A Comprehensive Look at Compostable Plastics

Compostable biobased plastics like PLA are poised to respond to numerous ecological challenges. From their low carbon footprint to the flexibility of their end-of-life, these plant-based materials represent a sustainable alternative to current petroleum-based, non-biodegradable plastics in a wide range of applications.

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A Closer Look at Plastic in Composting

A conscientious approach to plastic use calls for circular product lifecycles, favouring reuse and mechanical recycling as primary solutions. An estimated 72%[1] of plastics packaging currently being interred in landfills or leaking into the environment. Reality suggests that adoption of compostable polymers in compatible applications represents an accessible, honest and effective manner to address long-term plastic pollution and complement the existing recycling solution with composting.

Numerous independent studies have proven that certified compostable plastics are well suited to end their life in industrial composting facilities. PLA as a biobased certified compostable plastic offers an alternative end-of-life option with many environmental benefits.

Scientifically proven facts on compostable plastics in industrial composting facilities:

- Although the EN13432 (compostable products) certification refers to a cycle of 12 weeks, PLA plastics disintegrate in actual industrial composting facilities within much shorter timeframes (2-3 weeks)
- Organic waste streams are highly contaminated by conventional plastics, replacing these conventional plastics by compostable ones would significantly reduce plastic contamination and increase the compost quality and the benefits for the soil
- 94% - 98% of microplastic contamination in compost test samples could be attributed to fossil-based non-degradable plastics; no PLA was detected
- In actual industrial composting facilities, where certified compostable plastics are treated, no particles of compostable plastics could be retrieved in the final compost

NETHERLANDS

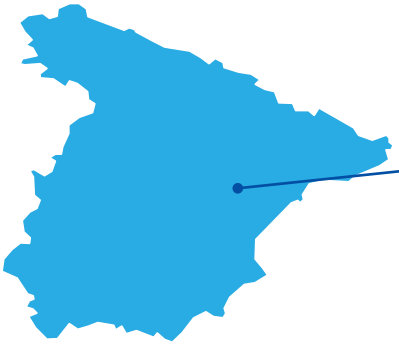
PLA plant pot completely disintegrated after 11 days

Compostable

A unique advantage of PLA biobased and compostable plastics is its ability to be effectively and quickly composted in dedicated biowaste-management facilities. According to a 2019 study conducted by Wageningen University (WUR) in the Netherlands, certified compostable products made of PLA plastics disintegrated faster than, for instance, orange peels, banana skins or paper, and some articles could not be detected even after one composting cycle of 11 days. This was not only the case for small items such as teabags but also thicker products like plant pots. If required, the recirculation of non-fully degraded biowaste after a first composting cycle ensures a complete degradation of compostable plastic items which started the degradation process in the first 11 days. In the end, the PLA plant pot fully disintegrated after 11 days and the PLA teabags fully disintegrated after 22 days, which is significantly below the 12 weeks disintegration time assumed in the EN13432 norm on industrial composting. This study proved that EN13432-certified plastic products are compatible with the Dutch industrial composting system using shorter composting cycles, beating the benchmark and providing excellent results.

For some products (in this trial the full PLA plant pot, product D), one waste treatment cycle of 11 days is sufficient for complete disintegration, which is significantly faster than the reference products (orange peel and banana skin).[2]

SPAIN



No microplastics from compostable plastic items retrieved in the final compost

Compostable

A 2021 study in Spain was conducted jointly by the Universidad Autónoma de Madrid and the University of Alcalá, across five composting facilities over five months. It found that while 94% of microplastic contamination could be attributed to 5 common types of fossil-based non-degradable plastics, namely PET, PS, PE, PP, PVC, no debris from compostable biobased plastics were detected in any of the samples – despite major differences in collection systems, concentration of non-desired materials, treatment technology, and density of served population across the study. Even in composting facilities where the use of compostable biowaste collection bags was well-documented, no microplastics from compostable plastic items could be retrieved.

One of the facilities analyzed was an anaerobic digestion plant with a post-composting phase. The results for this plant were the same as the others; plastic contamination in the final compost resulted from conventional plastics, and not compostable biobased polymers.

No debris from compostable bioplastics were found in any of the samples, meaning that if correctly composted their current use does not contribute to the spreading of anthropogenic pollution.[3]

GERMANY

98% of particles found in compost originated from conventional plastics

Compostable

Likewise, a field study by the Witzenhausen Institute and the University of Bayreuth in Germany concluded that compostable bags, certified according to EN13432, do not pose any challenges to the quality of compost. 10 final composts were analysed coming from 8 different biowaste treatment plants. Here too, the vast majority of the plastic particles that were found (98%) were derived from conventional, non-biodegradable plastics. Out of the 10 compost, compostable plastic films could be detected in only 7. In total, 446 plastic film particles were detected in composts analyzed and only 8 were from compostable plastics.

The use of compostable plastic bags for the biowaste collection would lead to a significant reduction in plastic particles in the compost if PE bags were substituted.[4]

ITALY

96% of compostable plastic biodegradation rate

Compostable

The Consorzio Italiano Compostatori (CIC) coordinated assessments examining biodegradation of compostable plastic packaging in a number of Italian biowaste treatment facilities. Compostable plastic packaging is widely used in Italy and accepted in industrial composting facilities. The results of the study showed that compostable plastic items do biodegrade in industrial facilities and ensure a low contamination of the final compost. Biodegradable plastics were mixed with organic waste (1% and 3%) to be treated in 3 existing composting plants and 2 anaerobic digestion plants. At the end of the composting cycle, 96% of the biodegradable plastics degraded.
Although studies conducted by Consorzio Italiano Compostatori of 27 industrial composting plants in Italy found conventional plastics to be below regulatory limits, there were very low levels of compostable plastic found in the compost samples during the cycle.

The average degradation rate of bioplastic tested in 5 biowaste treatment plant was between 95-96%.[5]

Tried & Tested

Despite a host of different methodologies, countries, and collection systems, the evidence rings clear: EN13432-certified compostable plastics are indeed compatible with current industrial composting systems and installations in real-world, field conditions. Furthermore, in many cases they perform far better and degrade more quickly than the 12-week timescale their certification requires. A true double-edged sword, compostable biobased plastics are helping to reduce plastic contamination in compost and increase both the biowaste collected and the quality and purity of final compost.

With the mandatory collection of biowaste across the EU coming into force in 2023, and similar measures being rolled out in the U.S., the opportunity for investors to create effective circular recycling and composting operations for compostable plastics have never been more enticing or relevant. The development of dedicated infrastructure is necessary to ensure that biobased and compostable plastics live up to their fullest ecological potential and that truly circular product life cycles can be achieved.

Learn more about the advantages of compostable biobased plastics like Luminy® PLA, and how these polymers promise to revolutionize how we think of plastic.

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[Sources]
1. 'EllenMacArthur Foundation – New Plastics Economy
2. The fate of (compostable) plastic products in a full scale industrial organic waste treatment facility. Maarten van der Zee, Karin Molenveld Institute: Wageningen Food & Biobased Research
3. Carlos Edo, Francisca Fernández-Piñas, Roberto Rosal. Microplastics identification and quantification in the composted organic fraction of municipal solid waste, Science of the Total Environment, 151902, 2022
4. Plastics in compost: Practical tests to determine the polymer affiliation, Dr. Michael Kern, Falk Neumann, Hans-Jörg Siepenkothen, Thomas Turk Witzenhausen-Institut für Abfall and Dr. Martin Löder, Universität Bayreuth
5. Optimization of organic waste recycling, Summary of the results of the CIC - COREPLA monitoring program (2019-2020)CIC - Consorzio Italiano Compostatori

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