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EFFECT OF BORON AND MOLYBDENUM ON YIELD AND UPTAKE OF NUTRIENTS IN RICE

The response of rice to application of micronutrients varies with the status of micronutrients in the soil, crop variety and nutrient interactions. While significant increase in straw yield was obtained by the application of B in a red loam soil of Kerala by Sreedharan and George (1969), positive response of rice to Mo application was reported by Ponnamperuma (1977) in an organic soil. But most of the studies revealed lack of significant increase in grain and straw yield of rice by the application of B and Mo either individually or in combination with other micronutrients (George and Sreedharan, 1966; Grewal *et al.*, 1969; Shukla and Mishra, 1976). This investigation was taken up to obtain conclusive results on the influence of these micronutrients on the growth, yield and uptake of nutrients in rice.

A field experiment was conducted at the Agricultural Research Station, Mannuthy, Kerala, using rice variety Jyothi during the kharif and rabi seasons of 1991. The soil was sandy clay loam in texture and the experiment was laid out in randomised block design with ten treatments replicated thrice.

The treatments applied were;

1 Control (No micronutrients)
2 Zinc ($ZnSO_4$ 20 kg ha^{-1} in soil + 1% foliar)
3 Manganese (Manganous sulphate monohydrate 2.5 kg ha ' in soil + 0.5% foliar)
4 Boron (Boric acid 750 g ha^{-1} in soil + 0.1% foliar)
5 Copper (Cupric sulphate 5 kg ha^{-1} in soil + 0.1% foliar)
6 Molybdenum (Sodium molybdate 1.25 kg ha^{-1} in soil + 0.1% foliar)
7 Sulphur (Biologically activated with *Thiobacillus* sp. and *Aspergillus avomerii* 10 kg ha^{-1} in soil + 1% foliar)
8 Magnesium ($MgSO_4.7H_2O$ 20 kg ha^{-1} in soil + 1% foliar)
9 Combination of nutrients given in the above treatments
10 Stanes Microfood (1.25 kg ha^{1} in soil + foliar)

Soil application of the treatments was done 15 days after transplanting and foliar application @ 250 1 ha^{-1} was done at the active physiological stage. Application of N, P and K at the recommended dose of 90:45:45 kg ha^{-1} and other cultural practices were done uniformly in all the treatments as per the package of practice recommendations (KAU, 1989). Soil and plant samples were collected at different stages of crop growth for chemical analyses. Available B in the soil was extracted by hot water treatment and estimations made colorimetrically by curcumin method. Estimation of available Mo in soil was done by extracting with ammonium oxalate solution (pH 3.3) followed by colorimetric determination by thiocyanate orange red colour method (Jackson, 1958). Determinations of B and Mo in plant samples were made colorimetrically by curcumin method and thiocyanate colour method, respectively. Yields of grain and straw were subjected to analysis of variance technique for RBD (Panse and Sukhatme, 1985).

The yield of grain, even though did not increase significantly, was higher than that in the control by the application of B in both seasons (Table 1). Plots which received Mo application stood on par with the control in grain yield in the first crop whereas it was better than the control in the second crop. Both the treatments failed to increase the grain yield significantly in both the seasons. The straw yield also followed a similar trend. Application of B and Mo did not influence the straw yield significantly thus revealing the lack of effect of application of these trace elements on the growth and yield of rice. This may be due to the optimum availability of these micronutrients from the soil to meet the requirement of the plants. The results of the present study are in agreement with that of most of the earlier studies reported (George and Sreedharan, 1966; Sarkar and Chakraborty, 1980).

The availability of B and Mo in soil after treatment application, the nutrient content of

Table 1. Yield of grain and straw of rice, kg ha^{-1}

Tr. No	First crop		Second crop	
	Grain	Straw	Grain	Straw
1	2065	4049	2813	2808
2	1774	3663	2486	2628
3	2127	3731	2813	2551
4	2314	3961	2964	3100
5	2314	3770	2943	2757
6	2087	3416	3005	2907
7	2460	4197	2689	3221
8	2276	3680	2709	2662
9	2232	3712	3185	2955
10	2696	3755	2464	2620

straw and the total uptake (grain + straw) of these nutrients in rice are presented in Table 2. Even though, the available B content of soil showed inconsistent trend, its content in the straw of B applied plots was the highest (122.3 ppm). The total B uptake in these plants was the second highest among the various treatments tried. In the case of Mo applied plots, even though a slightly higher

Table 2 Availability of B and Mo in soil after treatment application and uptake of B and Mo in rice

Tr. No	Boron			Molybdenum		
	In soil, ppm	In straw, ppm	Total uptake kg ha^{-1}	In soil, ppm	In straw, ppm	Total uptake kg ha^{-1}
1	2.79	116.5	0.53	2.52	2.66	12.79
2	2.56	93.2	0.46	2.80	1.68	8.14
3	0.58	46.6	0.26	3.08	1.54	8.28
4	0.47	122.3	0.59	2.66	1.26	7.42
5	0.12	58.2	0.37	3.22	2.24	11.36
6	0.23	81.5	0.38	3.64	1.40	7.12
7	2.09	110.7	0.62	3.36	1.54	9.56
8	1.17	116.5	0.51	3.08	1.40	7.06
9	2.10	104.8	0.52	2.80	1.33	7.12
10	0.93	52.4	0.35	3.08	1.40	8.18

availability was recorded, its content in straw and uptake by the crop were not considerably affected.

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REFERENCES

George, C.M. and Sreedharan, C. 1966. Micronutrient studies on paddy in kayal lands at Vellayani. *Agric. Res. J. Kerala* 4(2) : 68-72

Grewal, J.S., Randhawa, N.S. and Bhumbla, D.R. 1969. Effect of micronutrients on yield of paddy and maize. *J. Res. PAU 6 : 38-45*

Jackson, M.L. 1958. *Soil Chemical Analysis:* Prentice Hall Inc., London, p. 498

KAU, 1989. *Package of Practice Recommendations.* Directorate of Extension, Kerala Agricultural University, Mannuthy, Thrissur

Panse, V.G. and Sukhatme, P.V. 1985. *Statistical Methods for Agricultural Workers.* 4th ed., ICAR, New Delhi, p. 347

Ponnamperuma, F.N. 1977. *IRRI Research Paper Series* 8. International Rice Research Institute, Laguna, Philippines, p. 15

Sarkar, A.K. and Chakraborty, S. 1980. Effect of micronutrients on yield of major field crops grown in the Gangetic delta region. *Indian Agricst.* 24(3/4) : 259-266

Shukla, D.N. and Mishra, R.N. 1976. Response of rice to micronutrients, *Indian J. Agron* 21 : 286

Sreedharan, C. and George, C.M. 1969. Effect of micronutrients on paddy in red loam soil of Kerala. *Agric. Res. J. Kerala* 7(2) : 61-66