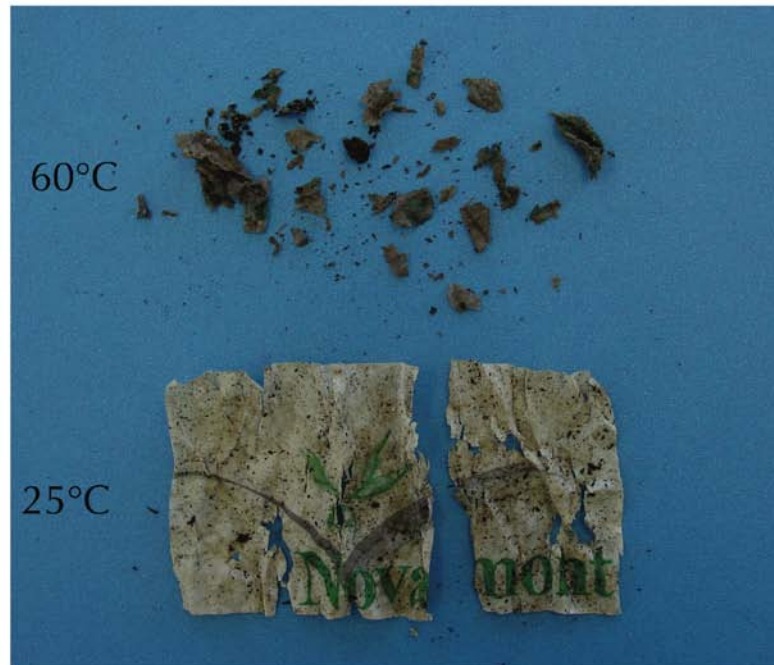




Degradation of Bioplastics in Industrial Composting Environments vs. Home Composting Environments

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SUMMARY:

The objective of the study was to conduct in-vessel laboratory evaluations of the effect on biological disintegration in composting of various bioplastics. Standard incubation composting was employed as per ASTM 6400. The study lapsed 180-days with weekly maintenance and imaging. The bioplastic bag and foam test-structures were placed as sheets (4½ x 3”) in duplicate glass 1-liter vessels, containing late-stage compost (ASTM inoculation) and incubated at both 60°C (similar to industrial composting facility temperatures) and 25°C (similar to home composting temperatures) for the duration of the study. Because some bioplastic bag brands claim to disintegrate in soil as well as compost, additional samples of the bags only (no foam) were also placed in soil at 25°C, using the same time frame and procedure.

MATERIALS LIST: (see attached images)

Four types of bioplastic bags comprising 5-samples were tested:

1. Novamont/Mater-Bi – a Polyester & cornstarch blend
2. Indaco/Bag-To Nature - PLA
3. Heritage/BioTuf – a PHA blend
4. Two different versions of Oxo-biodegradable, one of which is being used in New York City grocery stores.

also:

Two bioplastic foam plates were tested:

1. Dyne-a-pak – PLA
2. Cascades – Oxo-biodegradable

CONCLUSION:

The study’s results proved that some bioplastics compost very well, especially at high temperatures, while others don’t seem to be compostable at all. Labels can be very misleading due to the fact that many don’t explain that materials are only likely to break down in hot compost under optimal conditions, which are unlikely to be attained in an average sized home compost pile or bin. Results were as follows: (page 3)

Note: this revised report contains a correction: Mater-Bi is a Starch/Polyester material

60°C Results Listed Best to Worst:

Bags -

- Novamont/Mater-Bi - gone at 9 weeks
- BioTuf - gone at 9 weeks
- Bag-To Nature - gone at 17 weeks
- Oxo-Biodegradable versions 1 and 2 – no degradation at all throughout the entire length of the study

Foam -

- Dyne-a-pak PLA - gone at 6 weeks
- Cascades Oxo-biodegradable - no degradation throughout the entire length of the study

25°C Results Listed Best to Worst:

Bags -

- Novamont/Mater-Bi - half way degraded by end of study
- BioTuf - small holes and breakage forming by end of study
- Bag-To Nature - almost no change by end of study
- Oxo-biodegradable versions 1 and 2 - no degradation throughout the entire length of the study

Foam -

- Dyne-a-pak PLA - very slight change by end of study
- Cascades Oxo-biodegradable - no degradation throughout the entire length of the study

Soil Results at 25°C Listed Best to Worst:

- Novamont/Mater-Bi - vertical tears noticed by end of study
- BioTuf - very slight change in texture noticed by end of study
- Bag-To Nature and Oxo-biodegradable versions 1 and 2 - no degradation throughout the entire length of the study

End Result: Novamont/Mater-Bi performed best in all categories.

Images of Foam and Bag Samples as Received:

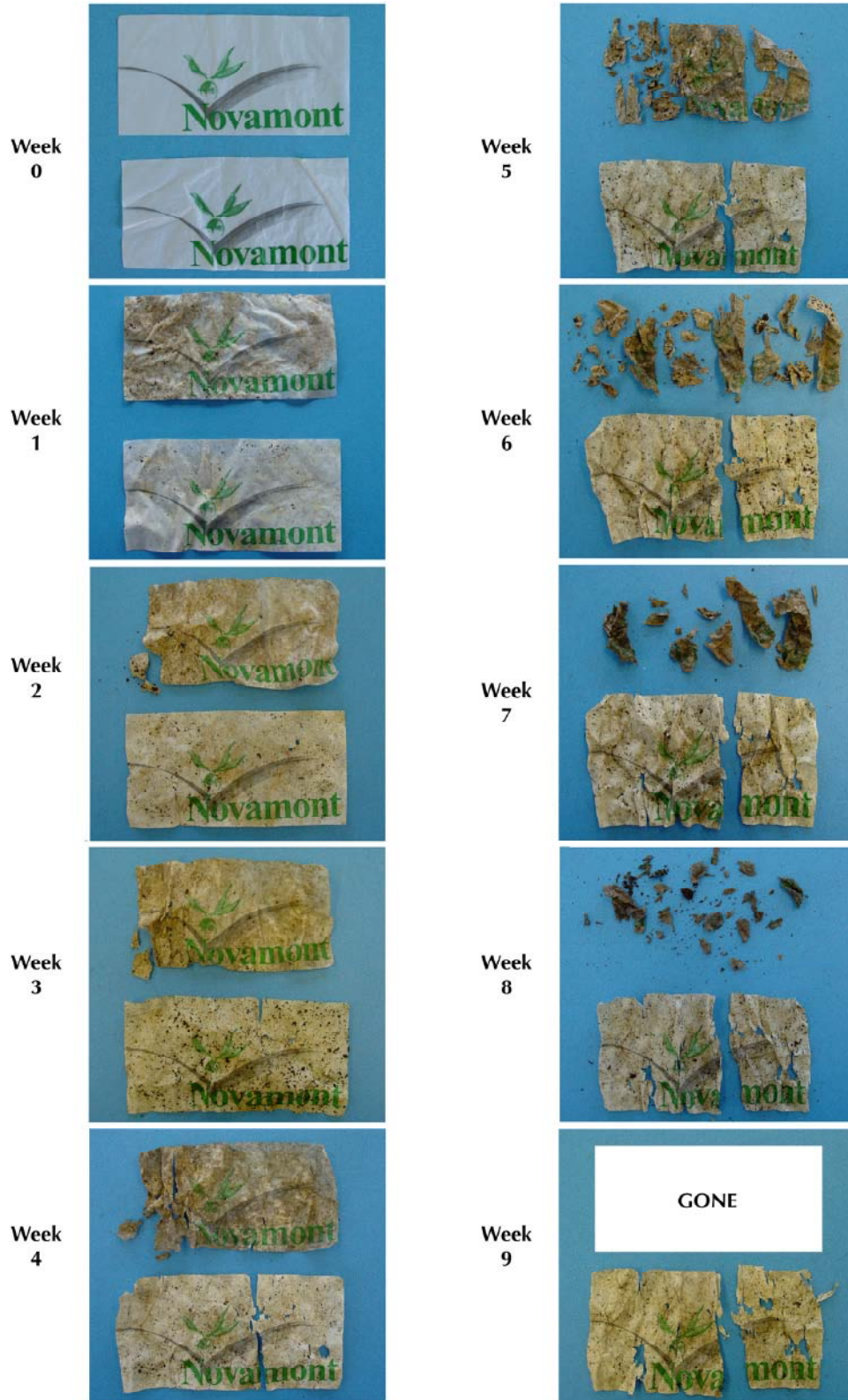
















The four types of plastic bags examined: The bottom two are both “Oxo-Biodegradable”.

Novamont Biodegradation Study

EACH IMAGE - top sample incubated in compost @ 60°C, bottom sample incubated in compost @ 25°C



	Week 1	Week 8	Week 25	
Top Sample - 60 C				Blue - Polyester / Cornstarch Blend
Bottom Sample - 25 C				
Top Sample - 60 C				Purple - PLA
Bottom Sample - 25 C				



EACH IMAGE - Top sample incubated in compost at **60 C**, bottom sample incubated in compost at **25 C**

Composting Bioplastic Foams - High Temperatures vs. Low Temperatures



Bioplastics Incubated in Soil at 25C - Week 25



Additional Sample Information:

Manufacturer / Brand - Novamont / Mater-Bi, BioBag

Polymer / Resin Ingredients - Cornstarch / Polyester

Labels / Certifications - they manufacture several different grades passing different European standards certified by Vincotte - (see attached PDF), US Composting Council (BPI) and Norway's Compostable certification

Products - food & yard waste bags, commercial shopping bags, dog waste bags

Sample Obtained – Orbit '08 Conference, Holland

Manufacturer / Brand - Herritage / Biotuf

Polymer / Resin Ingredients - PHA (polyhydroxyalkanoate) Blend

Labels / Certifications - US Composting Council (BPI)

Products - trash bags for commercial & industrial use

Sample Obtained – Directly from Company

Manufacturer / Brand - Natureworks, Indaco / Bag-To Nature, Dyne-A-Pak

Polymer / Resin Ingredients - PLA (polylactic acid)

Labels / Certifications - US Composting Council (BPI), Norway's Compostable certification

Products - trash bags, commercial shopping bags, foam plates, plastic cups

Sample Obtained – Directly from Company

Manufacturer / Brand - Oxo-biodegradable / epi.

Polymer / Resin Ingredients - Polyolefin Plastics

Labels / Certifications - None, but print their own label which resembles a compostable certified label (see attached) , and print a recycling label as well as this wording: "Oxo-biodegradable will first degrade, then bio-degrade in the presence of moisture, oxygen, micro-organisms and soil." and "This environmentally friendly plastic bag is reusable, recyclable and Oxo-biodegradable." .

Products - commercial shopping bags, foam plates

Sample Obtained – 1. Woods End contact from BPI, 2. Brooklyn, NY grocery store

Oxo-Biodegradable Misleading Labels

Bag Version #1
Labels/Wording



Brand's label made to resemble legitimate certification symbols.

Bag Version #2
Labels/Wording

