OPEN ACCESS Freely available online

Current Synthetic and Systems Biology

Perspective

Industrial Process of Citric Acid Fermentation

Mariliyan Rohan*

Department of Biotechnology, Federal University of Lafia, Lafia, Nigeria

DESCRIPTION

Citrus acid (2-hydroxy-propane-1,2,3-tricarboxylic acid) derives its name from the Latin word citrus, which is related to a tree whose fruit is similar to lemons. Citric acid has a molecular weight of 210.14 g/mol and three carboxylic functional groups with varying pKa values (3.1, 4.7, and 6.4). It is a major metabolic product of the tricarboxylic acid (or Krebs) cycle that can be found in trace concentrations in nearly all plants and animals. In 1784, it was separated from lemon juice Citric acid was first commercially prepared in England around 1826 from imported Italian lemons (lemons contain 7-9% citric acid). Until 1919, when the first industrial process containing *Aspergillus niger* occurred in Belgium, lemon juice was the commercial source of citric acid[1] . Citric acid extraction is now limited to a few small factories in Mexico and Africa. Giroux and Adams synthesized citric acid from glycerol and later from symmetrical dichloroacetate. Since then, other ways based on other synthetic materials have been published, but chemical methods have so far proved uncompetitive[2-3] . Especially considering the fact that various organisms can be used to make citric acid, *A. niger* remains a strong industrial producer. In fact, special strains capable of producing small citric acid in various fermentation techniques have been produced. The marginal product of anhydrous citric acid per 100 g sucrose is 112 g. However, due to trophophase losses, the output of citric acid from these strains minimum depth of 70% of the actual yield on the carbon source. Despite a long and successful history of producing citric acid, the biochemical basis of the process is not well recognized. The composition of the medium has a major influence on the development of citric acid, mainly in submerged fermentation processes. However, except for Currie's early investigations, there was no other previous research on the composition of the medium until the 1940's. These authors created a medium that served as the foundation for further study into the manufacture of citric acid. The most important terms influencing citric fermentation were reported to be the kind and quantity of carbon supply, nitrogen and phosphate limitation, pH, aeration, oligo-elements concentration, and form of the creating microorganism to be the most important parameters influencing citric fermentation[4].

The composition of the medium has a major influence on the buildup of citric acid, especially in submerged fermentation processes. In a nutshell, overproduction of citric acid necessitates a one-of-a-kind combination of unusual nutritional conditions (excess carbon source, hydrogen ions, and dissolved oxygen, as well as suboptimal concentrations of certain trace metals and phosphate), which influence fermentation performance synergistically. An essential factor is a requirement that the Krebs cycle is completed in order to enable ongoing citric acid synthesis. To compensate for the lack of cycle intermediates caused by the metabolic dysfunction that causes citric acid accumulation, pyruvic acid produced from glucose is not only decarboxylated to acetyl-CoA by the pyruvate dehydrogenase complex, but it is also partially carboxylated to oxaloacetic acid during the idiophase by the action of pyruvate carboxylase[5].

CONCLUSION

According to some the production of citric acid requires the inactivation of the Krebs cycle enzymes responsible for its removal, aconitase and isocitrate dehydrogenase. However, there is evidence that the krebs cycle is active during the synthesis of citric acid, producing intermediates essential for biomass creation As a result, as kubicek (points out, the citric acid buildup may be the result of augmented (deregulated) production rather than restricted breakdown. Tricarboxylate transporter activity, which competes with aconitase for citric acid, could explain citric acid formation. This enzyme ejects citric acid from the mitochondria without inhibiting cycle enzymes when its affinity for citric acid is larger than that of aconitase. Finally, *A. niger* produces three principal isozymes of isocitrate dehydrogenase, of which one is NAD+ dependent in the mitochondria and two of these are NADP+ dependent in the cytoplasm. All require Mg^{2+} or Mn^{2+} , and the NADP+ dependen -t form is blocked by citric and ketoglutaric acids enabling citric a -cid storage.

Correspondence to: Dr. Mariliyan Rohan, Department of Biotechnology, Federal University of Lafia, Lafia, Nigeria, E-mail: marirohan@edu.com

Received: 02-May-2022,Manuscript No.CSSB-22-18200; **Editor assigned:** 05-May-2022, Pre QC No.CSSB-22-18200 (PQ); **Reviewed:** 19-May-2022,QC No.CSSB-22-18200;**Revised:** 26-May-2022, Manuscript No. CSSB-22-18200 (R); **Published:** 02-June-2022, DOI: 10.35248/2332-0737.22.10.003.

Citation: Rohan M (2022) Industrial Process of Citric acid fermentation. Curr Synth Syst Bio. 10: 003.

REFERENCES

1. Forster A, Aurich A, Mauersberger S, Barth G. Citric acid production from sucrose using a recombinant strain of the yeast *Yarrowia lipolytica*. Appl Microbiol Biotechnol. 2007;75(6):1409-17.
2. Angumeenal AR, Venkappayya D. An overview of citric acid production. LWT-Food Sci Technol. 2013;50(2):367-70.
3. Ates S, Dingil N, Bayraktar E, Mehmetoglu U. Enhancement of citric acid production by immobilized and freely suspended *Aspergillus niger using silicone oil*. Process Biochem. 2002;38(3):433-6.
4. Berovic M, Legisa M. Citric acid production. Biotechnol. Annu. Rev. 2007;13:303-43.
5. De Jongh WA, Nielsen J. Enhanced citrate production through gene insertion in *Aspergillus niger*. Metab. Eng. 2008;10(2):87-96.