



## FIRST RECORD OF BARNYARD MILLET AS A HOST FOR FALL ARMY WORM *SPODOPTERA FRUGIPERDA* (J E SMITH)

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### ABSTRACT

Damage potential of maize fall army worm (FAW), varies from 9.0 % to 62.5 % on different seasons and in different regions of India. FAW threatens food and nutritional security of millions of farmers in India. Here is the first record of FAW in a new host barnyard millet and a study on its biology. The infestation began from seedling stage and extended till reproductive stage. During seedling stage, the larva caused scrapping of leaf and cut the central shoot, resulted in drying of central shoot, which resembled dead heart symptom. In vegetative stage, it caused scrapping and defoliation of leaves and also caused whorl damage. There were no parallel hole symptoms observed as like maize. The egg duration was  $2.8 \pm 0.83$  days. Larva usually had six instars with life period of  $3.2 \pm 0.83$  Days,  $3.0 \pm 0.70$  Days,  $2.4 \pm 0.54$  Days,  $2.6 \pm 0.54$  Days,  $3.4 \pm 0.89$  Days and  $6.0 \pm 0.70$  Days for I to VI instars respectively. The total larval duration ranged from 17 to 23 days with a mean of  $20.6 \pm 2.07$  days. Pupal and adult duration were  $8.8 \pm 1.30$  and  $10.2 \pm 2.04$  Days respectively. The total life cycle in barnyard millet under laboratory condition was  $42.2 \pm 4.26$  days.

**Key words:** First record, *Spodoptera frugiperda*, egg, larva, pupa, adult, barnyard millet, Madurai, biology, life stages, symptom, Invasive pest

The fall army worm (FAW) *Spodoptera frugiperda* (J E Smith) is an invasive pest of maize and it was first reported in May 2018 from Karnataka, India (Sharanabasappa et al., 2018). In Tamil Nadu, it was reported in maize during August 2018 in Karur and it was observed in sugarcane during November 2018 from Erode (Srikanth et al., 2018). It feeds on more than 100 hosts, and it is a voracious feeder and polyphagous in nature, feeding on 353 plant (Montezano et al., 2018). The main host are maize, sorghum, rice and sugarcane, with extensive damage, more damage was recorded on maize (77.2%) followed by sorghum (60.1%) and pearl millet (41.4%) (Suby et al., 2020). It attacks at seedling, vegetative, flowering and reproductive/ fruiting stages (Montezano et al., 2018). Although the pest has been reported in millets, there was no record on barnyard millet. Hence the biology of FAW in barnyard millet was studied.

### MATERIALS AND METHODS

The survey was conducted in five plots of barnyard millet in the Agricultural College and Research Institute (AC & RI), Madurai, Tamil Nadu, India from June to

March in 2021. Larvae were collected from the plots and field symptoms were observed. Larvae were brought to the Insectary of AC&RI, Madurai and reared individually. Morphological characteristics of larval and adult were established based on Sharanabasappa et al., (2018b). Roving survey was made to estimate the infestation.

Larvae from barnyard millet field was collected, fed with barnyard millet leaves and reared individually in rearing trays to avoid cannibalism. The later instar larvae were maintained in trays with sand for easy pupation. Pupae were transferred to adult rearing cages. Adults emerged were maintained at adult rearing cage, fed with honey solution mixed with vitamin E tablets and allowed for egg laying. In successive cycles, biology was studied by maintaining five replications and observations on duration of egg, larva, pupa, adult and fecundity rate of female were made.

### RESULTS AND DISCUSSION

Adults were found to rest in the whorls, and laid eggs on the abaxial surface of newly emerged leaves

and also in the whorls. The infestation began from seedling stage and extended till reproductive stage. During seedling stage, the larva seen in rhizosphere region (Fig. 1) caused scrapping (Fig. 2) of leaf and cut the central shoot, resulted in drying of central shoot, which resembled dead heart symptom. In vegetative stage, it caused scrapping and defoliation (Fig. 3) of leaves and also caused whorl damage. There were no parallel hole symptoms observed as like maize. During flowering stage, it consumed spikelet's and also fed on grains at milky stage (Fig. 4). Extent of infestation during seedling, vegetative and reproductive stage ranged from 10% to 11%, 60% to 75% and 65% to 80%, respectively. The larval population varied from 0.1, 0.6 and 1.0 larva per hill respectively. It caused heavy damage to Barnyard millet from seedling to harvest stage. After hatching, the neonate larva began feeding on one side of younger leaves leaving the other side, caused windowpane symptom and sometimes caused scraping on young shoot (Fig. 2). Papery window symptom on damaged older leaves (Fig. 3). Many small caterpillars were present in same plant, but only one or two big larvae sustained in one plant accompanied by larval droppings. If it was young plant the plant died, if it was older plant with inflorescence, the larva entered and caused damage by improper fertilization and poor grain development. During reproductive stage of plant, the mature larva voraciously fed on spikelets (Plate 4) (Maruthadurai and Ramesh, 2020).

The eggs were laid in mass and covered with tuft of hairs. The egg duration was  $2.8 \pm 0.83$  days. Eggs were creamy, dome shaped, flattened base and upwardly curved, pointed apex usually deposited in two to four layers as cluster. Eggs were laid in inner side of whorl and outer side of leaves and also in stem. Egg period under laboratory condition was  $2.8 \pm 0.83$  days, which was in accordance with CABI (2018) and

Sharanabasappa et al. (2018) reported egg period as 2 to 3 days on warm condition. Larva had six instars with life period of  $3.2 \pm 0.83$  Days,  $3.0 \pm 0.70$  Days,  $2.4 \pm 0.54$  Days,  $2.6 \pm 0.54$  Days,  $3.4 \pm 0.89$  Days and  $6.0 \pm 0.70$  Days for I to VI instars respectively. The total larval duration ranged from 17 to 23 days with a mean of  $20.6 \pm 2.07$  days. At sixth instar, the larva attained 45 mm in length with inverted Y shape suture on head, typical four large spots forming square shape were present on dorsal side of the penultimate segment, four small spots in the form of trapezium seen on dorsal side of next segment in the body and dark band on lateral side of body with tiny spines were present (ICAR-NBAIR, 30th July, 2018; Prasanna et al., 2018). Larva usually hides during bright light. Larval period changed with climate as 14 days and 30 days, in summer and winter, respectively (CABI, 2018, Deshmukh et al., 2021). After attaining prepupal stage, the larva dropped to ground for pupation. During prepupal stage the larva became pale green and later turned into dark brown. Larva constructed cocoon in oval shape, and pupated in soil at a depth of 3 to 8 cm and also in leaf debris. Pupal duration was  $8.8 \pm 1.30$  days, whereas Prasanna et al., (2018) reported that duration varied from 9 and 30 days, in summer and winter, respectively. Adults were nocturnal and more active in warm and humid condition. Forewings of male moth were grey with circular spot on centre and triangular white patch on tip of the wing; whereas female forewing was uniform fine greyish brown. Hind wing of both male and female had narrow dark border with silvery white appearance (Sharanabasappa et al., 2018; CABI and FAO 2018). Life span of adult was  $10.2 \pm 2.04$  days. Female started laying eggs on fourth day and its continuous up to third week. Each female laid  $7.6 \pm 2.07$  egg mass was in their life time with 150-200 eggs/ egg mass. Its total lifecycle in barnyard millet under laboratory condition was  $42.2 \pm 4.26$  days.



Fig. 1-4. Incidence of *S. frugiperda* on barnyard millet. Presence of larva in soil; 2. Scrapping of leaves by larva; 3. Leaf damage by larva; 4. Larva feeding on spikelet's

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**AUTHOR CONTRIBUTION STATEMENT**

Roopika M, Moorthy A V performed field trial of barnyard millet. Srinivasan G and Shanthi M identified larva as fall armyworm.

**CONFLICT OF INTEREST**

No conflict of interest.

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