chapter-3
MATERIALS AND METHODS

In order to maintain stock in the laboratory large number of mature adults and immature stages of *Phlaeoba infumata* and *Oedaleus abruptus* were collected from different areas of Aligarh (Lat. 27° 34' 30" N and Long. 78° 4' 26" E) (Fig. 2). They were kept in insect breeding cages, each measuring 54 cm × 40 cm × 30cm. Three sides of the cages were made of wood while the front side was further divided into two parts, the upper and the lower. The upper part was fixed and made of glass panel, measuring 31x 31cm, while the lower part, measuring 31 x 12cm, formed a wooden window for cleaning the fecal matter (Fig. 40).

A false-floor of wire gaze was provided at the level of glass plate inside the cage. Six perforations, each measuring 4.3 cm in diameters were provided inside the cage to support egg-laying tubes.

The metallic tubes measuring 11cm in length and 4cm in diameter, filled with sterilized sand and moistened with distilled water (8 ml distilled water for every 100 gm of sand) were inserted into the perforations for ovipositions.

These cages were not thermostatically controlled but changing the number and wattage of the electric bulb in the cage could roughly regulate the heat, which served two purposes; heat and photoperiod for normal growth and development. Each cage was provided with a number of sticks for perching and moulting and also for basking. A petridish of water covered with perforated
zinc sheet was kept in each cage and refilled as often as necessary, to keep the humidity at the desired level.

In order to obtain eggs, adult males and females of these grasshoppers were also placed in the glass jars, each measuring 21cm × 19cm. Each jar was provided with a cardboard having a circular hole, 5cm in diameter, in the center. A beaker, measuring 5.4 cm × 5 cm, with sterilized sand (wet) was placed inside the hole of the cardboard. The egg-pods were moistened daily according to the requirement.

The hoppers thus hatched were transferred in glass jars (15x20cm) with the help of especially designed aspirator and fed twice daily with fresh leaves of maize (Zea mays) as per the experimentally designed. The open ends of the jar were covered with muslin cloth held with rubber band. Four different combinations were made by using two ecological parameters viz. temperature and crowding. Two of them were reared at 27±1°C both under isolated and crowded conditions. Similarly rest of the two groups reared at 37±1°C both under isolated and crowded conditions. In isolated condition only two individuals, one from each sex was taken, but in case of crowded condition 25 pairs were placed in a glass jar. Two more replicas of each four combinations were run in parallel to replace the experimental jars, if secondary infection leading to mortality. On every stage of development, the morphometrics was done for the developmental rate and differences between various biological stages.

The daily temperature, relative humidity and rainfall in the field was recorded from the weather station, Department of Physics, A.M.U. Aligarh, which is hundred yards away from our field
laboratory. The incubators were set at 27±1°C and 37±1°C with 70 ± 5% R.H. for above conditions. The egg-pods were moistened daily according to the requirement.

Whole work is divided into four parts, which are as follows.

A. Population studies.

B. Biology.

C. Colour patterns.

D. Morphometrics.

Population studies were made by random sampling of these grasshoppers in and around Aligarh thrice a month for three years (2002-2004). Population fluctuations for both hoppers and adult stage were made separately on monthly basis.

Second part is dedicated to their biology in which different life processes were observed at different life stages. During adult stage; pre-copulation period, copulation period, oviposition period, preference of soils, and longevity of adult were studied under different experimental conditions. Dimension of egg pods, length of froth and eggs were measured using vernier dial caliper. At hopper stages; moulting, time taken during each instar, development of alar rudiments, posterior margin of pronotum, formation of eye stripes, and total hopper duration were studied in detailed. Average fecundity was calculated under isolated and crowded conditions. Growth indices were calculated and compared in different experimental conditions. Dyar’s low was applied on these grasshoppers using maximum width of head.
Third part of the observation deal with the most important aspect of the chromatic changes. The colour changes under stress of different experimental conditions were studied and presented in the form of colour plates. Only head and thorax (both dorsal and lateral) were taken into account to simplify the work. Poster colours were used to prepare the colour plates. Name and codes of colours exhibited by these grasshoppers were recorded using the Dictionary of Colour by Maerz and Paul (1950).

In morphometrical studies sixteen body parts were measured using vernier dial caliper (least count, 0.05 mm) for each instar. Measurements of body parts were taken after five days of moulting of a given instar to neutralize age factor. Rate of increase, differences between means of body parts, differences between means of ratios of different body parts, standard error and standard deviations were calculated at two different temperatures (27±1°C and 37±1°C), under isolated and crowded conditions. The data thus recorded were analysed statistically.