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MICROORGANISMS – PRODUCERS OF CITRIC ACID

Citric acid is widely used as a flavor additive, acidity regulator and preservative in the food industry (food additives E330). It is found in almost all fruit and vegetable juices, confectionery products, juice-containing drinks. In the oil and fat industry, citric acid significantly reduces the possibility of rancidity of fats, margarines and animal oil.

In industry, citric acid is obtained using Aspergillus niger micromycetes [1]. This is due to the fact that A. niger is able to synthesize a large amount of citric acid on cheap nutrient media. As a rule, the components of such environments are cornmeal, molasses, etc. The industry also knows the synthesis of citric acid with the help of yeast Yarrowia lipolytica, which also grows on inexpensive substrates. However, when producing citric acid, yeast synthesizes isocitric acid in the environment, which complicates the isolation and purification of the finished product. Unlike yeast, A. niger mushrooms do not synthesize such byproducts as isolitric acid [2].

There is information in the literature [2] that citric acid can also be produced by other microorganisms, namely, the bacteria Arthrobacter paraffinens, Bacillus licheniformis, Corynebacterium ssp, as well as the yeast Candida tropicalis, C. oleophila, C. guilliermondii, C. citroformans, Hansenula anomala and Yarrowia lipolytica. However, the yield of citric acid cannot compete with industrial strains such as A. niger and Y. lipolytica.

Also, one of the modern trends is obtaining mutant strains capable of synthesizing a larger amount of citric acid. The authors [1, 3] obtained transformants

of A. niger (A. niger CGMCC 10142), which used corn starch as a substrate. This resulted in increased glucosamylase activity and decreased α-glucosidase activity in the transformed strains. Due to this, residual reducing sugars decreased by 88%, while the yield of citric acid increased by 17% [2]. This was confirmed by other researchers [3]. They described in their works that they obtained genetically engineered strains of A. niger, which reduced residual sugar by 10% and increased the yield of citric acid by 12% [3, 4].

Thus, it can be concluded that using genetic engineering methods of biotechnology, mutants capable of synthesizing an excess of citric acid can be obtained.

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