



E-ISSN: 2320-7078

P-ISSN: 2349-6800

JEZS 2019; 7(3): 1417-1419

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Received: 18-03-2019

Accepted: 21-04-2019

Nagamandla Ramya sri

Department of Entomology,
College of Agriculture, PJTSAU,
Rajendranagar, Hyderabad,
Telangana, India

Mogili Ramaiah

Department of Entomology,
College of Agriculture, PJTSAU,
Rajendranagar, Hyderabad,
Telangana, India

Uma Maheswari T

Department of Entomology,
College of Agriculture, PJTSAU,
Rajendranagar, Hyderabad,
Telangana, India

A rapid method for identification of *spodoptera* species

Nagamandla Ramya sri, Mogili Ramaiah and Uma Maheswari T

Abstract

Prolongs of lepidopteron larvae have a small circle of gripping hooks, called "crochets". Which play an important role in diagnosing an insect species. In order to observe arrangement of crochets in four species of *Spodoptera*, which include *S. litura* (Fabricius), *S. mauritia* (Boisduva), *S. exigua* (Hubner) and the recent introduction *S. frugiperda* (J.E Smith). Larvae were collected and prolegs were dissected out and crochets arrangement, size were observed under stereozoom binocular microscope. The arrangement was found to be uniordinal mesoserries in four species with slight variation in arrangement. The length of crochets were found to be 0.321mm in *S. litura*, 0.241 mm in *S. mauritia*, 0.244 mm in *S. exigua* and 0.315mm in *S. frugiperda*, which helps in rapid identification of *spodoptera* species.

Keywords: Identification of *spodoptera* species, species

Introduction

Prolong is a small, fleshy, club like structure found on the ventral surface of the abdomen in most of the larval forms of order Lepidoptera. Prolongs of lepidopteran larvae have a small circle of gripping hooks, called "crochets". Which play an important role in diagnosing an insect species [4]. On the planta, crochets are arranged in the form of a full circle, half circle (Miseries or later series) or 70 percent circle with small break or gap in the series of hooks (pen ellipse). The term series refers to the arrangement of the crochets in different rows i.e universal, biserial and multiserial with same or different lengths (ordinal). If all crochets are of same length they are termed as uncordial, if they are arranged in two, three and more than three alternating lengths are termed as ordinal, triordinal and multiordinal respectively.

The noctuid genus *Spodoptera* contains many pests throughout the world [5]. *Spodoptera* are totally polyphagous in nature and therefore have huge potential to invade new areas and to adapt to new climatic and or ecological situations [1]. Four species are known to cause serious damage in India, This include *Spodoptera litura* Fabricius, *Spodoptera mauritia* Boisduval, *Spodoptera exigua* (Hubner) and the recent introduction *Spodoptera frugiperda* (J. E. Smith), A reliable morphological identification is necessary to identify the pest and carry out suitable management practices. Which is generally done for adult stages. But species level identification can be done based on the morphology of immature stages (in particular larvae) [2]. This present study is based on importance of arrangement and size of crochets in species level identification of *Spodoptera* apart from other morphological features.

Materials and methods

Collection and storage

The present study was conducted at Department of Entomology, College of agriculture Rajendranagar, and PJTSAU. In order to observe arrangement of crochets in four species of *Spodoptera*, which include *S. litura* (Fabricius), *S. mauritii* (Boisduva), *S. exigua* (Hubner) and the recent introduction *S. frugiperda* (J.E Smith). Larvae were collected from field in 70 per cent ethanol and brought to laboratory and stored in -20⁰ C refrigerator.

Prolong dissection

Dissection of larval prolongs was carried out under stereo zoom binocular microscope where larval prolongs were cut with sterilized scalpel and lacto phenol was added to the cut portion which was left overnight, in order to remove the extra tissue. After tissue disintegration crochets arrangement and size was observed clearly under stereo zoom binocular microscope.

Correspondence

Nagamandla Ramya sri

Department of Entomology,
College of Agriculture, PJTSAU,
Rajendranagar, Hyderabad,
Telangana, India

Results and discussion

First stage larvae (egg- larvae) of *Spodoptera* species are 1-2.5 mm long, whitish with a black head and dark pinacula. They cannot be distinguished morphologically from other *Spodoptera* species. Morphological identification is possible with late larval instars.

Spodoptera litura

In case of *S. litura* larvae are dark blackish brown with three lines one orange coloured central line, and two lateral yellow lines. Black intermittent spots are present dorsally along each lateral yellow line from anterior to posterior part of the body.

Spodoptera mauritii

Mature larvae of *S. mauritii* are 3.8-4 cm long which are green, grey, or brown colour with dark dull dorsal and sub-dorsal longitudinal stripes. Two rows of C-shaped black spots are visible along the backs.

Spodoptera exigua

In *S. exigua* late instar larvae are green dorsally with pink or yellowish on ventral side. A white lateral stripe and a series of dark spots are often present dorsally and dorso-laterally. Sometimes larvae are very dark in colour, even black. The spiracles are white with a narrow black border. The body is practically devoid of hairs and spines.

Spodoptera frugiperda

Late instar larva of *S. frugiperda* are brownish, with lateral white lines. Head is reddish brown, brownish larval body

bears white sub-dorsal and lateral lines. Elevated spots occur dorsally on the body; they are usually dark in colour, and bear spines. Presence of four spots on the eighth and ninth abdominal segment in the form of a square is the characteristic feature of the larva. The face of the mature larva was also marked with a white inverted "Y" shaped suture.

In the present study, the arrangement of crochets on the Planta was found to be unordinal miseries in all four species. However their arrangement in a single row differed by being half circular with a deep curve in the inner line of crochet arrangement in *S. litura*. Complete half circle in *S. mauritii* and *S. frugiperda*, whereas half circle with slight curve in the lower row of crochets in *S. exigua*.

In addition to arrangement, length of crochets vary from 0.241 to 0.321 mm among four species i.e 0.321mm in *S. litura*, 0.241 mm in *S. mauritii*, 0.244 mm in *S. exigua* and 0.315mm in *S. frugiperda*.

Discussion

Arrangement of crochets in all species is unordinal misusers with some variation like complete half circle in *S.mauritia* and *S. frugiperda* but both species can be identified by crochet length which is 0.241 mm and 0.315mm in *S. mauritii* and *S. frugiperda* respectively. Where as in case of *S. litura* crochets are arranged in half circle with deep curve measuring 0.321mm and arrangement in *S. exigua* varied from *S. litura* by having slight curve in the lower row of crochets measuring 0.244 mm. Hence crochets mapping can be a rapid tool for characterisation and identification of species

Table 1: Crochet arrangement and length of important species of *Spodoptera*

S. no	Insect Species	Crochet arrangement	Crochet length (mm)*	SD ± (mm)	Range (mm)
1.	<i>Spodoptera litura</i>	Uniordinal mesoserries	0.321	0.019	0.321 0.360
2.	<i>Spodoptera mauritia</i>	Uniordinal mesoserries	0.241	0.037	0.204 0.278
3.	<i>Spodoptera exigua</i>	Uniordinal mesoserries	0.244	0.019	0.225 .0263
4.	<i>Spodoptera frugiperda</i>	Uniordinal mesoserries	0.315	0.012	0.302 0.328

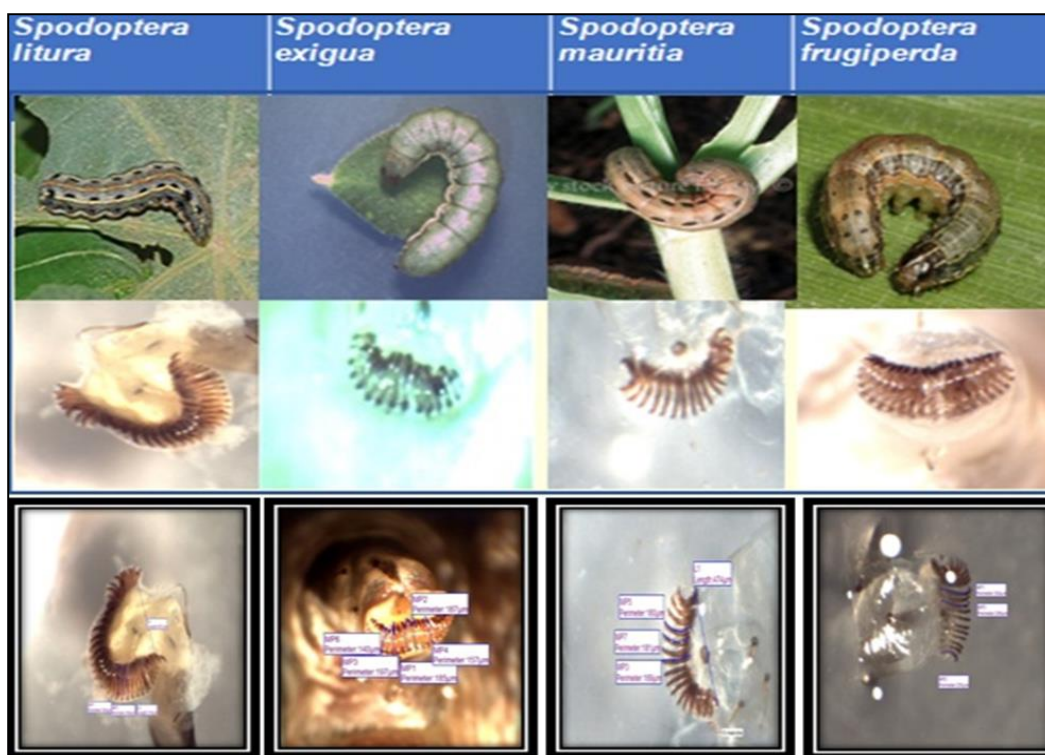


Fig 1: Crochet arrangement of important species of *Spodoptera*

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