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ASSESSING THE SURVIVABILITY OF PROBIOTIC MICROORGANISMS IN STIRRED PAPAYA YOGHURT DURING STORAGE PERIOD

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Abstract: Yogurt is a product of the lactic acid fermentation of milk by addition of a starter culture containing *Streptococcus thermophilus* and *Lactobacillus delbrueckii ssp. bulgaricus*. Yoghurt is a fermented milk product with custard like consistency. The popularity of yoghurt has increased significantly in the last few decades because of incorporation of probiotics microorganism into the product that gives an extra nutritional physiological value. The present study was conducted to assess the survivability of probiotic microorganisms in stirred papaya yoghurt during different storage period viz., zero, 7^{th} day, 14^{th} day and 21^{st} day. Four treatments (Control, T1, T2, T3 and T4) were conducted using different inclusion level of papaya fruit each at different levels (0 %, 5.0%, 10%, 15% and 20 %) respectively. The result showed that the viability of probiotic bacteria (*Str. Thermophilus* and *Lb. delbrudckii spp. Bulgricus*) in all yoghurt treatments during the cold storage was higher than the recommended minimum levels (10^6 cfu/ml or g). There was no significant reduction in probiotic microorganisms in papaya stirred yoghurt.
Keywords: Stirred papaya yoghurt, Survivaibility, Probitocis organisms.

INTRODUCTION

Yoghurt is a fermented milk product traditionally obtained by lactic acid fermentation through the action of lactic acid bacteria *Lactobacillus delbrueckii subsp. bulgaricus* and *Streptococcus salivarius subsp. thermophilus* [1]. The nutritional value of yoghurt is made up of the nutrients of the milk and the nutrient among metabolites produced during the fermentation by lactic acid [2]. There are many health benefits from yoghurt. Lactic acid aids in calcium absorption and digesting some of the lactose for people with lactose intolerance, Yoghurt also acts as an antibiotic, protects against gastrointestinal upset, decreases risk of cancer, lower blood cholesterol especially low density lipoprotein cholesterol and help the body to assimilate protein, calcium and iron. The organisms in yoghurt also can produce some B vitamins which are needed by the human body. Collectively, these contribute to a

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high level of nutrition and contribute to the strengthening of the immune system [3]. Fruits and vegetables are good sources of vitamins, minerals, antioxidants and fibres. So, certain fruits can be used in yoghurt production for improving the nutritional values and sensory properties [4]. Papaya fruit is known for its high nutritional and fibre content and it is generally consumed ripe due to its characteristics flavour and aroma. Moreover, it is characterized by high content of protelytic enzyme papain as well as a similar enzyme called chymopapain which may play an important role in food digestion [5].

MATERIALS AND METHODS

Fresh cow milk obtained from the Dairy Farm, Veterinary College and Research Institute, Namakkal was used. Skim milk powder testing 5per cent moisture and 95per cent solubility was purchased from Aavin. Commercially available good quality cane sugar was used. Freeze dried DVS cultures containing yoghurt bacteria *Lactobacillus delbrueckii* ssp. *bulgaricus* and *Streptococcus salivarius* ssp. *thermophilus* obtained from was used in this study. Good quality papaya fruit purchased from local market in Namakkal.

Media employed

Modified MRS agar (pH 5.4) and M17 agar (Himedia).

Methods

Preparation of fruit pulp

Fresh ripend fruit of papaya were purchased and after gentle wash under tap water, the fruits were subjected to pulp extraction.

Ripend papaya

↓

Washing

↓

Peal outer covering

↓

Cut into slices

↓

Remove the seeds

↓

Extract fruit pulp

Procedure for the preparation of plain yoghurt

Plain yoghurt was prepared using fresh milk. Skim milk powder at the rate of 4 per cent (w/v) and sugar at the rate of 6 per cent (w/v) were added to it and homogenized at 2500 psi. The contents were mixed well and pasteurized at 85˚C for 30 minutes, cooled to room temperature and inoculated with 2 per cent of yoghurt cultures containing *Lactobacillus delbrueckii* ssp. *bulgaricus*, and *Streptococcus salivarius* ssp. *thermophilus*. It was then mixed well and incubated at 42˚C for 4 to 5 hours and finally stored at 5˚C.

Flow diagram of preparation of papaya stirred yoghurt

Fresh milk

↓

Addition of skim milk powder (4 per cent) and Sugar (6 per cent)

↓

Homogenization (1000 psi)

↓

Pasteurization (85˚C for 30 min)

↓

Cooling (42˚C)

↓

Inoculation (2 per cent yoghurt culture)

↓

Incubating at 42 ˚C /4-5 hrs

↓

Stirring

↓

Addition of papaya fruit pulp

↓

Mixing and storage (5^0C)

RESULTS AND DISCUSSION

Survivability of *Str. thermophilus* and *Lb. delbrudckii spp. bulgricus* (log cfu/ml) in stirred fruit yoghurt during the storage at 5 ± 1^0C for 21 days is shown in table 1. It could be noticed that, addition of fruit homogenates had significantly negative effect on the viability of the two lactic acid bacteria strains (*Str. thermophilus and Lb. delbrudckii spp. bulgricus*). *Lb.*

delbrudckii spp. Bulgricus was much more sensitive either to sugar or fruit homogenate compared with *Str. thermophilus*. The high osmotic pressure due to the addition of sugar and or furit homogenate seemed to be reason of the low viability occurred but S*tr. thermophilus* and rather by *L. delbrudckii subsp. bulgaricus*. This finding was mainly observed in many types of yoghurt with sugar by Briollao *et a.l,* [6]. Along the cold storage period, *Str. thermophilus* and *Lb. delbrudckii spp. bulgricus* counts gradually decreased till the end of the storage period. The gradual decrease in lactic acid bacterial counts may be due to the sensitivity of these bacteria to acid developed during the storage period. The results are in harmony with those obtained by Oliveira *et al.* [7]. The results also revealed that *Str. thermophilus* counts in stirred yoghurts (control and treatments) were higher than the *Lb. delbrudckii spp. bulgricus* during the storage period.

The beneficial effects of the regular consumption of yoghurt on the consumer's health have always been related to the presence of a high concentration of viable lactic acid bacteria in the product [6] and [8]. Because of this, several countries have established minimum levels of lactic acid bacteria for yoghurt and or fermented milks during shelf life. These values range from 1 $x10^6$ to 5 $x10^8$ CFU/g [8]. However it is clear that, the viability of lactic acid bacteria strains (*Str. Thermophilus* and *lb. delbrudckii spp. Bulgricus*) in all yoghurt treatments were higher during the storage at (5 ± 1^0C for 21 days) than recommended minimum levels (10^6 cfu/ml or g).

CONCLUSION

The viability of lactic acid bacteria strains (*Str. Thermophilus* and *Lb. delbrudckii spp. Bulgricus*) in all yoghurt treatments during the cold storage was higher than the recommended minimum levels (10^6 cfu/ml or g). So, it can be concluded that stirred papaya yoghurt does not affect the viability of probiotics organisms during storage period.

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Table 1: Changes in microbial counts of stirred papaya (10 per cent) yoghurt during storage periods at 5 ± 1^0C

Treatment /Days	Zero day	7th day	14th day	21st day
S. thermophius (log 10 cfu/g)				
Control	8.93 ± 0.01^{cB}	8.93 ± 0.12^{cB}	8.75 ± 0.14^{bB}	8.10 ± 0.085^{aB}
Stirred papaya (10%) yoghurt	7.15±0.15bA	7.34±0.11dA	7.20±0.15cA	7.08±0.09aA
L. bulgaricus (log 10 cfu/g)				
Control	8.31 ± 0.01^{dB}	8.15 ± 0.11^{cB}	8.05 ± 0.15^{bB}	7.16 ± 0.124^{aB}
Stirred papaya (10%) yoghurt	7.11 ± 0.15^{bA}	7.30 ± 0.10^{dA}	7.15 ± 0.14^{cA}	7.05 ± 0.13^{aA}

Mean within the row and column bearing the same letters are not significantly different (P>0.05)