

Effect of plant density and nitrogen levels on growth and yield of onion seed crop (*Allium cepa* L.)

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ABSTRACT

Field experiment was conducted to study the effect of plant density and nitrogen levels on growth and yield of onion seed crop. The experiment consisted of twelve treatment combinations of three spacing (20cm,30cm,40cm) with four levels of nitrogen (0, 100,150,200 kg/ha) and was laid out in Randomized Block Design. The spacing of 20 cm within the row gave better result in respect of plant height, number of leaves, number of umbel per plant and seed yield per hectare. On the other hand large spacing 40 cm produced large size umbel but less number of umbel per plant. Nitrogen at 200 kg per hectare increased the plant height, average length of leaf sheath, seed yield per umbel, no. of umbel per plant and seed yield per hectare. The spacing of 20 cm within row and fertilizing at 200kg/ha gave good result in growth and yield performance for onion seed crop.

KEY WORDS : Plant density, Nutritional requirement, Onion seed crop

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INTRODUCTION

Onion is a major bulbous crop among the cultivated crops and it is of global importance. Although onion is grown commercially for bulbs in most of the region of the country, but its seed production is limited only to some regions. The reason for lower productivity of onion in India could be attributed to the limited availability of quality seed and lack of developments of hybrids in onion is major limiting factors among the others. If the area is increased under seed production, the farmer might be able to get excellent quality seed in cheaper rates. The yielding capacity and quality of seed crop is influenced by a number of factors. Amongst all factors some factors like bulb size, spacing and nutritional requirement is most important. The seed yield / plant increased considerably with increasing bulb spacing but the yield per hectare was greatest at the closet spacing (Chaturvedi, 1996). A closer spacing of 30 cm within rows gives higher yield of seed than when the bulbs were planted at 45 cm.

MATERIALS AND METHODS

A field experiment was conducted at Department of Horticulture, College of Agriculture, Allahabad University, to study the effect of plant density and Nitrogen level on growth and yield of onion seed crop in 1998-1999. The experiment was laid out in Randomized Block Design with four replications. The treatments consisted of three spacing (S₁=45 x 20 cm, S₂= 45 x 30 cm, S₃=45 x 45 cm) and four nitrogen levels T₀=control, T₁=100 kg /ha T₂=150 kg /ha, T₃=200 kg/ha with constant dose of 100 kg P₂O₅ and 100 kg K₂O per hectare. The total quantity of phosphorus and potash along with the half quantity of nitrogen were applied as basal dose, rest half of nitrogen was applied as top dressing. The fertilizer was applied uniformly to all the plots of each of size 1.5 x 1.5 mt. Observation on growth parameter viz., duration from sowing to bud initiation, height of plant, number of leaf sheath /plant, seed yield per umbel, number of umbel per plant and seed yield per hectare had been taken.

RESULTS AND DISCUSSION

The seed yielding potentiality of onion plants showed a better variation against the plant population level i.e. spacing within the row. The closet spacing of 20 cm apart yielded maximum yield of 705.31 kg/ ha seed where as the yield received when the plants were spaced at 30 cm (632.54 kg /ha) and 40 cm (634.34kg/ha) within the row

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recorded significantly lower yield (Mathanker, 1990). The seed yield per umbel was maximum (1.57g) with the widest spacing of 40 cm within the row and minimum (1.53g) with the closet spacing of 20 cm. Number of umbel per plant was maximum (4.27) in wider spacing of 40 cm and minimum (4.09) in close spacing of 20 cm.

Nitrogen levels/ha significantly influenced the onion seed yield over the control. The maximum yield of 768.31 kg/ha was received when the highest dose of 200 kg of nitrogen was applied followed by 747.45 kg / ha, 680.60 kg /ha and 605.85 kg/ha at nitrogen level of 150, 100 and 0 kg /ha., respectively. As the nitrogen levels increased, the seed yield per ha increased significantly over the control but the difference in seed yield produced at nitrogen level 150 and 200 kg/ha was very nominal and nonsignificant. Same results were reported by Singh *et al.* (1988). Similar and identical results were obtained in seed yield/umbel where N₃ was superior to N₂, N₁ and N₀. Seed yield per umbel was maximum (1.81 g) in 200 kg/ha followed by 1.59g, 1.54g and 1.32g in nitrogen level of 150 kg/ha, 100kg/

ha and N₀/ha (control), respectively. Similarly the number of umbel per plant increased with increase in nitrogen levels over control significantly. Number of umbel per plant was maximum in 200kg/ha nitrogen level (4.63) and minimum in control (4.25).

However, floral mechanism of onion seed stalks were least affected by spacing within the row and hence it can be said definitely that spacing has the role to change the floral mechanism towards betterment either in seed quality or quantity. As far as duration from showing to bud initiation in days is concerned, the minimum duration of bud initiation was 42.5 days with the S₂ (30 cm) followed by S₃ (40 cm) and S₁ (20 cm).

The floral mechanisms influenced by different nitrogen level also presented a very interesting trend. The duration from sowing to bud initiation was minimum N₃ (42.80 days) with nitrogen level of 200kg/ha followed by N₂ (43.16 days), N₁ (44.08 days) and N₀ (Control) (49.58 days). As far as duration from showing to seed maturity is concerned, here again minimum number of days *i.e.* 68.25 was with the nitrogen of 200 kg/ha, where as maximum number of days was 71.5 when plant received no nitrogen.

The growth parameter e.g. height of plant at different spacing of 20, 30, 40 cm increased up to 90 D.A.S after which the plants reached the vegetative maturity. At none of successive stages of growth spacing significantly affected the height of the plants. Similar trend was observed in number of leaf sheaths/plant where as S₃ remained better than S₂ and S₁ but the changes were not significant (Rogers, 1977).

The morphological changes of onion seed plants as influenced by different nitrogen levels again confirmed the positive correlation between nitrogen and growth parameter as depicted through height of plant and no. of leaf sheath per plant. Height of plant at most successive

Table 1 : Effect of spacing and nitrogen level on seed yield/ umbel, number of umbel /plant and seed yield per ha

Treatments	Seed yield per umbel (g)	No. of Umbel per plant	Seed yield per hectare (kg)
S ₁ (20 cm)	1.53	4.09	705.31
S ₂ (30 cm)	1.56	4.26	640.54
S ₃ (40 cm)	1.57	4.27	632.54
C.D. (P=0.05)	0.08	0.13	8.6
N ₀ (Control)	1.32	4.25	605.85
N ₁ (100 kg/ha)	1.54	4.29	680.60
N ₂ (150 kg /ha)	1.59	4.49	747.45
N ₃ (200 kg/ha)	1.81	4.63	768.31
C.D. (P=0.05)	0.09	0.14	11.01

Table 2 : Effect of spacing and nitrogen levels on leaf sheath, length of leaf, height of plant, duration of bud initiation and maturity of seed

Treatments	No. of leaf sheath/plant	Avg. length of leaf sheath (cm)	Height of plant (cm)	Duration from sowing to first bud initiation (days)	Flower appearance to maturity of seed
S ₁ (20 cm)	40.66	67.20	52.82	46.37	70.43
S ₂ (30 cm)	36.56	66.50	51.82	42.50	68.52
S ₃ (40 cm)	30.31	68.10	52.91	45.81	69.34
C.D. (P=0.05)	4.83	7.01	6.67	2.53	1.34
N ₀ (Control)	31.43	57.51	34.91	49.58	71.50
N ₁ (100 kg/ha)	42.16	69.29	56.59	44.08	71.08
N ₂ (150 kg /ha)	38.63	72.14	58.66	43.16	69.83
N ₃ (200 kg/ha)	30.75	75.50	59.85	42.80	68.25
C.D. (P=0.05)	4.23	8.34	6.73	2.92	1.46

stages of growth were maximum at N_3 followed by N_2 , N_1 and N_0 . Similarly the no. of leaf sheath per plant was maximum 42.16 at N_1 followed by 38.62 at N_2 , 31.34 at N_0 and 30.75 at N_3 . It may be further added here as expected nitrogen, very much influenced the growth as well as yield parameter towards better quantitative and qualitative onion seed yield. Similar result have been reported by Mishra (1994) and Chaturvedi (1996).

The interrelationship between different spacings and nitrogen levels have been insignificant and nominal in all the parameters of growth, flowering and yield but it may be added here that spacing (20 cm) and nitrogen level (200 kg/ha) have been the best combination for higher and economical yield.

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