

ADVANCED BIOTECHNOLOGY FOR CITRIC ACID AND CITRIC ACID ENZYMES

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Abstract

Today there is a world tendency to use starch containing raw materials for citric acid production instead of the traditional ones. An enzymes-induced synthesis acting as a catalyst for the polysaccharide hydrolysis in the acidic media occurs during fermentation together with the main product. The goal of this research is to develop technologies for the production of several desired products during a one process.

Hydrolyzed corn starch was used as a raw material. The following devices were applied: a shaking incubator Multitron, a drum set Sartorius, cartridge filters with molecular weight cut-off of 100 and 15 kDa for citric acid and enzymes separation, extraction and purification. The enzyme activity was evaluated by spectrometry. Methods to regulate citric acid biosynthesis during corn starch hydrolysates fermentation using *Aspergillus niger* strains are developed.

It was established that glucose concentration has a main influence on the citric acid biosynthesis. Enzyme production depends largely on the maltose concentration. A considerable influence exerts the carbohydrate - nitrogen ratio being C : N = 55 : 1. Due to the optimal fermentation conditions balance mechanisms to produce two microbial biosynthesis products are assured. Finally a basis for the new integrated technology that permits to produce citric acid and a number of acid-stable enzymes in one process is developed. The quality of the isolated citric acid satisfies GOST R 908-2004. An integrated enzymatic formulation with α -amylase, glucoamylase, protease, xylanase, maltase activities is received together with the citric acid. The amylase activity corresponds to foreign multi-enzyme preparations. The isolated enzymes formed part of the multipurpose complex food additive destined to intensify fermentation processes and to improve final food product organoleptic properties.

The new technology is able to meet world market competition. It is possible to apply the isolated substances as a part of food additives for produce bread, bier, alcohol and soft drinks and as a processing aid in starch, light and medical industries.

Key words: Citric acid, Acid-stable amylolytic enzymes, Multipurpose food additives.