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Evaluation of radish (*Raphanus sativus* L) varieties under valley condition of Garhwal hills

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Abstract

Field experiment was conducted at Horticultural Research Centre, H.N.B. Garhwal University, Srinagar-Garhwal, Uttarakhand (India) during rabi season 2014-15 to identify the suitable varieties for cultivation with high yield and quality traits using 22 varieties of radish (*Raphanus sativus* L.). The experiment was laid out in Randomized Block Design with three replication. The results are indicated that, the analysis of variance revealed highly significant differences among varieties for almost all the traits. The yield parameters showed that Snow White variety significantly maximum plant height (66.33 cm) and number of leaves (23.70). The maximum root diameter (5.91 cm) was observed in Pusa Mirdula and the maximum total weight of plant (435.31 g/plant), root yield per plot (30.56 kg) and root yield per hectare (509.28q) was recorded in variety of Evergreen. From nutritional point of view the variety Local 3 recorded highest TSS content of 6.13 °Brix. The variety J.U. recorded highest acidity (0.45 mg/100 g) and highest Vitamine C (27.14 mg/100 g) was found in Baramasi variety.

Keywords: radish, quality, variance, variety and yield

Introduction

Radish is one of the most important edible and nutritious root vegetable crops in world. It belongs to family Brassicaceae, originated from the Europe and Asia (Thompson and Kelly, 1957) [8]. Radish is grown in tropical and temperate region. It is grown for its young tender tuberous roots which are eaten raw as salad or cooked as a vegetable. Radish is most frequently consumed root vegetable in different part of India because root and leaves are rich source of carbohydrate, vitamin A, vitamin C and minerals. The characteristics pungent flavor of radish is due to the presence of volatile isothiocyanate (trans-4-methylthiobrate climate. Radish is best adapted to a cool or moderate climate. Radish is useful in liver and gall bladder troubles. In homeopathy they are used for neurologic headaches and sleeplessness. Roots and leaves are active against gram-positive bacteria. The roots are useful in urinary complaints, piles and in gastrodynia. The juice of fresh leaves is used as diuretic and laxative. Pink skinned radish is generally richer in ascorbic acid than the white skinned one. Vitamin C content of radish roots is greatly influence by light condition. Sid'ko *et al.*, (1975) [7] found that root vitamin content was higher in plants grown under blue light, while Lichtenthaler (1975) [4] noted enhanced synthesis of β carotene under red light. The Asian cultivars with greater temperature adaptation can resist more heat than the European cultivars. Wendt (1977) [10] reported that, an increase in soil temperature from 5-20 °c favoured leaf development. At 20 - 25 °c uptake of nutrient was greater and dry matter content was higher but at a still higher temperature (25-30 °c).

The climate and soil condition of Garhwal region allow cultivation wide range of vegetable crop including radish. Shortage of improved germplasm and good quality seed is the main factor for low production and productivity in India and also in valley region of Garhwal Himalaya. The main objective of this study was to compare the growth, yield and quality parameters of different radish varieties and to select the suitable varieties for sub tropical condition of Garhwal Hills.

Materials and Methods

The experimental materials constituted a collection of 22 varieties of radish (*Raphanus sativus* L.) namely, Arka Nishant, Baramasi, Bharsar Local 2, Dehli White, Dunagiri, Evergreen, Hill Queen, J.U, Japanese White, Local 1, Local 2, Local 3, Local 4, Local 5, Local 6, Local 7, Local 8, M.E.L.W, Pusa Mirdula, Snow White, Sonali White and Pusa Chetki varieties were collected from Bharsar, Ranichori, Srinagar, Rudrapriyag (UK), Varanasi (UP), Amritsar (Punjab), Jobner, Ajmer, Udaipur and Bhilwara (Rajastan). The experiment was conducted in rabi season, 2014-15 at Horticultural Research Centre of H.N.B. Garhwal University,

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Srinagar (Garhwal) situated in the Alaknanda valley (78° 47' 30" E longitude and 30° 13' 0" N latitude and at an elevation of 550 m above MSL), a semiarid, sub-tropical climate with dry summer and rigorous winters with occasional dense fog in the morning hours from mid December to mid February. The experiment was laid out in Randomized Block Design with three replications. The entire experimental field was divided into three blocks of equal size and each block possessed 22 plots. Each plot measured 3 X 3 m² area. The varieties were sowed at ridges of 23 to 25cm above the soil surface and spacing of ridges to ridges is 45 cm and plant to plant 6 to 8cm and seed are sown 1.5 to 3cm deep in the soil. All the recommended agronomic practices were followed to raise a healthy crop (Choudhury, 2000) [3]. Observation were recorded on quantitative and qualitative traits viz., plant height, number of leaves, days taken to harvest, leaf length, root length, diameter of root, yield/ha, TSS, and acidity on five randomly selected plants. The data obtained from selected plants were subjected to analysis of variance (Panse and Sukhatma, 1967).

Results and Discussion

The analysis of variance revealed highly significant differences for all the characters. The data presented in Table 1 and fig 1. Showed that significant difference were recorded

among the radish varieties. The maximum plant height at harvest (66.33 cm) was recorded in Snow White, whereas the minimum (31.92 cm) plant height was observed in pusa mirdula variety. These variations in relation to height of plants for various radish cultivars might be affected by the environment to the great extent besides genetic potential, similar results were also confirmed by Alam, *et al.*, (2010) [1] in radish.

The maximum number of leaves at harvest (23.70) was found in Snow White whereas the minimum (10.29) was found in pusa mirdula variety. These variations in radish cultivar might be affected by the environment to the great extent besides genetic potential. Similar results were also reported by Naseerruddin *et al.*, 2014 [5] in Radish. The higher total weight of plant (435.31 g) was obtained in variety Ever Green whereas the minimum (150.37g) was recorded in variety Pusa Mirdula. Differences among the cultivars may be due to genetic factors and their interaction to the environmental conditions. The similar results were reported by Bhatti, *et al.*, (1983) [2] and Naseerruddin *et al.* (2014) [5] in radish. The higher root yield (30.56 kg/plot and 509.28 q/ha) was obtained in variety Ever Green, whereas the minimum (15 kg/plot and 250.05 q/ha) was recorded in variety Pusa Mirdula. The similar results were reported by Thorat *et al.*, (2013) [9] in radish.

Table 1: Varietal differences of quantitative and qualitative traits in Radish (*Raphanus sativus* L.) under condition of Garhwal Hills.

S. No	Name of varieties	Plant height at harvest	No. of leaf at harvest	Total wt. of plant (g)	Root yield (kg/plot)	Root yield (q/ha)
1	Arka Nishant	60.66	11.94	316.92	20.37	339.5
2	Baramasi	58.12	15.18	323.96	21.14	352.33
3	Bharsar Local-2	52.75	14.49	319.53	22.15	369.17
4	Delhi White	53.62	12.28	320.49	21.92	365.28
5	Dunagri	50.83	15.45	339.57	24.08	401.39
6	Ever Green	64.02	20.74	435.31	30.56	509.28
7	Hill Queen	59.95	18.66	376.4	24.77	412.89
8	J.U.	50.02	16.61	268.48	20.93	348.89
9	Japanese White	51.01	14.76	336.5	22.86	380.94
10	Local 1	51.22	12.62	380.39	23.13	385.56
11	Local 2	47.71	14.33	180.34	17.43	290.55
12	Local 3	53.61	16.1	292.51	18.1	301.67
13	Local 4	57.98	14.61	312.52	17.77	296.22
14	Local 5	51.57	16.57	335.7	20.17	336.11
15	Local 6	56.63	15.67	345.56	19.86	335.5
16	Local 7	58	13.73	326.67	21.27	354.44
17	Local 8	54.43	14.24	245	16.44	274
18	M.E.L.W	59.23	17.1	306.3	19.17	319.44
19	Pusa Mridula	31.92	10.29	150.37	15	250.05
20	Snow White	66.33	23.7	416.4	28.45	474.17
21	Sonali White	61.88	19.49	368.62	22	366.67
22	Pusa Chetki	52.25	18.33	337.77	26.64	444.06
S.Em±		1.26	0.58	1.15	0.4	6.88
CD at 5%		3.61	1.65	3.28	1.14	19.63

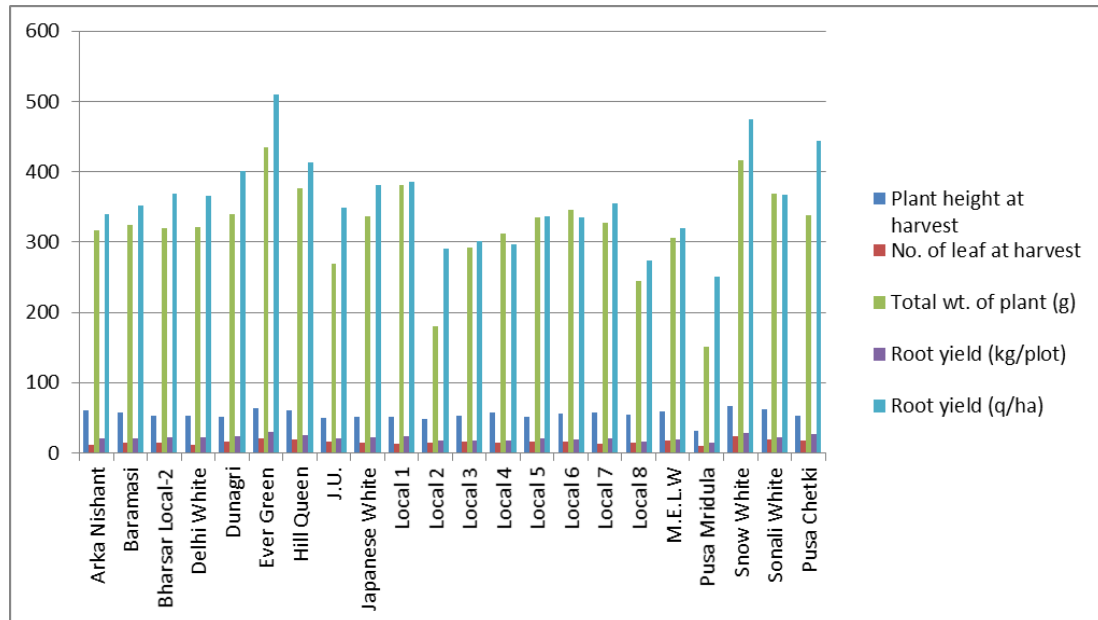


Fig 1: Varietal differences of growth and yield traits in Radish (*Raphanus sativus* L.) under condition of Garhwal Hills.

The analysis of variance revealed highly significant differences for all the quality characters. The data presented in Table 2 and Fig 2. Showed that significant difference were recorded among the radish varieties. All the qualitative characters TSS, vitamin C and acidity were highly significant different among the varieties. The maximum TSS (6.13 °Brix) was recorded in variety Local - 3, whereas the minimum TSS (4.80 °Brix) was recorded in variety Delhi White. The maximum vitamin C (27.14 mg/100g) was recorded in variety

Baramasi, whereas the minimum vitamin C (12.11 mg/ 100 g) was recorded in variety M.E.L.W. the maximum acidity (0.45 mg/100g) was recorded in variety J.U., whereas the minimum acidity (0.12 mg/100g) was recorded in variety Hill Queen. This is accordance with the findings of Naseeruddin *et al.*, (2014) [5] in radish. On the basis of present study, it may be concluded that Ever Green variety of radish was found superior variety for Garhwal hills on the basis of yield parameters followed by Snow White and Pusa Chetki.

Table 2: Variation in quality parameters of radish varieties under condition of Garhwal hills.

S. No	Name of varieties	TSS (°Brix)	Acidity (mg/100g)	Vit.-C (mg/100g)
1.	Arka Nishant	5.77	0.18	17.55
2.	Baramasi	5.83	0.19	27.14
3.	Bharsar Local-2	6.03	0.40	15.35
4.	Delhi White	4.80	0.35	18.01
5.	Dunagri	5.73	0.19	21.21
6.	Ever Green	5.03	0.16	13.61
7.	Hill Queen	5.87	0.12	18.24
8.	J.U.	5.75	0.45	21.38
9.	Japanese White	5.01	0.33	15.84
10.	Local 1	5.20	0.43	19.14
11.	Local 2	6.00	0.39	19.67
12.	Local 3	6.13	0.32	25.84
13.	Local 4	5.01	0.15	14.52
14.	Local 5	5.80	0.30	19.76
15.	Local 6	5.87	0.26	21.48
16.	Local 7	5.97	0.15	18.61
17.	Local 8	5.63	0.26	17.35
18.	M.E.L.W	5.90	0.25	12.11
19.	Pusa Mridula	5.77	0.14	22.64
20.	Snow White	5.00	0.14	25.85
21.	Sonali White	5.33	0.13	13.54
22.	Pusa Chetki (check)	6.02	0.18	14.53
S.Em±		0.04	0.01	00.4
CD at 5%		0.11	0.02	01.15

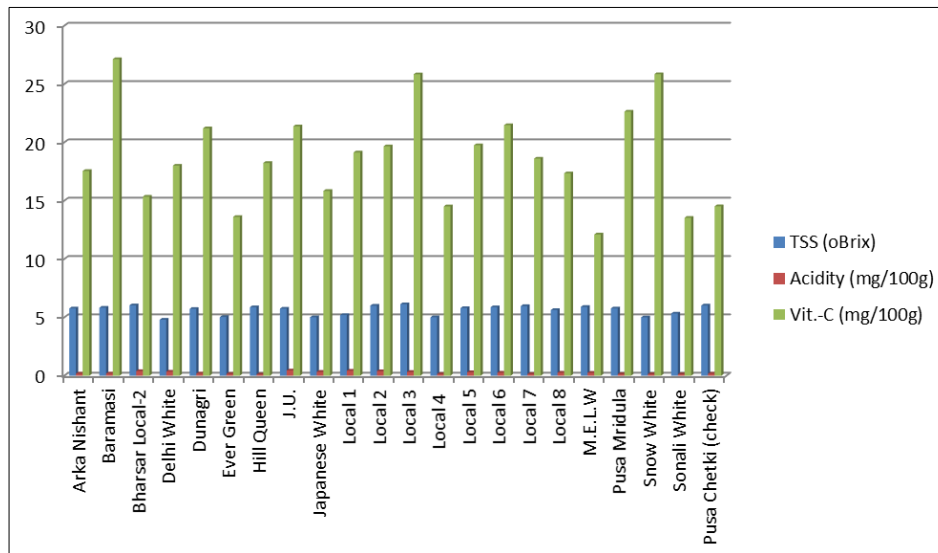


Fig 2: Variation in quality parameters of radish varieties under condition of Garhwal hills.

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