Soil-Biodegradable Plastic Mulch in Organic Agriculture

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Summary:
Soil-biodegradable plastic mulch (BDM) can be a sustainable technology with several advantages over traditional plastic mulch, such as reduced labor costs for removal and disposal, and reduced landfill waste. Biodegradation of BDMs under field conditions depends upon its feedstock and soil microbes, temperature and moisture. Environmental factors affecting biodegradation include climate, soil type, pH, and other production practices. This fact sheet provides an update on the use of soil-biodegradable plastic mulch film in organic agriculture.

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USDA United States Department of Agriculture National Institute of Food and Agriculture

Soil-Biodegradable Plastic Mulch for Organic Production Systems

Soil-biodegradable plastic mulch film (BDM) has been commercially available since the 1990s, and in October 2014 the USDA National Organic Program (NOP) added BDMs to their list of allowed substances, defined in rule §205.2. However, one of the criterion for that rule was that BDMs must be made with 100% biobased feedstock material, which is commercially unavailable. In October 2021, the National Organic Standards Board (NOSB) Crops Subcommittee has proposed the following annotation change to the rule for BDMs:

(1) Meets the compostability specifications of one of the following standards: ASTM D6400, ASTM D6868, EN 13432, EN 14995, or ISO 17088 (all incorporated by reference; see § 205.3)

(2) Demonstrates at least 90% biodegradation absolute or relative to microcrystalline cellulose in less than two years, in soil, according to one of the following test methods: ISO 17556 or ASTM D5988 (both incorporated by reference; see § 205.3)

(3) Must be at least 80% biobased with content determined using ASTM D6866 (incorporated by reference; see § 205.3).

BDMs that do not meet these criteria should not be used in organic agriculture. At this time there are no commercially available BDMs that meet these criteria outlined for use in organic agriculture by the NOP and NOSB Crops Subcommittee.

Mulch Biodegradation

Biodegradation of BDMs under field conditions depends upon its feedstock and soild microbes, temperature and moisture. Prevailing environmental factors that affect biodegradation include climate, soil type, pH, irrigation, and other production practices (e.g., tillage, cover cropping, chemical input application). The

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biobased content of a BDM indicates the source of the material that is used to make the mulch film. However, it is important to note that BDM biodegradation is not dependent upon its biobased content. Environmental weathering of the mulch film and the chemical properties of its feedstock (e.g., chemical bonds) influence the susceptibility of a BDM to biodegradation.

Growers will need to take appropriate action to ensure that proper degradation of the mulch is occurring; BDM fragments following till-down must be well incorporated into the soil to encourage breakdown. If an operation or grower uses practices that do not promote degradation, mulch plastic fragments will accumulate in the environment over time.

Product Organic Compliance

There are several BDMs available in the U.S. and worldwide. **Currently, no BDM made with plastic polymers has been approved for use in certified organic production because, so far, none meet the requirement of using at least 80% biobased feedstock.** Non-biobased synthetic polymer feedstocks, such as petrochemical resins, are not permitted for organic agriculture, nor are feedstocks derived from, or using, GMO organisms. Before using any product in a certified organic production system, check with your organic certifier to ensure that such use is in compliance with your certification.

On-Going Research

University research programs are investigating the use and biodegradation of BDMs in fruit and vegetable crop production systems. To date, most research has shown yields of crops grown with BDMs are equivalent to when they are grown with polyethylene mulch. Special attention is currently focused on characterizing BDM degradation constituents and their fate, residence time, and potential for ecotoxicity effects to better understand their impacts in soil and aquatic environments. An overall goal of the research is to provide growers, crop consultants, manufacturers, and policy makers with data that can be leveraged to make informed recommendations. Research results will also provide growers with a guide of best management practices for the use of BDMs.

Additional Information

Visit our website https://smallfruits.wsu.edu/plastic-mulches/ for more information about BDMs in fruit and vegetable crop production systems. You can also follow us on Twitter!

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