

Microplastics in Compost

Environmental Hazards of Plastic-Coated Paper Products



WOODS END LABORATORIES & ECO-CYCLE

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AT ISSUE

A growing number of U.S. and Canadian communities are recovering their food scraps through composting to reduce their climate impact, work toward Zero Waste and return valuable nutrients to local soils. Half of these programs allow residents and businesses to include plastic-coated paper products for composting in order to increase the convenience of composting and the amount of materials that can be accepted. Plastic-coated paper products include milk and juice cartons, hot and cold paper drinking cups, frozen food containers, plastic-lined paper bags, take-out containers and some paper plates. These products, made predominantly from paper fibers, are traditionally coated with a petroleum-based plastic to prevent liquid absorption or freezer burn, or to otherwise enhance product performance.

The growing epidemic of plastic pollution in the environment has led to concerns about what happens to the plastic coatings on these products during the composting process, since petroleum-based plastic particles break down into smaller fragments but do not biodegrade. Research from Eco-Cycle and Woods End Laboratories demonstrates that microplastics are shed from all plastic-coated paper products during composting. These microplastics may pose a significant risk to our soils, freshwater and marine environments, wildlife, and ultimately, human populations. This potential threat justifies a ban on non-biodegradable plastic-coated paper products in compost.

FIGURE 1. COMMON PLASTIC-COATED PAPER PRODUCTS.



RESEARCH

In order to ascertain what actually happens when including plastic-coated paper products in the feedstock of a composting process, Woods End Laboratories, Inc. (Mt. Vernon, ME) and Eco-Cycle, Inc. (Boulder, CO) partnered to test a range of these materials in a controlled biodegradation process:

- milk/juice cartons (double-coated LDPE)
- cups (double-coated LDPE)
- plates (clay with binders)
- paper food boat (clay with binders)
- freezer box (single-coated LDPE)
- oven-able tray (double-coated PET)

The study showed conclusively that micro-plastic fragments were shed from all plastic-coated samples, whether single or double-coated. This means any plastic-coated paper product, even those that are partially screened out during the composting process, is contaminating the finished compost with plastic particles.

Since composters generally use a 1/2 inch (12mm) sieve, or 3/8 inch (9mm) sieve under optimal dry conditions, any plastic particles under this size will remain in the finished compost and will be dispersed into the environment during compost application. Previous research by Woods End found that extremely fine polyethylene (PE) fragments and strands as small as 100 microns are present in composts—that is, impossible to recover or screen out.



FIGURE 2. MICRO-PLASTIC PARTICLES WERE RELEASED FROM ALL PLASTIC-COATED PAPER PRODUCTS SUCH AS THIS PAPER ORANGE JUICE CARTON, SHOWN BEFORE AND AFTER TESTING.

Products with a PET or LDPE coating on both sides (double-coated products) showed very little decomposition during the Woods End tests, as the plastic coating on both sides of the paper severely retarded decomposition. The product size, therefore, remained large enough to be screened from the finished compost as a contaminant. This contamination can be very costly to

compost facilities. In addition, this study is the first to show these products are also shedding microplastics during the biodegradation process, contributing to the contamination of the finished compost (along with the single-coated products tested). In order to eliminate

microplastics from finished compost, all plastic-coated paper products should be excluded from the composting process.

POTENTIAL HARM

The microplastic fragments shed from plastic-coated paper products that are present in finished compost will be disseminated into the environment through the application of compost to soils. These microplastics will eventually migrate into other land and aquatic ecosystems through wind and surface run-off, exacerbating the existing threats to wildlife and ultimately humans. While there needs to be more research on the specific effects of microplastics in all ecosystems, growing evidence on the threats to wildlife and humans from terrestrial, freshwater and marine-based plastic particle pollution are enough to cause serious concern.

Macroplastic particles (>5mm) are a well-known threat to wildlife, causing suffocation, entanglement and starvation. New evidence shows that there is also a growing abundance of microplastics in the soil, rivers and oceans, mirroring the rise of global plastics production. These particles come from a variety of sources, both land- and ocean-based. Smaller in size, the particles are more likely to be ingested by wildlife such as

filter feeders and deposit (bottom) feeders. Microplastics may then move up the food chain when these creatures are eaten by predators such as birds, crabs, starfish and humans. These plastic fragments have also been shown to concentrate persistent organic pollutants (POPs) such as DDT, PCBs and dioxins, and their movement up the food chain may increase the exposure of wildlife and humans to these dangerous toxins. Prudence and the Precautionary Principle would dictate that any source of plastic fragments, including plastic-coated paper products from composting operations, should be eliminated in order to decrease the impact of the growing problem of plastic pollution in all environments.



FIGURE 3. MICRO-PLASTIC PARTICLES CAN MOVE UP THE FOOD CHAIN, CARRYING WITH THEM TOXIC POLLUTANTS.

CALL TO ACTION

1. **No plastic-coated paper products in compost.** Local governments, nonprofits, compost facilities and compost haulers should immediately exclude these products from their collection programs. Only products that meet ASTM 6400, EN 13432 or BPI standards should be allowed in food waste collection programs.
2. **Recycle milk and juice cartons for highest and best use.** There are increasing opportunities to recycle gable-top and aseptic containers used for milk and juice packaging. Visit <http://www.recyclecartons.com> to learn more.
3. **Hold the packaging industry accountable.** Fraudulent or deceptive claims such as “earth-friendly” or “biodegradable” are no longer permitted by the Federal Trade Commission (FTC). Speak out against this greenwashing and support companies and programs that utilize compostable standards.
4. **Educate and promote best practices.** The U.S. Composting Council should undertake the leading role in providing program planners with best practices on composting collection guidelines, supplying educational materials to dispel consumer confusion over misleading packaging labels, and promoting only products certified as compostable.

LEARN MORE

Read the full report and find more information at www.ecocycle.org/microplasticsincompost.