SUSTAINABLE PRODUCTION OF FUEL (BIOETHANOL) FROM SHELLFISH WASTE

DESCRIPTION OF THE TECHNOLOGY

A novel process has been developed to produce bioethanol and fungal biomass for agrobiotechnological use from the shellfish industry (or other sources of chitin or chitosan) as an alternative to the use of agroforestry crops or residues as raw materials. It is an ecological and sustainable way to minimise the pollution produced by shellfish waste.

To do it, at least, one of the following three fungi (nematophagous and entomopathogenic) are used, and from any by-product (comprising chitosan, chitin or derivatives thereof), are able of growing and producing ethanol under anaerobic conditions from the sugars produced as a result of the degradation of these residues:

- *Pochonia chlamydosporia*.
- *Beauveria bassiana*.
- *Metarhizium anisopliae*.

These fungi (both conidia and chlamydospores) are in certain concentrations that allow their rapid and plentiful growth without producing self-inhibition.

MARKET APPLICATION SECTORS

This invention finds its application in:

- Obtaining **biofuels** (bioethanol), as an alternative to ethanol produced by fermentation processes (using yeasts) from vegetable matter.
- Production of **fungal biomass** for agrobiotechnological use.
- **Degradation** and **decontamination** of waste generated by shellfish industry.

TECHNICAL ADVANTAGES AND BUSINESS BENEFITS

A novel procedure has been developed that allows the use of wastes and by-products of the shellfish industry as an alternative to agroforestry crops or residues as raw materials to produce biofuels (ethanol) using nematophagous and entomopathogenic fungi, instead of traditional fermentation processes. Among the main advantages are:

- Fungi can grow in the presence of **high concentrations of chitosan**: these conditions are highly toxic to other microorganisms, which reduces pollution naturally.
- Fungi use chitosan as the **sole source of nutrients**.
- Fungi transform sugars into **ethanol**.
- Fungi can grow under conditions of **anaerobiosis**.
- Fungi are able to **tolerate a very amount of ethanol** that they produce in the culture medium.
- Fungi have in their genome the sequences of zinc-dependent alcohol dehydrogenases and pyruvate decarboxylases necessary to produce **ethanol**.
- Fungi are able to produce ethanol and fungal biomass from **shellfish industry waste**, thus reducing contamination that they cause.
- It is a **sustainable** and **environmental friendly** procedure.
- It is an **economically viable** procedure.
- **Performance is very profitable**.

SUSTAINABLE PRODUCTION OF FUEL (BIOETHANOL) FROM SHELLFISH WASTE

CURRENT STATE OF DEVELOPMENT

The experiments have been carried out successfully inoculating nematophagous and entomopathogenic fungi (*Pochonia chlamydosporia*, *Beauveria bassiana* and *Metarhizium anisopliae*) in a medium whose only source of nutrients was chitosan, under both aerobic and anaerobic conditions, and more than 2% of ethanol was obtained on a **laboratory scale**.

The research group has the **knowledge**, **experience** and **technology** necessary to replicate the experiment at **pre-industrial level** to validate its efficiency, performance, and technological and economical feasibility.

INTELLECTUAL PROPERTY RIGHTS

The present invention is protected through **three patent granted**:

- Title of the patent: "Procedimiento para la producción de bioetanol a partir de quitosano mediante el uso de los hongos *Pochonia chlamydosporia*; *Metarhizium anisopliae*; *Beauveria bassiana*". Application date of the three patents: 27th April, 2015. Application numbers: **P201530552**, **P201530894** and **P201530895**, respectively.

COLABORATION SOUGHT

It is looking for companies or investors interested in acquiring this technology for **commercial exploitation** through:

- Patent license agreement.
- Search for financing opportunities to develop new applications, adapt them to the specific needs of the company, etc.
- Technology or knowledge transfer agreements.

RELATED IMAGES

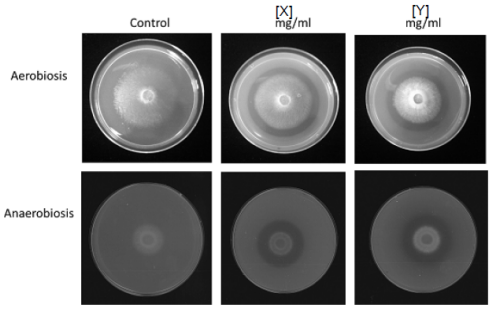

Image 1: Appearance of the colonies of *Pochonia chlamydosporia* (15 days) growing with chitosan in aerobic and anaerobic conditions. The dark zone around the colonies of the fungus corresponds to the halo of chitosan degradation.

CONTACT

Víctor Manuel Pérez Lozano
SGITT-OTRI (University of Alicante)
Phone: +34 965 909 959
Email: areaempresas@ua.es
Web: http://innoua.ua.es/