



***CHAPTER- IV***  
***DISCUSSION AND***  
***CONCLUDING***  
***REMARKS***

## **DISCUSSION AND CONCLUDING REMARKS**

In view to find out the effect of saline soil on growth and breeding of the earthworm '*Eisenia foetida*' a manure worm ; the present investigation is undertaken.

### **Discussion on soil salinity :--**

As stated earlier saline land has become a major problem for farmers in various parts of Maharashtra, The problem of salinity is vital concern especially with reference to irrigated lands. Presently thousands of hectares of the most productive fertile irrigated lands have gone out of cultivation. In these regions numerous factors are responsible for salt accumulation. The factors like arid to semi- arid climate, seepage, topographical position or water shade, poor drainage, high water table and excessive use of water for crops are important.

Our survey on soil salinity showed that much of the black agricultural lands are greatly affected by salinity. Ray Choudhary ( 1960 ) recorded the similar observation, that the black soil are highly retentive of moisture and due to their compactness the salinity creeps in this soil.

Further, the saline soils occur mostly in black soil areas which are rich in lime and magnesium.

There is very scanty literature available on soil salinity in relation to soil fauna, whereas a large number of references are available on soil flora of saline soil. As there are many salinity resistant plants such as *Acer negundo*, *Potentilla fruticosa*, *Rosa rugosa*, *Ficus species*, *Fraxinus*, *Gleditsia*, *Nerium*, *Magnolia grandiflora* etc.

### **Discussion on earthworms and soil reclamation :-**

Ansari ( 2007 ) while studying on soil sodicity, highlighted the role of earthworms in the process of soil reclamation. But in our present investigation, the earthworm species fail to survive in total saline soil but they grow and reclaim the semi-saline soil up to certain extent. Thus they may play a role in restoration of semi-saline soil.

Stockdill ( 1982 ), Hoogerkamp et al. ( 1983 ), Curry ( 1988 ) and Tsukamoto and Watanabe, (1977 ) revealed that earthworms are not only capable of improving the fertility and productivity of reclaimed soils but also have the potential for management of wastes.

Our observations on reclamation of saline soil showed that only earthworms are not capable to restore or reclaim the total saline soil. For reclamation of some other factors such as vegetable wastes, as well as of excess dissolved salts like chlorites of Na, K, Mg removal along with porous pipe drain water is necessary.

Thus before introduction of earthworms in saline land, reclamation of soil is very important. For the reclamation of semi-saline soil, some salinity resistant plants such as *Acer negundo*, *Potentilla fruticosa*, *Rosa rugosa*, *Ficus species*, *Fraxinus*, *Gleditsia*, *Nerium*, *Magnolia grandiflora* etc. should be planted. But these practices should be carried before the land has become totally saline.

Our observations on total saline soil showed that such type of land become completely barren which does not support any type of vegetation.

### **Discussion on survival of earthworms in saline soil :--**

It is well known that the earthworms grows and survive in soil containing high moisture, humus and large amount of organic matter. Thus the present investigation is under taken to investigate effect of

saline soil on the survival and other life processes of the earthworm *Eisenia foetida*. From the observations it seems that the earthworms are unable to survive in total saline soil may be due to very low contents of organic matter and moisture. Similarly the saline soil contains the toxic elements of chemical fertilizers such as chlorides of sodium, potassium, magnesium etc. may affects on the survival of the earthworm, these elements may alters the metabolic activities of the worm.

### **Discussion on growth of earthworm *Eisenia foetida* in saline soil :--**

Hutchinson (1967) reported the interrelationship between various physico-chemical parameters of the habitat and their cumulative effect upon the organisms. In our present investigation it seems that, the physical parameters of soil such as colour of substrate media greatly related to soil salinity. Generally, the salinity occurs in black soil. The soil salinity affects on growth and survival of earthworm. Similarly the chemical parameters such as Electrical conductivity and Sodium are also greatly affect on the survival and the growth of earthworm as compaired

to the reddish or brownish soil. These two main parameters determine the habitat of the earthworms. Thus in saline soil and in semi-saline soil the population of earthworm is greatly affected.

Curry and Balger, (1984) summarized that the availability of the food resources in the habitat is responsible for weight gain and weight loss. Our observations are also co-related with the above in which the saline soil do not contain the organic matter which is the food of earthworms and so saline soil do not provide any type of nutritional support to the earthworms. Thus it may lead to total eradication of earthworm species in the total saline soil.

The moisture content of the saline soil is very low. Generally the earthworms are found in soil containing sufficient amount of moisture, and where there is ample availability of organic matter. But in saline soil moisture content is very low and organic matters are totally absent. Nauhauser *et al*,(1980) also reported the same observation that, the growth of earthworm *Eisenia foetida* is related to food rationing in the soil.

Our results on the growth of earthworms greatly resembles with the results of Edwords (1998). According to him, the type, quality and

quantity of the organic wastes are very important for determining the rate of growth of the earthworms. In our investigation in semi-saline soil the growth of the earthworm is greatly affected due to the absence of organic wastes in the soil

The survey of literature showed that the total saline soil do not support any type of flora and fauna. In the present investigation also as the earthworms are exposed to total saline soil, all of them dies within a period of 15 to 30 minutes.

### **Discussion on reproduction of earthworm in saline soil :--**

Our observation on reproductive biology of earthworm *Eisenia foetida* are correlated with the observations of Giraddi *et al.*, ( 2008 ). He reveled about cocoon laying ability ( Fecundity ) of earthworm *Eudrilus eugeniae* . Further he stated that this species produces 7.75 cocoons per week per pair of worms during rainy season to a significantly lower 5.40 cocoons per week per pair of worms on a moist filter paper during various seasons of the year.

In our present investigation in semi-saline soil the worm *Eisenia foetida* produces 17.5 cocoons for 6 weeks, that is 0.64 cocoons per week

per pair of earthworm. As compare to above the number of cocoon production is very less. It may be due to salinity and low content of organic matter in the soil. In addition to this, certain amount of energy may be utilized to tolerate soil salinity.

Butt ( 1993 ) studied the growth and reproduction of earthworms '*Lumbricidae*' in laboratory culture to assess soil restoration. He worked on disposal of degradable organic waste. According to him , the earthworms are capable of restore the soil containing degradable organic wastes. In our present investigation it was found that the earthworm *Eisenia foetida* are also restore the partly saline soil at some extent

The life cycle of *Eisenia foetida* showed that the cocoon production continued for more than 600 days under favourable condition of temperature and nutrient ( Reinecke *et al.*, 1992 ). Our observations on cocoon production are greatly resembles with the above results. Observations on cocoon production in normal soil was 76 cocoons in a six weeks of duration, where as the rate of cocoon production in saline soil was very slow and it was 17.5 cocoons in a six weeks. As in total saline soil the mortality was 100 per cent and so there is no breeding and cocoon production in this soil substrate.



Much of the investigation is carried on cocoon production in relation to season, temperature, pH of soil, nutrient etc. Our observations are greatly resemble with Reincke & Hallat (1989) in which the growth rate of cocoon production was greatly affected in semi-saline soil.

Chris Klok et al reported that the soil acidity had a strong negative effect on earthworm survival, and the maturation weight decreased with clay content. They showed that individual weight gain in *L.rubellus* decreased with the acidity of the soil changes the population composition towards younger age classes our results also showed that weight gain and growth of the *Eisenia foetida* is greatly affected by the soil salinity. In semi-saline soil the growth and weight gain is moderate but in total saline soil they fail to survive and grow.

## **Concluding remarks :-**

The present investigation was undertaken with a view to get an insight into the behavioral, morphological, survival, growth and breeding aspects of the earthworm *Eisenia foetida* in various soil samples such as total saline soil, semi-saline soil and normal soil as control substrate soil. Since survival, growth and breeding of earthworm is not possible in total

saline soil, the results of above mentioned aspects are studied in relation to semi-saline soil and are compared with the normal or fertile soil. As mentioned earlier in previous part of dissertation, the earlier aspects like influence of temperature, pH, season, humidity, nutrients etc. on the growth and breeding of various earthworm species have been studied in greater details, but yet there is no literature available on the effects of saline soil on the growth, survival and breeding of the earthworms. At a comparative level the chemical parameters such as Nitrogen, Phosphorus, Manganese, Zinc is low in total saline soil, whereas, it is high in Electrical conductivity and Sodium . Similarly the semi-saline soil is low in Nitrogen, Phosphorus, Iron, Manganese and Zinc, whereas high in Electrical conductivity and Sodium as compared to normal soil.

The morphological studies in relation to body weight of worms in total saline soil is unable to record due to 100 % mortality in it, where as in semi-saline soil the body weight of worms in terms of grams . was found to be decreased showing negative effect as compared to normal soil.

From the observations on survival rate it seems that there is 100 % mortality in total saline soil. But, in semi-saline soil the mortality is 77.5

% . As these values are very high as compared to normal soil, where the mortality is 2.5 % . Thus semi-saline soil and total saline soils are not suitable for the successful growth and survival of the earthworm *Eisenia foetida*.

The various observations on breeding in relation to reproductive performance showed that there is no breeding in total saline soil as there is 100 % mortality. Similarly there is very least net reproductive rate 9.9 per cent per week as compared to normal soil where net reproductive rate is 13.23 per cent per week and in buffalo dung it is 17.5 per cent per week .The present dissertation provides some information on morphological, behavioural and reproductive aspects in the vermicomposting earthworm *Eisenia foetida*. On exposure to various soil samples especially the semi-saline soils.