The Andhra Agric. J 57(3):266-271, 2010

Taxonomic Studies on the Different Lepidopteran Caterpillars Associated with Oilseeds in Guntur District

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ABSTRACT

Different Lepidopteran larvae were collected from various places from Guntur district on oilseeds. The larvae were brought to the laboratory reared, preserved, identified through proper studies. The larvae *viz.,* Spodoptera litura (Fabricius), Achaea janata (Linnaeus), Ergolis merione (Cramer), Euproctis fraterna (Moore), Pericallia ricini (Fabricius), Syntomis divisa Walker and Aproaerema modicella (Deventer) were identified and described based on the morphological characters and chaetotaxy of thoracic and abdominal segments especially 3rd abdominal segment and arrangement of crochets on the ventral prolegs. For easy identification of these larvae a taxonomic key was prepared with the help of line diagrams of thoracic and abdominal segments.

Key words : Lepidopteran Caterpillars, Oilseeds, Taxonomy

The main oilseeds grown in India are groundnut, linseed, sesamum, mustard, rapeseed and castor with a production of 25.1 million tonnes. In Andhra Pradesh oilseed crops are grown in an area of 26.29 lakh hectares with a production of 33.08 lakh tonnes (The Hindu Survey of Indian Agriculture, 2008 and Statistical Abstract Andhra Pradesh, 2008).

The oilseed crop ecosystems are infested by a number of Lepidopteran pests. Majority of the Lepidopteran pests cause economic damage and mainly feed on roots, foliage, stem, buds and blossoms. The identification of these pests in the larval stage is difficult when compared to the adult stage. An accurate identification of pest species damaging the crop should be known for effective pest management practices, as most of them are species specific. Hence, the taxonomic studies of the larvae of Lepidoptera is necessary in order to identify the Lepidopteran pests at larval stage under field conditions.

MATERIAL AND METHODS

The investigation was conducted in the Department of Entomology, Agricultural College, Bapatla, Guntur district during 2005-06. The larvae belonging to the order Lepidoptera infesting oilseed crop ecosystems were collected from different places in Guntur district. The collected larvae were brought to the laboratory and transferred to rearing jars. The jars were covered with muslin cloth and the larvae were fed daily until they reach the final instar. A few final instar larvae were killed in K. A. A. D mixture (kerosene-1 part, 95 per cent ethyl alcohol- 7 parts, glacial acetic acid - 2 parts and dioxan - 1 part) as advocated by Peterson (1948).

The caterpillars were allowed for thirty minutes to four hours depending on nature and size of larvae and then transferred them to 95 per cent ethyl alcohol for longer preservation. The specimens which were preserved in 95 per cent ethyl alcohol were given a dorsoventral cut with the help of sharp blade. The specimens were kept in 10 per cent potassium hydroxide overnight. The specimens were rinsed with water and were retained in different grades of alcohol *viz.,* 50, 70 and 95 per cent alcohols successively for about 10-15 minutes to facilitate dehydration. The specimens were transferred into clove oil for 10-15 minutes for clearing. Finally a phenol + xylol mixture in the ratio of 1:1 was used to retain the specimens until the permanent slides were prepared with Canada balsam.

The specimens were kept on glass slides with few drops of mounting media, Canada balsam and oriented in a required direction with the help of needles. A cover slip was placed on the slide gently. The mounted slides were kept on a leveled surface at room temperature for 24-36 hours for drying. Later, the specimen code number and name of the part of the specimen was written on the mounted slide. The line diagrams of thorax and abdominal segments of the caterpillars were drawn with the help of drawing attachment with Olympus Trinocular Research Microscope.

RESULTS AND DISCUSSION

Seven caterpillars belonging to different families, collected in oilseed crop ecosystems are listed below.

Key to The Lepidoteran Caterpillars Associated with Oilseed Crop Ecosystems

A key for distinguishing the following Lepidopteran larvae associated with oilseed crops was prepared for easy and accurate identification. The key is mainly based on different characters *viz.,* colour of larvae, armature on the body, chaetotaxy of prothorax and 3rd abdominal segment and the arrangement of crochets.

1. The thoracic and abdominal segments with long numerous hairs without any definite setal arrangement. … 2

- The thoracic and abdominal segments with short, definite number of hairs with definite setal arrangement … 5

2. Head with a pair of horn like processes; larva green with sharp branching hairs in glumes all over the body (Figs. 5 & 6)

… *Ergolis merione* (Cramer) Fy: Nymphalidae

- Head without horn like processes; larvae not as above … 3

3. The crochets on ventral prolegs are uniordinal mesoseries heteroideous. Larvae blackish brown with red head and long thick hairs arising on warts found on its body (Figs 9 and 10)

… *Pericallia ricini* (Fabricius) Fy : Arctiidae

- The crochets on abdominal prolegs are uniordinal mesoseries or mesopenellipse but not heteroideous. Verruca on abdominal segment with short hairs or setae … 4

4. Each abdominal segment with two pairs of verrucae on dorsal area, a pair of verrucae on supra spiracular area and a pair of verrucae on sub spiracular area with short hairs or seta (Fig 13 and 14) and

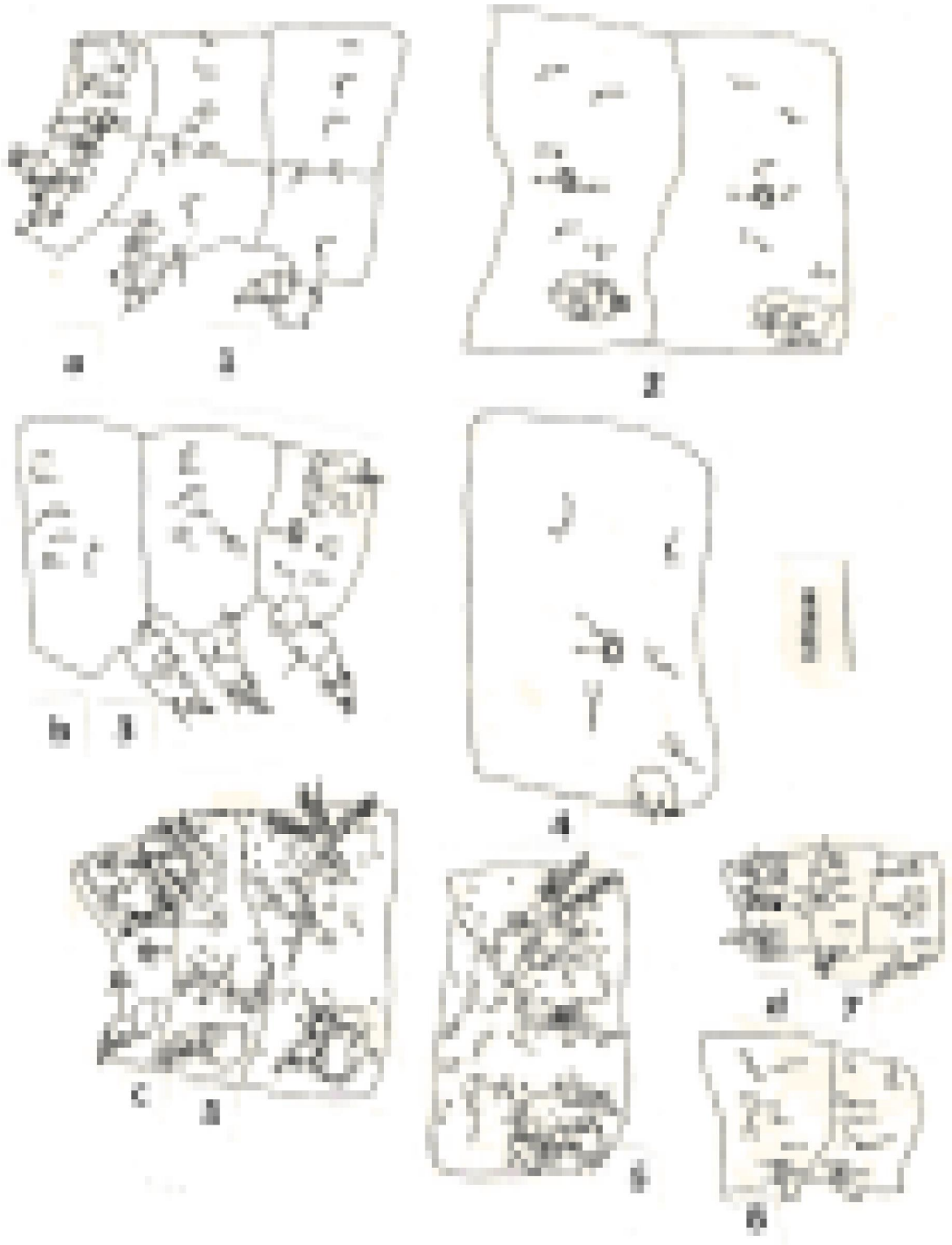
… *Syntomis divisa* Walker Fy : Ctenuchidae (Syntomidae)

- Abdominal segments without above combination of characters, abdomen with pink colored dorsal stripe on cream colored back ground; On either side of the above stripe a pair of black colored warts with sparsely hairy on each segment (Figs 11 and 12)

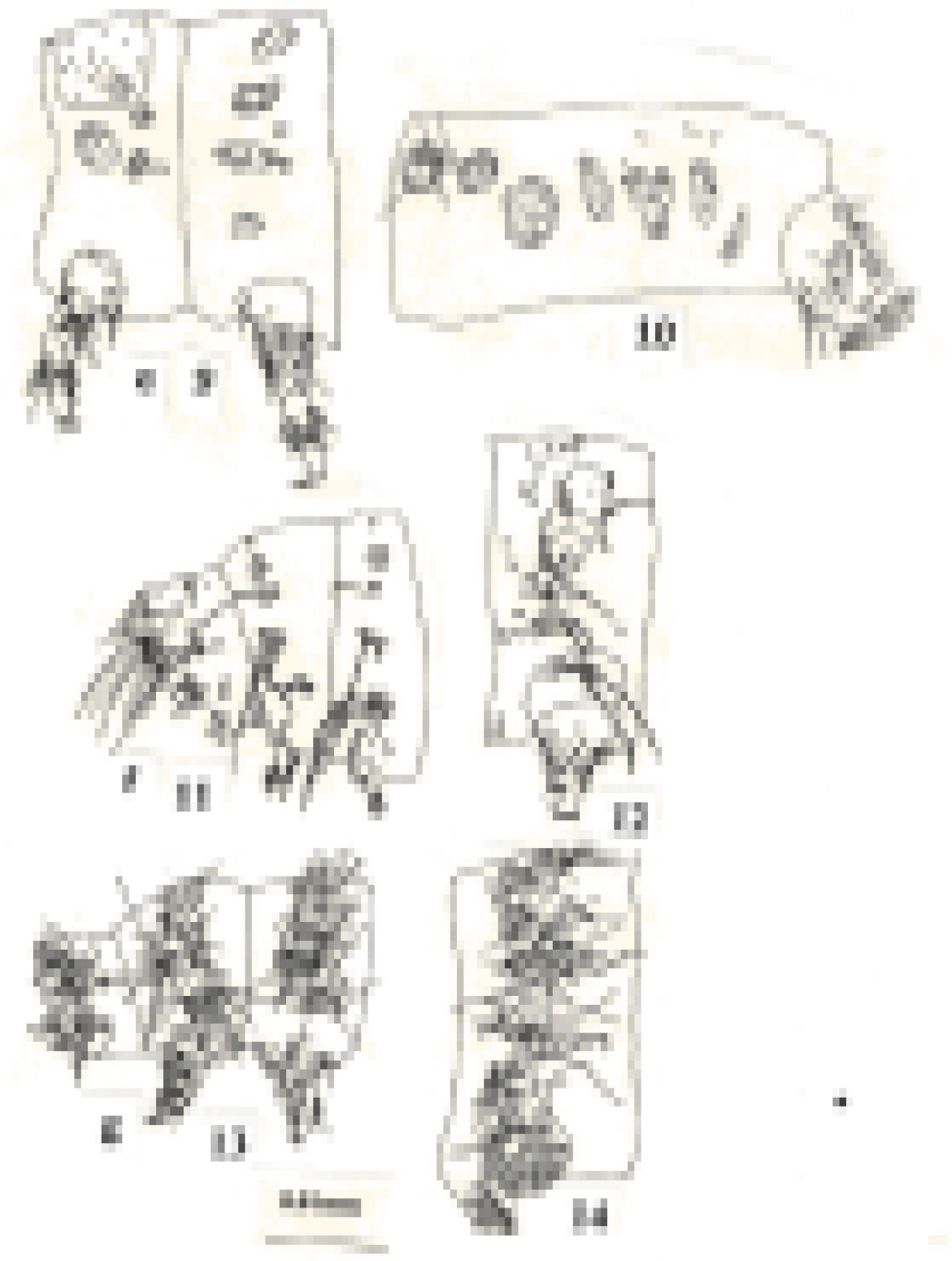
… *Euproctis fraterna* (Moore) Fy:Lymantriidae

5. Crochets arranged in uniordinal lateropenellipse larva forms a loop due to the non-functioning of one or two pairs of prolegs on abdomen. Larva is brownish in colour with black head, a red spot on the black loop and red anal tubercles. (Figs 3 and 4)

S.No	Common name	Scientific name	Family	Host plants
1	Tobacco caterpillar	*Spodoptera litura* (Fabricius)	Noctuidae	Castor, Sunflower, Groundnut, Niger, Soybean, Bhendi, Cotton, Tobacco, Chilli, Greengram, Blackgram, Cowpea
2	Castor semilooper	*Achaea janata* (Linnaeus)	Noctuidae	Castor
3	Spiny caterpillar	*Ergolis merione* (Cramer)	Nymphalidae	Castor
4	Red tussock caterpillar	*Euproctis fraterna* (Moore)	Lymantriidae	Castor, Cotton
5	Garden hairy caterpillar	*Pericallia ricini* (Fabricius)	Arctiidae	Castor
6	Woolly bear	*Syntomis divisa* Walker	Ctenuchidae	Castor
7	Leaf miner	*Aproaerema modicella* (Deventer)	Gelechiidae	Groundnut



Cheatotaxy of a) *Spodoptera litura* (Fabricius)
1. Thorax 2. Abdomen b) *Achaea janata* (Linnaeus) 3. Thorax 4. Abdomen c) *Ergolis merione* (Cramer)
5.Thorax 6. Abdomen d) *Aproaerema modicella* (Deventer) 7. Thorax 8. Abdomen



Cheatotaxy of e) *Pericallia ricini* (Fabricius) 9. Thorax 10. Abdomen f) *Euproctis fraterna* (Moore) 11. Thorax 12. Abdomen g) *Syntomis divisa* Walker 13.Thorax 14. Abdomen

... *Achaea janata* (Linnaeus) Fy: Noctuidae

- Loop not formed due to the presence of all 5 pairs of functional prolegs on abdomen. Crochets may be uniordinal mesoseries or biordinal mesoseries ... 6

6. Crochets uniordinal mesoseries. Caterpillar is stout, cylindrical, brownish with dorsal, subdorsal spiracular stripes of different colours (Figs 1 and 2)

... *Spodoptera litura* (Fabricius) Fy: Noctuidae

- Crochets biordinal arranged in a complete circle. The caterpillar is cream - light green coloured with prognathous head. (Figs 7 and 8)

... Aproaerema modicella (Deventer) Fy:Gelichiidae

In S. litura prothorax consists of prothoracic shield which extends up to the margin of XD2; *A. janata*, prothoracic shield extends up to the ventral margin of SD1. Dorsal, anterior dorsal, lateral, subventral, micrscopic setae are present. In mesothorax of all the five caterpillars dorsal, subdorsal, lateral and ventral setae are distinct.

Peterson (1948) explained that the family Noctuidae bears uniordinal (rarely biordinal) crochets arranged in a mesoseries. Issac and Rao (1941), Bretherton *et al.,* (1983), Ahola (1986) and Chakravorty and Mandal (1989) studied the chaetotaxy of different Lepidopteran larvae belonging to the family Noctuidae and provided a key based on the external morphological features and chaetotaxy.

The larvae of castor spiny caterpillar, *E. merione* belonging to the family Nymphalidae is green with sharp branching hairs arising from the warts all over the body. Head is with two horn like processes by which it can be easily identified from all other larvae. On prothroax, mesothorax and 3rd abdominal segment numerous setae are present and their arrangement is irregular to describe. Crochets on the abdominal prolegs are arranged in triordinal mesopenellipse. The adult butterfly is dark brown in colour with wavy lines on the wings.

There is no definite pattern of chaetotaxy in the caterpillar of *E. merione*. It is identified based on the external morphological features and the arrangement of crochets on the abdominal prolegs. Peterson (1948), Chu and Cutkomp (1992), Wilmott *et al.,* (2001) and Tavares *et al.,* (2002) studied the external features including the arrangement of crochets which are triordinal and provided an identification key.

The larvae of Lymantriid caterpillar, *E. fraterna* is pink coloured dorsal stripe on cream coloured back ground and on either side of the above stripe a pair of black coloured warts with sparsely hairy on each segment and can easily be identified from all others. The setae on thoracic and abdominal segments are very long, numerous and arranged all over the body which are difficult to describe. Crochets on the abdominal prolegs are arranged in uniordinal mesoseries. The moth is medium sized and has greyish brown wings.

The garden hairy caterpillar, *P. ricini* belonging to the family Arctiidae was recorded and described. The thoracic segments and 3rd abdominal segment consist of numerous and irregularly arranged setae. The irregular setal arrangement on prothoracic, mesothoracic and 3rd abdominal segment pose considerable difficulties in explaining the chaetotaxy. The crochets on abdominal prolegs are uniordinal mesoseries heteroideous when compared to the other hairy caterpillars. The moth is greyish brown with dark spots on the brown forewings and also on the pinkish hind wings. Peterson (1948), Chu and Cutkomp (1992) concluded that the arrangement of crochets on the abdominal prolegs are uniordinal arranged in a heteroideous mesoseries.

The groundnut leaf miner, *Aproaerema modicella* (Deventer) belonging to the family, Gelechiidae was identified and described. In *A. modicella*, head is projected towards cephalad. In A. modicella, prothoracic shield is extended up to margin of L2. The dorsal, anterior dorsal, lateral, subventral and ventral setae are distinct in prothroax. In mesothorax dorsal, subdorsal, lateral, subventral and ventral setae are distinct. In *A. modicella* crochets are biordinal and arranged in a complete circle.

Peterson (1948) studied the crochets arrangement on ventral prolegs and concluded that the crochets are usually biordinal and arranged in a complete circle or two transverse bands. Chu and Cutkomp (1992), Rose and Pathania (2003) prepared a key for easy identification.

The caterpillar of castor woolly bear, *Syntomis divisa* Walker belonging to family Ctenuchidae (Syntomidae) is greenish brown with small hairs all over the body and looks like woolly bear. The setae on prothroax and mesothorax are numerous and their arrangement is irregular. The setae on 3rd abdominal segment is with two pairs of verrucae on dorsal area, a pair of verrucae on supra spiracular area and another pair of verrucae on sub spiracular area with short hairs on setae by which these larvae can easily be identified. Crochets on abdominal prolegs are uniordinal mesoseries.

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(Received on 08.03.2010 and revised on 20.5.2010)