

Influence of organic manures and biofertilizers on the yield of *Amaranthus dubius*.

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Original Article

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Abstract

The maximum productivity was shown by vermicompost (T1) treated plants. The next higher productivity was exhibited by *Pseudomonas* treated plants (T2). After 30th day vermicompost treated plants had higher growth rate compared to *pseudomonas* treated plants. The leaves of vermicompost treated plants are large and more greenish in colour. The stem is more swollen and hard. *Pseudomonas* also showed comparatively greater vegetative growth to *Amaranth* plants.

Key Words: *Amaranthus*, vermicompost, *Pseudomonas*, organic manures, biofertilizers

Introduction

The environmental impact of excessive use to chemical fertilizers and pesticides was only revealed as years passed by. In 2009, under a Green peace Research Laboratories investigation, Dr. R Royes Tirado, from the University of Exeter, UK, conducted a study in 50 villages in Muktsar, Bathinda and Ludhiana Districts, that revealed chemical, radiation and biological toxicity was rampant in Punjab 20% of sampled wells showed nitrate levels above the safety limit of 50 mg / 1, established by WHO. The study connected this finding with high use of synthetic nitrogen fertilizers. A joint study by PGIMER and Punjab Pollution Control Board in 2008, revealed that in Villages along the Nullah, Calcium, Magnesium, Fluoride, Mercury, Beta – Endosulphan and Heptachlor pesticide were more than permissible limit (MPL) in ground and top waters. Plus the water had high concert ration of COD and BOD, Ammonia, Phosphate, Chloride, Chromium, Arsenic and Chlorpyrifos pesticide. The ground

water also contains nickel and selenium while the top water has high concentration of lead, nickel and cadmium.

Crop scientists all over the world are facing this alarming situation and there are trying to overcome this condition by exploring alternative sources which is cost effective and save the environment. Bio-fertilizer, an alternative source of N – fertilizer, especially rhizobia in legume symbiosis is an established technology. Use of the bio-fertilizers can also prevent the depletion of the soil organic matter (Jeyabal and Kuppuswamy, 2001). Inoculation with bacterial bio-fertilizer may reduce the application of fertilizer – N by increasing N uptake by plants (Choudhury and Kennedy 2004, Kennedy et al, 2004, Mia et al, 2005 and 2007).

Organic fertilizers contain nutrients; provide additional health and environmental benefits to crops, to soil, and to the gardeners and farmers using them. It improves the biodiversity and long-term productivity of soil and may prove a large depository for excess carbon dioxide. The use of organic fertilizers and water retaining products if economically viable may contribute to overcome these constraints and improve land productivity (FAO, 2006).

Amaranthus dubius, a morphologically deviant allopolyploid, is very close genetically to both *A spinosus* and members of sect. *Amaranthus*. This species most probably originated as a result of ancient hybridization between *A. spinosus* and either *A. hybridus* or *A. quitensis* (Palm et al 1972 ; Sauer 1967). Easy to grow nutrient rich foods can help to improve nutrition and food security among communities that heavily depend on substance agriculture. In this context, a study has been envisaged on fertilizer effects on *Amaranthus dubius* and to analyses the morphological, anatomical variation exhibited by the plant using, organic fertilizers. Work is done in high yielding green variety *Amaranthus dubius* co-I.

Material and Methods

Treatment details

The experiment was laid out in randomized block design with 5 replication with four treatments as given below :

- T0 - Control : Untreated (Without fertilizers)
- T1 - Vermicompost : 250 gm / sack.
- T2 - Pseudomonas : 1 mg / sack.
- T3 - Mixture of vermicompost and Pseudomonas : 125 gm + .5 mg / sack

The potting mixture was prepared by mixing 15 kg of soil and 5 kg of sand in 3 : 1 ratio. The biometric parameters such as number of leaves, root length, net assimilation rate, productivity etc. were conducted by the methods adopted by Vilasini ,1978; Sharma and Saran, 1992; Charankumar *et.al*,2011.

Results and Discussion:

On the 10th day of sowing the maximum number of leaves were showed in T1 (Vermicompost) treatment. At the 20th day T2 (Pseudomonas) treatment showed higher number of leaves. At the 30th day maximum number of leaves were found in (T1) and (T2). At the 40th day the number of leaves were decreasing order, T1, T2, T3 and T0 respectively. The variations in number of leaves are given in Table-1.

Table-1. Number of leaves

Treatments	10 th day	20 th day	30 th day	40 th day
T0	4	5	6	8
T1	6	8	10	14
T2	5	9	10	12
T3	5	7	9	10

Maximum growth of root was found in Vermicompost (T1) treated plants on 10th and 20th day (Table-2). But on 30th day maximum length of root was attained in Pseudomonas treated plants (T2).

Table-2. Root length in cm

Treatments	10 th day	20 th day	30 th day	40 th day
T0	0.76	3.17	6.52	7.05
T1	2.13	7	12.69	14.24
T2	1.7	5.92	15.32	12.28
T3	1.03	4.23	8.24	10.55

The maximum productivity was shown by vermicompost (T1) treated plants. The next higher productivity was exhibited by Pseudomonas treated plants (T2). Then the lowest productivity was shown by T3 and T0 (Table-3).

Table-3. Productivity

Treatments	10 th day	20 th day	30 th day	40 th day	Productivity
T0	0.036	0.46	0.62	0.72	0.02
T1	0.220	1.1	1.4	4.76	0.12
T2	0.059	1.58	1.319	3.48	0.09
T3	0.06	0.56	0.686	2.14	0.05

From Figure-1-2, it is evident that net assimilation showed maximum in T1 and T2 on the 10th day and 20th day observation. During later growth period net assimilation showed maximum in T2 and it showed minimum in T0.

In this experiment we observed maximum growth and yield in Vermicompost treated plants (T1). Vermicompost contains more than 8 kinds of useful microbial bacterium groups . So it can supply all nutrition elements needed by the variety of plants. Pseudomonas secretes plant growth promoting hormones like cytokinin and IAA leading plant growth stimulation. All these different organic fertilizer treated plants showed increasing vegetative growth than plants growing without fertilizers (T0). Thus we can conclude that fertilizer application increased crop yield. Use of bio-organic fertilizers like vermicompost promotes faster growth of plants and increases crop yield that was observed by many workers like Singh *et. al.*,(2011)., George *et. al.*,(2000). Agarwal *et. al.*,(2003) reported that application of vermicompost significantly increased biomass production. The present findings are agreement with the above observation.

Conclusion:

An overall observation from seeding to harvest, the germination rate of the seeds show greater in mixture of Pseudomonas and Vermicompost treated plants. From the beginning vermicompost and pseudomonas treated plants had higher growth rate. After 30th day vermicompost treated plants had higher growth rate compared to pseudomonas treated plants. The leaves of vermicompost treated plants are large and more greenish in colour. The stem is more swollen and hard. Pseudomonas also showed comparatively greater vegetative growth to Amaranth plants. From this study it is assessed that all the organic fertilizers had much beneficial effect on the morphological growth on *Amaranthus dubius* CO-I.

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