Effect of date of planting, size of bulb sets and method of sowing on growth and yield of kharif onion (*Allium cepa* L)

AMANDEEP KAUR

ICAR- Krishi Vigyan Kendra (PAU), Kapurthala 144 620 Punjab, India
Email for correspondence: amandeep-fass@pau.edu

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ABSTRACT

The present investigations were conducted at Krishi Vigyan Kendra, Kapurthala, Punjab during kharif season 2017 to evaluate the effect of different planting dates, size of bulb sets and methods of sowing on growth and yield of kharif onion. The experiment was laid out in randomized block design with three replications. All the crop management practices were followed as per the recommendation of Punjab Agricultural University, Ludhiana, Punjab. The statistical analysis of data revealed that bulb weight, bulb diameter and yield increased significantly with increase in size of bulb sets and non-significant differences were recorded for plant height, number of leaves and neck thickness. The planting time also had significant effect on various parameters under study. The planting date 16 July (D_2) resulted in maximum plant height, bulb diameter, bulb weight and yield. All the growth and yield contributing parameters viz plant height, number of leaves per plant, neck thickness, bulb weight and bulb yield were significantly better in bed planting as compared to flat planting system. The study revealed that planting of bulb size (2.7-3.1 cm) on 16 July by bed planting gave higher yield (223.800 q/ha) as compared to all other combinations of planting dates and size of bulb sets.

Keywords: Kharif onion; bulb sets; planting dates; planting method

INTRODUCTION

Onion (*Allium cepa* L) is an important crop grown in India and is widely cultivated throughout the country. Major onion producing states are Maharashtra, Gujarat, Karnatka, Tamil Nadu and Orissa. In India onion crop is grown in about 1.20 million hectare area with an annual production of 19.40 million tonnes and productivity of 16.12 tonnes per hectare (https://krishijagran.com/agripedia/onion-farming-in-india/).

The pungency in onion is due to volatile oil known as allyl-propyl-disulphide which converts into allicin when its modified leaves are crushed. Allicin reduces cholesterol production by inhibiting HMG-CoA reductase enzyme in the liver cells (Sharma and Jarial 2017). Keeping in view the importance of crop it needs concerted efforts to increase cultivated area as well as boost the bulb production per unit area. It is rich source of vitamin C and vitamin E and has various medicinal values. Besides the traditional rabi crop, kharif crop is now being grown successfully in the northern and eastern parts of the country which has revolutionized the onion production and marketing. The crop harvested in April-May is stored and made available for domestic supply as well as export up to September-October. There is a critical gap in the supply of onion from October to March and as a result the prices shoot up. Raising a kharif season crop can bridge the gap between demand and supply of onion during this lean period. Further production of onion during kharif season offers a good alternative to the farmers for obtaining higher returns.

Onion bulbs are usually produced by transplanting of seedlings but farmers can also raise kharif season crop by planting of bulb sets produced in the month of March. Date of planting, size of sets and methods of planting are the three major factors responsible for economic cultivation of kharif onion. Therefore present study was conducted to study the effect of above mentioned factors on kharif onion.

MATERIAL and METHODS

The experiment was conducted on N-53 variety of kharif onion at the farm of Krishi Vigyan Kendra, Kapurthala, Punjab during 2017 to study the effect of planting dates, size of bulb sets and methods of planting on kharif onion production. The soil of the farm was sandy loam in texture. Bulb sets were produced by sowing nursery 1 to 2 cm deep in lines at 5 cm spacing in beds in the month of March. The seeds were sown uniformly in these lines and covered with a thin layer of well-decomposed farmyard manure and light irrigation was applied just after sowing of seeds with the help of sprinkler. The nursery beds were irrigated twice a day ie in the morning and in the evening. Seeds were treated with 3 g of Captan per kg of seed before sowing. In the last week of June the bulb sets were uprooted and stored in a well-ventilated dry room.

Experiment was laid out in randomized block design. Treatments comprised three sizes of bulb sets (small 1.5-2.0 cm, medium 2.1- 2.6 cm, large 2.7- 3.1 cm), three dates of planting (4 July, 16 July and 29 July) and two methods of planting (flat and ridge) with three replications. Sixteen bulb sets were used for each treatment in both the planting methods. Selected plot was thoroughly ploughed and 50 tonne FYM, 225 kg urea, 312.5 kg single super phosphate and 87.5 kg muriate of potash per hectare were added. Entire dose of FYM, SSP and muriate of potash and half nitrogen were applied before sowing and remaining dose of nitrogen was applied a week after sowing. Row to row and plant to plant spacing was maintained at 15 x 7.5 cm. Five plants from each plot were selected randomly and tagged for observations like plant height, number of leaves per plant, neck thickness and bulb weight. Bulb yield was recorded on plot basis.

The data were finally analyzed by using OPSTAT (Sheoran et al 1998).

RESULTS and DISCUSSION

Effect of bulb set size: Data presented in Table 1 reveal that bulb weight, bulb diameter and yield increased significantly with increase in size of sets. This might be due to the fact that large bulb sets contain more food which helps in more sprouting. Similar findings were observed by Singh et al (2001) in kharif onion. Differences were found to be non-significant for plant height, number of leaves and neck thickness with increase in set size.

Effect of date of sowing: Significant values were obtained for effect of dates of sowing on different growth parameters (Table 2). Maximum plant height and number of leaves per plant were observed in crop sown on 4 July (D_1) and minimum in sown on 29 July (D_3). Dev et al (2005) and Malik et al (1999) also reported the significant effect of sowing date on plant height and number of leaves in kharif onion. It may be due to the reason that in early planting plant gets enough

Table 1. Effect of bulb set size on growth and yield parameters of kharif onion

Set size (cm)	Plant height (cm)	Number of leaves/plant	Bulb diameter (cm)	Bulb weight (cm)	Neck thickness (cm)	Bulb yield (q/ha)
Small (1.5-2.0)	50.1	7.4	2.7	53.4	1.3	147.9
Medium (2.1-2.6)	48.2	7.5	2.9	55.9	1.4	162.8
Large (2.7-3.1)	49.2	7.4	3.3	68.1	1.5	202.9
$CD_{0.05}$	NS	NS	0.3	11.2	NS	24.8

Table 2. Effect of different dates of sowing on growth and yield parameters of kharif onion

Date of planting	Plant height (cm)	Number of leaves/plant	Bulb diameter (cm)	Bulb weight (cm)	Neck thickness (cm)	Bulb yield (q/ha)
D1 (4 July)	52.8	7.6	2.6	53.4	1.0	148.4
D2 (16 July)	49.2	7.5	3.1	65	1.3	194.8
D3 (29 July)	46.7	7.0	3.0	62	1.2	179.4
$CD_{0.05}$	4.6	NS	NS	11.2	NS	21.6

Table 3. Effect of different methods of planting on growth and yield parameters of kharif onion

Planting method	Plant height (cm)	Number of leaves/plant	Bulb diameter (cm)	Bulb weight (cm)	Neck thickness (cm)	Bulb yield (q/ha)
Ridge	50.2	7.6	3.4	66.7	1.5	190.8
Flat	48.2	7.0	2.5	51.6	1.3	160.4
$CD_{0.05}$	9.2	0.6	0.2	0.2	NS	20.3

Table 4. Yield of kharif onion as affected by interaction among method of sowing, date of sowing and bulb set size (q/ha)

	A_1 (Ridge sowing)			A_2 (Flat sowing)		
	D_1 (4 July)	D_2 (16 July)	D_3 (29 July)	D_1 (4 July)	D_2 (16 July)	D_3 (29 July)
Small (1.5-2.0)	101.333	210.767	192.233	101.833	148.453	133.167
Medium (2.1-2.6)	164.933	199.000	190.367	192.000	172.133	158.433
Large (2.7-3.1)	211.467	223.800	223.533	158.800	220.900	178.717

A: Method of sowing, D: Date of sowing

time and comparatively higher temperature which induces maximum vegetative growth before the initiation of bulb development (Hamma et al 2013).

Maximum value of bulb diameter was reported in D_2 (16 July sown crop) followed by D_3 (29 July sown crop) and least in D_1 (4 July sown crop). Early and delayed sowing resulted in lower bulb diameter. Kumbhkar et al (2017) also reported significant effect of date of sowing on bulb diameter. Bulb weight was directly proportional to bulb diameter. Therefore trend was similar as observed in case of bulb diameter. Maximum bulb weight was reported in D_2 (16 July sown crop) and minimum in D_1 (4 July sown crop). Neck thickness is another important parameter that influences the storage life of onion. Onions with less neck thickness can be stored better than those having thick neck. Yield showed a significant response to different dates of planting. The highest yield was recorded in the crop sown on 16 July (D_2) followed by 29 July (D_3) and 4 July (D_1). Late planting often confines required photoperiod for vegetative growth and as the temperature increases plants start bulb formation which leads to poor bulb yield (Misra et al 2014). Sharma (2009) and Kandil et al (2013) also advocated the role of planting dates on bulb yield.

Method of planting: All the growth and yield parameters like height, number of leaves per plant, neck thickness, bulb weight and bulb yield were significantly better in bed sowing as compared to flat sowing due to favorable environment for growth on beds (Table 3). Bulbs store more food for vegetative as well as reproductive growth and thus accumulate more photosynthates. Similar observation was made by Bosekeng and Coetzer (2015).

Interaction effect: Data on the interaction (Table 4) reveal that maximum yield of 223.800 q/ha was observed under ridge sowing on 16 July (D_2) followed by ridge sowing on 29 July (D_3) and flat sowing on 16 July (D_2) but the size of bulb was large for obtaining all these three yield levels. The lowest yield was obtained with small bulb sowing on 4 July (D_1) irrespective of method of sowing may be flat (101.833) or ridge (101.333) respectively. It was concluded that sowing of large bulb size (2.7-3.1 cm) on 16 July by bed planting gave higher yield as compared to all other combinations of date of sowing and bulb size.

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