WASHINGTON STATE UNIVERSITY EXTENSION

SPECKLED GREEN FRUITWORM

Insect Pest Management in Hybrid Poplars Series

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Speckled Green Fruitworm

Orthosia hibisci Guenée (Lepidoptera: Noctuidae: Noctuinae)

Introduction

We cannot definitely list *Orthosia hibisci* Guenée as an annual pest of hybrid poplar trees in Oregon and Washington. However, a major defoliation of older trees due to this pest in 2005 lead to an application of diflubenzuron (Del Pozo-Valdivia 2011) in May 2006 to target early instars. In 2008, we captured over 300,000 *O. hibisci* male moths with just one baited sex pheromone per 160 acres (65 hectares). After five years (2006–2011) of monitoring *O. hibisci* populations, we know that their numbers do increase within each planting as poplar trees age, and growers have a valid concern about their potential to defoliate trees. Our objective is to provide professional integrated pest management (IPM) managers with: a means to identify *O. hibisci*, a way of monitoring their numbers, and a means to control the population if necessary.

Taxonomy

Three Noctuinae species have been pests of poplar in eastern Oregon and eastern Washington. In addition to *O. hibisci*, *Spodoptera praefica* Grote, the yellowstriped armyworm, and *Noctua pronuba* L., the winter cutworm, have all been recorded as defoliating pests of poplar. In the poplar farm, the most common species in the green fruitworm complex (Chapman and Lienk 1974; Rings 1975) is *O. hibisci*. Two additional fruitworm species (*Amphipyra pyramidoides* Guenée, Amphipyrinae, and *Lithophane antennata* Walker, Cuculliinae) are present in the Pacific Northwest area (Howell 2011), but they have not been captured in poplar plantations. These three fruitworm species were introduced from Europe in the 1800s (Chapman and Lienk 1974).

Hosts

Speckled green fruitworm (SGFW) *O. hibisci* is commonly found attacking a large variety of trees and shrubs, including tree fruits and other woody plants within five plant families, especially Rosaceae and Salicaceae. This species mainly attacks apple, crabapple, pear, peach, apricot, plums, cherry, willow, birch, poplar, alder, and maple (Rings 1970; Chapman and Lienk 1974; Vincent and Simard 1986; Besin 2003; Steffan and Alston 2005; Howell 2011). The larvae of SGFW also feed on red stem osier, ninebark, *Ceanothus* spp., roses (Rosetta 2009), hawthorn, quince, almond, box-elder, oak, currant, aspen, and some conifers (Chapman and Lienk 1974; Natural Resources Canada 2015; Howell 2011). This characteristic of having a wide host range provides SGFW with the ability to survive outside of insecticide sprayed areas (Rings 1975), thus the population retains susceptibility to specific active ingredients.

Range

Orthosia hibisci is found throughout moist deciduous forests, riparian zones, and agricultural and urban woodlots in northern latitudes from 35°N to 45°N (Rings 1970). Although more common east of the Great Plains states, it occurs in California, Oregon, and Washington (http://www.butterfliesandmoths.org).

Life History

Orthosia hibisci populations are univoltine. Adults emerge in February and mate. The forewings are grayish pink, with two mid-wing purplish gray spots, outlined by a narrow pale border (Figure 1). Females lay eggs, followed by six larval instars, and finally overwinter as pupae.

Figure 1. Life cycle of the speckled green fruitworm (Del Pozo-Valdivia 2011).

Eggs are about 0.8 mm, almost spherical with a slightly flattened top, and are deposited singly or in pairs on leaves.

Larvae develop rapidly through six instars. Newly hatched larvae are 2–3 mm, and last instars can be 30–40 mm in length. Greatest potential for damage is late April and the first two weeks of May. There are two color morphs in eastern Oregon. Most common is the green larva, but some develop to an almost black color (Figure 2). The dark brown pupae are about 16 mm in length and overwinter in the top 2–4 inches of soil.

Figure 2. Two color morphs of *Orthosia hibisci* larvae (Photo by A. Del Pozo-Valdivia).

Damage

Because eggs are not laid in clusters, we seldom see major defoliation due to SGFW feeding, but the population can build up in poplar stands between harvests. Harvesting operations often kill the overwintering pupae in the ground, reducing the number of adults emerging for several years in new plantings.

Biological Control

Various parasitic flies (genera: *Wagneria, Tachinomyia, Wintermia, Campsilura,* and *Ernestia*) and wasps (genera: *Apanteles, Microplitis, Cemedo, Paniseus, Meteorus,* and *Eulophus*) attack SGFW; however, the percentage of control by these natural enemies is still low (Rings 1970; Howell 2011). Late-instar fruitworms are often parasitized by Tachinidae flies, and the parasite can be seen directly behind the head of the larva. *Eulophus orgyiae* adult wasps lay their parasitic eggs in fruitworm larvae as well.

Monitoring

The sex pheromone of the female SGFW, Z9-14 aldehyde:Z11-14 aldehyde (Hill and Roelofs 1979), was used to monitor male moths in all GreenWood Resources (Boardman, Oregon) tree farms since 2006.

Research on three European species in the genus *Orthosia* showed that the sexual attractants are composed mainly of two compounds, predominantly (Z)-9-tetradecenyl acetate (100) and a small amount of (Z)-11-hexadecenyl acetate (1) (Booij and Voerman 1984).

To execute an IPM program, it would be necessary to predict when *Orthosia* larvae will hatch in order to accurately schedule the location and time to apply insecticides that target susceptible pest stages (Mols et al. 1998). A temperature summation model developed by Judd et al. (1994) is suitable for phenological forecasting of Orthosia species. Subsequent studies on SGFW conducted by Judd et al. (1996) revealed crucial information about developmental times that led to degree day (DD) models which predict the flight of the first SGFW male moth. Judd et al. (1994) indicated that SGFW eggs held at 5°C and 7.5°C failed to hatch after 25 days of incubation. At the end of Judd et al.'s (1994) work, developmental thresholds for each stage were estimated to be: 3.4°C (as an average of developmental base temperature) for eggs, 3.6°C for all instars, and 2.8°C for pupae. Judd et al. (1996) suggested that predictive models for *Orthosia* phenology should assist the timing of pest control measures in order to be most effective during the management program. Further research conducted by Judd and Gardiner (1997) addressed the use of the biofix, which is the time when the first male is caught by a pheromone-baited trap. The biofix is the reference point to start the DD summation for the rest of the SGFW stages (Figure 3). They concluded that 50% of the female emergence and oviposition behavior occurred when 63.5 DD and 94 DD were reached after biofix, respectively.

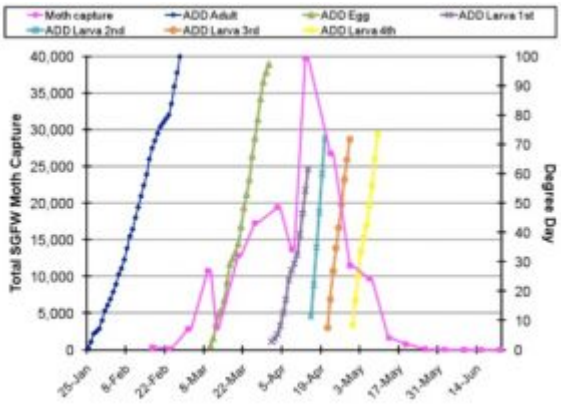

Figure 3. Capture of speckled green fruitworm adult males (biofix) in pheromone-baited traps and the degree day model predicting the presence of the damaging 4th instars over four years, 2007–2010 (Del Pozo-Valdivia 2011).

Management

Chemical control of SGFW populations is rarely necessary in poplars, but a “good neighbor” treatment might be wise if apple orchards are adjacent or near poplar plantings because SGFW can damage developing apple fruit.

Currently an insect growth regulator, Dimilin (diflubenzuron), has a derogation allowing it to be used on Forest Stewardship Council (FSC) certified poplars in eastern Oregon. Dimilin should be used to target populations of early instar *Orthosia* larvae. If larvae have developed to the final instar, use Steward (indoxacarb) according to label instructions. Other FSC allowed insecticides include Conserve (spinosad) and Coragen (chlorantraniliprole). If poplars are not being grown for FSC certification, several alternative insecticides will control this pest. *Orthosia* populations can be controlled by spraying organophosphate insecticides (chlorpyrifos, dimethoate, or malathion), a carbamate (carbaryl), or synthetic pyrethroids (cyhalothrin or permethrin) according to their labeled instructions. Currently, Oregon and Washington have registered the use of all these non-FSC-approved insecticides to protect tree pulp/wood production.

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Use pesticides with care. Apply them only to plants, animals, or sites as listed on the label. When mixing and applying pesticides, follow all label precautions to protect yourself and others around you. It is a violation of the law to disregard label directions. If pesticides are spilled on skin or clothing, remove clothing and wash skin thoroughly. Store pesticides in their original containers and keep them out of the reach of children, pets, and livestock.

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