CHAPTER-4

GENERAL

MORPHOLOGY
Before dealing with the actual taxonomic treatment to various genera and species of the family Pyralidae, it will be worthwhile to understand the general morphology of this group of insects. The details of head, thorax, abdomen and the male and female genitalia of the family Pyralidae are described below, with particular emphasis on the taxonomic characters and the terminology involved in explaining the same (Plate 1 figs. 1, 2).

HEAD

The uppermost region of the head, lying between the dorsal inner margin of the compound eyes, is the vertex which is with ocelli well developed, reduced or completely absent. The occiput occupies the posterior area of head around the occipital foramen. The major frontal area of head is the clypeus, to which the frons is fused, and thus this combined structure is known as fronto-clypeus.

Frons is variable, being smooth, moderately reduced to acute protuberance and with or without corneous point distally. Antennae are characterized by indefinite number of segments and present in the upper region of fronto-clypeus. They are variable, either simple and filiform in both the sexes, or slightly thickened, weakly or strongly serrate, laminate or pectinate in males, and with two rows of scales attached to each segment dorsally, but uniformly pilose, ciliate or fasciculate on underside. In some males, the antennal segments at the base are fused or incised, and bear specialized tuft of scales.

The labrum is very minute and concealed under the anterior margin of fronto-clypeus. It is also very short and triangular with mentum usually obsolete. Labial palpi three segmented, often very long and porrect, giving an appearance of a snout at the front, or moderately long to very short, upturned or porrect or slightly down curved distally, often clothed with short or long scales or even hollowed to receive the maxillary palpi. Maxillary palpi three to four segmented, often dilated with scales at
extremity and prominent or reduced to brush like structure, hidden in the hollowed labial palpi.

Proboscis composed of two, greatly elongated galeae, each these is channeled along its inner surface. Galeae are held together by means of hooks and inter-locking spines and form a tube, through which liquid food is imbibed. When not in use, it is spirally coiled beneath the thorax. This may be present and prominent, or reduced and rudimentary or completely absent (Plate I, figs. 3, 4, 5, 6, 7, 8).

**THORAX**

The prothorax is reduced, assuming the form of a collar. It frequently carries a pair of small lateral processes called patagia. The mesothorax is largest and most prominent. Dorsally, it can be distinguished into a narrow band like prescutum, a very large longitudinally divided scutum and a well developed rhomboidal scutellum. Tegulae are developed. The last segment of thorax *i.e.*, metathorax is relatively much smaller, as compared to mesothorax (Plate I, fig. 9).

All the three pairs of legs are generally well developed and its different parts are coxa, trochanter, femur, tibia and tarsi, with the claws and pulvilli. Generally legs are covered with scales and hairs, but the presence of spines on the tibia are of much importance. Fore legs are generally without tibial spurs. Middle legs are generally with one pair of spurs. Hind legs are generally with two pairs of tibial spurs which are very important taxonomically at generic and species level (Plate 2, figs. 10, 11, 12, 13).

The wing membranes are characteristically covered with highly modified and flattened macrotrichia in the form of overlapping scales, which exhibit a wide range of variation in the form and sculptures. Different patterns formed by these scales provide the most important taxonomic characters for identification of various species. The wing membranes are traversed by a system of veins, which are again of great taxonomic value (Plate 2, figs. 16, 17)

Wing venation provides one of the most important and reliable taxonomic character for the identification of pyralids. Fore wing typically has 12 veins and hind wing has 8 veins. The first branch is the costal vein which forms the edge on costa of the wing. Subcostal (Sc) vein (vein 12) comes next which always remains unbranched
and runs from the base of wing to costal margin and remain always free from the other veins. This is 12th vein in fore wing and 9th vein in hind wing. Then follows the radial vein which is normally 5 branched (vein 7 to 11 or R5, R4, R3, R2 and R1) and in hind wing its first branch i.e. 11th or R1 is fused with Sc (vein 8) called Sc+R1 and the remaining four branches are completely fused and called as Rs (7th Vein). Next is the median vein which is 3 branched in both wings (vein 4 to 6 or M3, M2 and M1), while cubitus which follows next, is divided into 2 branches called as 3rd and 2nd or Cu1 and Cu2. Anal veins are three branched (vein1) or 1st A, 2nd A and 3rd A), out of which vein 1st A is generally absent in fore wing except in subfamily Schoenobiinae, where it is present in the terminal region of fore wing; in hind wing all the three branches of anal veins are present.

The branches of radius, median and cubitus are nearly always united by short cross-veins called discocellular in both the wings at about middle of the wing, leaving an enclosed basal space in the central part of the wing called “cell”. The cell is bounded anteriorly by the base of radius and posteriorly by the base of cubitus and the base of median, which traverse the cell, is invariably obliterated.

The fore-and hind wings are held together by frenulum, composed of strong curved bristles arising from the base of the costa of hind wing and fitting into a retinaculum which usually consists of a tuft of hairs arising from the ventral side of the costal vein of fore wing. In males, there is generally a single frenulum, whereas in females, there are two or three frenulums, with few exceptions (Plate 2, figs. 14, 15). Common (1960) and Nazmi (1963) have been followed in the present study for naming the different veins of fore and hind wings.

ABDOMEN (Plate 1, fig. 2)

The abdomen consists of 10 segments. The first segment is reduced and its sternum is either membranous or wanting. Segments 8, 9 and 10 are greatly modified in order to form the genitalia. The abdomen may be densely or sparsely clothed with scales and hairs. The caudal extremity of females of some of the species are provided with tuft of anal hairs.
GENITALIA

Usually 8th to 10th abdominal segments are modified to form the genitalia. The principle parts are generally withdrawn into the 8th segment and consequently they may be clearly visible only when microscopic preparation is made and studied under a high magnification.

MALE (Plate 2, figs. 18, 19)- It has following parts:-

**Tegumen:** It is dorsal part of the 9th segment which is usually large and sclerotized to form a hood-like structure and serve as a base for the attachment of other genital appendages. It usually forms a complete transverse ring with the sternite which is modified to form vinculum.

**Pedunculi:** The lateral extensions of tegumen, which articulate with the dorsal end of vinculum, are called pedunculi.

**Vinculum:** It is actually derived from the 9th sternite and is a thin U or V-shaped structure that remains continuous across the ventral side.

**Saccus:** Mid-ventrally to the vinculum, there is a blind tubuler process, extending cephalad inside the body, known as saccus.

**Uncus:** This forms the dorsal process of the 10th segment and is in close contact with the caudal end of the 9th tergite. It is well sclerotized structure which occupies the central upper part of the tegumen. This structure is of great taxonomic value as it exhibits considerable amount of variation with respect to shape and size among different species.

**Gnathos:** In close proximity and lateral to socci there are a pair of arms, called gnathos. These articulate with caudal margin of tegumen and are derived from the sternum of 10th segment.

**Tuba-analis:** it is the posterior most part of the digestive tract which is ventral to tegumen and uncus.

**Anellus:** This is the beginning of the central part of the diaphragm which gets evaginated dorso-ventrally to form a funnel-like cone around penis from where the latter protrudes out of the body.

**Aedeagus:** It is the outside covering of penis and is a stout tube, with an opening on the side near the base. This receives the seminal duct and contains the reversible balloon like membrane known as vesica which is most delicate structure
and often bears sclerotized spines, scobinated patches, spicules or a band, termed as cornuti and penetrates into bursae-copulatix of the female during copulation. It is variable in size and with or without cornuti.

Valva-Valvae: These are paired clasping organs which basally articulate with the vinculum and lie in a latero-ventral position. The front margin is termed as costal margin and the outer one as termen. Its ventro-proximal region, bearing various process is termed as sacculus. The dorsal distal setose part of valva is called cucullus. The sclerotized dorsal proximal margin of the valva is known as costa. The shape of the valva and its manner of articulation appears to be highly variable among various genera. Mostly it is reduced to sub-rounded or pointed apex, simple and weakly sclerotized lobe but becomes large in some genera. It often gets divided into two lobes, a feature that runs through many genera and provides a good taxonomic characters for their diagnosis. The costal lobe may be simple or rigidly sclerotized and gets developed as a long curved spines.

FEMALE: (Plate 2, fig. 20) It has following parts:-

Papillae anales: They are typically the external structure of 9th and 10th segments, forming a pair of lobes between which the anus and ostium oviducts open outside. They are usually more or less separate, soft, rounded, blade like and strongly setose structures.

Apophyses: These are derived from the cephalo-dorsal or lateral edges of the 8th and 9th tergites. Those of the 8th segment are anterior apophyses and those of 9th segment are posterior apophyses. Both the apophyses i.e. anterior and posteiior are paired structure and are of same size or varying size.

Ductus bursae: This is a tubular structure in between ostium bursae and corpus bursae. It is membranous or slightly sclerotized and short or long.

Corpus bursae: The ductus bursae end in the form of a blind sac which is known as corpus bursae. The variable shape of corpus bursae are of important taxonomic value. Sometimes sclerotized structure of different shape and size are found at different places of corpus bursae which are known as signum. The presence or absence, number and location in corpus bursae, size and shape of signum are of great taxonomic value.