World Applied Sciences Journal 3 (1): 88-90, 2008
ISSN 1818-4952

Influence of Lactulose on the Survival of Probiotic Strains in Yoghurt

F. Tabatabaie and A. Mortazavi

Department of Food Science, Faculty of Agricultural,
Ferdowsi University of Mashhad, P.O. Box 91775-1163, Iran

Abstract: Dairy products containing lactic acid bacteria are often consumed because of the health-promoting activities of some strains of these bacteria as probiotics. It is important that these strains survive the acidic environment of the product since only microorganisms that are alive can be functionally active. This report describes the potential of luctulose to improve the survival of available probiotic strains in yoghurt. Yoghurt with and without lactulose were produced in which these strains were present. The survival of the probiotic strains was monitored for 5 weeks at 4ºC. The main conclusions are: Lactobacillus rhamnosus and Bifidobacterium bifidum were found to be extremely stable during the 5 week storage period and survives slightly better the presence of lactulose.

Key word: Lactulose · lactobacillus · bifidobacter · probiotic · yoghurt

INTRODUCTION

Lactobacillus and Bifidobacterium species are well known for their application in fermented milk products. Consumption of these bacteria is frequently related to the health promoting activities of some strains [1, 2]. Strains with beneficial characteristics are referred to as probiotics. The application of these strains in fermented dairy products requires the use of adapted manufacturing technologies. The problem of survival the strains in the acidic environment of the product must be improved since only micro-organisms that are alive can be functionally active. Lactulose is semi synthetically disaccharide and know for its stimulating effect on intestinal lactic acid bacteria, especially Bifidobacterium species. Besides it might have the potential to improve the survival of probiotic bacteria in fermented dairy product and its application as a prebiotic ingredient in several food products. The present study influence of lactulose on the survival of two strain of probiotic bacteria in yoghurt stored at 4ºC was studied [1, 3].

MATERIAL AND METHODS

Bacterial strains: Lactobacillus rhamnosus and Bifidobacterium bifidum were supplied by Hunsens's company.

Yoghurt preparation: Yoghurt milk (skim milk +1% (W/V) skim milk powder) containing 0, 1 and 3% lactulose was pasteurized for 5 min at 85ºC and cooled to 32ºC and inoculated with 0.63 ml 1:10 diluted Streptococcus thermophilus and probiotic bacteria include of Lactobacillus rhamnosus and Bifidobacterium bifidum. After gently mixing the yoghurt was divided into bottles and were incubated at 32ºC for 14.5 h. during the incubation, the pH was measured every 30 min. The end samples were homogenized and stored at 4ºC. These samples were used for evaluation of the survival of the probiotic bacteria [4].

Yoghurt analyses: The survival of the yoghurt bacteria was tested during 5 week period by plating appropriate dilutions in a sterile solution of 0.85% Nacl and 0.1% peptone on MRS-agar (merck) incubation of all probiotic strains was performed at 37ºC under an aerobic condition for 3 days (1).

RESULTS AND DISCUSSION

The addition of probiotic strains resulted in a slightly faster acidification of the yoghurts during 14.5h incubation period and lactoluse did not have any effect on acidification.

Corresponding Author: Dr. F. Tabatabaie, Department of Food Science, Faculty of Agricultural, Ferdowsi University of Mashhad, P.O. Box 91775-1163, Iran

Table 1: Influence of lactulose on pH and number of probiotic becteria

Probiotic strain	Lactulose (%)	pH	Number of probiotic bacteria (CFU ml^{-1})
Lacto bacillus rhamnosus	0	4.32	1.0×10^{8}
Lacto bacillus rhamnosus	1	4.33	1.0×10^{8}
Lacto bacillus rhamnosus	3	4.32	1.1×10^{8}
Bifido bacterium bifidum	0	4.28	1.6×10^{7}
Bifido bacterium bifidum	1	4.29	2.3×10^{7}
Bifido bacterium bifidum	3	4.29	2.4×10^{7}

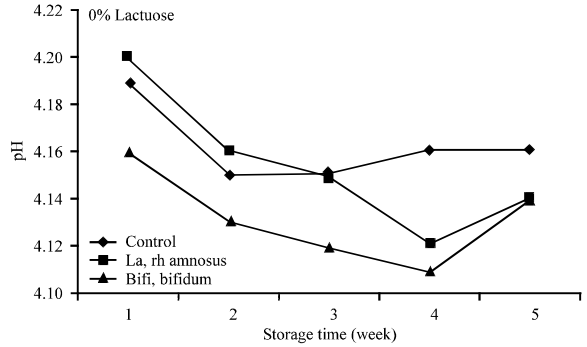

Fig. 1: Development of the pH during storage of the yoghurts 0% lactulose

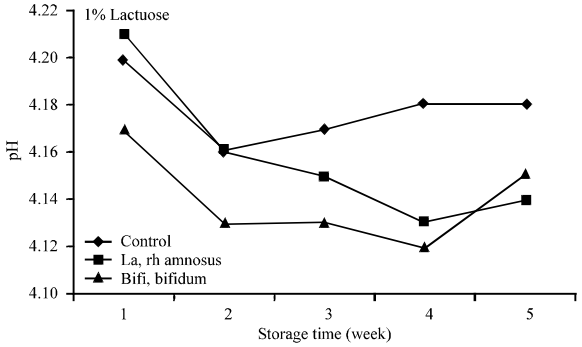

Fig. 2: Development of the pH during storage of the yoghurts 1% lactulose

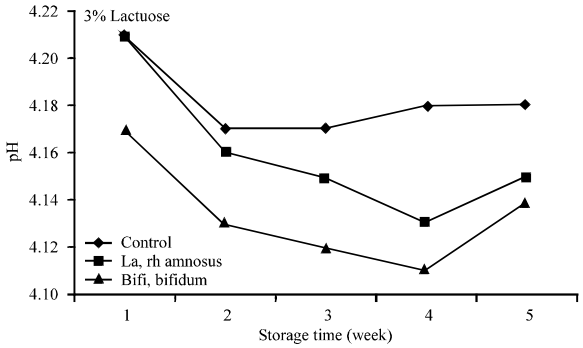

Fig. 3: Development of the pH during storage of the yoghurts 3% lactulose

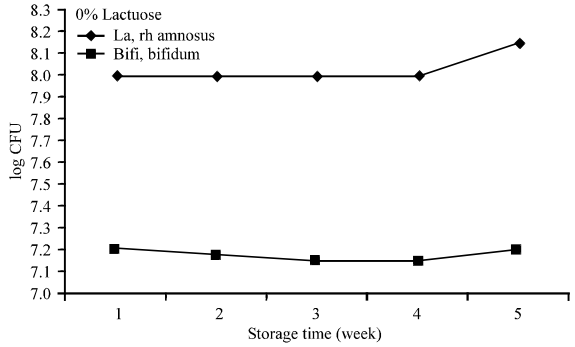

Fig. 4: Stability of for two probiotic strains during the storage of the yoghurts 0% lactulose

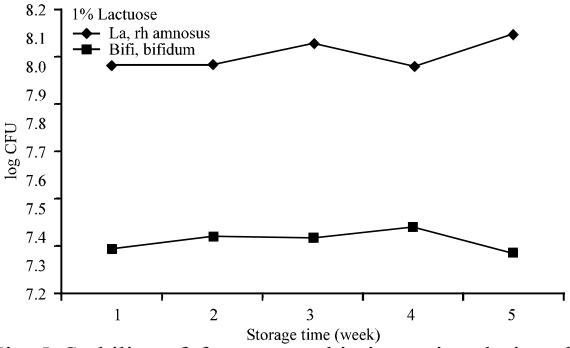

Fig. 5: Stability of for two probiotic strains during the storage of the yoghurts 1% lactulose

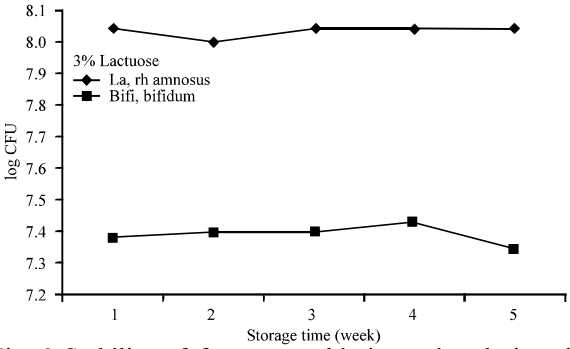

Fig. 6: Stability of for two probiotic strains during the storage of the yoghurts 3% lactulose

After cultivation, the pH and number of probiotic in the yoghurts were determined, the results are listed in the Table 1. from this table, it can be concluded that there is no effect of lactulose on the final pH.

Also, a small decrease in pH was observed during storage of the yoghurt at 4ºC (Fig. 1-3). This decrease was most serve in yoghurts containing either lacto bacillus rhamosus and Bifidobacterium bifidum. No effect of lactulose was observed on this process.

The prbotic strains were surprisingly resistant to the storage condition (Fig. 4-6) and no effects of lactulose

was observed for these strains. Except of the yoghurt containing 3% lactulose was observed protective effect after 4 week of storage (Fig. 6), Bifidobacerium bifidum remained higher in the presence of lactulose throughout the test period.

Lactobacillus rhamnosus and Bifidobacterium bifidum did not lose their viability during the 5-week storage period and a protective effect of 3% lactulose was found after 5 week of storage (Fig. 6). The use of lactulose might the effective for strains having intermediate survival behariour.

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