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COMPLEXATION OF HIGH LEVELS OF COPPER TO REDUCE THE TOXICITY IN MINE TAILINGS IN MANITOBA

RESEARCH COOPERATORS

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TRIAL OBJECTIVE

Mine tailings from a former gold mine in the interlake region of Manitoba is highly contaminated with copper. As a result of this and other deleterious soil conditions, the site is unable to sustain productive plant life. The purpose of this trial was to determine if Black Earth and other amendments would be able to complex significant amounts of copper in order to permit plant growth.

CERTIFICATIONS

Black Earth Humic products are:

- » Listed by OMRI
- » Registered with CFIA
- » Certified for use for NOP
- » Certified by the CDFA

EXPERIMENTAL – TREATMENTS

Designation	Black Earth Rate	Wheat Straw Rate	Nitrogen Rate	Lime Rate
Control	–	–	–	–
T1	4 g carbon /kg of soil	–	50 mg N/kg soil	–
T2	4 g carbon /kg of soil	7.5 g carbon /kg of soil	50 mg N/kg soil	–
T3	–	7.5 g carbon /kg of soil	50 mg N/kg soil	–
T4	–	–	50 mg N/kg soil	4 g $CaCO_3$ /kg soil

The materials were mixed with 200 gms. of soil gathered from the former mine site and incubated for 24 weeks. After completion of incubation the resulting soil was analyzed with respective copper analysis methods to determine the form of copper existing in the soil.

black earth

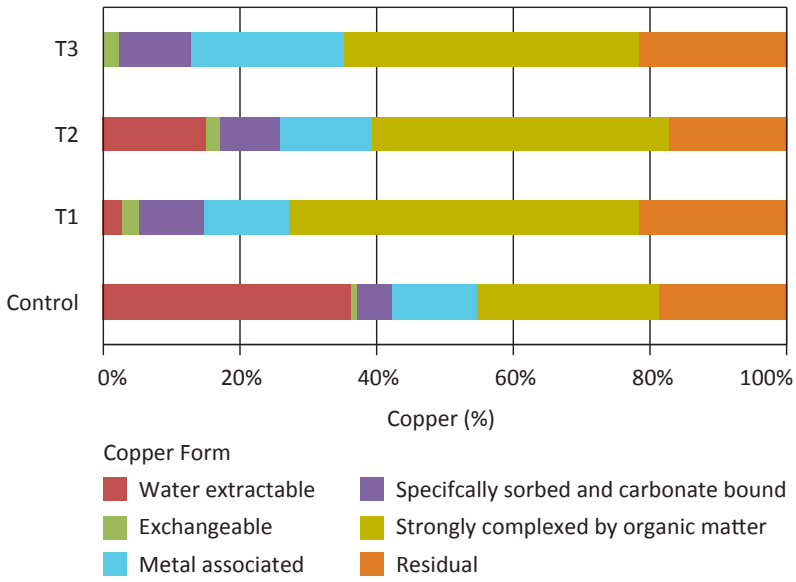
RESULTS

Usually, average value for total copper content of world soils is 30 ppm, with values ranging from 2 to 250 ppm. Phytotoxicity of copper could be predicted either on total or extractable basis. Copper toxicities have been associated with total soil copper values of 150 to 400 ppm and extractable values exceeding 30 ppm to 100 ppm, depending on the method of extraction.

Total copper concentration in the mine tailings was found to be in excess of 2000 ppm. This is an indication that copper toxicity is very likely. In our results, we have fractionated total copper by sequential extraction into these following forms.

Black Earth wheat straw and lime treatments were effective in complexing copper in the soil. Black Earth treatment was found to be the most effective. The greater the amount of complexed copper and less in water soluble and exchangeable forms in the soil means less toxic conditions would exist. This would be beneficial in lowering toxic condition of the mine tailings with respect to copper and potentially remediating the soil and returning the mine site to a productive state supporting plant life.

Distribution of Copper Fractions



Form of Copper Existing In Soil	Relative Plant Toxicity
Water extractable	Highly toxic
Exchangeable	Toxic
Specifically sorbed and carbonate bound	Sometimes toxic
Metal associated (sorbed or occluded) mainly on iron and manganese oxides	Sometimes toxic
Strongly complexed by organic matter	Non-toxic
Residual	Non-toxic

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