

Natural additives improve biodegradable plastics

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The times in which we live have often been described as "The Plastic Age" for obvious reasons. The invention and widespread adoption of synthetic polymers in the 20th Century as alternatives to wood, ceramics, stone, metals and alloys, and countless other materials has revolutionized the world we live in. We extract the starting materials from crude oil and have made from those myriad variations on the polymer, plastic, theme, for an incredible range of applications in construction, manufacturing, healthcare, food and water supply and beyond.

Unfortunately, our reliance on plastics has increased considerably in the last few decades and the inevitable disposal of products made with these materials, particularly [single-use plastic items](#) such as food and drink packaging has led to the accumulation of vast quantities of waste in landfills and dumps. Worse much of our [plastic waste](#) is never recycled and much of it finds its way from landfills and waste streams into the environment, into rivers, and into the sea.

Plastic waste now represents an unimaginable environmental burden, a problem we cannot easily solve. More than 5 million metric tons of plastic is disposed of each year in landfill and the ocean. Add to this the fact that we now know that many plastic products end up as near-microscopic particles in waterways and oceans and the problem is obviously worse than the notion of plastic bottles and bags accumulating in oceanic gyres and such. The microplastics can readily enter the food chain and pose an increasingly worrying risk to the health of marine life and ultimately those who depend on it for food.

There have been many efforts over the years to find simpler ways to collect and recycle plastics into secondary use products, but these have limited success given the huge scale of production around the world. There has also been considerable research effort put into finding ways to make biodegradable alternatives to plastic, some of which may still be derived from petrochemicals but others that turn to crops raised for the

specific purpose of making novel materials.

New work published in the *International Journal of Industrial and Systems Engineering*, has looked at the possibility of making [biodegradable plastics](#) using natural additives to replace wholly synthetic materials.

Amal Elhussieny, Marwa Faisal, and Irene S. Fahim of the Nile University in Giza, Egypt, and Giacomo D'Angelo, Nesma T. Aboulkhair, and Nicola M. Everitt of the University of Nottingham, Nottingham, UK, explain how they have looked at the alternatives to [plastic](#) film that have natural additives for reinforcement. Plastic film is considered to be one of the major pollutants given it is commonly single-use in almost every industry. Natural additives derived from chitosan extracted from shellfish shells and rice straw waste are the focus of the current study.

The team carried out experimental and statistical analyses of natural filler types and the concentration in biodegradable films in terms of the composite materials' physical, biological, mechanical, and thermal properties. The team reports that both chitosan and rice-derived additives added to levels of 25 percent and 35 percent by weight, respectively, can improve all these various properties.

"Further characterisation work is underway with promising results that will pave the way for industry uptake of these materials and their manufacture in the form of pellets," the team concludes.

More information: Amal Elhussieny et al, Biodegradable plastics with natural additives as a replacement for synthetic plastics, *International Journal of Industrial and Systems Engineering* (2022). [DOI: 10.1504/IJISE.2021.120622](https://doi.org/10.1504/IJISE.2021.120622)

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