

Biodegradable mulches: How well do they work?

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Background

Vegetable growers in New York and the Northeast rely on black plastic mulch film to enhance early growth and total yield of many crops, including cucurbits, peppers and tomatoes. These polyethylene mulch films help growers achieve early, more lucrative markets through improved soil temperatures, water and nutrient availability. A continuing problem with using plastic mulch film, however, is the increasing costs of disposal. Grower estimates of labor to pick up plus charges to dispose of plastic mulch film at a landfill range from \$25 to \$100 per acre, depending on landfill fees. While black plastic mulch film is relatively inexpensive, biodegradable mulches could be tilled in at the end of the season, reducing labor hours for pick up as well as disposal costs. Biodegradable mulches of interest are those made from plant starches (corn or wheat) and are completely biodegrade in the soil. Soil microorganisms should be able to break down the mulch to carbon dioxide and water, leaving no mulch residues in the soil. Ideally, these mulches would adhere to the soil, so they do not blow off the field as they degrade. Other degradable films have been commercialized, but growers have complained that breakdown is uneven and large pieces may blow off the field, creating litter. These other degradable films may also be made primarily of polyethylene, and degrade very slowly in the environment.

Predicting degradation is the challenge with using biodegradable mulches. Generally, thicker biodegradable mulches should last longer in the field, but our experience has shown that breakdown rates are not always tied to mulch thickness. With biodegradable mulches, the rate of break down is affected by climate (temperature, sunlight and moisture), soil type, crop cover and weed pressure. Ideal conditions for crop growth are also those that will help with the breakdown of biodegradable mulch. Warm temperatures, rainfall and sunlight enhance microbial activity of the soil and speed the breakdown. Soils higher in organic matter will generally have higher microbial activity, leading to faster breakdown. As the crop grows over the mulch, the shading will provide some protection of the mulch against the sun. As the mulch breaks down, weeds that emerge through holes in the mulch will stretch the mulch and speed breakdown.

Our research

For the last several years, we have been evaluating new types of mulches for use in vegetable production. We are interested in finding reliable substitutes for black plastic mulch. Our efforts initially focused on paper mulches, and now we have focused on a biodegradable product. This is very different from the photodegradable products released years ago. This mulch is primarily made of plant starches that can be broken down by microorganisms in either soils or composts. We evaluate soil temperatures, air temperatures above the mulch, crop growth rate and total yield and quality of melons. We use melons as our test crop, based upon their sensitivity to soil warming and responsiveness to black plastic mulch.

Our Results in 2006

Field application of Mater-Bi was similar to black plastic. The products had excellent stretch and soil temperatures were similar early in the season. Mid season plant fresh weights indicate that growth on Mater-Bi mulches was similar to black plastic. All Mater-Bi products were starting to break down (areas exposed to direct sunlight) at the end of July. Despite some early breakdown, we found no differences in early or total yield with any of

the different colors of biodegradable mulch and black plastic mulch. Average fruit size and weight (4.0 lbs) were similar among mulch treatments.

Farmer Comments 2007

Most growers interviewed have used biodegradable and plastic mulches for at least two growing seasons. Four growers are using organic growing practices. A farm in New York used 15,000 feet this year and would like to grow other crops on it in the future. Crops grown were basil, tomatoes, eggplant, peppers, pumpkins, green beans, flowers, muskmelons, watermelons, carrots, zucchini, summer and winter squash, sweet potatoes, cabbage, onions, and early broccoli. Mulch layers are used to apply mulch. All growers were satisfied with how it laid, lasted and dissolved in the field. It is very important to have all tension off the roll when laying unlike plastic. A grower greased the spindle of their mulch layer to ensure the mulch would not stretch excessively during application. A grower in MA observed in fields with higher organic matter mulch broke down more quickly, especially when rye stubble is present. They also found mulch was not strong enough to grow crops with close spacing (onions and garlic) or when stepped on frequently (staked tomatoes). Although another farmer in NY said they grow onions successfully on biodegradable mulch. Another suggestion is to apply mulch early in the day when temperatures are lower to decrease stretching. Stretching tends to cause the mulch to breakdown more quickly. Many growers rototill or disk the mulch at the end of the season. Using an interseeded can be a problem when planting a fall cover crop with mulch present. Pieces of mulch can be entangled in the seeder or even a rototiller.

A farm in the western US was able to supply their CSA members with a much wider selection of crops this year while using biodegradable mulch. The farm is located in La Jara, Colorado where the growing season is about 90 days (8000' elevation). By using biodegradable mulch, they have added 2-3 weeks to their season. Eggplant, cucumbers and peppers are now grown. Overall farmers are very happy with the mulch's performance on their farm. They feel biodegradable mulch has many advantages despite its high cost. They don't have the cost of dumping fees and labor to remove it or plastic in their fields.

Important Tips for Success with Biodegradable Mulches

Storage

Cool and dry- this product will start to degrade if stored warm and moist!

Buy what needed each year

Store upright, on ends avoids getting holes in the roll

Application

Do not stretch as tight as standard black plastic

- Stretching starts the degradation
- Will increase rate of breakdown

Apply right before planting

- Sunlight and moisture will start breakdown

2007 Commercial Sources

Biobag USA

www.biobagusa.com

1-800-959-2247

1-800-959-2248

Dubois Agrinovation

www.DuboisAg.com

1-800-667-6279