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Effect of micronutrients on yield of mulberry in sub-tropical region

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The beneficial effect of micronutrients on mulberry in tropical region under irrigated condition has been reported (Roy and Gupta, 1974; Viswanath, 1979; Lokanath and Shivashankar, 1986, Bose *et al*., 1994). Such reports under rainfed condition in sub-tropical region are probably lacking. Hence, the present experiment was conducted.

The field experiment with mulberry plants was conducted for three years under rainfed condition at Regional Sericultural Research Station, Jammu (Sub-tropical region). The plantation was raised and established with 'S_{146}' mulberry variety as bush with a spacing of 90 cm x 90 cm on sandy loam soil having pH 7.20, EC 0.227 dS/m, oxidizable organic C 0.57%, total N 0.035%, available P 8.30 kg/ha and available K 222.39 kg/ha, available Zn 0.55 ppm, available Fe 6.00 ppm, available Cu 0.40 ppm, available Mn 3.50 ppm, available B 2.0 ppm and available Mo 1.5 ppm in the year 1993. The experiment was laid out in a randomized block design with three replications. The average annual rainfall for the period of experiment was 1133 mm.

The treatments included two levels each of six micronutrients, *viz.*, iron (5.0 and 10.0 kg/ha/yr), manganese (5.0 and 10.0 kg/ha/yr), copper (5.0 and 10.0 kg/ha/yr), molybdenum (5.0 and 10.0 kg/ha/yr), boron (5.0 and 10.0 kg/ha/yr) and zinc (10.0 and 20.0 kg/ha/yr). The treatments were applied to one year old plantation in the sulphate form except for boron and molybdenum which were applied as disodium tetraborate (borax) and ammonium molybdate, respectively. The treatments were given in two split doses before spring and autumn crops, *i.e.,* one month before each harvest. Normal fertilization with 150 kg N, 75 kg P_2O_5 and 75 kg K_2O/ha/yr was provided in two split doses. The first dose of fertilizer was applied in February, before the spring crop with $^1/_2$ N, full P_2O_5 and full K_2O. The remaining half dose of nitrogen was applied in August, before the autumn crop. The N, P_2O_5 and K_2O were applied in the form of urea, diammonium phosphate and muriate of potash. In addition, a basal dose of farm-yard manure @ 10 mt/ha/yr was applied. Two harvests were taken in a year during spring and autumn seasons. The plantation was middle-pruned in December *i.e*., before the spring crop and bottom-pruned in July *i.e*., before the autumn crop. The leaf yield and yield attributes were recorded. The net profit/loss caused by micronutrients application was found by economic analysis.

Results showed that all the micronutrients (at both doses) significantly increased the leaf yield of mulberry (Table 1). Zinc @ 10.0 kg/ha/yr recorded maximum yield and there was an increase of 34.76% over the control (Table 1) followed by 33.72% with the application of boron @ 10.0 kg/ha/yr (Table 1). Their effects were statistically on par. The leaf yield was attributed by an increase in plant height, number of shoots/plant, length of leaf bearing shoot and leaf area. Bose *et al*. (1994) also observed similar significant increase in leaf yield due to the application of micronutrients.

Economic analysis indicated that only the lower levels of iron and zinc and both the levels of manganese and copper increased the net income (Table 1). The maximum net income of Rs 6810=00/ha/yr were obtained by the application of zinc @ 10.0 kg/ha/yr and iron @ 5.0 kg/ha/yr, respectively.

Though the application of zinc @ 10.0 kg/ha/yr improved the leaf yield and the yield attributing characters of mulberry to the maximum extent, the application of iron @ 5.0 kg/ha/yr recorded the highest net income.

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Table 1: Effect of micronutrients on the yield and yield attributes of mulberry

Treatments	Doses (kg/ha/yr)	Yield attributes						Leaf yield (mt/ ha/yr)	Net profit/loss (Rs.)
		Height of plant (cm)	Number of shoots/ plant	Number of leaves/ plant	Length of leaf bearing shoot (cm)	Number of nodes/ plant	Leaf area (sq.m./ 100 leaves)		
Control	0.0	143.52	5.69	327.11	718.27	343.50	1.14	13.52	---
Iron	5.0	163.55	7.38	397.99	920.41	406.55	1.52	17.66	6,810.00
Iron	10.0	153.22	6.52	347.08	795.58	366.35	1.28	14.80	-260.00
Manganese	5.0	158.74	6.86	358.85	861.97	380.91	1.42	16.08	3,400.00
Manganese	10.0	158.69	6.97	374.08	917.38	402.38	1.35	16.28	2,200.00
Copper	5.0	153.46	6.66	346.02	813.49	369.50	1.37	15.10	440.00
Copper	10.0	157.83	6.83	363.63	874.22	382.38	1.41	16.28	200.00
Molybdenum	5.0	155.33	6.74	362.41	859.16	388.27	1.41	16.12	-2,480.00
Molybdenum	10.0	152.52	6.55	346.30	788.25	361.60	1.32	14.72	-12,840.00
Boron	5.0	156.55	6.80	351.05	853.19	367.63	1.39	16.04	-30.00
Boron	10.0	164.10	7.63	412.80	966.60	416.24	1.54	18.08	-900.00
Zinc	10.0	164.66	7.69	413.69	971.58	446.41	1.58	18.22	4,980.00
Zinc	20.0	155.88	6.80	360.35	858.88	381.16	1.45	16.14	-3,480.00
LS.D.(0.05)		**8.12**	**0.82**	**50.69**	**116.08**	**NS**	**0.10**	**0.42**	