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Effect of various concentrations of Biofertilizers on the seedlings of *Capsicum annum* L.

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ABSTRACT

The seedlings of *Capsicum annum* L. variety Agnijwala were raised in various concentrations of soil, vermicompost and FYM (Farm Yard Manure) biofertilizers in proportions 1:2, 1:4 (Soil and Vermicompost), 1:2, 1:4 (Soil and FYM) and 1:2:2(S:V:FYM), 1:4:4(S:V:FYM), 1:2:4(S:V:FYM), 1:4:2(S:V:FYM) containing in earthen pots for 43 days maintaining control (Soil). The results showed that increase in total plant length (4.17 to 24.78%), leaf area (1.01 to 40.17%), fresh weight (51.10 to 156.2%) and dry weight (20.46 to 128.8%), as compared to seedlings raised in sole soil. Nevertheless, the increase in chlorophyll content in the biofertilizers treated plant reflected the potential of biofertilizers in the enhancement of the photosynthetic rate of seedlings which may lead to an increase in yield.

Key words: *Capsicum annum L., FYM (Farm Yard Manure), Vermicompost.*

Introduction

The chili (*Capsicum annum* L.) plant belongs to the family Solanaceae. It is used as a fruit vegetable and also a condiment but the popular use of chili throughout the world is spice because of its pungency and pleasant flavor. Chilies require an amount of nutrients for their luxuriant growth and development. Natural organic substances including plant waste, compost, and vermicompost are encouraged to be used in organic agriculture as an alternative approach (Shannon *et al*., 2002). It has been widely accepted that organic produce could serve as a holistic approach to achieving sustainable agriculture and environment eco-friendly (Ahmed *et al*., 2000). Vermicompost is also known as black gold.

Furthermore, vermicompost is also strongly recommended as soil conditioner has been emerging as a potential useful for increasing soil productivity (Narkhede *et al*., 2011).

Indiscriminate use of inorganic fertilizers in agriculture deteriorates the soil quality. Organic manure like vermicompost and FYM (Farm Yard Manure) could be able to increase the soil quality and productivity of land and produce healthy, eco-friendly and safe food and fodder (Ramesh *et al*., 2005). Out of other biofertilizers vermicomposting and FYM biofertilizer are important because they convert all biodegradables and provide nutrients required by the plant. The use of biofertilizers helps farmers to avoid the loss of physico- chemical characteristics of soil which leads to maintaining the health of soil and soil maintaining microbes. On the other hand, production of crops by using biofertilizers are chemical free and have no side effects on human health and nature. Although traditionally proven the significance of the use of biofertilizers, scientific proofs are required to prove the importance of biofertilizers in

the agriculture field.

Materials and Methods

Seven-days-old seedlings of *Capsicum annum* L. were cultivated in each earthen pot filled with soil and biofertilizer mixed with various proportions as Soil and Vermicompost (1:2, 1:4), Soil and FYM (1:2 1:4) Soil, Vermicompost and FYM (1:2:2, 1:4:4, 1:2:4, 1:4:2) keeping in some control pots for comparison which were filled with sole soil.

Every two alternate days seedlings were irrigated with water. Then 43 days old seedlings of *Capsicum annum* L. were uprooted and used for measurement of growth parameters and chemical analysis.

The chlorophyll content was estimated by using the method of Arnon (1949) and the Carotenoid content was measured by using the method of Kirk and Allen (1965).

Root length and shoot length

Five seedlings were selected from each pot separately for recording the root length and shoot length by using a scale and compared with the seedlings grown in control (sole soil).

Fresh weight and dry weight

All seedlings from each pot were selected separately. The roots, stems and leaves were separated and weight was taken by using digital balance which was considered as a fresh weight. After that, these seedlings were sundried and again their weight was also taken which was considered as dry weight.

Table 1a. Effect of various concentrations of biofertilizers on the total height, fresh weight, dry weight and leaf area of seedlings of 43 days old *Capsicum annum* L.

Treatments	Symbols	Total height of seedling (cm)		Fresh weight of seedling (gm)		Dry weight of seedling (gm)		Leaf area (cm^2)	
		cm	%	g	%	g	%	2 cm	%
Control (Soil)	C	35.23	0.00	4.5	0.00	0.83	0.00	12.82	0.00
1:2 (S:V)	T1	43.6	23.75	9.7	115.5	1.7	104.8	17.97	40.17
1:4 (S:V)	T2	38.64	9.67	10	122.2	1.7	104.8	13.31	3.82
1:2 (S: FYM)	T3	43.24	22.73	11.53	156.2	1.9	128.8	15.96	24.49
1:4 (S: FYM)	T4	37.74	7.13	7.4	64.4	1.4	68.62	15.13	18.01
1:2:2(S:V:FYM)	T5	40.6	15.24	6.8	51.10	1.0	20.46	12.69	1.01
1:4:4(S:V:FYM)	T6	43.96	24.78	8.9	97.77	1.4	68.62	13.93	8.65
1:2:4(S:V:FYM)	T7	39.56	12.29	7.6	68.88	1.2	44.54	14.52	13.26
1:4:2(S:V:FYM)	T8	36.7	4.17	8.2	82.22	1.3	55.58	16.08	25.42
T: Treatment	S: Soil	C: Control							

V: Vermicompost FYM : Farm Yard Manure

Table 1b. Effect of various concentrations of biofertilizers on chlorophyll-a, chlorophyll-b, total chlorophyll and carotenoid in the 43 days old seedlings of *Capsicum annum* L.

Treatments	Symbols	Chl -a Mg/gm of fresh tissue		Chl -b Mg/gm of fresh tissue		Total chlorophyll Mg/gm of fresh tissue		Carotenoid content Mg/gm of fresh tissue	
		Mg/g	%	Mg/g	%	Mg/g	%	Mg/g	%
Control (soil)	C	0.66	0.00	0.24	0.00	0.92	0.00	1.9	0.00
1:2(S:V)	T1	1.42	115.1	0.74	208.3	2.00	117.3	2.6	36.84
1:4(S:V)	T2	0.98	48	1.2	400	2.2	139.0	5.1	168.4
1:2(S: FYM)	T3	1.58	139.3	0.6	150	2.18	136.8	3.5	84.20
1:4(S: FYM)	T4	1.92	190.8	0.86	258	2.8	204.1	4.2	120.0
1:2:2(S:V:FYM)	T5	1.68	154.5	0.62	158.3	2.3	149.8	4.4	131.5
1:4:4(S:V:FYM)	T6	1.98	199.9	1.04	333.3	2.96	221.5	4.8	152.6
1:2:4(S:V:FYM)	T7	1.9	187.8	1.00	316.0	2.94	219.3	4.2	121.0
1:4:2(S:V:FYM)	**T8**	**1.96**	**196.9**	**1.00**	**316.0**	**2.96**	**221.5**	**4.6**	**142.1**
T: Treatment	S: Soil	C: Control							

FYM: Farm Yard Manure V: Vermicompost

Leaf area

Four leaves of seedlings from each pot are selected randomly for measuring leaf area. Leaves are placed on graph paper and measured leaf area by using formula: L×B×0.517 in cm^2.

Results and Discussion

The total length, leaf area, fresh weight and dry weight of plants raised in biofertilizer treated plants were maximum as compared to those plants raised in control.

Chlorophyll and carotenoid content in leaves of seedlings grown at various doses of biofertilizer varied between 48 to 196.99 %; 150 to 400% ; 117.3 to 221.5 ; 36.84 to 168.4 chl- a, chl-b, total chlorophyll and carotenoid respectively which was maximum than seedlings raised in control, indicated that physiological characters of plants also changed due to application of biofertilizer.

Fig. 1. 43 days old seedlings grown in pots containing various concentrations of biofertilizers

The results were also similar to Mali. (2014) who reported root-length, shoot-length, leaf area and growth of plant of *Phaseolus mungo* Linn. grown in soil-vermicompost mixture with ratios 1:2, 1:3 and 1:4 (Soil : Vermicompost) and keeping control as a sole soil.

Summery and Conclusion

Based on the experiment conducted with eight treatments it is found that T1, T3, and T6 also shows better results in seedling height, fresh weight, dry weight and leaf area than other treatments and controls. The content of chlorophyll and carotenoids in the treatments T2 and T6 shows better results as compared to other treatments and controls.

An increase in the various studied parameters and better growth results in treatments strongly indicates that soil is a very poor culture for the growth of crops because 1: 2 proportion of soil: biofertilizer means double the amount of fertilizer is added than the amount of soil for the conversion of non- productive soil into productive one. However, the addition of fertilizer is not affordable to the farmer. But to avoid the soil beauty from a couple of non-fertile steps are to be taken by the government to check the future loss of yield.

Hence use of only biofertilizers would be an effective alternative to “Sustainable agriculture”.

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Conflict of Interest- None

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