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EFFECT OF THE ORGANIC MANURES AND COPPER FERTILISATION ON COPPER FRACTIONS IN SOILS

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ABSTRACT

Field experiments was conducted in maize with organic manures (poultry manure @ 6.25 t ha^{-1} and FYM @ 12.5 t ha^{-1}) and copper sulphate at different levels and methods (6.25,12.5,25 and 50 kg $CuSo_4$ ha^{-1} and 0.1 and 0.2% foliar spray thrice on 30th, 40th and 50th day after sowing). Organic manure application was found to have non significant effect on copper fractions whereas increasing levels of $CuSO_4$ increased the copper fractions significantly. Bulk of the soil copper was in the residual form. The percentage of added copper that was found in organic fraction was much higher than that with other fractions. Path analysis study revealed that direct contribution of inorganic copper towards DTPA-Cu was the highest.

KEY WORDS: Maize, Organic manure, Copper sulphate, Copper fractions, Path analysis

Copper exists in soils in various chemical forms such as water soluble + exchangeable significantly adsorbed into inorganic sites, complexed copper and copper in secondary and primary minerals. Contributions of these forms to soil available copper vary widely depending upon physical and chemical properties of soils. The sequential fractionation of copper carried out in soils of Karnataka revealed that both water soluble + exchangeable and organically bound copper was the major fraction (2.6 to 35.3% of total copper) next to residual copper (53.8 to 93.8% of total copper) (Raghupathi and Vasuki, 1991) and the major pathway by which the applied copper passes to plant was through inorganically bound form (Raghupathai and Vasuki, 1992). The present investigation was taken up to find out the effect of copper and organic manures application on copper fractions.

MATERIALS AND METHODS

A field experiment was conducted in sandy loam soil deficient in DTPA-Cu (0.58 mg kg^{-1}) with a pH of 7.1 and EC of 0.19 dSm^{-1}. The treatment comparised of three main plots (M_0 : control, M_1 : Poultry manure @ 6.25 tha^{-1}; M_2: FYM @ 12.5 tha^{-1} and seven sub plots control Cu_0) and $CuSO_4$ $5H_2O$ application @ 6.25 kg ha^{-1} (Cu_1): 12.5kg ha^{-1} (Cu_2), 25 kg ha^{-1} (Cu_3), 50.0 kg ha^{-1} (Cu_4), 0.1% (Cu_5) and 0.2% (Cu_6) foliar spray thrice on 30th, 40th, and 50th days after sowing. The treatments were replicated thrice and the test crop was maize (Co.1). Recommended dose of N, P_2O_5 and K_2O were applied @ 135: 62.5 and 50 kg ha^{-1} respectively as urea, super phosphate and muriate of potash. The soil samples were collected at flowering stage, processed and passed through 2 mm sieve and the copper fractionation was carried out as per the method described by McLaren and Crawford (1973). Copper in the extract was estimated by using Atomic Absorption Spectrophotometer.

RESULTS AND DISCUSSION

Application of Organic manures (Poultry manure and Farm Yard manure) was found to have a non-significant effect on water soluble + exchangeable, inorganic, organic, occluded and residual copper fractions.

Application of copper to soil significantly increased the water soluble + exchangeable, inorganic, organic and occluded copper over that of foliar application and control. A linear increase for water soluble + exchangeable and inorganic copper fractions with levels of copper sulphate indicated the conversion of added copper into the above two forms at a faster rate than the other fractions. (Table 1)

Appreciable quantity of organic bound forms indicated a close association of added copper with organic constitutents. Similar findings were reported by Shuman (1979). Mullins *et al* (1982)

Table 1. Effect of copper and organic manure application on copper fractions in soil (mg kg^{-1})

Treatments	Water Soluble + exchangeable	Inorganic	Organic	Occluded	Residual
Main Plots					
M_0	0.03	0.26	8.9	2.54	25.9
M_1	0.04	0.27	8.9	2.59	26.0
M_2	0.03	0.28	8.9	2.60	26.0
Sub Plots					
Cu_0	0.01	0.04	7.9	2.30	25.9
Cu_1	0.02	0.14	8.3	2.40	26.0
Cu_2	0.02	0.27	8.7	2.57	26.1
Cu_3	0.06	0.42	9.6	2.87	26.1
Cu_4	0.11	0.93	11.8	3.30	26.2
Cu_5	0.01	0.04	7.9	2.27	25.9
Cu_6	0.01	0.04	7.9	2.33	25.9
CD (P=0.05)					
M	NS	NS	NS	NS	NS
Cu	0.01	0.03	0.6	0.19	NS
M x Cu	NS	0.02	NS	NS	NS

observed that organically bound and sesquioxides occluded copper contained most of the added copper. These forms of soil copper are considered unavailable to plant (Miller *et al.*, 1986).

Bulk of soil copper was in the residual form. The per cent increase in residual copper over control was insignificant. The inclusion of added copper into structural silicate clays and minerals in a short period was negligible (Table 1). Similar finding was reported by Randhawa and Singh (1996).

The impact of different fractions of copper on DTPA-Cu evaluated through path analysis revealed that the direct contribution of inorganic copper towards DTPA-Cu was the highest followed by occluded and water soluble + exchangeable Cu. Direct contribution of organic copper towards

Table 2. Direct and Indirect effect of different fractions of soil copper on DTPA-Copper

	Water Soluble + exchangeable	Inorganic bound Cu	Organic Bound Cu	Occluded Cu	Total Indirect	Total effect (r)
Water soluble + exchangeable Cu	**0.0764**	0.6957	-0.1836	0.3600	0.8721	0.9485
Inorganic bound Cu	0.0721	**0.7376**	-0.1914	0.3725	0.2532	0.9908
Organic Bound Cu	0.0732	0.7360	**-0.1918**	0.3738	1.183	0.9912
Occluded Cu	0.0715	0.7137	-0.1863	**0.3850**	0.5989	0.9839
					Residual (R) : 0.008	

Bold indicates direct effect

DTPA-Cu was the least (Table 2). Similar finding was reported by Raghupathi and Vasuki (1993).

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RESEARCH NOTES

INFLUENCE OF WEED CONTROL ON GROWTH AND YIELD OF SOYBEAN

Soybean yields are often reduced to considerable extent due to the presence of weeds. Rains during *kharif* season are unpredictable hence any schedule of manual weeding can easily be unsettled. Therefore, use of pre-plant or pre-emergence herbicide can be of great utility to keep the weeds under check during first 30-45 critical days.

A field experiment was carried out on clay loam soil of Udaipur during rainy season, 1993. The soil of the experimental site contained 0.87% organic carbon, 0.09 total nitrogen and 18.45 and 185.82 kg/ha of available phosphorus and potassium respectively.

The experiment was conducted in randomised block design with four replications. Ten treatments tried were one hand weeding (30 DAS), two hand weedings (20 & 40 DAS), three hand weedings (20,40 & 60 DAS), pre-emergence application of metribuzin 0.5 kg/ha, oxyflourfen 0.125 kg/ha, pendimethalin 1.0 kg/ha, metolachlor 1.0 kg/ha and alachlor 1.0 kg/ha and pre-plant incorporation of fluchloralin 1.0 kg/ha.

The major weeds of the experimental site were jangli rice (*Echinochloa colunum* (L.) Link), barnyard grass (*Echinochloa crusgalli* (L.) Beauv.), Yerba-de-tago (*Eclipta alba* (L.) Hassk), day flower (*Commelina benghalensis* L.) and nituri (*Phyllanthus niruri* Hook F.) Monocots were dominating weeds of the site.

Examination of data (Table 1) reveals that weedy plots produced the greatest height of crop plants. The phenomenon of increased plant height in weedy plot can be explained in terms of their racing up for the search of sun light out of the shade. created by weeds. Maximum dry matter per plant, No.of primary branches and LAI was produced by three hand weeding, while amongst herbicide metribuzin was closely followed by alachlor. The yield attributing characters viz. pods per plants, test weight and seeds per pod were also recorded to maximum limit by three weedngs while metribuzin and alachlor headed the list of herbicides. Compared to weedy check, three and two hand weeding, metribuzin and alachlor registered 15.77, 12.44, 12.17 and 11.72 q/ha more soybean seed yield. Similarly returns per rupee were also the highest with three hand weedings. Alachlor and metribuzin occupied the first and second position amongst herbicides with regard to economics. Varying growth and yield of soybean can be attributed to corresponding level of weed control by treatments. The results are in agreement with those obtained by Porwal *et al.* (1990) and Kamala Bai *et al.* (1994).