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SCIENTIFIC RESEARCH CONFIRMS THE MARINE BIODEGRADABILITY OF MATER-BI

But no tolerance for irresponsible behaviour: marine biodegradability to be seen merely as a factor mitigating ecological risk

Novara - Rome, 2 July 2019 - Is it possible to solve the huge problem of marine plastic pollution by using biodegradable and compostable alternatives to plastic?

Science teaches us that any substance, material or product released into nature creates a potential ecological risk: even pouring olive oil from a can of tuna into the sea is potentially damaging to the marine ecosystem. It goes without saying that if, instead of biodegradable olive oil, which tends to have a short lifespan, we throw non-biodegradable oil, the potential damage is increased tenfold. In any case, regardless of biodegradability, uncontrolled release must be stigmatised and the end-of-life of compostable products must continue to be what the products were designed for, i.e. industrial composting through separate waste collection and recovery of kitchen and garden waste. Compost is an indispensable tool that can help solve the problem of degradation of soil, which is becoming increasingly low in carbon content and, therefore, less and less fertile.

But what happens if - as unfortunately happens with the packaging of any material (glass, aluminium, paper, etc.) - a bag made of Mater-Bi is not recovered but is discarded into the natural environment?

To answer this very question, Novamont has developed a far-reaching programme of scientific studies. Some of the studies were carried out in its own laboratories while others were entrusted to research institutes, and today in Rome the results have been announced.

Coordinated by Francesco Degli Innocenti, Novamont Director of Ecology of Products and Environmental Communication, the studies were divided into 3 areas: intrinsic marine biodegradability (Novamont laboratories), disintegration in the marine environment (Hydra) and ecotoxicity released into sediment as a result of biodegradation (University of Siena) of fruit and vegetable bags made of Mater-Bi.

BIODEGRADABILITY IN THE MARINE ENVIRONMENT

Mater-Bi plastics were analysed by means of new internationally standardised biodegradation tests. Products were tested using the UNI EN ISO 19679: 2018 method (*Plastics - Determination of aerobic biodegradation of non-floating plastic materials in a seawater/sediment interface - Method by analysis of evolved carbon dioxide)*. This method involves exposing plastic samples to the microorganisms found in marine

sediment and measuring the plastic's transformation into carbon dioxide. The tests carried out by researchers at Novamont's laboratories, some of which have been corroborated within the European Commission's "Environmental Technology Verification" pilot programme, showed that when Mater-Bi was exposed to marine microorganisms, it behaved in a similar way to cellulosic materials (e.g. paper) in terms of levels and timeframes. Mater-Bi achieves high levels of biodegradation, essentially the same as those reached by the paper used as reference material, over a test period of under one year.
Lastly, it was shown that the speed of biodegradation increases the lower the dimensions of the item[1]. This means that Mater-Bi does not release persistent microplastics, as they completely biodegrade within 20-30 days, the time required by OECD guidelines[2].

DISINTEGRATION IN THE MARINE ENVIRONMENT

These experiments were conducted by Christian Lott, researcher at the German marine biology research and documentation institute, Hydra Marine Sciences GmbH, at the institute's base on the island of Elba.
The test concerned the compostable fruit and vegetables bags used in supermarkets. In practice, sandy sediment taken from different coastal areas around Elba (Marina di Campo, Portoferraio, Naregno and Fetovaia) was introduced into sea water aquariums in order to simulate the seabed, where waste naturally tends to accumulate. The bags were placed in the aquariums and sampled at different times to track their disintegration. The investigation showed that Mater-Bi fruit and vegetable bags disappeared completely in a period of time ranging from less than four months to just over a year, depending on the nature of the seabed under consideration and its chemical/physical and biological characteristics. In the same timeframe, samples of similar fruit and vegetable bags made of PE were found to remain fully intact.

ECOTOXICITY

The purpose of these investigations, conducted by Maria Cristina Fossi and Silvia Casini at the Biomarkers and Plastic Impact laboratory of the Department of Environment, Earth and Physical Sciences at the University of Siena, was to evaluate a series of ecotoxicity biotests on three model species of organisms exposed to extracts ("elutriates") of marine sediment injected with Mater-Bi or with cellulose. The sediment samples were incubated at 28°C and tested after 6 months, when there were clear signs of Mater-Bi's degradation, and after 12 months, when the injected samples had completely disappeared. The model organisms selected for the study were unicellular

[1] For more information:
https://www.sciencedirect.com/science/article/pii/S0141391017303816
https://www.sciencedirect.com/science/article/pii/S0141391019301934
[2] https://www.oecd-ilibrary.org/docserver/9789264030213-en.pdf?expires=1561740175&id=id&accname=guest&checksum=10B44F7382D25B1C2CA5C65F0939D0F7

algae (Dunaliella tertiolecta), sea urchins (Paracentrotus lividus) and sea bass (Dicentrarchus labrax). The unicellular algae and the sea urchins were used to investigate the possible effects of growth inhibition and embryotoxicity, while juvenile sea bass specimens were tested to evaluate possible sublethal effects. Sediment elutriates injected with Mater-Bi for 6 and 12 months revealed that there were no toxic effects in the model organisms exposed in this study. The process of breaking down the Mater-Bi did not generate or transfer toxic substances into the elutriates that could cause alterations in the growth of unicellular algae, embryotoxicity in sea urchins and oxidative stress or genotoxicity in sea bass.

All these analyses were made possible through the pioneering activities of the Open-bio research consortium chaired by Ortwin Costenoble of the Netherlands Standardisation Institute NEN and funded by the European Commission, which laid the foundations for the development and standardisation of the marine testing methods.

According to Francesco Degli Innocenti, Novamont Director of Ecology of Products and Environmental Communication, “All products must be collected and recycled, including biodegradable products made of Mater-Bi, which must be recovered in the form of compost together with kitchen waste. Nothing must be discarded irresponsibly whether on the ground or in the sea, as this creates a potential ecological risk. The intrinsic biodegradability of Mater-Bi products is a factor that can mitigate ecological risk. This, however, must not become a commercial message but a further element to help assess the environmental profile of biodegradable products”.

"In less than a century we have gone from being an empty planet to a full planet in terms of population, concentrations of greenhouse gases in the atmosphere, quantities of products placed on the market. If we want to tackle in a serious and concrete way the complex environmental and social challenges we are facing, we must think about value rather than volumes, in a logic of circular economy with soil and water quality at its core" declares Catia Bastioli, Novamont Chief Executive Officer. “The regeneration of these precious resources requires minimizing the use of products and rethinking them throughout their whole life cycle. Biodegradability in different environments is an essential characteristic when there is a high risk of pollution of organic matter, which, in a full world, must always be treated by an efficient network of plants. This allows the restoration of high-quality humus to the soil, with the dual effect of counteracting the loss of fertility and maximizing the carbon sink. An approach that allows at the same time to prevent water pollution, for 80% caused by inadequate management of waste on land ", concludes Bastioli.

“What is happening to the sea because of plastic is there under our eyes for all to see and a joint commitment is needed by the world of research and business to tackle the environmental degradation that involves the entire planet. We must not forget that the only road to sustainable growth is the transition to a circular economy in which waste becomes a resource. But above all we must remember that we all have to behave

responsibly and that each and every one of us must be aware of the consequences of each single action. Therefore, it is absolutely essential that we dispose of waste correctly and do not simply discard waste of whatever kind into the environment", declares Mrs Rosalba Giugni, president of Marevivo Association.

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Novamont Group is world leader in the production of bioplastics and the development of biochemicals and bioproducts through the integration of chemistry, the environment and agriculture. With 600 people, the Group posted sales of about €238 million in 2018 and made continuous investments in research and development activities (5% of turnover, more than 20% of its staff) and has a portfolio of around 1,800 patents and patent applications. The group has its headquarters in Novara, a production facility in Terni and research laboratories in Novara and Piana di Monte Verna (CE). Novamont subsidiaries are based in, Bottrighe (RO), Patrica (FR) and Porto Torres (SS). Active in Germany, France and the United States through commercial offices and a representative office in Brussels (Belgium), Novamont operates through own distributors in more than 40 countries in all continents.

Novamont Press Office
Francesca De Sanctis - francesca.desanctis@novamont.com - tel.: +39 0321.699.611 - mob.: +39 340.1166.426