Building on Organic Knowledge: On-Farm Transfer of a Key Pest Trap Cropping Method to Conventional Strawberry Production

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Situation:

Strawberry production in California, which produces 86% of the U.S. total, encompasses 34,600 acres and generates $1.3 billion in farm-gate sales. However, the strawberry industry faces potential economic, social, and environmental problems from the use of insecticides in local watersheds of Santa Cruz and Monterey counties, where 40% of the state's strawberries are grown in drainages leading to the Monterey Bay National Marine Sanctuary. Most insecticides are used to combat the western tarnished plant bug, or lygus bug. The bug's feeding results in cosmetically degraded fruit unacceptable in fresh marketing.

In a previous Western SARE Research and Education Grant (SW02-035, Control of Lygus Hesperus Knight in Organic Strawberry Systems Using Trap Crops and Tractor-Mounted Vacuums), the research team demonstrated that lygus bugs were highly attracted to alfalfa trap crops.

In that project, a twice-weekly summer vacuuming treatment of alfalfa trap crops significantly lowered damage from lygus bugs in associated organic strawberries compared with the organic strawberry grower's standard whole-field vacuuming treatment. The method reduced grower vacuuming costs (tractor, tractor fuel, and driver time) by 78%. An economic analysis indicated an overall positive return of $734/acre for the three months of trap cropping treatments in 2004.

Applying this same trap crop technique to nonorganic strawberry production could improve the environmental health of the marine sanctuary, improve water quality, provide savings to farmers by cutting chemical, energy, and labor costs, and increase protection of worker health and safety.

Objectives:

- Determine whether using trap crop-directed insecticide applications on managed trap crops can decrease the need for insecticides for lygus bug control in associated strawberries
- Attempt to inform conventional producers as to the broad applicability of observations made with a previous Western SARE Research and Education Grant on organic acreage

One row of alfalfa trap crops was interplanted every 40 rows of strawberries.

Actions:

On a 44-acre conventional strawberry ranch in the Salinas Valley, the project team set up an intercropped pattern by planting one alfalfa row for every 40 rows of strawberries. The alfalfa trap crop comprised 2-3% of the overall acreage.

Four 100-foot-long alfalfa trap crop rows and 15 adjacent downwind strawberry rows were randomly assigned as experimental plots for these treatments:

1. Insecticide-treated alfalfa trap crop (no associated strawberry treatment until needed)
2. No alfalfa trap crop (conventional chemical control in adjacent strawberries)
3. Untreated control with no trap crop

Trimmed (cut periodically to 24 inches) and untrimmed subplots were added to treatments 1 and 2.

Lygus bug adult and nymph abundance were sampled weekly during the harvest season using a hand-held vacuum suction device. All harvestable strawberries and lygus-damaged strawberries were counted weekly on 75 randomly selected plants in the 15 adjacent rows.

A western tarnished plant bug nymph, or lygus bug, dines on a maturing strawberry. – Photo by Colin Brown

An adult lygus bug perches on a leaf. – Photo by Colin Brown

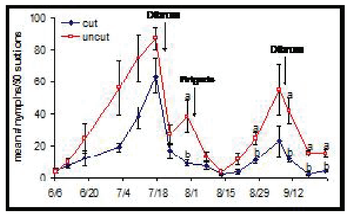
Results:

Lygus bug abundance was significantly reduced in insecticide-treated trap crops when compared with untreated trap crops, and damage in adjacent strawberry rows was only slightly increased.

Whole season damage rates from unsprayed strawberry rows adjacent to a sprayed trap crop were greater than damage rates from sprayed strawberry rows without a trap crop, but the difference was less than 1%, and both damage figures were below the 5% limit acceptable to the grower. During the same period, there was no significant difference between damage rates in strawberry rows adjacent to cut vs. uncut trap crops.

Cutting of the alfalfa trap crop for height control was associated with significantly greater lygus bug control in the trap crop and reduction of damage in neighboring strawberries.

Insecticides were sprayed on the alfalfa trap crop to reduce lygus abundance.



This graph shows the reduction in WTPB nymphal abundance in cut and uncut alfalfa trap crops exposed to insecticide applications in 2007. Arrows indicate application dates. Treatment differences with different letters are significantly different.

Potential Benefits/Impact:

The participating grower was optimistic that appropriate trap crop management strategies could enhance lygus bug suppression with limited, directed insecticide applications. Both Dibrom and Brigade significantly reduced pest densities, particularly lygus bugs, in the trap crops, a new finding that opens the door for further research inquiries:

- How can early-season (June) applications impact growing lygus populations?
- Which lygus bug insecticide is best suited to reduce lygus densities?
- What is the optimum application frequency?

Timed cuttings of the alfalfa trap crop could prevent trap crops from growing too tall and wide for spray applications to successfully penetrate the foliage.