

Progress Report to Southern Region Small Fruit Consortium

Title: Exploring Banker Plant Systems for IPM of Off-Season Greenhouse Strawberry Production

SRSFC Project 2008-19

Project Type: Research

Name(s), Mailing, and Email Address of Principal Investigator:

Dr. Carl E. Sams
University of Tennessee, Plant Sciences Department
2431 Joe Johnson Drive, 252 Ellington Plant Sciences Building
Knoxville, TN 37996
Email: carlsams@utk.edu
Phone: 865-974-8818

Co – Principle Investigator:

Dr. Dennis Deyton
University of Tennessee, Plant Sciences Department
2431 Joe Johnson Drive, 252 Ellington Plant Sciences Building
Knoxville, TN 37996
Email: deytond@utk.edu

Cooperator:

Susannah Amundson
University of Tennessee, Plant Sciences Department
2431 Joe Johnson Drive, 252 Ellington Plant Sciences Building
Knoxville, TN 37996
Email: sstofer@utk.edu

Objectives:

The objectives of this research project are to evaluate various banker plant systems for control of two-spotted spider mite (*Tetranychus urticae* Koch), Western flower thrips (*Frankliniella occidentalis*), and aphids in greenhouse strawberries grown for the off-season (October-June) market in Tennessee.

Justification:

Off-season strawberry production in greenhouses in the Southeast is a small but growing industry. In East and Middle Tennessee, tobacco and row crop growers have been looking for new ways to supplement farm income. Off-season production of strawberries involves transplanting into production systems in September and harvesting from late October through May, providing a lucrative winter crop. In 2003, the majority of strawberries produced in Tennessee were field-grown in matted-row systems (400-450 acres) during the summer season when market prices are lowest. This system relies heavily on fumigation using methyl bromide (NSF center for IPM, 2003). Greenhouse

production systems eliminate the reliance on soil fumigation, improve yields, reduce pesticide usage, and permit harvests during the time of year when market prices are at their highest.

Common greenhouse strawberry pests include aphids, western flower thrips, and two-spotted spidermites. Controlling these pests with natural enemies has many economic, human health, and environmental benefits. Banker plants are plants grown along side a crop for the sole purpose of sustaining a population of reproducing natural enemies of crop pests. Banker plants are easy to grow and mobile, they reduce the need for chemical control of greenhouse pests, permit early and consistent intervention, and provide significant cost savings (Pratt and Croft, 2000).

Methodologies:

In the current research, barley infested with cereal aphids is utilized used in conjunction with the parasitic wasp (*Aphidius colemani*) to control aphids, marigolds are used in conjunction with *Orius insidiosus* to control thrips, and bush beans infested with spider mites are used in conjunction with *Phytoseilus persimilis* to control spider mites.

Two isolated greenhouse bays are used. Bay 1 contains both strawberries and banker plants, and bay 2, acting as the control, contains strawberries only. Predators were released in each bay, and their numbers are monitored weekly, in order to determine the effectiveness of the banker plants in maintaining a viable predator population.

On September 22nd, strawberry plugs were transplanted into 3", 4", and 6" round pots containing 50% Promix and 50% perlite. Pots were placed in two separate and isolated greenhouse bays. They were situated on greenhouse benches in trays that kept pots spaced 12" on-center. Plants are fertilized using a hydroponic system containing Hydro-Gardens strawberry formula 8-12-32, magnesium sulfate, and calcium nitrate. Greenhouse temperatures are maintained at 75° F during the day and 65° F at night.

On October 16th, barley banker plants infested with cereal aphids (*Rhopalosiphum padi*), were transplanted into 12, one-gallon pots containing 50% Promix and 50% perlite. Two of these were placed in a separate room to sustain a supply of prey that has not been exposed to the parasite. The rest were placed into bay 1 intermixed among the strawberries. Barley seeds are planted every 2 weeks to maintain a continuous supply of young plants for the aphid prey to survive on. One thousand aphid parasites (*Aphidius colemani*), were released in bays 1 and 2 on October 29th.

Five varieties of marigolds, 'Aurora Light Yellow', 'Hybrid Inca II', 'Janie Yellow', 'Parks Whopper Yellow', and 'Calendula Bon Bon' were seeded on November 11th. Marigolds were transplanted into 6" x 4.5" pots containing 50% Promix and 50% perlite on November 20th, after seedlings developed first true leaves. Once flowering, they will be placed throughout the strawberries. The thrip predator, *Orius insidiosus*, will be released once marigolds are in bloom, sometime in mid-December.

On October 14th, 2000 predator mites (*Phytoseiulus persimilis*), were released onto strawberry plants. One thousand predator mites have been continually released every 2 weeks. Bush bean plants infested with spider mites will act as the banker plant for the predators and will be installed soon.

Results:

The grant was allotted in March after the off-season production of strawberries had passed. Therefore, we have only begun the program of installing banker plants, releasing predators, and monitoring their populations, and have no data to report yet. We have formed an agreement with Carol Glenister from IPM labs, and she has agreed to provide us with the necessary plants, predators, and prey and advise us in the appropriate methods of monitoring populations.

We are currently monitoring predator populations. We will compare predator and parasite populations between the greenhouse bays with and without banker plants. We are working with Carol Glenister to develop monitoring systems. Strawberry yield and quality will also be evaluated through May 2009.

Conclusions:

Not enough data to form any conclusions thus far. We plan on monitoring the banker plant systems for the 2008/09 and the 2009/10 greenhouse strawberry crop.

Impact Statement:

The banker plant systems have the potential to reduce or eliminate pesticide use and thus reduce pest control costs, environmental and human health concerns. The banker plant system should also reduce the need for multiple predator introductions and thus reduce biological pest control costs. At the end of the 2 year experiment we will evaluate the cost of biological control of strawberry pests with and without banker plants.

Literature Cited:

Glenister, C. 2006. "Developing beneficial insect habitat for greenhouses." Sustainable Agriculture Research and Education. Final project report, # ONE05-037.

http://www.sare.org/reporting/report_viewer.asp?pn=ONE05-037&ry=2006&rf=1

NSF Center for IPM. "Crop Profile for Strawberries in Tennessee." 2003.

www.ipmcenters.org/cropprofiles/docs/TNstrawberries.html

Pratt, PD and BA Croft. 2000. "Banker plants: evaluation of release strategies for predatory mites." J. Environ. Hort 18(4):211-217.

