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Cover crops go round three with black plastic

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Posted by admin

By Lindsey Brielle

This is the third year of our three-year Sustainable Agriculture Research and Education (SARE) grant that is exploring alternatives to black plastic. Rodale Institute is collaborating with four other farms for this study: John and Aimee Good who run Quiet Creek CSA at Rodale Institute, Mike Baki of Community Supported Garden at Genesis Farm in Blairstown, New Jersey, James Weaver of Meadow View Farm in Bowers, Pennsylvania, and Doug and Elizabeth Randolph of Swallow Hill Farm in Cochransville, Pennsylvania near the Maryland border. This field study was designed to discover the impacts of black plastic and cover crops mulches on weeds, soil quality, yields and season length for tomatoes (Rodale Institute, Baki and Weaver), acorn squash (Good and Randolph), squash (Baki), melons (Baki), and cabbage (Weaver).

The project field consists of nine treatments at Rodale Institute, replicated four times, culminating in 36, 50-foot rows with 24 tomato plants per row. The nine treatments combine one of three cover crop treatments (vetch alone, rye alone and a rye/vetch mix) with one of three termination treatments (plowing for black plastic, mowed cover crop mat and rolled cover crop mat). Our four collaborating farmers, who have participated in project field work since the fall of 2010, have more simplified plot designs in their fields, comparing only two treatments (varying from farmer to farmer) with roller-crimping of a rye/vetch cover crop. For more detailed information about the treatments read Black plastic alternatives: Fertility, variety, seasonality.

Tomatoes in black plastic at Rodale Institute.

We are very intrigued by the preliminary results from last year in comparison to the year before. In 2010, the rolled vetch treatment was weediest (it had to be replanted due to winter kill and, as such, did not produce enough biomass to create a solid mulch mat), and the mowed rye/vetch mixture had the fewest weeds compared to the black plastic. Both the rolled and mowed rye and rye/vetch treatments kept weed biomass under 1500 kg/ha even at 8 weeks after planting, and both treatments also produced yields that were comparable to those of the black plastic treatment.

In 2011, the rolled rye/vetch treatment controlled weeds almost as well as the black plastic treatments at 4 weeks after planting, but after 8-10 weeks, most of the rolled and mowed cover crops were equally weedy, with biomass over 3000 lbs/ac (up to 6000 lb/ac). Unlike the 2010 results, in 2011 the black plastic treatments out-yielded all the other treatments in all the cover crop types. However, in the rolled and mowed treatments, the rye/vetch cover crop out-yielded the vetch alone and rye alone, and both termination techniques yielded equally in both the rye/vetch and vetch alone treatments.

The most noticeable trend coming out of the first two years of this study is the rolled rye vetch treatment is the most successful at suppressing weeds. Although the rolled rye vetch treatment out performed the other cover crop treatments last year it didn't compete as well with the black plastic treatment as the year before. We think this is due to the immense amount of rain we had late in the season. It will be interesting to see what results we get this year.

Rolling cover crops.

Upon further compilation and analysis of data from last year, we also saw there were areas where we could improve the study. For example, in 2012 we will be examining the soil biology in each treatment as an additional soil health test. This complementary analysis looks at soil health from a microbial perspective rather than a chemical point of view creating a more holistic view of the health of the soil.

We will take a composite sample from each plot at all the study sites and assess the quality of the microbial soil life. We are looking at micrograms of bacterial and fungal biomass, as well as total numbers of protozoa and nematode populations, noting the different size, shape, color, surface appendages, and movements of the bacteria, fungi, protozoa and nematodes. Then we can determine if we have the ideal microorganism numbers and diversity to adequately support the crop growing in a particular area.

We are also making a few changes to the weed biomass measurements and weeding procedure to make the plots more manageable for our collaborating farmers and improve the overall usefulness of the data for our farmer stakeholders.

Christine Ziegler-Ulsh taking weed biomass cuts.

We are still taking weed biomass cuts at four to six weeks after the crop is planted. However, after that cutting, we will then weed the plots, logging the amount of time spent on weeding and noting the differences in the weeding process from treatment to treatment. We determined that gathering data on the amount of time and energy spent to manage the weeds in each treatment would be more relevant to farmers than information on the weed biomass that the treatments produced as they consider adopting these techniques.

When taking our weed biomass cuts last year, we were using a quarter meter frame placed next to the tomato plants. After further reflection, we decided this method ignores the mass of weeds that grow at the edge of the black plastic. We are currently still considering our options on how to improve this procedure to include the weed growth next to the black plastic. One idea is to use a half meter frame, because it should be large enough to encompass the weeds beyond the edge of the black plastic that we were not able to capture with the smaller quad.

We are looking forward to another year of discovery in the world of cover crops and black plastic. And we are currently developing a field guide for cover crop use which we should be releasing in the fall.

This material is based upon work supported by Northeast SARE, under Subaward LNE 10-295.

Tags: cover crops, farming, organic no-till, research, rodale institute, SARE, soil health, weed management

2 Responses to “Cover crops go round three with black plastic”

1. *Diane*
   June 9, 2013

   Do you know where I can find the effect of “black plastic” on the bio-system of the soil underneath it?

   Rather than spraying as seems to be the practice even of landscapers concerned about the environment, I’m using a roll of roofing rubber for an entire growing year to eliminate European bellflower in an area of my yard. While I know this is not a permanent solution due to their seeding and vigorous root systems, I’m more concerned about what effect it has on the rest of the living organisms under that roofing rubber. Does it all turn into the Sahara or what? (Minnesota)

   Reply

2. *amanda*
   June 11, 2013

   Hi Diane. Our researchers said…

   There are several components to the answer, depending on exactly how you are using your version of the black plastic approach.

   If the black plastic is sealed around the edges and there are few holes are in the plastic so no air gets under the plastic, extremely anaerobic conditions will occur especially as the temperature climbs into the 100-degree F or more range. If moisture is present when the temperatures hit above 100-degrees F, then most of the beneficial organism, as well as disease organisms in the soil, will be steam-killed, or solarized. Once plastic is removed, if no or few beneficial organisms remain, the “bad guys” (pathogens, pests and parasites) will easily take over.

   To “fix” the imbalance, when the plastic is removed apply a strong dose of excellent compost, compost extract or compost tea with all the beneficial organisms present in order to resuscitate the beneficial life needed by plants.

If plenty of air holes are cut into the plastic, and/or if the edges of the plastic are not all sealed shut, then lack of oxygen is less likely, but effective solarization is also less likely.

These sorts of effects are discussed in papers about solarization, but the effects on beneficial soil microorganism and on the whole Foodweb are not well studied.

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