

**SWEET CORN PEST MANAGEMENT
STRATEGIC PLAN (PMSP)**

**September 30, 2009
Belle Glade, FL**

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Executive Summary

Florida ranks first nationally in the production and value of fresh market sweet corn, typically accounting for approximately 20 percent of both national sweet corn production and of U.S. cash receipts for fresh sales. Sweet corn has typically ranked as one of Florida's four most valuable vegetable crops in terms of acreage and value. A total of 664 million pounds of fresh sweet corn, valued at \$157 million, was produced on 41,500 acres in Florida during the 2008 season. Costs to deliver a sweet corn crop to market vary somewhat, depending upon the production region and other factors. Typically, total costs for a crop are approximately \$4,000 per acre. Nearly 20 percent of sweet corn producers' overall total direct expenses are invested in scouting, pesticide, and pesticide application costs.

Action items from the meeting group were placed into the following three categories:

- Research**
- Design and conduct tests to investigate fall armyworm resistance to commonly used insecticides.
 - Design and conduct tests on silkfly repellency and attraction semiochemicals with concomitant work on insecticide efficacy.
 - Examine common seed treatment efficacy on cucumber beetle larvae.
 - Design and conduct tests to gauge the durability of rust resistance.
 - Design and conduct tests to manage bacterial leaf spot (chemical, phage, etc.).
 - Design and conduct tests to provide cold protection (cultivar, bacteria, etc.).
 - Determine possible atrazine resistance in lambsquarter and purslane.
- Education**
- Design and conduct an education program for silage corn/stover management, ditchbank sanitation, as well as pinhook education.
 - Design a monitoring program for diseases in other perennial grass crops.
 - Conduct grower trials with bird repellent.
- Regulation**
- Determine whether sweet corn pesticides can be used on field stover.
 - Continue working towards chlorantraniliprole registration.
 - Investigate possibility in reducing plantback periods for tembotrione (especially sugarcane).

Sweet corn PMSP List of Attendees

Sweet corn Scouts/Registrants

Loren Horsman - Glades Crop Care

Chris Miller - Glades Crop Care

Charles Mellinger - Glades Crop Care

Madeline Mellinger - Glades Crop Care

Brett Highland - Certis

Chuck Goodowns - Certis

Eric Rawls - Syngenta

Alex Truskowski - Dupont Crop Protection

Jon-Erik Escribano - Bayer CropScience

Charles Hollingsworth - CPS

Bruce Johnson - independent scout

Rachel Giles - independent scout

Extension Personnel

Mary Lamberts, Vegetable Pest Management Specialist, Miami-Dade County Extension Office, 18710 SW 288th St., Homestead, FL 33030

Dakshina Seal, Vegetable Pest Management Specialist, Tropical Research and Education Center, 18905 SW 280th St., Homestead, FL 33030

Les Baucum, Sweet Corn Specialist, Hendry County Extension Office, 1085 Pratt Blvd., Labelle, FL 33975

David Sui, Vegetable Specialist, Palm Beach Extension Office, 559 Military Trail, West Palm Beach, FL 33415

Ron Rice, Palm Beach Extension Office, 2976 SR15, Belle Glade, FL 33430

Rick Raid, Sweet Corn Pathologist, Everglades Research and Education Center, 3200 E. Palm Beach Rd., Belle Glade, FL 33430

Gregg Nuessly, Sweet Corn Entomologist, Everglades Research and Education Center, 3200 E. Palm Beach Rd., Belle Glade, FL 33430

Nick Larson, Everglades Research and Education Center, 3200 E. Palm Beach Rd., Belle Glade, FL 33430

Robert Beiriger, Sweet Corn Physiologist, Everglades Research and Education Center, 3200 E. Palm Beach Rd., Belle Glade, FL 33430

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Introduction

Florida ranks #1 nationally in the production and value of fresh market sweet corn, typically accounting for approximately 20 percent of both national sweet corn production and of U.S. cash receipts for fresh sales. Sweet corn has typically ranked as one of Florida's four most valuable vegetable crops in terms of acreage and value. Harvested acreage for sweet corn represents approximately one-sixth of the state's total vegetable acreage during that season, while production value represents about six percent of the total production value of all Florida vegetables.

A total of 664 million pounds of fresh sweet corn, valued at \$157 million, was produced on 41,500 acres in Florida during the 2008 season. Florida's fresh sweet corn producing acreage has ranged from a high of nearly 51,300 acres harvested in 1992 to less than 27,000 acres harvested in 2006.

Costs to deliver a sweet corn crop to market vary somewhat, depending upon the production region and other factors. Typically, total costs for a crop are approximately \$4,000 per acre. Nearly 20 percent of sweet corn producers' overall total direct expenses are invested in scouting, pesticide, and pesticide application costs. Scouting is conducted every two or three days.

The principal fresh sweet corn production region in Florida is the Everglades area (Palm Beach County) with over half of the production. The southeastern/southwestern area (Miami-Dade, Collier, and Hendry Counties) are responsible for about a quarter of the state's production. The west/north area (Suwannee and Jackson Counties) account for a minor amount of sweet corn production in the late spring months. Sweet corn is still grown in the central area around Lake Apopka, but this region only produces a small amount of the crop since the muck soils in this area have been taken out of production.

Most of Florida's sweet corn producers grow the crop on organic muck soils, with lesser amounts on sandy soils and rockland (limestone) soils. Sweet corn seeds can be planted any time from August through April, depending on the specific production region. However, growers usually plant in north Florida from February to April, in central Florida from January to April, and in south Florida from October to March. Standard spacing allows for approximately 30 inches between rows, with seeds typically planted about one inch deep, 6-8 inches apart. Maximum plant population is approximately 24,000-32,000 plants per acre. Stand uniformity is a vital component of production. A total of 64-90 days elapses from seeding to harvest. Sweet corn is wind pollinated, so isolation of varieties must occur to produce desired characteristics. Typically, a distance of at least 300 feet is needed to avoid cross-pollination. Adequate water is especially important in sweet corn production during periods of silking and tasseling and of ear development. Most of Florida's sweet corn is grown under some type of irrigation. Sweet corn harvest can occur from mid-November through mid-July, with the most active harvest period occurring from April through May. Sweet corn ears are harvested only once, using either hand or mechanical methods. The majority is harvested by hand.

Mites

Mites can occasionally be present at detrimental levels during hot and dry conditions. As much of the sweet corn is grown under moist irrigation regimes, conditions must be severe for this to occur. The PMSP members did not believe that this group of pests warranted either research, extension, or regulatory assistance. It was noted that bifenthrin is currently an IR-4 A-priority in sweet corn.

For sweet corn miticides, there are no carbamate, organophosphate, carcinogen, PHI, or REI concerns with the currently registered materials.

Insects

The lepidopteran larvae responsible for plant and ear damage (fall armyworm, corn earworm) are inconsistent in pressure. If scouting indicates economic pressure, early life cycle larvae are managed with pyrethroid and *B.t.* products. Methomyl, as well as organophosphates and pyrethroids are materials used during the later half of the season, but these materials seem less efficacious against fall armyworm when applied at historically effective rates. Currently, no research is actively tracking this observation. Chlorantraniliprole/rynaxypyr was also an active ingredient discussed that may have good fit into a sweet corn IPM program (i.e., as soft of materials as possible in the beginning of the season) and the company representative stated that Dupont hopes to have a sweet corn label by November with less restrictive plant-back periods.

Silage corn, which has been modified with the *B.t.* toxin, has been planted near the sweet corn production areas of Florida (approximately 10,000 acres around Lake Okeechobee) for dairy use. This corn is not sprayed with insecticide, so it provides refugia to non-*B.t.*-affected pests that may affect sweet corn. It also provides a constant refugia as this corn grows during the summer months when Florida sweet corn growers fallow fields. There is consequently more untreated stover in the area as well. Old sweet corn fields may also be pin-hooked, and this leaves trash around to serve as refugia as well. The group felt there were not many options for management in corn stover sites. There was also no history or experience working with commercial viral pesticides, such as Gemstar7.

With regard to seed treatments, all sweet corn seed is treated with an insecticide (usually clothianidin) and a fungicide, which can be a single material or mixture. Farmers have many options and combinations from which to choose when ordering seed. With the use of these seeds, wireworm problems have become less an issue unless following third or fourth ratoon sugarcane.

Increased stover in the area may well be leading to increased populations of silk fly, of which four species are known in the production area. Three of these are major pests while one is incidental. Silk fly is a pest of increasing concern for sweet corn growers. Applications must be made every other day or even daily for this pest during the silking period with high rates of material. Silk flies seem to enter the field near the perimeters and then work inward over several

days. The group discussed bait and kill attraction with semiochemicals. Since the prototype silkworm repellent (which is a natural food grade product) is not amenable to aerial application, it must be used in some other manner, such as border repellency. The effectiveness of some of the older insecticide materials was also questioned with regard to efficacy. The mixture of chlorantraniliprole and lambda-cyhalothrin (Voliam Express⁷) was noted as an effective tool for silkworm management, and the company representative stated that sweet corn was soon to be labeled for this product.

Leaf feeding coleopterans such as cucumber beetle (banded and spotted) have also become increasingly noted pests in the last several fall seasons. Lodging occurs due to larval feeding (especially in the fall) and adults feed/destroy the seedling growing point in several days if not controlled. The beetles are believed to be coming from ditchbank weeds but also may start coming from the modified corn plantings as well.

None of the members were aware of any arthropod/disease complexes in Florida sweet corn production.

For sweet corn insecticides, there are no carcinogen or REI concerns with the currently registered materials.

Nematodes

While most of the nematode pressure on muck soil is minimal, sting and lesion nematode damage can occur on sandland sweet corn. Organic sweet corn grown in the area (approximately 100 acres) also has nematode pressure. Some growers do grow a cover of marigold or vetch. Some of the newer seed treatments have components that are nematicidal or nematostatic, such as abamectin or thiodicarb. Another product mentioned was Melocon⁷ (a fungal nematode predator). However, delivery of the fungal conidia is difficult due to application diluent requirements.

For sweet corn nematicides, there are no carbamate, organophosphate, carcinogen, PHI, or REI concerns with the currently registered materials.

Diseases

With the advent of quality seed treatments and vigorous seed, soil borne diseases are not prevalent in Florida sweet corn production. Leaf diseases are the primary pathology in the field. Sweet corn breeders have historically bred for taste, storage, and disease resistance. Consequently, the gene imparting rust resistance may start to break down as these fungi evolve based on gene for gene evolution. Group members felt that rust has become a larger issue recently, and that it may well have future impacts.

Bacterial leaf spot has caused some large losses in commercial acreage in fall production that is wet and warm, such as 2009. It was noted that little bacterial protection is available for either this disease or for freeze protection (for which bacteria have been registered).

Another consideration voiced by the meeting members was the beginning of large scale planting of biofuels such as sorghum and elephantgrass. In addition to sugarcane, all of these large tropical grasses may serve as inoculum banks for sweet corn diseases.

For sweet corn fungicides, there are no carcinogen, PHI, or REI concerns with the currently registered materials.

Weeds

The historic and current mainstay of the weed control program in Florida sweet corn production is atrazine, with some minor use of metolachlor and carfentrazone. Tembotrione was mentioned as a new material, but plantback restrictions limit the utility. Many herbicides are registered in sweet corn because of the linkage to field corn and popcorn. However, the economics and efficacy of the older herbicides provide little incentive to transition to newer materials.

Meeting members voiced concern regarding two weeds that may be developing resistance to atrazine - lambsquarter and purslane. Both of these species have been present in the production area but seem to be less controlled lately. Parthenium and yellow nutsedge have always been problematic to control but less prevalent in sweet corn production.

For sweet corn herbicides, there are no carcinogen, PHI, or REI concerns with the currently registered materials. There is a desire to reduce the plantback for tembotrione if possible (especially the four-month restriction with sugarcane).

Vertebrates

There are multiple bird species that can cause extensive damage both at the seedling stage and after ear production. Damage has reached up to 40 percent on ears in some instances. Shotguns, air cannons, and even flying aircraft have been employed to scare or roust the birds from fields. Methyl anthranilate (grape flavoring) is registered for use in sweet corn although few members had direct contact with it. Bird Shield⁷ is applied at one pint per acre by air, so this could be a potential management tool for birds.

Rabbits and rats can also become nuisance pests in sweet corn production. Bait stations are placed in high-travel locations to try to reduce pressure. Most damage occurs on the borders of the field.

Summary

Based on the input of the members of the Florida sweet corn PMSP, the following items have been placed on the “To Do” list.

- Research**
1. Design and conduct tests to investigate fall armyworm resistance to commonly used insecticides.
 2. Design and conduct tests on silkfly repellency and attraction semiochemicals with concomitant work on insecticide efficacy.
 3. Examine common seed treatment efficacy on cucumber beetle larvae.
 4. Design and conduct tests to gauge the durability of rust resistance.
 5. Design and conduct tests to manage bacterial leaf spot (chemical, phage, etc.).
 6. Design and conduct trials to provide cold protection (cultivar, bacteria, etc.).
 7. Determine possible atrazine resistance in lambsquarter and purslane.
- Education**
1. Design and conduct an education program for silage corn/stover management, ditchbank sanitation, as well as pinhook education.
 2. Design a monitoring program for diseases in other perennial grass crops.
 3. Conduct grower trials with bird repellent.
- Regulation**
1. Determine whether sweet corn pesticides can be used on field stover.
 2. Continue working towards chlorantraniliprole registration.
 3. Investigate possibility in reducing plantback periods for tembotrione (especially sugarcane).