CHAPTER I

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The soil arthropods are important and most species rich component of any terrestrial ecosystem. Arthropods are one of the major groups of soil fauna inhabiting soil and these are integral to a functioning ecosystem and perform key roles as detritivores, herbivores, predators and prey. Soil microarthropods can be defined as those organisms which are very small, free living soil inhabiting species. They are major fraction of the mesofauna which have body width ranging from 0.1 to 2 mm and body length between 0.2 mm and 10 mm. Microarthropods in particular acari (mites) and collembolan are the most abundant and diverse group of soil arthropod community living in soil and litter environments. Acari are essential for efficient decomposition and nutrient cycling (Seastedt, 1984) and these are sensitive to soil disturbances (Clapperton et al., 2002). Cryptostigmata or Oribatids are one of the most numerically dominant arthropod groups in the organic horizons of most soils (Norton, 1990). They influence decomposition and soil structure by shredding and feeding on fungi and dead organic matters (Behan-Pelletier, 2003).

Agriculture is the practice of cultivating the soil to produce crops. The fertility of soil is an important factor for cultivation of different crops. But in agricultural fields due to application of different fertilizers and also by crop rotation, tillage, irrigation etc the natural soil conditions and natural microarthropods and their ecology are affected (Sarkar et al., 2007). So bio-monitoring is the only way to gather knowledge about the prevalence or declining trend of population of specified soil
organisms under diverse stress conditions. Microarthropod plays the role of bioindicators in agricultural soils (Behan-Pelletier, 1999).

Disposal of solid waste is a growing environmental problem. Municipal solid waste (MSW) includes degradable (paper, textiles, food waste and yard waste etc), partially degradable (wood, disposable napkins and sludge, sanitary residues) and non-degradable materials (leather, plastics, rubbers, metals, glass, ash from fuel burning like coal, briquettes or woods, dust and electronic waste) (Herat, 2009 and Jha et al., 2007). Due to urbanization and rapid population growth there is production of bio degradable as well as non-bio-degradable wastes. Their disposal in the soil affects the soil faunas which in turn may affect the maintenance of soil fertility in the soil ecosystem obviously.

Monitoring the environmental impact of anthropogenic disturbance on soil ecosystem is of great importance for optimizing strategies for soil use, conservation and remediation. Human induced disturbance could have affected main chemical and biological properties in an agricultural field. Soil microarthropods fauna (Oribatid and Collembola) of municipal solid waste treated soils may serve as bioindicators to evaluate the role of waste application on the soil habitat. The various chemical substances play an important role in the life cycle of soil microarthropods. The correlationship of chemical factors with the soil fauna have been studied by many workers (Mukharji and Singh, 1970). High status of organic matter is maintained in the soils by huge amount of litter on the soil surface and its rapid decomposition due to favorable condition like moisture and temperature (Singh et al., 1995).
Considering the great role played by various groups of arthropods, many researchers in India had taken up the studies on soil arthropods in different vegetation sites and agricultural fields.

In Assam, especially in the Barak Valley, the basic information on the occurrence and ecology of the soil microarthropods is lacking for a long time except for some works done by Gope and Ray, 2006a; Ray and Gope, 2006; Gope and Ray, 2012 and Singh and Ray, 2015. Considering its important role in the decomposition and maintenance of soil fertility in the soil ecosystem an important attempt has been made to investigate the ecology and diversity of soil microarthropods in the cultivated field and municipal wastes disposal site in Cachar District of Assam with the following objectives.

**Objectives:**

1. To survey the type and extent of municipal wastes in the dumping site.

2. To study the population dynamics of microarthropods in relation to climatic factors and edaphic factors.

3. To analyze the community structure of microarthropod.

4. To study the physico-chemical properties of the soil.

**Descriptions of the study sites**

**Location and boundary**

The North Eastern region of India, a part of Eastern Himalaya, is a recognized biodiversity hotspot (Myer *et. al.*, 2000) of the world and our present investigated areas belongs to Cachar District of the state in Assam situated in hot spot area. Cachar
district situated at Barak valley, one of the major divisions of the state Assam with other two districts viz., Hailakandi and Karimganj. This district is located in the southern part of Assam, NE India lies between latitude of 24°41’29.9” N and longitude of 92°45’25.9” E and 36m above msl. The total area occupied by Cachar district is 3786 sq km. The valley is bounded by the North Cachar Hill District of Assam and Jaintia Hill District of Assam in the North, the state of Mizoram and Manipur in the South and East, respectively and by the state of Tripura and the Sylhet District of Bangladesh in the West.

Climate

The climatic condition of the valley is sub-tropical warm and humid. Most of the precipitation occurred here during May to September, which mainly controlled by southwest monsoon season. The average rainfall of this valley is more than 2500 mm. most of which is received during the (May to September).

Study sites

Four different fields were selected to investigate the ecology and diversity of soil microarthropod population viz., Municipal solid wastes disposal site, Municipal solid waste control site, Cultivated site and Cultivated control site. For the experimentation of the effects of Municipal solid waste disposal site soils on the agricultural fields, two fields were selected viz., Municipal solid waste treated cultivated field and a grassland as the control site.

a) Municipal solid wastes disposal site (MSW): This study site was located in the Meherpur area which is 5 kms away from Silchar Municipal office where household and other garbage of Silchar are dumped regularly by
Municipal Corporation. No tree species is present at this site. The soil is mainly composed of huge quantities of decomposed and semi-decomposed organic materials generated from the dumping materials.

b) **Municipal solid waste control site (MSW-CONT):** This site was situated near the Municipal solid waste disposal site where there is no dumping of solid waste materials.

c) **Cultivated site (CULT):** This area of investigation was situated in Dorgakona village which is 15 kms away from the Municipal solid waste disposal site of Meherpur. During the study the site contained cultivated plants like potato, tomato, coriander, brinjal, mustard (*Brassica sp.*) etc. The site was manured by cow-dung only.

d) **Cultivated control site (CULT-CONT):** The present investigation site is mainly dominated by grassland (*Imperata cylindrica*) which is adjacent to the cultivated site and about 1 km away from it.

e) **Municipal solid waste treated cultivated field (MSW-TREAT):** This area of investigation was also located in Dorgakona village which is 15 kms away from the Municipal solid waste disposal site of Meherpur. In this cultivated study site, potato, tomato, coriander, brinjal, mustard (*Brassica sp.*) etc. were grown.

f) **Grassland control site (GL):** This investigation site is mainly dominated by grassland (*Imperata cylindrica*) which lies adjacent to the Municipal solid waste treated cultivated field and about 1 km away from it. This site was taken as a control to compare the effect from the solid waste treated cultivated field.
Figure 1.1: Map showing study sites
Figure 1.2: Municipal Solid Waste Disposal Site (MSW), Meherpur, Silchar

Figure 1.3: Municipal Solid Waste Control Site (MSW CONT), Meherpur, Silchar
Fig. 1.4: Cultivated site (CULT), Dorgakona, Cachar District, Assam

Fig. 1.5: Cultivated control site (CULT CON) (Grassland), Dorgakona, Cachar District, Assam
Fig. 1.6: Municipal solid waste treated cultivated field (MSW TREAT), Dorgakona, Cachar District, Assam

Fig. 1.7: Municipal solid waste treated control site (Grassland), Dorgakona, Cachar District, Assam