Development of bacteriocin based biopreservative for preservation of Paneer (an Indian soft cheese)

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Food safety has become an issue of increasingly important international concern. The application of bacteriocins (antimicrobial peptides) from lactic acid bacteria that target food pathogens and spoilage bacteria without toxic or other adverse effects has received great attention. The present study deals with the production of pediocin 34 in standardized skim milk based medium and the development of the skim milk fermentate as a biopreservative for extending the shelf life of Paneer, an Indian soft cheese. A highly potent bacteriocin producing organism Pediococcus pentosaceus 34 was isolated from Cheddar cheese. Pediocin 34 was found to be active against a large number of food spoilage and pathogenic organisms including Listeria monocytogenes. However, it was found to be effective against Gram negative bacteria in the presence of 20mM sodium citrate. The skim milk based medium comprising 10% reconstituted skim milk, 2% glucose, 1% yeast extract and 0.1% Tween-80 was found to be an excellent medium for the growth as well bacteriocin production by the bacteriocinogenic strain. The bacteriocin, pediocin 34, was optimally produced in this medium in a 7-litre capacity fermenter at 30°C for 24 h and agitation at 100 rpm. Down stream processing of the fermentate yielded 160,000 AU/g of the bacteriocin activity in the spray dried powder. Biopreservative formulation containing 5,000 AU/ml pediocin, 0.1% potassium sorbate and 20mM sodium citrate was used for extending the shelf life of Paneer. The Paneer block/cube samples were dipped in the biopreservative solution for 2h before packaging individually in the polyethylene (HDPE) bags and stored at refrigeration temperature (5-7°C). The control and treated samples were analyzed for various sensory, microbiological and chemical parameters at regular intervals for a period up to 75 days. The shelf-life of the biopreservative treated Paneer samples extended up to more than 60 days at refrigeration temperature suggesting strong potential of its application in extending the shelf-life of several other perishable foods. The pediocin 34 powder showed a storage stability of more than six months at refrigeration temperature without losing any appreciable activity. The preclinical toxicity studies of the biopreservative preparation showed that the preparation is absolutely safe.

Keywords Paneer; bacteriocin; biopreservation; pediocin 34