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Effect of integrated nutrient management on growth and yield of onion (*Allium cepa* L.) seed production

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ABSTRACT

A field experiment entitled, "Effect of integrated nutrient management on growth and yield of onion seed production" with variety of N-2-4-1 was conducted at the Central Farm, M.P.K.V., Rahuri during *rabi* 2004-05. The experiment was laid out in randomized block design with nine treatments and three replications. Significantly higher values of all growth attribute parameters were recorded with the treatment (T_2) fertilizer combination of 120 : 60 : 60 N : P_2O_5 : K_2O kg ha^{-1} + 20 t FYM ha^{-1} over all treatments but was closely followed by application of RDF as per soil test. The treatment (T_3) 75 % RDF + 5 t FYM ha^{-1} recorded the lowest values of growth attributes. Treatment (T_2) 120 : 60 : 60 NPK + 20 t FYM ha^{-1} recorded highest number of umbels/plant, number of seeds/umbel, weight of seeds/umbel and 1000 seed weight (g). The use of 100 per cent RDF (T_2) through inorganic source with 20 t FYM ha^{-1} was capable to gain the highest residual N, P and K. The results obtained in the present investigation indicated that the treatment (T_2) combination of 100 % RDF of NPK (120 : 60 : 60 kg ha^{-1}) with FYM (20 t ha^{-1}) gave the highest seed yield. So it can be advocated for cv. N-2-4-1 in *rabi* season under irrigated conditions.

Key words : Nutrient management, Seed production.

INTRODUCTION

Onion (*Allium cepa* L.) is one of the most important vegetable cash crop grown for vegetable in green stage as well as for mature bulb. Onion has called as "Queen of Kitchen" (Selviraj, 1976). India is the second largest producer of onion in the world with an area of 5.2 lakh ha and production of 65.7 lakh MT next only to China (Anonymous, 2003). Onion ranks first in the export of fresh vegetables from India constituting 73.94 per cent. It's productivity was low i.e. 10.67 t ha^{-1} compared to world average productivity of 17.16 t ha^{-1}. Maharashtra is the largest producer of onion in the country with an output of 30 lakh metric tonnes production from 1.03 lakh ha area which is about 25 per cent to the production and 20 per cent to the total area. As per the estimates of NSC, India needs about 4000 tonnes of certified seed of onion per year while the production of seed for year 1998-99 was about 6000 quintals (Singh, 2003) this indicates that there is a great need for increasing seed production of onion. The yield of onion seed depends mainly on cultural practices like nutrition, irrigation, plant protection measures besides the congenial climatic factors. Nutrition is one of the most important factor which governs the onion seed production. There is need of supplementing the use of chemical fertilizers with organic manures. Organic matter provides many additional benefits such as supply of micronutrients, preventing erosion improving drainage and food microorganisms as well as increase in base exchange capacity. As NPK doses and FYM application are varietal specific also, here is need to undertake the research on seed production aspect to onion cultivation. Therefore, it is envisaged to investigate the optimum dose of NPK and FYM application for onion seed crop to maximize the seed yield under Rahuri conditions. With these considerations in mind, the present trial was conducted to study the INM on growth and yield of onion seed crop.

MATERIALS AND METHODS

The present field investigation entitled, "Effect of integrated nutrient management on growth and yield of onion seed production" was carried out during *rabi* season 2004-05 at Central Farm, M.P.K.V., Rahuri (M.S.). The soil of the experimental field was clayey in texture, alkaline in reaction (pH 8.30) low in available nitrogen (141.41 kg ha^{-1}), medium in available phosphorus (19.11 kg ha^{-1}) and high in available potassium (450 kg ha^{-1}).

The experiment was laid out in randomized block design with nine treatments and three replications. Treatment consisted of RDF dose of NPK ha^{-1} (as per soil test), RDF of NPK (120 : 60 : 60 NPK kg ha^{-1}) + 20 t FYM ha^{-1}, 75 % RDF + FYM 5 t ha^{-1}, 50 % RDF + FYM 10 t ha^{-1}, 25 % RDF + FYM 15 t ha^{-1}, FYM 5 t ha^{-1}, FYM 10 t ha^{-1}, FYM 15 t ha^{-1} and FYM 20 t ha^{-1}. Good quality bulbs of onion variety N-2-4-1 were used.

RESULTS AND DISCUSSION

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Treatment details :

Symbol	Treatment details	Abbreviation
T_1	Recommended dose of fertilizer (RDF) as per soil test	RDF (as per soil test)
T_2	100 % recommended dose of fertilizer (RDF) + 20 t FYM ha^{-1}	100 % RDF + 20 t FYM ha^{-1}
T_3	75 % recommended dose of fertilizer (RDF) + 10 t FYM ha^{-1}	75 % RDF + 5 t FYM ha^{-1}
T_4	50 % recommended dose of fertilizer (RDF) + 5 t FYM ha^{-1}	50 % RDF + 10 t FYM ha^{-1}
T_5	25 % recommended dose of fertilizer (RDF) + 5 t FYM ha^{-1}	25 % RDF + 15 t FYM ha^{-1}
T_6	5 t FYM ha^{-1}	
T_7	10 t FYM ha^{-1}	
T_8	15 t FYM ha^{-1}	
T_9	20 t FYM ha^{-1}	

1. RDF (as per soil test) : 150: 60 : 30 ($N:P_2O_5:K_2O$ kg ha^{-1})
2. RDF for onion seed crop : 120 : 60 : 60 ($N:P_2O_5:K_2O$ kg ha^{-1})

Growth studies :

Plant height :

The significant difference in plant height at all the crop growth stages were observed due to various treatments. The treatment where highest doses NPK through inorganic and organic sources were applied produced significantly more plant height as compared to rest of the treatments at all crop growth stages. The favourable effect in increase in plant height were observed due to better availability of nutrients, better moisture utilization, better soil moisture etc. These results were in agreement with those reported by Nehra *et al*. (1988), Singh and Kumar (1989) (Table 1).

***Number of seed stalks per plant* :**

It was substantially indicated that the integrated nutrient management through various organic and inorganic fertilizes showed better effect on number of

Table 1 : Mean periodical plant height (cm), number of seed stalks per plant, number of days to maturity as influenced by various treatments

S. No.	Treatments	Plant height (cm) Days of the planting				Number of seed stalks per plant	Number of days to maturity
		30	60	90	At harvest		
1.	T_1 : RDF (as per soil test)	6.21	20.48	70.46	87.59	6.10	134.85
2.	T_2 : 100 % RDf + FYM 20 t ha^{-1}	6.13	20.66	72.67	89.75	6.16	137.22
3.	T_3 : 75 % RDF + FYM 5 t ha^{-1}	6.18	19.93	68.93	82.14	5.91	137.93
4.	T_4 : 50 % RDF + FYM 10 t ha^{-1}	6.08	19.89	68.10	82.12	5.86	131.89
5.	T_5 : 25 % RDF + FYM 15 t ha^{-1}	6.04	18.65	65.58	75.63	4.18	144.19
6.	T_6 : FYM 5 t ha^{-1}	5.70	15.75	52.12	65.44	3.15	150.25
7.	T_7 : FYM 10 t ha^{-1}	5.86	17.42	59.69	68.13	3.92	141.10
8.	T_8 : FYM 15 t ha^{-1}	5.90	17.44	59.71	68.51	3.99	147.12
9.	T_9 : FYM 20 t ha^{-1}	5.97	17.47	59.74	68.54	4.00	148.97
	'F' test	N.S.	Sig.	Sig.	Sig.	Sig.	N.S.
	SEm $\pm$	0.19	0.18	0.74	0.86	0.02	6.34
	C.D. at 5 %	-	0.54	2.22	2.60	0.08	-
	General mean	6.00	18.63	64.35	76.47	4.81	141.50

Sig. = Significant, N.S. = Non-significant

seed stalks per plant. These results are in conformity with the finding reported by Nehra *et al.* (1988) who showed that as the level of N, P and K was increased the number of seed stalks also increased (Table 1).

Number of days to maturity :

The application of organic and inorganic fertilizers and their integration did not effect days for maturity of onion seed crop significantly (Table 1).

Yield studies :

***Number of umbels per plant* :**

The maximum number of umbels per plant obtained in treatment (T_2) 100 % RDF + 20 t FYM ha^{-1} (6.15) which was significantly higher than any other treatment except treatment (T_1) RDF as per soil test. The nutrient availability might be coincide with the physiological development of onion crop. This has reflected in maximum number of umbels per plant (Table 2).

Number of seeds per umbel :

The treatment (T_2) 100 % RDF + 20 t FYM ha^{-1} exhibited significantly maximum number of seeds per umbel (1274) in all treatments but at par with treatment (T_1) RDF as per soil test. This might be due to inorganic fertilizer which supply all the essential nutrients for growth and development of crop and FYM influenced soil physical environment and biological activity which reflected in terms of increased seed number per umbel. The similar results reported by Cuocola and Barbieri (1988) and Ilin (1992) (Table 2).

Seed weight per umbel :

The application of 100 % RDF + 20 t FYM ha^{-1} produced significantly highest seed weight per umbel than any other treatment (3.80 g). It was followed by treatment (T_1) RDF as per soil test which was at par with treatments T_3, T_4 and T_5 (Table 2).

Thousand seed weight :

The thousand seed weight was not affected significantly due to various treatments under study. However, maximum thousand seed weight was recorded in treatment (T_2) 100 % RDF + 20 t FYM ha^{-1} 92.59 g) (Table 2).

Seed yield :

Seed yield per plant :

The treatment (T_2) 100 % RDF + 20 t FYM ha^{-1} recorded significantly the highest seed yield per plant than any other treatment (23.37 g) (Table 3).

Table 2 : Yield contributing characters as influenced by various treatments

S. No.	Treatments	Number of umbels/ plant	Number of seeds / plant	Weight of seeds / umbel (g)	1000 seed weight (g)
1.	T_1 : RDF (as per soil test)	6.07	1255	3.49	2.78
2.	T_2 : 100 % RDf + FYM 20 t ha^{-1}	6.15	1274	3.80	2.99
3.	T_3 : 75 % RDF + FYM 5 t ha^{-1}	5.89	1235	3.44	2.79
4.	T_4 : 50 % RDF + FYM 10 t ha^{-1}	5.85	1221	3.43	2.85
5.	T_5 : 25 % RDF + FYM 15 t ha^{-1}	4.16	1178	3.39	2.88
6.	T_6 : FYM 5 t ha^{-1}	3.12	1081	2.63	2.43
7.	T_7 : FYM 10 t ha^{-1}	3.90	1129	2.81	2.49
8.	T_8 : FYM 15 t ha^{-1}	3.97	1131	2.84	2.51
9.	T_9 : FYM 20 t ha^{-1}	3.99	1135	2.85	2.51
	'F' test	Sig.	Sig.	Sig.	N.S.
	SEm $\pm$	0.03	6.00	0.03	0.20
	C.D. at 5 %	0.10	19.00	0.11	-
	General mean	4.79	1182	3.19	2.69

Seed yield and straw yield per hectare (kg):

The application of 100 % RDF + 20 t FM ha^{-1} recorded the highest seed yield per hectare (1259 kg) which was significantly higher than any other treatment under study. The treatment T_2 was followed by treatment T_1. The results obtained under treatment 5 t FYM ha^{-1}

Table 3 : Mean seed yield per plant (g), straw yield per hectare (kg) and seed yield per hectare (kg) as influenced by various treatments

S. No.	Treatments	Seed yield per plant (g)	Seed yield per hectare (kg)	Straw yield per hectare (kg)
1.	T_1 : RDF (as per soil test)	21.18	1528	1118
2.	T_2 : 100 % RDf + FYM 20 t ha^{-1}	23.37	1587	1259
3.	T_3 : 75 % RDF + FYM 5 t ha^{-1}	20.29	1474	1058
4.	T_4 : 50 % RDF + FYM 10 t ha^{-1}	20.36	1431	1050
5.	T_5 : 25 % RDF + FYM 15 t ha^{-1}	14.11	1265	739
6.	T_6 : FYM 5 t ha^{-1}	8.20	881	422
7.	T_7 : FYM 10 t ha^{-1}	10.96	933	578
8.	T_8 : FYM 15 t ha^{-1}	11.27	947	586
9.	T_9 : FYM 20 t ha^{-1}	11.37	981	590
	'F' test	Sig.	Sig.	Sig.
	SEm $\pm$	0.26	16.66	17.00
	C.D. at 5 %	0.80	50.00	52.00
	General mean	15.68	1225	822

recorded the lowest seed yield per hectare (422 kg). Similar results were also obtained for straw yield of onion seed crop.

The results indicated that the application of combination of inorganic fertilizers with organic manures were found highly beneficial. The increase in yield appeared due to increased growth of plants in respect of various growth parameters and yield contributing characters.

The significant effects of NPK elements on onion seed yield were reported by Chakrabarti *et al* (1980), Nehra *et al*. (1988), Bhatia and Pandey (1991) and Tiwari *et al.* (2002).

The application of 100 % RDF + 20 t FYM ha^{-1} significantly increased seed yield as compared to rest of the treatments. It was followed by RDF as per soil test. This indicates that adoption of integration of organic and inorganic fertilizers are beneficial for higher onion seed yield.

The combination of organic manure and inorganic fertilizers proved advantageous as compared to use of organic manures or inorganic fertilizers alone.

REFERENCES

Anonymous (2003). Indian Agriculture. pp. 373.

Bhatia, A.K. and Pandey, U.C. (1991). Effect of planting methods, fertility levels and spacing on seed production of *kharif* onion. *Res. and Develop. Reporter,* **8 (1) :** 10-16.

Chakrabarti, A.K., Choudhary, B. and Singh, C. (1980). Effect of nitrogen and phosphorus on seed production of onion (*Allium cepa* L.). *Seed Res.*, **8 (1) :** 1-4.

Cuocola, L. and Barbieri, G. (1988). The effect of nitrogen fertilization and plant density on seed yield of onion (*Allium cepa* L.). *Rivista di Agronomia.*, **22 (3) :** 195-202.

Ilin, Z. (1992). Onion seed quality in relation to fertilization. Sauremena polijoprivreda. **40 (4) :** 51-54.

Nehra, B.K., Pandita, M.L. and Singh, K. (1988). 1. Cultural and nutritional studies in relation to seed production in onion (*Allium cepa* L.). 2. Effects of bulb size, spacing and nitrogen on plant growth and seed yield. *Haryana J. of Hort. Sci.*, **17 (1-2) :** 106-110.

Selvaraj, S. (1976). Onion queen of the Kitchen. Kisan world, **3 (12) :** 32-34.

Singh, K. (2003). Approaches for sustainable development of onion and garlic NHRDF, Nashik. Pp. 1-13.

Singh, K. and Kumar, K. (1989). Effect of nitrogen and phosphorus fertilization on the growth and yield of onion (*Allium cepa* L.). *J. Res. Punjab Agril. Univ.*, **6 :** 764-768.

Tiwari, R.S., Agarwal, A. and Sengar, S.C. (2002). Effect of nitrogen doses and spacing on seed yield of Onion (*Allium cepa* L.) cv. Pusa Red. *Seed Res.*, **30 (2) :** 230-233.

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