Evaluation of Different Culture Types and Development of a Set Yoghurt With Cost Optimized Culture Option

S.A.V. Padmaraja, A.M.N.L. Abesinghe, D.C. Mudannayake,
Animal Science Degree Programme. Uva Wellassa University. Badulla. Sri Lanka

and

M.N.P. Perera

Fonterra Brands Lanka (Pvt) Ltd., Biyagama. Sri Lanka

Introduction

Over the last decade yoghurt and its preparations have developed into one of the most well-accepted and consumed acidified products. Mild acidic tastes, good digestibility, variations in taste and high dietetic value as well as stable quality have contributed to this growth. The starter culture is a critical factor in the production of set yoghurts it influences the organoleptic properties of the set yoghurt. A few studies have been conducted on evaluating the potential of using different culture types for yoghurt production. Kumari (2001) reported about the selection of a starter culture to improve the texture of plain set yoghurt at reduced total solid levels. Wijesinghe (1997) tested production of yoghurts using different ratios of *Streptococcus thermophilllus* and *Lactobacillus bulgaricus* and found that the best ratio of *Streptococcus thermophilllus* and *Lactobacillus bulgaricus* is 1:1.

This study was carried out in one of the dairy factory in Sri Lanka where probiotic yoghurts are produced using two imported yoghurt starter culture types as base culture and probiotic culture. Base culture includes *S. thermophilus* , *L. bulgaricus* and *Bifidobacterium* species. From these three species, first two are considered as authentic yoghurt starter bacteria whereas the other is a probiotic bacterium. Probiotic culture includes *Bifidobacterium lactis*. The viable bacteria count in probiotic yoghurts at the end of shelf life is 10^6 cfu mL^{-1} However, it was found that the probiotic bacteria in base culture do not contribute much to maintain the viable probiotic bacterial population in set yoghurt. Therefore, the main objective of this study was to select a suitable non-probiotic base culture for the existing set yoghurt without changing its organoleptic properties and thereby optimize the cost of set yoghurt production by selecting suitable non-probiotic base culture.

Methodology

Set yoghurts were prepared according to the standard procedure. The production process of set yoghurt includes yoghurt mix preparation, culture solution and skim milk solution preparation, activation of cultures, inoculation of activated cultures, incubation of yoghurt cups and transferring to the refrigerator. Selection of suitable base culture was done through trial and error method. Trials were conducted to compare new products with current product formulation. Two different multiple species non-probiotic cultures were used (A and B). The yoghurts prepared with non-probiotic base cultures were compared with the existing product for its organoleptic characteristics. Culture type C was the existing probiotic base culture. Both A and B included *Streptococcus thermophilus, Lactobacillus delbrueckii* subsp. *Bulgaricus* whereas C included *Streptococcus thermophilus, Lactobacillus delbrueckii* subsp. *Bulgaricus* and *Bifidobacterium* species. Completely Randomized Design (CRD) comprising three

treatments in ten replicates was used as the experimental design. Treatments were; treatment 1 – base culture A + probiotic culture, treatment 2 – base culture C + probiotic culture (existing set yoghurt) and treatment 3 – base culture type A + B + probiotic culture. Treatment 3 (existing set yoghurt) was used as the control.

Parametric data analysis was done using ANOVA for significance under α=0.05 level using Minitab 14 statistical software package. Non parametric data analysis was done by Friedman non - parametric test using Minitab 14 statistical software package. In this analysis, 95% confidence interval was considered. The sensory evaluation was carried out with 20 semi trained panelists using nine point hedonic scale to assess sensory attributes of appearance, flavour, texture and overall acceptability. Three sensory evaluations were carried out to determine significant differences between sensory attributes of selected set yoghurt and existing set yoghurt. Shelf life determination was done by analyzing titratable acidity, pH, yeasts and moulds, coliforms at five days intervals for 35 days compared with existing set yoghurt (control sample). Incubation time was measured in final product. Probiotic count was measured during 14, 21, 28 and 34 days under refrigerated storage. Cost analysis for starter cultures was done and compared with existing set yoghurt production.

Results and discussion

Treatment 1, base culture type A and probiotic culture added set yoghurt was rejected after five repeated trials. According to the preliminary studies of culture types, treatment 3 (combination of culture type A and B with probiotic culture) was selected as the best non-probiotic culture for further analysis. There were no significant difference ($p>0.05$) between sensory attributes of appearance, flavour, texture and overall acceptability of non-probiotic set yoghurt and the control set yoghurt. Results revealed that total coliform, yeast and mould counts, pH and titratable acidity were in conformity to the Sri Lanka Standards limits. Oraganoleptic characteristics and incubation time of selected set yoghurt were similar to the control. The probiotic count during the refrigerated storage is higher than 10^6 cfu mL^{-1} in both yoghurts. The cost optimized by 5 cents per set yoghurt using selected culture and it can be stored at 4 $^{\circ}$C up to 35 days without reducing the viable probiotic counts than standards.

Treatment 1 was rejected because of ropiness of texture compared to the control. Treatment 3 was selected after three repeated trials and three sensory evaluations because there were no difference ($p>0.05$) between sensory attributes of appearance, flavour, texture and overall acceptability of non-probiotic set yoghurt and the control set yoghurt. Coliform count was zero in both yoghurts during 35 days of shelf life period. This may be due to minimum level of contaminations, strictly maintained hygienic practices and addition of preservatives to the set yoghurts. The survival of Coliform bacteria is very low in lactic acid medium. There were zero counts of yeast and mould, because addition of preservatives to the yoghurt mix inhibited their growth. Similarly, the pasteurization of yoghurt mix helped to inhibit the growth of these microorganisms. There was no significant difference ($p>0.05$) of pH in set yoghurts during incubation period and the refrigerated storage period. The titratable acidity of selected set yoghurt was within the range of 0.8 - 1.25% lactic acid (w/w) and it complies to the Sri Lanka Standard specifications. Therefore, it revealed that, non-probiotic base culture has not contributed to the post acidification of yoghurt compared to the control. The viable probiotic counts of the probiotic yoghurt were within the standards (10^6 cfu mL^{-1}) and it

indicates that the elimination of probiotic bacteria from the base culture did not affect the viable probiotic count during its shelf life. The cost optimized by 5 cents per set yoghurt due to the usage of non-probiotic base culture and it reduced the cost of production of set yoghurt by Rs. 3,000,00 per month.

Conclusions

It can be concluded that the combination of non- probiotic base culture A and B with probiotic culture was selected as the cost optimized culture option for the set yoghurt production.

References

Kumari, A.A.T.T. 2001. Selection of a starter culture to improve plain set yoghurt texture at reduced total solid levels, B.Sc. Dissertation. University of Peradeniya, Sri Lanka.

Wijesinghe, S.A. 1997. Producing yoghurt using different ratios of *Streptococcus thermophillus* and *Lactobacillus bulgaricus*, B.Sc. Dissertation, University of Peradeniya, Sri Lanka.