

Organic weed control in no-till vegetable systems

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Cover crops of rye, hairy vetch, hairy vetch+rye, tillage radish and no cover crop have been grown over the last 5 years and vegetables have been planted into these various cover crops which were managed in several different ways for weed control.



These methods included:

1. Using tillage or strip tillage and planting into bare soil
2. Tillage using plastic mulch or biodegradable OMRI approved mulch or paper mulch
3. Rolling and crimping the cover crop and planting directly into the killed mulch

This report examines using no-till of cover crops for weed control in organic vegetables

The roller-crimper is used to break (crimp) in several places along the length of the stems of the cover crops to more completely dry out the plants than if they were simply rolled. This crimping must be done at certain phenological times in the growth of the cover crop or the stems are too resilient and will not crimp sufficiently to die. For hairy vetch, plants must be in late flowering with seed pods just beginning to form on the stem. For rye the seed-heads should be in early dough stage for crimping to take place. Tillage radish can not be crimped and should winter kill (but sometimes it does not). Waiting for the best time to crimp does lead to later plantings-usually in late May or in early June in central Maryland.



This is an area of vetch, rye, rye+vetch, tillage radish and no cover crop that was crimped and rolled 2 weeks prior to this picture being taken. You can see sweet corn coming up through the mulch. Corn was planted just a few days after crimping.



This is about 4 weeks later. The sweet corn is doing well in the vetch and rye+vetch areas (foreground) but not as well in the rye area (or in the tillage radish area or the no cover-crop area both of which look like the rye area-background) with a great deal of grass weeds choking out the corn. So even though all the areas started out looking the same many of the cover crops do not do a good enough job of preventing grasses coming up through the mulch.





In some years the grass was so bad that yields of sweet corn were reduced by 40%.

The worst years are the ones that have a great deal of rain, especially large thunderstorms that drop several inches of rain in a short period and then it dries out for many days. The grasses respond to this by growing rapidly through the mulch and taking up much of the rain water and nutrients during the rest of the summer.

In the last few years I have started to use weed barriers on top of the tilled soil, but especially on top of the crimped cover crops. These barriers are cloth-like but tough (still using the same ones after 3 years) that allow rain to pass through. These barriers are then placed alongside plants in a row and staked down for 1-2 weeks. I usually try to cover weeds after they have flushed and are small, but sometimes the weeds get ahead of me.....



Here is a no-till crimped area in early June with a good stand of grass in my tomato planting—it was a wet spring. I did not think there was much hope for the barriers to work, but I tried laying down a 50 ft long x 4 ft wide weed-barrier on either side of the tomato rows and let them sit for just 2 weeks and then I moved them by taking out the ground pins and sliding the barriers down the row until they reached the prior end of the barrier.



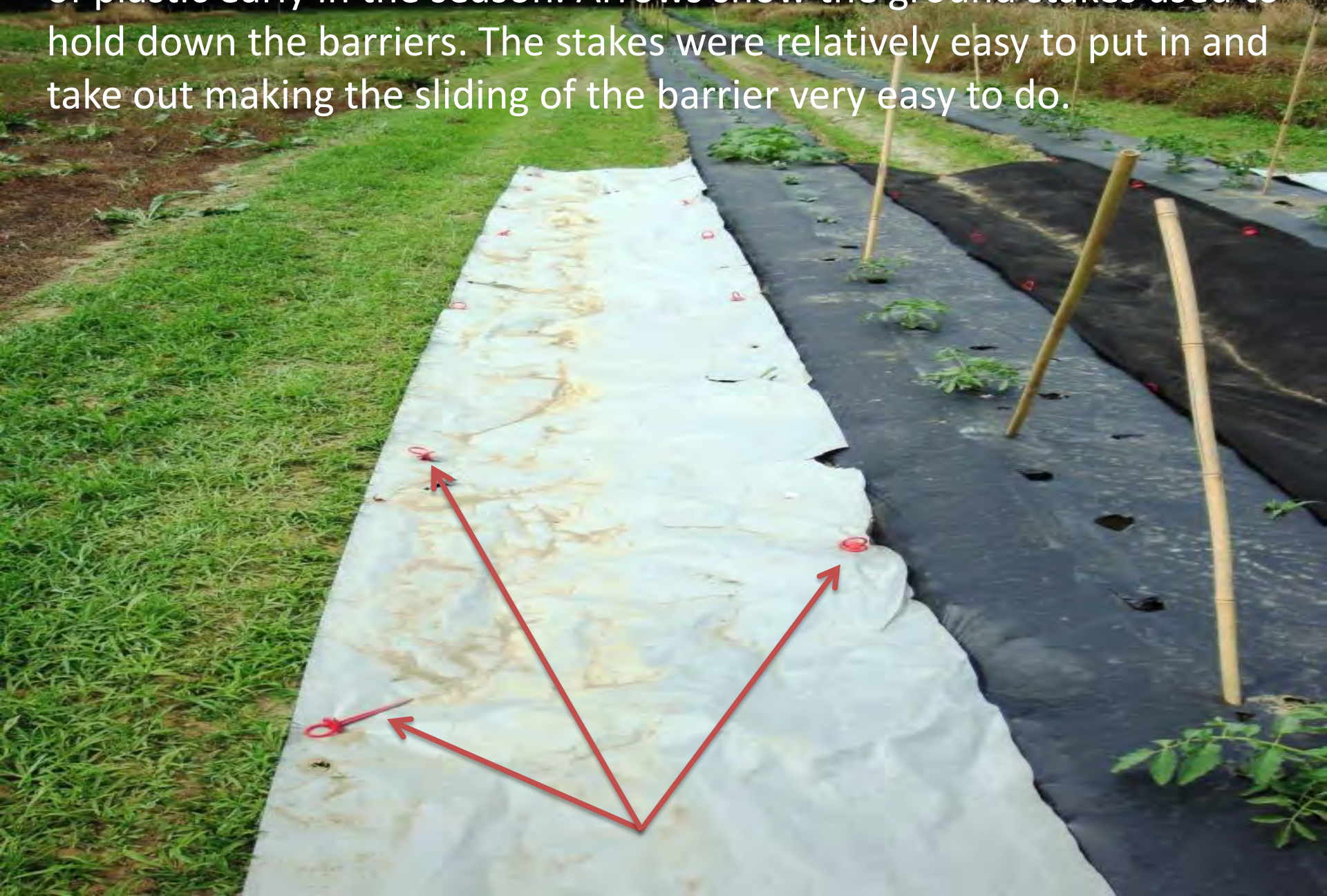


This is the results of letting the barriers sit in one spot of heavy grass for 2 weeks. The grass is not only dead, but also adds to the mulch layer of rye or vetch. The barrier was moved, slid-down another 50 ft for 2 weeks to kill the grass in that area of the tomato field. The barrier works best when it is sunny, hot and dry. That makes the results here even more remarkable as this was a wet spring/summer. I only needed to irrigate once the entire season. The rains were consistent and moderate throughout the entire growing season and yet the barrier still killed tall grass in as little as two weeks. You can see what happens if no barrier is used in these areas with the white arrows. These areas had a crimped cover crop, but no weed barrier.

This is a close-up of a very grassy area that had the weed barrier on it for 2 weeks during the early part of the season. This is 8 weeks after the weed barrier was removed and the weed control is still very good. What is occurring here is the creation of a 'stale seed bed' under the mulch. As long as the soil is not disturbed a great deal, new weed seeds, even grasses, will not germinate to any great extent. Workers can walk on the mulch without disturbing the seed-bed and the mulch keeps the field much cleaner for workers and the tomato plants.



This is looking at paper mulch vs the weed barrier between rows of plastic early in the season. Arrows show the ground stakes used to hold down the barriers. The stakes were relatively easy to put in and take out making the sliding of the barrier very easy to do.



This is 2 days after the barriers were moved down the row





This is 4 weeks after barriers were moved...



...and this is 8 weeks after barriers were moved.

On bare tilled ground using the weed barrier we can get some very clean areas if it goes down early in the season after a flush of weed growth occurs. However, without a cover-crop mulch being present the ground is always being 'roughed up' with foot steps of workers doing their jobs in the tomatoes (pruning, staking, tying, in row weed control, data collecting, etc. thereby causing seed germination and greater weed density in these areas vs in cover-crop mulched areas.





The right side of this row of pumpkin and squash had a weed barrier for 2 weeks, the left side did not have a barrier. There had been a heavy rain a few days before removal and it flooded the area under the weed barrier moving soil on top of the mulch (arrows). Weed seeds can now germinate from this soil.



The area above the black line had been mowed (old lawn mower set at 2.5 inches) about three weeks prior to the picture. The grass weeds are coming back.

The area below the black line had a weed barrier for 2 weeks, this is 10 weeks after its removal, still with good weed control.

Summary

The crimping/rolling of the cover crops is usually not enough to have good weed control throughout the season.

Using the weed barrier will kill a flush of new weed growth or a thick stand of 1-3 ft tall grass or broadleaf weeds.

The weed barrier does not have to sit very long, just 1-2 weeks (1 wk if dry and 2 wks if wet) to create a 'stale' seed bed under the mulch or on the bare ground. It can then be moved to another location in the field for weed control.

Once removed, the weed barrier provides 2-3 months of good weed control if there is a cover-crop mulch layer present, if just bare ground the weed control lasts 4-6 weeks, but longer under dry conditions.

The weed barrier is not too laborious as one person can move the barriers and set them up again. Mowing weeds on top of the cover crop mulch is another option as this gives good weed control for ~3-4 weeks depending on rainfall amounts—more rain shorter control.



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Questions

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