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Brinjal Fruit and Shoot Borer, *Leucinodes orbonalis*: Biology, Marks of Identification, Nature of Damage and Integrated Pest Management in Brinjal

Rakesh[1], Jaswant[2] and Yogesh Panwar[1]

[1]B.Sc. (Hons.) Agriculture, College of Agriculture Jodhpur, Agriculture University Jodhpur, Rajasthan

[2]B.Sc. (Hons.) Forestry, College of Horticulture and Forestry, Jhalawar, Agriculture University, Kota, Rajasthan

SUMMARY

Brinjal (*Solanum melongena* L.), is vegetable crop, originated from India and it is also known as "eggplant" or "King of vegetables". The crop is attacked by a number of insect-pests including shoot and fruit borer, whitefly, leafhopper, aphid, Hadda beetle, Stem borer, Lacewing bug, Brinjal brown leafhopper, and Leaf roller. Besides these insects brinjal is also attacked by mites, which results in significant losses in the production and productivity. This article mainly focused on the identification, life cycle, nature of the damage, and Integrated Pest Management (IPM) of Brinjal Shoot and Fruit Borer.

INTRODUCTION

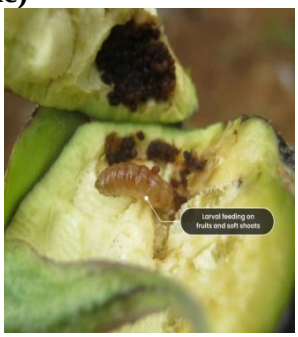
Brinjal, *Solanum melongena* Linnaeus is one of the most important vegetables in South and South-East Asia (Thapa, 2010). It belongs to the plant family Solanacae and is the most commonly grown vegetable of this family (Kantharajha and Golegaonkar, 2004). The Indo-Pak Subcontinent is reported to be the native land of brinjal (Dunlop, 2006). Different insect pests attack brinjal from time of planting till its harvesting. Some important insect pests are brinjal shoot and fruit borer (BSFB) (*Leucinodes orbonalis*), coccinelide beetle (*Epilachna vigintioctopunctata*), jassid (*Amrasca bigutulla bigutulla*), aphid (*Aphis gossyppii*) and white fly (*Bemisia tabaci*) (Latif et al., 2009). BSFB is the major pest of brinjal (Latif et al., 2010; Chakraborti and Sarkar, 2011; Saimandir and Gopal, 2012) and is found in all brinjal producing countries (Dutta et al., 2011). It is the most important insect pest of brinjal in Africa, Sahara and South-East Asia (CABI, 2007). It causes severe damage in South Asia (Thapa, 2010) , where yield losses may reach up to 85 to 90 percent (Misra, 2008; Jagginavar et al., 2009). The larvae bore into tender shoots at the vegetative stage, flower and fruit (CABI, 2007). Flower infestation is very rare, but infested flowers cannot produce fruit (Alam et al., 2006). It is also reported to infest the petiole and midrib of leaves (Alpureto, 1994; AVRDC, 1998) causing withering and drooping of young leaves and shoots. But once fruit setting has been initiated, shoot infestations become negligible (Kumar and Dharmendra, 2013) or completely disappear (Naqvi et al., 2009). The larvae, after hatching, bore inside fruit and the minute entrance hole is closed by the excreta of feeding larvae (Alam et al., 2006). Larvae feed on the mesocarp of fruit and the feeding and excretion result in fruit rottening (Neupane, 2001), making it unfit for human consumption (Baral et al., 2006). On average a larva can infest 4 to 7 fruits during its life span (Jayaraj and Manisegaran, 2010). Infestation by this pest results in lowering the vitamin C content up to 80 percent in infested brinjal fruit (Sharma, 2002).

Brinjal Fruit and shoot borer (BSFB), *Leucinodes orbonalis* (Lepidoptera: Pyralidae)

Adult of BSFB

Withering leaves

Shedding of flower buds



Larva feeding on fruits

Biology or Life cycle and Marks of Identification

BFSB is mostly monophagous. Adult females lay about 200 creamy white eggs on the undersides of leaf tender shoots, flower buds, or the base of developing fruits, either singly or in groups of two to five. Until hatching, these eggs turn red, and the egg cycle is three to five days. The larvae are creamy white to pink in color in their early stages, and mature larvae have a dark brown or blackish head. The larva usually has five instars, sometimes six and the larval period is about two weeks in summer and three weeks in winter. The larva pupates on the plant parts or plant debris on the soil surface. The pupa has tough silken cocoons and is dark brown in colour. On the dorsum of the thorax and abdomen, the moth is white or pale brown with black spots. The female is bigger than male, with a bulged abdomen. The female moth tends to curl its abdomen upwards. The adult life span is about a week; the females live longer than males. In a year there are five overlapping generations.

Nature of Damage: The newly hatched larva begins to bore near the growing stage, flower buds, or fruits. It feeds on tender shoots during the early vegetative phase of crop development. The larva fills the entry hole with excreta shortly after drilling into the fruits. The larva tunnels within the shoot, feeds on the inner material, and then excretes into the feeding tunnels. This resulted in the withering of the plant.

Management of Fruit and shoot borer, *Leucinodes orbonalis*

- Remove the affected terminal shoot and fruits showing boreholes.
- Avoid continuous mono cropping of brinjal crop.
- Grow the varieties with long and narrow fruits in endemic areas.
- Installation of pheromone trap@12/ha.
- Encourage the activity of larval parasitoids: *Pristomerus testaceus, Cremastus flavoorbitalis*.
- Avoid use of synthetic pyrethroids and avoid using insecticides at the time of fruit maturation and harvest.
- Spray any one of the following chemicals starting from one month after planting at 15 days interval.

Integrated Pest Management in Brinjal

Cultural Method

- Soil solarization using black plastic transparent polythene sheets (60 to 100 guage) on nursery-on-nursery beds for about 15 to 21 days which helps in killing alternate host and resting stages of pests to sunlight.
- Avoiding overdose of Nitrogen and Phosphorous fertilizers on brinjal reduce the incidence of fruit and shoot borer.
- Select less susceptible varieties like SB 17-4, PBR-129-5, Punjab Barsati, Arka Kasumkar, Pusa Purple Round, Punjab Meetam for shoot and fruit borer.

Mechanical Method

- Collection and burning of affected plant parts and management of crop residues.
- Collection and destruction of egg masses, larvae and adults of Hadda beetle and tobacco cutworm, etc.
- Removal of damaged shoots, fruits and fruit borer and destruction.
- Use of yellow pan/sticky traps for sucking pests @ 10 per ha.
- Regular destruction of damaged fruits at each harvest in brinjal to reduce the population.

Biological Method

- Grow cowpea or pulses on the bunds to buildup natural fauna.
- Installation of bird per chers 2 50 ha.
- Encourage the activity of larval parasitoids: *Pristomerus testaceus, Cremastus flavoorbitalis*.
- Release Chrysoperla carnea @ 2 grubs per plant to control aphida and other soft bodied insects during early in the season.
- Inductive release of T, chilonis @ 50,000 per ha, in brinjal five times starting from flower intiation satge at weekely interval angaist fruit and shoot borer.
- Spray Bacillus thuringiensis var kurstaki, the commercial preparation @ 500 g/ha against lepidopteran pests.

- Five percent NSKE spray for sucking pests in early stages of the crop. It also takes care of serpentine leaf minor, etc.
- Application of Neem cake @ 200 kg per ha, a basal dose at the time of land preparation for controlling root-knot nematode infection.

Chemical Method:

Recommended pesticides against Brinjal Pests				
Pests/ Pesticides	**Dosages**			**Waiting period (days)**
	a.i. (gm)	**Formulation (gm/ml)**	**Dilution (Litre)**	
Fruit and shoot borer				
Azadiractin 1%(10000 PPM)	-	1000-1500	500	3
Chlorpyrifos 20% EC	200	1000	500-1000	-
Cypermethrin 25% EC	37-50	150-200	500	1
Fenvalerate 20% EC	75-100	375-500	600-800	5
Lambda-Cyhalothrin 4.9% CS	15	300	500	5
Jassid				
Cypermethrin 25% EC	37-50	150-200	500	1
Phosphamidon 40% SL	250-300	625-750	500	10
Whitefly				
Diafenthiuron 50% WG	300	600	500-750	3
Thiomethoxam 25% WG	50	200	500	3
Aphids				
Phosphamidon 40% SL	250-300	625-750	500	10
Thrips				
Phorate 10% CG	1000	1000	-	-
Red spidetr mites				
Fenazaquin 10% EC	40	400	400-500	5
Fenpropathrin 30% EC	75-100	250-340	750-1000	7
Flufenzine 20% SC	80-100	400-500	500-1000	5
Propargite 57% EC	570	1000	400	6
Spriromesifen 22.9% SC	96	400	500	5

CONCLUSION

The indiscriminate and injudicious use of chemical pesticides in agriculture has resulted in several associated adverse effects such as environmental pollution, ecological imbalances, pesticides residues in food, fruits and vegetables, fodder, soil and water, pest resurgence, human and animal health hazards, development of resistance in pests etc. Therefore, the use of integrated pest management, reduce cost of cultivation and promote organic pest management.

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