OKLAHOMA PRODUCER GRANTS

## PROJECT FACT SHEET

# Biological Control of Corn Earworm *(Heliothis zea)* in Sweet Corn *(Zea mays)*

Jesse Snyder setting out wasp eggs

**YEAR GRANT AWARDED: 2000**

**AREA 7: Environmentally-Safe Pest Management**


**PRINCIPAL COOPERATOR**
Jesse Snyder
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Prague, OK 74864
(405) 567-4383

**OTHER COOPERATORS**
Dr. Warren Roberts, Lane Agriculture Center, Oklahoma State University.
Jonathan Edelson, Lane Agriculture Center, Oklahoma State University.


**PROJECT BASICS**
*Duration:* Two years (2000-2001)
*Type:* Demonstration project
*Grant Amount:* $1,950
*Location:* near Prague, Oklahoma. Exit 200 (Prague-Seminole), I-40, 3 1/2 miles north to Moccasin Trail, then west 3 3/4 miles.


For more information/ to apply, contact:

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### FARM/RANCH PROFILE:

Jesse Snyder farms large acreages near Prague, Oklahoma, in Pottawatomie County, in the central part of the state. His family runs a diversified operation, which includes cattle, wheat, corn, soybeans, peanuts, Milo, sweet corn, pumpkins, and more recently, goats.

### PROJECT OBJECTIVES

At the time Snyder began the project the family had been growing sweet corn for fifteen years. He began looking for a better way to control earworms in his sweet corn crop, and he hoped parasitic wasps might provide the means to that end.

**His project objectives were:**

1. Demonstrate the effectiveness of parasitic wasps on corn earworms in sweet corn.
2. Increase awareness of beneficial insects for pest control among sweet corn and other produce growers
3. Produce a truly organic sweet corn.

Snyder says he believes neither of the two conventional options for control of corn earworm is satisfactory. The first, extensive use of chemicals, exposes everyone and everything involved to risks he would like to avoid. "Insecticidal control of corn earworm *(Heliothis zea)* in a sweet corn crop can be costly, time consuming, dangerous, dependent on the right conditions, and sometimes not all that effective, " he explained.

The other option, doing nothing at all, usually results in an end product that is poor in quality.

Snyder suggested that, if it works, biological insect control using parasitic wasps would be a great alternative for four reasons:

1) Consumers want fewer chemicals on their food.
2) Biological control should be less damaging to the environment.
3) The corn is hand picked and workers would have less pesticide exposure. Since his sweet corn operation is mostly a family enterprise, the safety of his "workers" is even more critical to him.
4) It might be more cost effective.

### PROJECT DESCRIPTION

The variety of corn the Snyders prefer, *Kandy Korn*, has a fairly open husk, and is especially susceptible to moth damage. In the year before receiving the grant, Snyder released some parasitic wasps *(Trichogramma pretiosum)* on a limited basis in his corn, and thought they showed promise.

The pale yellow *Trichogramma* micro-wasps (1/100th of an inch long) are the world's most widely used commercially produced beneficial insects. The different species and

strains of the wasp destroy the eggs of over 200 pest moth species. They have been used to control caterpillars in a wide variety of agricultural settings, from field, row and vegetable crops to orchards and vineyards.

Kerr Center president Jim Horne congratulates Snyder on his project

How does the wasp get the worm? First the corn earworm moth *(Heliothis zea)* lays her eggs on the corn silk. (Other names for the corn earworm are tomato fruitworm and cotton bollworm.) The resulting worms begin to eat the corn kernels at the silk end and can severely damage the ear.

However if *Trichogramma pretiosum* wasps are present, the worms never get a chance to hatch. The wasps drill through the moth eggs and deposit one to three eggs in each moth egg. When the wasp eggs hatch, the larvae eat the moth eggs from the inside, and then pupate and exit the shell of the moth eggs as adults.

In year one of their grant, the Snyders worked the soil with every flush of spring weeds and prepared for planting. The corn was planted in 36-inch rows at the rate of 15,000 seeds per acre. They used cultivation and hoeing as needed for weed control.

At the end of May, when the corn reached the tassel stage, the Snyders released 40,000 wasps per acre, and then each week released 20,000 per acre until harvest (usually five weeks).

The wasps are shipped inside parasitized moth eggs glued to perforated cards that can be broken into 30 one-inch squares for distribution throughout a field. Loose eggs are available for aerial release.

Each Wednesday the Snyders received the cards. The wasps emerge from the cards in two to five days, depending on temperature, and emergence can be delayed by holding them at cooler temps (not less than 40 degrees F). By the weekend, when the wasps began hatching out, Snyder divided each card, putting each square in the crook of a leaf on corn plants throughout the patch.

Snyder then evaluated earworm damage

## COST COMPARISION

| | Conventional | Year 1 Organic | Year 2 Conventional (herbicide) + *Trichogramma*+ Turkey Litter |
|---|---|---|---|
| | $/acre | $/acre | $/acre |
| Land rent | 50.00 | 50.00 | 50.00 |
| Equipment | 35.00 | 35.00 | 35.00 |
| Chemical fertilizer (100#N, 34#P, 34#K) | 42.00 | 0.00 | 0.00 |
| Turkey litter | 0.00 | 100.00 | 100.00 |
| Seed | 53.00 | 53.00 | 53.00 |
| Herbicide (1/2 qt. Bicep-$12 + applic. $4) | 16.00 | 0.00 | 16.00 |
| Cultivate & hoe | 0.00 | 35.00 | 0.00 |
| Insecticide *(10 applic. ASANA + applic. cost) | 102.50 | 0.00 | 0.00 |
| Wasps | | 50.00 | 50.00 |
| Harvest | 230.80 | 230.80 | 230.80 |
| Irrigation | 60.00 | 60.00 | 60.00 |
| Total expenses | $589.30 | $613.80 | $594.80 |

* Applied at recommended rate of 8 oz./acre = $6.25 per acre, plus application cost of $4 per acre

Tiny parasitic wasp, *Trichogramma*, lays its egg in eggs of a number of moth species, such as the corn earworm (also called tomato fruitworm or cotton bollworm) egg shown here.

## ANOTHER MIGHTY LITTLE WASP

Researchers at Cornell University have found beneficial wasps of the variety *Trichogramma ostriniae* can reduce damage from European corn borers *(Ostrinia nubilalis)* by half. In that study, 6% of the ears were damaged in the fields where wasps were released, while 12% of the ears were damaged in the control fields.

For more information see http://www.cips.msu.edu/ncr125/StateRpts2001NY.htm

at harvest and hosted a field day to show others the results of the demonstration.

The Kerr Center grant involved one year of organic production. However, weed pressure the second year forced him to modify the system by using an herbicide.

Snyder also grew sweet corn by more conventional methods and provided a cost comparison.

## PROJECT RESULTS

Snyder said he was pleased with the results of the demonstration and believes the *Trichogramma pretiosum* wasps could be a viable alternative to chemical control of earworms for sweet corn growers.

"The quality of the crop was as good as or better than in years past when on a very strict spray schedule," he said.

Under a strict spray schedule, he would usually receive several phone calls a season from customers to let him know they had found earworm damage. When he used the Trichogramma, customers were told about the wasps. No customers called to tell him about any damage. He says either there was less damage or customers expected some damage and were not surprised when they found it.

"Something I feel is important is the safety of the harvesters, as this crop is harvested by hand," he added. "The spray is very irritating and though it is a cleared product, this is a concern to me."

Snyder family and friends pitch in to pick and sell corn locally.

He also noted the difficulties of spraying for earworms during the wet season, especially for ground application of the spray.

"If you look at the expense chart… the parasitic wasps have a place in sweet corn production if one can get comparable results," he said. As the table shows, year two of the project was only slightly more expensive ($5.50/acre) than a strictly conventional production system. The organic system cost $24.50/acre more than a conventional system.

Snyder also pointed out that sweet corn grown conventionally with ground application of pesticide requires the grower to leave alleys consisting of four rows for the spray rig to travel down to spray for corn earworm. After satisfying himself that the wasps were working, he decided to eliminate the alleys since the wasps fly over the entire area.

On a ten-acre field, this results in an additional 1 1/2 acres of harvestable sweet corn. At harvest, the pickers simply drive down selected rows to reestablish the alleys, harvesting as they go. The alleys are then used to harvest the side rows. Under Snyder's production system, this resulted in an additional $1,000 gross income over the same production area.

Snyder also notes that the cost assigned to turkey litter as fertilizer does not take into account the values of organic matter and micronutrients added to the soil.

His demonstration plot for Year One of the project yielded 115.4 bushels per acre, which he sold for $9 per bushel, for a gross value of $1,038.60 per acre. Snyder notes this was not a premium price, as some people would charge more for crops that had not been treated with pesticides. Year Two yielded similar results.

Gina Snyder, Jesse's wife, and Mary Margaret Snyder, his mother, served field day visitors fresh sweet corn from their farm.

## RESOURCES

Rincon-Vitova Insectaries, Inc.
P.O. Box 95
Oak View Ca. 93022
(805) 643-5407

OKLAHOMA
PRODUCER GRANT PROGRAM
The Kerr Center
FUNDING FARMER INNOVATION

*Grants Awarded Statewide!*

# OKLAHOMA PRODUCER GRANT PROGRAM

Farmers and ranchers know their land better than anyone else. They know their problems, and they often have innovative ideas about how to solve those problems.

While good ideas may not in short supply, money often is. This program, the first of its kind in Oklahoma, supports farmer and rancher innovation with cash grants.

Established in 1998, the Oklahoma Producer Grant program encourages an exchange of ideas and experiences between producers that will benefit all.

## WHAT IS A PRODUCER GRANT?

- It funds projects that promote a sustainable agriculture and are innovative, unique, and experimental
- Two year grants are funded up to $3,500, three year grants up to $7,500

## WHAT KIND OF PROJECTS WILL BE FUNDED?

- Those that address one or more of eight priority areas (some years, special areas are added)
- Research, demonstration or educational projects*
- Research and demonstrations with a strong educational component—results are shared with other producers
- Projects with agriculture professionals (Extension, NRCS, etc.) as collaborators/cooperators given priority
- Ideas applicable to more than one farm

* A demonstration project is an on-farm demonstration of a farming/ranching practice; a research project is an on-farm test of an idea or technology. An educational project shares information about innovative approaches.

## WHO MAY APPLY FOR A GRANT?

- Active, resident producers in Oklahoma

## HOW ARE GRANTS AWARDED?

- Annually, on a competitive basis
- Proposals are evaluated by an impartial technical committee of ag professionals and producers

## WHAT IS THE APPLICATION PROCESS?

- Producers or producer groups may submit grant proposals once a year during the "Call for Proposals" time period
- Application forms are available from the Kerr Center or online

## WHAT IS A SUSTAINABLE AGRICULTURE?

- A sustainable agricultural system will last over the long term because it maintains or increases net farm profit, protects and conserves natural resources, and is equitable to farmers and ranchers.

## Eight Priority Areas and a Few Examples

**1. Soil Conservation, Soil Health**
Farming methods that stop erosion, increase organic matter, improve texture and structure and microorganisms.

**2. Water Quality, Water Conservation**
Farming methods that prevent soil erosion or filter pollutants, efficient irrigation systems

**3. Proper Management of Organic Wastes**
Non-polluting approaches to waste application, composting, new, less concentrated systems of raising livestock and poultry

**4. Crops and Livestock Adapted to Oklahoma**
New crops or varieties that match climate and soil type, livestock adapted to climate and forage

**5. Biological Diversity**
Incorporating wildlife habitat, rotations, diversified crops and livestock, cover crops

**6. Environmentally-Safe Pest Management**
Approaches to weed management that eliminate or cut spraying, methods of insect and disease management that emphasize use of beneficials, biological control agents, or innovative rotations

**7. Energy Conservation**
Reducing use of diesel or gasoline through lowering horse-power needs, reducing tillage, using renewable fuels, recycling

**8. Farm Diversification and Increased Profitability**
Cutting expenditures for inputs, adding value to crops or livestock, diversifying farm enterprises, growing crops that receive premium prices, maximizing the use of on farm resources, substituting management for off-farm inputs, direct marketing

For more information on the program, field events, application, and descriptions of funded projects go to www.kerrcenter.com