



BIOLOGY OF PINK STEM BORER *SESAMIA INFERENS* WALKER ON BARNYARD MILLET *ECHINOCHLOA FRUMENTACEA*

M ROOPIKA*, G SRINIVASAN AND M SHANTHI

Department of Agricultural Entomology,
Agricultural College and Research Institute, TNAU, Madurai 625104, Tamil Nadu, India

*Email: roobika1997@gmail.com (corresponding author)

ABSTRACT

Laboratory study was conducted to assess the biology of pink stem borer *Sesamia inferens* Walker on barnyard millet during February to April. The eggs were round and creamy white, and were laid inside the leaf sheath. The incubation period was 10.88 ± 0.41 days, and hatching % was 68.19 ± 1.16 and the larva had six instars. The weight of first, second, third, fourth, fifth and sixth instar were 0.21 ± 0.01 , 6.86 ± 0.57 , 36.29 ± 2.79 , 63.75 ± 2.06 , 135.97 ± 2.57 and 225.05 ± 4.65 mg, respectively; duration of these instars was 3.76 ± 0.23 , 3.92 ± 0.17 , 5.08 ± 0.21 , 5.52 ± 0.28 , 5.72 ± 0.23 and 6.68 ± 0.36 days, respectively. The total larval and prepupal duration were 30.68 ± 0.89 days and 1.48 ± 0.10 days, respectively, with a pupation of $86.4 \pm 1.86\%$ and pupal period of 9.96 ± 0.46 days. The pupal weights of males were 138.12 ± 3.05 mg and females were 196.63 ± 1.56 mg. The adult emergence was $84.4 \pm 1.93\%$, with female being larger than males; with filiform antenna, while the had bipectinate antenna. The weight of male adult was 110.20 ± 4.73 mg and female adult was 189.30 ± 9.40 mg, and longevity was 4.92 ± 0.16 and 6.4 ± 0.21 days, in male and female, respectively. The fecundity ranged from 28 to 226 eggs/ female (118.4 ± 12.09) and the total lifecycle ranged from 41 to 63 days (51.2 ± 1.44 days) for male and from 47 to 70 days (58.12 ± 1.47 days) for female.

Key words: *Sesamia inferens*, *Echinochloa frumentacea*, egg, larva, pupa, adult, duration, weight, sex ratio, pupation, longevity, fecundity, lifecycle

Barnyard millet (*Echinochloa frumentacea*) which belongs to the family Poaceae, is a multi-purpose crop cultivated for both food and fodder (Gomashe, 2017). It is enriched with nutrients like proteins and dietary fibers. The grains are good source of carbohydrate and minerals like zinc and iron when compared to other major cereals (Renganathan et al., 2020). Barnyard millet is ravaged by several insect pests like defoliators, stem borers and sap feeders. Among these, the pink stem borer *Sesamia inferens* Walker (Noctuidae: Lepidoptera) is a serious pest in barnyard millet (Gahukar and Reddy, 2019). In peninsular India, pink stem borer causes more damage throughout the year (Santhosh et al., 2008). Adults lay eggs inside the leaf sheath in clusters. After hatching, the larva bores into the stem and feeds inside. During panicle emergence, the infestation causes white chaffy panicles, termed as white ear (Reddy et al., 2003). Concerned with the threat caused by pink stem borer, this study on its biology was carried out.

MATERIALS AND METHODS

The biology study on *S. inferens* was conducted in the Post Graduate Entomology Laboratory, Agricultural College and Research Institute, Madurai (9.9699°N, 78.2040°E). The larval and pupal samples were collected

from barnyard millet fields of Madurai district. These were mass cultured in barnyard millet stem following Singh and Kular (2015a). For studying the biology, in each stage 25 individuals were selected with three replications. The duration in various developmental stages was recorded in egg, larval, pupal and adult. The % hatchability, egg duration, larval duration, larval weight, % pupation, pupal duration, % adult emergence, sex ratio and adult longevity were recorded by observing each stage as per the methodology suggested by Chaudhari et al. (2018). The eggs were allowed to hatch and the duration and the hatchability % were noted, and for the incubation period, these were kept in petri plates until they turn to black head stage. These petri plates were provided with moist cotton to avoid drying, and eggs hatched was counted regularly to know the hatchability%. The newly emerged larva were provided with soft stems as a food supplements and in later stages they were provided with matured stem cuttings. By regular observation of moulted skin or head capsule, the changes in the instars were recorded. The weight and duration of each instar were recorded regularly, and pupation % was noted from the larvae transformed into pupa, along with weight and duration. The adult emergence % was observed from the adults

emerged, along with number of male and female, and sex ratio and their duration worked out. The weight of both male and female adults was also recorded. The number of eggs laid was counted to know the fecundity. By adding the duration of different stages, the total duration of lifecycle was calculated. The data collected were analysed using descriptive statistics (Sharma et al., 2017).

RESULTS AND DISCUSSION

The eggs of pink stem borer were round and creamy white and laid inside the leaf sheath. The fecundity was 118.4 ± 12.09 and the incubation period was 10.88 ± 0.41 days. Prior to hatching, the eggs turned black and the hatching % was 68.19 ± 1.16 (Table 1). This is in accordance with Sharma et al. (2017) who studied its biology in maize genotypes. The larval duration was 30.68 ± 0.89 days, with six instars. Post-hatching, the tiny and soft first instar larva started scrapping the leaf sheath. The first instar lasted for 3.76 ± 0.23 days, and weighed 0.21 ± 0.01 mg; the second was seen with duration of 3.92 ± 0.17 days, and made small bore holes in the stem and fed on inner contents of stem, and weighing 6.86 ± 0.57 mg. The third instar larva fed inside the stem and duration and weight was 5.08 ± 0.21 days and 36.29 ± 2.79 mg, respectively. The fourth instar weight was 63.75 ± 2.06 mg and the duration was 5.52 ± 0.28 days. The fifth instar lasted for 5.72 ± 0.23 days, and weighed 135.97 ± 2.57 mg; the final instar was large stout and pinkish, weighing from 185.61 to 253.37 mg and lasted for 6.68 ± 0.36 days. The infested crop showed deadheart symptom during tillering stage and white ear symptom during reproductive stage in accordance with Chaudhari et al. (2018); this study reported that the instars lasted for 4.04 ± 0.84 , 3.44 ± 1.16 , 4.96 ± 0.79 , 5.56 ± 1.04 , 6.00 ± 0.82 and 7.44 ± 1.19 days, respectively and also confirmed that the pupation takes place inside the stem.

Upon completion of six instars, the larva entered into prepupal stage which lasted 1.48 ± 0.10 days, with pupation being $86.4 \pm 1.86\%$, and pupal duration was 9.96 ± 0.46 days. The male pupal weight was 138.12 ± 3.05 mg and female was 196.63 ± 1.56 mg. Total developmental period was 48.8 ± 1.56 days. Similarly, Singh and Kular (2015b) in wheat reported that the pupal duration was 36.05 ± 0.36 days for male and 37.78 ± 0.17 days for female. The adult emergence was $84.4 \pm 1.93\%$, with female larger than the male; female had filiform antenna while in male it was bipectinate. The number of males emerged was 10.2 ± 0.36 , and

Table 1. Biology of *S. inferens* reared on barnyard millet stem

| S. No. | Parameters | Mean± S.E. |
|--------|-----------------------------------|-------------------|
| 1. | Fecundity (no.) | 118.4 ± 12.09 |
| 2. | Incubation period (days) | 10.88 ± 0.41 |
| 3. | Egg hatching (%) | 68.19 ± 1.16 |
| 4. | Larval period (days) | 30.68 ± 0.89 |
| | I | 3.76 ± 0.23 |
| | II | 3.92 ± 0.17 |
| | III | 5.08 ± 0.21 |
| | IV | 5.52 ± 0.28 |
| | V | 5.72 ± 0.23 |
| | VI | 6.68 ± 0.36 |
| 5. | Larval weight (mg) | |
| | I | 0.21 ± 0.01 |
| | II | 6.86 ± 0.57 |
| | III | 36.29 ± 2.79 |
| | IV | 63.75 ± 2.06 |
| | V | 135.97 ± 2.57 |
| | VI | 222.05 ± 4.65 |
| 6. | Pre-pupal period (days) | 1.48 ± 0.10 |
| 7. | Pupation (%) | 86.4 ± 1.86 |
| 8. | Male pupal weight (mg) | 138.12 ± 3.05 |
| 9. | Female pupal weight (mg) | 196.63 ± 1.56 |
| 10. | Pupal period (days) | 9.96 ± 0.46 |
| 11. | Adult emergence (%) | 84.4 ± 1.93 |
| 12. | Adults emerged (No.) | 10.2 ± 0.36 |
| | Male | |
| | Female | 11.0 ± 0.37 |
| 13. | Adult weight (mg) | |
| | Male | 110.20 ± 4.73 |
| | Female | 189.30 ± 9.40 |
| 14. | Adult longevity (days) | |
| | Male | 4.92 ± 0.16 |
| | Female | 6.4 ± 0.21 |
| 15. | Total developmental period (days) | |
| | Male | 51.2 ± 1.44 |
| | Female | 58.12 ± 1.47 |
| 16. | Male female ratio | 1: 1.08 |

Mean± SE (n=20); SE - Standard error

in female it was 11.0 ± 0.37 , while these weighed 110.20 ± 4.73 and 189.30 ± 9.40 mg, in male and female, respectively; longevity of male was 4.92 ± 0.16 and in female, it was 6.4 ± 0.21 days. Total lifecycle lasted for 51.2 ± 1.44 days for male and 58.12 ± 1.47 days for female. These results are in consonance with those of Singh and Kular (2015b).

REFERENCES

- Changmei S, Dorothy J. 2014. Millet- the frugal grain. International Journal of Scientific Research and Reviews 3(4): 75-90.

- Chaudhari N S, Patel A A, Deb S, Patel P S. 2018. Biology of pink stem borer, *Sesamia inferens* (Walker) on wheat. An International e Journal 7 (2): 133-147.
- Gahukar R, Reddy V P. 2019. Management of economically important insect pests of millet. Journal of Integrated Pest Management 10(1): 1-10.
- Gomashe S S. 2017. Barnyard millet: Present status and future thrust areas: Biology and genetic improvement. Millets and Sorghum 134: 184-198.
- Gomez K A, Gomez A A. 1984. Statistical procedures for agricultural research. 2nd edition, John Wiley and Sons, New York: 680.
- Reddy M, Babu T R, Reddy D D R, Sreeramalu M. 2003. Determination of economic injury and threshold levels for pink borer *Sesamia inferens* (Walker) in maize *Zea mays* L. International pest control 45(5): 260-263.
- Renganathan V G, Vanniarajan C, Karthikeyan A, Ramalingam J. 2020. Barnyard millet for food and nutritional security: Current status and future research direction. Frontiers in Genetics 11: 1-21.
- Santhosh H B, Sekhar J C, Rakshit S, Gadag R N, Sain D. 2008. Detection of epistatic interaction for susceptibility towards pink stem borer (*Sesamia inferens* Walker) in maize (*Zea mays* L.). Indian Journal of Genetics and Breeding 72(3): 284-289.
- Sharma H, Jaglan M S, Yadav S S. 2017. Biology of pink stem borer, *Sesamia inferens* (Walker) on maize, *Zea mays*. Journal of Applied and Natural Science 9 (4): 1994-2003.
- Singh B, Kular J S. 2015a. Influence of abiotic factors on population dynamics of pink stem borer, *Sesamia inferens* Walker in rice-wheat cropping system of India. Journal of Wheat Research 7 (2): 23-28.
- Singh B, Kular J S. 2015b. Notes on the bionomics of the pink stem borer, *Sesamia inferens* Walker (Lepidoptera: Noctuidae): an upcoming pest of wheat in India. *Acta Phytopathologica et Entomologica Hungarica* 50 (2): 239-259.

(Manuscript Received: March, 2021; Revised: May, 2021;
Accepted: May, 2021; Online Published: August, 2021)
Online published (Preview) in www.entosocindia.org Ref. No. e21054