Development of Long Shelflife Probiotic Lassi

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ABSTRACT

Lassi was prepared by inoculating different combinations of starter cultures like LS1 - Lactobacillus delbrueckii ssp bulgaricus, Streptococcus thermophilus, Bifidobacterium bifidum NCDC15, LS2 - L. delbrueckii ssp bulgaricus, S.thermophilus, L.acidophilus NCDC232 and LS3 - S.thermophilus, B.bifidum NCDC15, L.acidophilus NCDC232 at 3% (1:1:1) into heat treated milk. Lassi was standardized to 10% total milk solids and 10% sugar by using probiotic dahi and sugar syrup. Lassi prepared from LS3 - S.thermophilus, B.bifidum NCDC15, L.acidophilus NCDC232 secured highest sensory score than the other combinations and the shelflife of lassi was increased by 6 days compared to control lassi prepared from L.bulgaricus and S.thermophilus. The increased shelflife may be due to exclusion of L.bulgaricus from fermentation process thus decreased post acidification during refrigerated storage increasing viability of probiotic cultures.

Key words: Lassi, Probiotic lassi, Shelf life.

INTRODUCTION

Lassi is a cultured milk beverage and a popular product in India. It is not only refreshing, delicious and nutritious, but it also possesses thirst quenching property and a high therapeutic value, due to which it is quite popular amongst all age groups. However, problems like short shelf life, whey syneresis etc hinder the market saleability of lassi.

The quality and acceptability of lassi depends on the degree of acidity. During the refrigerated storage there will be metabolism of microorganisms which may lead to post acidification, proteolysis which affects the product quality and reduces the shelflife of the product (Ashwani et al., 2003).

The shelflife of lassi can be increased by heat treatment (Deshmukh et al., 2013 and Schulz, 1966), aseptic processing (Aneja et al., 2002), addition of preservatives (Hussain et al., 2014 and Gupta and Prasad, 1989), different packaging materials (Patidar and Prajapati, 1998) and use of Humectants (Lacroix and Lachance, 1990). However in doing so the live nature, health cum therapeutic and sensory quality of the lassi may have to be compromised with the improved shelf life but by use of special cultures (Bio-stabilization) i.e. replacing high acid producing microorganisms with low/medium acid producing microorganisms can increase the shelf life of lassi without compromising live, health cum therapeutic nature and sensory quality.

Kulpesh (1971) stressed the need of special cultures for prolonging the shelf life of fermented milks. He noticed yoghurt made from L. acidophilus (or) B.bifidus instead of Lactobacillus delbrueckii ssp bulgaricus had a better acceptability than ordinary yoghurt after one month.

Yoghurt made from B.bifidus in place of Lactobacillus delbrueckii ssp bulgaricus kept well for 14 days at 5°C without souring during storage (Hinterwalder, 1971).

With above views, present study was designed with respect to shelflife and viability of lassi with yoghurt culture cum probiotic strains in different combinations i.e. L. bulgaricus, S.thermophilus, B.bifidum NCDC15 (LS1) combination, combination of L. bulgaricus, S.thermophilus, L.acidophilus NCDC232 (LS2) and S.thermophilus, B.bifidum NCDC15, L.acidophilus NCDC232 combination (LS3).

MATERIALS AND METHODS

Lassi was prepared as mentioned by Ashwani and Solanky, (2002) with suitable modifications as required. Fresh cow milk procured from Student Experimental Dairy Plant, KVAFSU, Hebbal, Bangalore-24 was standardized to 3.5% Fat and 8.5% SNF using cream and skim milk powder (SMP). Then the milk was preheated to 60-65°C, homogenized at 2000 psi and 500 psi and heated to 85°C/30 minutes followed by cooling to 42°C. Starter culture for control lassi consisting of Lactobacillus delbrueckii ssp bulgaricus, Streptococcus thermophilus and experimental samples prepared with combinations of L.bulgaricus, S.thermophilus, B.bifidum NCDC15 (LS1), L.bulgaricus, S.thermophilus, L.acidophilus NCDC232 (LS2) and S.thermophilus, B.bifidum NCDC15, L.acidophilus NCDC232 (LS3) at 3% in the ratio of 1:1:1 was inoculated, followed by gentle stirring. Then it was filled in clean, sterile stainless steel vessels, covered with lids and incubated at 42±1°C till desired acidity of 0.6-0.65% lactic acid was obtained in the probiotic dahi. It was finally stirred by a mechanical stirrer and cooled to 10°C using ice-bath. The preparation of control lassi and probiotic lassi with different combinations of culture was given in Fig I (I-A and I-B) respectively. The stirred probiotic dahi was adjusted to 10% sugar, 10% milk solids and acidity to 0.5-0.55%LA with pasteurized sugar syrup and rapidly chilled to 4±1°C. B.bifidum NCDC15 and L.acidophilus NCDC232 were enumerated by using Bifidobacterium agar and Rogosa SL...
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Agar (The Himedia manual, 1998). The probiotic count was analyzed on the day of preparation and once in three days till end of the shelflife. Three replications of the above samples were taken in the present study. Milk fat, milk solids not fat, acidity of milk and dahi were determined as per IS: 1981. The total milk solids were estimated gravimetrically (MIF, 1959).

The present research is aimed to increase the shelflife of the product without compromising on sensory, health cum therapeutic benefits of the lassi. Attempts have been carried to improve the shelf life of the product by using principle of Bio-stabilization (special cultures).

SENSORY ANALYSIS

The sensory analysis was carried out by serving control samples of lassi with experimental samples to panel of judges with 100 points score card to adjudge the quality of product with respect to flavour, body and texture, acidity, container and closures. The total scores given by panel of judges were then statistically analyzed. The samples were code numbered to avoid identification and bias (Dharampal and Gupta, 1985).

The experimental results were analyzed statistically for test of significance by using ANOVA as per SPSS 9.0.

RESULTS AND DISCUSSION

The control sample and three different combinations of lassi were packed in PET bottles, stored at 4±1°C and studied sensory, physicochemical characteristics and viability of probiotics. The sensory scores awarded for control lassi was 82 out of 100 as against 80.73, 82.67 and 90.58 with different combinations like LS1 (S.thermophilus, L.bulgaricus, B.bifidum), LS2 (S.thermophilus, L.bulgaricus, L.acidophilus) and LS3 (S.thermophilus, B.bifidum, L.acidophilus). The lassi made with LS3 combination secured highest average sensory score while the lowest sensory score of 80.73 with LS2 combination.

Control lassi and lassi was prepared from LS2 combination having acidity (Fig 2) of 0.51% LA on 0 day and 0.71, 0.72% LA on end of shelflife i.e. on 12th day. Acidity of LS1 combination lassi was 0.51 on 0 day and increased to 0.7% LA at the end of the shelflife and acidity of LS3 combination lassi was 0.51 and 0.7% LA respectively on 0 and end of the shelflife.

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Control sample and lassi made with LS2 combination was acceptable upto 12 days, lassi made with LS1 combination was acceptable upto 15 days and LS3 combination lassi was acceptable upto 18 days at refrigerated temperature (4±1°C). Shelf life of lassi was increased by 6 days without compromising on sensory characteristics from LS3 combination.

Kim et al. (1993) excluded L.bulgaricus from fermentation and noticed significant decrease in pH during storage. L.bulgaricus caused over acidification during manufacture and storage. They suggested use of starter cultures like L.acidophilus, B.bifidum and S.thermophilus which did not increase the acidity during storage, keeping them in viable condition.

Table I shows the viability of probiotics with different combination of cultures from 0 day to till end of the shelf life of lassi (12 to 18 days). The viable count of B.bifidum NCDC15 in LS1 combination was decreased from 8.30 to 6.26 log10cfu/ml while viable count of L.acidophilus
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Fig 2: Acidity of control lassi and experimental lassi during storage at 4±1°C.

Table I: Viability (log_{10} cfu/ml) of probiotic cultures in experimental lassi packed in PET bottles during storage at 4±1°C.

| Number of Days | LS1: B. bifidum | LS2: L. acidophilus | LS3: B. bifidum | LS3: L. acidophilus |
|----------------|-----------------|--------------------|----------------|-------------------|
| 0              | 8.30            | 8.47               | 8.33           | 8.50              |
| 3              | 7.65            | 7.74               | 7.77           | 7.77              |
| 6              | 6.83            | 7.06               | 7.39           | 7.60              |
| 9              | 6.78            | 6.79               | 7.11           | 7.34              |
| 12             | 6.63            | 6.40               | 6.86           | 7.08              |
| 15             | 6.26            | -                  | 6.69           | 6.80              |
| 18             | -               | -                  | 6.33           | 6.59              |

Note:
LS1- Lactobacillus delbrueckii ssp bulgaricus, Streptococcus thermophilus, Bifidobacterium bifidum NCDC15.
LS2 - L. delbrueckii ssp bulgaricus, S.thermophilus, L.acidophilus NCDC232.
LS3 - S.thermophilus, B.bifidum NCDC15, L.acidophilus NCDC232.

NCDC232 in LS2 combination was decreased to 6.4 from 8.47 log_{10} cfu/ml. Similarly there was significant decrease in the viability of B. bifidum and L. acidophilus from 8.33 to 6.33 and 8.5 to 6.59 log_{10} cfu/ml in LS3 combination respectively at the end of 18 days of storage. Lassi prepared from three combinations showed viable one million probiotic bacteria until the end of the shelflife.

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