



## Effect of boron on growth, yield, protein and ascorbic acid content of radish (*Raphanus sativus* Linn.)

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### Abstract

A field trial on effect of boron on growth, yield, protein and ascorbic acid content of radish (*Raphanus sativus* Linn.) was carried out at the experimental farm of the Department of Horticulture, AKS University, Satna (M.P.) India during 2014 revealed that soil application of 10kg Borax per ha increase the yield of radish roots to the extent of 42.0% and improved its quality by increasing protein and ascorbic acid content of roots considerably.

**Keywords:** Radish (*Raphanus sativus* Linn.), Boron, Yield & Quality.

### Introduction

Radish (*Raphanus sativus* Linn.) is a short duration and quick growing root crop which tops and roots both are used as salad and vegetable. The soils of Vindhya region of Satna (M.P.) are deficient in boron. Boron deficiency symptoms are commonly seen in case of cauliflower and radish particularly in this region. Result of earlier studies conducted elsewhere showed that boron influences water relations of protoplasm and absorption of calcium and formation of peptic substances in cell wall and in general carbohydrate and protein metabolism Gandhi and Mehta 1960 <sup>[1]</sup>, Kother 1963 <sup>[3]</sup>, Myszka 1958 <sup>[4]</sup> and Maurya & Maurya 2015 <sup>[6]</sup> reported that application of boron and manganese increased the ascorbic acid content of vegetables. The present investigation work was carried out to quantify the dose of borax for higher productivity and better quality of radish in agro-climate of Vindhya region of Satna (M.P.) India.

### Material and method

A field trial was laid out in randomized block design at Vegetable Experimental Farm of the Department of Horticulture, AKS University, Satna (M.P.) during the winter season of 2014. There were five levels of borax (Di- Sodium tetra borate) viz. 0, 5, 10, 15 and 20 kg per ha was replicated four times. The experimental plot soil was sandy loam, medium in fertility with a pH of 6.5. A radish variety commonly cultivated in this area and is known as Pusa Chetki was selected for this study. The sub-plot size was 2.4m x 1.8m. Spacing of 30cm x 15cm between and within the rows was followed. Seeds were sown on 15<sup>th</sup> of October 2014. A manurial dose consisting 15 tones of Farm yard manure, 50kg N, 40kg P<sub>2</sub>O<sub>5</sub> and 80 kg K<sub>2</sub>O per ha was followed. Other cultural practices were done as per recommended package of practices for radish. The crop was harvested 55 days after sowing and observations on growth and yield were recorded. Protein and ascorbic acid were analyzed as per methods suggested by Piper (1950) <sup>[5]</sup> and Jacob (1958) <sup>[2]</sup> respectively. While 100g fresh root and tops were dried in hot air oven at 90

°C till constant weight and per cent dry matter was worked out.

### Results & discussion

Data recorded on ancillary characters and yields of radish are presented in Table 1. It is clear from the data presented in Table 1 that boron influenced the growth traits such as plant heights, number of leaves, length and diameter of roots, fresh weight of tops and roots of radish significantly. Borax at a rate of 10kg per ha was found to be significantly superior regarding growth parameters as compared to control. However application of higher dose of borax reduces the growth parameters considerably. Treatments 15kg and 20kg borax were found to be at par regarding length and diameter of roots and fresh weights of tops. These results are in conformity of the findings of Skok (1941) <sup>[8]</sup> and Maurya & Singh (1985) <sup>[7]</sup> and Maurya & Maurya (2015) <sup>[6]</sup> who observed that boron influence the growth of radical of plants

As regards the yield of root, treatment 10kg borax per ha found to be superior with an increase of 42 percent over control. Treatment 5kg borax recorded 26.8 percent higher yield over control. Similar results were also obtained by White and Stevens (1941) <sup>[9]</sup> in case of radish, table beet and cauliflower.

The data on percent dry matter, protein and ascorbic acid contents are presented in Table 2. Boron influenced the dry matter production, protein and ascorbic acid contents of both tops & roots of radish. These quality components were significantly higher under 10kg of borax per ha while lower in control. When dose of borax was increased beyond 10kg per ha the percentage of dry matter, protein and ascorbic acid decreases gradually. It may be due to detrimental effect of higher doses. Kother (1963) <sup>[3]</sup> reported that plants well supplied with boron took up and stored more carbohydrate and nitrogen due to which per cent dry matter and protein increased in the roots and tops of radish. Gandhi & Mehta (1960) <sup>[1]</sup> also reported the similar results. Myszka (1958) <sup>[4]</sup> reported that Vitamin –C increased in vegetables due to application of judicious doses of boron and manganese.

In light of above findings it is concluded that application of 10 kg boron per ha increased the yield of radish roots and

improved its quality by increasing protein and ascorbic acid considerably.

**Table 1:** Effect of boron on ancillary characters & yield of radish.

Treatments Levels of Borax(kg/ha)	Plant Height (cm)	No. of leaves per plant	Length of roots (cm)	Diameters of roots (cm)	Fresh weight of Tops(g/plant)	Fresh weight of roots(g/plant)	Yield of roots (q/ha)	Response of boron over control (%)
0 Control	48.25	12.34	18.12	4.09	217	129.50	287.77	-
5	51.46	14.18	23.66	5.10	250	164.20	364.88	26.8
10	55.15	18.40	27.88	6.50	300	183.89	408.64	42.0
15	54.80	17.02	26.14	5.12	284	177.45	394.33	37.02
20	52.18	16.00	25.00	5.84	279	169.96	377.68	31.25
C.D.(P=0.05)	2.17	0.92	1.60	0.67	15.16	6.17	10.12	-

**Table 2:** Effect of Boron on percent dry matter, protein and ascorbic acid content of tops and roots of radish

Levels of Borax (Kg/Ha)	Tops			Roots		
	Percent dry matter	Protein on dry wt. basis (%)	Ascorbic acid (mg/100g fresh tops)	Percent dry matter	Protein on dry wt. basis (%)	Ascorbic acid (mg/100g fresh tops)
0 Control	9.81	35.79	20.51	6.00	16.26	24.56
5	10.54	39.14	23.82	7.86	18.34	26.78
10	13.25	51.88	26.81	9.40	21.98	28.89
15	22.04	39.47	26.87	8.22	19.90	27.55
20	11.82	38.06	25.99	8.06	18.66	24.40
C.D.(P=0.05)	1.09	2.31	1.13	0.971	2.01	2.10

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