

BIOPRODUCTION OF LACTIC ACID FROM AGRO INDUSTRIAL WASTES

By

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ABSTRACT

Bio-production of lactic acid using microorganisms is promising natural processing, particularly, lactic acid production from industrial wastes such as voluble by-products of dairy industries as well as molasses which is by-product of the sugar manufacturing process. The aim of the present work was to produce LA using different known strains of lactic acid bacteria, isolation of LAB from salted whey capable of growing on high salt concentration and enhancement production of LA by the obtained strains using immobilization technique in repeated batch fermentation process. Factors affecting lactic acid production yield were studied during fermentation process of whey permeate, salted cheese whey and their mixtures using different known strains of lactic acid bacteria (LAB). Optimum conditions for production of lactic acid were mixture of salted whey and whey permeate (1:1), contained 5% sugar, 3% salt and 0.5% calcium carbonate during static state fermentation at 37°C to give 27-38 g/l with efficiency ranged between 60- 80%. *L. casei* and *L. rhamnosus* B-445 were the most efficient strains. Seventy four strains of LAB were isolated from salted cheese whey and examined its ability to produce lactic acid. The most efficient nine isolates were biochemically and molecular identified as *Enterococcus faecalis*– 30, *Enterococcus faecium* -57, three strains (*Enterococcus faecalis*–53, 54 and 58), three strains (*Enterococcus faecalis* – 48, 51 and 65) and *Enterococcus hirae*-68. Production of LA decreased with increasing of sugar concentration, where better sugar concentrations was 5 followed by 10% for production of LA from molasses. *Enterococcus faecalis*-58, *Enterococcus hirae*-68, mixture of them and *L. casei* were immobilized by sodium alginate 2% entrapped cells. Repeated batch used for LA production by immobilized *Enterococcus faecalis*-58, *Enterococcus hirae*-68, mixture of them and *L. casei* cells under optimum conditions. Results indicated that: The best bacterial strain was *Enterococcus faecalis* 58 which gave maximum LA production and yield 36.95 g/l and 81% respectively after 36 h of incubation period using medium containing 5% sugar concentration. Sodium alginate immobilized cells exhibited good mechanical strength during repetitive fermentations and could be used in repetitive batch cultures for more than 126 days.

Key words: lactic acid bacteria, whey permeate, salted whey, molasses, batch and repeated batch fermentation, immobilization.

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