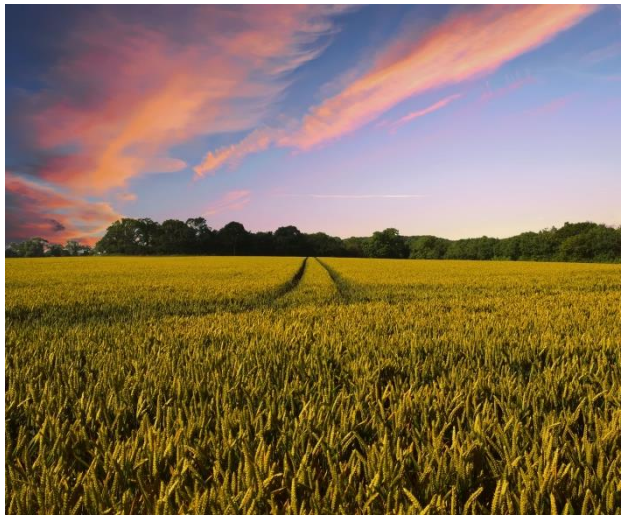
PHOTOBIOLOGICAL PRODUCTION OF POLY HYDROSSIBUTIRRATE FROM BIOMASS WITH NON-SULFURE RED BACTERIA

DESCRIPTION:

The patented technology allows the use of the mutant bacterial strain *Rhodopseudomonas palustris* as a photofermenter of biomass of vegetable origin. The photofermentation allows the **production** of hydrogen and **poly-β-hydroxybutyrate**, with consequent **energy optimization** of residues and the production of recyclable and environmentally friendly plastics.

The proposal contributes in a sustainable and economic manner to the correct development of alternative energy technologies, in the context of growing attention to the **green economy** and to the development of a low-carbon agriculture. Biomass: cane, corn, bran, pomace, are abundant, economical, renewable and biodegradable substrates and can be used as source for the photofermantation of the Rhodopseudomonas palustris mutant bacterial with the production of poly-β-hydroxybutyrate, biopolymer usable for the production of bioplastics.



ADVANTAGES:

Choice of biomasses (food residues, resource availability),

recovery of areas subject to environmental problems,

enhancement of marginal territories,

energy exploitation of these residues,

efficiency of disposal,

bioplastic production and plastic reduction.

APPLICATIONS:

Green economy

Biogas plants

Industrial photobioreactors

Biomass disposal and conversion

Utilizers of the photofermentation system

Bioplastic production

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The use of photofermentation for the production of **recycable plastic** is an outstanding advance in the direction of **green economy**, thanks to this method it will be avoid the huge production of plastic. It will be used **biomasses**, cereal crops, agro-industrial residuals, humid and dry, such as common reed, corn, wheat bran and pomace. Cane is characterized by constant and **high productivity**, **adaptability** to different types of soil, **low water consumption** and is a non-food crop with little susceptibility to fungi and pathogenic insects and high competitiveness with respect to infesting plants. Corn is widespread and commonly used in the bioenergy sector, such as biogas. The pomace is a remnant of the oil industry and internationally Italy is the second largest olive oil producer and second largest producer of pomace, with an annual production of 2.5 - 3 million tons. Pomace is a substrate rich in structural carbohydrates, lipids, polysaccharides and proteins. Wheat bran is a residue of the milling industry and this too is an interesting by-product to be used for bioenergy purposes. It is a matrix consisting of structural carbohydrates, starch and proteins and in Italy there is an annual production of 1.1 - 1.4 million tons. Furthermore, a central point for the sustainability and economy of the use of biomass in bioenergy on an industrial scale is conservation, ensiling is a method of conservation and at the same time a biological pre-treatment of biomass.

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cane

bran

mais

pomace

Energy (H+) and poly-β-hydroxybutyrate (PHB)

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The Institute of Life Science - Agricultural Science Area

Main goal and research activities of is understanding the physiological and molecular interactions between agricultural plant species and the environment, by:

Evaluating the negative and positive effects of environmental factors on plant production and identifying the plant genotypes resistant to environmental stress that can be introduced in sustainable production systems.

Evaluating “no food” plant species for the **phytoremediation** of soil and ground water.

Studying in vitro plant systems as a tool for: a) biochemistry-molecular studies; b) the propagation and conservation of the germplasm; and c) secondary metabolite production.

The analysis and characterization of the germplasm of woody and herbaceous plants.

The development of Information and Communication Technology (ICT) tools and of a Web-based Decision Support System applied **to crop monitoring** (protection, maturation, irrigation) networks.

Improving the knowledge of the life history and population dynamics of insect pests, studying the functional biodiversity of insect communities in agroecosystems, **Developing Decision Support Systems** (DSSs) for area-wide and integrated pest management through the Information and Communication Technology (ICT).

These activities are pursued trough the cooperation with local and international stakeholders in devising strategies and tools for sustainable agroecosystem management.

Other tasks are conducted in an international team conducting inter- and trans-disciplinary research on several aspects of agronomy and field crops, with emphasis on:

Sustainability of food and non-food cropping systems
Soil fertility and plant-soil interactions
Influence of management techniques on greenhouse gas emissions
Agricultural **water management**
Landscape agronomy to support the development in rural and and peri-urban areas
Management of functional biodiversity at species and habitat level for the provision of agroecosystem services
Agroecological management in low input and organic cropping and farming systems
Integrated pest and weed management
Management techniques for increasing **nutraceutical** properties of food and feed

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