Strategies for Sustainable Control of Fall Armyworm, *Spodoptera frugiperda*

Insecticide Resistance Action Committee

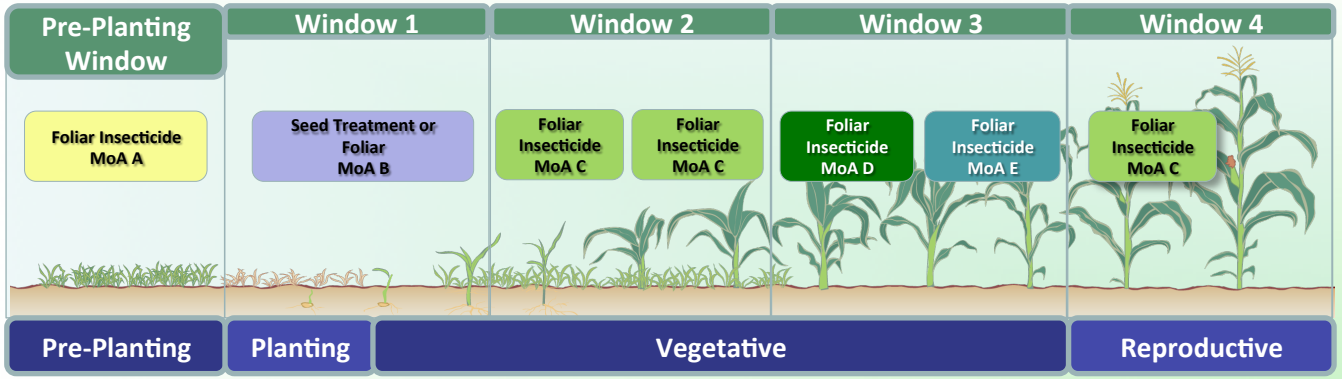
www.irac-online.org

FAW - Background

Fall armyworm (FAW), *Spodoptera frugiperda* (J.E.SMITH), (Lepidoptera: Noctuidae) is native to tropical and subtropical regions of the Western Hemisphere, and regularly migrates to cooler regions in summer. FAW has a very wide host range, with a preference for grasses. The most frequent crop hosts are field corn, sweet corn, rice, sorghum, sugar cane, and Bermudagrass. It is also a serious pest in soybean, cotton, peanut/groundnut, *Brassicaceae*, *Cucurbitaceae*, alfalfa/lucerne, onions, sweet potatoes, tomatoes and other *Solanaceae*, and various ornamental plants. Crop damage results mainly from larvae consuming leaf tissue, but larvae will also burrow into the growing point (bud, whorl, etc.), destroying potential future plant growth. Yield loss can reach 30-60%. The life cycle is highly temperature dependent and lasts about 30 days in summer to 90 days in winter, resulting in multiple generations per year. There is no diapause in this species. FAW has a high reproductive rate. Females can produce up to 2000 eggs, which are deposited on plant leaves in masses of 900-1000 eggs. The egg stage lasts 2-3 days in the summer months. The larval stage lasts 14-30 days and there are usually 6 instars. Pupation takes place in the soil and lasts 8-30 days. Adults are nocturnal and are most active during warm, humid evenings.

The occurrence of multiple generations, the ability to migrate, and the ability feed on a wide range of host plants makes fall armyworm one of the most severe economic pests in the Western Hemisphere.

FAW IRM example – Spray windows for conventional maize, Brazil



Known insecticide resistance in FAW

Resistance results from the repeated exposure of multiple pest generations to the same insecticide Mode of Action. Several biochemical mechanisms are known to contribute to the evolution of insecticide resistance in FAW. These mechanisms may act separately or in concert. Known resistance has occurred to the following MoA groups: Carbamates (Group 1A); Organophosphates (Group 1B); Pyrethroids (Group 3); *Bacillus thuringiensis* and Cry1F protein (Group 11A).

FAW Resistance Management

To prevent the development of insecticide resistance, use a combination of all available pest management and resistance management tools to decrease FAW exposure to insecticides.

- 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 (MoA) of each product.
- Do not treat successive generations with products of the same MoA.
- Follow the "treatment windows" approach (see example above)
- A "treatment window" is the period of residual activity provided by single or sequential applications of products with the same mode of action. This "treatment window" should not exceed approximately 30 days (generally used as the length of an insect pest generation) but can be less and should not exceed more than 2 applications of products from the same MoA.
- Following this treatment period rotate to an approximate 30 day "window" of effective insecticides with different modes of action if needed.
- Generally, the total exposure period of products representing a single MoA applied throughout the crop cycle (from seedling to harvest) should not exceed approximately 50% of the crop cycle or exceed 50% of the total number of insecticide applications targeted at the same pest species.
- Apply insecticides only when needed based on economic thresholds.

Photo Credits: FAW damage to maize (credit: Cesar Santos); Adult moth (credit: Winfield Sterling); Larva (credit: Winfield Sterling); Egg mass (credit: Leonel Aviles); Pupa (credit: Dave Davis)

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