Compostable Bags: A Glance of What's Packed in the Bag

Institute for Local Self-Reliance

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Compostable plastic bags are becoming more prevalent in the market for use in collecting food scraps for composting. Compostable bags effectively remove the "ick factor" associated with collecting food residuals by keeping collection containers clean and odors at bay.

Unfortunately, there are now many plastic bags in the market claiming to be "biodegradable" or environmentally preferable in other ways. Often claims cannot be verified or are misleading. The companies selling these products are taking advantage of markets that are unaware of the difference between certifiable compostable and biodegradable products and those that are not. Oxo-degradable plastics, for instance, do not meet any standards in place for biodegradability and should not be considered biodegradable or compostable.

While many bioplastics are certifiable as compostable in commercial compost facilities, not all can be home composted and not all are biodegradable in the marine environment. Furthermore, a number of petrochemical-based polymers are certified biodegradable and compostable. Biodegradability is directly linked to the chemical structure, not to the origin of the raw materials.

Truly biodegradable plastics are plastics that can decompose into carbon dioxide, methane, water, inorganic compounds, or biomass via microbial assimilation (the enzymatic action of microorganism). To be considered biodegradable, this decomposition has to be measured by standardized tests, and take place within a specified time period, which vary according to the "disposal" method chosen. The American Society of Testing and Materials (ASTM) has created definitions on what constitutes biodegradability in various disposal environments.

Plastics that meet ASTM D6400, for instance, can be certified as biodegradable and compostable in commercial composting facilities. In Europe the equivalent standardized test criteria is EN 13432. Other countries have similar standards and certifications. Belgium is unique in offering "The OK Compost HOME" mark, which assesses whether the product can be composted in home composting systems.

The purpose of this fact sheet is to provide purchasers with information on compostable plastic bags and environmental attributes worth considering in order to drive demand for environmental preferable biobased products.

ILSR surveyed compostable bag manufacturers to solicit data and requested bag samples, which we had tested for biobased content and marine biodegradability (see table). All the compostable bags surveyed meet the standards for compostability in commercial composting facilities. But they differ in other aspects, such as their biobased content, whether or not the biobased feedstocks are derived from genetically modified organisms, and if they will break down in typical backyard compost bins or even in the marine environment. Marine biodegradation test results are not yet available.[1]

Performance may vary too, but our survey did not address this important attribute. Users want bags that will not break under the weight of wet and heavy organic materials such as food scraps, and that will not degrade before reaching the compost facility. Manufacturers acknowledge that biobased content is currently low in bags. Bags lose strength as biobased content rises. As the industry grows and more research goes into creating biobased resins and additives, improvements in both performance and environmental attributes will certainly be made.

Considering use of compostable plastic bags? Ask for proof of compostability and biobased content.

[1] The US Army Natick Soldier Research, Development and Engineering Center is testing select compostable bags for biodegradation in the marine environment.

PERCENT BIOBASED CONTENT

The biobased (organic) carbon content is a ratio of the amount of biobased organic carbon to the total amount of organic carbon in the material or product. It is important to note that biobased content is not the amount of biobased carbon to the total weight of the product, but to the total amount of organic carbon in the product. Biobased carbon represents renewable or biological carbon such as corn sugar, bagasse, canola oil, castor seeds, wheat straw, potato starch, switchgrass, and forestry residues. The radiocarbon analysis described in ASTM D6866 – Standard Test Methods for Determining the Biobased Content of Solid, Liquid, and Gaseous Samples Using Radiocarbon Analysis – is the US-government-approved method for determining the biobased content of biobased products. It is also used in Europe. The US Department Agriculture now offers a biobased content label under its BioPreferred® Program. Look for this product label when purchasing products claiming biobased content.

Some bag makers falsely claim or imply they are 100% biobased. We had bags tested by a reputable lab and found that the highest percentage of biobased content was 47%, with the lowest level at 1%. When surveying companies, several manufacturers disregarded the need for ASTM D6866 and said they knew the amount of biobased content in their product because they knew the amount of biobased resin that is in their product. Trust but verify.

GENETICALLY MODIFIED (GM)

In North America, many of the biomass crops currently in production have been genetically modified, primarily for resistance to herbicides or insects. For example, 85% of all field corn planted in the US, 91% of the soybeans planted in the US, and 85% of the canola planted in Canada in 2009 were genetically modified. This profusion of GM crops on the landscape makes it difficult to directly source non-GM crops for industrial production, despite concern among potential buyers about the potential environmental and health impacts of GM crops. The widespread use of GM biomass crops has resulted in a documented increase in the use of herbicides and the spread of herbicide-resistant plants. There remain many under-addressed and under-researched environmental, biodiversity, and health concerns about the introduction, use, and dissemination of GM biomass crops.

For this reason, we asked bag manufacturers to share whether the biomass used in their products was genetically modified. Of the ten manufacturers who responded to our survey, five indicated use of GM feedstocks, while two indicated use of GMO-free biomass. Data was not available for three. Novamont and Cereplast are two resin manufacturers that pride themselves on using non-genetically modified feedstock and Novamont regularly traces the origin of their raw material to be certain. As a further measure to improve the availability of GM-free corn, Novamont takes part in offset programs to assure the growth of GM-free crops when sourcing additives from markets and geographical locations that GMO cannot be avoided.

While much of the corn currently used to produce the corn-derived polylactic acid (PLA) plastic is genetically modified, GMO corn is not required for PLA production.

COMPOSTABILITY

The primary purpose of using compostable bags is to divert organic materials, such as food scraps and yard trimmings, for composting. Ensuring the compostability of bags is important. Existing tests and standards, such as EN13432, ASTM D6400, ISO 17088, and AS 4736, evaluate the compostability of bags and other products in commercial or industrial composting systems. Bags that meet these standards can be third party certified by the Biodegradable Products Institute (BPI) in the US, Bureau de Normalisation du Québec (BNQ) in Canada, AIB-Vinçotte in Belgium, Din-Certco in EU, Japan Bioplastics Association, or the Australian Environmental Labeling Association to receive a certification logo that can be displayed on the bag.

It is important for products to display certification logos and have the words “compostable” legibly written on the bags. This minimizes confusion when collected and builds trust that the product is what it claims. Products should be third-party certified compostable or at least meet the compostability standards to ensure the product will break down in industrial facilities. The word “biodegradable” does not equal compostable. Compostable means that the product will decompose in commercial compost facilities within 180 days.

In places such as California, bags claiming compostability must be labeled with a third party certification logo indicating the bags meet ASTM D6400, and one of the following: bag is a uniform green color with the word “compostable” in 1-inch high letters on one side of the bag, or labeled “compostable” on both sides of the bag in at least 1-inch high green letters or in a contrasting color on a 1-inch high green band.

Encouraging the use of backyard compostable products can potentially facilitate wider composting of biobased products than is currently possible due to the lack of commercial composting facilities that accept such products. Composting essentially takes place within two temperature ranges in which certain microorganisms thrive: mesophilic (10-40°C) and thermophilic (over 40°C). Not all products that meet the ASTM D6400 composting standard will biodegrade and disintegrate at lower mesophilic temperatures. Backyard composting systems can reach thermophilic conditions, but not all do.

Products that can compost in a variety of backyard/home systems greatly increase the opportunities for waste diversion, given that many regions of the country lack commercial composting facilities. (Although mesophilic temperatures and microorganisms can allow effective composting given sufficient time, it should be noted that thermophilic temperatures destroy more pathogens, weed seeds, and fly larvae in the composting materials. Higher temperatures also speed the composting process and facilitate thermophilic fungi and bacteria favorable for effective composting.)

Products may be backyard or home compostable if they are certified by Vinçotte OK Compost HOME. OK Compost HOME is the only certification that assesses compostability in typical backyard compost settings, which do not reach or maintain the high temperatures of industrial compost facilities. Only two of our surveyed bag products indicated they met the Vinçotte OK Compost HOME standard.

AQUATIC BIODEGRADABILITY

The negative impact of plastics on aquatic ecosystems is increasingly being documented. Plastics fragment into minute pieces and are mistaken for food by the tiniest of species as well as by larger marine animals. Aquatic biodegradability is an added environmental attribute for any biobased product. We had the bags tested by the US Army Natick Soldier Research Development & Engineering Center (NSRDEC) to determine marine biodegradability of the bags according to ASTM D7081, Standard Specification for Non-Floating Biodegradable Plastics in the Marine Environment. Results are not yet in.

Vinçotte's OK Biodegradable WATER certification verifies products that are freshwater biodegradable.

Compostable Bags (3-33 gallon size) Surveyed for Environmental Attributes

Bag Brand (Company)	Composition Resin Blends	Biobased Content (%)[2]	GMO-free?	Certified Compostable? Industrial	Home/Backyard
Bag-to-Nature (Indaco Manufacturing)	Naturework's PLA BASF's EcoFlex	16%	No	BPI Din Certco	
Biobag (Biobag International)	Novamont's Mater-Bi	46%	Yes[3]	BPI Vinçotte Din Certco	
BioSak (W. Ralston)	PCL	27%	N/A	BPI BNQ	OK Compost HOME
Comp-Lete (Fortune Plastics, Inc.)	Novamont's Mater-Bi	26%	Yes	BPI Cedar Grove	OK Compost HOME
Ecosac (IBI Plast Inc)	Novamont's Mater-Bi	47%	Yes	Vinçotte Din Certco	
EcoSafe 6400 (Plastics Solutions)	Naturework's PLA BASF's EcoFlex	9%	No	BPI	
Maximum (CPI Plastics Group Ltd)	Naturework's PLA BASF's EcoFlex	9%	Unsure	BPI	
Nat-UR Bags[3] (Cereplast Inc.)	Cereplast Resin	26%	Yes	BPI Cedar Grove	
Natur-Tec (Northern Technologies International Corp)	Natur-Tec BF703B BASF's EcoFlex	1%	N/A	BPI	
Quikki (El-En Packaging)	BASF Ecoflex and Ecovio	10-15%	Yes[4]	BPI	

Acronym Guide:
PLA = Polylactic acid (biobased)
PCL = Polycaprolactone (petroleum-based)
GMO = Genetically Modified Organism
BPI = Biodegradable Products Institute
BNQ = Bureau de Normalisation du Québec

COMPOSTABLE BAG COMPANIES THAT DID NOT RESPOND TO OUR INQUIRIES OR SURVEY

The following companies did not respond to our survey or requests for data on their products. Please submit company/product updates to bplatt@ilsr.org

Company	Bag Brand(s)	Company	Bag Brand(s)
Farnell Packaging	BioTrue	US Compo Solutions	Compo-Bags
Inteplast Group	InteGreen Compostable Bags	Sharp Packaging Systems	Compostable Bags
Heritage Bag Company	Bio-Tuf Compostable Bags	S & Q Plastic	Green Line, Impact

[2] These bags were originally tested in 2008 by Beta-Analytic. Since then, formulations and biobased content may have changed. We asked for updates in 2012 but did not get any claims substantiated with lab data, therefore this table presents the 2008 data. Institutional and other large-scale purchasers should request updated biobased content data.
[3] Cereplast uses nanocomposites for optimizing the surface of their resin pellets.
[4] Majority of feedstock is reportedly GMO-free.