EFFECT OF TREATMENT WITH LEAD SULPHATE ON SOIL MYCOBIOTA

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Abstract: Nineteen species of fungi were isolated from control soils and that treated with lead sulphate solutions (20ppm, 40ppm, 100ppm and 250ppm) for 90 days. Treatment with lead sulphate did not result in substantial decrease in the number of species isolated. Greater number of isolates was obtained from Pb-treated soils except in general. The species which could tolerate higher concentration of lead sulphate for 90 days included *Aspergillus flavus, Aspergillus ustus, Aspergillus niger* and *Trichoderma lignorum. Aspergillus fumigatus* and *Botryotrichum piluliferum* exhibited remarkable resistance to lead as these dominated the soil treated with lead sulphate solution for 90 days.

Keywords: Heavy metals, Lead pollution, Metal tolerant fungi, Soil microflora.

REFERENCES

Antonovics, J., Bradshaw, A.D. and Turner, R.G. (1971). Heavy metal tolerance in plants. *Adv. Eco. Res.* **7**: 1-85.

Atlas, R.M. and Bartha, R. (1998). *Microbial Ecology: Fundamentals and Applications* (8th edn.), Benjamin/ Cummings Publishing Co., California.

Babich, H. and Stotzky, G. (1982). Gaseous and heavy metal air pollutants. In "*Experimental Microbial Ecology*" (Eds. Burns, R. G. and J. H. Slater), Blackwell Scientific Publications, London: pp. 631−670.

Can, C. and Jianlong, W. (2010). Removal of heavy metal ions by waste biomass of *Saccharomyces cerevisiae. Journal of Environmental Engineering,* **136**: 95−102.

Charaya, M.U. (2006). Successive microbial colonization of wheat colonization of wheat straw decomposing under different situations. *J. Indian Bot. Soc.* **85**: 121−134.

Cole, M.A. (1977). Lead inhibition of enzyme synthesis in soil. *Applied and Environmental Microbiology* **33**: 262−268.

Dickinson, C.H. and Paugh, G.J.F. (1974). Biology of litter decomposition. Vol.I & II. Academic Press London and New York.

Dube, V.P.; Charaya, M.U. and Modi, P. (1980). Ecological and *in vitro* studies on the soil mycoflora of mango orchards. *Proc. Ind Acad. Sci* (Plant Sci.) **82:** 151−160.

Dushenkov, V.; Kumar, P.B.A.N.; Motto, H. and Raskin, I. (1995). Rhizofiltration: the use of plants to remove heavy metals from aqueous streams. *Environ. Sci. Tech.* **29**: 1239−1245.

Fomina, M.; Burford, E.P. and Gadd, G.M. (2005). Toxic metals and fungal communities. In "*The Fungal Community: Its Organization and Role in the Ecosystem"* (Eds. Dighton, J., White, J. F. and P. Oudemans), Boca Raton, FL, USA. pp. 733−758.

Fomina, M.A.; Alexander, I.J.; Hillier, S. and Gadd, G.M. (2004). Zinc phosphate and pyromorphite solubilization by soil plant-symbiotic fungi. *Geomicrobiol. J.* **21**: 351−366.

Gadd, G.M. and Griffiths, A.J. (1978). Microorganisms and heavy metals toxicity. *Microbial Ecology* **4**: 303−317.

Galloway, L.D. (1935) Indian Soil fungi. *Ind. J. Agric. Sci.* **6**: 578−585.

Gilman, J.C. (1957). *A Manual of Soil Fungi.* IOWA State University Press, U.S.A.

Hayes, W.A. and Lim, W.G. (1979). Wheat and rice straw composts and mushroom production. In "*Straw decay and effect of its diposal and utilization*" (Ed. Grossbard, E.), John Wiley and Sons, Chichester, New York, Brisbane, Toronto: pp. 83−93.

Hemapriya, J. and Kannan, V.R. (2010). Comparative assessment of heavy metal removal by immobilized and dead bacteria cells: A biosorption approach. *African J. Env. Sci. Tech*. **4**: 077−083.

Henriksson, L.E. and DaSilva, E.J. (1978). Effects of some inorganic elements on nitrogen-fixation in blue-green algae and some ecological aspects of pollution. *Zeitschrift fur Allgemeine Mikrobiologie* **18**: 487−494.

Hudson, H.J. (1968). The ecology of fungi on plant remains above the soil. *New Phytol.* **67**: 837−874.

Hutchinson, T.C. (1973). Comparative studies of the toxicity of heavy metals to phytoplankton and their synergistic interactions. *Water Pollution Research, Canada* **8**: 69–90.

Jensen, H.L. (1931). The fungus flora of the soil. *Soil Sci.* **31**: 123−158.

Konopka, A.; Zakharova, T.; Bischoff, M.; Oliver, L.; Nakatsu, C. and Turo, R.F. (1999). Microbial biomass and activity in lead contaminated soil. *Appl. Environ. Microbiol.* **65**: 2256−2259.

Kumar, P. (2011). *Studies of certain biotechnological aspects of microbe-metal interactions.* Ph.D. thesis, C.C.S. University, Meerut.

Lacina, R.; Ahuja, P.; Khan, S.; Saxena, R.K. and Mohpatra, H. (2000). Microbial biosorbents: meeting challenges of heavy metals pollution in aqueous solutions. *Curr. Sci.***78:** 967−973.

Lewis, A.E. (2010). Review of metal sulphide precipitation. *Hydrometallargy* **104**: 222−234.

McGrath, S.P.; Zhao, F.J. and Lombi, E. (2001). Plant and rhizosphere process involved in

phytoremediation of metal-contaminated soils. *Plant Soil* **232**: 207−214.

Nagmani, A.; Kunwar, I.K. and Manoharachary, C. (2006). *Handbook of Soil Fungi.* I.K. International Pvt. Ltd., New Delhi, Mumbai, Banglore.

Nawachukwu, M.A.; Feng, H. and Alinnor, J. (2010). Assessment of heavy metal pollution in soil and their implication within and around mechanic villages. *Intern. J. of Environ. Sci. and Technol*.**7**: 347−358.

Pal, T.K.; Bhattacharyya, S. and Basumajumdar, A. (2010). Cellular distribution of bioaccumulated toxic heavy metals in *Aspergillus niger* and *Rhizopus arrhizus*. *Int. J. Pharm. Biol. Sci*. **1**: 1−6.

Piccardo, M.C.; Ferreira, A.C. and Dacosta, A.C. (2009). Continuous thorium biosorption–dynamic study for critical bed depth determination in a fixed-bed reactor. *Bioresour. Technol*. **100**: 208−210.

Pickett, S.T.A. and White, P.S. (1985). *The Ecology of Natural Disturbances and Patch Dynamics.* Academic Press, New York.

Rai, B.; Chandra, A. and Singh, S.K. (1995). Effect of heavy metals on growth of some pathogenic and non pathogenic soil microflora. *J. Indian Bot. Sci*. **74**: 35−39.

Raper, K.B. and Thom, C. (1949). *A Manual of Penicillia*, Williams and Wilkins, Baltimore Md.

Sen, S. and Charaya, M.U. (2010). Copper-tolerant microfungi for bioremediation. *Prog. Agric*. **10**(1): 66−71.

Sen, S.; Charaya, M.U. and Singh, P.B. (2009). Screening of soil for lead toletrant fungi. *Indian J. Plant Genet. Resour*. **22**: 191−194.

Singh, P.N. and Charaya, M.U. (1975). Soil fungi of sugarcane field at Meerut. Distribution of soil mycoflora. *Geobios* **2**: 40−43.

Singh, R. (2004). *Studies on the fungal decomposition of above ground residues of wheat crop*. Ph.D. thesis, C.C.S. University, India.

Smith, W.H. (1977). Influence of heavy metal leaf contaminants on the *in vitro* growth of urban-tree phylloplane-fungi. *Microbial Ecology* **3**: 231−239.

Subramanian, C.V. (1971). *Hyphomycetes*. Indian Council of Agricultural Research, New Delhi.

Takara, H.C.M.M.; Higiene, G.; Segurana, M.A. and E-Qualidade, M.A. (2001). *Standards for mining activities and environment*. IMWA. Symposium, Brazil.

Tiwari, A. (2010). *Studies on the mitigation of metal pollution through biosorpeion by soil fungi*. Ph.D. Thesis, C.C.S. University, Meerut.

Tiwari, A. and Charaya, M.U. (2006). Effect of chromium sulphate on soil mycobiota. *Bio-Sci. Res. Bull*. **22**: 53−56.

Waksman, S.A. (1917). Is there any fungal flora of the soil? *Soil Sci*. **2**: 103−155.

Waksman, S.A. (1927). *Principles of Soil Microbiology*. Williams and Wilkins, Baltimore Md.

Zak, J.C. (1992). Response of soil fungal communities to disturbance. In: "*The fungal community: its organization and role in the ecosystem*" (eds., Carrol, G.C. and D.T. Wicklow), Marcel Dekker, Inc., New York; pp. 403–425.

Zlochevskaya, I.V. and Rukhadze, E.G. (1968). A study of the toxic action of some lead compounds. *Microbiology* **37**: 951−955.