

Discovering the "third generation" of bioplastics

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The ongoing revolution in packaging is the use of 100% organic materials obtained from the leftovers of agricultural production. An expert from the Italian National Research Council (CNR) says that in the

early 2020s these bioplastics may become as competitive as traditional ones, even if not suitable for all uses

What if we could turn the waste from the world's crops into a biomaterial suitable for packaging? This is not science fiction. Today plastics can be made with the waste from tomato production, for example. Or with the unused organic elements of coffee, spinach or cauliflower plants. In this way, oil derivatives and other first-generation organic polymers can be replaced by renewable and sustainable 100% organic raw materials.

These bio-materials are being studied by the Italian Institute of Technology ([IIT](#)) based in Genoa, Italy. "The main advantage is their biodegradability, in addition to the opportunity offered to stimulate the process of a circular economy," explains Giovanni Perotto, researcher at the [Smart Materials](#) lab of IIT. "One possible result could be a shopping bag similar to traditional polyethylene ones, but which is organic and sustainable. If we think about it, it does not make sense today to use [plastic](#) that lasts for millennia for a product we use for only five minutes".

The innovation doesn't involve producing a completely organic [polymer](#), but rather to use materials that would otherwise be wasted. "This is the third generation of bioplastics," says Mario Malinconico, research director of the Italian National Research Council ([CNR](#)) and scientific coordinator of the association [Assobioplastiche](#). "We are talking about a kind of production that has not yet become an industrial reality, but for which we already have a lot of prototypes. Wherever there is an agri-food chain with a large amount of process waste, the production of polymers could possibly be introduced."

But how can these materials become competitive? "To analyse this, it is necessary to evaluate the whole lifecycle, from raw material flows to

management costs, taking into account the additional recycling and decontamination issues associated with traditional plastics," continues Malinconico.

Although [bioplastic](#) still costs 50% more to produce, two main factors will narrow the gap with traditional plastic: firstly, economies of scale once large plants for organic polymeric packaging and the associated logistics chains are set up; and secondly, regulations on non-degradable plastics will be increasingly stringent at a time when oil extraction costs go up year-on-year.

According to Malinconico, "the cost differential will ultimately be cancelled out, and [biodegradable](#) polymers could overtake traditional plastic in a few years, probably in the early 2020s".

But which features do these 100% bioplastic prototypes have? Observing closely, one first notices their delicate smell, which is the perfume of the plant from which the material has been obtained.

"The process we have implemented at IIT is completely water-based," explains Perotto, "And it takes up to half a day. After optimising the process, it will take just a few hours from waste [organic material](#) to obtain the bioplastic." One of the added values of this process is the sustainability of the production, which is not always taken for granted when dealing with organic [materials](#).

The durability of these plastics can be extended to a few months or even years if they are put in a drawer. However, they degrade in a few weeks in the soil or in the sea.

The first and most simple application remains non-food packaging, since a little more research needs to be done to verify food safety.

At present, regulations are less stringent when food is not involved. Moreover, these bioplastics are edible and can be cooked, but they cannot be used at high temperatures, for example as baking paper or for hot beverages.

In this context, at the 2017 global food innovation summit [Seeds & Chips](#), held in Milan, the Italian company Metalvuoto (SAES group) presented an active packaging able to extend shelf life and avoid the use of preservatives.

A water-based layer, applied on the plastic surfaces of fresh food packaging, is capable of absorbing gases and substances that can quickly deteriorate foods. "New packaging must above all be safe and environmentally friendly," claims managing director Stefano Tominetti, "But it must also have high performance and be lightweight in order to reduce logistical costs. It is thus possible to pass on significant benefits to consumers, distributors and even to the environment".

With the high standards required by the food packaging industry, the most likely scenario will be the coexistence of different types of plastics in the next years. In particular, traditional plastics will still be more suitable in those cases where compostability is not a fundamental feature, such as [packaging](#) for reuse or recycle, and in high-temperature environments.

Provided by Youris.com

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