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Standardization of time of seed sowing and seed rate for the production of onion sets and raising of kharif onion crop through sets

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Abstract

Seed sowing dates significantly influenced the production of sets and the highest yield of 2074.0g/m² was obtained when seeds were sown on March 1. Delayed sowing (beyond March 1) besides giving poor yield, produced larger proportion of smaller sets (<1.50cm). Seed density also influenced yield as seed rate of 20g/m² exhibited highest sets production of 1967.0g/m², followed by 1856.0g when sown at 10g/m². Experiment on inter- and intra- row spacing of these sets revealed that a medium spacing of 15x10 cm was optimum for higher bulb production in kharif season.

Introduction

The significance of kharif onion in checking the sky rocketing prices during October-March and problem of bolting cum rotting in storage are well understood. Undoubtedly, kharif onion has played a major role in enhancing the area and production of the country. However, raising of kharif onion through seedlings which is a common practice in Maharasthra, Andhra Pradesh and Karnataka, is difficult in the low hills of Himachal Pradesh owing to the prevailing high temperature and heavy rainfall at the time of nursery raising i.e. June – July. In the absence of healthy seedlings, the production of onion bulbs during kharif through the planting of sets (small onion bulbs or bulblets) has been reported successful elsewhere (Nandpuri, 1990., Salazar-Munoz *et al.*, 1995 II and Gupta *et al.*, 1999). However, no information is available on the production of these sets and subsequent production of onion bulbs through them under subtropical submontane low hill zone-1 of HP. The proposed investigation has therefore, been aimed at standardizing production technology for raising sets and then using these sets for ultimate production of onion bulbs during kharif season in the low hills of HP.

Material and Methods

The study was conducted during 2003, 2004 and 2005 at Regional Horticultural Research Station, Jachh, Kangra of Dr. Y. S. Parmar University of Horticulture and Forestry, representing subtropical submontane low hill zone-1 (428m above mean sea level) of Himachal Pradesh.

Dates of sowing and seed density are the two vital factors in the successful production of sets. Therefore, the seeds of a known kharif onion cv. Agrifound dark Red (AFDR) were sown on five different dates (February 1, February 15, March 1, March 15 and April 1) and at four densities (10,20,30,40 gm/m²), replicated thrice and arranged in factorial Randomized Block Design. The sets were harvested during June and graded according to their diameter viz; > 2.00 cm (G_1), 2.00-1.50 cm (G_2), 1.50-1.00 cm (G_3) and < 1.00 cm (G_4).

The raised sets were further investigated with regard to their scope in production of onion bulbs during kharif season. As plant to plant and row to row spacing play an important role in growth and development of onion bulbs, the present investigation was also therefore, designed to find out an optimum inter and intra row spacing of sets for higher production of onion bulbs during kharif. The sets ranging between 1.50-2.00 cm (G_2) diameters were planted under three spacing viz., 10 x 10, 15 x 10 and 15 x 15 cm in six replicates each and laid out in Randomized Block Design. The planting was done in

1.5 x 1.5 m plots during mid August, 2004 and 2005. The data were analyzed as per Panse and Sukhatame (1967)

Results and Discussion

The studies pertaining to sets (bulblets) production exhibited the highest mean yield (2074.0 g/m^2) over three years period of study, when seeds were sown on March 1 (Table 1), closely followed by February 15 which registered an average yield of 2024.0 g from same area in the nursery. The subsequent sowings on March 15 and April 1 resulted into a significantly reduced yield at 1576.0 and 1216.0 g/m^2, respectively. Perusal of influence of different sowing dates on the size of sets revealed that delayed sowing (beyond March 1) resulted in larger proportion of smaller sets (<1.50 cm). Lower yield and larger proportion of smaller size sets with delay in sowing is due to decrease in growing duration (Schemetuk and Antonento, 1987; Pandey *et al.*, 1992 and Gupta *et al.*, 1999).

Seed rate also significantly influenced sets yield and the highest mean production (1967.0 g/m^2) over three years study was observed at a seed density of 20g/m^2, followed by1856.0g when sown @ 10g/ m^2. However, increase in seed density (30 or 40 g/m^2) not only gave significantly reduced yield but also produced larger proportion of small sized sets. Nandpuri (1990) and Gupta *et al* (1999) obtained maximum large sized sets from nursery beds planted at low seed density. Sidhu and Dhatta (2005) obtained maximum number of medium size sets with 20g/m^2 seed rate. Salazar-Munoz *et al* (1995 I) tried different seed rates and found that 8g/m^2 produced the maximum bulblets. Higher seed density resulted into increased competition for foliage growth which in turn

Table 1. Effect of sowing dates and seed rate on production of different grades and total yield of onion sets

Treatments	Size (Diameter) of sets (cm)				Total yield
	>2.00(G_1)	2.00-1.50(G_2)	1.50-1.00(G_3)	<1.00(G_4)	(g/m^2)
Date of sowing					
February 1 (D1)	311.00	406.10	447.90	490.40	1655.00
February 15 (D2)	317.10	519.70	562.20	630.20	2024.00
March 1(D3)	309.90	554.50	558.70	656.10	2074.00
March 15 (D4)	165.20	370.60	416.10	423.80	1576.00
April 1 (D5)	92.50	307.10	405.40	411.20	1216.00
CD (P=0.05)	28.94	32.07	40.39	54.44	83.30
Seed rate (g/m^2)					
10	319.70	566.40	503.80	466.00	1856.00
20	309.30	536.70	576.90	544.50	1967.00
30	179.30	336.40	431.10	616.00	1563.00
40	148.20	287.00	400.60	622.90	1451.00
CD (P=0.05)	25.88	28.68	36.13	48.70	74.50

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reduced assimilates for sets growth and hence resulted in lower yield (Gupta *et al.*, 1999). Further, the higher proportion of smaller sets at increased seed density was due to the fact that at higher seed rate, the number of sets per unit area increased and this reduced the availability of assimilates for individual sets to grow properly.

The mean weight per set was found to be 5.45, 2.31, 1.48 and 0.60g for >2.00 cm (G_1), 2.00-1.50 cm (G_2), 1.50 – 1.00 cm (G_3) and < 1.00 cm (G_4) diameters of sets. respectively. Therefore, at a standard spacing of 15x10cm (Table 2), 36.35,15.41,9.87 and 4.00 qtls of sets of G_1, G_2, G_3 and G_4 grades, respectively, are required for raising kharif onion crop over an area of one hectare. Yamashita and Takase (1987) noticed that onion sets of 2.5 cm diameter produced bigger bulbs and higher yield than smaller sets. Yewale and Patil (2005) found 1.0-2.0 cm sets suitable for kharif bulbs production. Anonymous (2004) noted that onion sets below 1.0 cm size were unable to produce marketable grade onion bulbs. Sidhu and Dhatta (2005) obtained highest marketable yield from B- grade (1.5-2.5 g) sets.

Further investigation to find out an optimum spacing of sets for kharif bulb production showed that the differences between three levels of spacing w.r.t. plant height were non- significant during both the years (Table 3). The numbers of leaves registered progressive increase with increased spacing, however, the differences were significant only in the year 2005. This might be due to better availability of plant nutrients and sunlight exposure under wider spacing (Singh *et al.*, 1994). The studies further revealed that, in both the years, the highest bulb production was obtained when sets were planted 15 x 10 cm apart. The increased yield at the medium spacing was primarily on account of increased bulb weight and increased proportion of "A" grade (>40g) bulbs. Sai Reddy *et al.* (1998) also reported that a spacing of 15 x 10 cm was optimum for kharif onion.

The study concluded that to obtain higher yield of kharif onion under low hill sub-montane conditions, seed sowing should be done between February 15 to March 1 at a seed density of 10 g/m^2 and setts so produced should be spaced 10 to 15 cm apart.

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Table 2. Per hectare requirement of different grades of onion sets (bulblets)

Parameters	Different grades of setts			
	G_1	G_2	G_3	G_4
Size of sets (diameters(cm))	>2.00	2.00-1.50	1.50-1.00	1.00
Mean weight per set (g)	5.45	2.31	1.48	0.60
Number of sets required/ ha (at 15x10 cm spacing)	6,67,000	6,67,000	6,67,000	6,67,000
Quantity of sets required (q/ha)	36.35	15.41	9.87	4.00

Table 3. Effect of spacing of sets on growth and development of kharif onion bulbs

Treatment	Years	Plant height (cm)	No. of leaves	Neck thickness (cm)	Polar diameter (cm)	Equatorial diameter (cm)	Bulb weight (g)		Marketable yield (q/ha)		Total marketable yield (q/ha)
							A-grade (>40g)	B-grade (20-40g)	A-grade	B-grade	
Spacings											
10x10cm	2004	48.23	9.73	1.38	3.97	5.68	47.42	25.85	55.85 (53.40)	48.74	104.59
	2005	52.60	8.39	1.47	4.23	5.71	50.81	29.80	46.50 (43.52)	60.34	106.80
15x10cm	2004	47.93	10.29	1.45	4.46	6.43	55.75	38.12	98.12 (73.26)	35.82	133.94
	2005	54.54	9.74	1.50	5.47	6.00	66.17	34.76	89.83 (52.53)	81.17	171.00
15x15cm	2004	46.61	10.37	1.52	4.82	6.38	54.17	39.47	80.49 (70.37)	34.22	114.38
	2005	54.46	10.08	1.48	5.41	6.11	73.49	34.37	86.79 (64.16)	48.48	135.30
CD (P=0.05)	2004	NS	NS	0.08	0.31	0.28	5.21	3.25	13.02	8.03	14.68
	2005	NS	0.71	NS	0.20	NS	6.80	4.09	15.03	21.37	24.32

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