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Root Yield of Radish as Affected by Sowing Dates and Spacing

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ABSTRACT

The study was conducted at College of Horticulture, Venkataramannagudem, West Godavari (Dist.), A. P., India; during the period from October, 2010 to January, 2011 to study the effect of sowing dates and spacing on root yield of radish cv. Pusa Chetki. The seeds sown on four different dates viz., 1st October, 15th October, 1st November and 15th November at different plant spacings of 45 × 10 cm, 45 × 20 cm and 45 × 30 cm. Results indicated that maximum root yield (13.88 t/ha) was recorded with early sowing on 1st October -D_1 with the closer plant spacing of 45 × 10 cm -S_1. Delayed sowing on 15th November -D_4 and closer spacing of 45 × 10 cm -S_1 recorded minimum number of days to maturity. Yield contributing characters like root girth and root weight were maximum with early sowing on 1st October -D_1 and wider plant spacing of 45 × 30 cm -S_3. Root length was found maximum with 1st October -D_1 sowing and closer plant spacing of 45 × 10 cm -S_1. Regarding root quality, percentage of root forking, spiltting and cracking disorders were maximum with delayed sowing on 15th November -D_4 and closer spacing of 45 × 10 cm -S_1.

Key words: *Tropical and Temperate Region, Sowing, Plant Spacing, Radish.*

INTRODUCTION

Radish is fast-maturing, easy-to-grow root vegetable in both tropical and temperate regions. There are many agronomic factors influencing radish root production. However, the important ones are proper time of sowing and optimum plant density, but these aspects are very much neglected by the farmers resulting in inferior quality roots and ultimately the poor yields. Though, the suitable time of sowing varies with the locality[15], early planting helped in producing of higher yields and quality than late planting[13] and Hawthorn[7]. Effect of plant density on yield parameters may be due to competition of plants for available nutrients, light and water.It is very difficult to raise the good quality radish roots because of excessive forking, splitting, cracking and pithiness, which is highly influenced by spacing and time of sowing.

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Hence, selection of optimum sowing time and spacing are key factors for successful radish production. But there is no satisfactory information available on the production aspects. Therefore, the present investigation was carried out to study the effect of sowing dates and plant spacing on root yield and quality of radish.

MATERIALS AND METHODS

A field experiment was conducted at College of Horticulture, Venkataramannagudem during the *rabi* season. The experimental site had red sandy loam with pH 6.9, EC 0.01 dS/m, 0.34 % organic carbon and 712, 32.5, 217.5 kg of N, P_2O_5 and K_2O per ha, respectively. The experiment was laid out in a factorial randomized block design with three replications having twelve treatments. The treatments comprised of the combination of four dates of sowing (1st Oct., 15th Oct., 1st Nov., and 15th Nov) and three plant spacings (45 × 10 cm, 45 × 20 cm and 45 × 30 cm). The seeds are sown on ridges at a depth of 1.5 cm. Thinning was done at 25-30 DAS by retaining one seedling per hill. The crop was nourished with 80 kg/ha of nitrogen and 50 kg/ha each of P_2O_5 and K_2O. Full P_2O_5, K_2O and half nitrogen were applied as a basal and remaining half dose of nitrogen was applied at early root formation stage. The other cultural and plant protection operations were carried out as and when required.Five plants were taken randomly from each experimental plot at different intervals. The yield parameters like days to maturity, root length (cm), root girth (cm), root weight (g) and root yield (t/ha) were recorded. Similarly, the root quality in terms of physiological disorders like root forking, spiltting and cracking were recorded as percentage of disorders per plot. The analysis of data was done by the method of variance outlined by Panse and Sukhatme[10].

Table 1: Effect of sowing time and plant spacing on days to maturity and root length (cm) in radish cv. Pusa Chetki

		Days to maturity			Root length (At 60 DAS)			
Sowing dates				**Plant spacing**				
	S_1	**S_2**	**S_3**	**Mean**	**S_1**	**S_2**	**S_3**	**Mean**
	(45x10 cm)	**(45x20 cm)**	**(45x30 cm)**		**(45x10 cm)**	**(45x20 cm)**	**(45x30 cm)**	
D (1st October)	65.33	66.33	67.67	66.44	22.95	19.85	19.29	20.69
1								
D (15th October)	64.67	64.33	64.00	64.33	21.91	17.18	15.13	18.07
2								
D (1st November)	61.00	61.67	63.00	61.88	20.03	17.17	16.47	17.88
3								
D (15th November)	58.00	60.00	61.00	59.66	16.15	15.10	14.17	15.13
4								
Mean	62.25	63.08	63.91		20.25	17.32	16.26	
Interaction effect								
Source	D	S	D x S		D	S	D x S	
S.Em ±	0.37	0.32	0.64		0.82	0.71	1.42	
CD at 5%	1.09	0.94	NS		2.41	2.09	NS	

RESULTS AND DISCUSSION

The results pertaining to root yield and quality of radish as influenced by sowing dates and plant spacing. Number of days taken to maturity was maximum in D_1 -1st October and in S_3 -45 × 30 cm spacing but the interaction was found to be non-significant (table 1). The results depicted that sowing dates and days to maturity were negatively correlated. Seeds sown earlier took more time period for maturity of radish roots. Higher photosynthesis and higher dry matter assimilation in vegetative growth for longer period led to delayed reproductive phase. The findings are in line with the results of Maurya *et al.*[8], Bhamburkar *et al.*[4] and Aziz-Ur-Rehman and Nawab Ali[3]. Among yield attributes, root length was found significantly maximum in early sowing on 1st October - D_1 followed by D_2 (table 1) and it was suggested that early sowing of radish variety gave a longest root length[2]. Significantly maximum root length was observed in closer spacing of 45 × 10 cm - S_1, while the minimum was in S_3, which was found to be on par with S_2. Pervez *et al.*[11] recorded increased root length with increased plant population. Similar results were obtained by El-Desuki *et al.*[6]. The root length was not affected significantly due to interaction. However, the longest root was obtained in the treatment combination D_1S_1.While the other yield parameters like root girth and root weight were maximum in D_1 -1st October (table 2). The rapid increase in root girth and weight was due to more vigorous vegetative growth in the earlier planting, resulting in more photosynthates translocation from leaves to roots. Similar results were reported by Ahmed and Siddique[1] and Maurya *et al.*[8]. However, there was a parity between D_2, D_3 and D_4 with respect to root girth and root weight. Among the spacings, wider spacing of S_3 -45 × 30 cm showed significantly higher values for root girth and root weight. Root girth and root weight was decreased as the plant density increased, which might be due to competition for light, moisture and nutrients. The wider spacing provides more space for development of root by proper utilization of accumulates which resulted in a maximum root girth and weight. These results are well supported by Sirkar *et al.*[14] and Rahman *et al.*[12]. Among the interaction, D_1S_3 recorded significantly maximum values for root girth and root weight.Root yield was found significantly higher in D_1 -1st October sowing followed by D_2 -15th October and the lowest was noted with the delayed sowing D_4 -15th November. Among the plant spacing, S_1 -45 × 10 cm resulted significantly highest root yield. While, the minimum root yield was recorded with wider spacing of S_3 -45 × 30 cm (table 4). Among the interaction, significantly higher yield was achieved in D_1S_1 (13.88 t/ ha) followed by D_2S_1 (12.34 t/ha). The higher yield is due to better plant survival owing to the favourable environmental conditions for growth and development of roots and the closer spacing accommodates more number of plants per unit area. Similar results were reported by Busell[5] and Aziz-Ur-Rehman and Nawab Ali[3].Among root quality parameters, root forking percentage (4.44 and 4.66%) and splitting and cracking percentage (15.00 and 12.25%) were maximum with delayed sowing D_4 -15th November and closer spacing of S_1 - 45 × 10 cm, respectively (table 3). This might be due to fact that early sown crop escaped to a greater extend the ill of rains associated with diseases and disorders. As the sowing is delayed, environmental conditions went on becoming adverse and affects the plant growth, yield and quality coupled with more plant population in closer spacing. Similar results were reported by Mengistu and Yamoah[9]. The root spilting and cracking disorders were not affected significantly due to interaction. While the root forking percentage was found significantly highest in D_4S_1 closely followed by D_3S_1 (table 3).Though, the yield attributing characters like root girth and root weight were better in S_3 the root yield was recorded maximum in S_1 -45 × 10 cm due to the accommodation of more number of plants per unit area. Since, all the characters were recorded best under early sowing and as disorders percentage was also recorded minimum in the early sowing. Sowing early on 1st October and closer planting of 45 × 10 cm is recommended.

Table 2: Effect of sowing time and plant spacing on root girth (cm) and root weight (g) at harvest (60 DAS) in radish cv. Pusa Chetki

	Root girth (At 60 DAS)				Root weight (At 60 DAS)			
Sowing dates				**Plant spacing**				
	S_1	**S_2**	**S_3**	**Mean**	**S_1**	**S_2**	**S_3**	**Mean**
	(45x10 cm)	**(45x20 cm)**	**(45x30 cm)**		**(45x10 cm)**	**(45x20 cm)**	**(45x30 cm)**	
D (1st October)	4.07	4.87	4.80	4.57	137.81	139.53	237.98	171.77
1								
D (15th October)	3.63	4.40	4.07	4.03	100.40	108.29	187.27	131.98
2								
D (1st November)	3.50	3.23	4.73	3.82	99.60	139.97	148.87	129.47
3								
D (15th November)	3.67	3.30	4.10	3.68	98.60	144.53	161.47	124.86
4								
Mean	3.71	3.95	4.42		109.10	125.58	183.89	
Interaction effect								
Source	D	S	D x S		D	S	D x S	
S.Em ±	0.15	0.13	0.26		2.25	1.95	3.90	
CD at 5%	0.44	0.38	0.76		6.60	5.72	11.44	

Table 3: Effect of sowing time and plant spacing on root forking and splitting and cracking at harvest (60 DAS) in radish cv. Pusa Chetki

	Root forking at harvest				Splitting and cracking at harvest			
Sowing dates				**Plant spacing**				
	S_1	**S_2**	**S_3**	**Mean**	**S_1**	**S_2**	**S_3**	**Mean**
	(45x10 cm)	**(45x20 cm)**	**(45x30 cm)**		**(45x10 cm)**	**(45x20 cm)**	**(45x30 cm)**	
D (1st October)	2.00	2.00	0.66	1.55	9.00	7.33	5.33	7.22
1								
D (15th October)	3.00	1.00	4.00	2.66	12.00	7.33	5.33	8.22
2								
D (1st November)	5.66	2.00	0.66	2.77	10.00	15.33	11.67	9.77
3								
D (15th November)	8.00	4.00	1.33	4.44	18.00	11.00	8.33	15.00
4								
Mean	4.66	2.25	1.66		12.25	10.25	7.66	
Interaction effect								
Source	D	S	D x S		D	S	D x S	
S.Em ±	0.30	0.26	0.52		0.80	0.69	1.39	
CD at 5%	0.89	0.77	1.55		2.35	2.04	NS	

Table 4: Effect of sowing dates and spacing on root yield (t/ ha) in radish cv. Pusa Chetki.

Treatments		**Plant spacing**		
Planting time	**S_1**	**S_2**	**S_3**	**Mean**
	(45 x 10	**(45 x 20**	**(45 x 30**	
	cm)	**cm)**	**cm)**	
D (1st October)	13.88	10.41	9.64	11.31
1				
D (15th October)	12.34	8.48	7.13	9.31
2				
D (1st November)	10.60	7.89	3.46	7.32
3				
D (15th November)	5.13	3.47	2.42	3.67
4				
Mean	10.49	7.56	5.66	
Interaction effect				
D	S	D x S		
SE.m ±	0.39	0.34	0.68	
CD at 5%	1.15	0.99	1.99	

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