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Fall Armyworm in Vegetable Crops

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Scientific Name: Lepidoptera: Noctuidae *Spodoptera frugiperda* (J.E. Smith)

Size: Caterpillars vary in length from 1/2 inch (2mm) as first instar larvae to 3/4 to 1 inch (35 to 50mm) as mature larvae (See Fig. 1). Adult moths have a wingspan of 1.2 to 1.6 inches (32 to 40mm).

Color: Larvae vary in color from light tan or green to dark brown (nearly black) [base color ranging from yellow-green to a dark brown to gray] with three yellowish-white lines down the sides and back from head to tail and four dark circular spots on the upper portion of each abdominal segment. Front of the head is marked with a prominent inverted white Y, but this characteristic is not always a reliable identifier. The forewing of adult male moths is generally shaded gray and brown, with triangular white spots at the tip and near the center of the wing. The forewings of females are less distinctly marked, ranging from a uniform grayish brown to a fine mottling of gray and brown. The hind wing is iridescent silver-white with a narrow dark border in both sexes.

Description: Larvae are hairless and smooth skinned (See Fig. 1).

Distribution: The fall armyworm is native to the tropical regions of the Western Hemisphere from the United States to Argentina. This species overwinters in the Gulf Coast states and Florida and continuously migrates north during the spring and early summer. Adult fall armyworms are strong fliers, and are able to disperse long distances annually during the summer months. They have been documented in virtually all of the states east of the Rocky Mountains. However, as a regular and serious pest of vegetable crops, its range tends to be mostly in the southeastern states.

Life Cycle: Seasonal fall-armyworm activities in non-overwintering areas begin with egg laying by moths migrating northward from out of their ranges in the southern United States and Mexico. The moths persistently continue to migrate and lay eggs throughout the summer. The female fall armyworm moth can produce approximately 1,000 eggs over her life span, and deposits them in clusters containing up to 400 eggs each (Fig. 2). Fall armyworm generations can occur every 23 to

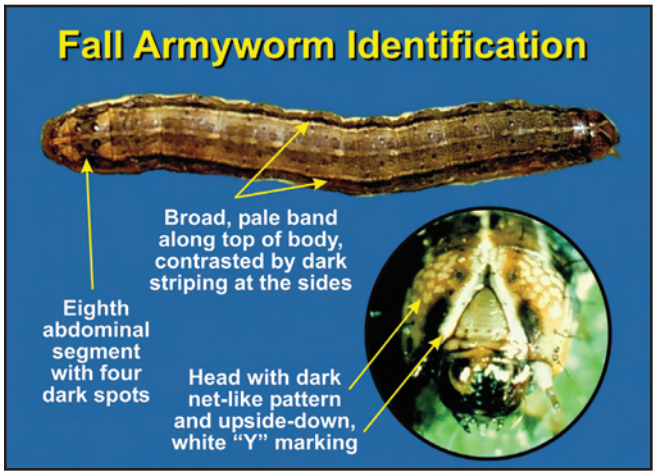

Fig. 1. Picture identification chart of the fall armyworm.
(Photo courtesy of University of Nebraska Department of Entomology)

Fig. 1b. Early instar fall armyworm.
(Photo courtesy of Marlin E. Rice, Iowa State University Department of Entomology)

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Fig. 2. Fall armyworm egg mass.
(Photo courtesy of Jim Kalisch, North Carolina State University Cooperative Extension)

25 days. First instar larvae are able to produce a silken thread, which allows them to drop or be blown (called ballooning) to other areas. In Virginia, fall armyworms are most active in the late summer/fall (See Fig. 3), beginning in early July. Caterpillars can cause severe damage and will eventually move into adjoining fields. Fall armyworms feed more in the daylight hours than other armyworms and feeding by large populations of fall armyworms can rapidly lead to severe damage.

Hosts: Fall armyworms feed on a wider range of plants than do true armyworms, *Pseudaletia unipuncta* (Haworth) (Lepidoptera: Noctuidae). The fall armyworm is a major pest of sweet corn, tomatoes, and peppers in Virginia and other southeastern states. However, fall armyworms have a wide host range with over 80 plants recorded, but clearly prefer grasses. The field crops frequently injured include alfalfa, barley, Bermudagrass, buckwheat, cotton, clover, corn, oats, millet, peanuts, rice, ryegrass, sorghum, sugarbeets, sudangrass, soybeans, sugarcane, timothy, tobacco, and wheat. Among vegetable crops, only sweet corn is regularly damaged. Other vegetable crops attacked include cole and crucifer crops. Weeds known to serve as hosts include bentgrass, *Agrostis* spp.; crabgrass, *Digitaria* spp.; Johnsongrass, *Sorghum halepense*; morningglory, *Ipomoea* spp.; nutsedge, *Cyperus* spp.; pigweed,

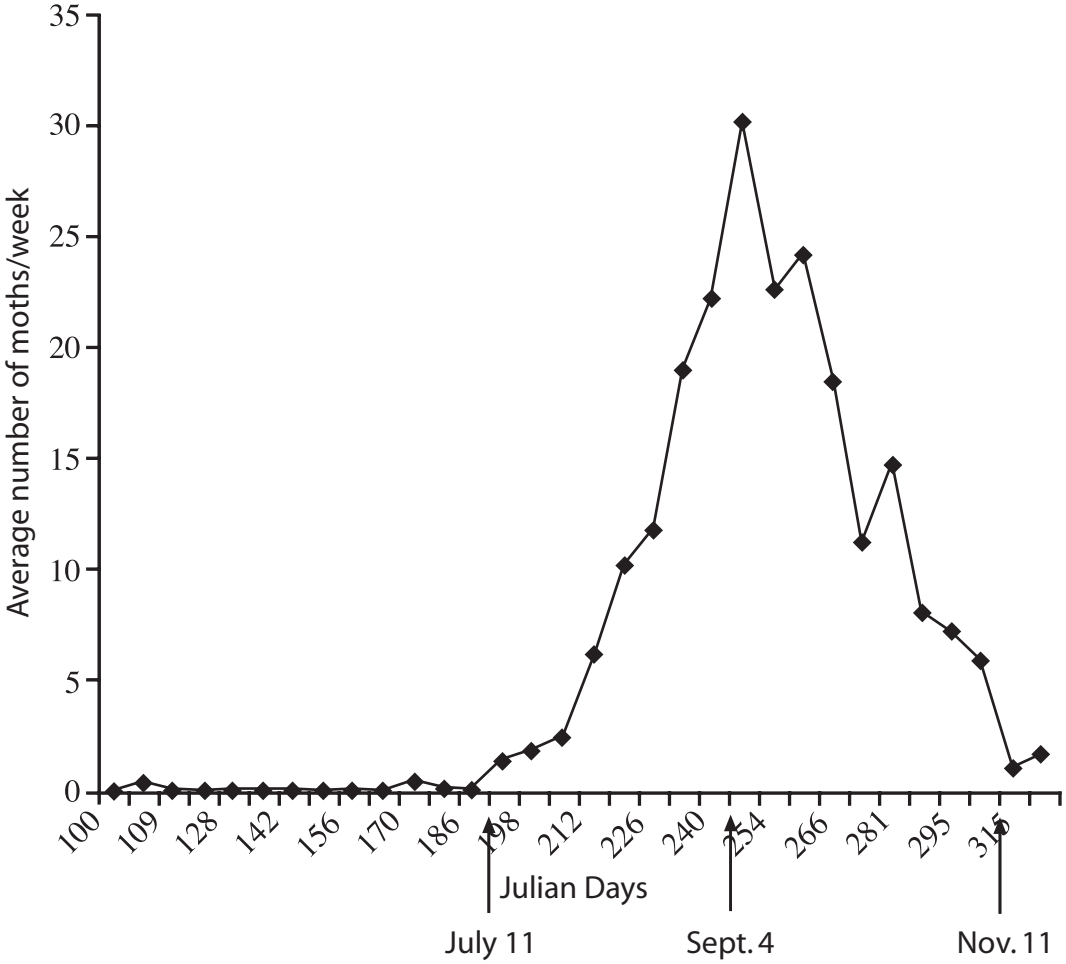

Fig. 3. Typical fall armyworm moth flights in Virginia showing the late summer/fall populations.

Amaranthus spp.; and sandspur, *Cenchrus tribuloides*. There is some evidence that fall armyworm strains exist based primarily on their host plant preference. One strain feeds principally on corn, but also on sorghum, cotton, and a few other hosts if they are found growing near the primary hosts. The other strain feeds principally on rice, Bermudagrass, and Johnsongrass.

Worm Injury to Crops: Fall armyworm larvae primarily cause damage by consuming foliage. In pepper and tomato, the fall armyworm can cause serious damage to the fruit, resulting in premature drop and fruit rot. The young larvae first feed near the ground where the damage goes unnoticed. They initially consume leaf tissue from one side, leaving the opposite epidermal layer intact. By the second or third instar, larvae begin to make holes in leaves, and eat from the edge of the leaves inward. Larval densities are usually reduced to one to two per plant due to cannibalistic behavior. Older larvae cause extensive defoliation, often leaving the plant with a ragged, torn appearance. Outbreaks typically happen in the fall, and are worse when rains are frequent and temperatures are cooler. When larvae are very abundant, they can defoliate entire plants. The larvae disperse in large numbers, consuming nearly all vegetation in their path, thus the "armyworm" name.

Control of Fall Armyworm in Vegetable Crops

Sampling: Moth populations can be sampled with black-light and pheromone traps. Pheromone traps are more efficient and sensitive to regional changes. Pheromone traps will only trap male moths and should be suspended at canopy height in the crop. Catches are not necessarily good indicators of density, but indicate the presence of moths in an area. Pheromone trap catches of 10 to 20 per night (70 to 100 per week) signal the need to begin insecticide applications to protect fruit. Once moths are detected, it is advisable to search for eggs and larvae. A search of 20 plants in five locations or ten plants in ten locations is generally considered to be adequate to assess the proportion of plants infested. Sampling to determine larval density often requires large sample sizes, especially when larval densities are low or larvae are young, so it is not often used.

Biological Control: Numerous species of parasitoids affect fall armyworm. The most frequent wasp parasitoids reared from larvae in the United States are *Cotesia marginiventris* (Cresson) and *Chelonus texanus* (Cresson) (both Hymenoptera: Braconidae) species that are also associated with other noctuid species. Among fly parasitoids, usually the most common species is *Archytas marmoratus* (Townsend) (Diptera: Tachinidae). However, the dominant parasitoid often varies from place to place and from year to year.

Chemical Control: In the southeastern United States, insecticides are used to protect crops against fall armyworm damage. Some crops, like sweet corn, require as many as four applications per week during the silking and ear stages. Some resistance to insecticides has been noted, with resistance levels varying regionally. Treatments using insecticides should be made when insect populations and/or damage levels reach economic thresholds. Refer to the *Pest Management Guide Field Crops* and the *Pest Management Guide Horticultural and Forest Crops*, Virginia Cooperative Extension publications 456-018 and 456-017 at *http://www.ext.vt.edu/pubs/pmg/index.html*, for specific thresholds.

Additional reading

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