



**Integrated solution for innovative biodegradation
control of agricultural plastic mulches**

Green solutions with black plastic.



**Newsletter
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CETEC

Biodegradable plastic are increasing their production, approaching 1% of the total plastic market. Its use in agricultural film take advantage of their biodegradability, as well as the opportunity to stimulate the process of a circular economy. Despite biodegradable plastic are still more expensive than conventional polymers, there are two factor to get closer the price differences. First, economies of scale with larger production plants and second, regulations on traditional polymer increasingly restrictives.

With the applications of the biodegradable film in agriculture, one of the most difficult items is to adequate the duration of the film to the period of the plant growth and crop. In this context, BIOMULCH is offering a biodegradable solution to agricultural mulching film that provides an exactly control of the biodegradation time period. With the help of microorganism linkers and enzymes, BIOMULCH films will biodegrade in less than three months from the date fixed by the farmer, normally the end of the crop. Likewise, the BIOMULCH film will last in best condition during the plant growth as traditional mulching polymers. At the end of the cycle, no rest of mulching film will pollute the soil and a new crop could be plant in a better conditions soil.

BIOMULCH mulching film is a sustainable solution for agriculture that helps farmers and consumers to have better ecological behaviors and contribute to the spreading of circular economy.



BIOMULCH film on
the experimental
farm of ADESVA



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Setup of the experimental BIOMULCH films in Adesva facilities - Interview with Magdalena Torres (MT) (ADESVA) and Manuel Jimenez (MJ) (Morera & Vallejo)



Magdalena Torres and Manuel Jimenez on the experimental farm of ADESVA (Spain)

How would you evaluate the installation of the BIOMULCH film in the experimental field?

MT: On September 18, the different biodegradable BIOMULCH films were installed. This work was carried out with the same technique like in the case of conventional polyethylene foil. All the plastics in the study had appropriate mechanical resistance that did not allow the film to suffer unwanted breaks.

MJ: The first tests carried out with the new films developed in the BIOMULCH project are a test to check, in the first place, the behavior of the film during the installation process in the field using the usual means in Huelva. All placement tests have been successful, having withstood all formulations / thicknesses of the plastic placement with tractor without breaking. With regard to the behavior of plastic in the soil, it is already possible to check which combinations of formula and thickness are more resistant, there being several that are going to be discarded due to premature degradation. In general, the tests are fulfilling the objectives set: to select candidates that resist the mechanical installation and are resistant to the initial degradation.

What are the first impressions about the BIOMULCH film?

MT: So far, a series of Biomulch film are behaving correctly, however there are others whose biodegradation has started too early, showing microperfora-

tions that are evolving into breaks. This is not desirable since the strawberry is a long-cycle crop and the fruits that come in contact with the soil will be depreciated in the market, not being able to sell as first class fruit.

MJ: The first impressions, based on the tests described above, are good, since there are several plastics that resist both mechanical installation and degradation. The goodness of the decision to try multiple combinations of formulation and thickness to discard weaker ones, that is, those that present previous degradation, has been proven.

What is your opinion about the situation of the bioplastic market today? Is there a potential in the BIOMULCH film?

MT: Biodegradable mulches can be a good alternative to polyethylene as long as the yield (grams / plant) or the quality of the fruits is not reduced and the price is competitive. They must also be able to fulfill their mission throughout the crop cycle, initiating biodegradation at the end of it.

MJ: There is already a market for biodegradable mulching film. MVI, as a manufacturer and distributor of agricultural film, can affirm it without any doubt, since we have clients willing to invest in plastics that are truly biodegradable in soil, avoiding the problems associated with the removal, transport and deposit of black film. In addition, there is a growing concern in public authorities to make the agricultural film biodegradable. This is the only way they have to be sure that no plastic will go rivers and seas or will be buried.



The installed experimental mulches

Microorganism solution - Interview with Wang Jingjue (THATCHTEC)



Wang Jingjue
researcher of
THATCHTEC

“We have isolated few microbial colonies which has potential for degrading Biomulch film...”

How would you evaluate the last period of your research?

The last period research, we were facing some challenges, for instance, a proper approach for isolating microorganisms that are responsible for degrading Biomulch film from soil culture. Therefore, we tried lot of different isolating methods, finally we have some promising results, which we successfully isolated eight microbial colonies. It is a big progress for our research, and the current research is to testing these isolates on different Biomulch film samples, and try to find out what is the optimal way and condition to apply these microorganisms in order to reach a good biodegradation.

Regarding to the microorganism solution what are the expectations in WP2?

We have isolated few microbial colonies which has potential for degrading Biomulch film, and then the colonies were enriched with nutrient broth in order to apply as a solution on different film samples. So far, two out of eight colonies showed an effective biodegradation ability on some film samples in soil condition (soil has been sterilized in advance). Different film samples react differently to same colonies, and now we are making a mixed solution with few colonies to test the effectiveness regarding to biodegradation. Therefore, the final product can be a mixed solution of few microorganisms.

What are the plans for the next period of the project?

The focusing of our research for next period is to

Testing of
samples
Photo by
THATCHTEC



The focusing of our research for next period is to identify the microorganisms, and their optimal growing condition. We are now preparing a 16 sRNA sequencing to identify the microbial community of soil samples. After that, together with the results of sequencing and literature research we could study the characteristics of the isolated microorganisms. On the other hand, we will estimate the optimal concentration and amount of microorganism solution for field application to make sure Biomulch film can be degraded within 90 days. And we will create a cost-effective approach for microorganism production, transportation, and application.

Agricultural Film 2017 Barcelona - Report by Nushin Behzadifar (FKuR)

During the AMI's 10th international conference Agricultural Film 2017 all possible solutions to the problems faced by today's protected agriculture were discussed. Growing concern about film waste and disposal is leading to interest in the use of biodegradable materials.

"Growing concern about film waste and disposal is leading to interest in the use of biodegradable materials."

FKuR as a leading producer of customized bioplastics such as biodegradable mulch films attended this event and appreciated the opportunity to introduce and present the concept of BIOMULCH project.

We have had discussions to find out whether the participants are interested in BIOMULCH concept and evaluate the feasibility of launching our new product in this project on the market.

We will stay in touch with the potential clients on the ongoing process of the project.

Carmen Michels (FKuR), Nushin Behzadifar (FKuR) and Alejandro Arribas (CETEC) at Agricultural Film 2017



Science Week 2017 (SeCyT 2017) - Report by Alejandro Arribas (CETEC)



Alejandro Arribas (CETEC) at SeCyT 2017

The Week of Science and Technology of the Region of Murcia was held under the motto "Science everywhere". From last Friday 10 to Sunday 12, in the Botanical Garden of Malecon de Murcia, visitors found many activities and workshops in which to participate and learn a little more about the scientific advances and the latest technologies applied in different fields of science.

The different Murcian universities, institutes of secondary education, associations, scientific bodies and technological centers, presented their latest research or made experimental demonstrations that delighted the youngest and their parents who came to the event.

CETEC, the Footwear and Plastic Technology Center, traveled to the Botanical Garden of Malecon to present its latest activities in relation to its projects. In particular, we present our European project BIOMULCH. BIOMULCH aims to develop biodegradable mulch for the protection of crops that once finished its function is able to biodegrade in a few weeks with the help of enzymes and microorganisms.

Global Biodegradable Polymers Market 2017-2021 - Technavio's report

The bioplastics market continues to show healthy growth. Analysts from technology research company Technavio have now separately examined the biodegradable plastics market. The research study covers the present scenario and growth prospects of the global biodegradable polymers market for 2017-2021.

The report also presents a detailed segmentation of the market by type (polylactic acid, starch-based polymer, and others), by application (food packaging, foam packaging, biodegradable bags, agriculture, and others), and by geography (Western Europe, North America, and ROW).

Overview of the global biodegradable polymers market

According to Technavio's market research, the global biodegradable polymers market can look forward to growth at a CAGR of 21.1% over the next five years. One of the key factors driving the growth of this market is the rise in enhanced consumer appeal to eco-friendly packaging. The shift in consumer behavior has compelled the major plastics manufacturers and packaging vendors to explore the possibilities of biodegradable polymers. The need to conform with government regulations is forcing vendors to focus on manufacturing biodegradable polymers and promote the products that have sustainable components in the export market. Single-use products such as bags, bottles, caps, cups, lids and straws have great potential to become truly sustainable products.

The market is divided into the following segments based on geography

- Western Europe
- North America
- ROW

“The shift in consumer behavior has compelled the major plastics manufacturers and packaging vendors to explore the possibilities of biodegradable polymers.”

Western Europe accounted for the largest market share of the global biodegradable polymers market in 2016. This dominance is due to market

maturation and easy adoption of new production technologies and greater consumer awareness in the region. Also, the legal framework and government strategies of Western

European countries promote the use of bio-based or biodegradable polymers through the provision of subsidies. The key products avail-



Biodegradable bag
Photo by F.
Kesselring



Biodegradable
loose-fill pack-
aging material
Photo by
Christian Gahle

“...PLA base bio-degradable polymer is expected to grow over the forecast period.”

able in the Western European market are compostable bio-based waste bags and loose-fill packaging materials. North America and ROW follow Western Europe.

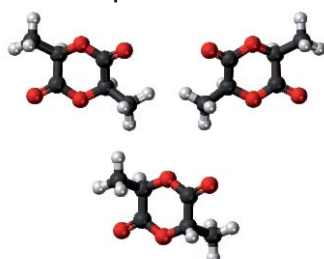


Biodegradable plastic utensils
Photo by Scott Bauer

Segmentation by product type and analysis of the biodegradable polymers market

- Polylactic acid (PLA)
- Starch-based polymer
- Others

During 2016, PLA-based biodegradable polymers dominated the biodegradable polymers market and accounted for a major part of the overall market share. The use of PLA-based biodegradable polymers is increasing owing to growing consumer appeal for biodegradable polymers in the packaging of deli and fresh consumables. PLA also has a high rate of water vapor transmission that aids the escape of water vapor from packaging and prevents fogging, keeping the food inside fresh. Due to the increasing use of PLA to manufacture credit cards, retail cards, membership cards the market for PLA base biodegradable polymer is expected to grow over the forecast period.



Polylactic acid (PLA)
Source: Karya Sendiri

Segmentation by application and analysis of the biodegradable polymers market

- Food packaging
- Foam packaging
- Biodegradable bags
- Agriculture

The food packaging segment accounted for the largest share of the global biodegradable polymers market in 2016, and this trend is expected to continue throughout the forecast period. Packaging products made of biodegradable polymers are used in the packaging of fresh food, dry snacks, candy, bakery goods, juice bottles, and meat trays as well as coatings for beverage cups, films, and card stock. These polymers are being considered as a replacement for the conventional polyolefins used for food packaging.

Source: Technavio

Plastic pollution - Causes, effects and solutions

Due to the growing world population the amount of plastic garbage is larger every year. It causes serious problems in the environment. Plastic pollution involves the accumulation of plastic products in the environment that adversely affects wildlife, wildlife habitat, or humans. While solving the problem of plastic pollution may seem as easy as just implementing recycling or cleaning up empty bottles, the truth is that the plastic causing the pollution can range in size from big to microscopic. Plastics that act as pollutants are categorized into micro-, meso-, or macro debris, based on size. The plastic pollution is present all over the world, affecting lands, waterways and oceans. The most compromised living organisms are marine animals, but humans are also affected. Accumulated plastic waste is slow to degrade and chemicals within plastics that cause interruptions in biological functions.

plastics in the ocean decompose faster than was once thought, due to exposure to sun, rain, and other environmental conditions, resulting in the release of toxic chemicals. One of the major long-term effects of plastic pollution is that it upsets

Microplastics
in the Azores
Photo by Peter
Charaf



the food chain. The polluting plastics even affect the world's tiniest organisms such as plankton. This can cause a whole slew of problems, each step further along the food chain. The plastic are present in the fish that many people eat everyday.

Decomposition of plastics

Many kinds of plastics exist depending on their precursors and the method for their polymerization.

Conventional plastic is composed of major toxic pollutants and it is meant for durability, so it is not biodegradable. These materials have the potential to cause great harm to the environment

“The plastic pollution is present all over the world, affecting lands, waterways and oceans. The most compromised living organisms are marine animals, but humans are also affected..”

A 2017 study found that 83% of tap water samples taken around the world contained plastic pollutants. Contamination rate of 94%, tap water in the United States was the

most polluted, followed by Lebanon and India. European countries such as the United Kingdom, Germany and France had the lowest contamination rate.



Gulf of Aqaba,
Red Sea
Photo by Ben
Mierement

in the form of air, water and land pollution. Polymer degradation takes much longer as a result of saline environments and the cooling effect of the sea. However, recent studies have shown, that

A sea turtle (*Chelonia mydas*) entangled in a ghost net
Photo by Doug Helton



Solutions to Plastic Pollution

As plastic is less expensive, it is one of the most widely available and overused material in the world today. It costs millions of dollars each year to clean affected areas after exposure, not to mention the loss of life to plants, animals, and people. Pollution has led to decreased tourism in affected areas, significantly impacting those economies.

Companies around the world agreeing to implement practices that reduce waste on every level. The first step to stop the plastic pollution is to handle the problem at the roots and start with change people's minds and routines. There's necessary to involve education.

Plastic doesn't break down easily (if ever), recycling plastic means that it is still plastic, just being used for a different purpose. Therefore, you're not actually reducing plastic amounts or exposure, even in the recycling process.



Sailors and Pacific Missile Range Facility personnel pick up trash during a beach clean up in support of World Oceans Day *Photo by Jay C. Pugh*

Glossary

Macrodebris

Plastic debris can be categorized as macrodebris when it is larger than 20 mm. For instance macrodebris are plastic grocery bags. Plastic pollutants with this size are often found in ocean waters. Fishing nets have been prime pollutants.

Mesodebris

Mesodebris is plastic pieces between 5-20 mm.

Microdebris

Microdebris is plastic pieces between 2 mm and 5 mm in size and it is more commonly referred to as nurdles. Nurdles are recycled to make new plastic items, but they easily end up released into the environment during production because of their small size.

Scrubbers

Microdebris that come from cleaning and cosmetic products are referred to as scrubbers.

Polymer

A substance which has a molecular structure built up chiefly or completely from a large number of similar units bonded together, e.g. many synthetic organic materials used as plastics and resins.

Polymerization

A chemical reaction in which two or more molecules combine to form larger molecules that contain repeating structural units.



Project

Partners

TECHNICAL SUPPORT AND PLASTIC VALIDATION. Project Coordinator.

CETEC – PLASTICS & FOOTWEAR TECHNOLOGY CENTRE OF MURCIA

COMPOUND FILM MANUFACTURER
FKUR KUNSTSTOFF GMBH

MICROORGANISMS SOLUTION MANUFACTURER
THATCHTEC

MULCH FILM MANUFACTURER. Technical Manager. Commercialisation & Exploitation Manager
MORERA & VALLEJO INDUSTRIAL, S.L.

VALIDATION OF BIOMULCH AT REAL FIELD. Dissemination and Communication Manager.
ADESVA – TECHNOLOGICAL CENTRE FOR AGRO-INDUSTRY



Project details

Call: H2020-FTIPilot-2016-1

Duration: Dec 2016 - Nov 2018

Total budget: 1 976 993,75 Euro

EU contribution: 1 613 667,50 Euro

Biomulch will:

- save time,
- reduce costs,
- make the waste handling easy,
- have competitiveness with the conventional mulch films.

Green solutions with black plastic.

Upcoming events

ICEESD 2018 : 20th International Conference on Ecosystems, Environment and Sustainable Development

The ICEESD 2018: 20th International Conference on Ecosystems, Environment and Sustainable development aims to bring together leading academic scientists, researchers and research scholars to exchange and share their experiences and research results on all aspects of Ecosystems, Environment and Sustainable Development.

1-2 February, 2018, Melbourne, Australia

11th World Congress on Agriculture & Horticulture

This revered conference will be focusing on the theme "Innovations and Advancements in Agriculture Research".

5-7 March, 2018 Paris, France

3rd International Conference on Environmental Sustainability, Development, and Protection (ICESDP'18)

The goal of ICESDP'18 is to gather scholars from all over the world to present advances in the relevant fields and to foster an environment conducive to exchanging ideas and information.

8-10 April, 2018, Budapest, Hungary

7th World Congress on Biopolymers and Polymer Chemistry

Theme: Present situation and future perspective of Bio-polymers and polymer chemistry

This session presents the Biodegradable plastics (Bio plastics) are one of the important issues in plastic industry. These are natural biopolymers that are synthesized and catabolized by various organisms.

June 4-6, 2018 Osaka, Japan

8th World Congress on Biopolymers

Theme: Biopolymers - A drug to heal the nature
Biopolymers are chain-like molecules made up of repeating chemical blocks and can be very long in length. Depending on the nature of the repeating unit they are made of polysaccharides, proteins of amino acids, and nucleic acids of

nucleotides. The studies are more concerned to Green Composites, Biopolymer Feed Stock Challenges, Biofibers & Microbial Cellulose, Biomaterials and Bioplastics. Advanced studies are being made to improvise developments in Biopolymer Technology, Waste Management, pharmaceutical and biomedical applications, Biodegrade ability, and many more.

June 28-30, 2018 Berlin, Germany

Global Summit on Agriculture & Horticulture

Agricultural Engineering conference is advanced to create improvements in sustainable agriculture which is totally eco-friendly.

09-10 July, 2018 Sydney, Australia

10th International Conference on Sustainable Development and Planning

Sustainable Development and Planning 2018 will bring together academics, policy makers, practitioners and other stakeholders from across the globe to discuss the latest advances in the field.

4 - 6 September, 2018, Siena, Italy

Agricultural Film 2018

Following the success of AMI's 10th Agricultural Film 2017 conference which gathered 200 delegates from over 40 countries around the world, the Agricultural Film 2018 is a must attend event not to be missed. It will bring together agricultural and horticultural cover specifiers, raw material and film manufacturers, professional researchers and educational institutions, cooperatives, growers and associations and public and private bodies involved in agriculture to provide a forum and a networking platform with professionals active in this challenging industry and global food supply in general.

September 17-19, 2018, Melia Castilla, Madrid, Spain

8th International Conference and Exhibition on Biopolymers and Bioplastics

Theme: Applications and Characterization of Biopolymers Vs Polymers: A Global Debate
October 15-16, 2018 Las Vegas, Nevada, USA

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