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Research Article

EFFECT OF DIFFERENT LEVELS OF SULPHUR ON GROWTH, YIELD AND QUALITY OF SOME RADISH VARIETIES

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Abstract- The present experiment was carried out at the Horticulture Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow, Uttar Pradesh, India during the year 2014-2015. The plant to plant and row to row spacing were maintained at 30 x10 cm respectively. The experiment was carried under Randomized Block Design (RBD) with three replications. The three varieties are Pusa Mridula, Pusa Chetki, Pusa Desi, and three different doses of Sulphur *viz.* 15, 30, 45 Kg were used for making treatment combination. The treatment combinations were Pusa Mridula + No sulphur, Pusa Mridula + 15 kg sulphur, Pusa Mridula + 30 kg sulphur, Pusa Mridula + 45 kg sulphur, Pusa Chetki + No sulphur, Pusa Chetki + 15 kg sulphur, Pusa Chetki + 30 kg sulphur, Pusa Chetki + 45 kg sulphur, Pusa Deshi + No sulphur, Pusa Deshi + 15 kg sulphur, Pusa Deshi + 30 kg sulphur, and Pusa Deshi + 45 kg sulphur. On the basis of overall performance under the present investigation, if may be concluded that the application of 4 kg sulphur in Pusa Desi (T_{12}) increased the growth, yield and nutritional quality of Radish under Lucknow condition.

Keywords- Radish, Sulphur, Yield and quality

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Introduction

Among the vegetable crops, Radish (*Raphanus sativus* L.) is the most important root vegetable, belonging to the family Cruciferae, is one of the most important universally cultivated root crops. The mode of pollination is entomophilies. The radish is very useful as intercrops or companion crops between rows or plants of slower growth. The tops (leaves) and roots are used as salad or cooked as vegetables in various ways. According to Purewal [1], it has cooling effect, prevents constipation, increases appetite and is tasteful when roots and leaves are cooked together. It is also considered to be useful for patients suffering from piles, liver trouble, enlarged spleen and jaundice. Red coloured roots are also found which are higher in ascorbic acid content. The pungency in radish is due to the presence of volatile isothiocynates and red colour due to anthocyanin pigment. It provides protein, carbohydrates, minerals vitamins A and C and roughage which constitute the essentials of balanced diet. Surveys carried out in different parts of country have shown that the chief deficiencies in our diet are calories, vitamin A and riboflavin. Sulphur has been known for its role in the synthesis of carbohydrates, proteins, vitamins, oils and flavor compounds. Sulphur is an essential input to sustain yields in many Indian soils due to widespread deficiency of sulphur reported in many districts. Sulphur is recognized as fourth major pant nutrient after N, P and K for the crop cabbage by Bhagavantagoudra et al. [2]. Tondon and Andrew [3] has been reported that cruciferous crops have shown improvement in the yield and quality through application of sulphur under field conditions. Tenbrunsel et al. [4] done a study was initiated to find out the effect of sulphur on yield and quality of radish. Omprakash et al. [5] found a good response to sulphur application has been reported by few workers with respect of cole crops but these responses has been founded to vary widely due to difference in location, soil types, available sulphur status, source of sulphur, genotypes growth conditions and crop management. Under normal agro- climatic condition the varieties which is most suitable and in which organic manure is supplied are the two chief factor which influence yield and quality of radish. Sulphur is essential in the biosynthesis of secondary metabolites with high nutritional value that typically accumulate in brassica species. Among these, glucosinolates are the most representative. The level of glucosinolates in these plants is highly dependent on genetic factors as well as environmental determinants, such as the available soil sulphur content.

MaterialsandMethods

The field experiment was carried out during winter season of 2014-15. The experiment was conducted at Horticulture Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University Vidya-Vihar, Rae Bareli Road, Lucknow, UP. The plant to plant and row to row spacing were maintained at 30 x10 cm respectively. The experiment was carried under Randomized Block Design (RBD) with three replications. The Size of each plot kept 1.50 x 1.0m. and total no of plots 36. The area of experimental field was 120 m2. The three varieties are Pusa Mridula, Pusa Chetki, Pusa Desi, and three different doses of Sulphur *viz.* 15, 30, 45 Kg were used for making treatment combination. The treatment combinations were Pusa Mridula +No sulphur, Pusa Mridula + 15 kg sulphur, Pusa Mridula + 30 kg sulphur, Pusa Mridula + 45 kg sulphur, Pusa Chetki + No sulphur, Pusa Chetki + 15 kg sulphur, Pusa Chetki + 30 kg sulphur, Pusa Chetki + 45 kg sulphur, Pusa Deshi + No sulphur, Pusa Deshi + 15 kg sulphur, Pusa Deshi + 30 kg sulphur, and Pusa Deshi + 45 kg sulphur. The observations were recorded on plant height (cm), number of leaves, length of leaves(cm) , root weight (g), length of root (cm), root diameter (cm), fresh weight (g), dry weight of leaves (g), yield (q/ha), ascorbic acid(mg/100g), reducing sugar,

non reducing sugar , total sugar and Total Soluble Solids. Vitamin C contents of fruits were determined by indo phenol dye extraction method [7].

Results and Discussion

Results of present investigation are summarized here which clearly showed the similarities and variation in respect of growth [Table-1] yield and quality parameters [Table-2] At 45 days after transplanting maximum plant height was recorded in T10 (17.00) followed by T10 (43.20) and minimum T2 (16.73) but found statistically at par. At 30 days after transplanting maximum plant height was recorded in T12 (16.80) followed by T10 (16.80) and minimum T2 (12.50). At 45 days after transplanting maximum number of leaves was also recorded in T12 (22.29) followed by T10 (21.22) and minimum T1 (11.30). The length of root under different treatments continued to increase till harvest and the maximum rate of root development take place during maximum length (66.47) was obtained under T6 followed by T7 (66.34). The increase in root length and diameter of radish in sulfur applied plots might be due to the higher production of metabolites and increase in meristamatic activity Arumugam and Sriramachandra sekharan [8]. No significant difference was noted between T12 and T9, T5, T10 and amongst T6, T2, T8 and T1 the minimum roots were recorded under the plants, which were in Pusa Chetki and 45 Kg of Sulphur. The maximum middle diameter of roots was recorded in T11 (3.90) followed by T1 (3.85) and minimum T8 (3.14) but found statistically at par. The mean values displayed clearly that Pusa Desi + 45 Kg Sulphur produced the maximum yield of roots (117.52) which was significantly higher than the values obtained under other treatments. The plant under No Sulphur dose provided with variety Pusa Mridula registered the minimum yield (73.04). The data recorded on the yield of whole plant were analyzed statistically. It is evident from the mean values presented in that treatment of T12 (Pusa Desi + 45 Kg Sulphur) dose exhibited the maximum values (117.52) followed by T6 (111.36) from Pusa Chetki + 15 Kg Sulphur and the minimum values recorded under T6. It was observed that T8 treatment increased the reducing sugar significantly over other. The maximum reducing sugars observed under T8 treatment followed by T12. Data on ascorbic acid revealed that there was remarkable increase in its content due to some of the treatments. There was significant rise under T7 treatment followed by T10 treatment. The minimum percent of ascorbic acid was recorded under control T1.

Table-1 *Effect of different levels of sulphur on growth of radish varieties*

S. No.	Treatments	Plant height (cm)			Number of leaves			Length of leaves (cm)		
		15 DAT	30 DAT	45 DAT	15 DAT	30 DAT	45 DAT	15 DAT	30 DAT	45 DAT
1.	T_1	8.00	15.00	25.08	5.17	8.00	11.30	6.00	10.16	13.27
2.	T_2	9.50	12.50	16.73	7.27	9.50	14.50	6.00	11.67	14.34
3.	T_3	15.00	13.93	27.50	6.34	11.90	16.18	8.00	12.54	16.34
4.	T_4	13.00	14.69	27.42	8.50	9.10	13.25	5.33	14.03	17.20
5.	T_5	22.66	14.80	29.14	7.24	11.50	13.17	5.60	12.26	17.42
6.	T_6	17.00	13.22	26.81	8.60	11.20	14.50	6.06	13.68	16.77
7.	T_7	11.00	13.27	23.23	8.60	12.10	17.35	5.80	13.65	16.30
8.	T_8	11.16	13.76	26.21	8.40	10.60	15.60	7.50	12.78	16.09
9.	T_9	15.00	14.35	33.99	13.30	16.26	17.55	7.14	7.41	12.50
10.	T_{10}	25.00	16.36	43.20	12.76	17.00	21.22	6.70	13.47	18.50
11	T_{11}	49.00	12.70	66.82	6.10	11.30	16.80	5.50	13.11	14.04
12	T_{12}	28.50	16.80	39.22	8.20	7.70	22.29	8.13	12.17	18.91
S.E ±		**8.16**	**1.21**	**9.27**	**1.74**	**1.85**	**2.39**	**0.96**	**1.41**	**1.44**
C.D. at 5%		**16.57**	**2.47**	**18.83**	**3.53**	**3.74**	**4.85**	**1.96**	**2.86**	**2.93**

Table-2 *Effect of different levels of sulphur on yield and quality of radish varieties*

S. No. I. No	Treatments	Root weight per plant (g)	Root length (cm)	Root diameter (cm)			Fresh weight (g)	Dry weight	Yield (q/ha)	Ascorbic acid (mg/100g)	Reducing sugar(g)	Non-reducing sugar	Total sugar	T.S.S
				Upper side	Middle side	Lower side								
1.	T_1	92.54	46.43	2.94	3.85	0.86	68.20	3.25	73.04	5.97	2.15	11.10	11.40	1.60
2.	T_2	136.92	41.97	2.30	3.27	1.42	84.00	4.03	103.99	7.40	2.24	15.27	15.53	3.10
3.	T_3	161.09	47.31	2.39	3.65	1.56	95.36	3.40	93.12	6.83	2.20	13.46	15.35	4.20
4.	T_4	159.53	51.84	2.44	3.17	1.65	67.81	3.53	94.66	7.17	2.20	15.51	15.67	3.80
5.	T_5	157.86	42.69	2.58	3.42	1.09	90.58	4.23	92.92	6.97	2.05	13.24	15.32	4.23
6.	T_6	183.34	60.47	2.41	3.57	1.65	73.03	5.43	111.36	7.47	2.39	14.96	13.86	3.03
7.	T_7	143.04	66.34	2.81	3.24	1.29	83.42	3.60	100.64	8.21	2.29	13.60	16.04	2.43
8.	T_8	169.63	40.13	2.50	3.14	1.27	112.50	3.36	100.22	7.33	2.67	16.15	17.41	3.43
9.	T_9	172.64	52.44	2.60	3.49	1.67	108.51	6.15	99.29	7.27	2.52	12.90	18.39	2.67
10.	T_{10}	148.65	48.66	2.67	3.41	1.69	82.75	4.32	98.94	8.15	2.37	12.52	15.41	3.43
11	T_{11}	159.13	48.4	2.69	3.90	0.65	80.25	5.26	83.26	7.19	2.23	11.75	14.65	4.07
12	T_{12}	198.31	56.32	2.45	3.56	0.68	85.70	5.32	117.52	8.12	2.62	17.99	18.55	4.27
S.E ±		**18.66**	**7.52**	**0.182**	**0.21**	**0.330**	**7.325**	**0.14**	**8.56**	**0.49**	**0.15**	**1.46**	**1.50**	**0.60**
C.D. at 5%		**37.88**	**15.27**	**0.371**	**0.43**	**0.670**	**14.87**	**0.42**	**17.38**	**0.99**	**0.31**	**2.97**	**3.05**	**1.22**

Conclusion

On the basis of present investigation, it may be concluded that by the application of 45 Kg sulphur was the best for the variety in Pusa Desi (T_{12}) for good growth, root yield and quality.

Conflict of Interest: None declared

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