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RESEARCH PAPER

Evaluation of weed vermicomposts on maize crop

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Abstract : A field experiment was conducted on the research farm of Dr. BabasahebAmbedkar Marathwada University, Aurangabad to evaluate the performance of weed vermicomposts on the growth of maize crop. The experimental design was a Randomized Block Design (RBD) with six treatments and four replicates. The treatments were *Achyranthes* vermicompost (AV), *Cassia* vermicompost (CV), *Tephrosia* vermicompost (TV), mixed vermicompost (MV), fertilizer (FE) and control (CO). The fodder maize (cv. African Tall) was sown at the rate of 100 kg/ha. The fertilizers were applied as N, P and K at the rate of 120, 80 and 40 kg/ha. The observations were recorded at 86 days after sowing (DAS). Based on the results, it is concluded that the combination of *Cassia* vermicompost (CV) and inorganic fertilizers was more effective in increasing the growth of maize crop as compared to other treatments.

Key Words : Green manure intercropping, Different levels, Fertilizer, Growth attributes, Rice

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INTRODUCTION

In the modern society, every member trying to attain the so called high standard of living, sophisticated industries and intensive methods of agriculture which always produces increasing quantities of solid wastes and causing environmental pollution. A large portion of this solid waste is non-toxic and organic in nature. Annually, India generates 25 million tones (MT) of municipal solid wastes, 320 MT of agricultural residues, 210 MT of cattle manure, 3.3 MT of poultry manure and so on (Mitra, 1997). The ecologically sound way for handling and disposal of the wastes is converting it to usable resource as compost through vermitechnology or earthworm technology.

Earthworms play a key role in improving soil fertility is well known since long (Kale and Krishnamoorthy, 1981). Since that time, the major influences of earthworms towards increased soil physical properties and nutrient status have received attention (Russell, 1973). They feed on any organic waste, consume 2 - 5 times their body weight and after using 5 - 10 % of the feedstock for their growth, excrete the mucus coated undigested finely divided peat like material termed as vermicompost. It is considered as an excellent product since it is homogenous, has desirable aesthetics, reduced levels of contaminants and tends to hold more nutrients over a longer period, without adversely impacting environment.The chemical composition of vermicomposts have reductions in pH, C:N, C:P ratio (Elvira *et al.,* 1998),

organic matter and organic carbon (Vinceslas-Apka and Loquet, 1977), increase in total nitrogen, phosphate and potassium (Elvira *et al.,* 1998) and available N, P, K, Ca, Mg, Mn, Na, Fe, Cu and Zn (Bansal and Kapoor, 2000).

Weed biomass is one of the easily available sources of organic matter and plant nutrients, which hitherto have not received necessary attention. The favourable climatic conditions lead to the production of gigantic weed biomass of diverse species composition both in cropped and non-cropped areas. The weed biomass production approximately ranges from 5 - 20 ton/hectare depending upon the weed species, season and growing circumstances. Economic utilization of this weed biomass for the production of vermicompost will open a new horizon. Therefore, the present study was undertaken to investigate the effect of weed vermicomposts on growth of maize crop.

MATERIAL AND METHODS

The fresh foliages of some weeds like Aghada (*Achyranthes aspera* L.), Tarwat (*Cassia tora* L.) and Unhali (*Tephrosiahamiltoni* Drumm.) were collected from University campus and cut into small pieces (2 - 3 cm). Equal amounts (13333 kg/ha) of weed pieces were used either individually or in combination (1:1:1) for the preparation of vermicomposts. These materials were placed into the pits to a height of 5 cm and then sprinkled with 10 % cow dung slurry and soil alternately. This procedure was repeated till the materials were used. Finally, the pits were closed with dung-mud mixture to prevent loss of heat or moisture. After partial decomposition (25 days), first turning was given for homogeneous decomposition of organic wastes. Afterward sufficient water was sprinkled for maintaining 50 - 60 per cent moisture and the exotic African night crawler variety *Eudriluseugeniae* (70 - 75 individuals per pit) was released. Identification of earthworm was done by Julka (1988). The vermicomposting was completed within 15 days and completely decomposed fine, dark brown colored granular materials were obtained for the field trials.

Thefield experiment was conducted on the research farm of Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. The experimental design was a Randomized Block Design (RBD) with six treatments and four replicates. The six treatments were (i) *Achyranthes* vermicompost (AV); (ii) *Cassia* vermicompost (CV); (iii) *Tephrosia* vermicompost (TV); (iv) Mixed vermicompost (MV); (v) Inorganic fertilizer (FE) and (vi) Control (CO). These treatments were applied to the appropriate plots along with chemical fertilizers and control plots. The fodder maize (*Zea mays* L. cv. African Tall) was planted at the seed rate of 100 kg/ha. A plot with the size 3 x 3 m^2 consisted of nine rows spaced 30 cm apart. The fertilizers were supplied as nitrogen (N), phosphorus (P) and potassium (K) at the rate of 120:80:40 kg/ha. Entire amount of P and K was applied as a basal dose to all the amendments except CO at the time of sowing and N was applied in two equal splits at 42 and 75 days after sowing (DAS) to sole application of FE treatment.

The morph-physiological traits of the crop were noted at 86 DAS (Days after sowing) as plant height, diameter, number of leaves per plant, fresh weight of root, stem, leaves and total weight, 4th upper leaf length, its width and weight and leaf area per plant was determined by gravimetric method (Shahane and Mungikar, 1984 and Mungikar, 1986) and leaf chlorophyll contents (a, b and total) were estimated following Nanjareddy *et al.* (1990). All the results were statistically analyzed after Mungikar (1997).

RESULTS AND DISCUSSION

The growth analyses of maize crop were done at 86 DAS (Tables 1). During the growth analyses, the tallest plant was observed with theapplication of TV followed in order by AV, CV and MV amendments and lowest in untreated plots(Table 1). The diameter of the plant was more in CV treated plots followed by AV and MV treatments and less in CO than that of FE alone. The root weight was greater for CV in comparison with other vermicompost and FE applications where as the stem weight was highest in TV amendment followed by CV, AV and MV applications and lowest in FE plots.The same pattern was observed in respect oftotal weight of plant. The 4th upper leaf length was high in CV treated plots then in the AV, MV, TV and FE over the CO plots.This trend was observed with respect to the weight of 4th upper leaf and almost similar results were observed for leaf area also while the width of 4th upper leaf was greater in AV amended plots than that of all other treatments (Table 1).

The weed vermicomposts had significant influence on leaf chlorophyll contents (a, b and total) of maize crop during growth analysis (Fig. 1). The mean values for chlorophyll contents ranged from 0.38 - 0.74, 0.21 - 0.42

Table 1: Growth analysis of maize crop (Age of plant: 86 DAS)

Treatments	Plant height (cm)	Circum-ference (cm)	No. of leaves (plant^{-1})	Plant fresh weight (gm)				4th upper leaf			Leaf area (cm^2 plant^{-1})
				Root	Stem	Leaves	Total	Length (cm)	Width (cm)	Weight (gm)	
AV	156.25	4.67	10.25	5.43	121.60	42.02	169.05	88.30	5.67	5.06	327.35
CV	155.82	4.87	10.00	6.46	122.23	45.91	174.60	96.62	5.42	6.02	378.66
TV	173.22	4.62	9.75	5.24	139.03	46.90	191.18	75.97	5.42	4.52	318.16
MV	146.10	4.67	9.75	4.88	121.31	42.29	166.48	83.00	5.37	5.03	333.93
FE	131.37	4.05	9.50	4.19	95.90	40.27	142.38	75.90	5.12	4.87	304.20
CO	78.02	3.72	8.25	3.01	54.63	25.49	83.14	66.10	4.05	3.71	212.43
S.E.	13.63	0.18					15.65				22.49
C.D.	35.03	0.46					40.22				57.80

Achyranthes vermicompost (AV),*Cassia* vermicompost (CV), *Tephrosia* vermicompost (TV), Mixed vermicompost (MV),Inorganic fertilizer (FE), Control (CO)

and 0.60 - 1.15 mg/gm leaf fresh weight (fw). The chlorophyll contents were more in all the vermicopmost based plots as compared tofertilized and absolute CO. Among them, chlorophyll a, b and total chlorophyll were higher in TV received plots (Fig. 1). Total chlorophyll content plays a significant role in the production of total biomass and productivity of the crops. Ruan *et al.* (2021) also reported that the vermicompost application substantially increased chlorophyll contents (a and b) in fragrant rice.

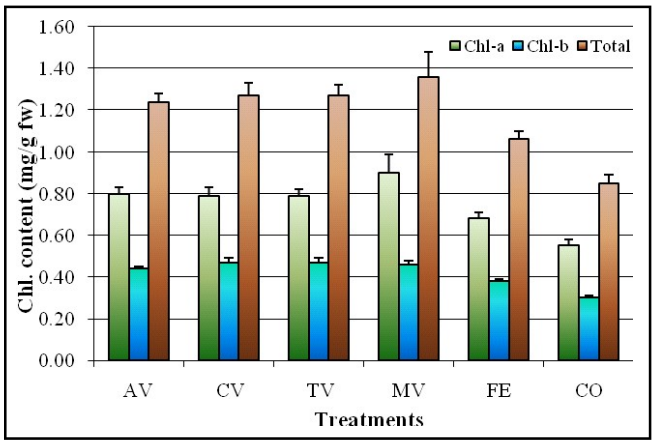

Fig. 1: Leaf chlorophyll contents of maize in response to weed vermicomposts at 86 DAS (n = 4 ± SE)

Based on the above results, it is obvious that theapplications of weed vermicompost significantly increased the growth of maize cropthan that of sole application of inorganic fertilizers. This is because of the better uptake of nutrients from the soil.Among the treatments, CV was more effective as compared to all other amendments.There are no earlier reports on increased crop growth amended with these weed vermicomposts. However, the growth of plants amended with other vermicompost have been reported by Arora *et al.* (2011) and Rekha *et al.* (2018).

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