

Production of Industrial Organic Acid from Cassava using Fungi

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Abstract: Citric acid an industrial organic acid produced by *Aspergillusniger* from *Manihotesculenta* peel with different carbon and nitrogen sources. Glucose enriched medium showed maximum yield of citric acid. Ammonium chloride and ammonium per sulphate reduced the formation of citric acid. The high amount of citric acid was observed in ammonium di hydrogen phosphate enriched source. The optimum yield of organic acid from cassava pulp in the presence of fungi was found in 20 days of fermentation with pH3 and room temperature.

Index Terms: fungi, carbon, nitrogen fermentation.

I. INTRODUCTION

Citric acid is an industrial organic acid which found in many citrus fruits. It is a natural occurring caking preservative. It is also gives sour taste to foods and soft drinks. It is important intermediate in the TCA cycle of all living things. It also serves as a bleaching agent and acts as an antioxidant. It is a white crystalline powder which can exist either in anhydrous form, or monohydrate[1]. Citric acid can generate heat in an alkaline state..

Citric acid is used in animal feed formulations to form soluble, rapid digestible with essential metal nutrients. It enhances best flavor to increase food uptake by an animals. It also helps to control gastric pH and maintain the efficiency status of the feed .Sodium citrate is used as a buffer in detergent making. Citric acid is produced from *Aspergillusniger* by utilizing starchy and sugar sources [3,4]

Organic acid is also mixed to cosmetics formulations to adjust the pH, act as aion stabilizer and cleave metal ions to prevent discoloration and decomposition. It is used in fruit flavors and to impart a better taste. It helps to maintain stability of the active ingredients in food products[5].

The marketing use of citric acid in syrups, elixirs, oral suspensions and solutions are good industrial applications. The citric acid used in pharmaceutical industry especially in antacids production[6]. The amount of starch was found in cassava pulp 31.6%. Therefore cassava is used as best substrate for ethanol and citric acid production[7]. It is recognized as safe for applicable use in food industry which is readily metabolized and eliminated from the body. The main objective of this study was to produce industrial organic acid from cassava pulp in fungal medium and its yield was analyzed

II MATERIALS AND METHODS

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Aspergillusniger was extracted from onion and cultured in a nutrient of potato dextrose agar media. Cassava pulp was washed, sliced and dried hot air oven at 60°C. This dried sample was powdered and subjected into acid hydrolysis and autoclaved for 20 minutes. The hydrolyzed materials were subjected to fermentation medium [8].

The fermentation media was enriched with cassava powder. Its approximate composition was determined. Different carbon sources of sucrose, glucose, maltose and nitrogen sources of ammonium chloride, potassium di hydrogen phosphate ammonium per sulphate and ammonium e were used for its optimization. The fermentation process was carried out at 30°C for 20 days [9,10].

Different carbon and nitrogen enriched media was carried out after three days of incubation. These were filtered into a clean beaker with the help of what mann no.1 filter paper. 1 M NaOH was prepared and taken in burette .The filtrate was titrated against NaOH with phenolphthalein as indicator till pink color appears. The readings were noted and amount of citric acid produced was calculated [11].

III RESULTS AND DISCUSSION

The cassava pulp powder was used as a nutrient source for growth of fungi to produce citric acid. *r* and its maximum yield through optimization parameters. Pandey et.al showed that Cassava pulp and waste disposal in the environment can cause serious environmental pollution due to its high organic material and biodegradable [5,10]. For optimum with pH, media with different pH were titrated and the optimum pH range was found to be within 1-3 where the amount of organic acid produced was estimated to be less than 1%.. The yield of citric acid was observed in glucose enriched medium. Hussein reported that 15% of sucrose enriched medium showed high yield n of citric acid [12]. Suitable carbon source was showed to be glucose as the best yield of citric acid.

Table 1: Citric acid production from cassava peel using different carbon sources

S l. no.	Vol ume of cassava filtrate (ml)	Car bon source	Vol ume of NaoH added (ml)	Nor mality of citric acid (m)	Weight of citric acid in 1000 ml G/t	Weight of citric acid in 100 ml %
1	50	Glu cose	0.6	0.014	0.78	0.078
2	50	Sucr ose	0.4	0.003	0.52	0.052
3	50	Mal tose	0.4	0.0078	0.42	0.042

In case of nitrogen source, NH₄Cl was found to be showed lower contribution for the citric acid which produced was estimated to be 0.06% The medium contained ammonium nitrate and sodium nitrate did not show any change in citric acid production but ammonium di hydrogen phosphate yield more amount of citric acid. Many of them explained that ammonium ions play an significant role in regulation of citric acid cycle.

Art (1987) stated that the higher concentration of ammonium constituents within cells could lead to prevent the citrate activity via PFK inhibitor[13].The substrates of urea, yeast and ammonium di hydrogen phosphate also showed high yield of citric acid [14,15,16] . The greater concentration of phosphate led to decline in fixation of carbon di oxide with certain amount of sugars and acids [16,17].

Table 2: Citric acid production from cassava peel using different nitrogen sources

Sl. no.	Volu me of cassava filtrate (ml)	Nitro gen source	Volu me of NaoH added (ml)	Norma lity of citric acid (m)	Wei ght of citric acid in 100 ml G/t	Wei ght of citric acid in 100 ml %
1	50	NH ₄ Cl	0.7	0.014	0.06	0.006
2	50	APS	0.7	0.014	0.896	0.0896
3	50	NH ₄ H ₂ PO ₄	0.9	0.018	1.152	0.1152
4	50	NH ₄ NO ₃	0.2	0.01	0.64	0.064

In case of temperature, the amount of citric acid produced was maximum (0.064%) at room temperature. The maximum yield of 0.1152% was obtained in optimized media after incubating for 6 days at room temperature.

IV CONCLUSION

The *Aspergillus niger* strain was grown on nutrient media and was used for the greater yield of citric acid. The optimization of culture and nutritional conditions were done for high and consistent yield of citric acid. Rapid amount of citric acid yield was observed in optimized media was found to be the maximum when compared with normal medium

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