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Short Communication

Effect of organic sources of plant nutrients on yield, quality and nutrient uptake in onion

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Onion (*Allium cepa* L.) is an important commercial crop grown worldwide. Now-a-days organically grown vegetables have more consumer acceptance and there is increasing demand of organically grown products. Organic farming is one among the broad spectrum of production methods that are supportive of the environment. Organic production systems are based on specific standards precisely formulated for food production and aim at achieving agro-eco systems, which are socially and ecologically sustainable. It is based on minimizing the use of external inputs through use of on-farm research efficiently compared to conventional farming. Thus the use of synthetic fertilizers and pesticides is to be avoided (Sivaraman 2007). Organic manures play an important role in improving soil physical, chemical and biological properties. The adoption of vermi-compost helps in minimizing use of chemical fertilizers to the extent of 25-50% and increases the crop yield by 15-20% due to increased supply of essential elements (Marinari et al. 2000 and Singh et al. 2013). Onion is grown in Maharashtra, Karnataka, Andra Pradesh, Gujrat, MP and other states of India in an area of about 12.03 lakh ha with total production of about 194.01 lakh tonne with average productivity of 16.12 t/ha. In Maharashtra, it is grown over on area of 4.68 lakh ha with production of 58.64 lakh tonne with average productivity of 12.53 t/ha (Anonymous 2014). The productivity of onion in India is low as compared to other countries due to disease, pests, mineral nutrition and management practices. Onion responds well to manures and fertilizers. However, it requires heavy manuring for its potential production. The use of expensive commercial fertilizers as per the requirement of crop is not much affordable to the average farmer. Further, the excess use of inorganic fertilizer leads to soil and environmental pollution too. Keeping in view the importance of organic components, the experiment on organic sources of plant nutrients on onion production was conducted to investigate the suitable organic source for better yield in onion.

A field experiment was conducted at MPKV, Rahuri during rabi season of 2015-16 on medium black soils. The materials under investigation consist of organic sources of plant nutrients along with one treatment of integrated nutrient management system in randomized block design with four replications. The seed of cv N2-4-1 was sown 60 days before transplanting. The seedlings were transplanted in plot size of 5.0×1.5 m and spacing of 15×10 cm. The onion was transplanted on 12/12/2015 and harvested on 04/04/2016. The treatment details for present investigation are viz., T_1: vermicompost @ 15 t/ha, T_2: poultry manure@ 15 t/ha, T_3: Farm Yard Manure @ 30 t/ha, T_4: Neem cake @ 5t/ha and T_5: INM ie 100:40:40:30 kg NPKS + 15 t FYM per hectare along with chemical plant protection measures at frequent intervals during crop growth period. The observations recorded on total & marketable bulb yield (t/ha), % doubles and bolters, total storage losses after 4 months, dry matter yield, macronutrient content in leaf and bulb, macronutrient uptake kg/ha, micronutrient content in bulb & leaf of onion, micronutrient uptake, TSS ^{0}B and pyruvic acid content of onion bulb. The initial soil properties were done and mentioned in uptake table of nutrients. The soil pH was 7.86, electrical conductivity was 1.70 ds/m and soil organic carbon was 0.79 mg/kg. The soil and plant analysis was done as suggested by AOAC (1990). The experimental data was analyzed by using Panse and Sukhatme (1985).

The data on yield contributing characters was depicted in Table1. The total bulb yield and marketable bulb yield was significantly influenced by various treatments. The

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Table 1: Effect of organic farming on yield and yield contributing parameters for onion

Treatment	TBY (t/ha)	Bolting (%)	Double bulbs (%)	MBY (t/ ha)	B:C ratio	TSL (%)	Dry matter yield (kg/ha)			TSS (^{0}B)	Pyruvic acid (µg/100 FW)
							Leaves	Bulbs	Total		
T1	44.68	1.61	0.09	43.92	2.16	15.61	29.50	48.37	77.87	11.50	7.33
T2	43.60	3.28	0.66	41.89	2.13	13.56	47.29	46.32	93.61	11.75	7.29
T3	46.30	1.23	0.52	45.49	2.28	12.10	46.32	58.46	104.78	11.20	7.32
T4	40.56	2.18	0.66	39.41	2.01	15.72	49.93	57.70	107.63	11.30	7.31
T5	48.30	0.95	0.85	47.44	2.26	17.83	40.62	51.41	92.03	12.00	7.33
SEM±	2.37	0.82	0.44	2.30	0.04	1.71	6.16	7.79	7.63	0.04	0.02
CD (5 %)	7.30	2.52	1.37	7.21	0.08	4.27	18.98	17.86	16.87	0.08	0.04
CV %	10.62	8.49	15.90	9.62	0.90	5.01	28.83	22.10	21.65	2.50	0.90

MBY-Marketable bulb yield, TSL-Total storage losses after 4 months, TSS-Total soluble solids

maximum yield was recorded by treatment T_5 i.e. INM (48.30 t/ha) and minimum was recorded by T_4 i.e. Neem cake treatment (40.56 t/ha). All other treatments were in between these treatments and recorded better yields. Similar results were also reported by Meena and Peter (1990) in experiment on an integrated approach with organic and inorganic fertilizers gave maximum yield in chilli. The maximum yield (46.5 t/ha) was produced with inorganic fertilizer dose (200:100:100 NPK kg/ha) with FYM 20t/ha which was at par with that produced by organic fertilizer (45.3 t/ha) containing FYM 20 t/ha + Neem cake-250 kg/ha, soil treatment with Trichoderma 6.25 kg/ha, Azospirillum 2.5 kg/ha, PSB 2.5 kg/ha with trap crop of marigold as a border row in tomato crop were reported by Patil (2003). In present investigation also vermicompost (44.68 t/ha), poultry manure (43.60 t/ha) and FYM (46.30 t/ha) alone recorded the yield in onion as only organic source of nutrients. Similar results were also reported by Thangaswamy et al. (2016) in onion.

Bolting was maximum in poultry manure (3.28%) treatment and minimum in INM treatment (0.95%). The double bulb was maximum in INM treatment (0.85%) and minimum in vermicompost treatment (0.09%). The maximum B:C ratio was recorded in FYM (2.28) and minimum in neem cake (2.01). The total storage loss after four months was maximum in INM treatment (17.83%) and minimum in FYM (12.10%). The increased levels of inorganic nutrient applications were responsible for increasing the total losses in onion. Similar findings were also reported by Mukeshkumar et.al. (2000). Moreover, total dry matter yield (kg/ha) was maximum in treatment T_4 ie neem cake (107.63) while it was minimum in T_1 i.e. vermicompost (77.87). The quality parameter TSS was maximum in T_5 (12.00) and minimum in T_3 (11.20). The pyruric acid was in the range of 7.29-7.33. The macronutrients (NPKS) and micronutrients (Zn, Fe Mn, Cu and B) content (%) in leaf and bulb of onion was depicted in Table 2. There was significant treatment wise differences in the NPKS and Zn, Fe, Mn, Cu and B content in leaf and bulb of onion. The macronutrients was maximum in INM treatment as compare to other organic sources and similar trend was also observed in micronutrients also and these nutrients was utilized better for growth and development of leaf & bulbs in onion. These results were in close agreement with that of Siag and Yadav (2004). The uptake of macronutrients (NPKS) and micronutrients (Zn, Fe Mn, Cu and B) was shown on Table 3 along with initial values for respective treatments. The uptake for macronutrients was maximum in T_5 treatment as compared to other treatments. The nutrients were better utilized by INM treatment as compared to other treatments. From these results, it is clearly seen that use of inorganic fertilizers along with

Table 2: Effect of organic farming on macronutrient and micronutrient content in onion

Treatment	N %		P %		K %		S %		Zn %		Fe %		Mn %		Cu %		B %	
	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb	Leaf	Bulb
T1	0.70	2.10	0.25	0.41	0.90	2.20	0.18	0.40	47	74	346	284	104	170	34	34	0.0	0.0
T2	1.12	1.68	0.28	0.35	1.15	2.40	0.22	0.44	68	81	286	224	112	136	49	34	0.0	0.0
T3	1.68	1.82	0.25	0.26	1.00	2.80	0.24	0.45	48	71	143	216	110	163	46	27	0.0	0.0
T4	1.40	1.82	0.32	0.36	0.95	2.70	0.21	0.44	103	76	332	483	139	193	41	28	0.0	0.0
T5	2.80	3.36	0.52	0.26	1.20	2.95	0.24	0.45	43	72	261	225	120	145	36	27	0.0	0.0
SEM±	0.03	1.00	0.03	0.04	0.02	0.05	0.02	0.03	2.50	1.30	5.50	2.40	1.30	4.50	1.40	1.10	0.0	0.0
CD (5.0 %)	0.06	2.00	0.06	0.08	0.04	1.00	0.04	0.06	5.30	2.50	15.20	4.50	2.70	16.20	2.80	2.30	0.0	0.0
CV %	0.52	3.50	0.80	0.90	0.08	0.95	0.50	0.60	5.20	4.20	10.21	5.30	4.21	9.21	3.80	3.40	0.0	0.0

Table 3: Effect of organic farming on macronutrient uptake (kg/ha) and micronutrient uptake (g/ha) by onion

Treatment	N	P	K	S	Zn	Fe	Mn	Cu	B
T1	232	86	1265	78	1.78	10	22	10	0.0
T2	216	54	896	86	1.26	6	22	8	0.0
T3	251	113	750	80	1.72	6	23	9	0.0
T4	232	45	1019	73	2.44	5	27	9	0.0
T5	257	121	1798	87	1.43	5	23	10	0.0
SEM±	2.32	3.50	15.20	1.50	0.04	0.02	1.10	0.04	0.0
LSD (5.0 %)	6.50	7.58	45.30	3.49	0.08	0.04	2.30	0.08	0.0
CV %	10.21	9.21	12.21	5.21	0.50	0.20	1.40	0.60	0.0
Initial values	273	46	1075	88	1.46	5	36	16	0.0

FYM results in significant improvement in available NPKS and Zn, Fe Mn, Cu and B status of the soil. Similar findings were also reported by Siag and Yadav (2004) and Thangaswamy et al. (2016). It has been observed that recommended dose of fertilizers along with application of FYM and plant protection measures was the best treatment for obtaining the higher yields in onion. However, by applying only organic sources viz., vermicompost, poultry manure, FYM and neem cake also resulted in better yields. The results also infer that use of organic sources of nutrients to onion crop is beneficial and suitable with use of different organic treatments. For obtaining the healthy food, reducing environmental and soil pollution, the organic sources of nutrients also found to be better in obtaining the quality yields of onion.

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