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Effect of foliar spray of micronutrients on yield and oil content of Indian mustard (*Brassica juncea*)

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ABSTRACT

A field experiment was conducted during the winter season (*rabi*) of 1989–90 and 1990–91 to study the effect of Zn, B and Mo on the yield and quality of Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] in acid lateritic soil of Kharagpur. Application of Zn and B along with recommended NPK increased the seed yield respectively by 26 and 18% in the first year and by 49 and 47% in the second year over NPK alone. The increase in seed yield was associated with the increase in siliquae/plant, seeds/siliqua and 1,000-seed weight. Significant increase in the oil content was also noted by the application of both Zn and B.

Acid lateritic soils are deficient in nutritional status and low in humus. The available micronutrients particularly Zn, B and Mo are relatively low. Consequently application of the nutrient elements through foliar spray at appropriate stages of growth becomes important for their efficient utilization and better performance of the crop. Hence an effort was made to find out the effect of Zn, B and Mo on growth, yield and oil content of Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson].

MATERIALS AND METHODS

The experiment was conducted during the winter season (*rabi*) of 1989–90 and 1990–91 at the experimental farm of Agriculture and Food Engineering Department, Indian Institute of Technology, Kharagpur, West Bengal, The soil was lateritic, sandy loam with 0.24% organic carbon, 0.025% total N, 4.1 ppm available P, 8.7 ppm available K, 28 ppm total Zn, 0.36 ppm totla B, 0.91 ppm Mo and pH 5.4. The experiment was carried out in randomized block design with 10 and 9 treatments respectively in first and second years, replicated 3 times (Tables 1, 2). All the treatments except the control received the recommended dose of 80 : 40 : 20 kg N : P : K/ha through urea, superphosphate and muriate of potash respectively. Zinc as zinc sulphate, B as borax and Mo as sodium molybdate were applied as per the treatments. About 500 litres of aqueous solution of each element per hectare was used with teepol as wetting agent. The micro-nutrients were sprayed at the time of

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maximum foliage of the crop. Indian mustard var. 'Varuna' was grown as test crop. The crop was sown in rows spaced 40 cm apart in the last week of October and harvested in the last week of February in both the years. The crop was irrigated twice at branching and pod-formation stage. The crop was adequately protected from insect pests and diseases.

RESULTS AND DISCUSSION

The yield components like number of siliquae/plant, seeds/siliqua and 1,000-seed weight were significantly increased by Zn

Table 1. Plant height, yield components and yield of Indian mustard as affected by micro-nutrients during 1989–90

Treatment	Plant height (cm)	Siliquae/ plant	Seeds/ siliqua	1,000-seed weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Oil content (%)
Zn	148.4	183	12.3	5.40	1,453	2,229	35.9
B	143.1	174	12.0	5.23	1,358	2,154	36.8
Mo	148.6	140	10.5	4.16	1,194	2,170	35.1
Zn + B	144.3	164	11.3	5.10	1,403	2.202	35.6
Zn + Mo	148.1	167	11.5	5.02	1,330	2,185	35.7
B + Mo	145.0	158	11.7	5.06	1,344	2,133	35.5
Zn + B + Mo	149.4	165	11.4	4.96	1,372	2,170	35.7
Zn + B + Mo + RL_4	145.4	165	11.5	5.00	1,367	2,151	36.0
RCr	107.3	66	7.7	3.08	506	1,190	28.3
$N_{80}P_{40}K_{20}$	145.3	105	9.6	4.79	1,153	2.094	33.6
LSD (P = 0.05)	14.3	16	0.2	0.20	95	169	1.8

Zn, B, Mo applied @ 500, 500 and 50 ppm respectively
PCr, Cr added to the previous crop of rice @ 60 kg P_2O_5; RL_4, lime applied to previous rice crop @ 4 tonnes/ha
Cr, Crop residue

Table 2. Plant height, yield components and yield of Indian mustard as affected by micronutrients durign 1990–91

Treatment	Plant height (cm)	Siliquae/ plant	Seeds/ siliqua	1,000-seed weight (g)	Seed yield (kg/ha)	Stover yield (kg/ha)	Oil content (%)
Zn	145.3	177.0	12.1	5.00	1,301	2.233	35.4
B	142.9	160.0	11.1	4.97	1,289	2,186	35.0
Zn + B	140.8	141.0	11.3	4.52	1,204	2,170	34.8
PS	106.1	88.0	8.2	3.47	702	1,494	29.3
Zn + B + RL_4	137.2	134.0	11.8	4.67	1,238	2,116	34.8
Zn + B + L_4	141.3	145.0	11.4	4.63	1,197	2,191	35.3
$N_{80}P_{40}K_{20}$	142.3	107.0	8.5	3.92	873	1,655	33.7
FYM	115.9	97.0	8.9	3.61	721	1,523	30.1
Control (no fertilizer)	95.3	63.0	8.6	2.88	564	1,458	27.9
LSD (P = 0.05)	16.2	27.0	1.0	0.33	103	104	1.5

PS and FYM are for paddy straw and farmyard manure respectively (applied equivalent to 40 kg P_2O_5/ha)
Numerals as suffix for L is in tonnes/ha; and for N, P and K in kg/ha
RL, Lime added to previous crop of rice

and B (Tables 1, 2). During both the years the crop was found more responsive to Zn than B. Application of Zn and B increased the seed yield by 26 and 18% in the first year and 49 and 47% respectively in the second year over NPK alone (Tables 1, 2). Significant increase in yield attributes of Indian mustard due to Zn and B application was also reported by Singh (1963) and Samui *et al.* (1980) and Tiwari and Pathak (1982). The physiological basis for increase in seed yield was mainly due to the increase in the number of siliquae/plant, seeds/siliqua and 1,000-seed weight of seeds under both Zn and B treatments. This is evident from the fact that when the application of these 2 micronutrients were withheld there was significant reduction in yield.

Application of Zn and B significantly increased the oil content (Tables 1, 2). Since zinc is considered to be essential for the activity of dehydrogenase enzyme (Hoch and Valle, 1958), any increase in oil content due to the application of $ZnSO_4$ could be expected. This is in conformity with the findings of Shukla *et al.* (1983) and Sinha *et al.* (1991). Application of lime along with micro-nutrients and crop residue either to Indian mustard or its residual effect did not show any yield advantage. The poor and stunted growth of the crop with the crop residue treatment indicates that in acid laterites application of crop residue alone is not sufficient for meeting the nutritional requirement of the crop and for improving crop growth and yield.

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