



Biology of Maize Stem Borer *Chilo partellus* [Swinhoe] under Laboratory Conditions

**Ravi Kumar Rajak^{a*}, Pankaj Kumar^a, Ragni Devi^a,
Umesh Chandra^a, Sameer Kumar Singh^a,
Kamal Ravi Sharma^a and Ram Veer^a**

^a Department of Entomology, Acharya Narendra Deva University of Agriculture and Technology,
Kumarganj, Ayodhya, Uttar Pradesh-224229, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Maize is one of the main cereal crops that is grown worldwide for food, fodder, and raw materials. It's a great source of vitamins, carbohydrates, and proteins. Because of the daily attacks by over 250 insect species and mites, maize yield is declining. The most damaging insect pest to maize production is *Chilo partellus*, sometimes known as the maize stem borer. A laboratory setting was used to grow the corn stem borer, *C. partellus*, in Department of Entomology, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, U.P. during 2023. The complete metamorphosis (egg, larva, pupa and adult) was recorded in *C. partellus*. The egg incubation period was 3.80 ± 0.79 days on average. There were six larval instar of *C. partellus* and total larval period was 29-37 days. The development phase of first, second, third, fourth, fifth and sixth larval instar was 3-4, 4-6, 6-7, 7-8, 7-8 and 2-4 days

*Corresponding author: E-mail: ravikumarrajak0106@gmail.com;

respectively on maize leaves. The average pupal period was 7.00 ± 0.96 days. The female was long lived than male. The total developmental period from egg to adult was 37-51 days.

Keywords: Maize stem borer; *Chilo partellus*; biology; complete metamorphosis; maize.

1. INTRODUCTION

One of the major cereal crops used worldwide for food, fodder, and raw materials for numerous industries as corn (*Zea mays* Linn.). Stem borer is a significant pest of maize in many regions of the world, and it poses a major threat to India's ability to cultivate maize successfully. In order to make pinholes and leaf windowing, newly hatched larvae feed on the leaves. They burrow into the plant whorl, feeding on it. They destroy the central stalk while eating in the plant whorl, which eventually dries out and causes a dead heart, which results in the crop being completely lost [1]. More than 130 insects have been documented to cause harm to maize, with roughly six insects having significant economic importance [2]. The main insect pests that assault maize crops comprise maize aphids, root worm, stem/shoot fly, cutworms and stem borer [3]. Among these, *Chilo partellus* Swinhoe (Pyralidae: Lepidoptera), the maize stem borer, has been identified as a significant productivity barrier across the nation. (Neupane, [4] Sharma & Gautam, [5] Thakur *et al.*, [3]. It attacks maize plants from the time the seeds are sowed until they reach maturity, feeding on every part of the plant (Gyawali, [6] Shivakoti & KC, [7] Neupane *et al.*, [8]. The borer generally leaves tiny holes in the leaves. Dead hearts, a condition in which the plants bear no ears at all, occur in extreme situations. As of yet, the correlation between stem tunnelling and leaf damage to monetary value has not been examined in conjunction with the yield loss caused by the maize stem borer in our particular circumstances. However, according to other experts, borer might result in a 20–87% yield reduction Mathur, [9] Chaterji *et al.*, [10]. Considering and realizing the significance of these aspects, in order to know the detailed biology of maize stem borer, the current investigation was conducted in the laboratory conditions of the Department of Entomology, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, Uttar Pradesh.

2. MATERIALS AND METHODS

The studies on the biology of the maize stem borer, *Chilo partellus* were conducted under

laboratory conditions of the Department of Entomology, Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, U.P. during 2023. The larvae that were gathered were taken to a laboratory to be raised. Ten larvae were placed into each of the plastic containers containing the fresh maize leaves. To prevent larvae from escaping, the openings of all plastic containers were securely wrapped with muslin cloth. Every few days, the larvae's food was switched up based on what they needed. Every day, the larvae were watched for pupation, and the pupae were gathered. The collected pupae were housed in individual containers, and their emergence was tracked every day. The adults that had emerged were moved into an oviposition cage that had sides lined with maize plant leaves for laying eggs and a bottom lined with black paper. The leaves were observed to alter daily. White paper and leaves were chopped into tiny pieces in order to gather eggs. In order for the eggs to hatch, they were transferred into Petri dishes. The eggs took three to five days to hatch, and the first instar larvae were then moved to rearing jars containing maize leaves as nourishment. The entire current pest life cycle, from egg to adult, was documented during the investigation.

3. RESULTS AND DISCUSSION

Research indicates that the Kharif crop contributes 90% more to maize output than other seasons. Serious disease outbreaks and insect infestations have a major impact on production. Among insect pests, *C. partellus*, the maize stem borer, poses a serious risk to crop productivity [11,12].

The fundamental understanding of pests is crucial prior to implementing any successful management measures, such as cultural, chemical, or biological [13] methods. Checking the biological parameters of the maize stem borer, *C. partellus*, was the goal of the current investigation. Under laboratory conditions, the pests were raised.

The maize stem borer placed its creamy white eggs on the dorsal and ventral sides of leaves in a flat, oval shape. After two and three days,

respectively, the eggs' colours were yellowish and yellowish brown. The eggs took 3.80 ± 0.79 days to incubate.

C. partellus has six larval instars, with a total larval period of 29–37 days. On maize leaves, the first, second, third, fourth, fifth, and sixth larval instars had growth periods of 3–4, 4–6, 6–7, 7–8, 7–8, and 2–4 days, respectively. The first instar among the early instars was little, slender, filthy white, and had a dark brown head. The body of the larva was hairy. Larvae in their second and third instars were respectively dull white and dirty white in hue with brown heads.

The translucent white body, dull white body, and reddish brown body were the colours of the fourth, fifth, and sixth larval instars, respectively. Pupal duration was 7.00 ± 1.15 days on average. The length of time that the maize stem borer *Chilo partellus* spent developing at each life stages are provided in Table 1. Numerous researchers have observed similar conclusions regarding larval description [14]. The little variations about developmental parameters of larvae were recorded between current study and early researchers' studies. The variations may be due to geographical variations [15].

Table 1. Developmental period of different life stages of maize stem borer *Chilo partellus*

Parameters	Stage	Mean \pm SD	Range (days)
	Egg period	3.80 ± 0.79	3 - 5
Larval duration			
	1st instar	3.80 ± 0.42	3 - 4
	2nd instar	5.30 ± 0.82	4 - 6
	3rd instar	6.40 ± 0.52	6 - 7
	4th instar	7.30 ± 0.48	7 - 8
	5th instar	7.50 ± 0.53	7 - 8
	6th instar	3.00 ± 0.67	2 - 4
	Total larval period	33.3 ± 3.44	29 - 37
Pupa			
	Pupa	7.00 ± 1.15	5 - 9
Total life cycle			
	Egg-Adult emergence	44.1 ± 5.38	37 - 51
Adult to longevity			
	Female	7.55 ± 0.96	6 - 9
	Male	6.45 ± 0.44	6 - 7

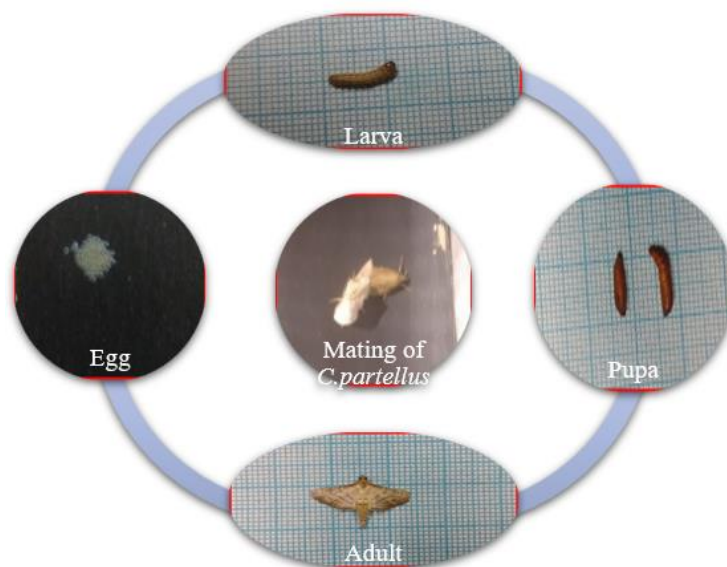


Fig. 1. Life circle of *Chilo partellus*

The life span of a male was 6-7 days, and that of a female was 6-9 days. Compared to the male, the female had a longer life span. Siddalingappa et al. [16] had published the comparable adult longevity findings. According to the findings of certain experts, the entire life cycle of the pest, from egg to adult, took 37–51 days. These findings go counter to those of Marulasiddesha, [17], who asserted that the pest's life cycle was completed in 30-69 days [18]. These differences could be brought on by certain foods or environmental factors [19].

4. CONCLUSION

The dead heart caused by the maize stem borer, *Chilo partellus*, lowers the productivity of maize. Because of the significant economic crop losses, it is regarded as a significant entomological research topic in India. The results of this study are crucial to the management plans used to combat this deadly insect throughout all of the world's maize-growing regions, but particularly in India. This study helps with the management of maize crops by offering fundamental knowledge on the biology and morphology of maize stem borer, *Chilo partellus*.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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