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## Data Article

# Experimental design data for the biosynthesis of citric acid using Central Composite Design method

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## ABSTRACT

In the present investigation, we report that statistical design and optimization of significant variables for the microbial production of citric acid from sucrose in presence of filamentous fungi *A. niger* NCIM 705. Various combinations of experiments were designed with Central Composite Design (CCD) of Response Surface Methodology (RSM) for the production of citric acid as a function of six variables. The variables are; initial sucrose concentration, initial pH of medium, fermentation temperature, incubation time, stirrer rotational speed, and oxygen flow rate. From experimental data, a statistical model for this process has been developed. The optimum conditions reported in the present article are initial concentration of sucrose of 163.6 g/L, initial pH of medium 5.26, stirrer rotational speed of 247.78 rpm, incubation time of 8.18 days, fermentation temperature of 30.06 °C and flow rate of oxygen of 1.35 lpm. Under optimum conditions the predicted maximum citric acid is 86.42 g/L. The experimental validation carried out under the optimal values and reported citric acid to be 82.0 g/L. The model is able to represent the experimental data and the agreement between the model and experimental data is good.

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## Specifications Table

Subject area	<i>Biology</i>
More specific subject area	<i>Microbial biosynthesis</i>
Type of data	<i>Table, text file, graph, figure</i>
How data was acquired	<i>Analytical method</i>
Data format	<i>Analyze</i>
Experimental factors	<i>Determination of the yield of Citric acid</i>
Experimental features	<i>The sterilization for fermentation experiment was carried out for 25% sucrose solution by supplying the water and oxygen to the fermentor. After adding the nutrients, clear supernatant liquid was diluted to 15% sucrose level. The solution and growth medium were sterilized. The prepared culture was poured to fermentor and thereafter fermentation experiments were carried out for different operating conditions.</i>
Data source location	<i>Data of experimental and model provided in Table 2.</i>
Data accessibility	<i>Data provided in the article</i>

## Value of the data

- The data presented for the production of citric acid using the *A. niger* using the batch solid state fermentor.
- The significant factors which influence on the growth of the citric acid are given in Table 3 both the CCD regression model and experimental data.
- The data presented in the article is useful to the industry as well as researchers. The detailed data of CCD and experimental data are useful to researchers for the production of citric acid with other strains.

## 1. Data

Citric acid is one of the most important biochemical products that are extensively used in many industrial processes like in the food technology to various fields of chemical industry [1]. Citric acid is in highly demandable product. It is produced by the extraction of citrus fruits, chemical synthesis and fermentation. Due to the limited supply of natural citric acid, it is produced commercially by using *A. niger* from the fermentation process of bulk hydrated materials and the byproducts of sugar production [2–5].

Citric acid is produced mainly by *A. niger* from the fermentation process [6,7]. The growth and production rate of *A. niger* are very much affected by the medium composition, fermentation variables and stimulators.

The worldwide demand for citric acid is increasing faster than its production and it requires more economical process models [3,8]. The raw materials for citric acid production include; brewery wastes, corn starch, beet molasses, coconut oil, carob pod extract, glycerol date syrup, and pure sugars such as glucose and sucrose [9]. In addition to molds, several yeast strains are now known to produce large amounts of citric acid [10,11].

The experimental plans were obtained from the Design expert soft ware. From that a set of combinations the experiments were performed. The experimental results were used to find a statistical mathematical model as a function of all the influenced factors or variables.

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