



Short Communication

Genus *Spodoptera* (Hadeninae: Noctuidae: Lepidoptera): A New Species from Southern Punjab, Pakistan

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ABSTRACT

A comprehensive and a comparative taxonomic study of new species of the genus *Spodoptera* i.e. *Spodoptera hirsutus* is very similar to the *Spodoptera litura* but easily distinguish on the basis of different characters of genitalia. Specimens of this genus were identified on the base of their genitalia characters. This new species *Spodoptera hirsutus* was collected from Muzzafarghar with the help of light traps. The abdomen was dissected for the removal of genitalia and these genitalia were mounted permanently with Hoyer's medium. A key to the species of the genus *Spodoptera* from Pakistan is also given here. Taxonomic review of Noctuidae becomes superlative and very essential with this contextual the state of Pakistan. This was selected to the taxonomic study of Noctuidae. This research is initiative clue for further description, illustration and classification of unidentified species of the genus *Spodoptera* from Pakistan.

The Noctuidae has most important insect pests which damage the cereal and cash crops. Among the Noctuidae, the genus *Spodoptera* have most damaging species of agricultural crops (Pogue and Passoa, 2000). *Spodoptera* are polyphagous in nature. Immature of this genus have numbers of host plant viz. more than 100 plant species; most of them are the economically important plants (Robinson et al., 2010). The larvae feed gregariously on plant leaves (Ahmad et al., 2007). The larvae of genus *Spodoptera* prefers to feed on tender leaves that result in severe damage to the most economical crops and vegetables (Zucchi, 1984).

The larvae of *Spodoptera* spp. mostly feeds on the underside portion of the leaves which causes skeletonization of leaves. Initially, there are several small feeding spots on leaf which lead to tunnels' formation as a result of harsh feeling like cabbage hearts. It mainly damages the foliage, leaves, and fruits (Waterhouse and Norris, 1987).

The larvae of *Spodoptera* creates brown flag syndrome in bananas and grapes (Ranjith et al., 1997), causing 5 to 10% yield losses (Balikai et al., 1999). Morphological identification and description of genus *Spodoptera* is difficult from their closely resembling color pattern of wings, types of legs and antennae thus genital examination is necessary (Brambila, 2014).

The *Spodoptera* was erected first time on the base of genitalia by Guenee (1852). Later, Hampson (1894) identified one species *Hadena mauritia* Boisduval and classified it as the type species of genus *Spodoptera*. Poole (1989) classified the genus *Spodoptera* in the subfamily Amphipyridae, with the addition of more than 33 species. Kitching and Rawlins (1999) revised it again under sub-family Hadeninae. Brown and Dewhurst (1975) distinguished its generic status and synonymized two genera i.e. *Prodeniagueneae* and *Laphygma* Hubner. Todd and Poole (1980a, 1980b) and Todd et al. (1984) also used the genital attributes for the diagnosis of the species of *Spodoptera* Guenée. Later on, Pogue (2002) described the first-time female genitalia of *Spodoptera*. Srivastava (2002) examined female genitalia of species *Elliptica bryk*

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AIM, MS, ZI, MNN and MUS participated in performing data collection, preservation and writing of the manuscript. QS and WJ reviewed and edited the manuscript.

Key words

Identification, Morphology, Armyworm, Male genitalia, *Spodoptera*

and synonymized two species i.e., *Albiceps matsumara* and *Obsecur awileman* under the genus *Westermannia* Hübner.

Rishi *et al.* (2003) have been worked on the taxonomic studies of *Spodoptera litura* (Fabricius) and *Spodoptera exigua* (Hubner) for the identification of both species. The taxonomic characters under their study include; cilia on antennae, wing venation, the orientation of labial palpi, presence or absence of hair on eyes and thorax and genitals of males and females. They have also done the morphometric analysis of these taxonomic characters such as length and width of head and thorax.

Pouge (2011) studied the genitalia of species *Leucochlaena hipparis* (Druce) and placed this in genus *Spodoptera*. He studied on morphological characters of male and female genitalia and they have also illustrated the cladogram that shows the position of *Leucochlaena hipparis* (Druce) in *Spodoptera*.

In the present studies, taxonomic studies of one species belonging to the genus *Spodoptera* were carried out from Pakistan.

Materials and method

The moths belonging to the subfamily Hadeninae and collected by the conical iron light traps from different localities of the District Muzaffargarh, Punjab, Pakistan. These selected localities (Adam Khakhi, Sheher Sultan, Kalar Wali, and Ali Pur) were divided in two main regions i.e. crop and agro-forest area. Light traps (220Volt, 20 Watt), which is considered one of the preeminent methods to assemble adults' moths of Noctuidae from a wide range of specific region. Collected specimens were placed in Potassium cyanide jar. After killing the specimens were soaked for 2-3 h on butter papers and placed in glass petri-dishes in order to soften the wings and other body parts, so that specimens can be easily pinned and stretched. For studying the forewings and hindwings venation they were detached by giving a gentle upward jerk. These detached wings were dipped into 70% alcohol for 1-2 minute, after this, they were placed in sodium hypochlorite up to 20 minutes for descaling and finally washed with distal water. For the genital study, the abdomen of the specimen was detached from the body by giving an upward jerk and dipped in 10% KOH solution for twenty-four hours or boiled for two to three minutes. The abdomen of the specimen was dissected with the help of fine forceps and needles under stereo microscopes and after removal the genitalia from the abdomen; it was washed for 2-3 times with distilled water to eliminate KOH. The genitalia was mounted permanently with the Hoyer's medium. The photos of adult specimen's and genitalia were taken by a Digital Camera. Identification of moths was carried out by

internet sources and standard books. A dichotomous key was also provided. All the research material was deposited in the Department of Entomology, Faculty of Agricultural Science Bahauddin Zakariya University, Multan.

Results and discussion

KEY OF GENUS SPODOPTERA GUENEE:

- Clavus present.....2
- Clavus absent8
- Juxta triangular with narrow base and a pointed process.....3
- Juxta quadrate with two ventrolateral projections.....4
- Clavus in the shape of bumb..... (*S. littoralis*)
- Clavus shaped as a thumb.....5
- Ampulla slightly curved (*S. litura*)
- Ampulla elongate and curved.....6
- Basal sclerite angular (*S. dolichos*)
- Basal sclerite rounded..... (*S. ornithogalli*)
- Clavus shape as a hairy toe..... (*S. pulchella*)
- Clavus as a club shaped.....7
- Costal process large and ampulla elongate, broad and curved..... (*S. latifascia*)
- Costal process small, narrow, elongate, straight and inclined and ampulla slightly curved (*S. frugiperda*)
- Costal process narrow and elongate (*S. albula*)
- Costal process short.....9
- Ampulla short, curved and with thumb shape process..... (*S. eridania*)
- Ampulla elongate, thin and curved.....10
- Large spine on vesica..... (*S. exigua*)
- Spines absent on vesica..... (*S. hirsutus* n.sp)

Genus *Spodoptera* Guenee

Guenée 1852, Boisduval and Guenée, Hist nat. Insecta (Lepid.), 5: 153.

Type species

Holotype was collected from Muzaffargarh with a light trap on 18-07-2016 and deposited in the department of entomology Bahauddin Zakariya University Multan.

Etymology

This species epithet is derived from the host cotton (*Gossypium hirsutum*).

Remarks

This new species is very close to already known species *S. litura* but this new species differ from *S. litura* due to following characters:

(i) Vinculum is round shaped at a base in *S. litura* but vinculum with pointed base in new species i.e. *S. hirsutus*. (ii) Valva fringed with long setae in *S. litura* but the valva of *S. hirsutus* without any long setae. (iii) Juxta of *S. litura* is Y-shaped but juxta of *S. hirsutus* is triangular shaped. (iv) Saccus of *S. litura* is a line like but in *S. hirsutus* no like structure is present. (v) The basis of valva in *S. litura*, a plane but the basis of valva in *S. hirsutus* have prominent nob like structure. (vi) Aedeagus of *S. litura* is moderately long with a proximal half tube like and plate-like cornuti but the aedeagus of *S. hirsutus* long, plane sclerotic and bulb shape. (vii) Aedeagus of *S. litura* yellowish white and plane but the aedeagus of *S. hirsutus* has a prominent longitudinal lining.

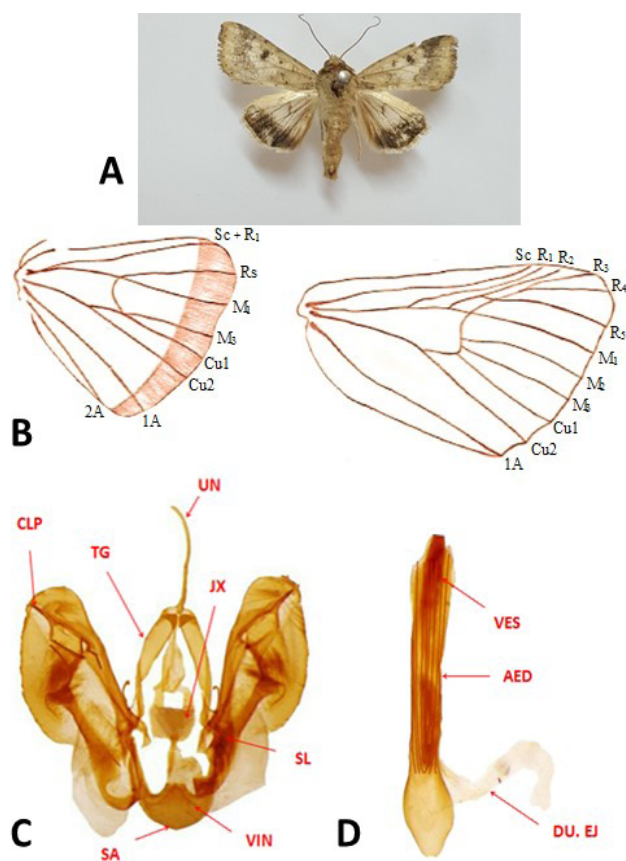


Fig. 1. Adult of *Spodoptera hirsutus*. n.sp. (B) Hind wings, Fore wings. (C) Male genitalia of *Spodoptera hirsutus*, (D) Aedeagus.

Diagnosis

Labial palpi upturned with frons reaching the second segment, third Segment reduced antennae ciliated, and abdomen with a tuft of hairs at base only; costal margin of forewings slightly curved towards apex; dense tufts of hair on fore tibiae and cilia slightly with small rounded teeth.

(Fig. 1).

Male genitalia

Uncus simple, thin, very long, curved and pointed towards the anterior end; tegumen long, inverted u-shaped, lightly sclerotized throughout its length; scaphium with the tuba analis lightly sclerotic; valva broad, leaf-like, differentiated into costa, cucullus, and valvula; costa well developed and sclerotic; cucullus and valvula moderately sclerotic, without long setae; sacculus well-developed; vinculum u shaped with pointed base; saccus thin without line; transtilla well developed; clasper well developed, with broad base, pointed and straight toward tip; juxta triangular-shaped; aedeagus moderately long, cylinder-shaped with bulb-like base; ductus ejaculatorius present at the distal end; membranous vesica, long, without lining and proximal tube and cornute, (Fig. 1C, D).

Female genitalia

Not found.

Statement of conflict of interest

The authors declare there is no conflict of interest.

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