

Effect of Root Dimensions on Seed Yield and Quality of Radish (*Raphanus sativus* L.) cv. Pusa Himani in High Altitude Cold Arid Conditions of Ladakh

NARENDRA SINGH AND ZAKWAN AHMED

Field Research Laboratory, Defence Research and Development Organization, C/o 56 APO (Leh-Ladakh, J & K)
narendradrdo@yahoo.co.in

ABSTRACT The present investigation was carried out to study the effect of root dimensions (root diameter and length) on seed yield and quality of radish cv. Pusa Himani during the year 2002 and 2003 in high altitude cold arid climatic condition at Field Research Laboratory, Defence Research & Development Organisation, Leh, Ladakh (J & K). The nine treatments combinations consist of three root diameters i.e. 1.5 cm, 2.5 cm and 3.5 cm and three root lengths i.e. 24 cm (full root), 16 cm and 8.0 cm (upper portion of the root) were evaluated during the experimentation. The result indicated that the root dimension had influence on plant height, number of branches, number of pods per plant and seed yield. However, survival percentage, number of seeds per pod and test weight had no significant effect during both the years. High seed yield was recorded with 3.5 cm diameter and 16 cm length of root.

Key words: Radish, root size, seed yield, high altitude and cold arid condition

Cultivation is practiced at 9000-14000 ft altitude in Ladakh region. During winter (Oct-April) temperature goes sub-zero, therefore only one crop (May-Sep.) is grown in the region. In this short period of time radish cv. Pusa Himani could produce good quality root but these roots needs to be stored during winter for planting in next season to produce the seed. It is found that the radish cv. Pusa Himani has poor storability hence can not be stored during long period of winter of Leh-Ladakh. In order to grow the radish especially the cv. Pusa Himani there is an urgent need to strengthen the local availability of quality seed.

MATERIALS AND METHODS

The experiments were conducted in main cropping season (May-October) during 2002 and 2003 at the experimental field of Field Research Laboratory, Defence Research and Development Organization, Leh-Ladakh (J&K). The sowing of seed was done in first week of March in

underground poly-trench for root production in both the years. The roots were ready for lifting in last week of May. After lifting the roots, true to type roots were selected and tops were removed keeping 5cm leaf portion intact with the root. The experiment was conducted with nine treatment combinations consisting of root diameters i.e. 1.5cm, 2.5cm and 3.5cm measured at 4.5cm below from upper end of the root and length of root i.e. 24cm (full size), 16cm and 8cm (upper portion of the root) in randomized block design with three replications. The root were planted in flat bed of 2.4m x 1.8m size at a spacing of 60cm x 45cm. 300 q/ha FYM and 40:60:60 kg N: P: K per ha were applied at the last ploughing and 40 Kg N per ha was given by top dressing after 45 days of planting. The crop was raised in irrigated conditions and all necessary standard agronomical practices were followed. The growth and seed yield parameters were recorded at harvest. Seed yield (q/ha) was calculated on gross plot. The crop was harvested

in first week of October in 2002 and in second week of October in 2003.

RESULTS AND DISCUSSION

The data presented in table 1 showed that the difference in diameter and length of root had no significant effect on survival percentage of the plants. However, plant height, number of primary and secondary branches per plant were significantly influenced with various diameter and length of root. Maximum plant height of 167.1cm (mean of both the years) was recorded with 3.5cm root diameter. Medium root length (16cm) recorded 159.1cm plant height which was significantly superior over 24cm and 8cm root lengths. The superiority of higher root diameter (3.5cm) on growth characters could be possibly due to presence of more food substrates available for initiation of early, plant sprout and better growth. The higher vegetative growth recorded at 16cm root length that might be due to quick establishment of the root. These results are in agreement with the findings of earlier workers [1, 2].

Number of primary branches per plant increased with increasing diameter of the roots,

hence, highest numbers of primary branches per plant (14.0) were recorded with 3.5cm diameter. The 16cm root length had produced significantly more number of primary branches compared to full and 8cm root length treatments. More number of branches per plant with 3.5cm root diameter and 16cm length may be attributed to better vegetative growth of the plants under the treatments. Similar trend was also recorded in case of secondary branches per plant and maximum secondary branches (38.3 and 33.2) were recorded with 3.5cm diameter and 16cm length of the root, respectively. The higher number of secondary branches per plant might be due to good growth and more number of primary branches per plant. Higher number of branches per plant also recorded with higher (60cm x 45cm) plant spacing in seed crop of radish [1] and carrot [3].

The data presented in table 2 indicates that high diameter of root produced significantly higher number of pods per plant (1098.8) as compared to other treatments. The 16cm root length recorded highest number of pods per plant (909.5), however number of pods per plant under 8cm root length was at par with 24cm. The higher

Table 1. Effect of different root diameter and length on growth and yield parameters in radish cv Pusa Himani

Treatment	Survival (%)			Plant height (cm)			No. of primary br./plant			No. of secondary br./plant		
	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
Diameter of root (cm)												
1.5	97.21	95.34	96.27	119.4	127.7	123.5	6.6	9.0	7.8	20.4	21.4	20.9
2.5	93.46	98.13	95.79	149.7	152.3	148.5	10.0	13.2	11.6	25.4	25.9	25.6
3.5	94.39	97.21	95.8	164.8	169.4	167.1	11.9	16.1	14.0	36.9	39.7	38.3
C.D (0.05)	NS	NS	4.65	3.27	0.97	1.33	2.48	2.15				
Length of root (cm)												
24	91.66	96.27	93.96	141.2	148.4	144.8	8.5	7.3	7.9	25.8	26.5	26.5
16	97.20	99.07	98.13	155.9	162.3	159.1	12.3	17.9	15.1	32.0	34.4	33.2
8	96.20	95.36	95.78	131.8	138.6	135.2	7.8	13.1	10.4	25.0	26.0	25.5
C.D (0.05)	NS	NS		4.65	3.27		0.97	1.33		2.48	2.15	

Table 2. Effect of different root diameter and length on seed yield attributes in radish cv Pusa Himani

Treatment	No. of pods/ plant			No. of seeds/ pod			1000-seed wt. (g)			Seed yield (q/ha)		
	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
Diameter of root (cm)												
1.5	496.6	480.9	480.9	5.2	5.4	5.3	10.4	10.5	10.45	10.15	10.39	10.27
2.5	716.2	726.1	726.1	5.5	5.5	5.5	10.6	10.6	10.06	16.09	15.04	15.56
3.5	1097.4	1092.3	1093.8	5.5	5.9	5.7	10.6	10.7	10.65	23.24	21.68	22.46
CD (0.05)	120.5	69.63		NS	NS		NS	NS		0.932	1.62	
Length of root (cm)												
											0.636	
24	693.5	709.9	701.7	5.5	5.5	5.5	10.3	10.1	10.2	15.30	14.43	14.86
16	915.0	904.1	909.5	5.4	5.6	5.5	10.8	11.0	10.9	19.17	18.60	18.88
8	699.7	685.3	692.5	5.4	5.7	5.6	10.5	10.4	10.45	15.01	14.08	14.54
CD (0.05)	120.25	69.63		NS	NS		NS	NS		0.932	0.636	

number of pods per plant under 3.5cm diameter and 16cm length of the root treatment might be due to more number of primary as well as secondary branches per plant as compared to other treatments. The data recorded on number of seeds per pod had no significant influence with the different diameter and length of root indicating that the seed quality under 3.5cm root diameter and 16cm root length was as good as that with other treatments.

The highest seed yield 22.46 q/ha (mean of both the years) was recorded with 3.5cm diameter of root which was significantly superior over 2.5cm and 1.5cm diameter of root and they yielded seed 15.56 and 10.27 q/ha, respectively. Length of root also influenced the seed yield significantly. Higher seed yield 18.88 q/ha (mean of both the years) was recorded under 16cm root length, which showed significant superiority over 24cm (14.86 q/ha) and 8cm (14.54 q/ha) root length treatments. However the seed yield under the treatment 8cm root length was at par with 24cm root length treatment.

The highest seed yield with greater diameter and medium size length might be attributed due to early emergence, better plant growth and more number of pods per plant in comparison to other respective treatments. Similar finding was reported by Malik *et al.* [1]. From this study it can be concluded that 3.5cm diameter and 16cm length of root are optimum to obtain maximum seed yield of radish cv. Pusa Himani under high altitude cold desert climatic conditions.

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