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Effect of Sowing Time on Different Radish Varieties (*Raphanus sativus* L.)

Arshpreet Kaur [1] and Navdeep Singh [2]

Department of Vegetable Science, University College of Agriculture,
Guru Kashi University, Talwandi Sabo, 151302 (Punjab), India

ABSTRACT

An experiment was conducted in Guru Kashi University research farm during the rabi season of the year 2019-20 to study the effect of sowing time on different radish varieties (*Raphanus sativus* L.). The experiment was laid out in randomized block design and replicated thrice. Seeds of the cultivars viz., Japanese White, Mino Early, INARA, Durga, Punjab Safed, Super Hill Queen and Pusa Chetki were sown on two different dates i.e. October 15th, and November 15th. According to varieties, Japanese White showed minimum average days to germination (5.20 d), although, maximum average root shoot ratio 3.17, average marketable yield per hectare 43t, maximum average plant height 81.07 cm and average root length 31.45 cm were observed in Durga. Maximum average leaf length 50.07 cm, the average number of leaves 15.27, average foliage weight 274.07 gm, average plant weight 550.14 gm, average root diameter 5.37 cm, average root weight 276 gm and average total yield per plot 59.23 kg, average marketable yield per hectare 53.33 ton were obtained in Punjab Safed variety. The combined effect of sowing dates and varieties showed that sowing of Punjab Safed on Oct 15th gave superior results for most of the growth and yield characters whereas, due to varietal differences Super Hill Queen exhibited inferior results on both the sowing dates.

Key Words: Japanese White, Mino Early, Durga, Punjab Safed, Super Hill Queen and Pusa Chetki.

INTRODUCTION

Radish (*Raphanus sativus* Linn.) is cultivated as an annual crop or biennial crop for the purpose of seed production. It is mainly cultivated for its modified tender roots all over the world. Temperature and other climatic conditions impose a huge effect on the growth of radish. The best root shape and superior quality is obtained when they are grown at 15-18˚C (Angell and Hillyer, 1962). If the temperature goes beyond 12˚C at the time of sowing then there are chances of bolting without the formation of edible roots. Growth and root formation of radish are also influenced by light intensity and day length. The duration and intensity of the light are very important factors in the elongation of roots. Root elongation occurred when plants were grown under a light intensity of 175UE/m2/s or less (Hall, 1990). In order to harvest quality crop and high yield, it needs to be sown at an appropriate time. Date of sowing differs in different varieties and late sowing leads to inferior quality of roots as well as reduced yield is obtained. For maximizing the harvest, selection of cultivars along with the time of sowing are utmost parameters which needs to be considered. According to Sandler *et al* (2015) the suitable sowing date helped to control the damage caused by cold or heat, pests, diseases, weeds and not only this, favorable climatic factors affect production such as the coincidence of flowering time with suitable temperature. (Lavanya *et al*, 2014) mentioned few recommendations regarding the date of sowing along with the cultivars which exhibited prominent changes in root growth and economic return. Al-Juboori *et al* (2019) concluded that interaction between sowing dates and varieties showed that sowing on 20th October was significant on growth and yield. Evakordor *et al* (2018) stated that sowing in late October and in the first week of November provided superior root yield. In conclusion, sowing on early dates provide long growth period and ultimately more yield. According to Sandipan *et al* (2021) the selection of a suitable sowing time offers abundant scope for increasing the yield of radish. However, by planting too early, crops

Corresponding Author's Email: navdeep.brar50@gmail.com; arshp761@gmail.com

may face completion with weeds and low temperature or attack by pests and diseases. By altering and changing the sowing date, the adverse effects of environmental stress can be minimized and stress in critical stages of plant growth can also be avoided up to some extent. Examination of sowing date as a prominent step in new varieties is needed as there is meagre information on this aspect. In order to find suitable dates of planting it is important to consider two factors i.e. one is to scrutinize physiological characters of plant along with the second factor of environmental changes that can be predicted. Keeping this in view, an attempt was made to evaluate the best combined effect of sowing dates with different radish varieties and data on growth and yield components was recorded to identify best variety from all of them.

MATERIALS AND METHODS

The research trial was conducted during 2019-20 in the experimental field area of Guru Kashi University, Talwandi Sabo. The experiment consisted of fourteen treatment combinations and laid out in randomized complete block design (RCBD) with three replications. The whole experimental area was divided into three equal blocks. All the blocks were later sub divided into fourteen plots. Thus, there were 42 (14 × 3) unit plots altogether in the experiment. The size of each unit plot was 2.5 m × 4 m. A distance of 45 cm is maintained between the ridges and 7.5 cm between the roots within each plot. The blocks were kept to facilitate different intercultural operations. The crop was raised by following the package of practice recommended by PAU, Ludhiana. The experiment comprised two main parameters, namely the sowing dates 15th October and15th November and the seven cultivars i.e. Japanese White, Mino Early, INARA, Durga, Punjab Safed, Super Hill Queen and Pusa Chetki. The data were analyzed for the average days to germination, average plant height (cm), average leaf length, the average number of leaves, average foliage weight (g), average plant weight, average root shoot ratio, average root length (cm), average root diameter (cm), average root weight per plant (g), average total yield per plot (kg), average yield per hectare (t/ha), average marketable yield per hectare (t/ha) with the help of IBM SPSS statistical software. The critical difference at 5% level of implication was calculated to equate the mean different treatments.

RESULTS AND DISCUSSION

Results revealed that minimum days (5.20) to germinate were taken by the Japanese White variety sown on 15th October and on 15th November sowing, a minimum of 5.36d were taken to germination by Japanese White. Ladumor *et al* (2020) found that all parameters showed a decreasing trend as sowing date was delayed. The highest plant height 81.07 cm was obtained in the Durga variety on 15th October sowing whereas on 15th November sowing maximum average plant height 54.74 cm was attained by Punjab Safed. On 15th November Pusa Chetki gave maximum average leaf length i.e. 41.00 cm whereas, on 15th October sowing, Punjab Safed showed superior results of average leaf length which is 50.07 cm. The highest average number of leaves 15.27 was in Punjab Safed on 15th October sowing whereas, on 15th November sowing highest average number of leaves was 14.07 in Super Hill Queen. Punjab Safed had a maximum average foliage weight of 274.07 gm on 15th October sowing but on 15th November sowing, maximum average foliage weight of 152.00 gm was observed in Durga. Similarly Al-Juboori *et al* (2019) studied interactions between sowing time and cultivars which showed that sowing on 20th October was more notable on growth parameters and yield characters such as total leaves per plant, total leaf area as well as root yield. The maximum average plant weight 550.14 gm was obtained in Punjab Safed on 15th October sowing whereas, on 15th November crop gave maximum average plant weight of 379.2 gm in INARA. Highest average root shoot ratio 1.76 was obtained in INARA and it was at par with Pusa Chetki (1.72). Crop sown on 15th November showed maximum average root shoot ratio of 3.27 in Japanese White and was at par with INARA (3.16). On both 15th October and 15th November sowing, Durga revealed superior results in average root length which is 31.45 cm and 29.21 cm, respectively. Along with this, Japanese white was found to be at par with Durga on 15th November giving average root length of 28.32 cm. Punjab Safed showed maximum average root

Table 1: Effect of sowing dates and genotypes on growth parameters in radish.

Parameters	Average days to germination		Average plant height (cm)		Average leaf length (cm)		Average number of leaves	
Variety	15th October	15th November	15th October	15th November	15th October	15th November	15th October	15th November
Japanese White	**5.20**	**5.36**	67.15	51.20	39.07	26.2	14.07	12.67
INARA	6.20	6.47	64.15	42.25	37.07	27.40	13.92	13.80
Durga	7.20	7.31	**81.07**	52.88	48.07	36.55	12.42	12.80
Mino Early	7.62	7.69	69.52	41.58	45.07	25.21	11.45	11.87
Punjab Safed	7.54	7.54	79.07	**54.74**	**50.07**	33.66	**15.27**	11.81
Super Hill Queen	7.35	7.01	65.07	38.90	43.07	30.12	11.05	**14.07**
Pusa Chetki	8.20	9.12	64.07	49.33	46.07	**41.03**	14.07	12.47
CD at 5%	0.27	0.31	0.76	0.72	1.34	1.24	0.50	0.47

diameter and maximum average root weight on both 15th October and 15th November i.e., 5.37cm, 3.71cm and 276g, 178g, respectively. Mino Early on 15th November was recorded to be at par with Punjab Safed exhibiting 3.41cm of average root length. Punjab Safed proved to be highest for average total yield per plot and average yield per hectare on both sowings which is 59.27 kg, 43.00 kg and 59.26t, 43 t, correspondingly. Whereas, in case of

Table 2: Effect of sowing dates and genotypes on growth parameters in radish.

Parameters	Average foliage weight (gm)		Average plant weight (gm)		Average root shoot ratio		Average root length (cm)	
Varieties	15th October	15th November	15th October	15th November	15th October	15th November	15th October	15th November
Japanese White	167.07	85.50	380.07	280.00	1.27	**3.27**	27.46	28.34
INARA	171.07	120.00	390.07	**379.20**	**1.76**	3.16	22.84	21.25
Durga	137.07	**152.00**	273.07	269.25	0.96	1.77	**31.45**	**29.21**
Mino Early	89.07	105.00	178.07	171.35	1.07	1.63	24.36	22.33
Punjab Safed	**274.07**	140.00	**550.14**	320.00	1.19	2.28	29.73	26.42
Super hill queen	82.07	92.00	160.72	170.22	0.93	1.93	23.50	21.66
Pusa Chetki	176.14	125.00	476.54	280.22	1.72	2.24	17.14	16.52
CD at 5%	0.48	0.59	0.76	0.82	0.24	0.52	0.94	0.89

Table 3: Effect of sowing dates and genotypes on yield parameters in radish

Parameters	Average root diameter (cm)		Average root weight (gm)		Average total yield per plot (Kg)		Average yield per hectare (ton)		Average marketable yield per hectare (ton)	
Varieties	**15th October**	**15th November**	**15th October**	**15th November**	**15th October**	**15th November**	**15th October**	**15th November**	**15th October**	**15th November**
Japanese White	3.17	3.32	214.00	148.00	34.82	39.00	34.12	39.50	30.70	**40.50**
INARA	3.77	3.15	166.66	154.00	25.35	27.20	25.33	28.20	22.79	25.38
Durga	4.12	3.22	136.00	142.00	19.15	21.38	19.14	21.45	17.22	19.30
Mino Early	3.87	3.41	102.33	120.23	17.87	20.34	17.85	20.55	16.85	18.67
Punjab Safed	5.37	3.71	276.00	178.00	59.27	43.00	59.26	43.00	53.33	38.78
Super Hill Queen	4.06	3.20	78.00	82.00	13.21	18.11	13.22	18.11	11.89	16.23
Pusa Chetki	3.77	2.86	206.00	137.00	30.08	26.00	30.09	26.00	27.08	23.46
CD at 5%	0.34	0.38	1.91	1.70	3.91	3.20	3.90	3.21	2.56	2.12

average marketable yield per hectare, Punjab safed gave prominent results 53.33 t on 1st sowing but on 2nd sowing Japanese white was ahead with 40.5t. In addition to this, on 15th November, Punjab safed was noted to be at par with Japanese white i.e. 38.78 cm. Similarly, Evakordor and Mehera (2018) concluded that there was combined effect of sowing dates and varieties and explained that on October 27, all varieties performed well in respect of yield and yield components. Priyanka *et al* (2018) also wind up that radish varieties, Japanese White and Arka Nishant were sown during second fortnight of August and first fort night of September were best suited for growing in southern agro climatic zone of Andhra Pradesh.

CONCLUSION

The present study inferred that the combined effect of sowing dates and varieties imposed a significant impact on growth parameters and yield components of radish. Varieties showed superior results on October 15th than the varieties which were sown late i.e., on 15th November. Delayed sowing gave decreased root yield due to non-availability of optimal weather conditions. Out of all the varieties sown, Punjab Safed and Japanese White were found to be the best performing varieties. Whereas, on both the sowing dates Super Hill Queen gave inferior results in most of the characters observed. Sowing of Punjab Safed on Oct 15th was revealed as the best combination with regards to its remarkable results.

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