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Short Communication

NAUSINOE GEOMETRALIS (GUENEE, 1854) (LEPIDOPTERA: CRAMBIDAE) A NEW PEST ASSOCIATED WITH JASMINE IN PUNJAB, PAKISTAN

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ABSTRACT

Jasmine belongs to the family Oleaceae and declared as a national flower of Pakistan. A number of insect pests like *Hendecasis duplifascialus* (Jasmine budworm), *Contarinia maculipennis* (Blossom midge), *Elasmopalpus jasminophagus* (Gallery worm), *Glyphodes unionalis* (Leaf roller), *Tetranychus urticae* (Two spotted mite) and *Nausinoe geometralis* (Leaf webworm) have been recorded for infesting Jasmine plantation from various parts of the world. Furthermore *Nausinoe geometralis* (Guenee, 1854) is considered as a major pest of this important plant. In present study we recorded this pest along with its distribution for the first time from Pakistan. Brief description supported with microphotographs is provided here. Larval incidence was also observed during the year 2018-19.

Keywords: Leaf webworm, New record, Jasmine, Punjab

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INTRODUCTION

Jasmine (*Jasminum sambac*) belonging to family Oleaceae within genus *Jasminum* is one of the oldest, traditional, and fragrant flowering plant. Members of genus *Jasminum* are cultivated in tropical and subtropical regions of the world (Kamala *et al*., 2017). Economically, Jasmine is being widely used in different industries and plays a key role in the economy of country (Rath *et al*., 2008). Moreover, this important plant also have significant value for exquisite sweet fragrance, cosmetics, decorative ceremonies, expressing affection, honoring guests, religious offerings and also used as medicinal purpose (Thakur *et al*., 2014).

Various studies demonstrated numbers of insect pest, *Hendecasis duplifascialus* (jasmine budworm), *Contarinia maculipennis* (blossom midge), *Elasmopalpus jasminophagus* (gallery worm), *Glyphodes unionalis* (leaf roller) and *Tetranychus urticae* (two spotted mite) were found to be infesting jasmine plantation. Similarly, *Nausinea geometralis* is one of potential pests of this plant and causing sufficient economic losses (Kamala and Kennedy, 2017). Major damaging symptoms due to *N. geometralis* include burning, skeletonization and leaves dryness which results in reduction of plant vitality, growth and the production of the bud-flowers (Gajera *et al*., 2012: Kamala *et al*., 2017).

The family Crambidae is largest and diverse group of Lepidoptera in superfamily Pyraloidea with more than 11,500 described species worldwide (Solis, 2007 and Powell, 2009). Members of this family have been documented as important pest of crops, forests and stored product and responsible for significant economic losses (Nagaharish *et al*., 2017). Crambid snout moths have different kinds of the life history and feeding adaptations such as web formations, leaf rolling, leaf mining, root feeding, bore development and seed feeding whilst few species have also been documented as natural enemies of scale insects (Schulze, 2000). With respect to the importance of this family several pest associated with jasmine plantations have been reported along with their level of incidence from neighboring countries of the Pakistan namely India, Sri Lanka, Bhutan, Nepal, China and Hong Kong (Robinson *et al*, 1995; Kendrick, 2002). In present study we have recorded a new pest *Nausinoe geometrialis* associated with jasmine plantations along with observation on seasonal incidence for the first time from Pakistan.

MATERIALS AND METHODS

Collection and rearing of webworm: Specimens of *Nausinoe geometralis* associated with *Jasminum sambac* were collected during 2018-19 from various districts of Punjab province (Rawalpindi, Chakwal, Jhelum, Faisalabad, Sargodha, Mianwali, Bhakkar, Layyah, Multan, Bahawalpur and Rahim Yar Khan). Infested leaves with larvae were also collected in plastic bags and placed laboratory at ambient temperature. Different larval stages were studied by using methodology given by Gajera *et al*. (2012). Webworm larvae were also reared on jasmine leaves in glass test tubes (2.50cm diameter and 7.50 lengths). The open end of tubes was covered with the lid having plastic mesh for larvae aeration. Jasmine leaves stem side was covered with wet cotton to reduce the leaves dryness. The larvae were provided with the jasmine leaves till the pupation. Pupae were placed in plastic pan having wet cotton for moisture on its base covered with perforated mylar cages. Emerged adults were placed in plastic jar and provided with 20% honey solution soaked cotton swabs as artificial diet.

Identification: Collected adults during surveys were identified upto the species level by using most relevant and available literature published by Arora (2000) and Nagaharish *et al*. (2017) with the help of ZMS stereoscopic 2000 compound microscope. Genital observations were performed with the help of Kirti and Gill (2005) and Nagaraj (2014). Staining of male and female genitalia was completed by proposed techniques of Lee and Brown (2009). Images of identified species were prepared using Amscope 18 megapixel camera attached with Leica MS 5 stereomicroscope. Prepared images were stacked with Helicon 6.7 software and then cleaned in Adobe Photoshop CS 6.0 as per requirement. Micrometry was analyzed by stage and ocular micrometer. All identified specimens were deposited in the Department of Agricultural Engineering, Khwaja Fareed University of Engineering and Information Technology Rahim Yar Khan.

Seasonal incidence: The seasonal incidence studies were carried out by tagging ten branches from the randomly selected ten jasmine plants in different localities of Rahim Yar Khan city and fortnightly observations were recorded. Total number of larval silk webbings was noted from all the tagged plants fortnightly.

Statistical analysis: The results obtained during seasonal incidence of jasmine webworm were analyzed by one-way ANOVA. Multiple comparisons of the means were conducted using Tukey's HSD post hoc comparisons method by using IBM SPSS Statistic-V19 software.

RESULTS

***Nausinoe geometralis* (Guenée, 1854)**
Nuss *et al*. (2003–2018): = *Lepyrodes geometricalis* Lederer, 1863.

Material examined: Attock (33°39.616"N'72°25.871"E), 15-iv-2019, 04♂; Dhok Bhatti (Mianwali) (32°52.224"N' 72°09.269"E), 08-viii-2019, 02♂; Dhok Bhatti (Mianwali) (32°52.224"N' 72°09.269"E), 08-viii-2019, 01♂ and 03♀; Phran Kas (Chakwal), (33°07.376"N' 72°38.347"E), 08-viii-2019, 04♂ and 07♀; Rawalpindi, (33°34'56.84"N' 72°58'9.48"E), 25-ix-2018, 04♂ and 03♀; Rawalpindi (Ayub National Park), (33°34'19.15"N' 73°4'59.05"E), 5-viii-2018, 06♂ and 03♀; Rawalpindi (Morgah Biodiversity Park), (33°32'46.06"N'73°'35.31"E), 19-viii-2018, 01♀; Jhelum, (32°56'32.85"N' 73°43'32.70"E), 11-ix-2018, 04♂ and 07♀; Dera Nawab Sahib (Bahawalpur) (N29.0937' 71.2714E), 104.85 m. elev., 20.ix.2018; Layyah (N30.991069' 70.965728E), 148.13 m. elev., 02.v.2018. 02♂ and 05♀; Bhakkar (31.6082° N, 71.0854° E), 08-viii-2019, 03♀; Faisalabad (31.4504° N, 73.1350° E), 08-viii-2019, 01♂ and 03♀; Sargodha (32.0740° N, 72.6861° E), 08-viii-2019, 01♂; Multan (30.1575° N, 71.5249° E), 08-viii-2019, 02♂ and 01♀; Rahim Yar Khan (28.4212° N, 70.2989° E), 08-viii-2019, 01♂.

Brief Description: Adult male and female width and length ranged from 21-00 to 22.50mm and 9.00 to 10.50mm (male) and 21.50 to 23,00mm and 11.50 to 13.00mm (female). Body yellowish or fulvous with black striations. Forewing subacute apically with two black edged, antemedial white spots below the cell. Hind wing with one frenulum hook (Figure 3 E) while in females one white spot is present in the subbasal area (Figure 3 F).

Male genitalia (Figure 1A-C): Uncus short, with rounded apex, having circular tuft of dense hairs; posterior aspect of tegument rhomboidal, sides slightly produced into conical lobes; tegument elongated, about 2X the vinculum, narrow anteriorly and broader medially; arms of vinculum narrow and slightly conical distally; valvae wider apically, fringed having short stiff hairs (Figure 1A-B); a sclerotized bar, having a spine-like process running across valvae toward distally; phallus long, stout, with a cleft distally; cornuti comprised of a long rod-like sclerotized process.

Female genitalia (Figure 1D): Ovipositer with with slit opening, valvae of papillae analis fairly broader; subgenital plate funnel shaped; ducts bursae thick, elongated; corpus bursae sac shaped; signum absent; duct bursa narrow and slender; anterior aspect of apophyses having stout basally; ovipositor short, lobes narrow in overall view.

Host plant: *Jasminum sambac* (Oleaceae)

Distribution: Palaeotropical. Africa: DR Congo, Gambia, Ghana, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Namibia, Réunion, Sierra Leone, South Africa, Zambia, Zimbabwe, Mali; Australasia: Australia; Oriental: India, Indonesia, Philippines, Sri Lanka and Taiwan (De Prins & De Prins 2018); Pakistan (new record)

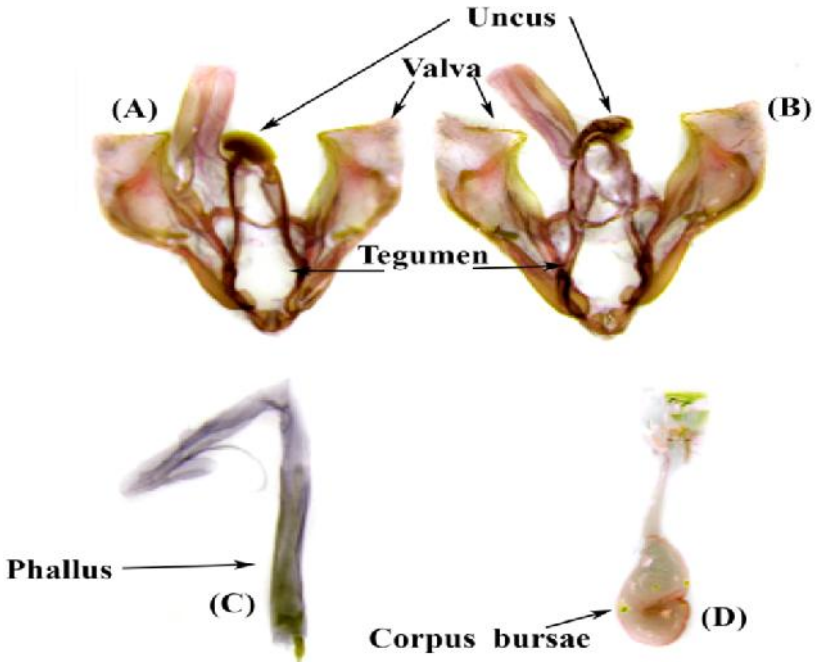

Fig. 1. (A) Male genitalia; ventral view (B) Male genitalia; dorsal view (C) Aedeagus (D) Female genitalia

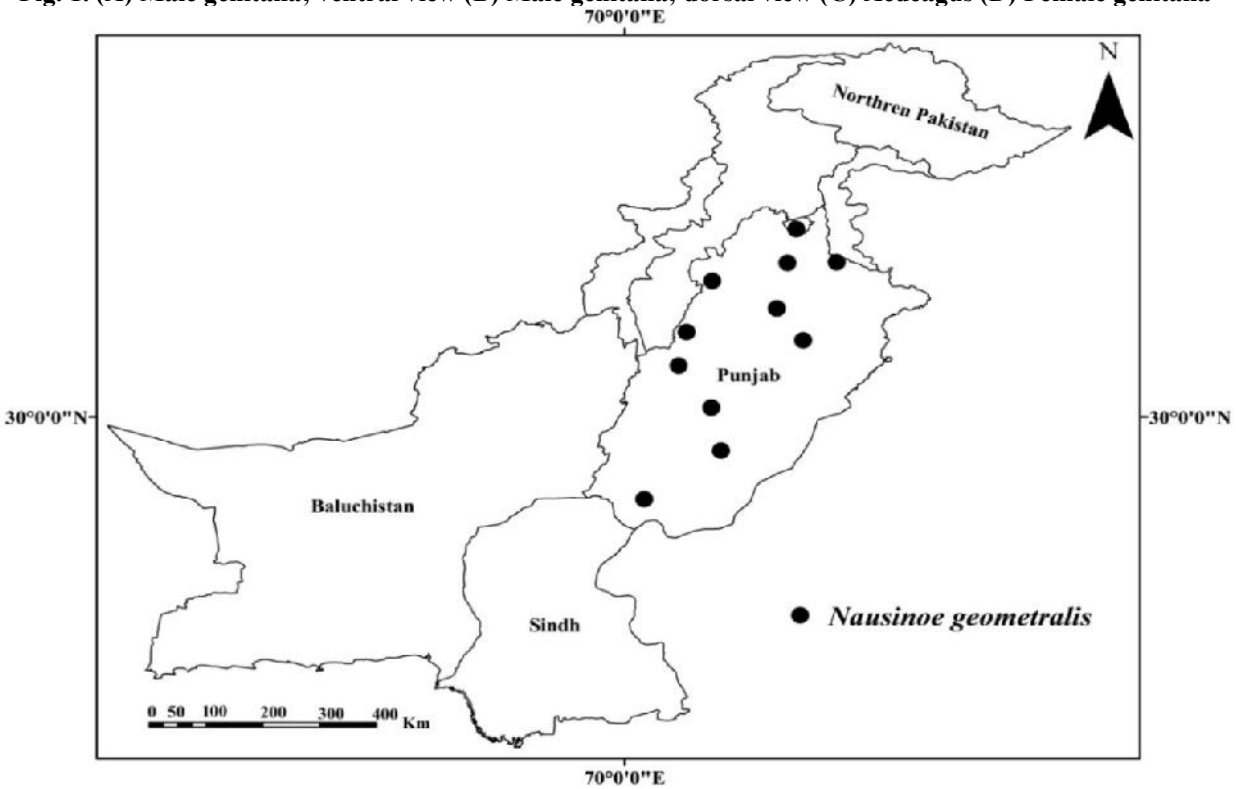

Fig. 2. Distribution map of leaf webworm in Pakistan

Larval and pupal stages: Jasmine webworm larvae go through five numbers of larval instars. Larval period of first instar, 2-3 days for first instar, 3-4 days for second instar, 2-3 days for third, fourth and fifth instar was observed. (Fig.3 A-D)

Larvae webs: Neonate larvae starts scraping the leaves chlorophyll just after hatching from the eggs and first and second instar larvae were observed in groups. There was no web formation during first and second instar. Web development was started during third to fifth nymphal stage The web becomes dirty because of larvae fecal pellets and Cast-off skins those remain attached with the web. (Fig. 3A, B, C).

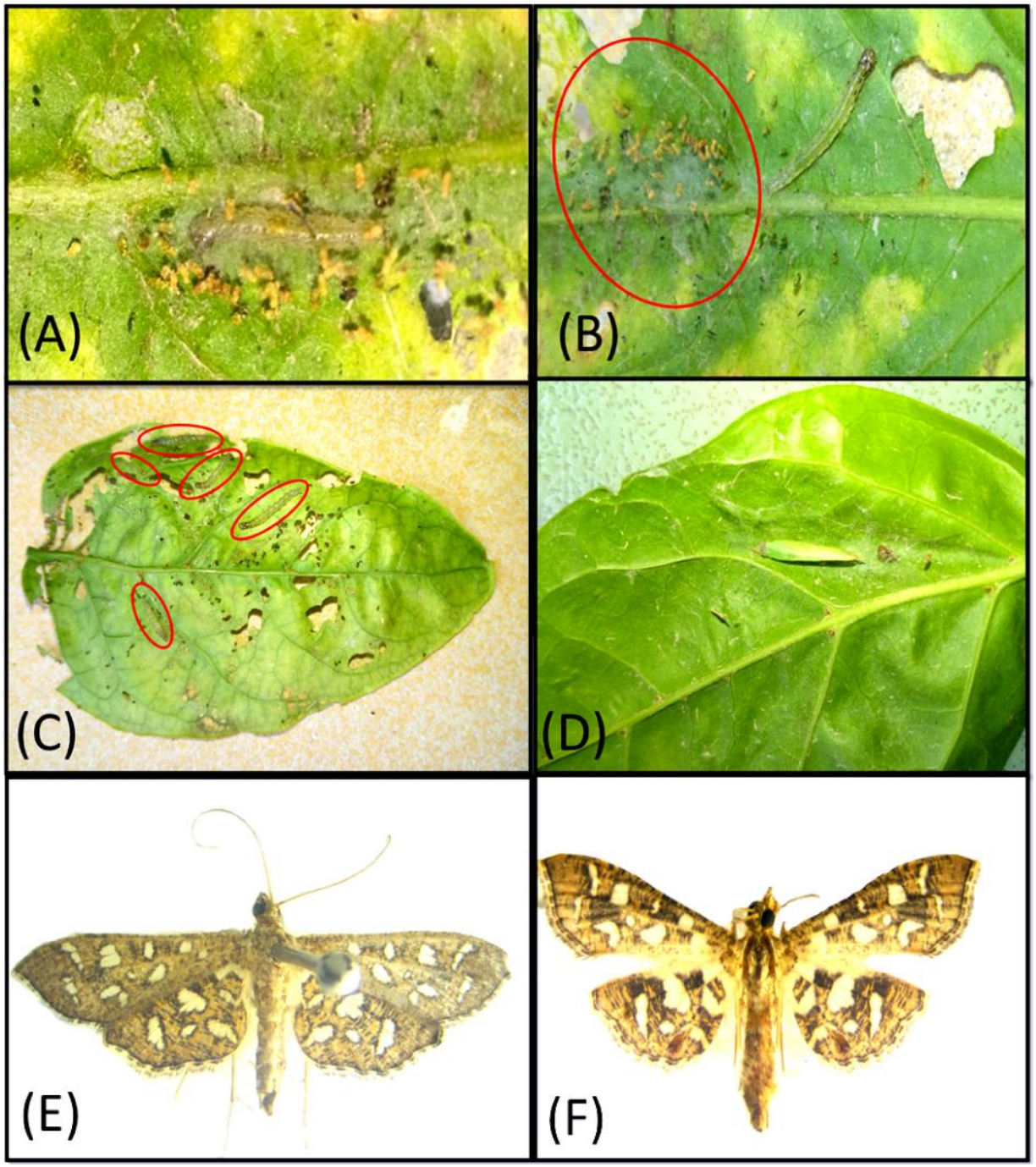

Fig. 3. (A) Webworm larvae inside developed web (B) Larvae feeding outside its web (C) Larvae feeding on a single leaf (D) Pupae inside web (E) Adult (Male) (F) Adult female.

Seasonal incidence: The occurrence of silken webs made by leaf web worm was significantly different within the months ($F_{23,\ 236}$=504.776, P< 0.00). The larval webs absent during July and August 2018. The peak incidence of the larvae was observed during November first and second fortnight due to favorable environmental condition (Temperature, Humidity) and lowest in January 2019. Moreover, larval population was absent from February-June 2019 due fluctuation in seasonal environmental factors (Figure. 4).

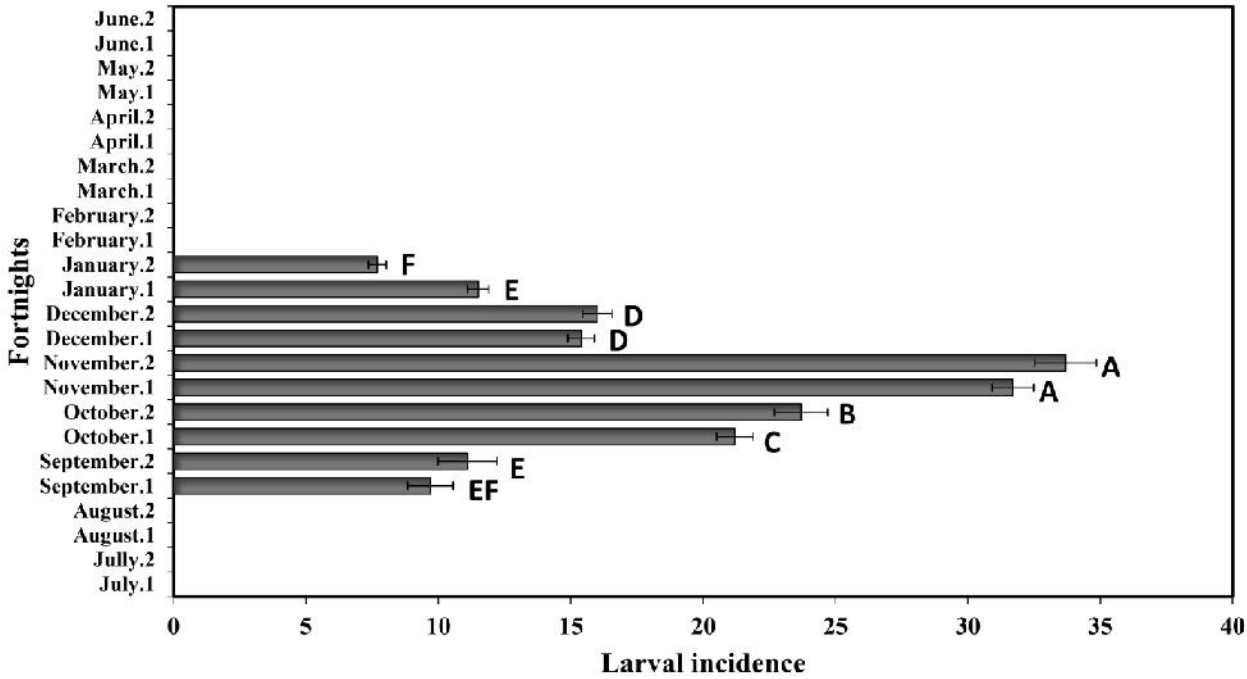

Fig. 4. Number of larval webbings (mean ± SE) observed during 2018-19. The different alphabetic capital letters show significant differences among different months larval incidence observations (P < 0.05, Tukey's test). Numbers 1 and 2 with each month starting from July-2018 to June-2019 show first and second fortnight.

DISCUSSION

Nausinoe geometralis has been observed as potential pest of *Jasminum sambac* in various localities of Rahim Yar Khan as well as various localities of Punjab. Immatures were found to be infesting the lower leaf surface. Leaf webworm is considered as serious pest of jasmine which leads significant economic losses. During present work various insects were also observed while they were showing predation and parasitism on *N. geometralis*. Various studies regarding to its distribution and exploration including Singh *et al*. (2017); Gajera *et al*. (2012) and Neelima (2005).

Results from the study of leaf webworm webbing occurrence indicated that this insect pest prevailed during September to January. The peak of incidence was observed during cooler month October to November those are in line with results of Kamala and Kennedy (2017)), in which they stated that the leaf webworm prevails at its peak during June and October every year. Similarly, in other studies peak populations were observed during the months of November (Gunasekaran 1989), September to November (Sudhir, 2002) and September to October. (Neelima, 2005). So, it is concluded that leaf webworm occurs in the cooler part of the year. Similar observations were also reported in a study where a negative correlation of larval leaf webworm population was observed with high temperature (Sudhir, 2002). Meanwhile, a positive effect of lower temperature, humidity and rainfall was observed for leaf webworm population occurrence (Neelima, 2005: Kiran *et al*., 2017).

Moreover, during mid-December various parasitoids (un-identified) and hyper parasitoids (un-identified) also appear to control webworm larval populations. There is a need to explore these important entities which will be helpful in biological control projects against this pest.

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