

PREFACE

Continuous applications of chemical fertilizers disturb the soil texture, physico-chemical properties as well as affect the human health and environment. Nutritional component like carbohydrate, amino acid and ascorbic acid are reduced in the food stuffs by use of nitrogenous and phosphatic fertilizer in soil. Biological wastes are a serious problem for the society. It caused environmental hazards and various ill effects on the human life and their domesticated animals if their proper management and disposal practices are not available. Use of organic matter in the form of vermicompost in agricultural field increases the bioavailability of nutrients to the growing plant. Data available from various sources indicate that vermicomposting could be an adequate technology for management of biological wastes through earthworms. *Eisenia foetida* (Savigny) (Oligochaeta : Annelida) is one of the suitable species for vermicomposting because it can tolerate wide variations of ecological factors such as temperature, humidity and wide variety of wastes.

In this thesis, I have investigated the accumulation of heavy metals (Co, Cr, Pb, Ni, Cd and As) by earthworm *Eisenia foetida* in the initial feed mixture and vermicompost prepared from combinations of different animal (buffalo, cow, goat, horse and sheep) dung with kitchen and municipal solid wastes and in earthworm body before inoculation and after vermicomposting as well as in field soil after harvesting the crops.

All the observations reported in the thesis are my own work. I have reported that the concentration of cobalt (Co) was observed to decrease significantly ($P < 0.05$) in the vermicompost of combination of buffalo dung with municipal solid wastes (1:1) as well as with combination of buffalo dung with kitchen waste (1:3). The concentration of chromium was also observed to decrease in the vermicompost when vermibeds were prepared with different combinations of buffalo dung with kitchen waste during vermicomposting by earthworm *Eisenia foetida*. The amount of nickel was decreased in all the combinations of different animal dung with municipal solid wastes even below the detectable limit during vermic-activity. The concentration of cadmium also significantly decreased in vermicompost of buffalo dung with municipal solid wastes in the ratio of 1:3. The arsenic concentration was also observed significantly to decrease in the combination of cow dung with kitchen wastes (in the ratio of 1:1, 1:2 and 1:3) below detection limit. It implies that the earthworm *Eisenia foetida* was suitable species for accumulation of heavy metals from different animal dungs along with municipal solid wastes.

The concentration of above heavy metals inside the body of *Eisenia foetida* before and after vermicomposting of different combinations of animal (buffalo, cow, goat, horse and sheep) dungs with municipal solid (MSW) wastes and kitchen wastes (KW) in the ratio of 1:1, 1:2 and 1:3 was observed. The results show that the accumulation of all the heavy metals examined in the body tissue of *Eisenia foetida* significantly increased during vermic activity after vermicomposting (60 days).

The concentrations of different heavy metals (Co, Cr, Pb, Ni, Cd and As) in the soil and in the soil with vermicompost of different animal dungs as well as after inoculation with the earthworm before sowing and after harvesting the crops were observed. Simultaneously, the heavy metals were estimated in the seeds of crop before sowing and in the grains of crop after its harvesting. The data demonstrated that the earthworm *Eisenia foetida* was responsible for the accumulation of heavy metals from different combination of soil with vermicompost of different animal dungs. It implies that the earthworm *Eisenia foetida* is a suitable species for vermicomposting that accumulates the heavy metals from the soil.

I am sure that the data emerging from the present study will help in minimization of heavy metals in the soil by earthworm *Eisenia foetida* as it converts the bio-wastes into rich organic manures through vermicomposting. The use of vermicomposts in crop field enhanced the plant growth and productivity.

Thus, the suitability of *Eisenia foetida* for bioaccumulation of heavy metal contents present in soil and different waste materials by accumulating in its body was established. Therefore, by using *Eisenia foetida* in vermibiotechnology will be useful for the management of the heavy metals from soil and different wastes thus protecting the human health and environment.

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