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SARE Project Final Report  
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## ENCOURAGING SPIDERS FOR PEST CONTROL

In 1994 I noted an increased spider population in mulched potatoes (compared to unmulched), and a corresponding decrease in the number of certain pests. My goals in 1995 were to continue the study, but look at a few more vegetable crops. In addition I hoped to look at whether a vetch/oat mulch might offer an attractive habitat for spiders as well, offering a mulch crop that could be grown in the bed or row and mowed prior to cropping.

Farm update: Harmony Farm has 1/2 acre tilled for crop production plus another very small intensive garden. The 1/2 acre garden is located on a hilltop, in rocky lordstown soil. It has been irrigated on a "needs" basis by trucking in water in a tank (usually done in the beginning for seedlings). During the drought of last summer we could not truck enough water to meet the needs of the market garden, and only watered those crops used in the study. As a result, very little produce was sold. The main crops were potatoes, garlic, and vegetables for table use. Because of the lack of water, cover/mulch crops did not germinate. We decided to take the land out of commercial production for one year (1996) in order to raise a series of restorative green manure and cover crops.

The Enright farm (our cooperators) produce potatoes, garlic, and other market vegetables, with a total of an acre under cultivation. Even though they irrigated with pond water, they suffered almost total loss of market vegetables, and tilled in some crops to provide organic material for their soil. Their attempts to establish a cover/mulch crop was unsuccessful as well. Although they will continue to produce commercially this season, they will also be rotating more land into green manure and cover to restore the soil.

### **What we did, and How we did it**

The following crops were mulched with grassy hay (depth of 4-6") at the time of planting: cabbages, broccoli, peppers, tomatoes, beans, onions, squash, cucumbers, pumpkins, and potatoes. All crops were grown in raised wide beds except for potatoes. They were planted in rows. At time of hilling, I removed the mulch, hilled them, and re-applied mulch.

Mulched and unmulched plants received the same amount of water when they were hand-irrigated. Pest insects were hand-picked off plants in both mulched and unmulched plots (on the same day) when the pest population exceeded our standards (which were rather relaxed compared to the economic threshold levels in IPM manual).

Each week we sampled spider and insect populations. Because the test plots were small, we sampled every 2nd or 3rd plant rather than use the IPM scouting walk. Unfortunately, due to the

demand for transporting water to the crops, we had no time to keep track of weed control. General impression: there were fewer weeds in mulched areas but, like the crops, weeds basically died due to lack of moisture.

Yield records were kept for potatoes only, as other crops did not produce marketable crops (crop loss).

The second part of the study was to compare types of mulches. We intended to grow a cover crop of hairy vetch and rye or oats to overwinter for cutting in the spring of 1996. Into this mulch we would plant the crops. Our plan was to apply for additional funding for 1996 to cover population sampling for spiders & pests.

We were unable to begin this part of the study. Due to the severe draught conditions on our hilltop farms, we doubted any cover crop would germinate, especially hairy vetch which requires some moisture. So we broadcast buckwheat as a test cover. Germination was less than 50% (determined by area covered by seedlings), and we chose to not purchase the expensive cover crop seed.

### **What we learned: Results**

To compare pest and spider populations, I have combined the samples from the entire season for each treatment.

Curcubits. Mulched plots had more spiders than unmulched (74 compared to 21). There were fewer pests in mulched plots (9 compared to 175 in unmulched). Pests include aphids, squash bugs, and any other pest insect for these crops. A Chi-square test shows significant difference between both pest and spider population totals in mulched and unmulched treatments. No yield due to draught.

Tomatoes. Pest counts were: Mulched plots = 448; unmulched plots = 1054. Significant difference with chi-square. Spider populations were also significantly different: mulched plots = 63; unmulched = 22. No yield due to draught.

Potatoes. This year the mulch was put on weeks sooner than last year (in 1994 we applied mulch after hilling). Our '95 counts show significantly more spiders in mulched potatoes (118) than unmulched (58). There was no significant difference in pests, though there were fewer pests in mulched rows (454) than unmulched (488). Combining data for both years does show a strong trend of fewer pests in mulched potatoes. Yields were greater for mulched potatoes than unmulched (116# from mulched rows, 82# from unmulched).

One of the things Abby Seaman found when she was doing ANOVA for potato data was that there IS a significant difference in leafhopper populations, especially nymphs. This difference might be due to spider (or other) predation, especially as we didn't hand-pick nymphs. (Leafhopper data from 1994). Also, the hand-picking of Colorado Potato beetles interferes with analysis of the data.

Peppers. In mulched plots there were more spiders and fewer pests. Mulched = 19 spiders; 36 pests. Unmulched = 4 spiders; 42 pests. A trend, but not significant.

Onions. Due to the dryness I observed no pests. Curiously, there were almost as many spiders in mulched onions (17) as unmulched (14).



Beans, Cabbages & Broccoli. crop loss/ tilled in.

### **Relevant site information & Economic findings.**

Most relevant is the lack of irrigation. Not only did the local streams dry up, but large rivers and ponds. This had impact on cover crops as well as cash crops. In a drought summer, having mulch hay available is an advantage if the mulch cover crop won't germinate. I had hoped to investigate whether bed-grown mulch might offer an alternative (and still attract spiders) to hay. It is not an alternative unless you can be sure of water to produce a thick enough stand to mow the following spring.

One of the things we discovered is that we still had to control pests using hand-picking, although once we knocked the pest population down we did not have so much to do. Spiders and other natural enemies may be keeping the pests in check, but they do not eliminate them, and you have to constantly monitor pest populations. If a farmer does IPM scouting, and can use non-harmful ways to decrease pest populations (methods that will not harm spiders, beetles, and other beneficials) I think he will have a lower pest population. Hay mulches applied to crops like squashes, tomatoes, and the like do not interfere with crop management and harvest. If there is an economical way to apply hay (it takes an hour to mulch 70 row-feet to 6" depth if using fork and wheelbarrow), I think the increased population spider & other arthropods will benefit the farmers. However, I have no way of proving this economically. Working farmers don't have time to do this sort of thing - it takes a lot of field time and is more appropriate work for students.

### **New Ideas & Where to Go from Here**

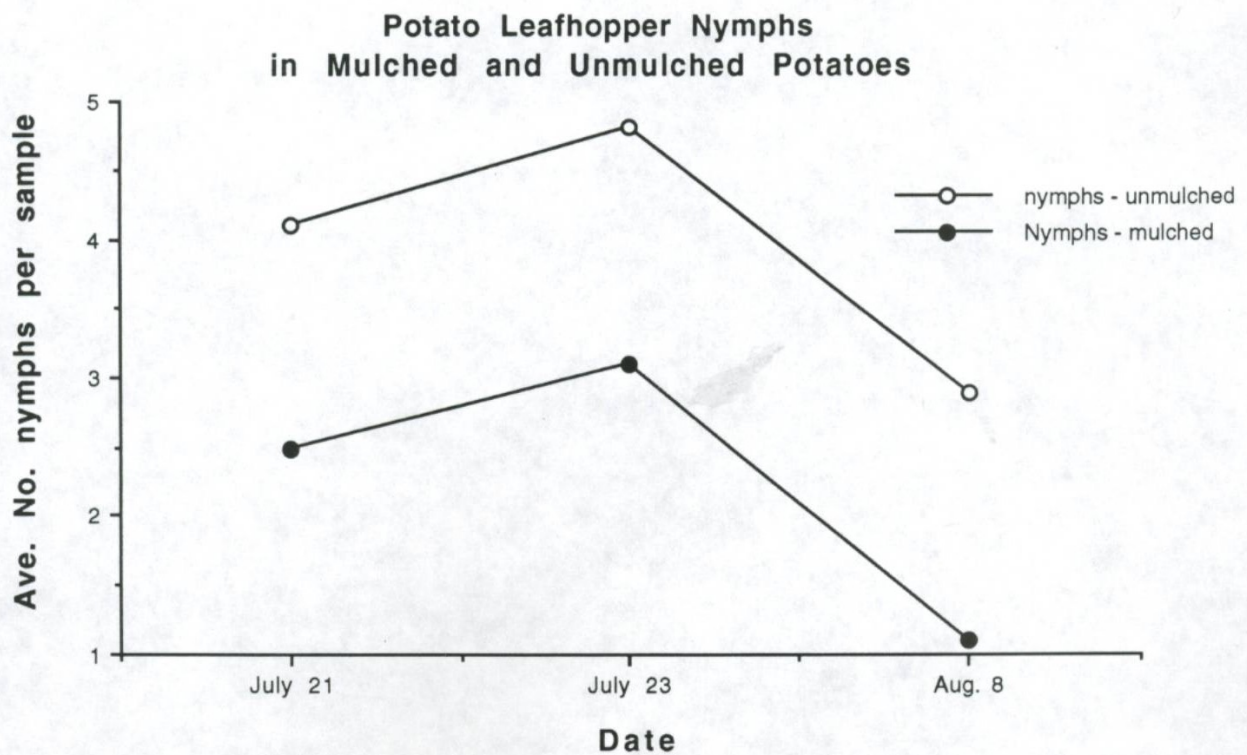
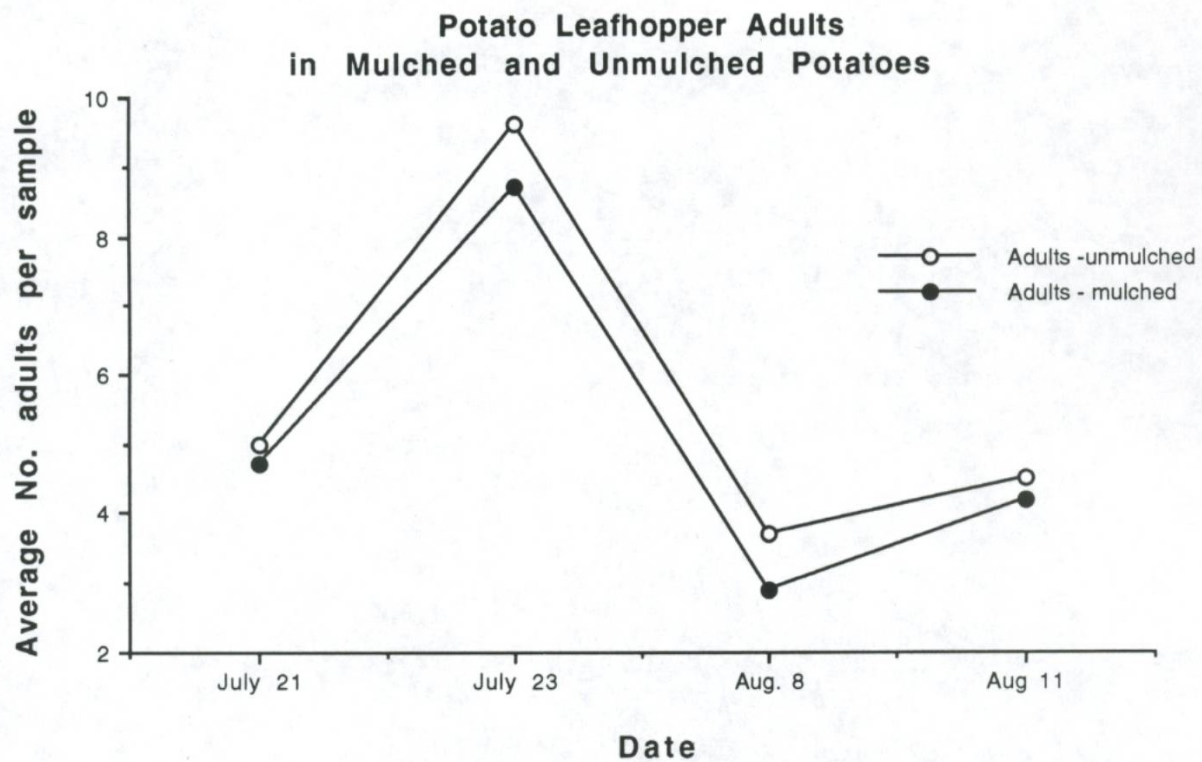
I think there is merit in looking at cover crops grown for mulching, and whether these provide attractive habitat for beneficials like spiders and ground beetles. Clearly one needs to consider the water requirements of non-cash crops, and requirements for irrigation may make this option less attractive. If I were to continue this project, I would choose one or two crops where mulching would not change crop management... like tomatoes or squashes. If water is a limiting resource, how would growing vetch cover crop in early August effect neighboring vegetables?

Abby Seaman has made a couple of suggestions I think worth considering. One, that it would be interesting to look at ground beetles, for they might be contributing as well as spiders to pest control. But more importantly, to focus on crops with pests that farmers can leave alone for an entire season. ( or else subsidize the crop loss and do no pest control measures like hand-picking.)

### **Outreach**

In the July/August issue of ORGANIC GARDENING magazine there was an entire article devoted to spiders. The author interviewed me about my garden experiments.

I reported this study in the following places: MOFGA (Sept/Nov 1995), The Gardener, and The Vegetable Garden Research. This summer I will discuss the spider project and other garden research at the Summer NOFA conference in Massachusetts. Also, on April 13th I gave a short talk and slide program on beneficial insects and shared some of my views on spiders (for a regional meeting of the upstate Men's Garden Clubs of America).





SPIDERS & MULCH

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