

## Influence of Microbial Enriched Vermicompost on the Growth and Nutrient Content of *Amaranthus Cruentus L.*



### Botany

**KEYWORDS:** Bioinoculants, vermicompost, *Amaranthus*, *Frateria*

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### ABSTRACT

A field experiment was conducted at Dept. of Botany, Bangalore University, Bangalore, in 2010-2011 to evaluate the response of microbial inoculants and organic manure (vermicompost) on growth of *Amaranthus*. Combined inoculation with vermicompost and bioinoculants *Frateria aurentia* (Potassium mobilizer), *Trichoderma viride*, *Azospirillum brasilense* and *Pseudomonas fluorescens* significantly increased plant biomass, yield and nutrient content. Plants inoculated with vermicompost and *Frateria aurentia* was showed highest nutrient uptake than vermicompost and *Azospirillum brasilense* inoculated plants followed by *Pseudomonas fluorescens*.

### INTRODUCTION

Vermicompost is an organic manure produced as the vermicast by earthworm feeding on biological waste material; plant residues (Rathore *et.al.*, 2007). Vermicompost is one of the best source of nutrients improves the physical and chemical properties of crops (Meena *et.al.*, 2007, Nag and Roy, 2008, Tolanur, 2009, Sinha *et.al.*, 2010). Bioinoculants are beneficial microbes which are used to promote plant growth, soil health and sustainable agriculture. Organic manure enriched with bioinoculants enhances productivity of a wide range of crops (Yadav *et.al.*, 2011). Leafy vegetables represent good sources of vitamin A, C as well as minerals such as iron and calcium, besides dietary fibres. *Amaranthus* is commonly used and cooked in local. Hence, the present study was carried out with a view to standardize, evaluate the effect of vermicompost used as soil amendment along with bioinoculants with due regards to growth, qualitative and quantitative modulation of leaf production. For determining the growth parameters were expressed as number of leaves, fresh weight and dry weight, whereas plant nutrient contents were determined by the method described by Piper, 1966 (calcium and magnesium) and Jackson, 1971 (phosphorus).

### MATERIALS AND METHODS

A field experiment was carried out at Dept. of Botany, Bangalore University, Bangalore, in 2010-2011, in replicated randomized block designs with three replications for each treatment. The traditional seed variety of *Amaranthus* were used for the experiment. Bioinoculants used for treatments were *Frateria aurentia* (potassium mobilizer), *Trichoderma viride* (biocontrol agent), *Azospirillum brasilense* (as nitrogen source), *Pseudomonas fluorescens* (growth promoting bacteria). The treatments are as follows: *Frateria aurentia* + Vermicompost (T<sub>1</sub>), *Trichoderma viride* + Vermicompost (T<sub>2</sub>), *Azospirillum brasilense* + Vermicompost (T<sub>3</sub>), *Pseudomonas fluorescens* + Vermicompost (T<sub>4</sub>) and Vermicompost alone as control. Bioinoculants containing 10<sup>9</sup> cells were enriched with vermicompost and applied to the plants. The plant parameters like root length, shoot length,

number of leaves were recorded at 15 and 45 days after harvest. Shoot dry weights were determined after drying the plant samples at 60°C to a constant weight in a hot air oven.

### RESULTS AND DISCUSSION

Table-1 depicts the response of different bioinoculants with vermicompost on growth parameters viz., root length, shoot length, number of leaves and fresh weight of *Amaranthus* at different duration. Among the various treatments significant increase in number of leaves were recorded in both T<sub>1</sub> and T<sub>3</sub> (*Frateria aurentia* and *Azospirillum brasilense*). These findings are in agreement with Thenmozhi, *et.al.*, 2010, which showed that bioinoculants viz., *Azospirillum* and *Pseudomonas*, and organic manure as vermicompost has influenced the growth attributes viz., shoot and root length, plant biomass and number of leaves in *Amaranthus retroflexus*. Higher leaf yield was recorded maximum in T<sub>3</sub> inoculated with vermicompost and *Azospirillum brasilense* followed by T<sub>1</sub> (*Frateria aurentia* along with vermicompost). More dry matter accumulation might be due to beneficial effect of vermicompost and Potassium. The results pertaining to changes in (Table-2) mineral nutrients indicated that the macro nutrient (calcium, magnesium and phosphorus) uptake significantly increased. Highest level of Calcium, Magnesium and Phosphorus was recorded for the treatment T<sub>1</sub> and T<sub>3</sub> (*Frateria aurentia* and *Azospirillum brasilense*). In general, organic fertilizer (vermicompost) in conjunction with biofertilizer recorded the highest values of macronutrients and concentrations in *Amaranthus* tissues than with other check treatments, whereas the lowest values of macronutrients (Calcium, Magnesium and Phosphorus) registered with sole application of bioinoculants.

Field results reveals that, by applying *Frateria aurentia* (potassium mobilizer) 15-20 per cent yield enhanced

Marked increase in nutrient contents were also observed in microbial enriched vermicompost than control (Table-2).

**Table: 1 Influence of Microbial Enriched Vermicompost on Growth Parameters of *Amaranthus cruentus L.***

Treatments	Plant Growth (DAYS)									
	15					45				
	R. L. (cm)	S L. (cm)	No. of Leaves	FW (g)	D.W. (g)	R. L. (cm)	S L. (cm)	No. of Leaves	FW (g)	D.W. (g)
T <sub>1</sub>	8.70	44.9	40.00	42.7	7.75	8.42	57.9	60.75	118.15	19.10
T <sub>2</sub>	5.87	45.5	36.50	38.7	8.40	8.40	52.4	51.75	86.65	12.82
T <sub>3</sub>	6.82	45.2	41.00	53.5	7.65	7.65	61.0	51.50	135.30	18.75
T <sub>4</sub>	3.70	41.2	36.25	36.7	6.65	5.75	48.2	31.25	67.50	8.50
C	5.12	34.3	31.25	24.0	5.22	3.42	36.3	43.00	33.50	6.62
SEM ±	0.2841	0.6823	0.975	1.2281	0.40896	0.7008	4.1532	2.275	3.1076	1.4980
CD @ 5 %	0.4989	1.1960	1.7086	2.1531	0.7163	1.2283	7.2808	3.9879	5.4478	2.6260

Present study revealed that microbial enriched vermicompost had positive influence on nutrient uptake by plant tissues over control. Highest total uptake of nutrients viz., Calcium, Magnesium and Phosphorus of *Amaranthus* crop was observed in T<sub>3</sub> followed by T<sub>2</sub> over control. The different biochemical changes due to different bioinoculants treatments were thorough studied by analysing the samples drawn at 15 and 45 day of harvest. Calcium, magnesium and phosphorus were estimated by adopting standard procedure.

Similar reports on combined inoculation of vermicompost with *Frateuria aurentia* and *Azospirillum brasilense* have been reported to show increased nutrients in *Amaranthus* in agreement with GeethaKumari *et.al.*, 2009. Further, the nutrients uptake in *Amaranthus* plants was also higher in consortia containing vermicompost with *Azospirillum brasilense* followed by *Frateuria aurentia* and the results are in conformity with the earlier findings of Kumarswamy (2002) and Chandra(2006,2010).

**Table: 2 Influence of Microbial Enriched Vermicompost on Nutrient Uptake of *Amaranthus cruentus* L.**

Treatments	Plant Growth (DAYS)					
	15			45		
	Ca (µg/g)	Mg (µg/g)	P (µg/g)	Ca (µg/g)	Mg (µg/g)	P (µg/g)
T <sub>1</sub>	1.72	5.22	21.0	2.52	7.32	42.5
T <sub>2</sub>	1.12	8.17	10.2	5.82	6.02	35.5
T <sub>3</sub>	4.75	13.2	11.7	2.47	5.75	43.7
T <sub>4</sub>	2.47	10.1	15.0	3.05	3.77	41.2
C	4.55	4.35	10.2	7.10	6.75	20.7
SEM ±	0.2035	0.1211	0.639	0.5276	0.6807	2.177
CD @ 5%	0.3571	0.2110	1.1204	0.8904	1.1934	3.8172

The data were analysed statistically with the help of IBM SPSS 20 statistical package.

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