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E: ISSN NO.: 2349-980X **Shrinkhla Ek Shodhparak Vaicharik Patrika**

Effect of Foliar Application of Micronutrients on Growth, Yield and Quality of Radish (Raphanus Sativus L.) cv. Kashi Hans

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Abstract

The field investigation was conducted during the year 2018-2019 at Raja Balwant Singh College, Bichpuri, Agra, U.P. to find out the effect of foliar application of micro nutrients T_1(Zn 0.4%), T_2 (Fe 0.4%), T_3 (Cu 0.2%), T_4(Bo 0.5%), T_5 (Zn + Fe 0.4% + 0.4%), T_6 (Zn + Cu 0.4% + 0.2%), T_7 (Zn + Bo 0.4% + 0.5%), T_8 (Zn + Fe + Cu + Bo 0.4% + 0.4% + 0.2% + 0.5%), T_9 (Control). Radish responded significantly to the application of Zn, Fe, Cu and Bo. Foliar application of Zn 0.4% + Fe 0.4% + Cu 0.2% + Bo 0.5% resulted in the production of significantly taller plant, number of fully open leaves, longest leaves, maximum width, fresh weight of leaves, fresh weight of roots, length of storage root, diameter of storage roots,maximum root yield (401.79 q/ha), marketable plant per net plot and dry matter content. Overall result showed that (Zn 0.4% + Fe 0.4% + Cu 0.2% + Bo 0.5%) was the best suitable doses for obtaining higher yield and quality of radish var. Kashi hans under Agra like climate conditions.

Keywords: Zinc, Boron, Iron and Copper, Nitrogen, Phosphorus, Potassium, Radish Root Yield.

Introduction

Radish (*Raphanus sativus* Linn) is one of the most popular root crop of the rabi season and widely acclaimed for its excellent nutritive and medicinal values. It belongs to family brassicaceae. Radish roots are rich in many minerals, they play an important role in the human body's metabolism. It is low caloric vegetable contains various vitamins such as vitamin A, B, C and use as salad. Boron plays a significant role in the physiological and biochemical processes within plant. The role of boron in carbohydrate metabolism, translocations of sugars and formations of chlorophyll in plants has already bean well establishment (Tariq *et al.* 2006). If the amount of available zinc is adequate, plant will not suffer from physiological stress. Zinc plays the vital role in other metabolic functions of plant (Alloway 2008).Copperbeing the stable factor of various enzymes and proteins, copper plays an indispensable role in regulating several metabolic and physiological processes of plant (Rehm and Schmitt 2002). Iron is an unavoidable and one of most prominent contituents of number of proteins and enzymes, that plays important roles in key metabolic processes including cellular respiration, oxygen transport and lipid metabolism (Adamski *et al.* 2012).

Materials and Methods

A field experiment was conducted during rabi season 2018-2019 at R.B.S. College research farm Agra. The experimental site was clay loam in texture with pH 8.15, organic carbon 0.36, available nitrogen 166.45 kg/ha,P_2O_5 30.0 kg/ha, K_2O 207.0 kg/ha. The experiment was laid out in simple RBD and replicated thrice. The treatments T_1 (Zn 0.4%), T_2 (Fe 0.4%), T_3 (Cu 0.2%), T_4(Bo 0.5%), T_5 (Zn + Fe 0.4% + 0.4%), T_6 (Zn + Cu 0.4% + 0.2%), T_7 (Zn + Bo 0.4% + 0.5%), T_8 (Zn + Fe + Cu + Bo 0.4% + 0.4% + 0.2% + 0.5%). The gross and net plot size of experiment were 2.0m × 1.6m and 1.2m × 1.4m respectively. Radish variety Kashi hans sown in spacing of 40 × 10cm with 10kg/ha seed rate. The recommended dose of NPK 100:60:80 kg/ha respectively was incorporated in soil. The observation data on growth, yield attribute and yield were recorded at harvesting. The crop was sown in the 1st weekofNovemberand harvested in the 3^{third}week of December month.

Results and Discussion

The data regarding vegetative growth, yield and quality of radish are presented in Table- 1 shows that different treatments attributes showed significant effect on various growth attributes. The significantly maximum plant height (52.36 cm), number of fully open leaves per plant (14.10) length of longest leaf (44.94cm), witch of longest leaf (11.68cm), fresh weight of leaves (180.83 g) and dry matter were recorded under T_8 (Zn + Fe + Cu + Bo 0.4% + 0.4% + 0.2% + 0.5%) followed by T_5 (Zn + Fe 0.4% + 0.4%) and T_6 (Zn + Cu 0.4% + 0.2%) which were found at par to each other where as, minimum plant height (39.72 cm), number of fully open leaves per plant (9.10), length of longest leaf (39.02 cm), width of longest leaf (9.69 cm), fresh weight of leaves (93.80 g) dry matter of leaves (8.98%) were recorded with T_9 control. These finding are in the close proximity to the results by Prasad *et al.* (1987), Sharma *et al.* (2000) and Mishra and Yadav (2009) in reddish. The favourable effect of micronutrients on plant growth might be due to their role in many physiological processes and cellular functions within plants. In addition, they also played an important role in improving plant growth through biosynthesis of endogenous hormones which are responsible for promoting of plant growth (Singh et al.2014).

Examination of data presented in Table- 2 revealed that all the treatments weresignificantly better in respect of fresh weight of root (g), length of root (cm), diameter of root (cm), dry matter contentof root (%), number of marketable root (%), yield (q/ha) as compare to control. The maximum fresh weight of root (198.66 g) observed under T_8 (Zn + Fe + Cu + Bo 0.4% + 0.4% + 0.2% + 0.5%) followed by T_5, T_6 and T_7 was statistically at par, the maximum length of storage root (26.44 cm), diameter of storage root (4.06 cm) were measured with T_8 (Zn + Fe + Cu + Bo 0.4% + 0.4% + 0.2% + 0.5%) followed by T_5, T_6 and T_7 which was found at par. The maximum significantly dry matter content of root (8.02%), number of marketable root (91.46%), number of unmarketable root (8.54%), yield (401.79 q/ha) were recorded with T_8 (Zn + Fe + Cu + Bo 0.4% + 0.4% + 0.2% + 0.5%) treatment followed by T_5 (Zn + Fe 0.4% + 0.4%), T_6 (Zn + Cu 0.4% + 0.2%) and T_7 (Zn + Bo 0.4% + 0.5%). The significantly minimum fresh weight of root (113.98 g), length of storage root (21.81 cm), diameter of root (3.15 cm), dry matter content of root (5.68%) number of marketable root (82.28%), number of unmarketable root (17.71%), yield (314.09 q/ha) were recorded with T_9 (control). These results are in close consonance with the results of Maurya and Singh (1985),Naguib *et al.* (2003), due and Deepika (2015). Higher root yield of radish was achieved due to the application of micronutrients which are known to increase photosynthetic activity and metabolic contents of leaves and thus improves the quality and yield of the roots.

Kumar, et. al. (2006) who reported that the increasing nutrition by micro-nutrients led to significant increase in yield contributory characters and consequently radish root yield.

Table No. 1 :- Effect of Micro Nutrients on Vegetative Growth of Radish

Treatments	Plant height (cm)	Number of fully open leaves per plant	Length of longest leaf (cm)	Width of longest leaf (cm)	Fresh weight of leaves (g)	Dry matter content of leaves (%)
T_1	43.52	11.69	41.34	10.86	121.70	10.07
T_2	42.04	11.24	41.17	10.81	111.07	9.52
T_3	42.62	11.16	40.40	10.28	102.78	9.40
T_4	42.39	11.22	39.62	10.14	102.41	9.27
T_5	48.74	12.96	44.62	11.33	135.75	10.32
T_6	47.54	12.31	44.64	11.30	133.14	10.28
T_7	47.09	12.09	42.69	11.30	130.97	10.27
T_8	52.36	14.10	44.94	11.68	180.83	10.58
T_9	39.72	9.10	39.02	9.69	93.80	8.98
SEm ±	**1.161**	**0.37**	**0.74**	**0.51**	**2.75**	**0.52**
CD at 5%	**3.48**	**1.12**	**2.22**	**1.52**	**8.23**	**1.56**

Table No. 2 :- Effect of micro nutrients on yield and quality of Radish

Treatments	Fresh weight of root (g)	Length of storage root (cm)	Diameter of root (cm)	Dry matter content of root (%)	No. of marketable root (%)	No. Of unmarketable root (%)	Yield (q/ha)
T_1	138.73	24.10	3.41	7.00	86.46	13.56	364.75
T_2	135.63	23.78	3.27	6.97	86.46	14.59	357.14
T_3	132.73	23.37	3.26	6.93	85.40	14.59	342.41
T_4	126.01	22.36	3.24	6.60	85.40	14.59	333.23
T_5	169.50	25.50	3.61	7.57	87.71	10.40	381.48
T_6	166.36	25.40	3.52	7.30	87.50	12.50	377.44
T_7	140.08	24.74	3.34	7.17	86.46	13.56	371.88
T_8	198.66	26.44	4.06	8.02	91.46	08.54	401.79
T_9	113.98	21.81	3.15	5.68	82.28	17.71	314.09

SEm ±	**3.08**	**0.75**	**0.16**	**0.60**	**0.33**	**0.60**	**4.75**
CD at 5%	**9.22**	**2.24**	**0.48**	**1.80**	**1.00**	**1.80**	**14.23**

Conclusion

It is concluded that for improving the growth, yield and quality of radish and to maintain the soil productivity, the use of different micro nutrients in combination is recommended. The result revealed that the foliar application of micro nutrients T_8 (Zn 0.4% + Fe 0.4% + Cu 0.2% + Bo 0.5%) should be sprayed twice at 15 and 30 days after sowing separately along with the soil application of recommended dose of fertilizers for better growth, yield and market quality of radish. Yield and net profit both are the important for a farmer, therefore the foliar application of Zn 0.4% + Fe 0.4% + Cu 0.2% + Bo 0.5% (T_8) is recommended for the profitable production of radish cv. Kashi hans under Agra like condition.

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