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EFFECT OF VERMICOMPOST ON YIELD AND QUALITY OF *KHARIF* SEASON OKRA (*ABELMOCHUS ESCULANTUS* (L) MOENCH)

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Summary

A field experiment was conducted at Vegetable Research Farm, JNKVV, Jabalpur during Kharif season of 2005 and 2006 to assess the effects of vermicompost on the performance uder different fertility levels on okra. Trial consisted of sixteen treatments combinations of four does of vermicompost (V_{01} : without vermicompost, $V_{1:}$ 3, V_2 :4 and V_3 : 5 t ha^{-1}) and four levels of fertility (F_0 : without fertilizer, $F_{1:}$ 40:30:30, $F_{2:}$ 60:45:45 and $F_{3:}$ 80:60:60 kg NPK ha^{-1}). It may be published after incorporating corrections. Study revealed the highest plant height (97.7cm), nodes per plant(14), fruit diameter(5.7cm) and fruit yield (73.8q/ha) as well as the protein content (18.5%) was recorded with fertility level of 80:60:60 kg NPK/ ha. This treatment also fetched net return of Rs. 46152 ha^{-1} and gave benefit cost ration of 2.68. incorporation of vermicompost 5 t ha^{-1} also recorded significantly higher values of yield attributes, fruit yield (69.2/ha) and protein content(18.0%) as well as B:C ratio (2.11)with net return of Rs. 35614 ha^{-1}. Application of vermicompost 5 t ha^{-1} proved equally good to recommended dose of fertilizes i.e. 80:60:60 kg NPK ha^{-1}.

सारांश

खरीफ मौसम में भिण्डी फसल पर केंचुआ खाद व रसायनिक तत्व नत्रजन, फास्फोरस एवं पोटाश के प्रभाव का अध्ययन किया गया। अध्ययन में कुल 16 उपचार जिनमें नत्रजन, फास्फोरस व पोटाश (बिना पोषक तत्व, 40:30:30, 60:45:45, 80:60:60, क्रि.ग्रा./हे.) व केंचुआ खाद कं 4 स्तर (बिना खाद, 3, 4 व 5 टन/हें.) को रेन्डोमाइज ब्लाक डिजाइन में व्यवस्थित किया गया है। प्रक्षेत्र प्रयोग के परिमाण प्रदर्शित करते है। कि पोषक तत्वों का स्तर बढानें पर पौध वृद्धि के साथ–साथ उपज व आय में भी सकारात्मक वृद्धि होती है। इसी प्रकार केंचुआ खाद के स्तरों का प्रभाव अपनें आप में बिना खाद की अपेक्षा अच्छा था। अतः 5 टन केंचुआ खाद सें अधिकतम अत्पादन (69.2 क्विं/हे.) प्राप्त होता है। गुणवत्ता की दृष्टि से प्रोटिन का प्रतिशत (18%) भी 5 टन केंचुआ खाद से प्राप्त अधिक हुआ तक रहा।

Introduction

The indiscriminate use of fertilizers in crops leads to nutrients imbalance in soil and showed detrimental effects on soil health. Now-a- days, it is being realized that organic manures is an economic source of nutrients that may help to curtail the use of inorganic fertilizers in agriculture. It plays a significant role in creating favourable environment to the micro flora. The vermicompost is an ideal organic source of nutrient as it is rich in macro and micro nutrients and may use to harvest more biomass for various vegetable and field crops (Hidalgo, 1999; Pahsanasi et al., 1996). Therefore, it is necessary to explore the potential of vermicompost and possibility of supplementing chemical fertilizers. So far, vey little work has been done on fulfillment of nutritional requirement of okra through vermicompost. Therefore, present experiment was conducted to study the effect of vermicompost alone and different combinations of recommendation dose of fertilizers on yield and quality of okra.

Materials and Methods

A field experiment was conducted at Vegetable Research Farm, JNKVV, Jabalpur during kharif season of 2004 and 2006 in a randomized block desgn having three replications. The soil of the experimental field was sandy loam which was neutral in reaction (7.25 pH), low inorganic carbon(0.41%), mediumin available nitrogen(234.8 kg ha^{-1}), phosphorous (12.6 kg $ha^{-1)}$ and potassi9um (335.4 kg $ha^{-1)}$ .There were sixteen treatment combinations comprising of four doses of vermicompost ($V_{01:}$ without vermicompost, V_1 : 3, V_2 : 4 and V_3 : 5 t $ha^{-1)}$ and four levels of fertility (F_0 : without fertilizer, F_1 : 40:30:30, F_2 : 60:45:45 and F_3 : 80:60: kg NPK ha^{-1}). Vermicompost contained 1.5, 1.2, and 1.2 per cent N, $P_2O_{5,}$ K_2O, respectively. The full dose of phosphorous and potassium as well as vemicompost was applied as basal as per treatments . The nitrogen was given in three split doses, 1/3rd as basal, and remaining 2/3rd in two equal split doses at 30 and 45 DAS. The recommended agronomic

practices were followed to grow successful crop during both the years. Seeds of variety parbhani Kranti were sown at 30x10 cm apart in rows using seed rate of 12 kg ha^{-1} on 8th and 5th July during 2005 and 2006, respectively. The data pertaining to plant height, number of nodes, number of fruits/ plant , fruit length, thickness as well as yield was recorded at each and every picking. Nutrients uptake were completed on the basis of concertration of nutrients and dry matter accumulation. Protein content and yield kg ha^{-1} were worked out by multiplying N content with constant factor of 6.25. Economics of different treatments were computed on the basis of prevailing market price of produce and agro inputs used.

Resuluts and Discussion

Effect of vermicompost: Growth parameters significantly influenced by various doses of vermicompost (Table1). The maximum plant height , number of nodes $plant^{-1}$ and length of root, fruit length, thickenss, numbers of fruit $plnat^{-1}$ were recorded with vermicompost 5 t ha^{-1} and proved significantly superior over rest of the doses, but found at per with 4 t ha^{-1} in case of number of nodes and root length $plant^{-1}$. Application of 5 t vermicompost ha^{-1} also proved significantly superior over rest of doses with respect to fruit yield (76.7 q ha^{-1}). Vermicompost at 3 t ha^{-1} did not show any significant response over without vermicompost but the variation between 3 and 4 t per ha vermicompost fount significant in relation to fruit yield. The beneficial effect of vermicompost have also been noted on growth and production of plant by Masciandaro *et al.*,(1999) as vermicompost contain several bio-humic substances and number of hormones like, auxins and cytokinins. These substance may promote the growth, induction of flowers, and formation of lateral roots which enhanced the uptake nutrients by the crop plants (Shroff and Devasthali, 1992).

Application of vermicompost 5 t ha^{-1} increased the concentration of N, P and K nutrients infruits. The protein content as well as yield were increased due to addition of vermicompost however the difference between two closer doses were found *at per*. Moreover, all the doses were proved significantly superior over control and highest dose of vermicompost 5 t ha^{-1} proved the best and recorded 2.95, 0.59, 3.94 and 18.5 per cent N,P,K and protein content in fruits respectively. This may be ascribed due to the increased availability of nutrient in soil and proliferated root system, which enhanced the absorption capacity of root for the nutrients. These findings are in close conformity with the findings of Bhawalkar(1992).

Effect of levels: The various fertility levels also had significant effect on growth traits and yield of fruit as well as quality. The plant height increases with each increasing level of fertility and maximum plant height of 101.4 cm was noted under 80:60:60 kg NPK ha^{-1} , while the lowest was (61.2 cm) under control. The maximum nodes (14.7) and length of root (47.8 cm $plant^{-1}$) were noted with 80:60:60 kg NPK ha^{-1} and proved significantly superior over 40:30:30 kg NPK ha^{-1} and control as well, but not over 60:45:45.

The yield attributing traits in relation to number of fruits, fruit length the fruit thicknesses as well as total yield significantly increased with increases in dose of fertilizer and the maximum values were recorded by applying 80:60:60 kg NPK ha^{-1}. However, the

Table 1. Effect of vermicompost and fertility levels on characteristics of okra during *Kharif* (Pooled over 2005-06)

Treatment combinations	Plant height (cm)	Root length (cm)	Number of nodes $plant^{-1}$	Number of fruit $plant^{-1}$	Fruit length (cm)	Fruit thickness (cm)	Number of pickings
F_0: No. fertilizer	61.2	29.0	9.2	6.0	7.1	4.7	9.5
F_1: 40:30:30 NPK kg ha^{-1}	74.1	41.0	10.7	8.3	8.7	5.7	12.5
F_2: 60:45:45 NPK kg ha^{-1}	91.5	45.6	13.0	10.9	10.1	5.8	16.0
F_3: 80:60:60 NPK kg ha^{-1}	101.4	47.8	14.7	12.9	11.0	6.0	18.5
CD (P=0.05)	2.60	5.13	2.25	1.21	1.41	0.66	1.99
V_0: No. Vermicompost	74.4	27.8	8.9	7.1	6.7	4.7	10
V_1: Vermicompost 3 t ha^{-1}	80.1	42.2	11.1	9.7	8.7	5.3	12
V_2: Vermicompost 4 t ha^{-1}	84.6	44.6	13.3	10.2	10.3	5.9	17
V_3 : Vermicompost 5 t ha^{-1}	89.3	48.8	14.4	11.0	11.3	6.3	18
CD (P=0.05)	2.60	5.13	2.25	1.21	1.41	0.66	1.99
F_0 V_0	52.6	23.5	7.0	5.5	4.9	3.6	6.3
F_0 V_1	58.9	28.1	8.5	5.9	5.8	4.3	8.5
F_0 V_2	62.0	30.2	10.9	6.4	7.8	4.7	9.6
F_0 V_3	64.7	34.2	11.6	6.6	8.2	5.8	9.6
F_1 V_0	65.4	27.5	8.1	6.1	6.2	4.4	7.9
F_1 V_1	68.5	39.4	10.4	7.4	7.6	5.1	10.0
F_1 V_2	74.2	46.5	11.5	8.8	9.0	5.8	12.3
F_1 V_3	79.6	49.3	13.3	9.3	10.5	6.2	12.9
F_2 V_0	84.7	29.5	9.9	7.5	6.6	4.7	8.6
F_2 V_1	88.3	47.4	10.8	9.9	8.9	5.4	10.8
F_2 V_2	90.7	47.8	13.8	10.6	11.0	6.0	15.9
F_2 V_3	94.5	53.2	16.9	12.6	12.1	6.6	17.7
F_3 V_0	93.7	31.1	12.2	9.1	7.8	5.5	13.2
F_3 V_1	98.6	51.5	13.7	13.1	10.5	5.9	14.7
F_3 V_2	101.2	52.3	15.8	13.8	11.4	6.2	18.3
F_3 V_3	104.5	53.4	15.8	13.8	12.4	6.0	19.1
CD (P=0.05)	5.21	NS	NS	NS	NS	NS	NS

difference between 40:30:30 and 60:45:45 kg NPK ha^{-1} was found *at per* with respect to length and thickness of fruit. Increasing fertility level significantly increased the yield and each level recorded 6.5,25.9 and 23.2 % higher yield over their preceding level. Improvement in growth and root dry matter accumulation in okra plants in above treatment might be due to application of balance fertilization, which build-upthe adequate food reserves for formation and elongation of cells, and fenhanced the photosynthetic activity by icreasing the leaf area and rate of photyosynthesis. The systhesised photosynthates might have translocated to in the growing gruits having more demand of assimilates which consequently lead to greater length, thickness and biomassas reported by Mani *et al.*(1999).

Table 2 Effect of fertility levels and doses of vermicompost on yield of okra during *Kharif* (Pooled over 2005-06)

Treatement Combinations	Yield q ha^{-1}	Dry matter accumulation (q ha^{-1})	Nutrient contains in fruits (%)			Protein content in fruit (%)	Cost of cultivation Rs. Ha^{-1}	Net return Rs.ha^{-1}	B: C ratio
			N	P	K				
F_0: No. fertilizer	49.0	22.9	2.46	0.42	3.38	15.4	13805	20476	1.47
F_1: 40:30:30 NPK kg ha^{-1}	53.2	31.8	2.68	0.51	3.66	16.8	15063	23140	1.53
F_2: 60:45:45 NPK kg ha^{-1}	67.0	37.2	2.89	0.55	3.85	18.1	15697	32414	2.04
F_3: 80:60:60 NPK kg ha^{-1}	82.6	41.2	3.05	0.59	4.04	19.1	16331	40712	2.48
CD (P=0.05)	4.30	2.41	0.36	0.09	NS	1.38			
V_0: No. Vermicompost	54.2	29.1	2.45	0.43	3.36	15.3	10732	25151	2.33
V_1: Vermicompost 3 t ha^{-1}	58.1	33.6	2.80	0.51	3.74	17.5	15222	25391	1.66
V_2: Vermicompost 4 t ha^{-1}	67.1	34.3	2.88	0.54	3.87	18.0	16722	30584	1.81
V_3: Vermicompost 5 t ha^{-1}	76.7	36.1	2.95	0.59	3.94	18.5	18222	35614	1.94
CD (P=0.05)	4.30	2.41	0.36	0.09	NS	1.38			
F_0 V_0	41.6	19.20	2.01	0.32	3.04	12.6	9335	17955	1.92
F_0 V_1	48.5	23.15	2.43	0.43	3.34	15.7	13795	21146	1.52
F_0 V_2	50.8	23.50	2.63	0.47	3.51	16.4	15295	21636	1.40
F_0 V_3	52.0	25.70	2.69	0.49	3.62	16.8	16795	21166	1.25
F_1 V_0	44.1	24.30	2.84	0.43	3.38	14.6	10563	19258	1.83
F_1 V_1	49.7	32.70	2.72	0.49	3.69	17.0	15063	20248	1.33
F_1 V_2	57.8	34.30	2.78	0.55	3.74	17.4	16563	26388	1.58
F_1 V_3	60.9	35.85	2.88	0.59	3.81	18.0	18063	26668	1.47
F_2 V_0	52.0	34.25	2.59	0.46	3.49	16.2	11197	25864	2.34
F_2 V_1	55.5	37.30	2.89	0.54	3.89	18.1	15697	24224	1.53
F_2 V_2	68.1	37.60	2.98	0.57	4.01	18.7	17197	32594	1.89
F_2 V_3	88.3	39.70	3.09	0.62	4.11	19.4	18697	46614	2.47
F_3 V_0	65.7	38.65	2.87	0.50	3.55	17.9	11831	37530	3.15
F_3 V_1	73.3	41.25	3.08	0.58	4.10	19.2	16331	35950	2.19
F_3 V_2	80.6	41.90	3.11	0.60	4.18	19.5	17831	41360	2.30
F_3 V_3	91.0	43.10	3.14	0.66	4.25	19.6	19331	48010	2.47
CD (P=0.05)	8.64	4.82	NS	0.18	NS	NS	-	-	-

Cost of treatment input (Rs kg^{-1}) : Nitrogen = 1097, Phosphorous = 20.00, Potassium =7.67 and Vermicompost =1.50 Sale price of produce (Rs kg^{-1}) : Kharit 2005 = 6.00, and Kharit 2006 = 8.00

Net return: Perusal of data (Table-1) data exhibited that vermicompost and fertilizers doses both had marked effect on net return and per rupee investment with the progressive increase in doses of vermicompost and chemical fertilizers. The highest dose of vermicompost (5 t ha^{-1}) fetched net return of Rs 35614 ha^{-1} with benefit cost ratio of 1.95. Moreover, the control plot gave maximum benefit cost ratio of 2.34 and seems to be better in terms of cost benefit ratio over, others, but net return was lowest as compared to 3, 4 and 5 tones vermicompost ha^{-1}. The highest benefit cost ratio with use of vermicompost and control was also reported by Pandey *et al.*(2006).The maximum net return (RS. 40712 ha^{-1}) and benefit cost ratio of 2.49 were recorded under highest fertility level of 80:60:60 kg NPK ha^{-1}. The interaction effect between fertility levels of 80:60:60 kg NPL ha^{-1} and vermicompost 5 t ha^{-1} was found non-significant with respect to fruit yield. The yield was further enhanced significantly over the separate application of each treatment. Thus, the net return and cost benefit ratio were increased accordingly.

Reference

Bhawalkar VS (1992). Chemical farming to natural farming. A quick changeover without loss of yield. In : Proc of Nat Sem. On Natural farming, Somani LL, Totawat KL and Baser BL (Eds.), pp. 79-88

Pandey AK, Gopinath KA, Chattacharya P, Hooda KS, Sushil SN, Kundu S, Selvakumar G and Gupta HS (2006). Effect of sources and rate of organic manures on yield attributes, pod yield and economics of organic garden pea (Pisum sativum sub sp hortence) in north west Himalaya. Indian J. Agric. Sci. 76(4): 230-4.

Hiedalgo P (1999). Earthworm castings increase germination rate and seedling development of cucumber. Mississippi and Farestry Experiment Station, Research Report 22: on. 6.

Masciandaro G, Cecconti B And Garcia C (1999). Soil agro ecological managemetn: fertigation and vermocompost treatments. Biores Technol. 59: 206.

Pashanasi B, Lavelle P, Alegre J and Charpentier F (1996). Effect of the endogeic earthworm, pontoscolex corethrurusbon soil chemical characterstics and plant growth in a low-input tropical agroecosystem. Soil Biol.& Bioch. 28: 801-808.

Shroff VN and Devasthali S (1992). Earthwarm Forming-scope and limitations. Proceedings of national Seminar on Natural Farming. L>L. Somani, K.L. Totwat and B.L. Baser (Eds.) pp 126-142.