CHAPTER- 4

MATERIALS AND METHODS

4.1 Study Sites:

Study was conducted during the period 2002 to 2005. Four crop fields *viz.* Savli (North), Dabhoi (East), Padra (West) and Karjan (South) around Vadodara were selected for study. Sugarcane, Wheat, Cotton and Castor were the main cash crops grown in these areas. These crops were selected for study because of the following reasons,

1. Economic importance to the farmers.
2. Soil difference property (Three study sites were composed of sandy loam soil while one was composed of deep black soil).
3. Farmers rated crops of Sugarcane, Wheat, Cotton and Castor more susceptible to termite attack.

Survey to assess the damage done by the termites to these crops was conducted during the cropping season.

4.2 Field survey method:

Around Vadodara all the four crops namely Sugarcane, Wheat, Cotton and Castor were present in all study areas i.e. Savli (North), Dabhoi (East), Padra (West) and Karjan (South) .Crops were surveyed at seedling stage and the stage just before maturing. Plants near the ripening stage are more vulnerable to termite attack (Pearce, 1997). From the general survey it was clear that the general activity of termites was more during mornings and late evenings. Hence, the studies were mainly carried out during that time.

4.3 Assessment of damage:

Crop susceptibility to termite damage was checked.

Samples of unhealthy looking plants from the crop field were located and sampled. Termites were collected from different parts of the unhealthy plants. Vials of collected termites were labeled. All possible observations on their micro habitats and infested parts of host plants were noted. Efforts were also made to record all termite species present in the study area. Pearce (1997) has stated that before starting the experiments, some knowledge of termite species present in study area is essential. So, possible habitats and micro habitats (e.g. wooden logs, under stone, sanding tree bark, stumps of cut tree, dry dung, wooden fencings, etc.) on hedges of agricultural field were also surveyed for termites.

4.4 Collection and preservation of termites:

Soldiers play an important part in the termite classification and identification of species. More efforts were made to collect soldier caste. All individuals of worker caste ware also collected from uprooted crop plant by keeping it on big white hard paper sheet. Termites were collected with the help of brush and preserved in 70% alcohol.

4.5 Laboratory studies:

Identification of species:

For Identification of termites the scheme of Roonwal and Chhotani (1989) and Chhotani (1997) was used, which is more acceptable and seems to be more practical and satisfactory in Indian context (Rathore and Bhattacharya, 2004).

The major characteristics used to distinguish termite genera were:

i. Head shape and size
ii. Fontanelle
iii. Labrum
iv. Clypeus
v. Mandible
vi. Pronotum
vii. Position of teeth and
viii. Number of antenna articles

Measurements were taken in alcohol-preserved whole specimens. While measuring, the body was kept as flat as possible and measured under a binocular stereo microscope with the aid of ocular micrometer. All measurements were recorded in millimeters. The micrometric measurements were compared with standard monographs and keys.

General features of soldier:

General features of soldier and taxonomic measurements used in this study are illustrated in the following figures.

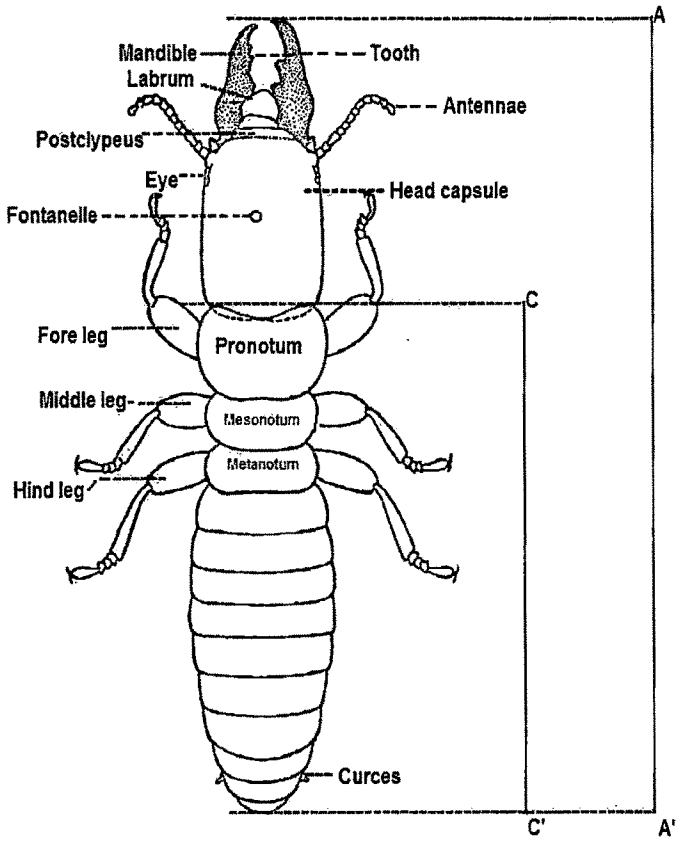

Figure 1. General body structure of the soldier termite. (Total body length AA', Body length without head CC').

Saddle shaped Flat shaped

Figure 2. Shape Difference in the pronotum.

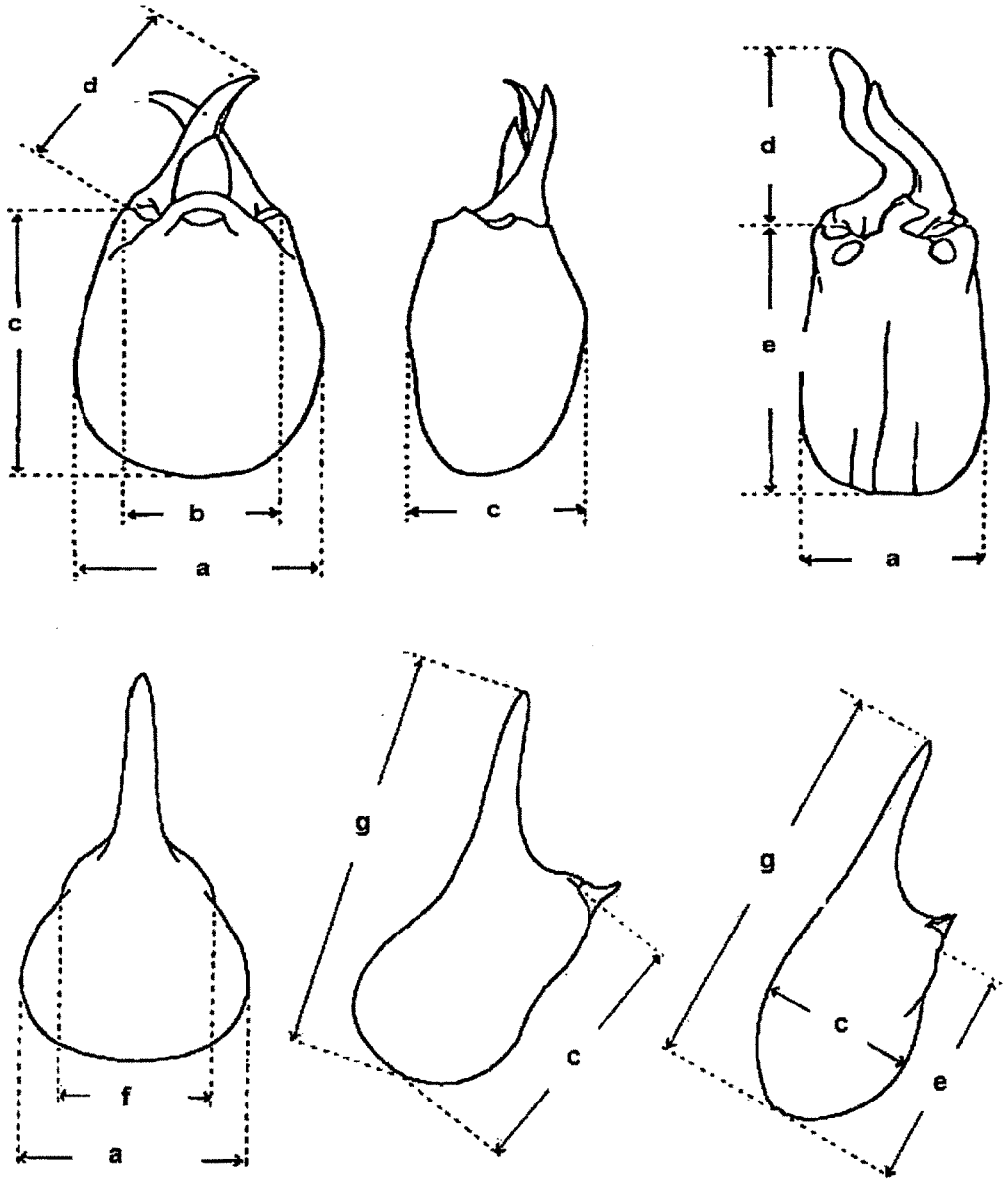

Figure 3. General taxonomic measurements of the soldier head.

Measurements used in quantifying the soldier head size: **a)** maximum width of head, **b)** width of head at base of mandible, **c)** height of head, **d)** length of left mandible, **e)** length of head to base of mandible, **f)** width of head at point of constriction, **g)** length of head to tip of nasutus. (Tho, 1992).

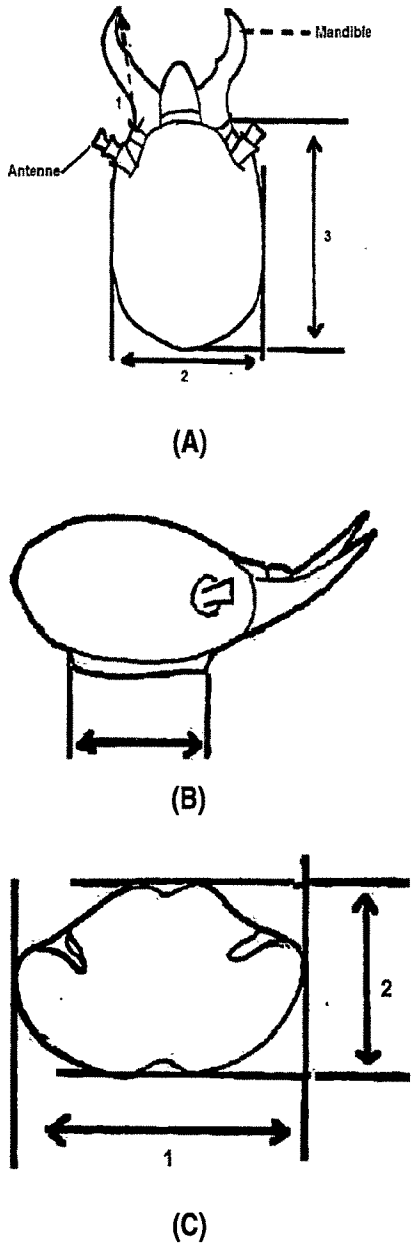

Figure 4. General taxonomic measurements of head and Pronotum of the soldier. **(A)** Length of left mandible (1) width of head (2) and length of head (3) **(B)** Length of postmentum. **(C)** Width of pronotum (1) length of pronotum (2) (Pearce, 1997).

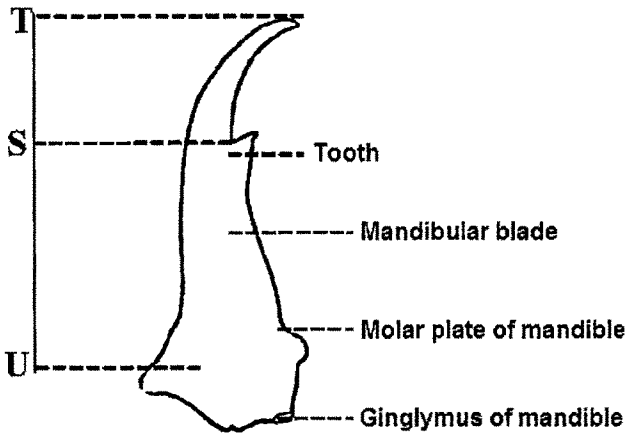

Figure 5. General taxonomic measurements of the soldier mandible. Left mandible of the soldier of *Odontotermes obesus* (Rambur): **a)** Tooth distance from distal tip of mandible (line ST) **b)** Tooth distance from mandibular base (line SU). (Roonwal, 1969).

4.6 Statistical analysis:

Percent presence has been calculated using the formula,

$d_i = (n_i \times 100) / N$ (South wood and Henderson, 2000).

Where,

d_i = Percent presence

n_i = No. of individuals of taxa

N = total no of individuals of taxa

4.7 Photography:

Termite soldiers were collected from the field and photographed in the laboratory with the help of Sony digital camera (Cyber Shot, DSC H2, 12x optical zoom).