

Entomologists at Cornell Fight Apple Pests Organically

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by Peter Seem

GENEVA, NY: Entomologists at Cornell's New York State Agricultural Experiment Station in Geneva, NY, have teamed up with Singer Farms in Niagara County to develop more effective methods of controlling pests that damage organically grown apples. Jim Bittner, president of Singer Farms, dedicated 30 acres of his 500-acre farm to the organic production of apples five years ago. Singer Farms is a diversified operation, with 250 acres of stone fruit under production as well as apples. Singer Farms is the only commercial orchard in the Northeast growing organic apples.

"Yields were lower and the trees seem to be getting weaker and weaker," said Bittner, citing thinning and pests as the two biggest problems facing his organic crop.

Thinning three or four of every five apples so the remaining fruits receive enough of the tree's resources to grow to marketable size is traditionally done chemically. There is no good organic substitute for chemical thinning. Organic growers are also



Suggested caption: Cornell University entomologist Art Agnello demonstrates physical exclusion using cloth mesh cages. He and Harvey Reissig are testing this and other methods of organic pest control on apple trees in Jim Bittner's orchard in Appleton, NY. CREDIT: K. Stevens/NYSAES/Cornell

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Suggested caption: The microsprayer developed by Michigan State University for pheromone disruption.

severely limited in the tools they have to fight diseases. "[Apple] scab is challenging, because you only have sulfur," Bittner explained.

The decision of what is permissible for organic production is made by independent organic certification agencies. Inspectors visit Bittner's farm annually to certify that he is growing his apple crops organically. Different agencies, however, have different standards, and there is disagreement within the industry. "There is no legal definition of organic," he said. "Some people feel 'organic' production shouldn't involve using plastic irrigation hose, because plastic isn't natural."

Bittner asked Geneva entomologists Art Agnello and Harvey Reissig for better ways to ward off pests.

Agnello recognized the challenges Singer Farms faces. "Apples are probably the hardest crop to grow organically. I can't think of any other crop that has so many different pests," he said.

The team is testing three different methods on plots on the Singer Farm. The most traditional approach is an alternate spraying program that replaces pesticides with natural compounds, chiefly horticultural oil, kaolin clay, and Bt compound. The oil is a petroleum product permitted by the Organic Certification Agency that is partially absorbed into the leaves and controls mites. Kaolin is a fine clay that is sprayed every other week and covers the trees. "It looks like they've been white-washed," said Agnello, describing the clay. Scientists are not certain of the mechanisms behind it, but the clay covering deters insects. Bt is an abbreviation for *Bacillus thuringiensis*, a natural bacterium that produces a chemical lethal to caterpillars. Some of these sprays have already been proven effective in more arid climates with far fewer insects and diseases than in the Northeast. This spring's frequent rains have made spraying programs more difficult and less effective. Bittner's voice trails off in disgust, when describing the Kaolin clay, "It has been effective on the West Coast, in a desert climate. Here, where we get rain every week it may not be as effective."

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Suggested caption: The microsprayer developed by Michigan State University for pheromone disruption positioned in the tree. CREDIT: K. Stevens/NYSAES /Cornell

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Michigan State University (MSU) has developed a microsprayer aerosol canister controlled by a microcircuit timer in conjunction with Ford. MSU provided the Experiment Station with units to field test on the Singer Farms. With a deceptively quiet click, the device releases a burst of pheromones into the foliage of the tree every three minutes. Pheromones are chemical signals produced naturally by insects to attract mates. The microsprayers disrupt the insects' mating habits and prevent reproduction by filling the air with so much pheromone that the males become confused and refuse to fly. Smaller than a two-liter bottle, the microsprayer contains a combination of three pheromones sufficient to cover a quarter-acre for the entire 90-day growing season. Although this technique has shown promise in the field for codling moth, oriental fruit moth and obliquebanded leafroller, the pheromones are very pest-specific. "Unlike pesticides, each pheromone only controls one specific insect," explained Bittner.

Agnello and Reissig are also testing a very unconventional approach to pest control they dub "physical exclusion using whole-tree screen cages." After pollination, they cover a row of apple trees on Singer Farms with a simple loose-mesh, drawstring bag. Agnello explained the reasoning behind this method, "There are farms where they cover each individual fruit, but those are operations directed toward the very high-end market, like overseas and specialty food distributors."

"There's actually a company that manufactures those bags. We thought if it was feasible to bag each fruit, we could at least bag the tree," said Reissig.

Bittner said the market for organic products "is completely consumer driven. There is a market willing to pay a premium."

Prices for organic products are approximately double that of their conventional counterparts, but this is not always enough to make up for lower yields and increased costs. Last year, organic apples from Singer Farms made little profit because of small amounts of fruit and insect damage.

The two researchers are optimistic they can help Singer Farms improve their bottom line over last year, when 30 to 40 percent of the crop was lost. Even with improvements, all of the organic apples produced are slated for processing. Without pesticides, Bittner said it is impossible to produce the quantity of organic apples perfect enough for sale as fresh produce in the Northeast. "People say they will accept blemishes [for organic fruit], but when they go to the store, it's the biggest, reddest apple they pick up."

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