

Study the Effect of Organic and Inorganic Fertilizer on Quality of Kharif Onion (*Allium cepa* L.)

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ABSTRACT

The field experiment was conducted to study the “Study the effect of organic and inorganic fertilizer on quality of kharif onion (*Allium cepa* L.)” in medium black soils of the Fruit Research Station, Entkhedi Farm, Rajmata Vijayaraje Scindia Krishi Vidyalaya, Bhopal, (M.P.) during kharif 2015-16. Treatment T₁₁ (RDF 75% 112.5: 60: 45kg NPK/ha + Vermicompost 5 t/ha) was recorded the lowest sorted bulb followed by T₁₀ (RDF 75% 112.5: 60: 45kg NPK/ha + Vermicompost 4 t/ha) and which were at par with each other. However, maximum sorted bulbs were found in T₁ (Vermicompost 3 t/ha). Significantly maximum “A” grade bulb yield per plot and per hectare were recorded under the treatment T₁₁, T₁₀, T₁₂, T₉, T₈, T₇ and T₆, respectively and which were at par with each other. However, the lowest “A” grade bulb yield per plot and per hectare was observed in treatment T₁. Treatment T₁₁, T₁₀, T₁₂, T₉, T₈, T₇ and T₆ were recorded significantly maximum “B” grade bulb yield per plot and per hectare and which were at par with each other. While, it was recorded minimum in treatment T₁. Therefore, C grade bulb yield did not exert any significant effect on different treatments observed in organic manure and inorganic fertilizers. Same trend (A and B) was observed in C grade bulb yield per plot and per hectare. The maximum “D and E” grade bulb yield per plot and per hectare were recorded in treatment T₁ (Vermicompost 3 t/ha). While it was found lowest under the treatment T₁₁ (RDF 75% 112: 60: 45kg NPK/ha + Vermicompost 5 t/ha) for the same.

Key words: Organic, Kharif, Vermicompost, Fertilizers and Grade.

INTRODUCTION

Onion (*Allium cepa* L.) is a member of Alliaceae family and is of great benefit to man due to its dietic and medicinal values. Onion is one of the most important vegetable crops in Nigeria where it is an important condiment in the preparation of

curry and spicy dishes. Onion cultivation in Nigeria is confined to the semi-arid northern Guinea and Sudan Savannah zones where it is normally transplanted in November and harvested in April in the dry season under irrigation.

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The soils in this area are mostly low in nutrients due to low organic matter content, which lowers the yield². Onion is grown as spice and vegetable crops and used for culinary purpose. Raw onion has an antiseptic value, promotes bile production and reduces blood sugar. It is rich source of phosphorus, calcium, vitamin C, protein and carbohydrates. Onion is known to check the deposition of cholesterol in blood vessels, thus protect against cure heart diseases resulting from blockage of arteries³. Onion is one of the most important commercial vegetable crops grown in India over an area covering 11.6 million hectares with a production of 17.32 tons/ha⁷. India is the second largest producer of onion in the world, next to China, with 70% of the total production comes as winter crop and remaining 30% as kharif onion as off season crop, accounting for 11.40 per cent of the area and 10.40 per cent of the world production and 16 per cent of productivity. In India, onion is being grown in an area of 3.64 million hectares with production of 68.45 million tonnes and the average productivity is 18.82 tonnes per hectare. China, India, U.S.A., Pakistan, Turkey, Iran, Brazil, Mexico and Spain are the major onion producing countries in the world. Maharashtra is the leading onion growing state of India¹. A global review of production of major vegetables shows that India occupies second position in the onion production in world⁸. Onion is a shallow rooted crop and is highly responsive to fertilizers in terms of improvement in yield and quality of onion⁴. But the continuous and liberal use of inorganic fertilizer alone affects soil health and thus resulting in lower yield with poor quality produce⁵. The good harvest in kharif season tries to bridge the gap. Integrated

nutrient management is one of the most important factors that greatly influence the quality and yield of onion⁶.

MATERIAL AND METHODS

The present experiment was laid out in the field of Fruit Research Satation Entkhedi Farm, RajmataVijayaraje Scindia Krishiv Vidyalaya, Bhopal, (M.P.). Bhopal is Situated on 23^o 15 north latitude and 77^o 24 east longitude at an altitude of 427 meters from mean sea level in Vindyan Plateau of Madhya Pradesh and enjoy subtropical Climate. The average rainfall Varies from 945.3 mm concentrated mostly from the month of last July to January (Crop period) less rainfall occurs during the winter season also. The average maximum temperature is 46^o C and minimum temperature 6.8^o C the average annual relative humidity is 74%. The soil of the experiment field was medium black with 37% clay, 38% salt and 25% send with P^H ranging 7.2. The soil was low in Available nitrogen, medium in available phosphorus and high in available potassium. The 12 treatments were replicated three times in randomized block design in 1.5m × 1.2m plots. The statistical analysis was done as per the standard procedure for analysis of variance for RCBD. Least significant difference was employed for mean comparison.

RESULT AND DISCUSSION

Quality parameter

Number of sorted bulbs per plot and per hectare

The number of sorted bulbs per plot and per hectare of different treatments of organic manures and inorganic fertilizers is given in table 1.

Table 1: Number of sorted bulb per plot and per hectare as influenced by different treatment of organic manure and inorganic fertilizers in kharif onion

Treat. Symb.	Treatments	No. of sorted bulb per plot	No. of sorted bulb per hectare
T ₁	Vermicompost 3 t /ha	3.33	189.98
T ₂	Vermicompost 4 t /ha	2.66	147.76
T ₃	Vermicompost 5 t /ha	2.33	129.43
T ₄	RDF 50%	2.10	116.66
T ₅	RDF 75%	1.50	83.33
T ₆	RDF 50% + Vermicompost 3 t /ha	2.00	111.10
T ₇	RDF 50% + Vermicompost 4 t /ha	1.70	94.44
T ₈	RDF 50% + Vermicompost 5 t /ha	1.66	92.21
T ₉	RDF 75% + Vermicompost 3 t /ha	1.40	77.77
T ₁₀	RDF 75% + Vermicompost 4 t /ha	1.10	61.11
T ₁₁	RDF 75% + Vermicompost 5 t /ha	1.00	55.55
T ₁₂	RDF 100% (check)	1.33	73.88
SEm±		0.66	3.74
C.D. at 5%		0.19	10.98

Treatment T₁₁ (RDF 78% 112.5:60:45 Kg NPK/ha + Vermicompost 5 t/ha) was recorded the lowest number of sorted bulbs 1.0 /plot and 55.55/ha followed by T₁₀ (RDF 75% 112.5:60:45 kg NPK/ha +Varmicompost 4 t/ha) (1.10/plot and 64.11/ha) and which were at par with each other. However, maximum number of sorted bulbs 3.33/plot and 184.98/ha was found in T₁ (Vermicompost 3 t/ha).

Yield of “A, B and C” grade bulb per plot (kg)

The weight of “A, B and C” grade bulb per plot was recorded and depicted in the table 2. Clearly indicated that the weight of “A and B” grade bulb per plot was responded significantly due to different treatments of organic manures and inorganic fertilizers.

Table 2: Effect of different treatment of organic manure and inorganic fertilizers on A and B grade bulb per plot in kharif onion

Treat. Symb.	Treatments	'A' grade bulb/plot	'B' grade bulb/plot	'C' grade bulb/plot
T ₁	Vermicompost 3 t /ha	0.467	0.907	0.423
T ₂	Vermicompost 4 t /ha	0.600	1.067	0.557
T ₃	Vermicompost 5 t /ha	1.367	1.110	0.640
T ₄	RDF 50%	1.450	1.167	0.650
T ₅	RDF 75%	1.487	1.200	0.773
T ₆	RDF 50% + Vermicompost 3 t /ha	2.100	1.573	0.783
T ₇	RDF 50% + Vermicompost 4 t /ha	2.133	1.777	0.833
T ₈	RDF 50% + Vermicompost 5 t /ha	2.610	1.983	0.853
T ₉	RDF 75% + Vermicompost 3 t /ha	2.617	2.067	1.057
T ₁₀	RDF 75% + Vermicompost 4 t /ha	3.003	2.150	1.083
T ₁₁	RDF 75% + Vermicompost 5 t /ha	3.133	2.183	1.357
T ₁₂	RDF 100% (check)	2.870	2.070	1.000
SEm±		0.44	0.30	0.20
C.D. at 5%		1.30	0.89	N.S.

Significantly maximum 3.133, 3.003, 2.870, 2.617, 2.610, 2.133 and 2.100 kg/plot “A” grade bulb yield were recorded under the treatment T₁₁, T₁₀, T₁₂, T₉, T₈, T₇ and T₆,

respectively and which were at par with each other. However, the lowest 0.467 kg/plot “A” grade bulb was observed in treatment T₁. Treatment T₁₁, T₁₀, T₁₂, T₉, T₈, T₇ and T₆ were

recorded significantly maximum 2.183, 2.150, 2.067, 1.983, 1.777 and 1.573 kg/plot “B” grade bulb yield respectively and which were at par with each other. While, it was recorded minimum 0.907 kg/plot in treatment T₁. Therefore, C grade bulb yield did not exert any significant effect on different treatment of

organic manure and inorganic fertilizers. Same trend (A and B) was observed in C grade bulb yield per plot.

Yield of “D and E” grade bulb per plot (kg)

The yield of “D and E” grade bulb per plot was recorded and depicted in the table 3.

Table 3: Effect of different treatment of organic manure and inorganic fertilizers on “D and E” grade bulb per plot in kharif onion

Treat.Symb.	Treatments	‘D’ grade bulb / plot	‘E’ grade bulb / plot
T ₁	Vermicompost 3 t /ha	0.673	0.320
T ₂	Vermicompost 4 t /ha	0.607	0.173
T ₃	Vermicompost 5 t /ha	0.550	0.153
T ₄	RDF 50%	0.480	0.143
T ₅	RDF 75%	0.427	0.137
T ₆	RDF 50% + Vermicompost 3 t /ha	0.417	0.130
T ₇	RDF 50% + Vermicompost 4 t /ha	0.410	0.107
T ₈	RDF 50% + Vermicompost 5 t /ha	0.380	0.100
T ₉	RDF 75% + Vermicompost 3 t /ha	0.340	0.077
T ₁₀	RDF 75% + Vermicompost 4 t /ha	0.310	0.057
T ₁₁	RDF 75% + Vermicompost 5 t /ha	0.170	0.020
T ₁₂	RDF 100% (check)	0.307	0.033
SEM±		0.15	0.05
C.D. at 5%		N.S.	N.S.

The maximum 0.673 and 0.320 kg/plot “D and E” grade bulb yield per plot were recorded in treatment T₁ (Vermicompost 3 t/ha), respectively. While it was found lowest 0.170 and 0.020kg/plot under the treatment T₁₁ (RDF 75% 112.5:60:45 kg NPK/ha + Vermicompost 5 t/ha), respectively for the same.

Yield of “A, B and C” grade bulb (q/ha)

The “A, B and C” grade bulb yield per hectare was recorded and depicted in the table 4. Clearly indicated that the yield of “A and B” grade bulb per hectare was responded significantly due to different treatments of organic manures and inorganic fertilizers.

Table 4: Effect of different treatment of organic manure and inorganic fertilizers on “A, B and C” grade bulb yield per hectare in Kharif onion

Treat. Symb.	Treatments	‘A’ grade bulb/plot	‘B’ grade bulb/plot	‘C’ grade bulb/plot
T ₁	Vermicompost 3 t /ha	25.94	50.38	23.50
T ₂	Vermicompost 4 t /ha	33.33	59.27	30.94
T ₃	Vermicompost 5 t /ha	75.94	61.66	35.55
T ₄	RDF 50%	80.55	64.83	36.11
T ₅	RDF 75%	82.60	66.66	42.94
T ₆	RDF 50% + Vermicompost 3 t /ha	116.66	87.38	43.50
T ₇	RDF 50% + Vermicompost 4 t /ha	118.49	98.71	46.27
T ₈	RDF 50% + Vermicompost 5 t /ha	144.99	110.16	47.38
T ₉	RDF 75% + Vermicompost 3 t /ha	145.37	114.82	58.72
T ₁₀	RDF 75% + Vermicompost 4 t /ha	166.82	119.43	60.16
T ₁₁	RDF 75% + Vermicompost 5 t /ha	174.04	121.27	75.38
T ₁₂	RDF 100% (check)	154.43	114.99	55.55
SEM±		24.71	16.96	11.55
C.D. at 5%		72.5	49.75	N.S.

Significantly maximum 174.04, 166.82, 159.43, 145.37, 144.99, 118.49 and 116.66 q/ha “A” grade bulb yield were recorded under the treatment T₁₁, T₁₀, T₁₂, T₉, T₈, T₇ and T₆, respectively and which were at par with each other. However, the lowest 25.94 q/ha “A” grade bulb yield was observed in treatment T₁. Treatment T₁₁, T₁₀, T₁₂, T₉, T₈, T₇ and T₆ were recorded significantly maximum 121.277, 119.43, 114.99, 114.82, 110.16,

98.71 and 87.38 q/ha “B” grade bulb yield and 75.38, 60.16, 55.55, 58.72, 47.38, 46.27 and 43.50 q/ha C grade bulb yield, respectively and which were at par with each other. While, it was recorded minimum 50.38 and 23.40 q/ha in treatment T₁.

Yield of “D, and E” grade bulb (q/ha)

The yield of “A, B and C” grade bulb per hectare was recorded and depicted in the table 5.

Table 5: Effect of different treatment of organic manure and inorganic fertilizers on “C, D and E” grade bulb per hectare in kharif onion

Treat. Symb.	Treatments	‘D’ grade bulb (q/ha)	‘E’ grade bulb (q/ha)
T ₁	Vermicompost 3 t /ha	37.39	17.78
T ₂	Vermicompost 4 t /ha	33.72	9.61
T ₃	Vermicompost 5 t /ha	30.55	8.50
T ₄	RDF 50%	27.05	7.94
T ₅	RDF 75%	23.72	7.61
T ₆	RDF 50% + Vermicompost 3 t /ha	23.16	7.22
T ₇	RDF 50% + Vermicompost 4 t /ha	22.78	5.94
T ₈	RDF 50% + Vermicompost 5 t /ha	21.11	5.56
T ₉	RDF 75% + Vermicompost 3 t /ha	18.89	4.28
T ₁₀	RDF 75% + Vermicompost 4 t /ha	17.22	3.17
T ₁₁	RDF 75% + Vermicompost 5 t /ha	9.44	1.11
T ₁₂	RDF 100% (check)	17.05	1.83
SEm±		8.85	3.21
C.D. at 5%		N.S.	N.S.

The maximum 37.39 and 17.78 q/ha “D and E” grade bulb yield per hectare were recorded in treatments T₁ (Vermicompost 3 t/ha), respectively. While it was found lowest 9.44 and 1.11 q/ha “D and E” grade bulb yield per hectare under the treatments T₁₁ (RDF

75% 112.5:60:45 kg NPK/ha + Vermicompost 5 t/ha), respectively.

Marketable bulb yield per plot and hectare

The data was analyzed statistically and the analysis of variance. The marketable bulb yield per plot and hectare as affected by different treatment is presented in table 6.

Table 6: Marketable bulb per plot and per hectare as influenced by different treatment of organic manure and inorganic fertilizers in kharif onion

Treat. Symb.	Treatments	Marketable bulb /plot (kg)	Marketable bulb / hectare (q)
T ₁	Vermicompost 3 t /ha	1.797	99.82
T ₂	Vermicompost 4 t /ha	2.224	123.54
T ₃	Vermicompost 5 t /ha	3.117	173.15
T ₄	RDF 50%	3.267	181.48
T ₅	RDF 75%	3.46	192.20
T ₆	RDF 50% + Vermicompost 3 t /ha	4.456	247.53
T ₇	RDF 50% + Vermicompost 4 t /ha	4.743	267.47
T ₈	RDF 50% + Vermicompost 5 t /ha	5.446	302.53
T ₉	RDF 75% + Vermicompost 3 t /ha	5.741	318.91

T ₁₀	RDF 75% + Vermicompost 4 t/ha	6.236	346.41
T ₁₁	RDF 75% + Vermicompost 5 t/ha	6.673	370.69
T ₁₂	RDF 100% (check)	5.94	329.97
SEM±		0.59	39.91
C.D. at 5%		1.75	117.08

Under the treatment T₁₁ (RDF 75% 112.5:60:45 kg NPK/ha + Vermicompost 5 t/ha), T₁₀ (RDF 75% 112.5:60:45 kg NPK/ha + Vermicompost 4 t/ha), T₁₂ (RDF 100% 150:80:60 kg NPK/ha check), T₉ (RDF 75% 112.5:60:45 kg NPK/ha + Vermicompost 3 t/ha) and T₈ (RDF 50% 75:40:30 kg NPK/ha + Vermicompost 5 t/ha), respectively and which were at par with each other. However, the lowest 1.797 kg/plot and 99.82 q/ha marketable bulb yield was observed in treatment T₁ (Vermicompost 3 t/ha).

CONCLUSION

Quality parameter i.e. maximum marketable bulb yield per plot and per hectare, “A” grade bulb and TSS per cent were recorded the highest in treatment T₁₁ (RDF 75% 112.5:60:45 kg NPK/ha + Vermicompost 5 t/ha), while, it was also gave the minimum sorted bulbs per plot and per hectare and “C” grad bulb.

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