

BIOrescue

Enhanced bioconversion of agricultural residues through cascading use



Summary

Europe's mushroom industry generates approximately five million tonnes of spent mushroom substrate (SMS). This is the extraneous substrate and mushroom mycelium that is left behind after harvesting the mushrooms. Storing and disposing of this SMS has become a significant economic and logistical problem. Disposing of it can cost up to €50 per tonne, creating a bill of up to €250 million for the mushroom industry each year.

BIOrescue aims to demonstrate and develop the concept of an integrated bio-production process based on the cascading use of SMS supplemented with wheat straw (WS) and other underutilised lignocellulosic feedstocks. When applied within a conventional mushroom production farm, this will turn it into an efficient and sustainable bio-refinery.

BIOrescue will turn the economic and logistical problem of waste SMS into biochemical materials that can be used as replacements to those derived from fossil resources.

<https://biorescue.eu/>

Type of Action:

Research & Innovation Action

Value Chain: Across VCs

Start date: 01 September 2016

End date: 31 August 2019

BBI JU contribution: € 2,635,140.63

Objectives

The BIOrescue project aims to develop and demonstrate a new innovative biorefinery concept based on the cascading use of spent mushroom substrate (SMS) supplemented by wheat straw and other seasonal underutilised lignocellulosic feedstocks. i.e pruning residues, residual citrus peels and wastes.

This new concept will avoid disposal and allow for the production of some biodegradable bio-based products and bioactive compounds that will help to replace the existing ones based on fossil resources.

Expected impacts

BIOrescue will:

- Use underutilised seasonal feedstock: in addition to using SMS and wheat straw, BIOrescue also evaluates the suitability of a range of other underutilised feedstocks for the process scheme.
- Ensure year round operation by using SMS as a major component and wheat straw which is a resource that is already stored at mushrooms farms.
- Consider cascading use of biomass when biomass is processed into a bio-based final product which is used at least once more, either for materials or energy.
- Upgrade the SMS feedstock into higher value derived bioproducts
- Achieve a 20% overall cost-reduction in the enzymatic hydrolysis step.
- Reach a 20% improvement in resource efficiency by reducing hydrolysis times and the amounts of cellulose and enzyme.
- Keep "Green Premium", which is understood as the extra price market actors

are willing to pay for a green/bio-based product, at minimums by efficiencies inherent in operational activities and production inputs that support the cost-effectiveness of the process.

- Investigate on the role of some of SMS-derived bioproducts compared to their respective fossil alternatives.
- Validate at pilot scale the production of bioproducts that are expected to have superior properties and characteristics compared to fossil based ones.

Achievements & milestones

Bio-based nanocarriers to cure plant diseases for the first time

20 May 2019

The BBI JU BIOrescue project investigates how to transform used mushroom compost into valuable bio-based products such as biodegradable nanocarriers for drug encapsulation. These have now been successfully tested to reduce symptoms of a common grapevine disease. [Read more](#)

Tailor-made enzymatic solutions reduce time and cost of biorefinery processes

25 April 2019

Key components in a biorefinery conversion are enzymes, which are used to break down the long-chains of sugar and lignin polymers present in the biomass into smaller pieces. As part of the BBI JU BIOrescue project, a Finnish company has created enzymatic solutions tailored to extract sugars from the mushroom compost in an optimal way. [Read more](#)

Mushroom compost: a rich source of bio-product innovation

21 January 2019

Our BIORESCUE project is developing innovative technologies that will enable mushroom farms to turn compost into novel bio-based products such as natural pesticides, cutting fossil fuel use and positioning the sector at the heart of Europe's circular economy. [Read more](#)

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