



# MICROBIAL PRODUCTION OF CITRIC ACID

December, 2010



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## ABSTRACT

Natural source of citric acid is a citrus fruits which contain 7 - 9 % of citric acid. At the beginning of 20<sup>th</sup> century about 10,000 tonnes of citric acid was obtained by the processing of citrus fruits. For the production of one tone of citric acid about 40 - 80 tonnes of lemons were being processed. Citrus fruits were unable to fulfil the growing demand for citric acid. Therefore, researchers shifted their attention towards microbial process for production of citric acid. Italy, alone having upper hand in the production of citric acid from lemon fruits. Various microorganisms like fungi and actinomycetes have to known to produce citric acid from carbohydrate substrate. Screening of microorganisms for the production of large amount of citric acid, after that *Aspergillus niger* was selected and grown on nutrient solutions of different concentration of carbon source. After incubation, it was found that 13 % sucrose concentration gave higher yield of citric acid. It was also noted that nutrient solution with glucose is not suitable for higher yield.

**Key Words :** Citric acid, Actinomycetes, Lemon, *Aspergillus niger*, Sucrose.

## INTRODUCTION:

Citric acid have pleasant taste and higher water solubility, most extensive applications in every carbonated soft drink, jam, jellies, pharmaceutical, cosmetics, soap, biodegradable detergent industries. Production cost of pure citric acid is more than Rs. 100 / Kg where as China made citric acid available in India Rs. 70 to 75 / Kg. That's why Indian citric acid industries shut down. According to Perquin 1938, the world production of citric acid amounted 10,400 tonnes of which Italy contributed 1800 tonnes from lemon and rest being produced by fermentation. Many microorganisms like *Botrytis cinerea*, *Mucor puriformis*, *Trichoderma viride*, *Candida* and many actinomycetes used for production of citric acid. Improvement in citric acid production by *A. niger* from beet molasses

detected by the incorporation of pH indicated by change in colour. *A. niger* isolated from soil samples collected from various locations by dilution method. The diluted solution samples spread separately on sterile nutrient ( Czepak Dox Agar ) medium contain streptomycin to avoid bacterial growth. For test spores from slant culture were incubated on sterilized Czepak Dox Agar medium plates incorporated with Bromocresol green dye. Inoculated plates were incubated at 28<sup>o</sup> C for 24 hours and checked for colour changes blue to yellow indicates organic acid production. Nutrient solutions were inoculated with pure culture of *A. niger* and checked the production of citric acid. In present study effect of different concentrations of sucrose ( 12 to 18 % ) and pH were tested, all over parameters of nutrient solutions were kept constant. Nutrient

**Table No. 1 :** Effect of different % of sucrose and glucose for the production of citric acid

Sr. No.	Sucrose %	Yield ( mg / ml )	Glucose %	Yield ( mg / ml )	pH
01	12	2.20	12	1.9	4.5
02	13	3.22	13	2.0	
03	14	2.45	14	2.4	
04	15	2.87	15	2.9	
05	16	2.57	15	1.4	
06	17	2.73	17	1.1	
07	18	1.89	18	1.3	

was reported by Wang-Jiglong ( 1998 ).

## MATERIALS AND METHODS:

*Aspergillus niger* producing citric acid from various carbon substrates often

solutions were inoculated with *A. niger* and incubated at 28°C for 12 days. After incubation the broth were checked for citric acid production.

by Szucs (1944). When in a nutrient solution glucose used as a carbon source in varying concentration, it showed little economical but no healthy yield. Overall

**Table No. 2 :** Effect of different pH on production of citric acid.

pH	2.5	3.0	3.5	4.0	4.5	5.0	5.5
Yield Mg/ml	2.6	2.8	3.0	2.9	3.9	1.9	1.3
Sucrose%				14			

**RESULT AND DISCUSSION:**

The data recorded in table No. 1 clearly indicated that only 13% of sucrose concentration gives higher yield than the other. It was also found that at higher concentration ( 15 to 18 % ) the yield decreases as compared to 13 %. Kovats ( 1960 ) reported that at higher sugar concentration the greater amount of residual sugar remains in the medium and thus process becomes uneconomical and similar results observed

glucose as a carbon source was not suitable. The results were compared with finding of Papagianni M. et.al. ( 1999 ). It was clear from table No. 2 that pH 4.5 was found to be suitable for the higher yield of citric acid.

**ACKNOWLEDGEMENTS**

Authors are thankful to authorities of Karmveer Ramraoji Aher College, Deola ( Nashik ) and K. A. A. N. M. S. College, Satana ( Nashik ) for research facilities.



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