

## PHYTOREMEDIATION POTENTIAL OF *BRASSICA JUNCEA* FOR MUNICIPAL SOLIDWASTE - A CASE STUDY

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**Abstract:** The problem of Municipal Solid Waste (MSW) management has acquired alarming dimensions in India during the last few decades. The complexity and diversity in composition of MSW makes it one of the important urban sources of pollution which is posing a major threat to public health and the environment. Agricultural applications of compost made from municipal wastes could be one of the most economic and attractive methods of handling the waste and is a common practice of small farmers in India. In addition, sites in and around of dump yard are developing into residential colonies due to urban pressure. The use of MSW as a source of organic manure is harmful since it contains toxic metals, harmful pathogens and many other organic and inorganic pollutants. The continuous accumulation of heavy metals in soil ultimately gets leach into ground water or it may enter into human food chain through plant products. The present investigation was carried out to find out the applicability of phytoremediation to MSW for the removal of heavy metals. The physico chemical characteristics of MSW is revealing in that the waste is rich in organic carbon (5.6%) and available nitrogen (3.6%). The sulphates, phosphates, chlorides, sodium and potassium are at optimum levels. The waste is rich in heavy metals such as zinc (616 ppm), copper (228 ppm), leads (191ppm) nickel (158 ppm) and are toxic due to excess levels. However, the germination studies had shown no inhibitive effect even at 100% MSW extract. The pot experiments were conducted by growing hyper accumulator *Brassic juncea* variety “Amulya” for a period of three months with various concentrations of MSW amends. The study results indicated that MSW is not showing any significant inhibitory effect on plant growth even at 100% concentration. The waste is also promoting earlier growth in over the controls in all the phenophases of *Brassica juncea*. The soil enzymes such as cellulase, amylase and acid phosphatase are showing a significant enhancement in their activity over controls in all the soil amendments with MSW resulting in the increase of soil organic matter and metal availability to plants. The study shown highly promising potential for removal of Pb, Zn, Ni and Cu by phytoextraction through *Brassica juncea*. Among the four metals Pb and Zn have shown good accumulation capacities over controls up to the final harvest day. The uptake efficiency increased with increase in concentration of MSW amends even up to 100% concentration. Nickel has shown 348% uptake-efficiency over the control, where as Zn, Pb and Cu have shown 120%, 168% and 178% efficiencies respectively. The correlation analysis of all the metals have shown positive trend with each other and with the soil enzymes. The present study shows that the level of concentration of the heavy metals in soils and plants from MSW dump yards is a problem of serious environmental health hazard. Hence, *Brassica juncea* is a potential species for phytoremediation of MSW this is a viable technique to manage and regulate the leaching of toxic elements into soil and ground waters contain their presence at the safe levels. The plant growth process also stimulates the microbial community, which in the course of normal metabolic activity degrades contaminants in soil or makes them available to rizhosphere.

**Keywords:** Phytoremediation, municipal solid waste, heavy metals, soil enzymes.