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Effect of Nitrogen and Weed Control Under Varying Plant Population on Yield and Quality of Onion (*Allium cepa* L.) Bulb Crop

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Field experiment was conducted during *rabi* season of 1991-92 at the Instructional Farm, Gujarat Agricultural University, Navsari. Three plant population (1000 x 10^3, 666 x 10^3 and 500 x 10^3 plants/ha i.e. 10 cm x 10 cm, 15 cm x 10 cm and 20 cm x 10 cm spacing, respectively), three nitrogen levels (60, 80 and 100 kg N/ha) and three weed control treatments (hand weeding at 20 + 40 DAT, pre-emergence application of oxadiazon @ 0.5 lit/ha and unweeded control) were tried in Factorial Randomized Block Design with three replications.

The soil of the experimental site was clay in texture (64.3% clay), high in total nitrogen (0.059%), medium in available phosphorus (39.90 kg P_2O_5/ha) and fairly rich in available potash (394.0 kg K_2O/ha) having 7.67 pH. Two months aged old seedlings of onion Cv. Pusa Red were planted on 24th December '91 and the crop was harvested on 23rd April '92. Basal application of 60 kg each of phosphorus and potash and half of 'N' as per treatment were made at the time of transplanting. Remaining half of N as per treatment was applied one month after transplanting. Herbicide application (as per treatment) was made 4 days after transplanting (DAT), using 500 lit. water per hectare. Eleven irrigations, in all, were given to the crop.

The data presented in Table 1 revealed that the different plant population treatments had significant effect on the bulb diameter, bulb weight, nitrogen content in bulb, black mould development at 90 days after harvest and bulb yield. The maximum values of bulb diameter (4.88 cm), bulb weight (49.52 g), Nitrogen content (1.13%) and black mould development (60.75%) were recorded with the 500 x 10^3 plant density treatment. Greater development of individual bulb in this plant density may be attributed to the better growth and development of individual plants, while in higher plant density i.e. 1000 x 10^3, there might have been competition between roots of the neighbouring plants for uptake of nutrient and water, which would have restricted the growth of plants. Highest bulb yield (312.03 q/ha) was recorded with higher plant density treatment. Increase in the size of individual bulb could not make up the loss in yield under wider spacing (lower plant density i.e. 500 x 10^3) as compared to yield

TABLE 1

Effect of plant population, nitrogen and weed control treatments on yield and quality of onion bulb crop.

Treatment	Diameter of bulb (cm)	Weight of bulb (g)	Bulb yield (q/ha)	Nitrogen content in bulb at harvest (%)	Bulb weight losses at 90 DAH (%) (ASTV)	Black mould development at 90 DAH (%) (ASTV)
Plant population (000/ha)						
1000	4.59	42.20	312.03	0.807	16.47 (7.59)*	50.58 (59.26)
666	4.83	46.85	280.04	0.925	15.70 (6.92)	58.06 (70.37)
500	4.88	49.52	235.18	1.137	17.72 (8.70)	60.75 (72.96)
C. D. 5 %	0.12	2.45	20.27	0.002	NS	6.09
Nitrogen (kg/ha)						
60	4.78	46.13	267.18	0.955	16.58 (7.55)	54.84 (64.44)
80	4.74	45.46	271.39	0.0954	16.89 (8.25)	57.95 (70.37)
100	4.79	46.98	288.68	0.960	16.42 (7.41)	56.60 (67.78)
C. D. 5 %	NS	NS	NS	NS	NS	NS
Weed control treatments						
HW 20 + 40 DAT	4.83	48.06	294.65	0.994	18.13 (9.09)	58.00 (69.26)
Oxadiazon 0.5 lit/ha	4.82	46.67	284.25	0.961	17.61 (8.63)	55.64 (66.30)
Unweeded control	4.64	43.85	248.35	0.914	14.15 (5.50)	55.95 (67.03)
C. D. 5 %	0.12	2.45	20.27	0.022	2.30	NS
C. V. %	4.68	9.70	13.46	4.260	—	—

DAH = Days after harvest HW = Hand weeding ASTV = Arc since transformed value.
*Figures in parentheses refer to actual values.

obtained under higher plant density. These results are supported by the finding of McGeary (1985).

Different yield attributes, quality parameters and yield were not affected significantly by different nitrogen levels. This may be due to higher amount of nitrogen content in the soil. These findings are in agreement with those of Rohal and Kalra (1986) but in contrast to that of Singh and Dhankhar (1988).

Results further indicated that weed control treatments had significant effect on the yield attributes viz., bulb diameter, bulb weight and bulb yield and quality parameter viz., nitrogen content and bulb weight losses. Hand weeding twice recorded significantly the highest bulb diamater (4.83 cm), bulb weight (48.06 g), nitrogen content in bulb (0.999%); bulb weight losses (18.13%) and bulb yield (294.65 q/ha) but not differing significantly from oxadiazon 0.5 lit/ha. Both the treatments controlled weed effectively, reduced the competition in terms of vegetative growth and nutrient uptake from the soil by weed to a greater extent and thus helped in faster growth of onion crop, resulting in production of bigger size bulb and ultimately leading to enhanced bulb yield. These findings are in agreement with those of Nandal *et al.* (1992). Significantly higher weight losses under hand weeding (twice) and Oxadiazon treatments were due to higher available soil moisture in soil at the time of harvest in these plots than in unweeded control plot.

Different interaction effects on bulb yield was turn out to be non-significant. Thus it appears that for obtaining better yield and quality of onion bulb, the crop should be transplanted with 1000 x 10^3 plant density/ha, i.e. 10 cm x 10 cm spacing, with application of 60 kg N/ha, coupled with hand weeding at 20 + 40 DAT or pre-emergence application of oxadiazon 0.5 lit/ha, for soil having higher total nitrogen (0.059%) under South Gujarat condition.

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