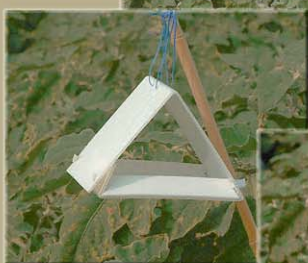


# How to Use Sex Pheromone for Controlling Eggplant Fruit and Shoot Borer



**AVRDC**

The World Vegetable Center



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# How to Use Sex Pheromone for Controlling Eggplant Fruit and Shoot Borer

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# Introduction

Sex pheromones are biological chemicals produced by female insects to attract males of the same species for mating. Mating results in more pests, which leads to more damage to crops.

The sex pheromone of an insect usually consists of a mixture of two to four chemicals. The chemicals and their proportions in the mixture are very specific to species. Thus, a pheromone produced by a female of one insect species will attract males of that species only. Scientists have identified and even synthesized the pheromones of most moths and beetles that feed on crops. Pheromones of many of these pests are commercialized and used by farmers in most countries.

One of the biggest advantages of using sex pheromones is that they are naturally occurring chemicals and are completely safe to humans and the environment. The chemicals evaporate and break-down in the environment quickly. The synthetic chemicals are rather expensive, but since they are needed in such tiny quantities, the use of these chemicals is economical.

Sex pheromone of eggplant fruit and shoot borer (EFSB), *Leucinodes orbonalis* (Guenée), has been identified. It consists of two compounds, (*E*)-11-hexadecenyl acetate and (*E*)-11-hexadecen-1-ol. A 100:1 blend of the first and second chemical attracts maximum number of EFSB male moths. This blend is now commercialized in India and Bangladesh.

In several field trials, the use of pheromone-baited traps has effectively controlled EFSB and minimized the need for toxic pesticides. The use of these traps was found to be more cost effective than the use of pesticides. This brochure is designed to illustrate how to use pheromone-baited traps for controlling EFSB in farmers' fields.

## Using sex pheromone

The use of sex pheromone for controlling EFSSB requires three items: a sex pheromone chemical, a trap, and a support to hang the trap in the field. Technically sex pheromones can be used in three principal ways:

**Monitoring:** The presence of an EFSSB moth emerging from within the same field or migrating from elsewhere into the newly planted field can be detected by installing a few pheromone-baited traps in the field. These traps will attract marauding male moths. Once the occurrence of the pest is detected, a farmer can begin taking suitable control measures.

**Mass trapping:** Sex pheromone-baited traps can capture male moths continuously, thus preventing mating and multiplication of the pest. For EFSSB, this approach has proven to be particularly efficient and economical.

**Mating disruption:** Sex pheromone can be used for disruption of mating, which is achieved by placing high concentrations of pheromone, usually without traps, at regular intervals throughout the field. The high concentration of pheromone saturates the area resulting in males failing to find females, which produce very minute quantities of these chemicals, thus preventing mating and multiplication of the pest.

Sex pheromone chemicals have to be purchased in the market. These chemicals are dispensed on a suitable carrier such as a rubber or plastic septa, inside a thin plastic tube or inside a plastic vial. Such formulation is usually called “sex pheromone lure” or simply “lure”. The lure is placed in a suitable trap, which in turn, is hanged in the field.

## Types of traps

Various types of traps are available commercially, while others can be made by farmers inexpensively at home. A pheromone-baited lure inside the trap will bring male moths inside the trap. Proper trap design is critical to kill the pest once it enters the trap. The type of trap to be used depends on the behavior of the male moth. Research studies show the traps most effective in controlling EFSB adults are delta traps, winged traps, and funnel traps.

### *Delta traps*

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A delta trap consists of a triangular or delta-shaped cardboard tube. The lure is hung in the top angled portion and the bottom surface is coated with glue. Male EFSB moths attracted to the lure enter inside the delta tube and while flying around the lure touch the lower sticky surface and become trapped in the glue from which they cannot escape.



In some cases, a 4-cm-wide slit is cut out along the lengths of the two sides. The slits provide additional openings for pheromone to seep out and moths to fly inside the trap and get caught. Such trap is called an “open-delta” trap. Relatively more EFSB moths are trapped in open delta compared to delta traps. Delta/open delta traps are available commercially in most countries and can be assembled at home using locally available materials.

## ***Winged traps***

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A winged trap consists of two wing-shaped boards hooked together by a wire. The lure is hanged underneath the top board. The bottom is covered with a sticky glue. The moth attracted to the lure flies inside the trap around the lure until it accidentally touches the lower surface where it is trapped in the glue from which it cannot escape. Winged traps are available commercially in some countries and are difficult to construct using homemade materials.



## ***Funnel traps***

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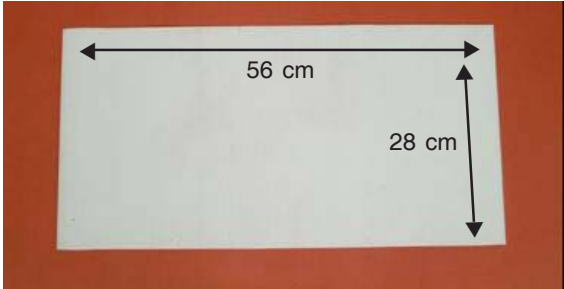
A funnel trap consists of a cover, a funnel with handle, an 'O' ring to fasten a plastic bag on the perimeter of the funnel, and a long plastic bag. The pheromone lure is attached to the underside of the cover and the open end of a long plastic bag is wrapped around outer edges of the funnel. The two parts are attached together by two or three pegs molded on the funnel. The male EFSB moth attracted to the lure flies around the lure, touches the smooth inner part of the funnel and slips down inside the plastic bag from which it cannot escape. Funnel traps are commercially available, especially in South Asia, and cannot be constructed readily using homemade materials.



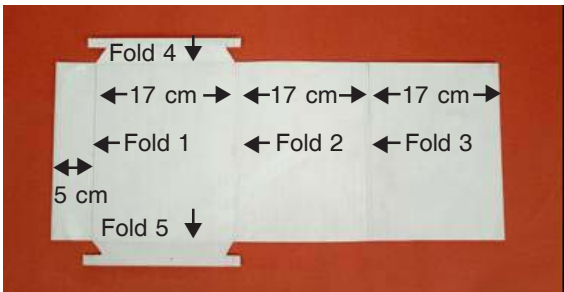


# Assembling traps

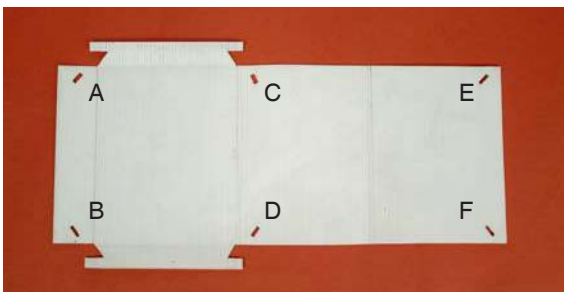
## Assembling Delta Traps



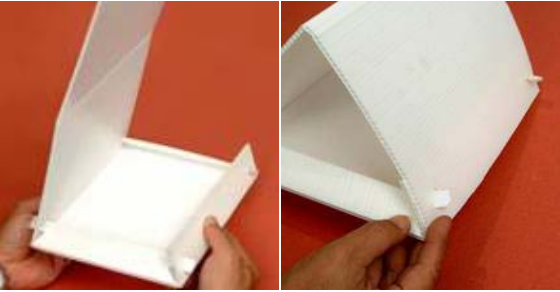
1. Start with a 56-cm-long and 28-cm-wide sturdy paper or cardboard sheet.



2. Cut the cardboard sheet and make five folds.



3. Cut slits of 15 mm  $\times$  3–4 mm each in the cardboard at the six points shown, designated as A, B, C, D, E, and F. The width of the slits will depend on the thickness of the cardboard—the thicker the cardboard, the wider the slits.



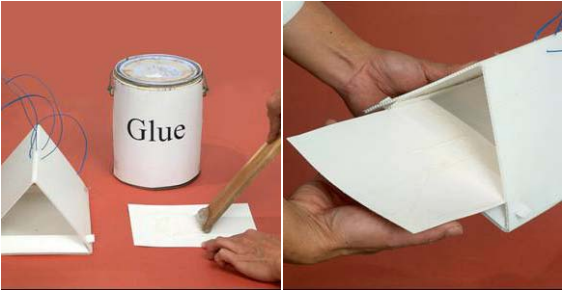
4. Bend cardboard at Fold 1 and Fold 2 along both sides of the bottom. Bend flaps on either side of bottom inwards (Fold 4 + Fold 5) and insert the cutouts into slits A, B, C, D (left photo). Bend the cardboard at Fold 3 and insert the cutouts, which are already in slits A and B into slits E and F (right).



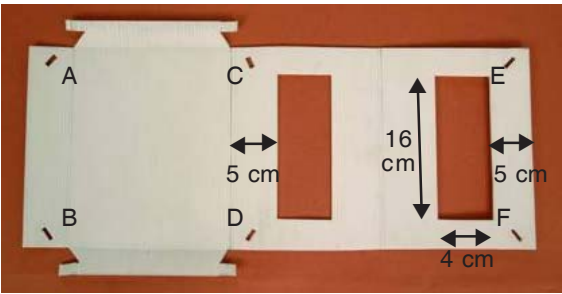
5. Use a needle to make one hole in the center of the top. This is meant to hang the lure inside the trap. then make two holes, 4 cm apart, in the top center by piercing a sharp needle through both flaps as shown.



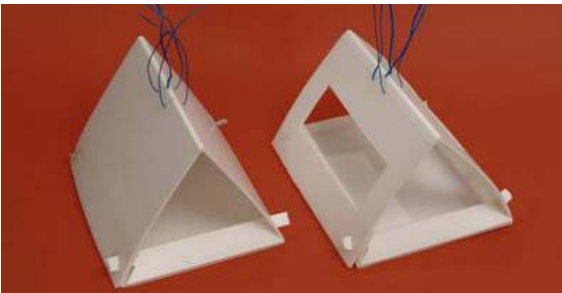
6. Hang the lure inside through the central hole in the top (left) and insert two strings through two holes as shown (right).



7. Paste industrial strength glue uniformly on one side of a 21 cm × 15 cm paper (left) and insert the paper, with glued surface up, inside the trap making sure it fits on the bottom tightly.



8. To prepare an open delta trap, at step 4, after cutting six small slits in the board, cut out two additional 16-cm-long 4-cm-wide portions in the center of the two upright sides.



9. Fully assembled delta trap (left) and open delta trap (right).

## ***Assembling Winged Traps***



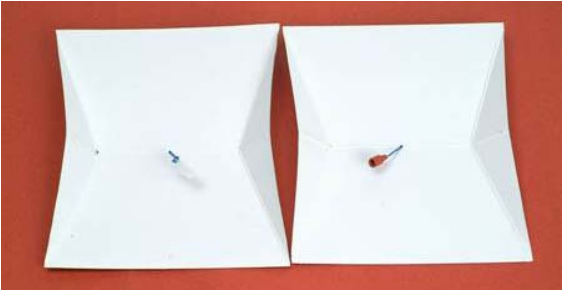
1. A winged trap consists of (shown left to right): bottom and top, both sold as folded equal size hard papers; two 4-mm-diameter 4-cm-long hollow straw tubes; and a 3-mm-diameter iron wire molded in the shape shown here.



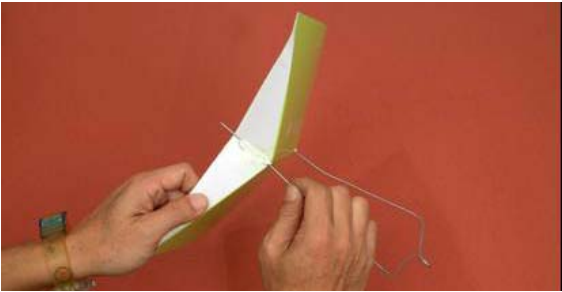
2. Open the folded bottom forcefully which will expose the inner sticky surface. Stretch the bottom completely to spread the glue over most of the inner surface (left). Open the top which has plain inner surface (right).



3. Depending on type of lure, hook a wire through the loop of the plastic vial lure or pierce it through the narrow end of the rubber septum lure.



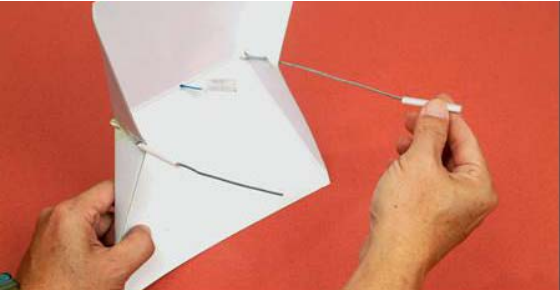
4. With the help of a needle, make a hole in the center of the top (left) and attach the lure to the inner side of the top (right). Make sure the lure remains firmly attached.



5. Iron wire is first pierced through the ready-made holes in the center of both outer sides of the top, as shown.



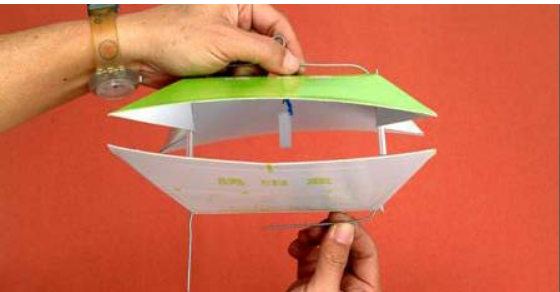
6. Both arms of iron wire are pierced completely, and the top is readied for assembling.



8. Insert one hollow straw tube through the wire on either arm of the wire and push the tubes as close to the top as possible.



9. Holding the top in one hand, push the open ends of the wire through the ready-made holes in the center of the outer sides of the bottom, making sure the glued surface is facing the top.

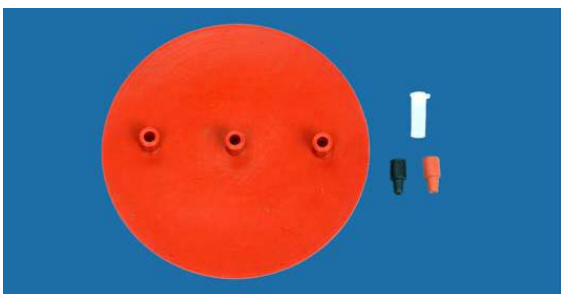


10. Both open ends of the wire pierced through the bottom are folded inwards to hold the bottom and top firmly together. The winged trap is ready for use in the field.

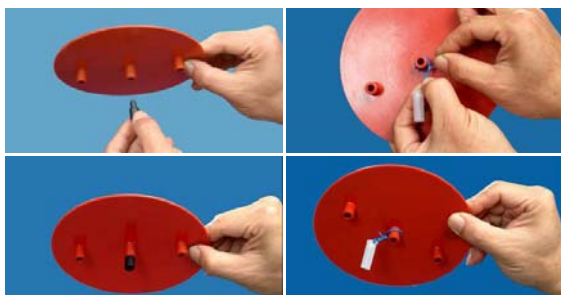
## Assembling Funnel Traps



1. A funnel trap consists of a top, funnel with handle, 'O' ring to fasten a plastic bag on the perimeter of the funnel, and long plastic bag.



2. The underside of the cover has round sockets. The central socket is used for attaching the lures (right). Outer sockets, two in this model, attach to the pegs of the funnel.



3. The lures, either rubber septa (left) or plastic vials (right), are attached in the central hole. The narrow end of a rubber septum fits tightly in the socket, but a plastic vial should be fastened using a thin wire or strong thread.



4. The plastic bag is then wrapped around outer edges of the funnel (left) and fastened tight by inserting an 'O' ring over the plastic bag until it reaches the upper edge of the funnel (right).



5. The top with either type of lure attached is then fastened over the funnel by inserting the outer sockets into the pegs on the periphery of the funnel and the trap at this stage is ready for use in the field.



6. This funnel trap is completely assembled and ready to go out to the field.



# Installation and care of traps

## ***When to install traps***

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EFSB infestation starts when the eggplant crop begins to flower. Pheromone-baited traps should be erected at this stage and kept there through the rest of the season. The first EFSB moths enter from other eggplant fields or from dried eggplant plants stored nearby. Starting about a month after flowering, most of the adults found in the field originate within the same field. Traps must be maintained until the last harvest to kill these insects.

## ***How to install traps***

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The trap should be installed in a grid of 10 m throughout the field starting 5 m from the border. This amounts to 10 traps per 0.1 hectare. Implant a sturdy stick firmly in the soil to support the trap. Then use a wire or sturdy thread to tie the trap to the stick. The lure inside the trap should always be 10–15 cm above the crop canopy. This requires moving the trap higher as plants grow taller.

## ***Replacing traps and lures***

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For delta and winged traps, their sticky surfaces get soiled due to dust and moth scales. If the surface is not sticky enough, additional moths will not be trapped. Check traps regularly and replace their sticky bottoms when needed. Intense sun, wind and rain can destroy entire traps. If this occurs, replace traps promptly. Funnel traps are more durable in the field but their plastic bags can be torn. Replace damaged bags to prevent trapped moths from escaping. Most commercial lures contains 2 mg of pheromone chemical. Such lures usually remain effective for one month; therefore, replace lures at least once a month.

## More information

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

Related publications are listed below. Numerous other publications are available at the AVRDC web site. Go to [www.avrdc.org](http://www.avrdc.org).

- How to Control Eggplant Fruit and Shoot Borer
- 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

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