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Short Communication

Effect of Crop Geometry on Growth and Yield of *Kharif* Onion

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ABSTRACT

The experiment was conducted to check the effect of crop geometry on growth and yield of *kharif* onion. The experiment was laid out in randomized complete block design with three treatments *viz.*, T_1=10×7.5cm, T_2=10×10cm and T_3=15×10cm replicated three times. Results showed that transplanting of onion in 15×10cm resulted in significantly higher plant height (30.87 cm), number of leaves per plant (12.20), bulb diameter (polar-5.20 cm and equatorial-5.74 cm) and average bulb weight (83.90g) as compared to 10×7.5 cm but statistically at par with 10×10cm crop geometry. Highest bulb yield was recorded in 10×10cm (307.64q/ha) with per cent increase of was 23.41 and 0.57 in comparison to 10×7.5 (247.85q/ha) and 15×10cm (305.89 q/ha), respectively. On the basis of results emanated from the present investigation conducted during *kharif* 2018, it was concluded that treatment 10x10cm crop geometry proved best in respect of maximum yield and productivity.

Key Words: Crop geometry, Growth parameters, *kharif* Onion, Yield attributes.

INTRODUCTION

Onion, a bulbous crop, belonging to family *Amaryllidaceae*, is cultivated as annual crop for bulb production and as biennial crop for seed production. The edible portion of onion is modified stem which is known as bulb and develops underground. Both immature and mature bulbs are used as vegetable and condiments having an important role in our daily diet. Onion contains carbohydrate (11.0 g), protein (1.2 g), calcium (180 mg), phosphorus (50 mg), iron (0.7 mg), nicotinic acid (0.4 mg), riboflavin (0.01 mg) and vitamin-C (11.0 mg) in each 100 g of edible portion (Bose *et al,* 2000). The pungency in onion is due to the presence of sulphur bearing compound in the volatile oil known as allyl-propyl disulphide ($C_6H_{12}S_2$). It has got many medicinal values and is commonly used as diuretic and anti diabetic drugs. India rank second after China in onion production. In India, the main onion growing states are Maharashtra, Gujarat, Karnataka, Tamil Nadu, Orissa, Madhya Pradesh, Uttar Pradesh, Andhra Pradesh, Bihar and Punjab.

India ranks second in area and production of onion in the world after china. The country has three onion growing seasons, out of which *kharif* and late *kharif* season accounts of 40 per cent of total onion production while the *Rabi* season accounts of the 60 per cent. The produce of *Rabi* season is stored for consumption in summer and *kharif* but due to non-congenial storage conditions and spoilage in the monsoon season, the availability of onion becomes less. Hence, production of onion during *kharif* is required to fill the gap of demand and supply. Wider spacing brought significant improvement in nitrogen uptake, though remained at par in phosphorus and potash uptake with intermediate spacing. Thus, it is inferred that application of 100 kg N/ha with crop geometry of 10×10 cm was better for realizing higher yield in onion production (Godara and Mehta, 2013). Planting geometry affects the growth and yield of the crop. Therefore, the present study was carried out with the objectives to study the effect of crop geometry on growth and yield of *kharif* onion.

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MATERIALS AND METHODS

The present investigation was carried out at the *Krishi Vigyan Kendra*, Langroya farm during *kharif* 2018, to find out the influence of crop geometry on growth and yield of onion. Geographically, Langroya is situated in 31^0 10' N and 76^0 17' E and at an altitude of 247 meters above mean sea level, in District SBS Nagar, Punjab. The rainfall of the locality varies from 900 to 1100 mm; most of which is received in rainy season from July to September. The soil of the experimental site was loamy clay. The experiment was laid out in randomized complete block design with three treatments *viz.*, T_1=10×7.5 cm, T_2=10×10 cm and T_3=15×10 cm replicated three times. Sowing of the onion nursery (cv N 53) was done on 15.06.2018 followed by transplanting of the bulb sets on 13.08.2018 in respective treatments. All other crop management practices were followed as per recommendations made by Punjab Agricultural University, Ludhiana. The data were subjected to statistically analysis as per the methodology of Panse and Sukhatme (1985).

RESULTS AND DISCUSSION

Growth Parameters

Scrutiny of data revealed that transplanting of onion in 15x10cm geometry recorded maximum plant height (30.87cm) which was statistically at par with 10x10cm crop geometry (28.93) but significantly different from 10x7.5cm (24.87cm) (Table 1). Decrease in closer spacing can be attributed to occurrence of inter-plant competition for growth factors like light, space, nutrients etc. Further, wider spacing (15x10cm) of onion seedlings resulted in about 20.8 per cent higher and significantly different number of leaves as compared to 10x7.5cm crop geometry (10.10) but statistically at par with 10x10cm crop geometry (11.60). More spacing led to better growth due to more availability of light, space and air contributing for more photosynthesis which might have been the reason for increase of leaf and ultimately leaf area per plant. These findings were in consonance with those of Aliyu *et al* (2008) and Patil (2017).

Yield and yield attributes

Scrutiny of data showed that transplanting of onion seedling in15x10cm geometry resulted in significantly higher polar diameter (5.20cm) which was statistically at par with 10x10 cm spacing (4.99cm) but significantly higher than 10x7.5cm (3.20cm) (Table 2). Crop geometry of onion by 15x10cm (5.74cm) resulted in 41.3 per cent higher equatorial bulb diameter as compared to 10x7.5cm (4.06cm) which was statistically at par with 10x10cm spacing (5.28cm) (Table 2). Highest average weight of bulb was noted in 15x10cm (83.90g) spacing followed by 10x7.5cm (80.17g) and 10x7.5cm (70.20g) (Table 2).

Transplanting of onion in 15x10cm crop geometry recorded 19.52 and 4.65 per cent higher average bulb weight as compared to 10x7.5 cm and 10x10cm geometry, respectively. There was significant effect of spacing on average weight of bulb per plant, equatorial diameter of bulb, polar diameter of bulb and bulb yield of onion. Each increase in level of spacing recorded increase in average weight of bulb, polar as well as equatorial diameter. Similar findings have been reported by Aliyu *et al* (2008), Jilani *et al* (2009), Dubey *et al* (2011), Godara and Mehta (2013) and Patil (2017). Crop geometry exhibited a significant effect on bulb yield of onion. For instance, transplanting of onion in 10x10cm spacing resulted in highest bulb yield (307.64q/ha) which was 23.41 per cent higher and significantly different from 10x7.5cm (247.85q/ha). At the same time, bulb yield in 15x10 cm (305.89q/ha) crop geometry was found statistically at par with 10x10cm but significantly higher than 10x7.5cm (Table 2). The plants grown under wider spacing received more nutrients, light and moisture around compared to plants of closer spacing, which was probably the cause of better performance in yield attributes and yield of individual. Sufficient availability of space for growth along with more number of bulbs might have been the reason for these findings (Godara and Mehta, 2013; Patil, 2017). On the basis of results emanated from the present investigation conducted during *kharif*, it

Table 1. Effect of spacing on growth parameters, yield and yield attributes of *kharif* onion.

Treatment	Plant height (cm)	Number of leaves	Polar diameter (cm)	Equatorial diameter (cm)	Average bulb weight (g)	Bulb yield (q/ha)
10x7.5cm	24.87	10.10	3.20	4.06	70.20	247.85
10x10cm	28.93	11.60	4.99	5.28	80.17	307.64
15x10cm	30.87	12.20	5.20	5.74	83.90	305.89
CD	3.61	1.42	0.67	0.67	9.45	46.87

was concluded that treatment T_2 (10x10 cm) proved best in respect of maximum yield and productivity.

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