Optimization of cold-adapted amylase and proteases production from newly *Streptomyces* 4 Alga using statistics based experimental designs

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Introduction

Streptomyces, filamentous bacteria, are important microorganisms because of their capacity to produce numerous **cold-active enzymes**.

These bacteria are widespread in large number, specially in soil and they do not have special nourishing needs.

Objectives

The present study was designed for emphasise the effect of carbon sources on **cold-active amylase (α and β amylase) and proteases** production by newly **psychrotolerant** Streptomyces 4 Alga in submerged culture, using statistical experimental design.

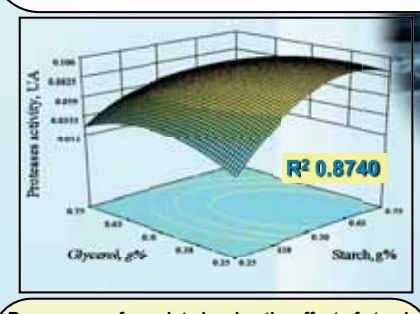
The polar bacteria was isolated from Antarctic vegetation samples from **Progress Lake 2** (East Antarctica coast) in 2008.

Preliminary studies on the carbon sources enabled identification of **starch** and **glycerol** as important variables with respect to cold active amylase and proteases production.

Methods

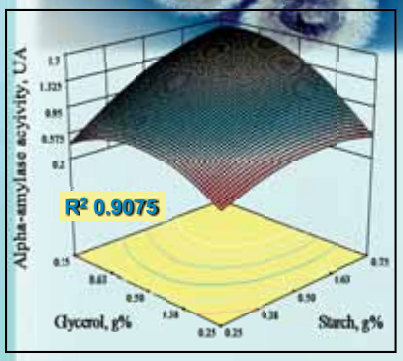
Central Composite Design (CCD) was used for model building and the optimal values of the carbon sources were performed by **Response Surface methodology** (RSM).

Numerical optimization was achieved using **Design Expert Software 7.1.6**, Stat-Ease Inc., Minneapolis, USA.

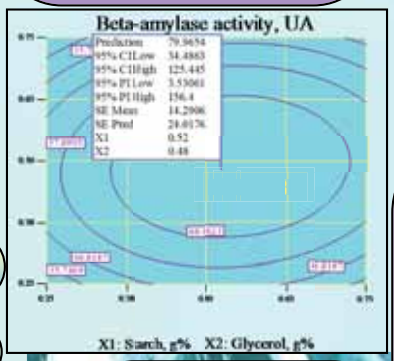


Response surface plot showing the effect of starch and glycerol concentrations on the production of cold-adapted proteases

Results



Response surface plot showing the effect of starch and glycerol concentrations on the production of cold-adapted α-amylase



Contour plot showing the effect of starch and glycerol concentrations on the production of cold-adapted β-amylase

Experimental range and levels of two independent variables considered using CCD in terms of actual and coded factors

Independent variables	Symbol code	Coded level of variables		
		-1	0	1
Starch, g %	A	0.25	0.5	0.75
Glycerol, g%	B	0.25	0.5	0.75

Conclusions

- The settings for maximum **cold-adapted alpha-amylase** production (1.61649 UA) were obtained at **0.75% starch** and **0.69% glycerol.**
- At optimum parameters (**0.52% starch** and **0.48% glycerol**) was performed greatest **cold-adapted beta-amylase** (79.9654 UA) production.
- The conditions for highest **cold-adapted proteases** production were obtained at **0.70% starch** and **0.35% glycerol**.
- The optimization strategy led to an increase in cold-adapted amylase (alpha and beta) and proteases production with **1.14**, **7.74** and **5.83**%, respectively.

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