Products made of plastic falsely claimed to be biodegradable are on sale at Brazilian supermarkets

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A well-known study published in the journal *Science* showed that some 6.3 billion metric tons of plastic polymer had been produced and

discarded in human history, and that only 9% had been recycled; 12% had been incinerated and the remaining 79% left to rot in landfills or garbage dumps, from which about 10% reached the coast and eventually the sea.

These numbers are from eight years ago. The situation is certainly worse now. Although some countries have announced "zero plastic" policies, factories continue to churn out 400 million tons of plastic per year, and the amount thrown away continues to accumulate.

As a result, contamination by microplastics (fragments less than 5 millimeters in length) has become one of the worst environmental problems in the world, almost as serious as the climate crisis. Microplastics are everywhere—on land, in the sea and in the air. They have even been found in the human body—in the bloodstream, heart and lungs, and in placenta.

"You don't find microplastics only where you don't look," said Ítalo Castro, a researcher and professor at the Federal University of São Paulo's Institute of Marine Sciences (IMAR-UNIFESP) in Brazil.

Unfortunately, some attempts at solving the problem are making matters worse, as shown by an investigation of greenwashing led by Castro in which researchers from IMAR-UNIFESP visited 40 supermarkets and analyzed products the manufacturers claimed to be made of biodegradable plastic. The stores belonged to major chains in São Paulo and Rio de Janeiro.

The study sample comprised 49 different products, including plates, cutlery, cups, straws, trays, and other utensils, as well as partyware. On average, they cost 125% more than the equivalents made from conventional (non-biodegradable) plastic. None of them, including the major brands, met the minimum requirements to be considered

genuinely biodegradable.

The results are published in *Sustainable Production and Consumption*. The first author of the article is Beatriz Barbosa Moreno, a Ph.D. candidate with a scholarship from FAPESP and Castro as thesis advisor.

"To be considered biodegradable, a product must convert into water (H_2O), carbon gas (CO_2), methane (CH_4) and biomass when discarded into the environment. This should happen relatively quickly, in a few weeks to a year, although there's no consensus regarding how long it should take. None of the 49 items investigated met this requirement," Castro said.

More than 90% were made of a class of material that has become known as oxo-degradable, he added. Despite the name, these materials do not degrade in normal environmental conditions. They are polymers of fossil origin additivized with metallic salts, which accelerate oxidation and fragmentation, but the fragments can remain in the environment for decades. Fragmentation does not contribute to degradation. It accelerates the formation of microplastic particles.

"Oxo-degradable plastic is banned in several parts of the world, including the European Union," Castro said. "In most cases, the ban was due to lack of evidence of biodegradability in real-world conditions, associated with the risk of microplastic formation."

Regulation

Oxo-degradable plastic has not been banned in Brazil, where it can legally be sold. However, quite apart from the misleading nomenclature, consumers are deceived by many companies that claim their products are certified to technical standards relating to biodegradability, such as ASTM D6954-4 or SPCR 141.

"These standards merely provide guidelines for comparing degradation rates and changes in physical properties under controlled laboratory conditions, and they don't concern the final stages of degradation. In fact, the organizations that produce the standards state on their websites that they must not be used for the purposes of certifying commercial plastic products as biodegradable," Castro said.

For Castro, the claim that a commercial product is biodegradable when it is nothing of the kind can be considered greenwashing.

"When a product that has been shown to harm the environment becomes widely used, official action should be taken to stop it. In Brazil, the Senate is debating a bill (PL 2524/2022) that would ban the use of oxo-degrading or pro-oxidant additives in thermoplastic resins, as well as the manufacturing, importing and marketing of packaging and products made of oxo-degradable plastic," he said.

If PL 2524/2022 is passed in its present form, Castro explained, it could enable Brazil to engineer a transition to a circular economy in plastics. "This transition is urgently needed," he said. "IMAR-UNIFESP is based in Santos on the coast of São Paulo state. In Santos, we detected an accumulation of microplastics in mangrove oysters [Crassostrea brasiliana] and brown mussels [Perna perna]. Both filter seawater for food and retain microparticles in their tissue, so that they are considered the gold standard for assessing environmental conditions in areas like this. The levels we detected were among the highest in the world compared with data from more than 100 similar studies conducted in 40 countries."

In response to our inquiries, the Brazilian Ministry for the Environment and Climate Change (MMA) said it supports PL 2524/2022 but with certain amendments. "The ministry is favorable to prohibition of oxo-degrading and pro-oxidant additives based on studies showing that

microplastic particles are created when these additives cause fragmentation of plastic, which is particularly harmful to the marine environment," it stressed.

The Brazilian Plastics Industry Association (ABIPLAST) also issued a statement saying it supports a ban on the use of oxo-degradable additives in plastic products. However, it opposes PL 2524/2022, which it sees as "confusing the circular economy with a ban on plastic products and targeting a single class of material." The text also says that "the circular economy entails a systemic change and therefore requires a macro approach involving all sectors of the manufacturing industry."

Meanwhile, another bill—PL 1874/2022 (establishing a National Circular Economy Policy)—includes important provisions regarding strategic resource management, promotion of new business models, investment in research and innovation, and support for the transition to low-carbon technologies by means of the creation of attractive conditions for public and private investment, among others provisions.

The statement sent by ABIPLAST says, it "trusts that a serious and accurate science-based debate will promote a constructive dialogue on the correct use of plastic and all the benefits the material has brought society. The plastic sector has taken a leadership role in actions to promote a circular economy of this material, investing in technology, sustainability and innovation."

More information: Beatriz Barbosa Moreno et al, High incidence of false biodegradability claims related to single-use plastic utensils sold in Brazil, *Sustainable Production and Consumption* (2023). DOI: 10.1016/j.spc.2023.07.024

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