



## IDENTIFICATION AND BEHAVIOURAL PATTERN OF LITCHI FRUIT BORER *CONOPOMORPHA SINENSIS* BRADLEY

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### ABSTRACT

*Conopomorpha sinensis* Bradley is one of the major pests of litchi. The present study has been undertaken to generate information on taxonomy, symptoms and behaviour of *C. sinensis*. The adult moths were morphologically identified as the *C. sinensis* which was a small dark coloured moth having body length 4-6 mm and width 0.8 to 1 mm. The antenna was filiform type, length 6 to 8 mm, width 0.07 to 0.09 mm, white with greyish annual bars. Maxillary and labial palpi white and hindwings darker in males. Forewing narrow, fringed, wing span 9-11 mm. Forewing length was 4 to 6 mm. The hind tibia is with long bristles and females have stout ovipositor. Female moths preferred to oviposit on the pericarp of litchi. Its larvae punctured the peduncle of fruits and started feeding on the seed neck and made holes filled with frass inside the nut. Site of pupation was leaves. On the basis of morphological studies, the present study hereby confirms that the species of Litchi fruit borer reported from Bihar was *Conopomorpha sinensis* and before our experimentation, no species level work has been done. It is an emerging pest of Bihar and species level identification is required for proper management.

**Keywords:** Litchi fruit borer, *Conopomorpha sinensis*, identification, diagnostics, life stages, behaviour, damage

The Litchi fruit (*Litchi chinensis* Sonn.), also regarded as “Queen of Fruits” is one of the important horticultural produce of Bihar. Botanically it belongs to the family Sapindaceae and sub-family Nephelaeae. The fruit not only known to possess attractive colour and juicy aril but also has high nutritive value and refreshing taste. Among all the states, Bihar only contributes to 74% of the total production from 54% of the total area. Among many factors responsible for declining the production and productivity of the crop, insects-pests play vital role. About 54 insects and mite species have been reported so far attacking trees and fruits of litchi at different stages of growth (Singh et al., 2001). Litchi fruit and shoot borer, *Conopomorpha sinensis* (Lepidoptera: Gracillariidae) is among the major threats to litchi growers, causing severe losses to fruit and young shoots, to the tune of 24- 48% and 7-70%, respectively (Srivastava et al., 2016). The borer damage is usually observed at the base of the fruit stalk and the bored hole is not usually visible externally. After opening the fruits, borer damage is evident within the seed showing frass-packed feeding tunnels. The stalk of the infested fruits dried which ultimately led to fruit drop. No significant works have been carried out on its identification and behavioural pattern from Bihar so far. So, keeping the above facts in mind, the present study has been conducted to generate more information regarding the pest.

### MATERIALS AND METHODS

The present investigation was carried out during the year 2018 and 2019 in the Litchi orchard of Horticulture garden, Bihar Agricultural University, Sabour, Bhagalpur located at 25°13'46"N and 87°2'45"E with an altitude of 45 m above mean sea level. For identification of the correct species of *Conopomorpha*, larvae were collected from the infested litchi fruits and pupae were collected from the leaves of the litchi plant carefully excising host tissues on which cocoon was attached thereby encompassing the entire cocoon without disturbing it. All pupae were held in rearing cages (10 each) until the adults were emerged. After the emergence of adults, the morphological observations of adults were carried out with the help of stereo binocular microscope and ocular measurement device using the holotype keys by Bradley (1986) at Department of Entomology, Bihar Agricultural University. Various body parts were studied viz., body length and width, head width, antennae: length, width, flagellomere, wing span, legs etc.

The pattern of larval infestation, site and pattern of pupation etc were observed. In order to observe behavioural pattern of *Conopomorpha sinensis*, infested fruits were collected. A fruit was assigned to be infested if a larva was present inside the fruit, or if evidence

was found that a larva had developed earlier (presence of entrance holes or insect excreta). The infested fruits were collected and carried to the laboratory out of which larvae of *C. sinensis* were isolated. They were transferred to rearing cages separately and were provided with fresh fruits and leaves everyday and observations on the infestation pattern and external symptoms of infestation on fruits were recorded. The larval colour, shape, instars etc were also recorded. They were allowed to pupate inside the cage and their pupation behaviour was observed. As soon as the adults emerged, they were being transferred to acrylic rearing cages where diluted honey with water solution dipped in cotton wicks was provided to the adult moths on a regular interval. The pattern and site of egg laying were observed. As soon as the adult was dying, they were taken out and pinned for the morphological studies.

## RESULTS AND DISCUSSION

### Identification

On the basis of morphological parameters adult moths were identified using holotype keys given by Bradley (1986) and identified as *Conopomorpha sinensis* Bradley. The body length of both male and female was observed to be ranging from 4-6 mm and the width of both the sexes varied from 0.8 to 1 mm. Head was primarily white in colour. Both the dorsal and ventral width of the head was varying from 0.7 to 0.8 mm whereas the lateral width was between 0.5 to 0.6 mm. The antenna was found to be filiform type. The antennal length was 7 to 8 mm which was approximately one and one-third length of forewing. The antenna was white in colour with flagellum having grayish annual bars. The antennal width was found between 0.07 to 0.09 mm. The length of middle flagellomeres was 0.07

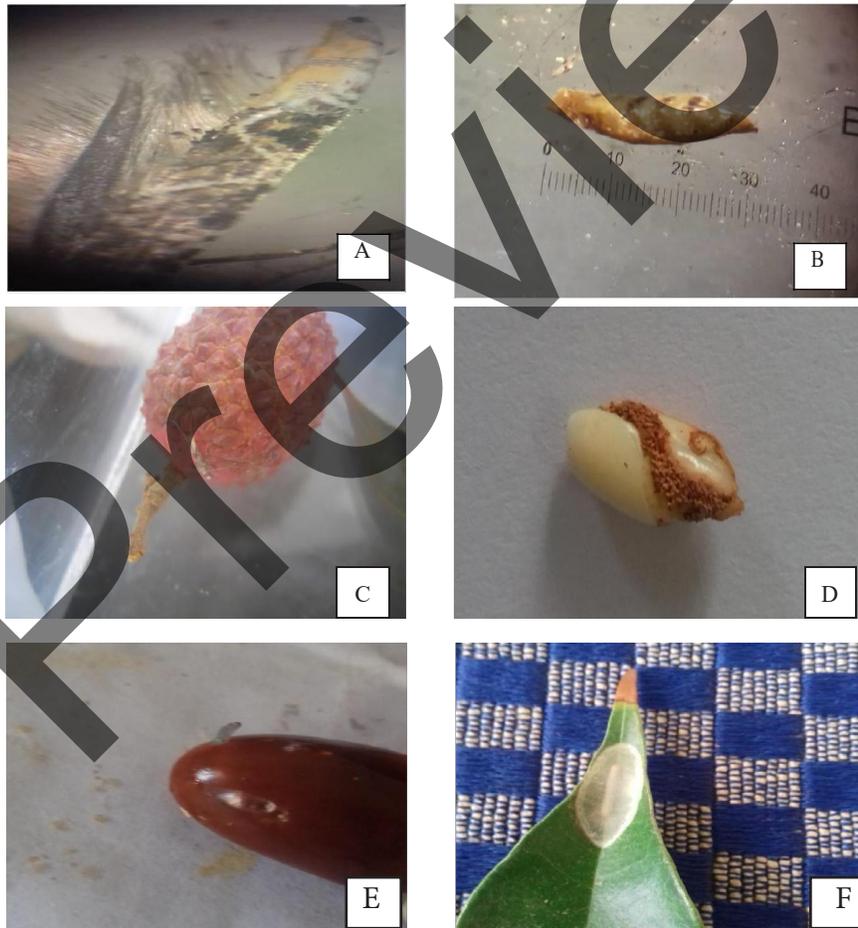


Fig. 1. *Conopomorpha sinensis*: A. Forewing- distal third orange yellow, basal part with a zig-zag pattern of white transverse lines; B. Abdomen; wedge shaped lateral stripes; C. Female in search of oviposition site; D. Tunnels by larva on the nuts; E. Larva penetrating the nut; F. Oval cocoon with thickened margin.

to 0.09 mm and those of the terminal flagellomeres was 0.05 to 0.07 mm. The mouth part was siphoning type having coiled proboscis. Labial and maxillary palpi were white in colour. The forewing was observed to be narrow and fringed. The wing span in both male and female was varying between 9-11 mm. The length of forewing was 4 to 6 mm; the apical width was lying between 0.4 to 0.6 mm whereas the basal width was ranging from 0.3 to 0.5 mm.

The basal two-third of forewing to apex was dark brown to black admixture and the distal third part was orange yellow. The basal part was seen marked with a zig-zag pattern of irregularly spaced white transverse lines. The dorsum was raised. The forewing was covered with scattered spatulated black scales all over. The cilia of the forewing were grey. The length of hindwing was ranging from 3 to 4 mm. The apical width was 0.2 to 0.4 mm and the basal width varied between 0.2 to 0.3 mm. The colour of hindwing was black. The cilia of hindwing were grey as well. The hindwings of males were darker than that of the females. The legs were pale white in colour. The hind tibia was distinct with long black bristles dorsally. The bristles extending to tarsal segments are comparatively shorter than those in tibial segments. Dorsally abdomen was dark in colour whereas laterally and ventrally they were observed to be white in colour. Laterally they were marked externally with wedge-like stripes which were extending towards the dorsum. The aedeagus of male genitalia were found to be paired with a heavy cornuti which were bifurcated at the tip. The females were having smooth edged transparent stout ovipositor. These results are in agreement with that those of Bradley (1986) and Ramakrishnaiah et al. (2017).

### Behavioural pattern

Infested fruit flesh was opened firmly in order to observe the behaviour of *C. sinensis*. Light yellow eggs were laid by the adults soon after mating on the grooves of the pericarp of the fruits. It was observed that eggs were being laid singly by the adults. The larva after hatching bores inside the fruits and start feeding on the seeds by making tunnels. The larval infestation was found to be one larva per fruit. The

pest had five larval instars. After the completion of last instar, larva came out of the fruit and pupates on leaves. The larvae changed colour from white to light green before entering into pupation phase. The borer damage was not externally visible so it was cut open in order to observe damage symptoms of *C. sinensis*. They entered by making minute pin sized holes at the bases of fruit stalks. After cut opening the fruits, the tunnels made by larvae inside the nuts was evident. The bored holes inside the nuts were full of frass. Before pupation, larvae came out from the nuts and pupated on the leaves inside a thin silken cocoon mostly on the dorsal surface towards the tip and the middle of the surface as well as on the corners of the walls of the cages. The abundance in pupation was found on the leaves nearer to infested fruits on the tree. The cocoon was oval in shape, light brown in colour with thickened margin. The pupa was light yellow initially which eventually turns brown before eclosion. The studies of Schulte et al. (2007) and Ramakrishnaiah et al. (2017) also supported the present investigation of the biology and behavioural pattern.

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### REFERENCES

- Bradley J D. 1986. Identity of the South-East Asian cocoa moth, *C. cramerella* (Snellen) (Lepidoptera: Gracillariidae), with descriptions of three allied new species. Bulletin of Entomological Research 76(1): 41-51.
- Ramakrishnaiah J M B, Damodaram K J P, Rai P S, Shashank P R, Sudhagar S, Thimmappa R, Thimmappa N. 2017. Occurrence of *Conopomorpha sinensis* Bradley, 1986 (Lepidoptera: Gracillariidae) on litchi (*Litchi chinensis*) in India. The Pan-Pacific Entomologist 93(4): 199-203.
- Schulte M J, Martin K, Sauerborn J. 2007. Biology and control of the fruit borer, *Conopomorpha sinensis* Bradley on litchi (*Litchi chinensis* Sonn.) in Northern Thailand. Insect Science 14: 525-529
- Singh H S, Rai M, Nath V. 2001. Status and management of insect pests and mites. Litchi, genetic resources, production, protection and post-harvest management. Mathura Rai, Vishal Nath and Pradip Dey (eds.). pp. 73-80.
- Srivastava K, Purbey S K, Patel R K, Nath V. 2016. a. Managing fruit-borer for having healthy litchi. Indian Horticulture 61(3): 39-41.