecology and Environment Division F.R. I. Dehradun. F.R.I is located at a distance of 4 Kms. from the clock tower of Dehradun. Geographically the Forest Reasearch Institute (F.R.I.) is situated in the globe on Longitude-30° 22' N, Latitude-78° 2' 30" E. The methods of analysis of certain physicochemical parameters were adopted as per Trivedy and Goel (1986) and Walkley and Black (1934). To observe the impact of both types of vermicomposts on the germination percentile of seeds, three types of seeds were taken. Six sets of polybags full of nursery manure were prepared. In first two poly bags, *Eucalyptus* seeds were sown, in another two polybags, seeds of *Acer* were sown and in the last two polybags seeds of *Anthocephalus* were sown. In the same manner six sets of polybags full of nursery manure and vermicomposts produced from municipal solid waste were taken. In the ratio of 1:1 and six sets of polybags full of nursery manure and vermicomposts produced from the cow dung in the ratio of 1:1 were prepared. In which three types of seeds were sown in the same manner as described above. The impact of both type of vermicompost on the shoot length and number of leaves of two types of seedling were also observed, these were *Leucaena leucocephala* and *Cassia fistula*.The data were stastically analysed. To observe the significance of the difference in the mean of each parameter for both types of vermicomposts student (t-test) test value was calculated.

Results and Discussion

Use of vermicompost promotes soil aggregation and stabilizes soil structure. This improves the air-water relationship of soil thus increasing the water retention capacity and encouraging extensive development of root system of plants. The mineralization of nutrients is observed to be enhanced, therefore results into boosting up of crop productivity. The vermicomposts have a higher base exchange capacity and more exchangeable calcium, magnesium, potassium and available phosphorous than the soil in which the worms live. The results of the analysis of two types of vermicomposts are shown in Table-1. Nitrogen in the vermicompost produce from cow dung was found 0.906% while nitrogen present in the vermicompost produced from municipal solid wastes was 0.814%. Suthar (2007) got the same results by using composting earthworm *Perionyx sansibaricus*

Table-1: Showing the comparison between the values of various parameters of the two types of vermicompost

Parameters (%)	Vermicompost Produced from Cow Dung	Vermicompost Produced from Municipal Solid Waste
Nitrogen %	0.906 ± .011	0.814 ± 0.04
pH %	7.646 ± 0.018	7.122 ± .0048
Phosphorus %	0.1766 ± 0.029	0.1206 ± 0.036
Organic Matter %	3.822 ± 0.32	3.602 ± .307
Magnesium %	0.114 ± 0.006	0.090 ± 0.022
Calcium %	2.849	1.70
Potassium %	0.79 ± 0.050	0.77 ± 0.050

Observation of Kale *et al.* (1982) was almost same. The pH in the vermicompost produced from cow dung is 7.64 and pH of the vermicompost produced from municipal solid wastes is 7.12. Magnesium present in vermicompost produced from cow dung is 0.114% and in the vermicompost produce from municipal solid waste is. 0.0907% . Parthasarthi and Ranganathan (2000) also came to the same conclusion. The amount of phosphorus in the vermicompost produced from cow dung was 0.176% and in the vermicompost produced from municipal solid waste was 0.120%.This has also been revealed by More (1994) while working on the effect of farm wastes and organic manures on soil properties, nutrient availability and yield of rice-wheat grown. The amount of calcium present in the vermicompost produced from cow dung was 2.849% while in case of vermicompost produced from municipal solid waste was 1.70%. Garg *et al.* (2006) revealed the same thing while working on vermicomposting of different types of waste using *Eisenia foetida.* The amount of potassium present in both type of vermicompost is successively 0.79% (cow dung) and 0.77% (municipal solid waste). Basker *et al.* (1992) showed almost same results. Organic matter is a special

constituent of soil. Organic matter in the vermicompost produced from cow dung is 3.82 % while organic matter present in the vermicompost produced from municipal solid waste is 3.602 %. These results are in accordance with the results showed by Edwards (1998) while working on the breakdown of animal, vegetable and industrial organic wastes by earthworms. Thus we observed that vermicompost produced from cow dung is more nutrient rich than the vermicompost produced from municipal solid waste. Thus it can be concluded that cow dung is purely organic, it means that organic content is present in much amount in cow dung. The vermicompost of cow dung also remains organic in nature. While in case of municipal solid waste organic as well as inorganic contents are present. Municipal solid wastes also contain a huge amount of toxic substances, metals, non degradable fraction which cow dung does not contain. So usually the vermicompost of cow dung remains more nutrient rich than the vermi compost produced from municipal solid waste. In our results we have also observed that the percentage of almost all the nutrients like nitrogen, potassium, phosphorus, calcium, magnesium *etc.* are more in the vermicompost of cow dung. Organic matter in the vermicompost of cow dung is more than the vermicompost of municipal solid wastes because of the presence of humus in the cow dung. Percentage of carbon is also more in the vermicompost of cow dung due to the same reason.Vermicompost of cow dung is more alkaline than the vermicompost of municipal solid wastes due to the presence of calcium, magnesium, potassium and phosphorus much amount. The results showing the impact of both the vermicomposts on the number of leaves and the height of two types of seedlings namely *Leucaena leucocephala* and *Cassia fistula* are given in Fig. 1 to 3. The results of the impact of vermicomposts on the germination percentile of the seeds are shown by the Table-2. As we have applied student (t-test) test to observe the significance of the difference in the mean of each parameter for both types of vermicomposts and the results were showing that calculated value of t is 0.21 at degree of freedom 11(p= 0.83).Here calculated value 0.21 is smaller than the tabulated value (1.796) at p= 0.83. Hence it is obvious that the difference between the means of various parameters of both types of vermmicomposts is significant.

Table-2: Showing the comparison of Impact of two types of vermicomposts and control on the germination of nursery grown seed

Seeds	Total Seeds sown in one set	Average germination in control	Average germination in cow dung	Average germination in the vermicompot produced from MSW	Germination in the seeds sown in vermicompost produced from Cow dung	Germination in the seeds sown in vermicompost produced from MSW
Eucalyptes	20	8	18	16	225%	200%
Acer	20	10	18	12	180%	120%
Anthocephalus	20	2	5	3	250%	150%

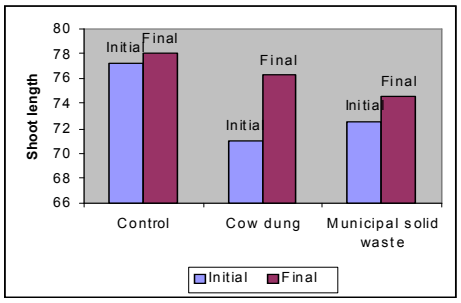

Fig. 1: Showing the comparative impact of Nursery manure and various vermicomposts on the shoot length of *Leucaena leucocephala*

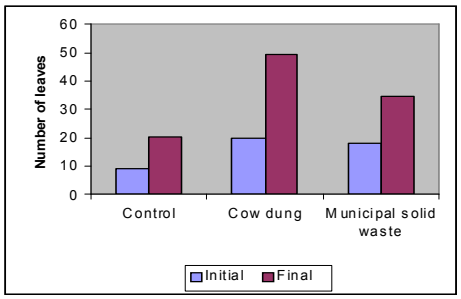

Fig. 2: Showing the comparative impact of Nursery manure and various vermicomposts on number of leaves of *Leucaena leucocephala*

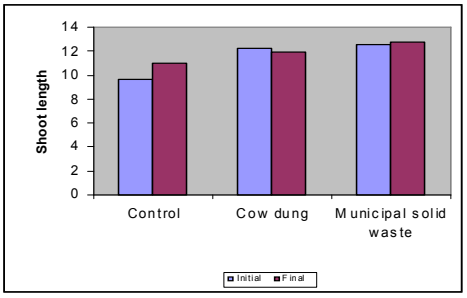

Fig. 3: Showing the comparative impact of Nursery manure and various vermicomposts on the shoot length of *Cassia fistula*

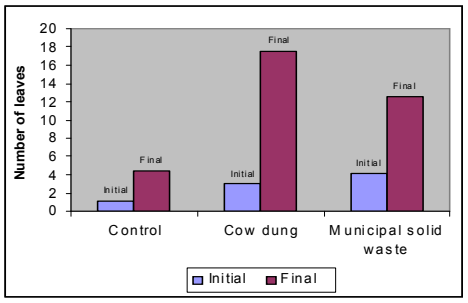

Fig. 4: Showing the comparative impact of Nursery manure and various vermicomposts on the number of leaves of *Cassia fistula*

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