

Biodegradable Mulch Demonstrations Update January 2012

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In order to look at the possible labor and resource savings Penn State Extension educators, working with growers, laid biodegradable mulch at seven sites in Northampton, Berks, Schuylkill, Snyder, and Bucks Counties. Take a look at what we learned and farmer tips on how to work with biofilms.

We all know the benefits of plastic mulch. Not only does it keep the weeds down, it warms up the soil giving us earlier (and more) tomatoes, peppers, eggplants and other heat loving veggies. But it costs us. Farmers estimate it costs \$25-100 an acre for labor and disposal of plastic mulch. A possible alternative to black plastic mulch is biodegradable film mulches that look and act much like black plastic, but instead of ripping them up in the fall, you till them into the soil and the microbes degrade the material, leaving you a clean field (hopefully) in the spring.

What is biodegradable mulch? Good biodegradables are made from plant starches such as corn and wheat. Soil microbes break down the starch into CO₂ and water. Warm, moist conditions that favor the microbes speed up biodegradation. Sticky starches help them adhere to soil, keeping them from blowing away/ littering. The technology has changed from the old degradable films made from polyethylene which degrades slowly and sometimes become dry and brittle, blowing into the neighbor's yards and hanging from the trees.

How do biodegradable mulches perform? At five of seven sites growers felt Eco-One and Biotelo performed well, sufficiently suppressing weeds and warming the soil. Biotelo seemed to be a bit more fragile than Eco-One. This may be by design to ensure sufficient decomposition over the winter. Two farmers tried paper mulch from Sunshine Paper Co. They were not able to lay it due to difficulties with ripping. In the two sites where the mulches did not sufficiently suppress weeds there were problems with perennials: sedge, thistle and johnsongrass. Sedge and thistles in particular poke right through the biodegradable films. There was no plastic at the site with sedge but sedge is known to pierce even regular plastic mulch. Research by Dr. Orzolek (2008) found that "Biodegradable performed as good or better than plastic for yields in pepper, cantaloupe."

Tips to working with biodegradable mulches – The biodegradable films are more fragile than black plastic mulch. Growers found it is critical to release the tension on the plastic layer to keep it from ripping. Just like black plastic, laying biodegradable mulch correctly is important. You want nice full beds with the edges well covered. When the beds are too clumpy or uneven the film will not lay nicely against it and stick to the soil. Loose film then can be battered by the wind and quickly fray. Loose edges will allow the wind to get underneath. There is nothing worse than seeing the wind pick up an entire bed of mulch newly transplanted to tomatoes. Unlike black plastic that you might be able to cover back up later, the biodegradable film becomes sticky when wet and adheres to itself where folded if you don't catch it right away. Growers also found that if they did not plant into Biotelo or Eco-One right away the mulch became fragile and tended to tear when they were transplanting. This seemed to impact the overall effectiveness of the mulch.

It is important to follow the manufacturer's guidelines:

- Avoid excess tension when laying.
- Plant immediately after laying.

- Do not store for a second season's use.
- Avoid transplanting mid-day in higher temperatures.

Additional tips from farmers include:

- Adjust the 'covering wheels' on the bed-maker so they do not nick the mulch. Nicks can turn into long tears.
- Use with crops that put on a lot of foliage and shade the soil early.

"When it got hot, it got loose and actually wrinkled. Try to avoid planting in the heat of the day. Keep the tension at the lowest setting to avoid tearing it. Cover the edges well. Don't walk on it and keep it tight to the ground." - Andrew, Frankenfield Farm Market

"Just like plastic good bed preparation is important. If the soil is cloddy, and the film too loose it will blow around and is more likely to pull up. If it does it tears easily and sticks to itself. Make sure you cover the edges well. Unlike regular plastic mulch you can't lay it super tight. I have seen it rip right down the middle from being too tight." - Tianna, Shooting Star Farms

"It flops around a little. Be careful with small seedlings." Harold, Meadow Gate Vista Farm.

"It seems that both Biotelo and Eco-One perform better when used with crops that put on foliage or shade fast like summer squash or tomatoes." Mike, Little Peace.

Aren't biodegradable mulches more expensive? The cost of biodegradable mulch has come down recently. With 2012 prices Eco-One is \$392/A for biodegradable mulch compared to \$314-424 for black plastic plus removal and disposal costs. This assumes \$80-100 for the labor to remove plastic mulch and \$10-100 for disposal.

For more information including pricing and distributors visit see the [biodegradable mulch factsheet](#).

Please see the following descriptions from each demonstration site for more details and advice from collaborating farmers.

Barefoot Gardens, Doylestown, PA.

Eric and Linda Vander Hyde run Barefoot Gardens in Doylestown, PA. They laid Biotelo and Eco-One starch based mulches on May 3rd for summer squash, cukes, melons, tomato, and peppers. Eric said that, "[Eco-One] laid down really well and was great to work with." Biotelo was just slightly more difficult to lay. He also tried a paper mulch from Sunshine Paper. He said he could not lay it without help.

Over the course of the season Eric says there were few differences between Eco-One and Biotelo. No weeds broke through the mulch. They were only in the pathways up through Mid-Aug. Bottom line: Biotelo and Eco-One both performed fine. Biotelo was more fragile than Eco-One. Paper mulch was difficult to lay and liked to tear.

Meadow Gate Vista Farm, Bowers, PA.

Harold Weaver runs Meadow Gate Vista Farm in Bowers, PA. He grows tomatoes, pumpkins, sweet corn and other vegetable crops working with his father James Weaver. Between Harold and his father they

have up to 25 acres in plastic mulch in a year. This year Harold tried biodegradable mulches – Biotelo and Eco-One for early sweet corn and tomatoes. Harold felt that, “[Biotelo and Eco-One] laid similar to plastic mulch.” Next time he might adjust the tension, as beds seemed a bit loose. Even though the wind picked it up in the middle a little, “it did not blow up and once plants were in seemed fine.”

Harold lays a thick layer of straw mulch down in his pathways. This seemed to protect the biodegradable mulch from tearing where it meets the soil and cushion it to foot traffic which tends to destroy the mulch. He was concerned that with early sweet corn the ground would not warm up as well. But Harold said if it did he, “Did not notice any differences, sweet corn planted the same day [into plastic] looked identical.” On September 1st, when I asked him when the weeds started to break through he said, “With all the wet weather in last few weeks, no weeds yet.”

One thing Harold warned us about is that the biodegradable mulches tend to be looser and flop around a little bit. He worries that with small transplants they will get battered. They did not have a problem since their transplants were large, but I did have a similar problem with small hot peppers.

They are interested in the biodegradable mulches to save labor in the fall. Picking up plastic is not a fun job. On the acre close to his house Harold estimates that it takes about 1 day/ Acre/ person; about \$80-100 in labor. This could be a big savings if it breaks down like it is supposed to.

Little Peace, Schuylkill Haven, PA.

Michael Scheidel runs Little Peace Farm, a family farm located near Schuylkill Haven, PA. They grow chemical-free, seasonal vegetables for their CSA members, restaurants, and farm market customers.

He laid Biotelo and Eco-One mulch on May 6, 2011 using a standard older model mulch layer. The plots were in two different parts of the farm. He planted tomatoes, peppers and melons into 2,000 linear feet of mulch. Mike said “Both laid fine, no problems, nothing more to adjust.”

Sedge grass began breaking through almost immediately, but most other weeds held off until the mulch was punctured or torn. It was difficult to tell if the weed pressure affected yield. Because of the extreme dry conditions [July] early pepper yield was down due to competition with weeds but other than that he thought his yields weren't affected. In terms of soil heating he did not notice much of a difference in when crops came in compared to conventional plastic but felt it was definitely earlier than bare ground or straw mulch.

Comparing Eco-One and Biotelo: *”Eco-One broke down very quickly on smaller transplants like peppers. By the time the peppers began to size up and put on foliage the mulch had already gotten brittle and began to shred. By fruit set, weeds were already coming through the tattered mulch. It also was breaking down quickly on my watermelon transplants. In both the peppers and the melons it became completely in-effective in controlling weeds by the middle of the season. It seemed that both Biotelo and Eco-One perform better when used with crops that put on foliage or shade fast; summer squash, tomatoes in my case. I used Eco-One on my first summer squash and zucchini and it held up better than the other crops I had on the same product.”*

Potential time savings: 2hrs/1,000 feet – 14 hrs/A

Potential disposal cost savings: \$30-50/yr -overtime with normal trash pickup.

Carl Wenger Farm, Liverpool, PA.

Carl Wenger runs Carl Wenger Farm in Liverpool, PA. He laid black plastic, Biotelo and Eco-One in the end of May. He did not make any special adjustments to the mulch layer. The biodegradable mulches went through the layer nicely. Carl felt he might have stretched the mulch a little too tight. The first holes in the mulch occurred where the press wheels touched the mulch. At the end of July both biodegradable mulches were holding up well. In July they were brittle and cracked when walked on. The cucumber harvest in that field will conclude in early August. There were a few more weeds in the biodegradable mulch due to small holes that formed about a month after laying. Overall he did not feel there was a significant difference between the effectiveness of the mulches.

Stouts Valley Farm, Raubsville, PA

Steve Bandi runs Stouts Valley Farm in Raubsville, PA. He grows 12 acres of tomatoes and peppers in plasticulture plus pumpkins, cabbage, hay and wheat. Steve laid biodegradable mulch in two 2,000 foot strips as part of his third planting of plasticulture tomatoes on June 10, 2011 using a Rainflo raised bed layer with the tension all the way out. Between plastic weed control was with Gramoxon. Steve felt that the biodegradables "Did not lay as well as plastic. We had to go back and cover the edges in some places." In mid July there were minimal differences between the two biodegradables. Biotelo and Eco-One did not start to break down until September, three months after they were laid. At that point there were tiny henbit weeds growing in the tares.

Cost Comparison: Steve uses about 7,000 feet of plastic per acre. One 8,000 ft roll at \$349/ A of biodegradable mulch (Eco-One). Regular plastic runs him \$95/ 4,000 ft roll. At two rolls/ A it costs him \$200/ A for plastic mulch. If you add in labor – plastic removal for an acre takes two hours for three guys, plus the tractor operator or about \$100/A acre. Disposal in this area is about \$50/ Ton. For 400 lbs of plastic/ A, another \$10/ A. Including these extra costs that is \$310/ A for plastic mulch plus removal and disposal. That does not include the time and hassle to dispose of it.

Raub Farm Market, Tatamy, PA.

Jeff and Kathy Raub run Raub's Farm Market in Tatamy PA. They produce corn, soybeans, pumpkins, mums, and mixed vegetables for their farmstand. This year they tested using plastic and biodegradable mulch for the first time. They laid plastic, Biotelo and Eco-One side by side with a Nolst plastic layer on May 9, 2011. Tomatoes, peppers and eggplants were transplanted into the mulch a month later.

It was difficult to lay the mulch due to wind and incorrect settings on the layer. The edges were not buried sufficiently and blew up in some places a few days later. There seemed to be a different flexibility between plastic, Eco-One and Biotelo.

The weeds started breaking through in July. There is significant thistle and johnsongrass pressure in this field. These perennial weeds were not sufficiently suppressed by the biodegradable mulches. There was also significant weed pressure between the beds.

However in terms of soil heating Kathy was pleased with how much quicker eggplants were ready compared to bare ground.

Frankenfield Farm Market, Elroy, PA.

Andrew Frankenfield, Penn State Extension, runs Frankenfield Farm Market with his family in Elroy, PA. They produce pumpkins, sweet corn, tomatoes, hay, soybeans, and flowers. He laid biodegradable mulch

June 1st, 2011 using a Rainflo 2550 raised bed mulch layer and a old flat bed mulch layer trailer type. Peppers, eggplants, tomatoes, zinnias were transplanted into the biodegradable mulches.

According to Andrew the biodegradables “laid fine, no issues. One time with the flat bed layer the mulch tore and we had to back up and overlap.” Andrew has worked with the biodegradables for a few years and has the following advice for using these films. “When it got hot, it got loose and actually wrinkled. Try to avoid planting in the heat of the day. Keep the tension at the lowest setting to avoid tearing it. Cover the edges well. Don’t walk on it and keep it tight to the ground.”

By July one row of the Biotelo started to tear at the side of the bed and as the wind got under it, progressed down the row. Both types started to get small holes in the plastic, it almost looked like birds were pecking at it, for the most part it stayed in place and provided good weed suppression. At the end of the season Andrew felt, “It performed as it should have. It is still mostly in place and is now breaking down.” Other than some annual weeds around the transplant hole and the edge of the plastic, weeds coming through the plastic was not an issue. In early September winter annual weeds were germinating where the plastic was coming off.

One problem Andrew has had is using Eco-One for a second year in a row last year. It seems to break down quickly and is very brittle the second year. This is a problem because the rolls (8,000 feet) are too long for him to use in one season.

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