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Response of nitrogen and row spacing on quality and economics of Onion cv. N-53 under Arid environment

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Abstarct

An experiment was conducted to investigate the response of nitrogen and row spacing on quality parameters and economics of onion cv. N-53 under arid environment at Research Farm, College of Agriculture (Swami Keshwanand Rajasthan Agricultural University), Bikaner. The experiment was laid out in a Randomized Block Design with five levels of Nitrogen *viz.* 0, 50, 100, 150 and 200 kg ha^{-1} and three levels of spacing 10, 15 and 20 cm. The result indicated that the statistically maximum number of leaves (8.36 and 803), volume of bulb (54.89 cc and 51.70 cc), diameter of bulb(4.75 cm and 4.68 cm), weight of bulb (49.57 g and 45.77 g), allyl-propyl disulphide (6.29 mg/100g and 6.21 mg/100g) and nitrogen content in leaves (0.953% and 0.959%) and bulb (1.40% and 1.35%) were recorded with application of 150 kg nitrogen ha^{-1} and 15 cm row spacing, respectively. Whereas, chlorophyll content in leaves (1.58 mg/g and 1.47 mg/g) was recorded maximum with 200 kg nitrogen ha^{-1} and 15 cm row spacing, respectively. B:C ratio (2.08 and 2.17) was observed highest in 150 kg nitrogen ha^{-1} and 15 cm row spacing, respectively.

Key words: *Onion, nitrogen, quality characters*

Introduction

Onion (*Allium cepa* L.) is one of the most important bulb crop grown throughout the country for local consumption as well as export. It is belonging to family Alliaceae. In India, onion growing area is 1064 thousand ha with a production of 15118 thousand MT and productivity 14.2 MT/ha and in Rajasthan, it is grown in 47.8 thousand ha with 812.6 thousand MT production with productivity 17.0 MT/ha (Anonymous, 2011). There is an increase in demand both in internal and external market for onion bulbs but our major problem is low productivity of this crop in the arid region. However, arid region are most suitable for onion cultivation but the cultivation of this vegetable is handicapped by several factors, such as poor fertility, inadequate nutrient management and improper plant population per unit area. Thus, there is ample scope for increasing the productivity of this crop in arid region through application of nitrogen fertilizers and proper the row spacing. It is evident that additional dose of nitrogen may enhance its yield potential in poor soil of this region (Ramamoorthy and Bajaj, 1969). Thus, the present investigation was undertaken to find out the response of nitrogen and row spacing on quality parameters and economics of onion cv. N-53 under arid environment.

Material and Methods

The present investigation was conducted at the Research Farm, College of Agriculture (Swami Keshwanand Rajasthan Agricultural University), Bikaner, during the *Rabi* season. The soil of experiment field was sandy loam with 8.20 pH, 0.09 per cent organic carbon and 63.85 kg ha^{-1} available nitrogen. The experiment was laid out in Randomized Block Design with three replications. The treatments included five nitrogen levels (0, 50, 100, 150 and 200 kg ha^{-1}) and three levels of spacing (10, 15 and 20 cm.). However, plant to plant distance in all treatments was maintained 10 cm. The experimental plants were managed with uniform cultural practices as per the standard recommendations with respect to irrigation, plant protection measures etc. Data on number of leaves (90 DAT), chlorophyll content of leaves (60 DAT), volume of bulb, diameter of bulb, weight of bulb, allyl-propyl disulphide in bulb, nitrogen content in leaves and bulb and B:C ratio were recorded. The observation was taken from selected five plants and averages were calculated. The statistical analysis was carried out as per the methods suggested by Panse and Sukhatme (1967).

Result and Discussion

The data presented in Table 1 revealed that all quality parameters significantly increased with increasing dose of nitrogen upto 150 kg nitrogen ha^{-1} (except number of leaves) and upto 15 cm row spacing. The numbers of leaves (8.36) were significantly higher with application of 150 kg nitrogen ha^{-1} than the 200 kg nitrogen ha^{-1}. This results could be due to better nutritional availability especially nitrogen in the root zone as well as in the plant system which ultimately resulted into optimum vegetative

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growth. Chlorophyll content (1.58 mg/g) was highest at 200 kg nitrogen ha^{-1}. It may due to application of nitrogen which is an integral constituent of chlorophyll by promoting greater photosynthetic activity (Aswani, 2001). The numbers of leaves (8.03) and chlorophyll content (1.47 mg g^{-1}) were significantly higher with 15 cm row spacing. It might be due to above row spacing facilitates lesser competition for space and availability of more light and nutrients to plants, leading to increase in growth attributes and chlorophyll content (Panda and Mohanty, 2001).

Among quality attributes, volume of bulb (54.89 cc), diameter of bulb (4.75 cm) and weight of bulb (49.57 g) were significantly higher in 150 kg nitrogen ha^{-1} because of optimum vegetative growth and chlorophyll content in leaves which increases the mobilization and accumulation of photosynthates towards storage structures. Therefore, the volume of bulb (51.70 cc), diameter of bulb (4.68 cm) and weight of bulb (45.77 g) were recorded significantly higher with 15 cm row spacing. This result might be due to lesser competition for nutrients and sum light, increasing food assimilatory efficiency and thereby more food reserve in bulbs. This row spacing produced good quality marketable large size bulb under optimum plant population (Panda and Mohanty, 2001).

Table 1. Response of nitrogen and spacing on quality and economics of onion.

Treatments	No. of leaves	Chlorophyll content (mg g^{-1})	Volume of bulb (cc)	Diameter of bulb (cm)	Weight of bulb (g)	Allyl-propyl disulphide (mg/100g)	N content (%)		B:C ratio
							leaves	bulb	
Nitrogen level kg ha^{-1}									
0	6.20	1.14	40.93	3.38	36.66	6.00	0.878	1.14	1.57
50	7.32	1.29	48.18	4.34	41.87	6.08	0.908	1.21	1.98
100	7.68	1.38	51.79	4.56	45.16	6.19	0.929	1.31	2.03
150	8.36	1.52	54.89	4.75	49.57	6.29	0.953	1.40	2.08
200	8.41	1.58	55.17	4.78	50.88	6.30	o.959	1.41	2.06
C.D. at 5%	0.42	0.03	2.39	0.07	1.57	0.03	0.0214	0.03	
Row spacing cm									
10	6.65	1.36	45.94	3.68	42.27	6.10	0.855	1.17	1.54
15	8.03	1.47	51.70	4.68	45.77	6.21	0.959	1.35	2.17
20	8.11	1.32	52.93	4.73	46.45	6.21	0.961	1.36	2.13
C.D. at 5%	0.32	0.02	1.85	0.06	1.21	0.03	0.0165	0.02	

Table 1 shows that the application of 150 kg nitrogen significantly increased allyl-propyl disulphide (6.29 mg/100g) in bulb. High nitrogen application might be due to better plant growth and more absorption of nutrients especially sulphur from the soil which caused higher production of allyl-propyl disulphide (Yadav *et al*., 2003). Nitrogen content in leaves and bulb (0.953% and 1.40%, respectively) also recorded statistically higher with this treatment. In 15 cm row spacing, allyl-propyl disulphide (6.21 mg/100g) in bulb was recorded significantly higher but further increase in row spacing upto 20 cm could not increased allyl-propyl disulphide significantly. Further, nitrogen content in bulb (1.35%) and leaves (0.959%) was also recorded significantly higher with 15 cm row spacing. Allyl-propyl disulphide and nitrogen content were higher because the application of nitrogen which improved nutritional environment in the dense root zone of the plant, that leads to greater availability of nutrients in the root zone coupled with increased metabolic activity at the cellular level might have increased the nutrients uptake and accumulation in plant parts. This leads to more metabolic activities and greater translocation of nutrients to reproductive organs (bulb) of the crop (Kwon *et al*., 1995).

The B:C ratio was obtained maximum with 150 kg nitrogen ha^{-1} and 15 cm row spacing 2.08 and 2.17, respectively. This result might be due to the direct influenced of row spacing in maximizing good quality marketable yield at this level.

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