

# Beneficial Microbes: Food, Pharma, Aqua & Beverages Industry

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## Design of a biofertilizer based on okara fermentated with *Bacillus licheniformis*

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*Bacillus licheniformis* is a Gram-positive, soil bacterium used in the biotechnology industry to manufacture industrial enzymes including several proteases,  $\alpha$ -amylase, lipases, chitinases, etc. These enzymes have a wide range of application in food and detergent industry. However, this organism may have other applications in the environmental field, thus marketed biological products for agriculture with biofertilizer capacity have been formulated based on *Bacillus licheniformis* and/or isolated extracellular enzymes that contribute to nutrient cycling in nature, which is responsible for the biofertilizer function. The objective of this work is to obtain a new product based on *Bacillus licheniformis* and hydrolytic enzymes with environmental applications. In order to obtain this product we have chosen an organic byproduct of low economic value, the okara obtained in large scale in the production of soy milk as fermentation source. The okara has also a great potential as a fertilizer because it has high concentrations of organic nitrogen and phosphorus, but has a problem because it is poorly bioavailable because it is insoluble and proteins and carbohydrates are high molecular weight. Briefly, the optimal fermentation conditions (pH, temperature, substrate concentration) has been determined, which has led to obtain a new product with agronomic/environmental applications, with three important features:

1. Total solubility, biopolymers have been hydrolysed (peptides, glucose, fatty acid)
2. High production of hydrolytic enzymes (protease, amylase and lipase)
3. High bacterial concentration (*Bacillus licheniformis*)

Chemical and microbiological characterization of this new product has been made, and its biofertilization activity has been tested.

### Biography

Angel Gomez Orts is a Doctoral candidate with several years of experience in biochemistry and enzymology. He is completing his doctoral thesis at the Faculty of Pharmacy of the University of Seville.

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