

Effect of spacing bulb size and fertilizers on growth and seed yield of onion (*Allium cepa* L.)

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SUMMARY

An experiment was conducted to study the effect of spacing, bulb size and fertilizers on growth and seed yield of onion during the *Rabi* season of the years 2003-04, 2004-05, 2005-06 and 2006-07. There were significant effect of spacing on bulb size on seed yield. Significantly the highest seed yield (639.70 kg ha⁻¹) was recorded by the planting of bulbs at 30 cm x 30 cm spacing and its effect was at par with 45 cm x 30 cm spacing. Among bulb size, the highest seed yield (576.50 kg ha⁻¹) was produced by the planting of large size of onion bulb (7 to 8 cm). While, various fertilizer levels could not produce any significant difference in seed yield. The maximum net returns of 46078, 38738 and 39638 Rs.ha⁻¹ were recorded by the spacing of 30 cm x 30 cm, large bulb size (7 to 8 cm) and fertilizer application on soil test basis, respectively. Where as, the highest benefit cost ratio of 0.92, 0.91 and 0.89 were recorded by the spacing of 30 cm x 30 cm, bulb size of 5 to 6 cm and fertilizer application on soil test basis, respectively.

Key words : Spacing, Bulb size, Fertilizers, Seed yield, Economics, Onion

Onion is an allogamous vegetable crop of global importance. It is popularly used both in immature and mature bulb stage as a vegetable and spices. Onion is a biennial crop for the purpose of seed production. In one season, bulbs are produced from seed and in the second season, bulbs are replanted to produce seeds. Onion seeds are poor in keeping quality and loose viability within a year. Therefore, it is essential to produce fresh seed for bulb production in every year. Onion seed production is a highly specialized job. Cultural practices determine greatly the seed yield. Onion seed crop is influenced by several factors *i.e.* temperature, bulb size, time of planting, spacing, nutrients etc. Among these factors, spacing, bulb size and fertilizers play an important role in increasing seed production per unit area. Closer spacing of mother bulbs resulted in higher seed yield per hectare (Singh *et al.*, 1990). Largest size bulbs have been reported to exert a great influence on the growth, yield and quality of the onion seed crop (Mishra, 1986). The

information on the influence of the spacing, bulb size and fertilizers is meagre in onion seed crop under Saurashtra conditions. Therefore, the present experiment was carried out.

MATERIALS AND METHODS

A field experiment was conducted during the *Rabi* season of the years 2003-04, 2004-05, 2005-06 and 2006-07 at Vegetable Research Station, Junagadh Agricultural University, Junagadh. Soil of the experimental area was medium black in texture, low in available nitrogen, high in available phosphorous and medium in available potash with the pH of 8.20. The experiment comprised of twenty four treatment combinations of three spacing levels *i.e.* 30 cm x 30 cm, 45 cm x 30 cm and 45 cm x 45 cm, two sizes of bulb *i.e.* small size (5 to 6 cm) and large size (7 to 8cm) with four levels of fertilizer (NPK kg ha⁻¹) *i.e.* 50-50-50, 100-50-50, 150-50-50 on soil test basis. The experiment was laid out in split plot design with three replications. Different spacing were allotted to main plots and bulb sizes and fertilizer levels were allotted to sub plots. Full dose of phosphorous, potash and half dose of nitrogen were applied as basal and remaining half dose of nitrogen at 30 days after planting in each year. The sources of nitrogen, phosphorous and potash were urea, diammonium phosphate and murate of potash. The bulbs as per treatments were planted on October 23, 2003, November 12, 2004, November 21, 2005 and November 16, 2006 at different spacing as per treatments. All the cultural operations were followed to raise a good crop of onion cv. GUJARAT white onion-1. The observations on

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growth and yield attributes were recorded from 5 randomly selected plants from each plot. The data were recorded for seed yield on net plot basis and then converted on hectare basis and subjected to statistical analysis.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been presented under following heads :

Effect on seed yield:

Results obtained are presented in Table 1. Analysis of variance revealed that spacing and bulb sizes had significant effect on seed yield. The pooled results indicated that seed yield increased with closer spacing and planting of large bulb size. Whereas, different fertilizers levels did not exert any significant effect on seed yield.

Maximum seed yield (639.70 kg ha⁻¹) was recorded with the spacing of 30 cm x 30 cm, but statistically, it was at par with the spacing of 45 cm x 30 cm (533.00 kg ha⁻¹). This might be due to more number of plants per unit area, which in turn into higher seed yield per unit area. These results are in concurrence with the finding of Tiwari *et al.* (2002) who reported that closer planting

spacing produced maximum seed yield of onion.

Seed yield increased with increased bulb size. Significantly the highest seed yield of 576.5 kg ha⁻¹ was noted with the large bulb size, which might be due to good growth of the crop and ultimately resulted in higher seed yield. Shukla *et al.* (2008) observed that large bulb size (90-120 g) produced maximum seed yield of onion at Raipur. While, various fertilizer levels increased the seed yield from 551.8 kg ha⁻¹ to 560.2 kg ha⁻¹, yet the increase was not significant. However, numerically higher seed yield of 560.2 kg ha⁻¹ was recorded with the fertilizer application on soil test basis. Gethe *et al.* (2006) also reported similar results.

All the interaction effects were found non-significant for the seed yield.

Economics:

In terms of monetary returns, among different spacing, the maximum net returns of 46078 Rs.ha⁻¹ and B : C ratio of Rs. 1: 0.92 were recorded with the spacing of 30cm x 30cm. Where as, though the net returns of 38738 Rs.ha⁻¹ was higher in large bulb size, the highest B : C ratio of 1: 0.91 was observed by the use of small bulb size. While, among various fertilizer levels, the non-significant effect was observed on seed yield, but the maximum net returns of 39638 Rs.ha⁻¹ and B : C ratio of

Table 1: Effect of spacing, bulb size and fertilizer levels on seed yield and economics

Treatments	Seed yield (kg ha ⁻¹)					Mean values					
	2003-04	2004-05	2005-06	2006-07	Pooled	Plants per plot (No.)	Plant height (cm)	1000 seeds weight (g)	Germination (%)	Net returns (Rs ha ⁻¹)	Benefit : cost ratio
Spacing levels											
S ₁ = 30cm x 30cm	599.3	613.0	785.7	560.9	639.7	81	62.5	3.82	92.0	46078	0.92
S ₂ = 45cm x 30cm	403.6	545.0	671.2	512.3	533.0	54	65.2	3.87	92.1	36054	0.82
S ₃ = 45cm x 45cm	326.8	477.3	642.8	484.7	482.9	36	67.0	3.84	91.8	32435	0.81
C.D. (P=0.05)	139.5	NS	NS	61.7	147.8	-	-	-	-	-	-
Bulb size											
B ₁ = 5 to 6 cm	414.8	507.9	725.8	460.2	527.2	57	64.3	3.86	91.8	37598	0.91
B ₂ = 7 to 8 cm	471.7	581.7	674.0	578.6	576.5	57	65.5	3.83	92.2	38738	0.81
C.D. (P=0.05)	NS	62.9	NS	50.2	42.1	-	-	-	-	-	-
Fertilizer levels NPK kg ha⁻¹											
F ₁ = 50-50-50	461.5	458.8	756.1	530.7	551.8	57	63.3	3.85	92.6	38705	0.88
F ₂ = 100-50-50	433.3	570.6	707.0	499.9	552.7	57	67.8	3.85	92.2	38295	0.86
F ₃ = 150-50-50	465.1	562.6	658.1	485.3	542.8	57	63.4	3.82	91.2	36265	0.80
F ₃ = Soil test basis (mean 80-50-50)	412.8	588.3	678.3	561.4	560.2	57	65.3	3.85	91.8	39638	0.89
C.D. (P=0.05)	NS	NS	NS	NS	NS	-	-	-	-	-	-

NS-Non significant

1 : 0.89 were recorded with the fertilizer application on soil test basis.

The results can be summarized that planting of large

bulb size (7 to 8 cm) at the spacing of 30cm x 30cm was found to be superior for seed yield of onion under Saurashtra region of Gujarat.

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