



## RESEARCH NOTE

### Existence of cannibalism in South American leaf miner, *Tuta absoluta* (Meyrick)

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**ABSTRACT:** This study emphasizes on the cannibalistic behavior of the larvae of phytophagous lepidopteran *Tuta absoluta* Meyrick a serious invasive pest of tomato. Of all the larval instars, only the third instar larvae attacked and cannibalized the conspecific pupae even with its host plant leaves provided. However, it only fed on the freshly formed pupae and not the mature, this might be due to the hard-sclerotized cuticle in the later. The current study adds another phytophagous lepidopteran species with cannibalistic nature to an already existing list, stating the need to generate spatial and temporal leaf miner infestation data under field conditions to understand the ecological significance of the observed cannibalism in this nefarious pest.

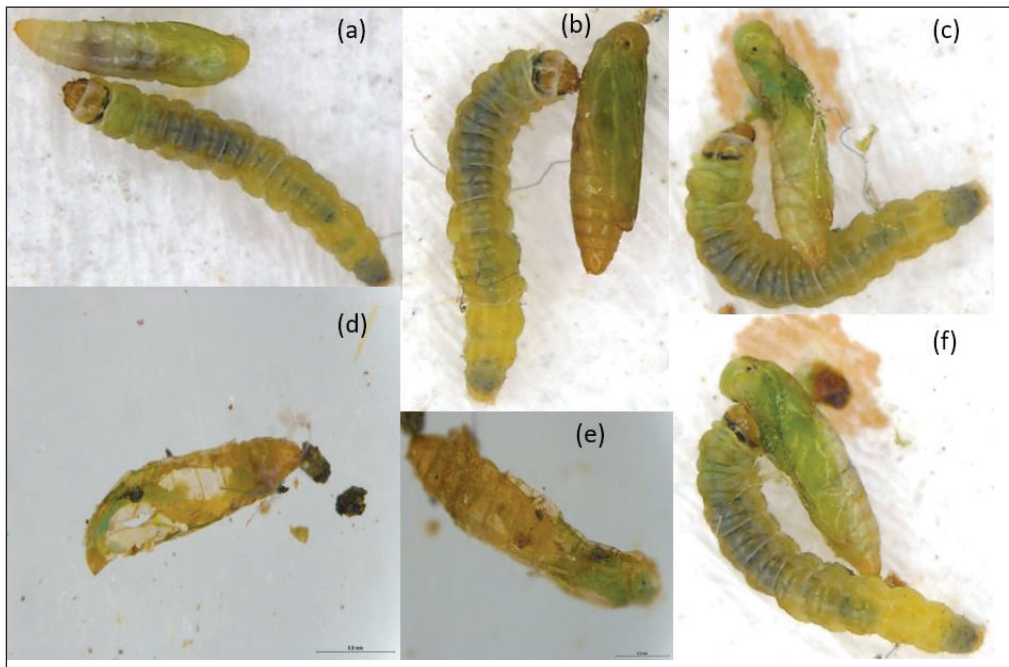
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Cannibalism, an act of killing and consuming the conspecific individuals of the same species, a behavior noticed in several carnivores was later also noticed in many non-carnivorous species, particularly insects including several herbivores (Richardson *et al.*, 2010). Recent studies opened up interesting facts in the role of the plant defenses inducing cannibalistic behavior among their herbivore insect pests to reduce the impact of herbivory (Orrock *et al.*, 2017). We observed similar cannibalistic behavior in South American leaf miner *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) during our insect culture maintenance, where the leaf miner larvae were seen feeding on their conspecific pupae. Detailed experiments have been conducted since this observation to confirm the cannibalistic behavior of *T. absoluta* larvae at the Division of Crop Protection ICAR-Indian Institute of Horticultural Research, Bangalore.

Pre-pupae of *T. absoluta* were collected from the previously established culture in the laboratory and were placed in petri dishes (13 cm diam.). Two types of *T. absoluta* pupae, namely freshly molted as well as older pupae were collected and placed individually in a petri dish along with a fresh leaf from the host plant, *Solanum lycopersicum* L. In each of the two petri dishes, individual larvae of different instars (I, II, III, IV) were placed and observed continuously for 24 h. Thus, the experiment involved a total of eight treatments and four replications were maintained for each treatment. The observations on the behavior of the larvae towards the conspecific pupae were recorded and number of cannibalized pupae was noted. The data were subjected to ANOVA.

The data on the cannibalism of *T. absoluta* larvae on its conspecific pupae revealed that significant differences exist in the amount of cannibalism exhibited by the different larval instars ( $P < 0.0001$ ) while feeding on fresh pupae. Among the different instars, only III instar larvae could damage and feed on 75% of conspecific pupae given. The presence of strong mandibles might have helped the III instar to feed on the pupae. However, none of the instars could attack the matured pupae (older pupae), this may be due to the sclerotized cuticle. The I instar larvae was subsequently dead by the next day due to starvation, whereas the IV instar larvae entered pupation.

Close examination of larval behavior revealed that initially the III instar *T. absoluta* larvae approached and circled around the pupa in an attempt to feed, even in the presence of host leaves. Additionally, the larvae also tried to web the pupa using silken threads. Later, it constantly searched all over the pupal surface for a suitable feeding area. Due to the exoskeleton of the pupa, the larva found it tough to puncture and feed on the pupa. However, due to its sustained efforts, the III instar larva managed to cut open the freshly molted pupae using its strong mandibles at the weak thoracic region joints. Immediately after rupturing the pupa's cuticle the larva started feeding on its internal contents leaving back the pupal exuviae.



**Fig. 1. Larvae of *T. absoluta* feeding on conspecific pupa. (a) Larva approaching the pupae (b) Larva attacking the pupa in proximal thoracic region (c) & (d) Larval feeding resulting in oozing of pupal body fluids (e) desiccated pupal after larval feeding (f) Left out pupal exuvia after larval feeding**

The cannibalistic tendency of the late larval stages of leaf miner, *T. absoluta* to devour the immobile, defenseless conspecific pupae opens up newer areas in its behavioral ecology. Generally, *T. absoluta* larvae tunnel their way within their host plant's leaves and finding multiple infestations of larvae on the same leaf is quite common indicating the high possibility of larval encounters with the developing pupae. Thus, in-depth niche as well as resource partition studies on a temporal scale are required to understand the possible niche-shift ability of developmental stages and also the oviposition decision making behavior of gravid female *T. absoluta* moths. The oviposition choice of female moths to lay eggs on the conspecific-infested leaves needs to be studied holistically to understand the opportunistic cannibalism of late larval stages of this lepidopteran leaf miner. Further, the role of host plant (*S. lycopersicum*) self-rescue behavior that turns hungry plant feeding caterpillars into cannibals even in the presence of ample food as observed in *Spodoptera exigua* (Orrock *et al.*, 2017; [www.sciencedaily.com/releases/2017/07/170710113714.htm](http://www.sciencedaily.com/releases/2017/07/170710113714.htm)), needs to also be researched in South American leaf miner, *T. absoluta*.

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#### REFERENCES

- Orrock, J., Connolly, B. and Kitchen, A. 2017. Induced defences in plants reduce herbivory by increasing cannibalism. *Nature Ecology & Evolution*, **1**: 1205–1207. doi.org/ 10.10 38/s41559-017-0231-6.
- Richardon, M. L., Mitchell, R. F., Reigel, P. F. and Hanks, L.M. 2010. Causes and consequences of cannibalism in noncarnivorous insects. *Annual Review of Entomology*, **55**:39-53. doi: 10.1146/annurev-ento-112408-085314

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