

EFFECTS OF A BACTERIOCIN OF *BACILLUS METHYLOTROPHICUS* STRAIN BM47 AND PASTEURIZATION ON THE STORAGE LIFE OF FRESH TOMATO JUICE

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Abstract

Bacteriocins are antimicrobial peptides of bacterial origin, which are widely used in the food industry as biopreservatives. Bacteriocins are safe, do not alter the organoleptic characteristics of food and can be applied directly in purified form or indirectly by in situ production in different food matrices. The aim of the current research was to apply a bacteriocin from *Bacillus methylotrophicus* strain BM47 in fresh tomato juice, and to evaluate the effects of the bacteriocin singly and in combination with pasteurization on the physicochemical and microbiological characteristics of tomato juice.

To conduct the study, four experimental groups of tomato juice were prepared: non-pasteurized; non-pasteurized with a bacteriocin; pasteurized and pasteurized with a bacteriocin, which were stored under refrigeration conditions (4 °C and 75% relative humidity) for 24 days. During the storage, all experimental groups were observed for decay and fungal growth, and samples for physicochemical and microbiological analyzes were taken at 4 days interval. From the physicochemical parameters the total soluble solids (by refractometric method), titratable acidity (by titration method), pH, organic acids (by high pressure liquid chromatographic analysis), total phenolic content (by spectrophotometric method), total chlorophylls and carotenoids content (by spectrophotometric method) and antioxidant activity (by DPPH free radical-scavenging method) were determined. From the microbiological parameters the total plate count of mesophilic aerobic and facultative anaerobic microorganisms (by colony-count technique on plate count agar at 30 °C) and the number of yeasts and fungi (by colony-count technique on chloramphenicol glucose agar at 25 °C) were determined.

The results showed that pasteurized tomato juice with and without addition of a bacteriocin retained lower titratable acidity and higher levels of total soluble solids, compared to non-pasteurized groups. Throughout the storage period, pasteurized tomato juice with and without addition of a bacteriocin kept lower concentrations of citric and fumaric acids, compared to non-pasteurized samples with and without addition of a bacteriocin. The bacteriocin application and pasteurization did not affect the lowering total phenolic content, total chlorophylls and carotenoids, but helped to maintain higher values of antioxidant activity during the entire storage period. The results from the microbiological analysis demonstrated that bacteriocin treatment, especially in combination with pasteurization reduced the total plate count (bacteria) and yeasts in tomato juice. The same treatment effectively inhibited the fungal growth in both pasteurized groups, and no signs of fungal decay were observed until the end of the storage period.

Therefore, the application of a bacteriocin from *Bacillus methylotrophicus* strain BM47 in combination with pasteurization could be considered as a promising approach for biopreservation and improvement of the storage life of fresh tomato juice.

Key words: Biopreservation, Tomato, Tomato juice, Bacteriocins, *Bacillus methylotrophicus*.