

RESPONSE OF SUNFLOWER TO MICRONUTRIENTS,

M. DEVARAJAN¹, K. R. KUMERASAN², G. RAMANATHAN³ AND RM. PANCHANATHAN⁴

A field experiment was conducted in a red sandy loam soil to determine the response of sunflower (EC, 68415) to the application of Zn, Cu, Fe and Mn and foliar spray of 0.5 per cent ZnSO₄ thrice during crop growth. Combinations of micronutrients (50+20+100+100 kg/ha of ZnSO₄, CuSO₄, FeSO₄ and MnSO₄ respectively) had also been tried to determine the effect of micronutrient mixtures. The effect being the same for all treatments as per data, foliar spray of 0.5 per cent ZnSO₄ thrice during crop growth registered significantly higher seed yield.

Large amounts of foreign exchange is being spent for importing oils and oilseed for meeting the demands in our country. To reduce the imports of oils, all possibilities were explored and sunflower was introduced for increasing oil seed production. Various research workers reported that the application of NPK at the rate of 60:60:40 Kg/ha respectively was adequate to reap a rich harvest in sunflower (Gaur, 1975; Ramaswamy *et al.* 1974). Very little information is available on the effect of micronutrients on sunflower yield. This paper reports the results of an experiment conducted to study the response of sunflower to micronutrients applied.

MATERIALS AND METHODS

A field experiment was conducted on red sandy loam soil of TNAU Farm at Agricultural Research station, Aliyarnagar with twelve treatments (Table 1) and four replications in a randomised block design.

The Variety EC 68415 of the sunflower was grown as test crop. The chemical characteristics of initial experimental soil are pH 8.2, organic matter 0.58 per cent; available N, P₂O₅ and K₂O were 216, 31.5, and 381 Kg/ha respectively. Diethylene Triaminepentaacetic (DTPA) extractable Zn, Cu, Fe and Mn were 2.0, 2.3, 8.0 and 3.8 ppm respectively. The treatments consisted of soil application of different micronutrients and foliar spray of 0.5 per cent ZnSO₄. Foliar spray of ZnSO₄ was given 30, 40 and 50 days after sowing during crop growth. Combination of micronutrients at 25+10+50+50 and 50+20+100+100 kg/ha respectively of ZnSO₄, CuSO₄, FeSO₄ and MnSO₄ had also been tried to determine the effect of micronutrient mixtures. The seed and stock yield were analysed by statistical method for interpretation.

RESULTS AND DISCUSSION

Yield: The results (Table 1) indicated that the treatments at higher doses

1, 2 and 3 Department of Soil Science and Agricultural Chemistry Tamil Nadu Agricultural University Coimbatore-641 003
4 Department of Agronomy

Table 1. Effect of Micronutrients on sunflower yield variety : EC 68415
(Mean of four replications)

S. No.	Treatments (Fertilizers)	Seed		Stalk	
		Yield (kg/ha)	Per cent over control	Yield (kg/ha)	Per cent over control
1.	NPK alone	1965	—	7619	—
2.	25 ZnSO ₄	2251	+15	8095	+6
3.	50 ZnSO ₄	2278	+16	7778	+2
4.	0.5% ZnSO ₄ —F.S.	2637	+34	8229	+16
5.	10 CuSO ₄	2405	+43	8413	+10
6.	20 CuSO ₄	2653	+35	8572	+12
7.	50 FeSO ₄	2394	+22	7540	-1
8.	100 FeSO ₄	2776	+41	7502	-4
9.	50 MnSO ₄	2411	+23	6508	-15
10.	100 MnSO ₄	2749	+40	7778	+2
11.	2 ^c + 10 + 50 + 50*	2510	+28	6597	-13
12.	50 + 20 + 100 + 100*	1999	+2	5397	-29
	C. D. at 5 per cent	527		1435	

C. S = Foliar spray — thrice during crop

* = as SO₄ of Zn, Cu, Fe and Mn respectively

were effective in significantly increasing the seed yield over NPK treated control. The effect was the same for all the micronutrient applied to soil. Foliar spray of 0.5 percent ZnSO₄, soil application of CuSO₄ at 10 and 20 kg/ha, ferrous and MnSO₄ at 100 kg/ha each were effective in resulting significant increase in seed yield of crop. However, it may be shown in this context that foliar spray of ZnSO₄ to the crop also registered higher seed yield and foliar spray treatment of ZnSO₄ was more economical than the application of other micronutrients to the soil. More or less similar trend was also observed in stalk yield and once again foliar spray of 0.5 percent

ZnSO₄ registered highest yield. Similar results were obtained by Dranicharikova (1977) who reported that in trials with sunflower on chernozem soil, application of zinc activated several physiological and biochemical processes in plant and increased seed yield. Application of zinc increased growth duration and yield. It has also been reported from Regional Research station, Kovilpatti (Anon, 1978) that foliar spray of 0.5 percent ZnSO₄ thrice during crop growth significantly increased seed yield of sunflower Ec. 68145 in black clay loam soil.

Data on micronutrient content and their uptake by sunflower seed are presented in Table 2.

Table 2. Effect of micronutrients on content and uptake in seed — sunflower
(Mean of four replication)

S. No.	Treatments (Fertilizers) — kg/ha	Content (ppm)				Uptake (g/ha)			
		Zn	Cu	Fe	Mn	Zn	Cu	Fe	Mn
1	NPK alone	27	9	36	16	53	17	72	32
2	25 ZnSO ₄	24	10	40	17	53	22	90	42
3	50 ZnSO ₄	29	13	68	18	66	29	155	42
4	0.5 per cent ZnSO ₄ — F.S	38	12	38	16	99	32	102	42
5	10 CuSO ₄	24	17	24	19	67	46	138	54
6	20 CuSO ₄	24	13	24	16	63	33	92	40
7	50 FeSO ₄	24	18	66	16	41	42	161	39
8	100 FeSO ₄	26	10	41	18	72	27	115	49
9	50 MnSO ₄	25	14	64	17	59	35	154	40
10	100 MnO ₂	32	12	41	17	87	32	112	46
11	25+10+50+50*	29	11	40	16	73	27	101	40
12	50+20+100+100*	30	11	41	16	61	22	81	32
	C D at 5 per cent	2.4	2.0	8.0	NS	NS	8.0	2.6	NS

F. S. = Foliar spray — thrice during crop growth period

* = as SO₄ for Zn, Cu, Fe and Mn respectivelyTable 3. Effect of micronutrients on content and uptake in stalk—sunflower.
(Mean of four replications)

S. No.	Treatments (Fertilizers) kg/ha	Content (ppm)				Uptake (g/ha)			
		Zn	Cu	Fe	Mn	Zn	Cu	Fe	Me
1	NPK alone	4	7	83	14	31	52	629	102
2	25 ZnSO ₄	7	9	70	16	52	70	568	115
3	50 ZnSO ₄	14	6	85	20	107	50	663	155
4	0.5 per cent — F. S	6	4	63	18	56	36	562	158
5	10 CuSO ₄	6	8	58	20	52	68	489	168
6	20 CuSO ₄	12	8	45	20	103	66	394	174
7	50 FeSO ₄	9	7	60	20	69	53	459	151
8	100 FeSO ₄	7	5	65	18	47	38	468	125
9	50 MnSO ₄	7	6	50	18	48	41	325	114
10	100 MnSO ₄	6	7	57	20	53	51	431	160
11	25+10+50+50*	9	8	65	15	61	53	425	130
12	50+20+100+100*	7	6	88	20	38	31	471	108
	C. D. at 5 per cent	0.8	NS	10	NS	15	NS	117	NS

F. S. = Foliar spray — thrice during crop growth period

* = SO₄ of Zn, Cu, Fe and Mn respectively

Individual application of $ZnSO_4$, as foliar spray, soil application of $MnSO_4$ (100 kg/ha) and combinations of micronutrients at higher levels (Treatment 12) significantly increased zinc content in seed. Though there was numerical increase, this trend had not attained statistical significance in Zn uptake by seed. Soil application of $CuSO_4$ resulted significantly beneficial effect in content and uptake of copper by seed. Iron content and uptake by seed were significantly influenced by ferrous sulphate at 50 kg/ha. Application of manganous sulphate had not indicated any trend on Mn content and its uptake of seed.

Content and uptake of micronutrients by sunflower stalk are Presented in Table 3. The results revealed that treatments significantly influenced Zn content and Zn uptake in sunflower stalk. In the case of Fe, soil application of $CuSO_4$ and $MnSO_4$ effectively reduced Fe soil content and uptake in stalk. This may be attributed antagonistic effect of Mn Fe in plant.

These results may, therefore, be concluded that foliar spray of 0.5 per cent $ZnSO_4$, soil application of

$CuSO_4$ at both levels, $FeSO_4$ and $MnSO_4$ at 100 kg/ha were effective in resulting significant increase in seed yield of sunflower. Foliar spray of $ZnSO_4$ alone resulted significant increase in Zn nutrition of sunflower seed though this trend had not attained statistical significance in the case of Zn uptake by seed. Individual application of Cu, Fe, and Mn favourably resulted increase in Cu nutrition of seed.

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