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## Occurrence of genus *Amyna* (Noctuidae: Bagisarinae) among the semilooper complex infesting soybean at Udaipur

**Ashok Kumar Meena, Rajendra Nagar and R Swaminathan**

### Abstract

The semilooper complex infesting soybean was studied in a field experiment laid out at the instructional farm of Rajasthan College of Agriculture, Maharana Pratap University of Agriculture and Technology, Udaipur, during *kharif* 2016. The semilooper complex included the following species: *Trichoplusia ni* (Hubner), *Chrysodeixis includens* (Walker), *Chrysodeixis acuta* (Walker), *Chrysodeixis chalcites* (Esper), *Amyna axis* (Guenee) and *Amyna natalis* (Walker). The semilooper population was the maximum during mid-August (7.25/5 plants) and evinced a significant negative correlation with the mean atmospheric temperature ( $r = -0.64$ ); while, a significant positive correlation with the mean relative humidity ( $r = +0.86$ ) and total rainfall ( $r = +0.61$ ), notable being abundant after the rains. The morphological characterization of the two species of *Amyna* is given with suitable photographs, besides reporting the occurrence of *A. natalis* on soybean for the first time. A key to distinguish the two species has also been presented.

**Keywords:** Lepidoptera, noctuidae, *Amyna*, seasonal incidence, soybean

### Introduction

The family Noctuidae commonly known as owlet moths is one of the largest families in the order Lepidoptera which comprises more than 35,000 known species placed in 29 sub-families and 4,200 genera. Noctuids are well represented in all important zoogeographic regions in a wide variety of habitats. Noctuidae reported so far from India (before partition) have been accommodated under 218 genera and 1431 species (Hampson, 1894; Holloway, 1989; Moore, 1879; Park, 2001; Walker, 1854-56) [10, 11, 15, 17, 27]. The checklist of the genera and species of Noctuidae from India lists a total of 1374 species under 351 genera (Sivasankaran *et al.*, 2012) [25]. Noctuid moths can be easily recognized from other Lepidoptera by their prominent eyes and comparatively robust structure. Most noctuids have drab forewings, although some have brightly coloured hind wings; are nocturnal and get attracted to light. They are a prominent group of terrestrial insect fauna, including innumerable ecological and economically important species. Several species have larvae that are agricultural or horticultural pests. Majority of the species happen to be polyphagous, restricted to herbaceous vegetation in the tropics, a category which includes agricultural crops. The plants belonging to Mimosaceae, Malvaceae, Euphorbiaceae, Graminae, Anacardiaceae, Leguminoceae, Myrtaceae, Apocynaceae, Verbenaceae, Coniferae and Moraceae are frequently infested by noctuids (Kirti and Dar, 2013) [13].

Soybean is a major oilseed crop in India and is grown in the states of Madhya Pradesh, Maharashtra, Karnataka, Uttar Pradesh, Rajasthan, Tamil Nadu, Andhra Pradesh and Uttarakhand. About 275 insect species have been recorded infesting soybean in India; among these, defoliators and sap-sucking insects are the major constraints to soybean production (Raju *et al.*, 2013) [19]. One of the more important semilooper pests is the genus *Amyna* represented by two species [*Amyna axis* (Guenee, 1852) and *Amyna natalis* (Walker, 1859) [28], Lepidoptera: Noctuidae: Bagisarinae]. The genus *Amyna* Guenée, 1852, contains about 35 recognized species distributed worldwide (Savelle, 2009) [23]; it was placed from the sub-family Eustroitiinae to the Bagisarinae by Holloway (2009) [12] mainly on the basis of larval characters, and discussed with additional characters by Wagner and Binns (2010) [26]. The majority of the species occur in Neotropical region, South Africa, throughout the oriental region, Japan and Pacific groups.

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It is a polyphagous insect species that feeds on different plant species, including all Amaranthaceae, Asteraceae, both Chenopodiaceae, Convolvulaceae, Euphorbiaceae, all Fabiaceae, Malvaceae, Sapindaceae, Solanaceae, Tiliaceae and Cannabaceae (Ferguson *et al.* 1991, Robinson *et al.* 2001, 2002) [6, 22]. It has also been recorded on other forbs and low-growing plants (Wagner and Binns, 2010) [26]. The genus has been reported in India from Barrackpore, Kolkata (West Bengal) on jute, sweet potato, sunnhemp, mesta, *Urena lobata*, ramie and the weed, *Digera arvensis* (Ayyar, 1963; Nair, 1973; Pradhan and Chatterji, 1978; Babu *et al.*, 2015) [18, 2] and one species *Amyna octo* from Sehore (Madhya Pradesh) on soybean (Singh, 1987) [24] and on Indian *Marijuana* (Rao, 1928; Cherian, 1932) [20, 3]. Sivasankar *et al.* (2012) [25] listed four species under this genus in their checklist of Noctuidae of India. Gurule and Nikam (2013) [9] listed *Amyna axis* Guenee in checklist of Moths of Northern Maharashtra. There are no records of damage to soybean by *Amyna natalis* as a pest from India.

### Materials and methods

A field experiment was undertaken at the Instructional Farm and in the Department of Entomology, Rajasthan College of Agriculture, MPUAT, Udaipur, during *kharif* 2016. Soybean variety JS-335 was sown in plots of size 4m x 3m and replicated six times, maintaining 30 cm row to row and 10cm plant to plant spacing. The population of semilooper complex was recorded on soybean from five randomly selected and tagged plants in each replication. The plants were gently shaken to dislodge the semiloopers on a white sheet of blotting paper kept underneath the plant. All the observations were taken during early hours of the day at weekly interval. The prevailing atmospheric temperature, relative humidity and total rainfall data were recorded from the meteorological observatory of the farm to work out the correlation coefficients between the semilooper population and the abiotic factors of the environment as per standard methodology.

Field collected healthy larvae of the semiloopers were reared in the laboratory to obtain adult moths. Fresh leaves of soybean from the field were provided daily till the larvae entered into the pupal stage. Pupae were kept individually in separate glass containers for adult emergence. The adults that emerged belonged to the following species: *Trichoplusia ni* (Hubner), *Chrysodeixis includens* (Walker), *Chrysodeixis acuta* (Walker), *Chrysodeixis chalcites* (Esper) and two species of genus *Amyna*. Male and female genitalia dissections were prepared following the methodology suggested by Clarke (1941) [4]. All slide preparations were examined under dissecting stereo-zoom binoculars. Wing length measurements were taken from the center of the auxiliary area to the apex of the forewing. Digital photographs of specimens and their body parts were taken with the help of Stemi 2000 C Stereozoom Binoculars of Carl Zeiss. The software used for linear measurements was Axio Vision L.E. 4.5. The identification of specimens from this material was carried out using the key of Hampson (1894) [10], Forbes (1914), Wagner and Binns (2010) [26] and Kirti and Dar (2013) [13]. The taxonomic glossary of genitalia in lepidopteran insects (Klots 1970) [14] was also consulted.

### Results and discussion

#### Incidence of semiloopers in soybean

The semilooper population on soybean as presented in Table (1) shows that infestation initiated on 24<sup>th</sup> July that continued

up to 9<sup>th</sup> October, 2016. The population gradually reached the peak on the 14<sup>th</sup> August with a mean population of 7.25 semiloopers/5 plants, when the mean atmospheric temperature was 25.12 °C, mean relative humidity 89.29 per cent and total rainfall 102.1mm. The population declined to a mean of 1.0/5 plants in the last week of August. The semilooper population showed a significant negative correlation ( $r = -0.64$ ) with the mean atmospheric temperature; whereas, it evinced a significant positive correlation with relative humidity ( $r = 0.86$ ) and total rainfall ( $r = 0.61$ ). The semilooper complex included: *Chrysodeixis includens* (Walker), *C. chalcites* (Esper) *C. acuta* (Walker), *Trichoplusia ni* (Hubner), species of *Mocis*, *trigonodus* and two species of the genus *Amyna* during first week of August to first week of September. Earlier, Evans (1985) observed the occurrence of *Amyna axis* on soybean in Queensland. Singh (1987) [24] recorded the larval population of *Amyna octo* in soybean from last week of July to first week of September causing 100 per cent damage to leaves of soybean during August, 1983. The initial larval population was 2.1 larvae/ 10 plants in the first week of August; thereafter, the population gradually increased to 2.3, 15.5, 17.3 and 24.8 larvae/ 10 plants on 4, 11, 18 and 25 August, 1983. Later, the larval population declined in the first week of September.

**Table 1:** Seasonal incidence of semiloopers in soybean during *kharif*, 2016

Dates of observation	Mean Temp (°C)	Mean RH (%)	Total Rainfall (mm)	Semilooper (No./ 5 plants)
24 – July	27.26	73.50	05.40	0.25
31 – July	26.75	84.36	199.80	3.75
07 – Aug	25.96	89.43	84.40	4.00
14 – Aug	25.12	89.29	102.10	7.25
21 – Aug	26.30	73.07	01.80	1.00
28 – Aug	25.28	87.57	60.00	6.25
04 – Sept	26.91	78.29	14.40	4.00
11 – Sept	25.94	67.50	00.00	0.25
18 – Sept	27.32	62.86	00.00	0.50
25 – Sept	28.79	65.64	05.40	1.75
02 – Oct	28.81	57.57	00.00	0.25
09 – Oct	26.96	76.86	62.40	2.50
Coefficient of correlation (r) for population and mean atm. temp.				-0.64*
Coefficient of correlation (r) for population and mean RH				0.86*
Coefficient of correlation (r) for population and Total Rainfall				0.61*

#### Species of genus *Amyna*

##### Genus *Amyna* (Guenee, 1852) (Plate-I)

The larvae, which are green in colour, feed voraciously making large irregular holes on soybean leaves (Fig. 1-3). The larvae measure 18-23mm in length having setae on the body and white stripes with small black dots on the dorso-lateral area from the anterior to posterior region. When alarmed the larva jumps from the host and continues to wreathe and wriggle widely; the mature larvae stop feeding and enter a pre-pupal stage on soybean leaves; prior to formation of pupa, the larvae turn pinkish and the body length contracts. Pupation occurs in soybean leaves/plant debris or at the soil surface. The pupa measures 10.10 - 11.50mm (Fig. 4); thorax without scale tufts. Abdomen is slender and tapering to a point, with dorsal tufts.

**Forewing**

Forewings are chocolate brown with numerous faint grey white lines and a faint small figure “8” on each forewing (Fig. 5). Males have a small semitransparent patch on each forewing.  $M_2$  is only slightly reduced, about  $\frac{3}{4}$  as thick as  $M_3$  (Fig. 6).

**Hind wing**

Typical venation of Noctuidae, where  $Sc + R_1$  is separated from  $R_s$  and is connected with discal cell at the base (Fig. 7). Fore and hind wings dissimilar in venation (Fig. 6-7). The hind wings are lighter with very faint marking.

**Labial palpi**

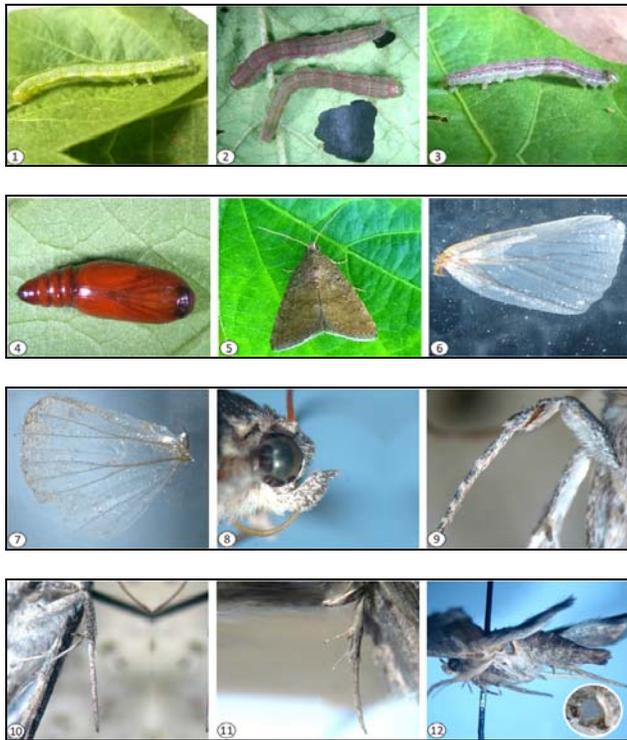
The labial palpi are of moderate dimensions, upturned, with the second segment densely scaled and reaching the vertex; the third generally short; eyes without hairs (Fig. 8).

**Legs**

Another identifying feature is number of tibial spurs i.e., 0-2-4 (foreleg-midleg-hindleg) and epiphysis present in foreleg (Fig. 9-11).

**Tympanum**

The tympanic hearing organs of most moths within the superfamily Noctuoidea occur bilaterally on the metathorax. Tympanum directed posteriorly, counter-tympanal hood on abdomen post-spiracular (Fig. 12).



**Plate I:** Genus *Amyna* 1-3. Field incidence, Larvae; 4. Pupa; *Amyna* male; 5-12: 5. Adult; 6. Forewing; 7. Hindwing; 8. Labial palpi; 9. Fore leg; 10. Middle leg; 11. Hind leg; 12. Tympanum.

**Key to species of *Amyna* (Guenee, 18052)**

1. Forewing five white dashes along the costa from the reniform spot to apex, markings are obscure, not presence of the tympanum organ in male; hind wing is dark gray; Aedeagus with spined vesica, vesica with an extensive scobinate area .....*A. axis*  
 -Forewing pale dull greyish brown with white and blackish

brown scales making up an indistinct pattern, cell bubble, presence of the tympanum organ in male; hindwing suffused with grey; Aedeagus vesica with two scobinate areas.....  
 .....*A. natalis*

***Amyna axis* (Guenee, 1852) (Plate- II: Details of Genitalia)**

**Material examined**

*Amyna axis* (30 Specimens, 21♂ & 9♀). India: Rajasthan, Udaipur; 20.VIII.2016, Coll. A. K. Meena (RCA, Udaipur) (13); 30. VIII. 2015, Coll. A. K. Meena (RCA, Udaipur) (8); 25. IX. 2016, Coll. A. K. Meena (RCA, Udaipur) (1); 01. X. 2016, Coll. A. K. Meena (RCA, Udaipur); 05. X. 2016, Coll. A. K. Meena (RCA, Udaipur) (3).

**Description**

Adult head, thorax, legs and abdomen drab ochreous brown, paler beneath. *A. axis* has a brown to reddish-brown forewing. The male has a round, white reniform spot. In the female the reniform spot is either absent or is cream coloured mixed with reddish-brown scales and is never bright white as in the male. There are five white dashes along the costa from the reniform spot to apex. Most of the forewing markings are obscure. Hind wing is dark gray. *A. axis* is a synonym of *A. octo* (Guenee) (Fig. 13).

**Male genitalia**

The male genitalia of *A. axis* are symmetrical (Fig. 14); uncus of moderate length, pointed and bearing a few simple setae (Fig. 17); anal tube rather long and with a weak narrow subscaphium; tegumen with highly developed lobes arising from the entire lateral margin and bearing specially modified setae; vinculum narrow and rounded or slightly excavated at tip; juxta large; transtillae short and broad, ventral view of genitalia (Fig. 16). Aedeagus with spiny vesica, with an extensive scobinate area, the cornuti elongate, more so than in *A. natalis* (Fig. 15).

**Female genitalia**

*Corpus bursae* small, balloon like, weakly sclerotized with striations, narrow towards *ductus bursae*; signum absent; *ductus bursae* membranous, broad towards *ostium bursae* and *corpus bursae*, narrow at middle; *ostium bursae* simple; posterior apophyses of equal length as anterior apophyses, sclerotized, spatulate apically; papilla analis flat, heavily sclerotized with macro and micro setae (Fig. 18).

**Measurements**

Wing expansion 20-23.50 mm, the forewing length is 10-12mm.

***Amyna natalis* (Walker, 1889) (Plate-II)**

**Material examined**

*Amyna natalis* (18 Specimens, 18♂). India; Rajasthan, Udaipur; 20.VIII.2016, Coll. A. K. Meena (RCA, Udaipur) (4); 30. VIII. 2015, Coll. A. K. Meena (RCA, Udaipur) (5); 25. IX. 2016, Coll. A. K. Meena (RCA, Udaipur) (3); 05. X. 2016, Coll. A. K. Meena (RCA, Udaipur) (2).

**Description: Adult**

Head, thorax and abdomen pale dull greyish brown, paler beneath. Forewing pale dull greyish brown with white and blackish brown scales making up an indistinct pattern. The cell is modified, containing a concavity which is thinly scaled and, to the naked eye, having the appearance of a bubble. Beneath there is a group of large plate-like scales arising from

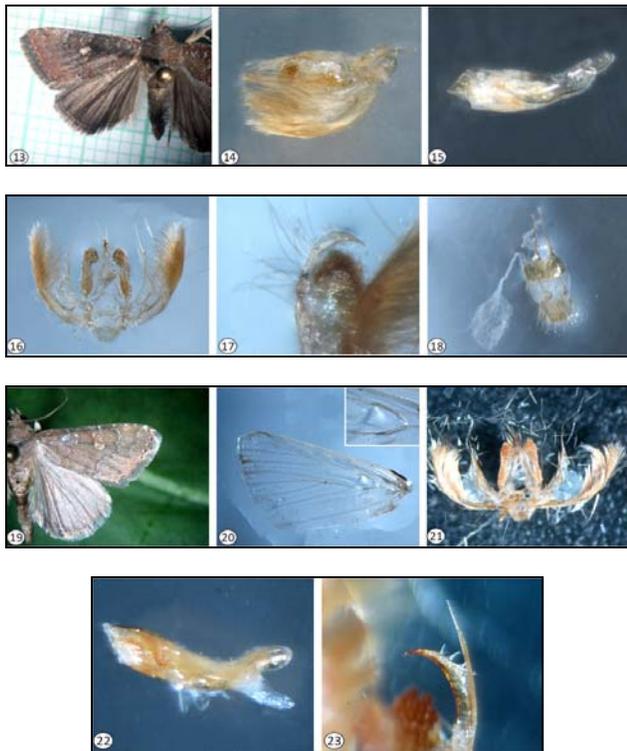
the base of the cell and forming an oblique 'roof' for half the length of the cell 'bubble'. Hindwing suffused with grey, a white lunule marginally in the anal angle. Abdomen and hindwings fuscous, abdomen with an indistinct post medial line (Fig. 19).

#### Forewing, tympanum

The forewing cell bubble, the wing tymbal of *A. natalis* is situated in a different part of the forewing. As indicated by the presence of the tymbal organ exclusively in the male, its main function is to attract females, or to mark the male's territory (Fig. 20).

#### Male genitalia

The male genitalia of *A. natalis* are symmetrical (Fig. 21); uncus of moderate length, pointed and bearing a few small setae at base (Fig. 23); anal tube rather long and with a weak narrow subscaphium; tegumen with highly developed lobes arising from the entire lateral margin and bearing some unusual type of setae; vinculum narrow and rounded or slightly excavated at tip; juxta large; transtillae short and broad. Aedeagus (Fig. 22) vesica with two scobinate areas and a sclerotised zone having thorn-like projections.



**Plate II:** Details of Genitalia, *Aymyna axis* (Guenee) Male 13-18: 13. Adult; 14. Genitalia; 15. Aedeagus; 16. Ventral view Genitalia; 17. Uncus; 18. Female, genitalia; *Aymyna natalis* (Walker) Male 19-23: 19. Adult; 20. Forewing, tympanum; 21. Genitalia; 22. Aedeagus; 23. Uncus.

#### Measurements

Wing expansion 20-22.50 mm, the forewing length is approximately 10 mm.

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