Researcher controls aphids by planting alyssum

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By Bob Johnson

Alyssum planted in this lettuce field provides an energy source for hover flies that help control aphids in organic lettuce fields. Photo/Eric Brennan, USDA

More than a decade of detailed research has yielded a way to plant flowers to attract beneficial insects that effectively control lettuce pests without sacrificing any productive ground.

The discovery that as few as 500 to 600 alyssum transplants an acre, strategically placed throughout the field, can feed enough hover flies to control the aphid population could remake the balance sheet for organic lettuce pest control.

"It means that with these less-intensive intercropping patterns we can produce alyssum flowers for beneficial insects without losing any lettuce yield," said Eric Brennan, U.S. Department of Agriculture Salinas station research horticulturist specializing in organic vegetables.

Brennan has grown two-acre plots of organic lettuce, broccoli and strawberries at the 23-acre USDA organic field in Salinas for the last decade.

The lettuce research is financed in part by selling the harvest to organic wholesalers, which encourages the search for the most efficient use of the ground when deciding how to interplant the alyssum that is used to protect the lettuce.

"In order to continue the research, I was highly motivated to maximize the marketable yield and efficiency of the lettuce production," Brennan said.

When the lettuce study began more than a decade ago, Brennan planted one row in six in alyssum in order to attract hover flies to the field.

Female hover flies seek out aphid infestations to deposit their eggs, and the hover fly larvae feed voraciously on the pest.

"I like to think of aphids as walking milkshakes for hover fly larvae. In fact, the larvae of some hover fly species can eat up to 150 aphids per day before they mature into flying adults," Brennan said.

The alyssum provides a ready source of food that give the adult hover flies the energy to go forth and multiply, he said.

"Hovering in midair requires lots of energy, which the adult hover flies get from the sugary nectar of the alyssum flowers. The pollen provides the adults with the protein that they need to reproduce. After feeding on flowers, the females fly through the fields searching for lettuce plants where they will lay their eggs. The females prefer to lay eggs on lettuce plants with aphids, because the larvae that hatch from the eggs in a few days feed on the aphids," Brennan said.

The strategy worked, but the aphid control came at too high a price in terms of ground lost to lettuce production.

"The rows devoted to alyssum were obviously effective but they were also reducing the area for lettuce by 17 percent. This displacement of lettuce for insectary plants is a major concern for farmers in Salinas, where the land rents are high. After four years of successful lettuce production without any major aphid problems, I wondered if I could reduce the amount of space allocated to alyssum and still control aphids," Brennan said.

He began the long process of scaling back on the alyssum, eventually cutting down from 4,420 to 605 plants per acre, until he eventually found a way to attract hover flies without losing any lettuce yield.

Beginning with the fifth year of the trial, Brennan replaced double rows of alyssum with two rows that each had one line of alyssum plants and one line of lettuce plants.

"This still provided excellent aphid control and boosted lettuce yields by 8 percent because there were 8 percent more lettuce plants in the field," Brennan said.

The final touch was scattering a handful of the alyssum within rows of lettuce, and adding a few perpendicular lines of the insectary flowers.

"In year nine, we planted alyssum in the same rows as at the beginning of the trial, but there was only one alyssum transplant added every five lettuce plants in one line of the bed. The perpendicular lines of alyssum were added because I was concerned that the relatively low-intensity additive pattern in the eight insectary beds alone might not provide quite enough alyssum flowers to encourage hover fly movement through the whole field. However, I really don't know if this concern was justified," Brennan said.

This small number of strategically placed flowers turned out to be enough to maintain control of the lettuce aphid, he said.

"I highly recommend this additive intercropping approach for transplanted lettuce because it's more land-efficient, and it didn't reduce marketable head weight. It's interesting to note we achieved excellent aphid control all year despite the drastic reduction in the number of alyssum transplants per acre. I estimate that additive intercropping with about 500 to 1,000 alyssum transplants per acre distributed throughout the field should provide sufficient pollen and nectar for hover flies to control aphids in transplanted romaine lettuce," Brennan said.

The decade-long organic lettuce trial also led to the conclusion that using alyssum transplants is more efficient than direct seeding.

"With direct seeding, the weeds and the alyssum emerged at the same time. This was extremely difficult to hand weed, and the situation got worse as the weeds and alyssum got bigger and entangled together," Brennan said.

The transplants also offered insurance that hover flies could find food early enough to be of some help for a short-season crop like transplanted lettuce.

"Even in the summer, alyssum seedlings often need to grow for about a month before they begin flowering. In contrast, alyssum transplants are often flowering at transplant. Early flowering is important for transplanted crops like lettuce that may be harvested 39 to 49 days after transplanting," Brennan said.

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