

# PHAntastic develops biodegradable agricultural plastics that deliver bio-based fertilisers and plant protection solutions

## EU-funded project advances sustainable alternatives to conventional agricultural plastics and chemical inputs

The Horizon Europe project **PHAntastic** is developing a new generation of biodegradable agricultural materials designed not only to replace conventional fossil-based plastics, but also to actively support more sustainable farming practices across Europe.

Running from September 2024 to August 2028, the project brings together 15 partners from seven European countries to tackle two major environmental challenges in agriculture: the heavy dependence on synthetic fertilisers and chemical pesticides, and the widespread use of non-biodegradable agricultural plastics such as polyethylene mulch films and conventional nursery growth foams.

Together, conventional agrochemical inputs and non-biodegradable agricultural plastics are associated with greenhouse gas emissions, soil degradation, biodiversity loss, water contamination, and the accumulation of persistent microplastics in soils.

PHAntastic addresses these issues by developing innovative biodegradable mulch films and growth foams made from PHBV, a polymer belonging to the **polyhydroxyalkanoates (PHAs)** family which are bio-based and biodegradable polymers produced from agri-food residues. Unlike conventional agricultural plastics, the materials developed within the project are designed to biodegrade directly in soil after use, eliminating the need for collection and disposal.

In addition, the new materials act as **functional delivery systems** capable of releasing bio-based fertilisers and plant protection substances in a controlled manner. These include amino acid-based biostimulants, algae-derived extracts, plant-derived elicitors and beneficial soil bacteria known as plant growth-promoting rhizobacteria (PGPR).

The project focuses on applications for horticultural crops such as lettuce and broccoli, as well as citrus and ornamental tree nurseries.



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“PHAntastic is transforming agricultural plastics into sustainable solutions that support crop growth, reduce pollution and safely biodegrade in soil.”

— Carmen Fernández Ayuso, Project Coordinator/CETEC

## Important progress achieved during the first project period

During its first reporting period, PHAntastic completed key scientific and technical activities that establish the basis for future pilot demonstrations and field validation.

Researchers selected and characterised several promising bio-based active substances using a comprehensive screening methodology that combined agronomic performance, compatibility with PHA materials and alignment with the European Union’s **Safe and Sustainable by Design (SSbD)** framework.

One of the project’s most promising lines of progress has been the identification of PGPR candidates with potential to support plant growth and contribute to PHA biodegradation in soil. This dual functionality represents a significant advancement for biodegradable agricultural delivery systems.

The consortium also successfully produced two different PHBV material grades at pilot scale using agri-food processing residues as feedstock, demonstrating the potential for circular and resource-efficient production chains.

Prototype biodegradable mulch films have already demonstrated mechanical properties comparable to commercial biodegradable benchmarks, while initial growth foam trials confirmed the feasibility of creating porous PHA structures suitable for carrying bio-based active substances and beneficial microorganisms.

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## About PHAntastic

PHAntastic directly contributes to several major EU policy priorities, including the European Green Deal, the Farm to Fork Strategy, the Zero Pollution Action Plan and the Circular Economy Action Plan.

The project is particularly relevant to the implementation of the **EU Fertilising Products Regulation (EU) 2019/1009**, which aims to phase out non-biodegradable polymer coatings in fertilising products. By developing technically validated biodegradable alternatives, PHAntastic is generating valuable scientific evidence to support future regulatory and standardisation efforts.

The project also demonstrates how agri-food residues can be transformed into valuable agricultural inputs, helping create circular value chains between food processing industries and farming systems.

Over the coming years, PHAntastic will continue scaling up its materials and validating their performance under real agricultural conditions, with the objective of reaching **Technology Readiness Level (TRL) 6** by the end of the project.

Through its innovative combination of biodegradable materials, bio-based crop inputs and circular production approaches, PHAntastic aims to contribute to a more sustainable, low-pollution and resource-efficient future for European agriculture.

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