Antarctic Soils Bacteria a Source of Enzymes as Bioremediation Agents

Gabriela BAHRIM* and Teodor NEGOITA**

**Dunărea de Jos* University Faculty of Food Science and Engineering, Galati Romania

**Romanian Polar Research Institute, C.P. 42-29, Bucharest, Romania

AIMS OF THE STUDY

Study of the Antarctic soils microbiota a bio-base of bacteria as good producers of hydrolases (amylases and proteases) and phenoloxidases with commercial importance and bioremediation implications.

Use response surface methodology to develop the effect of some nutrients on the enzyme biosynthesis yields in *Bacillus subtilis* and *Streptomyces* sp. selected polar strains.

The control of the enzymes biosynthesis through qualitative and quantitative variations of the carbon, nitrogen and phosphorous sources in the fermentative media.

PURPOSE AND HYPOTHESIS

The designing of the biotechnology to produce microbial enzymes is based on the physiology of the producing agent and its behaviour depending on the medium composition and the cultivation conditions.

Currently there is still no appropriate bioprocess with a well-established bioengineering basis to effectively and simultaneously produce multienzymes by a single microbial culture.

Bacterial amylases, proteases and phenoloxidases are extracellular enzymes which synthesis depends on the environment conditions.

A repression of the enzymes biosynthesis process can be caused by the fast-metabolized carbon or nitrogen easy assimilable sources, which generates the catabolism repression.

This study presents a simple way of guiding and monitoring enzymes biosynthesis with a view to modifying the enzymes yields and proportion by changing the composition of the fermentative medium using response surface methodology.

The experiments were planned to establish the correlation between the biosynthesis performances and the fermentation medium's composition from hydrolase by *Bacillus subtilis* and phenoloxidase by *Streptomyces* sp.

MATERIALS AND METHODS

Two selected bacteria strains *Bacillus subtilis* MIUG 6.150 and *Streptomyces* MIUG 1P was isolated, in 1999, from polar soils, the area Larsemann Hills Progress Station, East Antarctic coast.

The cultures belong to the Microbiology Laboratory of Galati University (Collection of Microorganims, acronym MIUG) and they are using as good Producers of amylases, proteases and phenoloxidases.

The influence of the medium composition on the enzyme production starting from a basal medium was established.

A number of nine variants of fermentative media were conceived and examined to quantitatively check the optimal composition of the carbon, nitrogen and phosphorous sources for an optimal enzyme biosynthesis.

The following enzymatic activities were examined in liquid culture, after biomass separation at 9000 rot/min, for 10 minutes: *α-amylase activity β-amylase activity; protease activity; phenoloxidase activity*.

RESULTS

The quantitative effects of the fermentative medium composition on the enzymes biosynthesis were analysed by means of the "composite design" technique.

For mathematical modelling of enzymes production the Response Surface Methodology was applied by using the numerical calculation experimental program (Table Curve 3D Jandel Scientific) to fit the polynomial equations to experimental data and generate the three-dimensional graphs.

In the second step mathematical models of the polynomial equations type were established.

CONCLUSIONS

By the response surface methodology the effect of some nutrients on the enzyme biosynthesis yields in *Bacillus subtilis* and *Streptomyces* sp. selected polar strains were studied.

The carbon, nitrogen and phosphorous sources significantly influence the biosynthesis yield through non-linear correlations inter-independently.

The researches have demonstrated that biosynthesis of the enzymes is also influenced by other components in the fermentative medium which effect needs further studies and optimization.

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Contacts: Gabriela.Bahrim@ugal.ro; negoita_antarctic@yahoo.com

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