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Effect of Zn enriched organics and multi micronutrients on sunflower

T. CHITDESHWARI AND S. POONGOTHAI
Dept. of Soil Science and Agrl. Chemistry, Tamil Nadu Agrl. Univ., Coimbatore - 641 003, Tamil Nadu

Abstract: Field experiment conducted with sunflower in the farmers holdings to demonstrate the effect of Zn enriched organics and multi micro nutrients on the yield and nutrient uptake revealed that the application of 50 kg FYM enriched with 5 kg Zn ha^{-1} recorded the highest seed yield of both hybrid and variety of sunflower. The per cent increase over control was 11 for hybrid Cargil and 18.4 for variety CO 1 and it was statistically comparable with the application of 50 kg FYM enriched with 2.5 kg Zn + 1.5 kg B ha^{-1} and individual application of 5 kg Zn + 1.5 kg B + 5 kg Fe. The uptake of all the micro nutrients *viz.*, Zn (53.9 g ha^{-1}), Fe (92.2 g ha^{-1} and B (49.8 g ha^{-1}) were increased with the respective nutrient application and the highest values were associated with the individual application of 5 kg Zn + 1.5 kg B + 5 kg Fe.

Key words : Sunflower, Zn enriched organic manures, Micro nutrient uptake.

Introduction

The Zn use efficiency is reported to be improved by mixing $ZnSO_4$ with manures. The beneficial effect of organic manures may be attributed to the production of chelating agents which form soluble complexes with Zn and these enhances the diffusion and mass low of Zn (Khandkar *et al.* 1992 and Poonia, 1998). The use of Zn enriched organics (FYM, Coirpith etc.) reduced the Zn requirement of crop by fifty per cent by incerasing the complexed Zn fractions and high Zn use efficiency (Takkar and Nayyar, 1984). The favourable effect of Zn amended organics for sustained productivity of crops also was well established. Hence field experiments were conducted in the farmers field to demonstrate the efefct of Zn enriched organics on yield and nutrient uptake in sunflower.

Materials and Methods

Front line demonstration trials were conducted in the clay loam soils of Kathiyavadi village of Arcot taluk (pH 7.8; DTPA Zn - 0.85 mg kg^{-1}; HWS - B - 0.40 mg kg^{-1}; DTPA - Fe - 3.3 mg kg^{-1}) during 1999-2000 and at Prithivimangalam village of Kallakurichi taluk (pH - 7.4; DTPA Zn - 0.72 mg kg^{-1}; Hot water soluble (HWS) B- 0.42 mg kg^{-1}; DTPA - Fe - 4.70 mg kg^{-1}) to study the effect of zinc enriched FYM and zinc mixed with coirpith and multi micro nutrients (Zn, B and Fe) on sunflower hybrid (Cargil) and variety CO 1. There were seven treatments replicated four times in a randomised block design. The treatment structure is furnished below:

T_1 - Control
T_2 - 1.25 kg Zn enriched FYM ha^{-1}
T_3 - 2.5 kg Zn enriched FYM ha^{-1}
T_4 - 5.0 kg Zn enriched FYM ha^{-1}
T_5 - 2.5 kg Zn + 1.5 kg B enriched FYM ha^{-1}
T_6 - 2.5 kg Zn enriched CCP ha^{-1}
T_7 - 5 kg Zn + 1.5 kg B + 5 kg Fe ha^{-1}

The crops were grown to maturity and harvested. The post harvest plant samples were analysed for Zn, Fe and B content by following the standard procedures and the uptake was computed from the concentrations of these nutrients in plant parts (Lindsay, and Norvell, 1978).

Results and Discussions

Yield of crops

The seed yield of sunflower hybrid Cargil during 1999-2000 ranged from 1350 to 1500 kg ha^{-1} while for the variety CO1 it was from 1143 to 1353 kg ha^{-1}. The response of variety

Table 1. Effect of Zn enriched organics and multi micronutrients on yield of sunflower (kg ha^{-1})

Treatments	Grain yield		
	2000	2001	Mean
Control	1350	1143	1247
50 kg FYM enriched with 1.25 kg Zn ha^{-1}	1381	1173	1227
50 kg FYM enriched with 2.50 kg Zn ha^{-1}	1425	1250	1338
50 kg FYM enriched with 5.0 kg Zn ha^{-1}	1500	1353	1427
50 kg FYM enriched with 2.5 kg Zn + 1.5 kg B ha^{-1}	1470	1317	1393
50 kg CCP enriched with 2.5 kg Zn ha^{-1}	1391	1273	1332
5 kg Zn + 1.5 kg B + 5 kg Fe	1489	1289	1398
CD	65.0	115.0	190.0

Table 2. Effect of Zn enriched organics and multi micronutrients on B uptake by sunflower (g ha^{-1})

Treatments	B uptake		
	2000	2001	Mean
Control	40.8	36.4	38.6
50 kg FYM enriched with 1.25 kg Zn ha^{-1}	43.9	37.3	40.6
50 kg FYM enriched with 2.50 kg Zn ha^{-1}	47.1	39.4	43.3
50 kg FYM enriched with 5.0 kg Zn ha^{-1}	47.3	43.9	45.6
50 kg FYM enriched with 2.5 kg Zn + 1.5 kg B ha^{-1}	50.2	47.8	49.0
50 kg CCP enriched with 2.5 kg Zn ha^{-1}	45.7	41.5	43.6
5 kg Zn + 1.5 kg B + 5 kg Fe	51.7	48.0	49.8
CD	NS	5.95	NS

to zinc enriched organics was found to be more than the hybrid. The highest seed yield was ercorded by the treatment which received 50 kg FYM enriched with 5.0 kg Zn ha^{-1} and the percent increase over control was 11 for hybrid Cargil and 18.4 for variety CO1. The same was statistically comparable with the treatments that received 50 kg FYM enriched with 2.5 kg Zn + 1.5 kg B ha^{-1} and individual application of multi micronutrients (Zn + B + Fe) without enrichment. Although the fields are deficient in Zn, Fe and B, addition of Zn alone showed response by recording the highest seed yield. Similar results were reported by Gangadhar *et al.* (1992) and Misra *et al.* (1985). Also lower levels of Zn (1.25 and 2.5 kg Zn ha^{-1}) showed lesser response than 5.0 kg Zn ha^{-1} and $ZnSO_4$ mixing with coirpith was found ineffective (Table 1). Lowest seed yield of 1350 and 1143 kg ha^{-1} respectively for Cargil and CO1 variety was observed in control (Table 1).

Uptake of micro nutrients

Total Zn uptake increased significantly with Zn treatments over the control and the highest Zn uptake of 54.5 and 53.3 g ha^{-1} respectively during 2000 and 2001 was recorded with the addition of 50 kg FYM enriched with 5.0 kg Zn ha^{-1}. The same was on par with the individual addition of micro nutrients (Zn + B + Fe). With regard to B, the highest mean uptake of 49.8 ha^{-1} was associated with individual application of Zn + B + Fe without organic enrichment. Inclusion of B in the fertiliser schedule significantly enhanced the uptake of

Table 3. Effect of Zn enriched organics and multi micronutrients on uptake of Fe in sunflower (g ha^{-1})

Treatments	Fe uptake		
	2000	2001	Mean
Control	68.2	68.3	68.3
50 kg FYM enriched with 1.25 kg Zn ha^{-1}	75.0	74.3	74.6
50 kg FYM enriched with 2.50 kg Zn ha^{-1}	75.5	80.4	78.0
50 kg FYM enriched with 5.0 kg Zn ha^{-1}	84.1	89.7	86.9
50 kg FYM enriched with 2.5 kg Zn + 1.5 kg B ha^{-1}	77.9	83.1	80.5
50 kg CCP enriched with 2.5 kg Zn ha^{-1}	74.6	82.1	78.3
5 kg Zn + 1.5 kg B + 5 kg Fe	87.0	97.4	92.2
CD	NS	13.0	NS

Table 4. Effect of Zn enriched organics and multi micronutrients on uptake of Zn in sunflower (g ha^{-1})

Treatments	Zn uptake		
	2000	2001	Mean
Control	38.9	35.8	37.4
50 kg FYM enriched with 1.25 kg Zn ha^{-1}	42.3	38.6	40.5
50 kg FYM enriched with 2.50 kg Zn ha^{-1}	47.7	44.6	46.2
50 kg FYM enriched with 5.0 kg Zn ha^{-1}	54.5	53.3	53.9
50 kg FYM enriched with 2.5 kg Zn + 1.5 kg B ha^{-1}	52.8	53.2	53.0
50 kg CCP enriched with 2.5 kg Zn ha^{-1}	46.1	46.4	46.2
5 kg Zn + 1.5 kg B + 5 kg Fe	53.9	53.9	53.9
CD	11.12	5.75	NS

micro nutrients which might be attributed to the increased supply of respective nutrients. In the case of Fe, the highest mean uptake of 92.2 g ha^{-1} was recorded with the individual application of 5 kg Zn + 1.5 kg B + 5 kg Fe ha^{-1}. Similar results were also reported by Takkar and Nayyar, (1984) and Singh *et al.* (2000). The nutrient removal by sunflower hybrid Cargil was found to be more than the variety CO1 indicating the higher requirement of micronutrient fertilisers.

The order of nutrient uptake by crops was Fe > Zn > B (Table 2, 3 and 4). The inclusion of respective micro nutrients in the treatment structure noticeably might be the possible reason for the enhanced uptake of micro nutrients. The results on the nutrient content of the plant samples also showed similar results as that of the crop uptake of Zn, B and Fe irrespective of crops and locations.

Generally the addition of Zn enriched organics and multi micro nutrients significantly increased the yield of sunflower and its nutrient uptake at both the locations.

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