BIOLOGY OF EGGPLANT FRUIT AND SHOOT BORER LEUCINODES ORBONALIS GUENEE FROM MALAYSIA: A REVIEW

ABDULBAQI ROSTAE

Entomology Department, Agriculture Faculty, Universiti Putra Malaysia (UPM), Serdang, Selangor Darul Ehsan, Malaysia
Email: abrostaee@gmail.com (corresponding author)

ABSTRACT

Eggplant Solanum melongena L. (Solanaceae), well known as brinjal, aubergine or garden egg is native to India and an important vegetable crop grown throughout the world, especially in South Asia. Like other vegetables, it is also subject to attack by various insect pests. Brinjal shoot and fruit borer is the most destructive and first ranked pest at both vegetative and reproductive stages in South and Southeast Asia. It causes significant reduction in yield up to 80%. This leads to problems for the farmers growing eggplant, this review on the biology of the shoot and fruit borer Leucinodes orbonalis Guenee (Lepidoptera). Since this pest causes economic damages in Malaysia, this article describes all stages of the life cycle, incubation and larval period, larval instars, pupal period, adult longevity, fecundity, and total developmental period.

Key words: Solanum melongena, fruit and shoot borer, biology, Malaysia, life cycle stages, duration, longevity, fecundity

Taxonomy

Leucinodes orbonalis Guenee was first described by Guenee in 1854. The preferred scientific name. Walker nominated it as the type species of the genus Leucinodes in 1859 (CABI, 2007). The taxonomic classification as per CABI (2007) is: Phylum: Arthropoda Class: Insecta Order: Lepidoptera Family: Crambidae (Syn: Pyralidae) Genus: Leucinodes Species: orbonalis Scientific name: Leucinodes orbonalis Guenee

Host range

Eggplant shoot and fruit borer is monophagous, prefers feeding on eggplant tender shoots and fruits; however, plants of the family Solanaceae had been reported as hosts. Major host plants known include: Solanum melongena Linnaeus (eggplant), S. tuberosum Linnaeus (potato), some are secondary hosts- Ipomoea batatas Linnaeus (sweet potato), Lycopersicon esculentum Mill (tomato), Pisum sativum var. arvense Linnaeus (Austrian winter pea), S. indicum Linnaeus, S. myriacanthum Dunal, S. torvum Swartz (turkey berry) and wild host S. gilo Raddi (gilo), S. nigrum Linnaeus (black nightshade) (CABI, 2007); S.anomalum Thonn (Kalda and Singh, 1997) and S. macrocarpon Linnaeus (Sadashiva and Kumar, 1996) are wild hosts.

Distribution

L. orbonalis has been reported from Africa, South of
the Sahara and South-East Asia, including China and the Philippines (CABI, 2007). In Asia continent, it is one of the most significant and the first ranked destructive pest in India, Pakistan, Sri Lanka, Nepal, Bangladesh, Thailand, Philippines, Cambodia, Laos and Vietnam (AVRDC, 1994). Its distribution is more with areas having hot and humid climate (Srinivasan, 2009).

Life cycle

*Leucinodes orbonalis* has four stages- egg, larva, pupa and adult, with larval period being the longest, followed by pupal and incubation period.

Oviposition takes place during the night and eggs are laid singly on the lower surface of the young leaves, green stems, flower buds, or calyces of the fruits and number of eggs laid by a female varies from 80 to 253 (Taley et al., 1984; Alpuerto, 1994), however, reported as high as 260 (FAO, 2003). The eggs are laid in the early hours of the mornings singly or in the batches on the ventral surface of the leaves (CABI, 2007). They are flattened, elliptical with 0.5 mm in diameter and colour is creamy-white but change to red before hatching (Alam et al., 2006). The egg takes incubation period of 3-5 days in summer and 7-8 days in winter and hatch into dark white larvae (Rahman, 2006).

The larval period lasts 12-15 days during summer and 14-22 days during winter season (Rahman et al., 2006). Larvae pass through at least five instars (Atwal, 1976) and there are reports of the existence of six larval instars (Baang and Corey, 1991; FAO, 2003). Sandanayake and Edirisinghe (1992) studied the larval distribution on mature eggplant. They found first instars in flower buds and flowers, second instar in all susceptible plant parts, third and fourth instar in shoots and fruits and fifth instar mostly in fruits. In general, the size of the first instar larvae are less than 1mm in length, the last instar larva is 15 – 18 mm long but Sandanayake and Edirisinghe (1992) reported the size of last instar larva to be 18 to 23 mm. Larval feeding in fruit and shoot is responsible for the damage. One fruit contains up to 20 larvae in Ghana (Frempong, 1979).

The full grown larvae come out of the infested shoots and fruits and for pupate in the dried shoots and leaves or in plant debris fallen on the ground within tough silken cocoons. There were evidences of presence of cocoons at soil depths of 1 to 3 cm (Alam et al., 2003). They pupate on the surface they touch first (FAO, 2003). The pupal period lasts 6 to 17 days depending upon temperature (Alam et al., 2003). It is 7-10 days during summer, while it is 13-15 days during winter season (Rahman, 2006). The colour and texture of the cocoon matches the surroundings making it difficult to detect, and mostly in fruits. In general, the size of the first instar larvae being <1 mm in length, and the last instar larva 15-18 mm long but Sandanayake and Edirisinghe (1992) reported the size of last instar larva to be 18 to 23 mm. Larval feeding in fruit and shoot is responsible for the damage. One fruit contains up to 20 larvae in Ghana (Frempong, 1979).

Within one hour after hatching, larva bores into the nearest tender shoot, flower, or fruit. Soon after boring into shoots or fruits, they plug or clog the entrance hole (feeding tunnel) with excreta (Alam et al., 2006). In young plants, caterpillars bore inside petioles and midribs of large leaves (Butani and Jotwani, 1984; Alpureto, 1994; AVRDC, 1998), resulting in wilting, drop off and wither of the young shoots leading to delay
on crop maturity, and reduction on yield. Larval feeding inside the fruit results in destruction of fruit tissue. In severe cases, rotting was common (Neupane, 2001). Larval feeding in flower was rare, if happen, failure to form fruit from damaged flowers (Alam et al., 2006). Damage to the fruits, particularly in autumn, is very severe and the whole crop is destroyed (Atwal, 1976).

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