

How to Control Eggplant Fruit and Shoot Borer



AVRDC

The World Vegetable Center

Introduction

Eggplant fruit and shoot borer (EFSB), *Leucinodes orbonalis*, is the most damaging pest of eggplant in South and Southeast Asia. Its larvae feed inside eggplant fruit, making the fruit unmarketable and unfit for human consumption (Fig. 1). At times, entire crops can be lost.

Farmers are currently using too many pesticides and applying them too frequently to control EFSB. This excessive pesticide usage threatens the health of farmers and consumers, pollutes the environment, besides making eggplant fruit costly to consumers. At the same time, frequent use of pesticides has made this insect tolerant to the chemicals, making it more difficult to control.

This guide will teach you a simple, safe, and economical method of controlling EFSB. This method has been successfully tested on farmers' fields in Bangladesh and India.

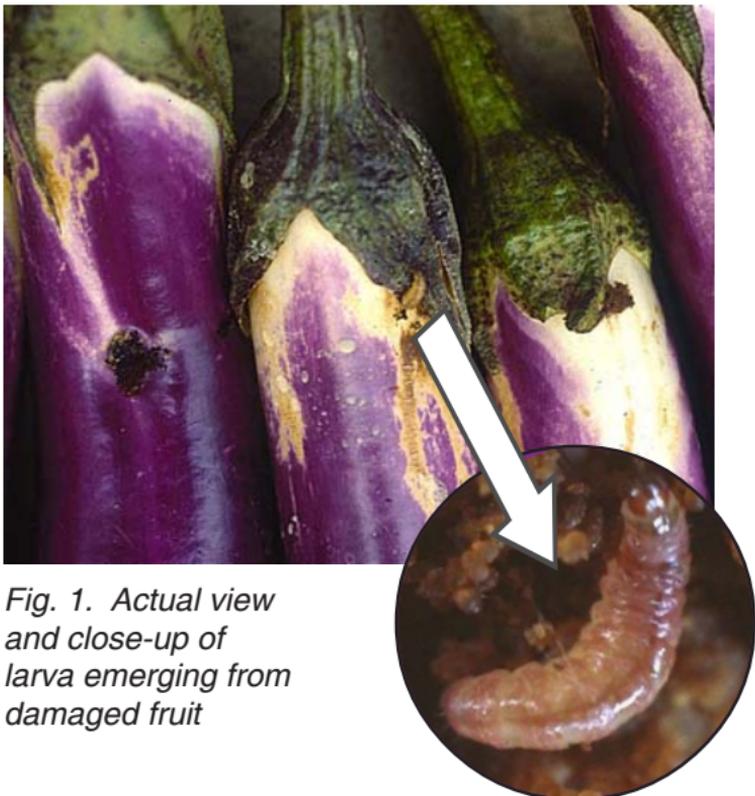


Fig. 1. Actual view and close-up of larva emerging from damaged fruit

How does EFSB look like and live?

EFSB goes through four different forms in one lifetime (Fig. 2). Moths lay tiny white **eggs**, mainly on leaves. After 4–5 days, eggs turn into tiny translucent **larvae**. These larvae tunnel inside a tender shoot or fruit. **It is the larvae feeding inside eggplant fruit that are responsible for damage.**

After 15–20 days of feeding, a larva is full-grown, measuring 10–15 mm. It makes a small hole in the fruit or shoot and escapes to the soil at night. It forms a sturdy cocoon around itself near the soil surface, and rests as a **pupa**. The pupa looks like dried plant debris and is hard to recognize.

After a week, the pupa changes into an **adult moth**, which comes out only at night. The moth is small, white with a pink and bluish tinge, and has a few brown spots on its wings. Moths do not feed on eggplant; rather, they survive on plant exudate or dew drops. During the day, moths hide under eggplant leaves. During the night, the moths come out in the open and mate in the eggplant field. Soon after mating, female moths lay eggs and the life cycle continues.

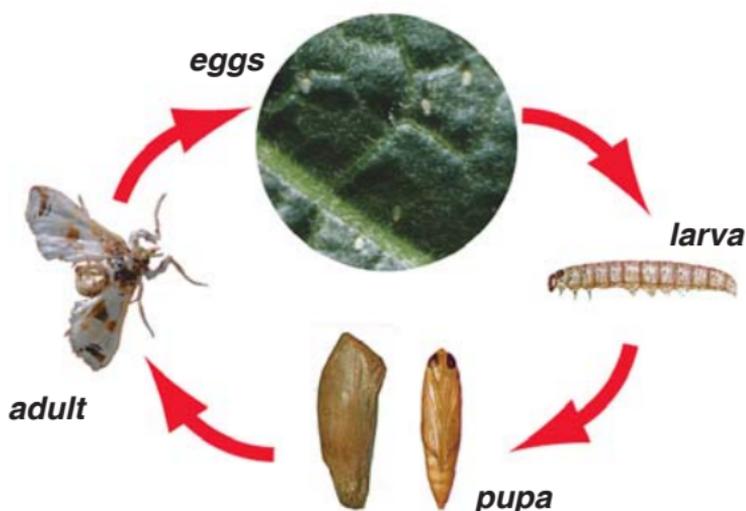


Fig. 2. Life cycle of EFSB

Where does EFSB come from?

EFSB feeds almost exclusively on eggplant. It can infest crops in four ways (Fig. 3):

First, in a newly-planted eggplant crop, EFSB moths can fly in from neighboring eggplant fields that have already been damaged. This is the most common source of infestation. **Since moths can fly from one field to another, it is important that all farmers in a community work together to keep EFSB under control.**

Second, eggplant seedlings used for transplanting can sometimes be carrying eggs or tiny larvae. This is especially true if one uses slightly

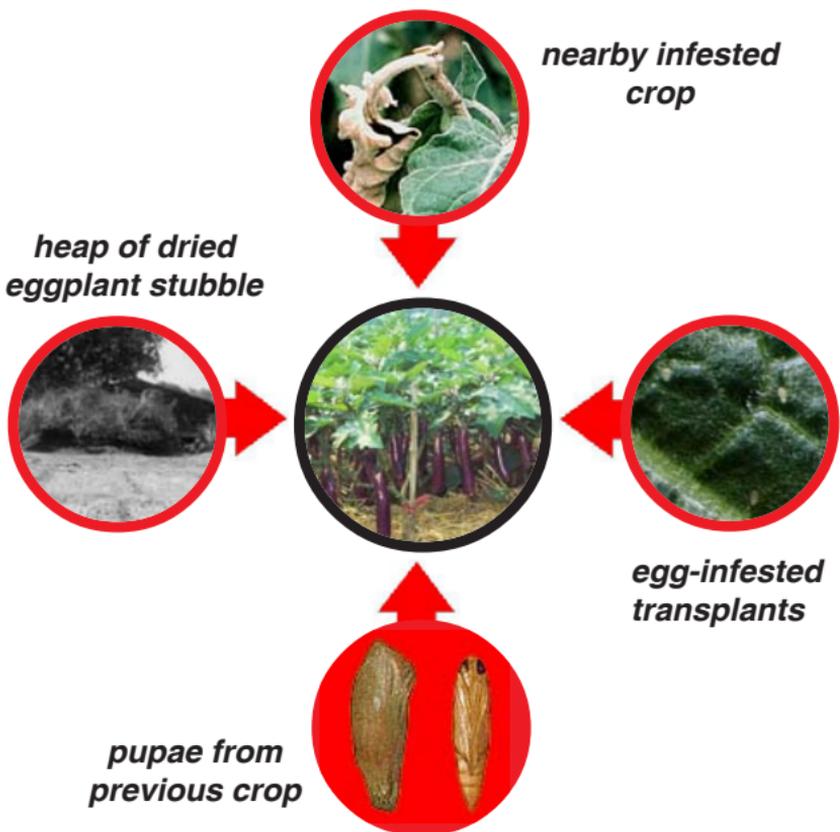


Fig. 3. Sources of EFSB infestation into a new crop

older seedlings that are raised near an EFSB-damaged older crop or heaps of dried eggplant stubble.

Third, if the previous crop grown in the field was also eggplant, the EFSB pupae from the previous crop resting within the soil will become adults and infest the new eggplant crop.

Fourth, if old, uprooted eggplant plants are stored nearby, the pupae from underneath such plant debris can develop into adults and infest the eggplant crop.

When and how does EFSB cause damage?

Infestations usually begin when the eggplant plants start to flower. No control is needed before this time. The first visible symptoms of pest activity are freshly wilted shoot tips (Fig. 4a). Insecticides used before symptoms appear are wasteful and will kill predators, which are important natural enemies of EFSB.

In crops that have not yet set fruit, all larvae go to the tender shoots and feed inside these plant parts. Later when plants start bearing fruits, most



Fig. 4a,b. Feeding of larvae inside shoot and fruit

larvae prefer to feed on the tender fruits (Fig. 4b). Larvae also feed on flowers, thereby reducing fruit set and yields.

When a larva becomes mature, it tunnels out of the fruit at night and descends to the soil for pupation. Exit holes are clearly visible in fruits (Fig. 5a), but may not be obvious in shoots because of the hairiness of shoots (Fig. 5b). Once insect infestation begins, it can continue until the final harvest.



Fig. 5a,b. Exit holes of EFSB larvae in damaged fruit and shoot

How do farmers control EFSB now?

Most farmers spray their eggplant crop with chemical insecticides to protect it from damage caused by EFSB and other insect pests (Fig. 6). Farmers use these chemicals indiscriminately, often using wrong chemicals and at wrong dosages. Many farmers spray their crop two or more times a week.

Such pesticide use is expensive and damaging to human health and the environment. Indiscriminate pesticide use allows the borer to become tolerant to these chemicals. As a result, it makes it impossible to control this pest again economically with the same chemicals.



Fig. 6. Farmer spraying his eggplant crop

What's the best way to control EFSB ?

Since EFSB moths lay eggs on and its larvae feed almost exclusively on eggplant, denying access of moths to the eggplant crop will easily confuse and kill the moth and stop EFSB epidemics. This can be achieved by thorough destruction of crop debris before planting, removal of infested shoots and fruits during production, using pheromone lures to trap male moths, and reducing the use of insecticides in order to permit the natural enemies of EFSB to proliferate.

1 *Destroy eggplant stubble*

Many farmers store dried eggplant stubble from the previous season's crop for use as fuel for cooking. Such stubble is heaped around the field or nearby dwellings (Fig. 7). EFSB pupae can survive in this stubble for several weeks. Then when the new eggplant crop is planted, the moths from these pupae fly and lay eggs on the crop, starting a pest epidemic. This stubble should be destroyed, either burned or buried, after harvest.



Fig. 7. Eggplant stubble near eggplant seedlings

2 Use healthy, pest-free seedlings

Most farmers grow eggplant seedlings in the open field, often near abandoned eggplant crops or heaps of dried eggplant stubble from the previous season. Adults from these old plants fly and lay eggs on seedlings. These eggs are very hard to see. The use of such contaminated seedlings spreads the pest into the production fields.

To avoid this, eggplant seedlings should be raised away from sources of infestation (please review Fig. 3). Also, growing seedlings under nylon netting prevents EFSB moths from laying eggs on the plants (Fig. 8).



Fig. 8. Eggplant seedlings grown under netting

3 *Remove and destroy infested shoots*

Before plants start fruiting, EFSB larvae feed inside tender shoots. These damaged shoots are readily visible as dried tips of branches (Fig. 9a). Cut and destroy these larvae-infested shoots immediately to prevent the larvae from developing and reproducing (Fig. 9b). The cutting and destruction of damaged shoots before fruiting will reduce the pest population drastically—especially if all farmers in a community do it—and this will significantly reduce pest populations and damage to eggplant fruit.



Fig. 9a,b. Larvae-infested, freshly wilted shoots should be identified, removed and destroyed

Do not drop the cut shoots in the field. They must be destroyed, preferably by burning. Bury them at least 20 cm deep in soil, or shred them into tiny pieces so that larvae are killed or deprived of food. Unless destroyed, the larvae in the shoots can pupate in the soil, become moths, and infest new plants.

These pruning activities are especially important in the early season. Once fruiting begins, most larvae will prefer to enter in fruits rather than shoots. Unlike damaged shoots, newly infested fruits are difficult to detect and the insect popula-

tion can multiply and spread the infestation before one sees the damaged fruits at harvest.

Continue cutting shoots at least once a week until the final harvest. This cutting will not harm the plant. Any infested fruits found during harvest should also be culled and destroyed immediately.

After the final harvest, the old plants should be uprooted and destroyed promptly because they may harbor EFSB larvae, which could become a source of future pest infestation.

4 *Use pheromone lures to trap male moths*

Sex pheromone is a natural chemical produced by female moths to attract males of the same species to mate. The pheromone of EFSB is now commercially available in India and Bangladesh. It consists of a mixture of (E)-11-hexadecenyl acetate and (E)-11-hexadecen-1-ol, in a mixture of 100:1. A 2–3 mg pheromone sample coated on a rubber septum, then baited in a suitable trap and placed in the field, can attract male moths continuously for up to 6 weeks.

Various traps are available in the market or can be prepared locally. Delta, winged, and plastic funnel traps (Fig. 10) are most suitable for trapping EFSB males. The pheromone lure is attached underneath the top of the trap, one lure per trap, which protects the lure from sun and rain.

In the case of delta and winged traps (Fig. 10a, b), the bottom surface is coated with a sticky material in which the male moths attracted to the lure are trapped and killed (Fig. 11). For the delta trap, opening a 2-cm-wide slit on either side will catch more moths. Delta and winged traps can be used in the field for 3–4 weeks depending

upon the weather. Traps can be damaged during rains or heavy winds and need to be replaced. Also during dry weather and strong winds, the sticky bottom surface can get soiled, which reduces stickiness and efficiency of insect catch.

A plastic funnel trap, developed for trapping tomato fruitworm or cotton bollworm (*Helicoverpa armigera*) will also trap EFSB moths (Fig. 10c). This trap is commercially available in some countries. It is made from a sturdy and inexpensive plastic material and does not have sticky surfaces. The lure is attached underneath the top cover just above the mouth of the funnel. The adults attracted to the pheromone lure slip through the smooth surface of the funnel into a long plastic bag, which is tied to the lower end of the funnel. This trap can last throughout the season and can even be used in subsequent seasons.



Fig. 10a,b,c. Delta, winged, and plastic funnel traps



Fig. 11. Male moths caught in a winged trap

Pheromone chemicals seep slowly and uniformly from this lure. Traps should be erected in the field starting 3–4 weeks after transplanting until the last harvest. A distance of 10–15 m should be maintained between traps in the field. The traps are hung in such a way that the lure is just above the plant canopy. This will require that the traps be moved higher as plants grow taller.

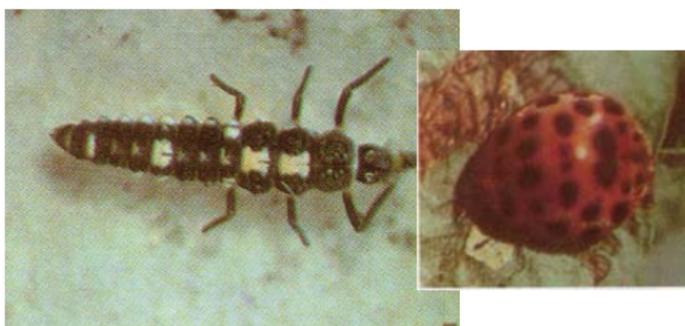
5 *Protect EFSB enemies by reduced spraying*

The indiscriminate use of toxic, broad-spectrum insecticides is not giving satisfactory control of EFSB. This is because within hours of hatching from eggs, EFSB larvae enter fruit or shoot. Once inside these plant parts, insecticides cannot reach larvae and kill them. Also, because of the frequent use of insecticides, EFSB has become tolerant and cannot be killed easily with these chemicals. At the same time, these pesticides are killing farmer-friendly pest predators such as spiders, mantids, earwigs, ladybird beetles, wasps, ants and others that are naturally found in the field (Fig. 12). These predators feed on pests and reduce damage to the eggplant crop. In fact, a long time ago these predators were giving adequate control of EFSB before farmers started using pesticides. Now, however, chances are that the more a farmer uses pesticides, the more he creates EFSB and other pest problems.

For this reason, the use of pesticides, especially the broad-spectrum ones, has to come down if we are to control EFSB successfully and produce safer eggplant fruit. If selective, preferably biological insecticides, such as Neem are used, parasitoids will survive and be able to help kill EFSB larvae. Natural enemies of pests are important assets of vegetable farmers and should be protected by reducing or, if feasible, eliminating broad-spectrum chemical pesticide use.

If one must apply insecticides to combat EFSB or other pests, it is important that only the locally recommended and still effective insecticides, preferably biological products, be used.

It is very important that all five steps listed above are adhered to, which will assure sustainable control of EFSB season after season.



Ladybird beetle larva and adult



Mantid



Predatory bug

Earwig



Spider

Trathala flavo-orbitalis

Fig. 12. Natural enemies of EFSB

More information

For more information on how to control EFSB, contact Dr. N.S. Talekar, Entomologist, AVRDC. E-mail: talekar@avrdc.org.

Related publications are listed below. Numerous other publications are available at the AVRDC web site. Go to www.avrdc.org

- Development of an Integrated Pest Management Strategy for Eggplant Fruit and Shoot Borer in South Asia
- A Farmer's Guide to Harmful and Helpful Insects in Eggplant Fields
- How to Use Sex Pheromone of Eggplant Fruit and Shoot Borer
- Socio-economic Parameters of Eggplant Pest Control in Jessore District of Bangladesh

Acknowledgement

DFID Department for
International Development

The production of this publication was funded by the UK Department for International Development (DFID). However, the views expressed are not necessarily those of DFID.



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2003

