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Effect of spacing and planting time on growth and yield of onion var. N-53 under Manipur Himalayas

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ABSTRACT

Closer spacing (10 cm × 10 cm) and planting on 25th November was the best for onion production under Manipur conditions to get higher productivity up to 358 q/ha. Closer spacing had higher leaf length (47.95 cm), leaf area (83.63 cm^2), leaf area index (4.21), bulb dry matter (13.30%) and yield (253.40 q/ha), while wider spacing had higher number of leaves (8.18), average single bulb weight at harvest (56.24 g), polar diameter (4.79 cm) and equatorial diameter (49.39 mm). Planting on 25th November recorded maximum No. of leaves (8.26), leaf length (50.50 cm), leaf area (87.93 cm^2), yield (267.20 q/ha), polar diameter (4.92 cm), equatorial diameter (53.68 mm), average single bulb weight (68.48 g), bulb dry matter (13.68%) and Harvest Index (72.92), while planting on 10th January had higher Leaf Area Index (4.04).

Key words: Growth, onion, planting time, spacing.

INTRODUCTION

Common onion (*Allium cepa* L.) is a bulbous biennial herb which belongs to the family *Alliaceae*. It is one of the most important species of the genus *Allium*. Onion bulb is rich in phosphorus, calcium and carbohydrates. In India, Maharashtra is leading in area (200.0 thousand ha) and production (3146.0 thousand tonnes), while productivity is highest (24.9 t/ha) in Gujarat in 2010-11 (Anon, 2). In Manipur, onion is grown since time immemorial for domestic consumption. The optimum temperature is 13° to 24°C before bulb formation and 16°C to 21°C during bulb formation. In Manipur, area and production of onion is very low as compared to other states of India. The total area, production and productivity of onion under Manipur conditions was 500 ha, 1,100 tonnes and 2.2 tonnes/ha, respectively, in 2005. The lower productivity may be because of non-availability of location-specific production technology. Planting time plays a vital role for the bulb formation. The spacing determines the optimum yield with quality bulbs. Therefore, location-specific suitable time and spacing needs to be standardized for optimum productivity of onion. The present investigation was undertaken to standardize planting time and spacing of onion var. N-53.

MATERIALS AND METHODS

Experiments were conducted at Horticultural Experimental Field, College of Agriculture, Central Agricultural University, Imphal (Manipur) during *rabi* seasons of two consecutive years in Factorial RBD. Onion var. N-53 with four different levels of spacing (S1 = 15 cm × 20 cm, S_2 = 10 cm × 20 cm, S_3 = 15 cm × 10 cm and S_4 = 10 cm × 10 cm) and four different planting dates (D_1 = 25th Nov., D_2 = 10th Dec., D_3 = 25th Dec. and D_4 = 10th Jan.) with three replications in 1.2 m^2 plots. Observations on number of leaves/ plant, leaf area (cm^2), leaf length (cm) and leaf area index were recorded at 75 days after transplanting while harvest index, average single bulb weight (g), bulb dry matter percentage, polar diameter (cm) and equatorial diameter (mm) of bulb and yield (q/ha) were recorded at harvest. Statistical analysis was carried out as per Gomez and Gomez (3).

RESULTS AND DISCUSSION

Maximum number of leaves/ plant was observed with spacing of 15 cm × 20 cm (8.18) which is closely followed by spacing of 10 cm × 20 cm (7.81) (Table 1). Planting time has significant effect on number of leaves/ plant. Planting on 25th November exhibits higher number of leaves/plant (8.26), which was closely followed by planting on 10th December (7.98). Spacing of 15 × 20 cm and planting on 25th November recorded the maximum number of leaves/ plant (10.17). Increase in number of leaves/ plant due to increase in spacing was also reported by Panda and Mohanty, (6) and Anisuzzaman *et al.* (1). Data on leaf length at different stages of growth indicated significant difference with the variation in spacing and planting time. The maximum leaf length was recorded

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Table 1. Effect of different spacing and planting time on growth of onion.

Treatment	No. of leaves/plant	Leaf length (cm)	leaf area (cm^2)	Leaf area index	Harvest index
		Spacing			
S_1	8.18	45.76	79.94	3.45	62.93
S_2	7.81	46.81	81.71	3.78	64.72
S_3	7.67	47.35	82.63	4.01	65.63
S_4	7.30	47.95	83.63	4.21	65.02
$CD_{0.05}$	0.28	0.71	1.20	0.24	NS
		Date of transplanting			
D_1	8.26	50.50	87.93	3.67	72.09
D_2	7.98	47.85	83.47	3.83	69.54
D_3	7.78	46.42	81.05	3.91	55.52
D_4	6.93	43.10	75.46	4.04	61.15
$CD_{0.05}$	0.28	0.71	1.20	0.24	2.25
		Interaction			
S_1 D_1	10.17	49.73	86.64	3.40	74.83
S_1 D_2	7.75	45.90	80.18	3.52	69.58
S_1 D_3	7.97	43.70	76.42	3.34	49.73
S_1 D_4	6.83	43.73	76.53	3.55	57.59
S_2 D_1	7.97	50.17	87.38	3.44	64.89
S_2 D_2	7.68	47.03	82.09	3.59	63.28
S_2 D_3	8.40	47.37	82.65	3.78	63.53
S_2 D_4	7.20	42.67	74.73	4.31	67.17
S_3 D_1	7.70	51.47	89.57	3.96	71.47
S_3 D_2	8.47	49.77	86.70	4.04	72.03
S_3 D_3	7.57	47.23	82.43	4.15	59.60
S_3 D_4	6.93	40.93	71.81	3.89	59.40
S_4 D_1	7.20	50.62	88.13	3.90	77.16
S_4 D_2	8.03	48.70	84.90	4.17	73.27
S_4 D_3	7.20	47.40	82.71	4.37	49.23
S_4 D_4	6.75	45.07	78.78	4.41	60.42
$CD_{0.05}$	0.56	1.42	2.40	NS	4.50

NS = Non-significant

in the spacing of 10 cm × 10 cm (47.95 cm), which was *at par* with the spacing of 10 cm × 15 cm (47.35 cm). Planting on 25th November recorded maximum leaf length (50.50 cm) which was closely followed by planting on 10th December (47.85 cm). The spacing of 10 cm × 15 cm and planting on 25th November recorded maximum leaf length (51.47 cm), which was *at par* with the spacing of 10 cm × 10 cm and planting on 25th November (50.62 cm). These findings are in close conformity with Singh *et al*. (9). Spacing of 10 x 10 cm recorded highest leaf area (83.63 cm^2) followed by spacing of 10 x 15 cm (82.63 cm^2), showing non-significant differences. Planting on 25th November observed higher leaf area (87.93 cm^2) whereas least leaf area (75.46 cm^2) was observed with planting on 10th January. Spacing of 10 cm × 15 cm and planting on 25th November recorded maximum leaf area (89.57 cm^2) which was *at par* with the spacing of 10 cm × 10 cm and planting on 25th November (88.13 cm^2). Leaf area index was significantly influenced by spacing and planting time. Spacing of 10 × 10 cm revealed maximum leaf area index (4.21), which was *at par* with the spacing of 10 × 15 cm (4.01). Planting on 10th January exhibits maximum leaf area index (4.04),

which was *at par* with the planting on 25th December (3.91). Interactions of spacing and planting time exhibited non-significant effects for leaf area index. Harvest index was influenced by planting time and interaction of spacing and planting time, while spacing was non-significant. Maximum harvest index (72.09) was recorded by planting on 25th November, which was closely followed by planting on 10th December (69.54).

The analysis of variance revealed significant variability in the bulb yield and quality of onion by various spacing, planting time and their interaction presented in Table 2. The yield (q/ha) revealed significant differences for spacing, planting time and their interaction, the highest yield (253.40 q/ha) was recorded with the closer spacing of 10 cm × 10 cm and lowest (149.20 q/ha) with spacing of 15 cm × 20 cm, although, higher equatorial diameter and polar diameter was observed by wider spacing. Maximum yield was recorded by planting on 25th November (267.20 q/ha) which was followed by planting on 10th December (209.30 q/ha). Delayed planting,

Table 2. Effect of different spacing levels and planting time on bulb yield and quality of onion at harvest.

Treatment	Equatorial dia. (mm)	Polar dia. (cm)	Av. bulb wt. (g)	Dry matter (%)	Yield (q/ha)
			Spacing		
S_1	49.39	4.79	56.24	12.14	149.20
S_2	47.95	4.46	54.90	12.50	160.40
S_3	46.35	4.32	52.74	12.98	169.30
S_4	43.71	4.23	48.48	13.30	253.40
$CD_{0.05}$	1.10	0.20	1.48	0.62	33.98
			Date of transplanting		
D_1	53.68	4.92	68.48	13.68	267.20
D_2	48.68	4.55	59.75	13.36	209.30
D_3	43.71	4.23	44.03	12.28	140.00
D_4	41.33	4.09	40.10	11.59	115.90
$CD_{0.05}$	1.10	0.20	1.48	0.62	33.98
			Interaction		
S_1 D_1	58.32	5.75	77.37	11.69	231.60
S_1 D_2	48.83	4.99	61.70	12.82	135.50
S_1 D_3	47.30	4.32	43.00	12.24	114.30
S_1 D_4	43.15	4.11	42.90	11.81	115.50
S_2 D_1	54.98	4.96	70.80	15.26	245.30
S_2 D_2	52.30	4.53	65.10	12.41	182.50
S_2 D_3	44.73	4.39	45.77	11.99	118.60
S_2 D_4	39.80	3.94	37.95	10.33	95.11
S_3 D_1	53.55	4.52	62.27	12.67	233.90
S_3 D_2	50.28	4.50	57.37	14.26	213.60
S_3 D_3	43.38	4.10	47.97	12.70	124.30
S_3 D_4	38.20	4.16	43.37	12.26	105.40
S_4 D_1	47.88	4.46	63.50	15.11	358.00
S_4 D_2	43.32	4.20	54.83	13.95	305.40
S_4 D_3	43.57	4.10	39.40	12.19	202.80
S_4 D_4	40.07	4.15	36.20	11.94	147.60
$CD_{0.05}$	2.20	0.41	2.96	1.23	NS

NS = Non-significant

may restrict required photoperiod for their vegetative growth and rise in temperature in the month of February and March leads to bulb formation which results less yield than planting on 25th November. Wider spacing of 15 cm × 20 cm produced higher equatorial diameter and polar diameter (49.39 mm and 4.79 cm, respectively) followed by spacing of 10 cm × 20 cm (47.95 mm and 4.46 cm, respectively). Planting on 25th November revealed higher equatorial and polar diameter (53.68 mm and 4.92 cm, respectively). Lowest equatorial and polar diameter (41.33 mm and 4.09 cm, respectively) were recorded by planting on 10th January. Spacing of 15 cm × 20 cm and planting on 25th November gave the maximum equatorial & polar diameter (58.32 mm and 5.75 cm, respectively). Data on average single bulb weight was significantly influence by spacing, planting time and their interaction; maximum average single bulb weight (56.24 g) was recorded by spacing of 15 cm × 20 cm followed by 10 cm × 20 cm (54.90 g). Planting on 25th November exhibits highest single bulb weight (68.48 g), whereas lowest (40.10 g) was recorded with planting on 10th January. Spacing of 15 cm × 20 cm and planting on 25th November observed higher single bulb weight (77.37 g) followed by spacing of 10 cm × 20 cm and planting on 25th November (70.80 g). Such results for average single bulb weight may be due to the increase in polar and equatorial bulb diameter (Khan *et al.*, 4). Dry matter percentage of bulb showed significant effect with various spacing, planting time and their interaction. Higher dry matter (13.30%) was observed by closer spacing of 10 cm × 10 cm and lowest by wider spacing of 15 cm × 20 cm (12.14%). Planting on 25th November results maximum dry matter (13.68%), which is closely followed by planting on 10th December (13.36%). Spacing of 10 cm × 20 cm and planting on 25th November recorded dry matter (15.26%), which was highest then rest of the interactions of spacing and planting time. Similar results were reported by Singh and Korla (8).

Hence, planting of onion on 25th November at 10 cm × 10 cm spacing was most effective for cv. N53 under Manipur conditions to achieve high yield and better quality bulbs.

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