

Absorption of Copper from Oxisols by *Brachiaria decumbens* Roots

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Brachiaria decumbens is a type of grass largely used in Brazil for cattle pastures. Copper-rich cattle manures are usually applied to Oxisols for pasture fertilization. The application of this type of effluent may increase copper concentration in the soil which can cause changes in the geochemical characteristics of the soil, and some of the changes may be harmful to the environment. Thus avoiding high copper concentrations in the soil is desired. This study was designed to evaluate the potential of *Brachiaria decumbens* roots to absorb copper in Oxisols.

The experiment was conducted in a greenhouse using an uncultivated and non-contaminated soil collected at a 0-30 cm depth. The soil was limed with CaCO₃ and chemical and physical parameters were determined after 90 days of aging (Table 1).

Table 1. Chemical and physical parameters of the limed soil.

Texture (g/kg)			pH (H ₂ O)	Org. Matter	Ca	Mg	Al	H ⁺ Al	K	CEC	K	P	Cu
Sand	Silt	Clay		g/dm ³	cmolc/dm ³						mg/dm ³	mg/cm ³	
290	64	646	5.1	3.5	0.8	0.3	0	3.1	0	4.2	10	0.5	1.7

After aging, the soil was contaminated with CuSO₄·5H₂O solution at concentrations of 0 (control); 4; 40; 80; 425; 800 and 1,000 mg of copper per kg soil, and transferred in triplicate for each concentration treatment to pots. Each pot received 5 pearlescent seeds of *Brachiaria decumbens* then was moved to the greenhouse and watered twice a day with automatic sprinklers for 10 minutes. Samples of the plant roots were collected at 30 and 180 days after seeding.

Root samples were collected by separating the soil thoroughly with the aid of a water jet, cut into small pieces (0.5 to 1.0 cm long), and dried at 70°C in an oven with forced air circulation for 72 hours. After drying, the material was ground in a stainless steel knife mill (Willey model) and sieved through a 2 mm sieve. Then total copper was extracted by the nitric-perchloric acid digestion method (Bezerra Neto and Barreto, 2004) using 0.4 g of the root sample. Copper concentration was determined by atomic absorption spectrophotometry.

Experimental results showed that the absorption of copper at 30 days was much lower than at 180 days after planting, and that the 80 mg/kg treatment showed the highest absorption percentage (Table 2). It is not clear why there was a higher absorption of copper at a concentration treatment of 80 mg/kg and future studies will be conducted to elucidate this issue.

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The lower absorption at 30 days may be related to limited root development coupled with the short time of interaction of these roots with the metal.

In conclusion, our results indicate a high potential of *Brachiaria decumbens* to absorb copper at 180 days after planting, which may lead to soil decontamination.

Table 2. Average values of copper concentration (mg/kg) in *Brachiaria decumbens* roots at 30 and 180 days after seeding.

Soil Treatment ([Cu] mg/kg)	Cu in roots (mg/kg)	% absorption	Cu in roots (mg/kg)	% absorption
	30 days		180 days	
0	0.0027		0.0800	
4	0.0473	1.18	1.633	40.8
40	0.0587	0.15	33.33	83.3
80	0.6783	0.85	81.10	101.4
425	0.3960	0.09	111.5	26.2
800	0.2780	0.03	583.3	72.9
1000	0.3930	0.04	671.0	67.1

References

Bezerra Neto, E., and L.P. Barreto. 2004. Métodos de análises químicas em plantas. Recife: Imprensa Universitária da UFRPE. 149 pp.