IDENTIFICATION OF FALL ARMYWORM DAMAGE TO COTTON

Jarrod T. Hardke
LSU AgCenter
Baton Rouge, LA
B. Rogers Leonard
LSU AgCenter
Macon Ridge Station
Winnsboro, LA

Abstract

For many common insect pests of cotton, little information has been produced during the previous decade on identification and characterization of crop injury. This is especially true for the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), as it relates to its occurrence in cotton fields and its damage to plant structures. The purpose of this report is to provide keys for identification and to describe this pest's behavior in a manner that is useful to cotton pest managers and producers.

Introduction

The fall armyworm is a migratory insect and a sporadic pest of cotton. Fall armyworm was the fifth most damaging cotton pest in Louisiana in 2006 (seventh in the U.S.), infesting 280,000 acres (Williams 2007a, Williams 2007b). This species lacks a diapauses mechanism, preventing it from overwintering in cotton-producing regions of the U.S. As a result, the adult stage of this insect migrates across the U.S. each year from warmer climates in overwintering areas such as southern Florida, the Caribbean islands, southern Texas, Mexico, and coastal areas of southern Georgia, Alabama, Mississippi, and Louisiana (Luginbill 1928, Sparks 1979, Knipling 1980, Ashley et al. 1989, Adamczyk 1998). Fall armyworm populations distribute from these source areas each spring in a northwesterly direction at a rate up to 300 miles per generation, extending in geographical range from the Rocky Mountains to Canada (Pair et al. 1986, Ashley et al. 1989). Fall armyworm movement each year generally creates sporadic problems across multiple crops.

Species Description

Eggs

Fall armyworm eggs (Plate 1) typically occur in an aggregate or mass and are found on the underside leaf (abaxial) surface within the lower two-thirds of the cotton plant canopy (Luginbill 1928, Sparks 1979, Ali 1989). Number of eggs in a mass may be fewer than ten, but more often occur in numbers reaching several hundred. Egg masses are distinct in appearance, in that they are often found to be covered with a white down (Luginbill 1928, Sparks 1979). Eggs are typically greenish gray in color immediately after oviposition. Eggs darken with age, progressing from the initial greenish gray appearance to brown, and finally to nearly black just prior to larval eclosion (Luginbill 1928).

Larvae

First instars are typically off-white to yellow in color with black head capsules. Additional instars (Plate 2) appear similar in color after molting, but darken in color with age. Later instars (Plate 3) are dark in color, ranging from green to brown to nearly black, with head capsules varying from brown to black. Fall armyworm larvae possess a distinct inverted "Y" on the head capsule which becomes increasingly prominent with age. Additionally, on late instars, there are four prominent black spots in a square pattern on the dorsal surface of the last abdominal segments. Other potential identifying marks may include a non-continuous white line in the mid-dorsal area, and/or intermittent yellow and red flecks on the abdomen (Oliver and Chapin 1981, Robinson 1999).

Adults

Moths (Plate 4) have a 1 ½ inch wingspan. Forewing color varies from a mottled, dark gray at the top to a light gray or brown at the bottom. A distinct white "spot" can be found near the tip of the wing. Hind wings are generally light gray to white in color. Male adults may be confused with yellow-striped armyworm, while female adults can be confused with beet armyworm. In addition, fall armyworm moths have filiform (threadlike) antennae and are generally active at night (Oliver and Chapin 1981, Robinson 1999).

Characterizing Damage to Cotton Plants

Damage in cotton fields from fall armyworm outbreaks can be unpredictable, and include feeding injury to a range of plant structures during vegetative and reproductive stages of development (Plate 5). In cotton, neonates and early instars initially cause a symptom known as "window-paneing" by feeding only on the lower (abaxial) surface of the leaf. Larvae continue to develop and may eventually "skeletonize" the leaf on which the egg mass was oviposited. Late-second and early third instars migrate from the site of eclosion and may infest a variety of plant structures. These stages and later instars will directly injure reproductive structures such as squares (flower buds), blooms (flowers), and bolls (capsules). On vegetative stage plants or on plants in the absence of fruiting forms, late instars have the potential to destroy terminal buds and cause loss of apical dominance (Leigh et al. 1996). On reproductive stage plants with fruiting forms, later instars prefer to feed on bracts, large squares, blooms, and young bolls. Heavy infestations may damage all fruiting structures (Leigh et al. 1996, Cook et al. 2004). Late instars also have the ability to bore into and feed within fruiting structures. As larvae develop, it is more common to find injury on blooms and older bolls lower in the plant canopy. Conventional chemical control strategies are not consistently effective due to a high tolerance of late instars to commercial insecticide rates, and problems with deposition of effective doeses low in the plant canopy (Cook et al. 2004).

References

Adamczyk, Jr., J. J. 1998. Pest status of the fall armyworm, *Spodoptera frugiperda* (J. E. Smith), on conventional and transgenic cotton expressing the *Bacillus thuringiensis* Cry1A(c) ∂-endotoxin: development, survival, and host-strain influence. Dissertation: Dept. of Entomology, Louisiana State University and Agricultural and Mechanical College.

Ali, A. 1989. Distribution, development and survival of fall armyworm, *Spodoptera frugiperda* (J. E. Smith), immature on cotton. Dissertation: Dept. of Entomology, Mississippi State University.

Ashley, T. R., B. R. Wiseman, F. M. Davis, and K. L. Andrews. 1989. The fall armyworm: a bibliography. Florida Entomol. 72: 459-465.

Cook, D. R., B. R. Leonard, and J. Gore. 2004. Field and laboratory performance of novel insecticides against armyworms (Lepidoptera: Noctuidae). Florida Entomol. 87: 433-439.

Knipling, E. F. 1980. Regional management of the fall armyworm – a realistic approach? Florida Entomol. 63: 468-480.

Leigh, T. F., S. H. Roach, and T. F. Watson. 1996. Biology and ecology of important insect and mite pests of cotton, pp. 17-85. *In* E. G. King, J. R. Phillips, and R. J. Coleman (eds.) Cotton insects and mites: characterization and management. (No. 3) The Cotton Foundation Reference Book Series.

Luginbill, P. 1928. The fall armyworm. USDA Tech. Bull. No. 34.

Oliver, A. D. and J. B. Chapin. 1981. Biology and illustrated key for the identification of twenty species of economically important noctuid pests. Louisiana Agric. Expt. Stn. Bull. No. 733.

Pair, S. D., J. R. Raulston, A. N. Sparks, J. K. Westbrook, and G. K. Douce. 1986. Fall armyworm distribution and population dynamics in southeastern states. Florida Entomol. 69: 468-487.

Robinson, J. V. 1999. Biology of the fall armyworm. Accessed July 5, 2007 [On-line] http://overton2.tamu.edu/insects/fawbio.pdf

Sparks, A. N. 1979. A review of the biology of the fall armyworm. Florida Entomol. 62: 82-87.

Williams, M., 2007a. Cotton insect loss estimates – 2006, pp. 1027-1042. *In* Proc. 2007 Beltwide Cotton Conf., New Orleans, LA. January 9-12, 2007.

Williams, M. 2007b. Cotton insect loses – 2006, pp. 974-1026. *In* Proc. 2007 Beltwide Cotton Conf., New Orleans, LA. January 9-12, 2007.

Plate 1. Fall armyworm egg mass

Plate 2. Early instar fall armyworm

Plate 3. Late instar fall armyworm

Plate 4. Fall armyworm adult

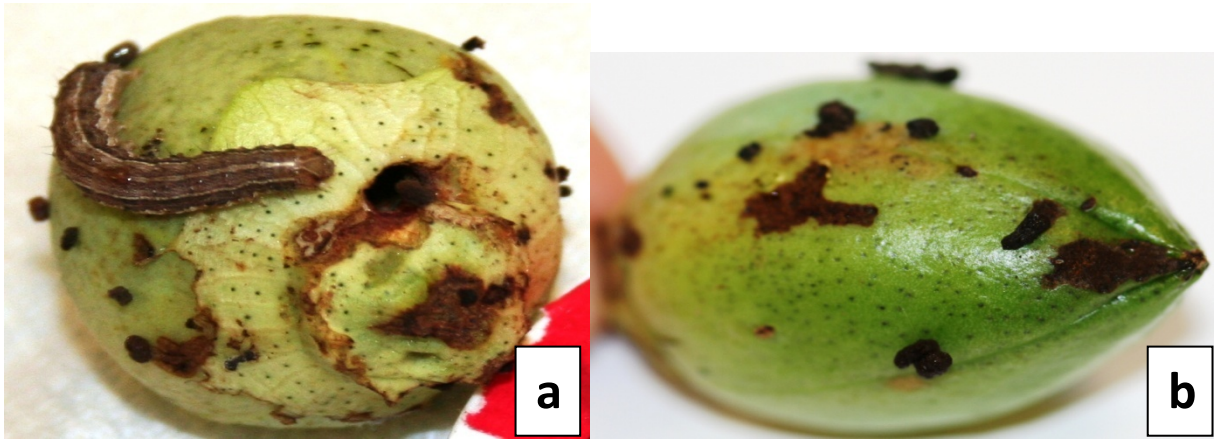

Plate 5. Damage – complete penetration (a) vs. etching (b)