EFFECT OF NISIN ON SHELF LIFE OF LASSI

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ABSTRACT

Lassi was prepared by using five levels of nisin i.e. $T_0$ (Control), $T_1$ (100 IU/ml), $T_2$ (200 IU/ml), $T_3$ (300 IU/ml) and $T_4$ (400 IU/ml). 8% cane sugar, 0.1% salt and 10% water level was used in all treatments. The Lassi prepared by addition of 400 IU/ml ($T_4$) nisin was organoleptically superior over the other treatments for the parameters colour and appearance (8.15), body and texture (8.20), flavour (8.15), acidity (8.22) and overall acceptability (8.18), respectively. Treatments $T_0$, $T_1$, $T_2$ and $T_3$ were acceptable up to 5th, 9th, 11th and 12th days, respectively. While treatment $T_4$ was acceptable up to 15th days. While studying microbial quality of preserved Lassi under refrigeration temperature (5°C). The treatment $T_0$ (Control) showed the higher SPC, YMC and E.coli count during study ranged from $16.32 \times 10^7$ to $8.63 \times 10^7$, $9.00 \times 30 \times 10^7$ and $6.00 \times 2.00 \times 10^7$, respectively. Whereas the treatment $T_4$ showed lowest microbial count over the other treatments i.e. ranged from SPC ($14.97 \times 7.85 \times 10^7$), YMC ($5.00 \times 30 \times 10^7$) and E.coli ($4.00 \times 1.00 \times 10^7$), respectively.

Key words: Lassi, Nisin, Organoleptic, Microbial quality.

INTRODUCTION

Lassi is a popular indigenous fermented milk beverage, which is usually prepared by mixing dahi and water in required proportions. The fermented milk products are prepared by the action of microorganisms by adding starter culture, which modifies the substrates biochemically, and organoleptically into edible products and are thus generally palatable, safe and nutritious (Campbell Platt, 1994).

Nisin is an antibiotic product by the lactococcus lactis var lactis is effective against spore farmers and gram-positive bacteria. Hence, widely used for the preservation of wide range of dairy products. It is non-toxic and obtained 'GRAS' status. Many chemical preservatives are harmful to health hence people prefer the natural food preservative and nisin is one of them. In 1969, joint food additive organization WHO expert committee on “Food Additive” gave international acceptance for nisin. The average daily intake being 0-33000-units/ kg body weight and the maximum level of addition is 100 mg of nisin per kg of food product. Nisin is used for enhancing shelf life used in dairy products like khao, lassi, shrikhand, cheese, pasteurized milk, paneer, and yoghurt.

The lassi has a very limited shelf life at room temperature and even at refrigerated temperature. The demand for lassi is increasing day by day. The consumer use to enjoy lassi at restaurant, bus stand, railway station and during journey they want to carry lassi but due to limited shelf life there are many problems in marketing of lassi. Therefore the present study was planned to enhance the shelf life of lassi by incorporating the various nisin levels viz., 100 IU/ ml, 200 IU/ ml, 300 IU/ ml and 400 IU/ ml in lassi.

MATERIAL AND METHODS

Fresh cow milk was used for product preparation during investigation. Freeze-dried LF-40 (Lactic fermenti) culture obtained from Division of Dairy Microbiology, NDRI, Karnal was used for study. The culture is activated as per the directives given by NDRI, Karnal. In order to keep the culture active, it was propagated once in a week. It was stored at
5°C in a refrigerator and utmost care was taken to avoid contamination to culture. Nisin obtained from Duke Thomson’s International Indore (MP) and cane sugar, salt etc. purchased from local market were used for preparation of Lassi.

**Packaging material**

Low density polyethylene bags of 250 ml capacity having film thickness of 200 guage were used for keeping product samples under storage study.

**Experimental trials:**

In this experimental trials, lassi was prepared by using five levels nisin (0, 100, 200, 300, 400 IU/ml), sugar level 8 per cent, water level 10 per cent and salt level 0.1 per cent i.e. common for all treatments added in lassi as finalized by organoleptic evaluation of lassi in preliminary trials. Culture used for lassi preparation was LF-40. Aim of experimental trial is to find out most acceptable treatment in lassi.

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<th>Details of treatment combination</th>
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**Preparation of lassi**

Lassi was prepared by using the procedure described by Gupta and Kulkarni (1983) with slight modification.

**Flow diagram for preparation of lassi**

1. Milk
2. Standardization to 4 per cent fat
3. Pasteurization of milk
4. 85 ± 1°C/ 10 min
5. Cooling 30° ± 2°C
6. Addition of starter culture @ 2 per cent
7. Incubation at 30°C (12 hrs)
8. Dahi
9. Breaking of coagulum
10. Add sugar @ 8 %
11. water @ 10 %
12. salt @ 0.1%
13. Nisin IU/ml (0, 100, 200, 300, 400)
14. Blending (mixing)
15. Packaging in LDPE pouches
16. Storage (5°C)

The lot of standardized milk (4 % fat) was heated to temperature 85 ± 1°C for 10 min and then cooled 30 ± 2°C. It was inoculated with starter culture (LF-40) at rate of 2 per cent incubated at 30°C for 12 hrs. The curd with well developed body and texture obtained was divided into five portions and lassi was prepared by adding sugar, water, salt and nisin as per treatment. The mixture is blended and filled in LDPE pouches. Separate samples were collected for organoleptic evaluation, chemical and microbial analysis. Separate samples were drawn for respective analysis.

**Organoleptic quality of lassi**

The fresh and refrigerated stored lassi (5°C) samples were subjected to organoleptic evaluation. The panel of 5 semi-trained judges was provided the prepared samples of lassi for sensory evaluation. Each treatment was given code number, which was changed during each replication so as to avoid its identity. The scoring was recorded by using ‘9’ point Hedonic scale.

**Microbial analysis of lassi**

1. Standard plate count – As per standard plate count method describe in IS 5402.
2. Yeast and mould – Determined as per manual of Dairy Bacteriology ICAR. (Anonymous, 1982)
Statistical analysis
The data were tabulated and analyzed according to Snedecor and Cochran (1994) method Completely Randomized Block Design (CRD).

RESULTS AND DISCUSSION
Organoleptic quality of lassi during storage at refrigeration temperature 5°C:

The panel of semi trained judges consisting of five members was given samples of fresh and refrigerated stored (for 15 days) from the five treatments for evaluation of their organoleptic qualities by using 9 point Hedonic scale. Each treatment was given code number, which was changed during each replication so as to avoid its identity. The scores given by the judges for individual quality attributes were computed to get means and these means were subjected to statistical analysis.

Colour and appearance
The score for colour and appearance of lassi are depicted in Fig.1 statistically significant. The colour and appearance score varied from 7.72 to 8.00 on fresh lassi sample. A gradual increase in the colour and appearance score was noticed during 0 to 3rd day of storage, but decreased in the colour and appearance score after 3rd day and sample T₄, T₅, T₆, T₇ and T₈ was acceptable up to 5th, 9th, 11th, 12th and 15th day respectively. T₈ had highest colour and appearance score as 8.15.

Body and texture
The score on organoleptic evaluation of lassi for body and texture attribute represented in Fig. 2 are statistically significant. The body and texture score of fresh samples ranged from 7.73 to 7.97 and on 5th day of storage ranged from 6.50 to 8.10 while sample T₁, T₂, T₃ and T₄ recorded score from 6.40 to 8.12, 6.45 to 8.15, 6.40 to 8.17 and 6.35 to 8.20, respectively during storage period. Control T₀, T₁, T₂ and T₃ were acceptable up to 5th, 9th, 11th and 12th days respectively. While T₄ was acceptable up to 15th day ranged from “like slightly”. Treatment T₄ had highest body and texture score as 8.20 over other treatment.

Flavour
The score on organoleptic evaluation of lassi for flavour attribute represented in Fig. 3 are statistically significant. It is apparent from the data presented in Fig. 3 that flavour values increased up to 3rd day and slowly decreased continuously as storage period increased. The flavour is the most important component of

![Graph](image-url)

Fig. 1 : Effect of nisin on colour and appearance (score) of lassi during storage at 5°C.
sensory quality. A gradual deterioration was observed in the flavour score during storage and $T_0$, $T_1$, $T_2$ and $T_3$ were acceptable up to 5th, 9th, 11th and 12th day respectively. While $T_4$ was acceptable up to 15th day ranged from “like slightly”. Treatment $T_4$ had highest flavour score as 8.18 over other treatment.

**Acidity**

The score allotted for acidity as a sensory attribute of lassi are depicted in Fig. 4 showed statistically significant. The acidity
score varied from 7.84 to 8.08 on the day of production. Acidity score increased up to 3rd day and after 3rd day decreased the acidity score. Treatments T0, T1, T2, T3 and T4 were acceptable up to 5th, 9th, 11th, 12th and 15th day respectively. During storage treatment T4 had highest score of acidity 8.22. Treatment T4 was superior over all treatment in regard to the acidity.

**Overall acceptability**

The score for overall acceptability of lassi are depicted in Fig 5 are statistically significant. The overall acceptability score varied from 7.77 to 8.01

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**Fig. 4**: Effect of nisin on acidity (score) of lassi during storage at 5°C.

**Fig. 5**: Effect of nisin on overall acceptability (score) of lassi during storage at 5°C.
on fresh sample of lassi. A gradual increase in the overall acceptability score was noticed during 0 to 3rd day of storage but decreased in the overall acceptability score after 3rd day and sample T₀, T₁, T₂ and T₃ was acceptable up to 5th, 9th, 11th and 12th day respectively. While T₄ was acceptable up to 15th day ranged from "like slightly". Treatment T₄ had highest overall acceptability score as 8.18 over other treatment. T₄ treatment was superior for overall acceptability of lassi.

**Yeast and mould**

Yeast and mould perhaps are important group of microorganisms responsible for spoilage of dairy products. The result of yeast and mould count represented in Fig. 7. Yeast and mould count was not observed on zero and first day. YMVS observed on second day, T₀ treatment had highest microbial load 9 x 10⁷ cfu/ml than rest of the treatment it was followed by treated samples T₁ (8 x 10⁷ cfu/ml), T₂ (7 x 10⁷ cfu/ml), T₃ (6 x 10⁷ cfu/ml). Treatment T₄ (5 x 10⁷ cfu/ml) showed least microbial load than T₀, T₁, T₂ and T₃. Yeast and mould count was observed highest in T₀ treatment due to which the sample deteriorated and was not acceptable. These counts were more or less similar to the results observed by Naresh Kumar and Prasad (1996) and Dave et al. (1991) in lassi.

**E. Coliform**

The presence of coliform in dairy products is suggestive of unsanitary conditions or practices followed during production process and taking inadequate care during post processing. From the data given in Fig 8, it is revealed that the coliform count was absent on zero, first and second day on third day coliform count showed in Fig 6.

**Microbial quality of lassi during storage at refrigeration temperature 5 °C**

**Standard plate count (SPC)**

The lassi samples under different treatment preserved at 5°C temperature showed variation in microbiological quality during the storage period (Fig. 6). On zero day control samples (T₀) had highest microbial load 16.32 x 10⁷ cfu/ml than rest of the treatment it was followed by treated sample T (15.88 x 10⁷ cfu/ml), T₁ (15.64 x 10⁷ cfu/ml), T₂ (15.45 x 10⁷ cfu/ml) and T₃ (14.97 x 10⁷ cfu/ml) treatment showed lowest microbial load than T₀, T₁, T₂ and T₃ due to level of nisin increase microbial load decrease showed in Fig 6.
The count was observed highest in T₀ (6.00 x 10⁷ cfu/ml) and lowest in T₄ (4 x 10⁷ cfu/ml). Coliform count in lassi was in range of (0 to 6 x 10⁷ cfu/ml), it is below the standard prescribed by BIS (i.e. up to 10 X 10⁷ cfu/ml). A graduate decline in count of coliform during storage and their absence of 7th day indicated their inhibition by lactic acid and antimicrobial. These counts were similar to the results observed by Mohanan et al. (1984) and Dave et al. (1991).

CONCLUSION

It may be concluded that addition of 400 IU/ml nisin with 8 percent sugar, 10 percent water and 0.1 percent salt combination for preparation of lassi increased the shelf life of lassi and produced best quality of lassi as compare to other treatments.

REFERENCES

Manak Bhavan, New Delhi.