

Culture Medium Design Based on Whey for the Growth and Bacteriocin Production of Strains of *Pediococcus pentosaceus*

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Abstract : Bacteriocins are antimicrobial peptides produced by bacteria as a competitive strategy for substrate and habitat. Those peptides have a potential use as food biopreservatives due to their antimicrobial activity against foodborne pathogens, avoiding the use of additives that can be harmful to consumers. The industrial production of bacteriocins is currently expensive; one of the options to be competitive is the development of economic culture media, for example, with the use of agro-industrial wastes such as whey. This study evaluated the growth and production of bacteriocins from four strains: *Pediococcus pentosaceus* 63, *Pediococcus pentosaceus* 145, *Pediococcus pentosaceus* 146 and *Pediococcus pentosaceus* 147 isolated from 'minas cheese' (artisanal cheese made from raw milk in the state of Minas Gerais, Brazil) in order to select a strain with growth at high rates and higher antimicrobial activity against *Listeria monocytogenes* 104 after incubation on the culture medium designed with whey and other components. The media used were: MRS broth, modified MRS broth (using different sources of carbon and nitrogen and different amounts of micronutrients) and a culture medium designed by a factorial design using whey and other components. The final biomass concentrations of the four strains in MRS broth after 24 hours of incubation were very similar 9.25, 9.33, 9.25 and 9.22 (log CFU/mL) for *P. pentosaceus* 63, *P. pentosaceus* 145, *P. pentosaceus* 146 and *P. pentosaceus* 147 respectively. In the same assays, antimicrobial activity of 3200 AU/mL for the first three and of 12800 AU/mL for *P. pentosaceus* 147 were obtained. Culture of *P. pentosaceus* 63 on modified MRS broth, showed the effect of some sources of carbon on the activity of bacteriocin, obtaining 12800 AU/mL with dextrose and 25600 AU/mL with maltose. Cultures of *P. pentosaceus* 145, 146 and 147 with these same sugars presented activity of 12800 AU/mL. It was observed that the modified MRS medium using whey increased the antimicrobial activity of the strains at 16000, 6400, 16000 and 19200 AU/mL for each strain respectively, keeping the biomass at values close to 9 log units. About nitrogen sources, it was observed that the combination of peptone (10 g/L), meat extract (10 g/L) and yeast extract (5 g/L) promoted the highest activity (12800 AU/mL), and in all cases MgSO₄, MnSO₄, K₂HPO₄ and ammonium citrate at low concentrations adversely affected bacteriocin production. Because *P. pentosaceus* 147 showed the highest antimicrobial activity in the presence of whey, it was used to evaluate the culture medium (peptone (10 g/L), meat extract (8 g/L), yeast extract (2 g/L), Tween® 80 (1 g/L), ammonium citrate (2 g/L), sodium acetate (5 g/L), MgSO₄ (0.2 g/L), MnSO₄ (0.04 g/L)). With the designed medium added with whey, 9.34 log units of biomass concentration and 19200 AU/mL were achieved for *P. pentosaceus* 147. The above suggest that the new medium promotes the antimicrobial activity of *P. pentosaceus* 147 allowing the use of an economic medium using whey.

Keywords : antimicrobial activity, bacteriocins, *pediococcus*, whey

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