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Assessment of the impact of dye effluent and the ameliorative potential of waterhyacinth and vermicompost on plant growth and microbial status of the soil

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SUMMARY

The present study was carried out to assess the impact of dye effluent (raw effluent, biologically treated effluent and effluent treated in dye factory by chemical process) and the ameliorative potential of vermicompost on plant growth of *Vigna mungo* (L.) Hepper and biological properties of the soil. Diluted effluent, biologically treated effluent and factory treated effluent enhanced plant growth and favoured microbial growth. Amendment of the soil with vermicompost also enhanced the growth of the plant. However, higher concentrations of the raw effluent were deleterious to the plant. Therefore, the dye effluent can be used for irrigation purpose only after proper dilution.

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Key words : Dye effluent, Biological treatment, Vermicompost amendment, Biological parameters

Industrialization has its inevitable effect on pollution of air, water and soil (Baver and Gardner, 1972; Bose *et al.*, 1973 and Hodges, 1973). The increased industrial activities generate copious quantities of soil and liquid wastes which when dumped on the natural environment slowly degrades the soil and water ecosystems. In this context, the effluent released from textile and dye factory containing a lot of hazardous chemicals exert severe impacts on plant growth and soil bio-ecosystems. The present investigation is aimed to assess the impact of dye effluent on plant growth and microbial populations of the soil. With a view to ameliorate the adverse effects of the soil under effluent irrigation, vermicompost amendment was tried in pot experiment.

MATERIALS AND METHODS

The effluent samples [both raw and effluent treated in dye factory by chemical process (T_3)] were collected from a medium sized dye factory. Some quantity of the effluent was taken in plastic containers and treated biologically using the aquatic macrophyte *Eichhornia crassipes*. The plastic containers were kept in the laboratory at $30^0 \pm 2^0$ C room temperature for 8 days (retention period). After the retention period 1 litre of this biologically treated effluent (T_1) was used for irrigating the crops. *Vigna mungo* (L.) Hepper was used as the test plant. It was grown in pots filled with field soil. In another experimental set, the soil in some of the pots was amended with vermicompost in the ratio of 5:1 (soil: vermicompost) and the plants were irrigated using treated effluents – biologically treated effluent (T_2) and chemically treated effluent (T_4). The plants were irrigated with different concentrations (25%, 50%, 75% and 100%) of raw effluent, biologically treated effluent (T_1) and factory treated effluent (T_3) at fortnightly interval. Tap water was used for intermittent watering whenever necessary. Control was maintained using tap water. No pesticide was applied to the plants during the course of study. The results were observed at four age levels (20, 40, 60, 80 – old days). Seed germination was studied using sand culture method. The growth parameters were studied in terms of root and shoot lengths. The yield was also studied in terms of pod length and number of seeds per pod. Dilution plate method was employed for the enumeration of microbial population in the soil samples.

RESULTS AND DISCUSSION

The dye effluent was very toxic to the plants. The process of seed germination and early seedling growth

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