Spodoptera exigua, Beet Armyworm

Recommendations for Sustainable Resistance Management

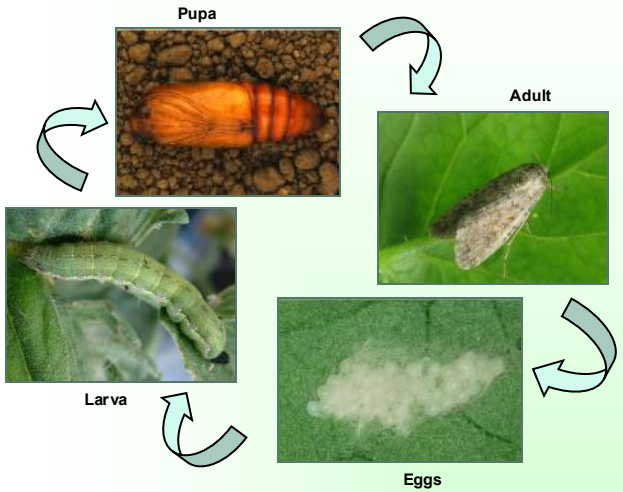
Insecticide Resistance Action Committee

www.irac-online.org

Introduction and Biological Background

Beet armyworm *Spodoptera exigua* (Hübner) (Lepidoptera: Noctuidae) is a highly dispersive, polyphagous species that can be a serious pest of vegetables, ornamentals and row crops. Host plants include asparagus, alfalfa, brassicas, celery, cotton, eggplant, lettuce, maize, pepper, rice, strawberry, sugar beet, tomato.

Life cycle:



Beet armyworm is native to southeast Asia but is now found in all continents, except Antarctica.

It lacks a diapause mechanism and can only overwinter successfully in warm regions or in greenhouses. Nevertheless, because of its dispersal abilities, beet armyworm will regularly invade temperate areas and cause damage during the growing season.

The larvae are gregarious and may feed in large swarms, causing devastating crop losses. As they mature, the larvae become solitary. Damage includes consumption of fruit and leaf tissue and contamination of the crop. One generation can be produced in as little as 21-24 days.

***S. exigua* damage to cabbage and tomato**

Damage and Symptoms

- Egg clusters: Small white egg masses can be found on the underside of leaves.
- Younger larvae skeletonize leaves, leaving veins intact. And older larvae: Consume entire leaves, creating irregular holes.
- Defoliation: Severe infestations strip foliage, stunting growth.
- Boreholes: Larvae burrow into fruits, flowers, and pods, causing yield loss.
- Wilting: Continuous feeding weakens plants, reducing photosynthesis and yield.
- Frass: Green to black pellet-like excrement near the feeding areas.

Integrated Pest Management

Integrated Pest Management (IPM) for *Spodoptera exigua* combines cultural, biological, and chemical strategies to effectively reduce pest populations while minimizing environmental impact. Key practices include:

- Avoid planting host crops like leafy greens, cotton, and tomatoes in consecutive seasons.
- Remove plant debris and weeds that serve as alternative hosts.
- Implement a pest monitoring routine using traps and inspections (visual or digital tools).
- Choose crop varieties that are less susceptible to beet armyworm and consider crop rotation.
- Safeguard predators and parasitoids or release natural enemies.
- Integrate entomopathogens (bioinsecticides) into the spray program.
- Apply insecticides only when necessary, based on pest pressure and thresholds.

Insecticide Resistance Management (IRM)

Resistance occurs because of repeated exposure of multiple pest generations to insecticide(s) with the same mode of action. Integrated resistance management strategies take advantage of all available pest management options to decrease insecticide selection pressure on insect populations. A combination of all available tools for *S. exigua* management should be used to prevent the development of insecticide resistance:

Chemical control

- Always follow the directions for use on the label of each product.
- Consult product label or IRAC's website (www.irac-online.org) to determine the mode of action of each product.

Mechanisms of Resistance

Several biochemical mechanisms may contribute to the evolution of insecticide resistance in beet armyworm. These mechanisms may act separately or in concert.

- Enhanced metabolic detoxification (or sequestration) by the overexpression or duplication of genes encoding for detoxification enzymes such as cytochrome P450-monooxygenases, carboxylesterases, glutathione S-transferases und UDP-glycosyltransferases.
- Target site insensitivity.
- Reduced penetration as a contributing factor.

IRM Recommendations

- Don't treat successive generations with products of the same mode of action.
- Use an approximately 30 day window to conduct sprays of insecticides of the same mode of action.
- Only reuse a mode of action if 30 days have passed since the previous treatment window.
- Do not apply products of the same mode of action over more than 50% of the crop cycle.
- To avoid treating subsequent plantings of short cycle crops (<50 days) with products of the same mode of action, consider using the duration of the crop cycle as the treatment window.

Photographs courtesy : DuPont Crop Protection, Designed by IRAC Chewing Pest WG, June 2025, Poster Ver. 2.0