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EFFECT OF VERMICOMPOST PRODUCED FROM TENDU LEAF LITTER ON PLANT AMENDMENTS OF *PHASEOLUS VULGARIS* BY USING POT METHOD.

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Abstract:-The solid waste generated in Solapur city mostly comprises of Tendu leaf litter. The present study aims at converting the tendu leaf litter organic waste into vermicomposting using *Esenia fetida* earthworms using pot method . The pot experiments on effect of Vermicompost produced from tendu leaf litter on the plant amendments of *Phaseolus vulgaris* like plant height, number of pods/plant, number of seeds/pod and seed yield per plant were studied by using pot method. T3 treatment group which includes 50% chemical fertiliser and 50% vermicompost is found to be more effective when compared to other treatment groups on the various plant amendments.

Keywords: Tendu leaf litter , pot method, Esenia fetida.

INTRODUCTION

The waste produced by the human activities is increasing enormously and is creating the problems of its disposal. In India solid waste disposal is done mainly by land filling (Sharma *et al*, 2005). The solid waste includes garbage, agricultural waste, industrial waste, sewage, waste from agro industry and other small scale industries like beedi industries. Solapur (Maharashtra) is famous for production of beedi. Beedi (Indian cigarette) is made from tendu leaf. Beedi rolling is done after stuffing tobacco for getting the final shape of beedi. Tendu leaf is cut into a proper shape and 40% of the leaf is thrown as a waste. The waste generated frombeedi industry is about 12 to 15 thousand tons per annum (Kadam *et al*., 2005). Due to non-scientific disposal of this tendu leaf into the garbage, it is creating environmental pollution. The garbage looks aesthetically ugly. Vermicomposting is the best method for converting this beedi leaf litter into useful compost with the help of earthworms. It is an ecofriendly and economically beneficial method of production of biofertiliser (Mushan.L.C, 2009).

The vermicomposting process includes the conversion of organic raw material processed through the earthworms transformed into worm manure which is rich in microbial activity and plant growth regulators. Mostly widely used method of converting organic raw material into vermicompost is the pot method in which an earthen container is used to convert the pre decomposed organic raw material into vermicompost. It is a conventional method and is been adapted in small scale. This simple biotechnological process can provide a solution for safe handling of organic biodegradable solid waste as well as the most needed plant nutrients for sustainable productivity (Wani, 2002).

Joshi *et al*.,(2013) studied how Vermicompost acts as soil supplement and enhance growth, yield and quality of *Triticum aestivum* . Uma and Malathi M (2009) investigated the Vermicompost as a soil supplement to improve growth and yield of *Amaranthus* species . Azarmi et al., studied the influence of vermicompost on soil chemical and physical properties in tomato (*Lycopersicum esculentum*) field . Application of vermicompost to various agricultural vegetable crops results enrichment of plant amendments including the height of plant, number of pods, number of seeds and number of seed yield/plant. Phaseolus vulgaris is a common bean and is a herbaceous annual plants. The beans are used for consumption and occasionally leaf is also used as fodder. Singh *et al.,* (2011) E studied the effects of vermicompost, fertilizer and mulch on French bean (*Phaseolus vulgaris* L.). plant Growth, nodulation and pod yield .

The present investigation is aimed to extend the knowledge of application of vermicompost produced from the tendu leaf litter produced through pot method using the commercial vegetable plant *Phaseolus vulgaris*. It is also aimed to understand the impact of biofertiliser produced by *Eisenia foetida* on plant height, number of pods/plant, number of seeds/pod

and overall seed/plant.

MATERIALS AND METHODS

The tendu leaf litter is collected from local beedi industries. The collected waste is processed and is decomposed by using decomposing culture for duration of 30 days in a pit after the decomposition of tendu leaf litter known quantity of this is transferred into a earthen pot and is subjected to convert the organic raw material into vermicompost by using the earthworm species *Eisenia foetida* as per the regular procedure. The process of vermicomposting is carried out with the help of multi-layered method for vermicomposting. During the process various parameters like temperature, moisture etc were maintained according to the standards. After the duration of 30 days of vermicomposting the waste is converted into vermicompost.

The vermicompost produced from this pot method is used for the production of bean plants *Phaseolus vulgaris* in pot method. Various parameters were analysed after duration of 15, 30, 45 and 120 days. During experimentation a concurrent control was maintained along with the treatment groups namely:

T1 - 100% nitrogen chemical fertilisers.
T2 - 100% nitrogen vermicompost produced
T3 - 50% nitrogen vermicompost + 50% nitrogen chemical fertilisers

Five replicates of each treatment were maintained under natural conditions. Two kilograms of soil is mixed with different treatments were taken in earthen pots. The pot with only 2kg soil acted as control. Bean seeds of local variety were sown and various characteristics recorded at different intervals. The results were statistically analysed by using student's t test and ANNOVA using graph pad prism software.

RESULTS

The results of plant amendment after putting vermicompost on bean *Phaseolus vulgaris* is give in Table-1 and Graph-1.The plant height of control and various experimental groups were measured at an interval of 15 days upto 45 days of experiment from all the treatment groups. Plant height was significantly increased when compared to respective control. Plant height was increased to its maximum after 45 days of treatment in T3 treatment (55.10%) similar increasing trends were noticed after 15th and 30th day of the treatment and it was more on 15th day in T3 treatment also.

Number of pods/plant was also recorded after 120 days of treatment. There was a progressive increase in the number of pods when compared T1 T2 T3 control groups. However T3 has shown 62.30% increase in total number of pods after 120 days of treatment (Table1).

The total number of seeds/pod is significant in analysing the effect of vermicompost on overall growth of the plant. When compared with control the T3 treatment has shown 85% increase in number of seeds/pod. However, there was a moderate increase in T2 treatment which is reflected by increase in upto 53.2%.

The vegetable crop production is mainly depending upon the total yield of the seed/plant which directly reflects the impact of the treatment on the vegetable crop. In this case also T3 treatment is found to be sharing significant increase in the seed yield/plant which is about 45.7% after 120 days of treatment (Table-1, Graph-1&2).

Overall from our results it was noticed that irrespective of plant amendment T3 treatment group which includes 50% chemical fertiliser is found to be more effective when compared to other treatment groups. The experimental groups of seed yield were subjected for one way ANNOVA for further confirmation. The results were significant (F value = 16-54 at $p \leq 0.001$).

DISCUSSION

Excess use of chemical fertilisers by farmers in unscientific manner to get more benefits for the better results is a major threat for sustainable agricultural practise. For getting optimum results it is highly essential to balance the soil nutrient capacity and plant growth to be synchronised to achieve better results in agriculture various methods are adopted in converting waste into vermicompost. Recycling of organic waste in ecofriendly manner especially by the pot method yield good vermicompost having large number of microflora, water holding capacity & high nutrient value (Edward and Bohlen, 1996).

In the present study it was noticed that *Phaseolus vulgaris*, commercial bean vegetable has given very good results after application of vermicompost produced from tendu leaf litter engineered by *Eisenia foetida*. Various important amendments including plant height, number of seeds/pod, number of pods/plant and overall seed yield of the plant showed significant increase. The tendu vermicompost might have enhanced the physical condition of the soil in the pot which supported better aeration in the roots helping in macronutrient uptake to the plant and could have shown the better yield and other plant amendments. Another significant result of present investigation is that only application of vermicompost is not sufficient but application of combination of 50% of vermicompost and 50% of chemical fertilisers showed enhanced results from all the amendments. This clearly suggest that the combined effect of vermicompost and chemical fertilisers facilitated further growth of the plant and ultimately reflected in the yield of the French bean plant Phaseolus vulgaris in pot culture

experiment. The organic raw material used to prepare vermicompost, microorganisms and amount of nutrients might affect the efficiency of vermicompost as a plant growth enhancer (Jack and Thies ,2006; Hameeda *et al*.,2007).

From our investigation it can also be suggested that 50:50 i.e. T3 treatment is the best viable alternative for getting good results when compared with T1 and T2.

It is recommended that vermicompost can be used for improving long term soil fertility, crop productivity and sustainable agriculture. Further investigation is necessary in connection with large scale field application of this vermicompost on the French bean *Phaseolus vulgaris* to draw final conclusion.

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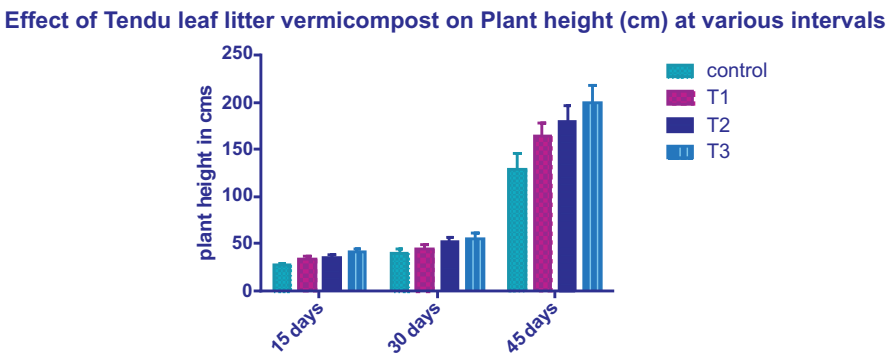
Table No.1
Effect of vermicompost produced by *Eisenia foetida* on Bean (*Phaseolus vulgaris*) plant height (cm), number of pods/plant, number of seed/pod and seed yield/plant (gms).

	Control	T1	T2	T3
Plant height 15 days	27.90±2.20	33.63±2.90* (20.50%)	35.30±2.50* (26.50%)	41.43±3.50** (48.49%)
Plant height 30 days	40.30±4.50	45.20±3.80 (12.20%)	52.73±4.90* (30.80%)	55.00±6.50*** (36.40%)
Plant height 45 days	128.3±17.56	163.7±14.00* (27.59%)	179.3±17.00* (39.75%)	199.0±19.52** (55.10%)
No.of pod/plant 120 days	7.67±0.58	9.60±0.57** (25.20%)	11.67±0.50*** (52.20%)	12.67±0.60*** (62.30%)
No.ofseeds/pod 120 days	5.00±1.00	6.30±0.50* (26.00%)	7.66±0.57** (53.20%)	8.50±1.00*** (85.00%)
Seed yield/plant 120 days	6.55±5.00	6.87±0.60 (4.90%)	8.96±0.70** (36.70%)	9.55±0.70** (45.70%)

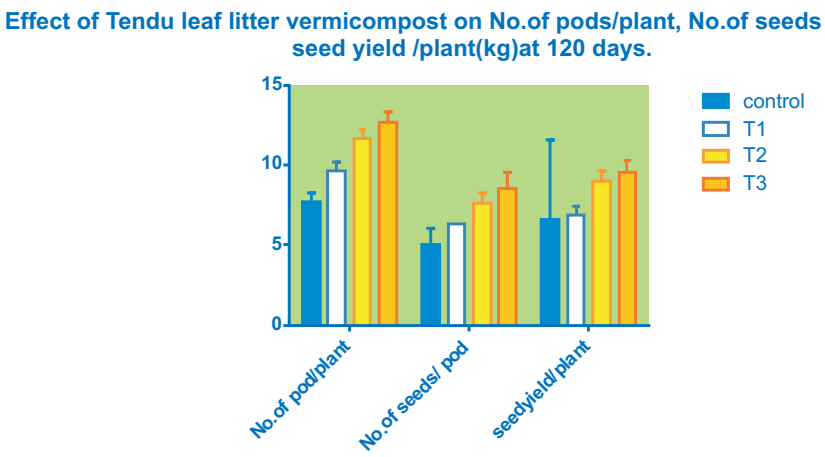
Values are significant at *P<0.05 ** P<0.01 *** P<0.001
Bracket values indicate percentage variation

Graph:1



T1 100% N through chemical fertilizer
T2 100% N - through Vermicompost
T3 50%Nthrough Chemical fertilizer + 50% N - through Vermicompost

Graph:2



T1 100% N through chemical fertilizer
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