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Effect of sowing time on the performance of radish (*Raphanus sativus* L.) cultivars under low hills of Himachal Pradesh

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Abstract

A field experiment was conducted during 2003 and 2004 with three seeding dates (February 15, March 15 and April 15) and three cultivars (Pusa Himani, Pusa Chetki and Early Mino White) in radish under low hill conditions of Himachal Pradesh (Jachh). Pusa Himani and Early Mino White, when sown on February 15 recorded significantly higher root weight with and without top, root length and root yield (without top), while, Pusa Chetki gave its best performance when sown on April 15 in respect of all the above mentioned traits, during both the years of study. Pusa Chetki gave highest root yield of 10.75 t/ha when sown on April 15, which was 77.69 and 151.76% higher than the mean highest root yield of Pusa Himani (6.05 t/ha) and Early Mino White (4.27 t/ha) in February 15 sowing date, respectively.

Introduction

Radish (*Raphanus sativus* L.) is one of the most popular and widely cultivated root vegetable crops in the hills of Himachal Pradesh. Radish is very specific in its climatic requirements especially to temperature. The variation in the performance of radish cultivars in relation to sowing dates has been reported (Dyal *et al.*. 1991; Rao and Manohar 1990 & 1996). Hence, it becomes imperative to study the appropriate sowing times of different cultivars to get optimum root yield. Therefore, the present investigation was carried out to select the most appropriate variety and optimum sowing time and to evaluate the growth behaviors as influenced by variety and spacing.

Material and Methods

A field experiment was conducted at Jachh (32° 18' N latitude, 75°55' E longitude and 428 m altitude) during 2003 and 2004. The experiment was laid out in split plot design with three sowing dates (February 15, March 15 and April 15) as main plot treatments and three cultivars (Pusa Himani, Pusa Chetki and Early Mino White) as sub plot treatments, replicated thrice. The soil of the experimental field was low in organic carbon and nitrogen, medium in phosphorus and fairly rich in potash having slightly alkaline reaction. The seeds were sown at spacing of 30 x 10 cm. The recommended package of practices was followed for raising the crop. The observations were recorded on days to maturity, root weight with and without top, root length, root girth and root yield. Yields were harvested from net plot. Standard statistical procedures were followed for the analysis of data.

Results and Discussion

Effect of seeding time

The data are summarized in Table 1. A perusal of the data revealed that the root weight with top during both the years and root girth in 2004 were significantly increased with advancing the seeding time from February 15 to April 15. While, root length during both the years decreased with delay in seeding. However, March 15 and April 15 seeding times were statistically at par in influencing root weight without top, root length and root girth in 2004, whereas, February 15 and March 15 seeding times were statistically at par for root length in 2003. Days to maturity and root weight without top were progressively decreased but not affected significantly due to seeding times evaluated. It is pertinent to highlight that while root weight with top was progressively larger, root weight without top was low with delay in seeding. This indicated more of foliage growth as the environmental temperature increases from February to April and comparatively less translocation of photosynthates from the source (foliage) to sink (roots).

A non-significant but small increase in root weight and higher root length might be ascribed to increase mean root yield (without top) significantly due to February 15 sown crop over other seeding times. This is followed by March 15 seeding date. Yield variation in radish due to sowing dates as

affected owing to variation in environmental temperature has been shown by various workers (Dyal *et al.* 1991; Kawai *et al.* 1992; Nomura *et al.* 1999; Rao and Manohar 1990 & 1996). However, March 15 and April 15 seeding time in 2003 and February 15 and March 15 seeding time in 2004 were statistically at par with each other in influencing root yield. The increase in root yield due to February 15 seeding time was 10.9 and 17.9 per cent higher over March 15 and April seeding times, respectively.

Effect of variety

Variety Pusa Chetki took significantly higher number of days to maturity as compared to Pusa Himani and Early Mino White (Table 1). All the yield attributes viz. root weight with and without top, root length and root girth and yield were significantly higher owing to variety Pusa Chetki followed by Pusa Himani and Early Mino White. Yield and quality variations among cultivars under different agro-climatic conditions have been well documented (Dyal *et al.* 1991; Sharma *et al.*. 2002; Rao and Manohar 1990 & 1996). The mean yield of the variety Pusa Chetki was 2.12 and 3.17 times higher than Pusa Himani and Early Mino White, respectively.

Integrated effects

Integrated effects of seeding time and cultivars were significant for root weight with and without top, root length and root yield (Table 2). A perusal of the data indicated that Pusa Himani and Early Mino White performed significantly better when sown on February 15 in respect of all the traits analyzed (root weight with and without top, root length and root yield), while Pusa Chetki gave its best performance when sown on April 15, during both the years of study. Pusa Chetki sown on April 15 gave highest root yield of 10.75 t/ha, which was 77.69 & 151.76% higher than the mean highest root yield of Pusa Himani (6.05 t/ha) and Early Mino White (4.27 t/ha) in February 15 sowing date, respectively. The variation in yield and related parameters due to cultivars to sowing dates has also been reported (Dyal *et al.* 1991; Rao and Manohar 1990 & 1996).

The present investigation conclusively inferred that for higher productivity of radish, the cultivars Pusa Himani and Early Mino White should be sown on mid February, while the cultivar Pusa Chetki should receive priority to be sown in mid April.

VIR SOFTECH

Table 1. Effect of sowing time and variety on yield attributes and yield of radish

Treatments	Days to maturity		Root weight with top (g)		Root weight without top (g)		Root length (cm)		Root girth (cm)		Root yield (t/ha)		
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	Mean
Sowing time													
February 15	40.6	41.6	65.4	68.7	52.2	52.4	15.4	16.0	5.9	5.6	6.07	6.94	6.51
March 15	37.6	38.6	67.4	70.4	50.2	51.1	15.0	15.3	6.2	6.5	5.12	6.61	5.87
April 15	34.6	35.6	68.7	71.7	49.4	51.3	14.7	15.2	6.3	6.5	4.83	6.21	5.52
LSD (P=0.05)	NS	NS	0.8	1.4	NS	NS	0.5	0.4	NS	0.6	0.4	0.37	0.27
Variety													
Pusa Himani	37.0	38.0	62.0	65.9	47.0	46.9	14.5	15.2	5.3	5.8	4.06	5.39	4.73
Pusa Chetki	38.3	39.3	84.2	87.1	64.9	67.3	17.0	16.9	6.6	6.3	9.33	10.69	10.01
Early Mino White	37.3	38.3	55.4	57.8	40.0	40.7	13.5	14.4	6.5	6.5	2.63	3.68	3.16
LSD (P=0.05)	0.7	0.7	2.0	2.6	1.8	1.9	0.3	0.3	0.4	0.3	0.45	0.22	0.28

VIR SOFTECH

Table 2. Integrated effects of sowing time and varieties on yield attributes and yield of radish

Seeding time	Root weight with top (g)			Root weight without top (g)			Root length (cm)			Yield (t/ha)		
	Pusa Himani	Pusa Chetki	Early Mino White	Pusa Himani	Pusa Chetki	Early Mino White	Pusa Himani	Pusa Chetki	Early Mino White	Pusa Himani	Pusa Chetki	Early Mino White
						2003						
February 15	62.6	74.3	59.3	50.7	60.3	45.7	15.1	16.7	14.3	5.59	8.48	4.13
March 15	61.6	85.7	55.0	45.7	65.3	39.7	14.7	16.6	13.8	3.64	9.42	2.31
April 15	61.7	92.7	52.0	44.7	69.0	34.7	13.8	17.7	12.4	2.94	10.08	1.45
LSD (P=0.05)		3.5			3.2			0.5			0.77	
						2004						
February 15	66.0	78.7	61.3	50.0	60.7	46.7	15.8	16.9	15.3	6.51	9.9	4.41
March 15	64.7	87.7	59.0	45.7	67.0	40.7	14.7	17.1	14.1	5.09	10.77	3.98
April 15	67.0	95.0	53.0	45.0	74.3	34.7	15.0	16.7	13.8	4.56	11.42	2.65
LSD (P=0.05)		4.5			3.4			0.4			0.38	
						Mean						
February 15	64.3	76.5	60.3	50.3	60.5	46.2	15.4	16.8	14.8	6.05	9.19	4.27
March 15	63.2	86.7	57.0	45.7	66.2	40.2	14.7	16.8	13.9	4.37	10.1	3.15
April 15	64.3	93.8	52.5	44.8	71.7	34.7	14.4	17.2	13.1	3.75	10.75	2.05
LSD (P=0.05)		2.3			2.4			0.3			0.49	

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