COMPARISON OF KINETIC EQUATIONS FOR THE RESPIROMETRY IN SOLID STATE FERMENTATION

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Introduction. Relatively simple equations have been used for describing the growth of microorganisms. They must be based on sufficient independent experimental data. However, the direct measurement of biomass is not very reliable in solid-state fermentation. It can also produce a limited number of data (1). Therefore, the production of carbon dioxide and the consumption of oxygen have been used as indirect methods. In addition, the growth profile form depends on the fungi and support.
The objective was to compare three kinetic equations by means of statistical considerations.

Methods. The conditions and monitoring of laboratory scale solid state fermentation of coffee pulp using with *Aspergillus tamarii* have been previously reported (2). Three independent set of data were recorded. The carbon dioxide production rate (CDPR) as a time function was described with the following equation: Exponential, Logistic and Gompertz. The sum of squared error (SSE) and the Durbin Watson test were calculated.

Results. An initial low respiration period of 7.9 h was observed (lag phase). After that, there was a rapid growth phase with increase in CDPR that stopped after 34.6 h of cultivation. Finally, a deceleration phase was observed. Exponential equation cannot describe this behavior. In addition, Durbin Watson test showed also correlation of the residues for the logistic and Gompertz equations. In order to compare the proposed equations only smaller set of data (31) corresponding to the first two phases data were used (Figure 1). The use of exponential equation shows the biggest SSE (26.2 ± 3.42). On the other hand, logistic and Gompertz equations present smaller SSE (10.95 ± 4.28 and 9.67 ± 5.63, respectively). Durbin Watson test suggested that only no correlation was present with Gompertz equation. Logistic equation has shown to describe better the growth of *Aspergillus spp* in solid state fermentation (1). Gompertz equation has been used for bacterial growth and spore germination (3,4). To our knowledge, it has not been used to describe the CDPR in solid state fermentation.

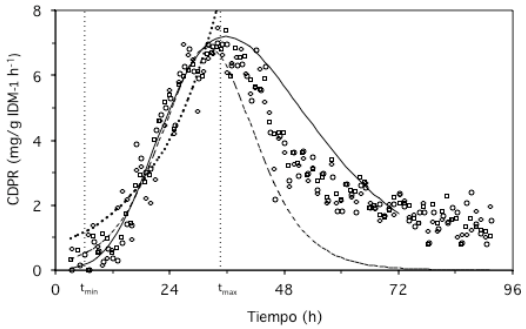

Fig. 1. Experimental data (points) and exponential (dotted line), logistic (dashed line) and Gompertz (solid line) equations for the CDPR during solid state fermentation of coffee pulp with *A. tamarii*.

Conclusions. The CDPR of *A. tamarii* on coffee pulp can be described only during the lag and rapid growth phases. Gompertz equation shows the smallest SSE and no correlation of the residues.

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