

Influence of Soil Amendments on Chemical and Microbial Properties of Cu-Ni Smelter-damaged Sudbury Soil

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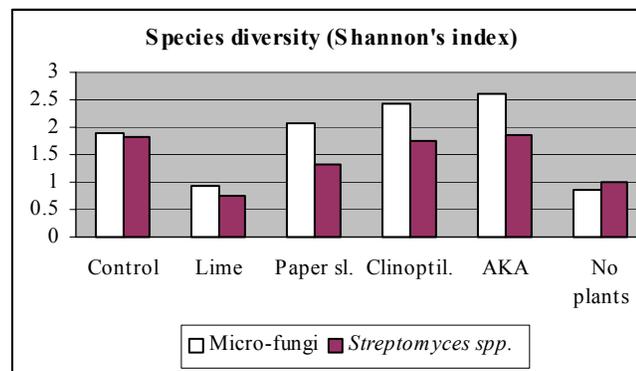
Abstract

The acidic (pH=5), heavy metal contaminated soil from the Cu-Ni smelter-damaged landscape of Sudbury, Ontario, Canada was used for establishing greenhouse experiments on soil stabilization/rehabilitation. Lime, paper sludge, and natural zeolites were applied in appropriate doses as soil amendments.

It was found that lime and paper sludge caused optimization of soil reaction (pH around 7), whereas zeolite treated soils remained acidic (pH around 5.5). Soil treated with paper sludge was characterized by the highest electrical conductivity. No statistically meaningful differences were found in crop yield capacity of red top grass between all variants, with the only exception being for lime, which caused poorer grass development. At the same time, red top grown on lime treated soil contained the lowest levels of cadmium, cobalt, manganese, nickel, and zinc.

The abundance of bacteria (total, oligotrophic, aerobic spore-forming, cellulolytic, and N₂-fixing), actinomycetes, and micro-fungi was studied. The numbers of almost all above-mentioned groups were extremely low, from $n \times 10^3$ to $n \times 10^5$ CFU/g. Soil treated with paper sludge was enriched with most of the microorganisms studied, whereas soil amended with lime or zeolite-Clinoptilolite was characterized by the lowest microbiological activity.

Representatives of 14 species of soil micro-fungi were counted and identified. The highest bio-diversity of the micro-fungal community was found in soil treated with zeolite-AKA, whereas limed soil was characterized with the lowest fungal diversity (Shannon index = 2.6 and 0.9, respectively). The highest diversity of soil actinomycetes (genus *Streptomyces spp.*) was found in soils treated with zeolites, and limed soil was characterized with the lowest actinomycetes diversity (Shannon index = 1.8 and 0.7, respectively).



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