Optimisation of sugar level and fruit pulp percent for preparation of stirred and set type of Yoghurt from toned milk.

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Abstract

The objective of the study was to develop probiotic stirred and set type yoghurt were prepared from fresh toned milk enriched with blueberry and strawberry pulp separately. Optimization of sugar level was done and on the basis of sensory evaluation 8% sugar containing yoghurt scored highest for flavour in both set and stirred type yoghurt. Blueberry and strawberry fruits pulps were added at the level of 5%, 10% and 15% in the yoghurt treatments separately in both set type and stirred type yoghurt and on the basis of sensory attributes 10% blueberry and 10% strawberry yoghurt treatment were preferred in stirred type and 10% blueberry and 10% strawberry yoghurt treatments in set type were selected.

Keywords: Set type, Stirred type, Toned milk, Probiotic.

Introduction

Yoghurt is made from the lactic fermentation of milk by associative growth of *Lactobacillus delbrueckii ssp. Bulgaricus* and *Streptococcus thermophilus* [1]. This mutuality gives yoghurt its unique texture by increased amounts of lactic acid coming from its live cultures. Recently, addition of probiotic cultures as *Lactobacillus acidophilus* and *Bifidobact eriumbifidus*, which are widely used in industrial applications, enhanced yogurts functional properties such as immune system boosting, digestion improvement, and anti-carcinogenic activity by reducing serum cholesterol levels [2]. Like milk, yoghurt is a healthy and delicious food due to its high nutritive and therapeutic value. Due to low lactose content yoghurt is easily digestible and palatable than milk. Yoghurt is valued for controlling the growth of bacteria and in curing of intestinal disease like constipation, diarrhea and dysentery, anti-carcinogenic effect and lowering of blood cholesterol [3]. Fruit yoghurt, a popular type of yoghurt is like by masses and is known as fruit stirred yoghurt [4]. FAO and WHO recommend 5-15% of fruit concentration of use in making value-added yoghurt [5]. For these reasons fruit yoghurt fortified with different levels of blueberries and strawberries in fresh toned was prepared

Material and Methods

Milk was purchased from Experimental Dairy Plant, Department of LPT, LUVAS, Hisar and standardized to 3% fat level. Yoghurt cultures NCDC-144 (*Lactobacillus delbrueckii* ssp. *Bulgaricus* and *Streptococcus thermophiles*) and probiotic culture NCDC-014 (*Lactobacillus acidophilus*) were purchased from the NDRI Karnal. Blueberry (*Vaccinium angustifolium*) and Strawberry (*Fragaria ananassa*) fruits were procured from local market. Powdered Sugar was procured from local market.

Stirred type yoghurt

Fresh toned milk (3% fat) was taken in a container heated to 95°C for 10 minute. Then Cool down to temperature 42 ° C after that Inoculation was done with starter culture (Lactobacillus delbrueckii ssp. Bulgaricus and Streptococcus thermophiles) and probiotic culture (lactobacillus acidophilus) @ 2%. Later incubated at 41/42 ° C for 4 hrs till pH reach 4.5. After fermentation addition of selected level of sugar by weight of yoghurt and selected level of fruit pulp (blueberry pulp/strawberry pulp) by weight of yoghurt were done then yoghurt is stirred in a stirrer. Packaging in polystyrene cups and storing at refrigeration temperature (4±1 ° C).

Set type yoghurt

Fresh toned milk (3% fat) was taken in a container heated to 950C for 10 minute. Then Cool down to temperature 42°C in container and added with selected level of sugar by weight of milk and selected level of chopped fruits pulp (blueberry pulp/strawberry pulp) by weight of milk. After that Inoculation was done with starter culture (*Lactobacillus delbrueckii* ssp. *Bulgaricus* and *Streptococcus thermophiles*) and probiotic culture (*Lactobacillus acidophilus*) @ 2%. Later incubated at 41/42°C for 4 hrs till pH reach 4.5. After fermentation the yoghurt was stored at refrigeration temperature (4±1°C).

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Results and Discussion

Yoghurt was prepared using fresh toned milk (3% fat, 8.5% SNF) with different sugar level is represented in table 1. Optimization of sugar level is done, yoghurt prepared with 8% sugar got highest score for flavour and acidity. Yoghurt with 8% sugar got significantly highest score for flavour. There were equal scores for colour and appearance, closure and container for all the three treatments (6%, 8% and 10%). Body and texture score of 10% sugar containing sugar yoghurt was significantly higher than 6% and 8% samples. Acidity scores of 6% sugar containing yoghurt were significantly higher than 8% and 10% sugar containing yoghurt. So, on the bases of flavour sensory attribute probiotic stirred type yoghurt prepared from fresh toned milk (3% fat) containing 8% sugar was selected and used as control (Csr)

Selection of fruit Pulp level in fresh toned milk probiotic stirred yoghurt

Selection of blueberry pulp level: Probiotic stirred yoghurt prepared from fresh toned milk (3% fat, 8.5% SNF) with incorporation of different levels of chopped blueberry pulp and strawberry pulp separately and 8% sugar. Their sensory scores have been presented in table 2.

Probiotic stirred yoghurt prepared from fresh toned milk (3% fat, 8.5% SNF) with incorporation of different levels of chopped blueberry pulp and strawberry pulp separately and 8% sugar. Their sensory scores have been presented in table 2. Flavour scores (8.66) of TB10 were significantly ($p \leq 0.05$) higher than treatments (TB5 and TB15) and Control (Csr) noticed by judges. Results indicated that scores for flavour declined as the level of pulp increased in yoghurt. Amongst all the treatments TB10 scored significantly highest for flavour. Panel of judges reported that the body and texture scores (6.83) of control (Csr) were significantly ($p \leq 0.05$) higher than all the treatments (TB5, TB10 and TB15). Treatment TB10 scores for acidity (2.83) and colour and appearance (2.92) were significantly($p \leq 0.05$) higher in comparison to control (Csr), and treatments TB5 and TB15 as reported by judges. Among all the treatments TB10 scored significantly highest for acidity and Colour and appearance. The Container and closure score (2.00) of TB10 were at par with other treatments and control (Csr).

Selection of strawberry pulp: Similarly, The scores for flavour (8.33) of TS10 were significantly ($p \leq 0.05$) higher than treatments TS5, TS15 and Csr as seen by sensory panellist. Results indicated flavour score declined as the pulp level increased in yoghurt. Amid all the treatments, TS10 scored significantly ($p \leq 0.05$) highest for flavour. It is evident from table that panelist scored Csr (6.83) significantly ($p \leq 0.05$) higher than treatments TS5, TS10 and TS15 for body and texture. Judges reported that Treatment TS10 scores for acidity (2.83) and colour and appearance (2.92) were significantly ($p \leq 0.05$) higher in comparison to control (Csr), and treatments TB5 and TB15. Amid all the treatments TS10 scored significantly highest for acidity and colour and appearance. Between the treatments and control all scored equal for Container and closure (2.00).

It is evident from the table 3 that sensory panelists scored 8% sugar containing probiotic set type yoghurt significantly higher than 6% and 10% sugar containing set type yoghurt for its flavour. Colour and appearance of all the treatments were equal and non-significant. The score for container and closure for all samples were equal. Body and texture scores for 10% sugar containing yoghurt were significantly higher than 6% and 8%. Acidity scores of 6% sugar containing yoghurt were significantly higher than 8% and 10% sugar containing yoghurt. Closure and container scores were equal for all samples. Judges preferred 8% sugar containing yoghurt as its flavour scores were highest.

Selection of fruit Pulp level in fresh toned milk probiotic set type yoghurt: Probiotic set type yoghurt prepared from fresh toned milk (3% fat) with incorporation of different levels of chopped blueberry pulp/ strawberry pulp and 8% sugar. Sensory score of different level of fruit fortified probiotic set type yoghurt using fresh toned milk have been presented in table 4.

Selection of Blueberry pulp level: The flavour scores (8.33) of B10 were significantly ($p \leq 0.05$) higher than treatments (B5 and B15) and Control (Cst) noticed by judges and results were depicted in table 4. Results indicated that scores for flavour declined as the level of pulp increased in yoghurt. From all the treatments B10 scored significantly ($p \leq 0.05$) highest for flavour. Sensory panellists observed that the body and texture scores (6.83) of control (Cst) were significantly ($p \leq 0.05$) higher than all the treatments (B5, B10 and B15). It is evident from table, treatment B10 scores for acidity (2.75) and colour and appearance (2.83) were significantly($p \leq 0.05$) higher in comparison to control (Cst), and treatments B5 and B15. Judges noticed that among all the treatments B10 scored significantly ($p \leq 0.05$) highest for acidity and colour and appearance. Amid all the treatment and control container and closure scores (2.00) were at par.

Selection of strawberry pulp level: Correspondingly, panellists observed that scores for flavour (8.17) of S10 were significantly ($p \leq 0.05$) higher than treatments S5, S15 and Cst as seen by sensory panellist. Results indicated flavour score declined as the pulp level increased in yoghurt. Between all the treatments, S10 scored significantly ($p \leq 0.05$) highest for flavour. Table 4 depicted that panelist scored Cst (6.83) significantly ($p \leq 0.05$) higher than treatments S5, S10 and S15 for body and texture. As the level of fruit pulp increases body and texture scores decline due to increase in moisture level. As arbitrated by the judges treatment S10 scores for acidity (2.75) and colour and appearance (2.83) were significantly ($p \leq 0.05$) higher in judgement to control (Cst), and treatments B5 and B15. Amongst all the treatments S10 scored significantly highest for acidity and colour and appearance. Container and closure (2.00) scores for all treatments and control were equal.

Discussion

Sensory panelist preferred yoghurt prepared using fresh toned milk (3% fat, 8.5% SNF) with 8% sugar over yoghurt prepared with 6% and 10%. It is understandable from table 1 that judges preferred yoghurt containing 8% sugar over other

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for its flavour with the use of score card. Similar findings were reported prepared yoghurt with different level of blueberry fruit pulp and sugar. They found that addition of sugar improved the flavour of yoghurts and yoghurt with 25% blueberry pulp and 4% sugar have better flavour than other treatments [6].

Selection of fruit Pulp level in fresh toned milk probiotic stirred yoghurt.

Sensory evaluation trials were conducted with inclusion of different levels of blueberry/strawberry fruit pulp in probiotic stirred yoghurt prepared from fresh toned milk for acceptability of developed products. It was observed from the results as presented in table 2,

Flavour scores of TB10 were significantly ($p \leq 0.05$) higher than treatments (TB5 and TB15) and Control (Csr) noticed by judges. Similarly [6] found that the flavour of yoghurt was improved with the addition of sugar and sample with 25 % blueberries and 4 % sugar in terms of flavour, body, texture, colour and appearance were got highest score. Amongst all the treatments TB10 scored significantly highest for flavour. Similarly [7] incorporated banana, apple in yoghurt with buffalo milk and the stirred yoghurt with 8 % apple and 8% banana pulp attained the highest sensory score Panel of judges reported that the body and texture scores of control (Csr) were significantly ($p \leq 0.05$) higher than all the treatments (TB5, TB10 and TB15). Treatment TB10 scores for acidity and colour and appearance were significantly ($p \leq 0.05$) higher in comparison to control (Csr), and treatments TB5 and TB15 as reported by judges. Among all the treatments TB10 scored significantly highest for acidity and body and texture. Similarly [8] reported that yoghurt with 10% strawberry pulp has scored better than 15% strawberry pulp for its sensory attributes. The Container and closure score of TB10 were at par with other treatments and control (Csr). Similar results were reported by [9] they developed yoghurt by incorporating with three different fruit pulps such as banana, papaya and watermelon. All fruits have found with superior organoleptic score than control.

Selection of strawberry Pulp level

Similarly, The scores for flavour of TS10 were significantly ($p \leq 0.05$) higher than treatments TS5, TS15 and Csr as seen by sensory panellist. Similarly [10] reported that panellists sensory panellists have given highest scores for flavour, aroma, colour and overall acceptability to the yoghurt containing soursop fruit pulp. Amid all the treatments, TS10 scored significantly ($p \leq 0.05$) highest for flavour. It is evident from table that panelist scored Csr significantly ($p \leq 0.05$) higher than treatments TS5, TS10 and TS15 for body and texture. Judges reported that Treatment TS10 scores for acidity and colour and appearance were significantly ($p \leq 0.05$) higher in comparison to control (Csr), and treatments TB5 and TB15. Amid all the treatments TS10 scored significantly highest for acidity and colour and appearance. Between the treatments and control all scored equal for Container and closure. Similarly [8] observed that 5 to 10 per cent addition of jackfruit juice had better appearance, colour, flavor, texture and overall acceptability compared to 15 per cent jackfruit juice incorporated yoghurt. Similarly Vahedi(2008) studied the effect of "Osmodehydrofrozen" fruits on sensory attributes and indicated that yoghurts which contained 10% apple or 13% strawberry and added after fermentation had better quality.

Panel of judges favored probiotic set type yoghurt prepared using fresh toned milk (3% fat, 8.5% SNF) with 8% sugar over yoghurt prepared with 6% and 10%. It was revealed from table 3 that judges liked yoghurt containing 8% sugar over other samples for its flavour. Similar findings were reported by [6] they developed yoghurt with different level of blueberry fruit pulp and sugar. They studied that addition of sugar improved the flavour of yoghurts and yoghurt with 25% blueberry pulp and 4% sugar have better flavour than other treatments. Similar findings were reported in our study addition of sugar improved flavour of yoghurt.

Selection of Blueberry pulp level

The flavour scores of B10 were significantly ($p \leq 0.05$) higher than treatments (B5 and B15) and Control (Cst) noticed by judges and results were depicted in table 4. From all the treatments B10 scored significantly ($p \leq 0.05$) highest for flavour. Similarly, [7] incorporated banana, apple in yoghurt with buffalo milk and the stirred yoghurt with 8 % apple and 8% banana pulp attained the highest sensory score. Sensory panellists observed that the body and texture scores of control (Cst) were significantly ($p \leq 0.05$) higher than all the treatments (B5, B10 and B15). It is evident from table, treatment B10 scores for acidity and colour and appearance were significantly ($p \leq 0.05$) higher in comparison to control (Cst), and treatments B5 and B15. Judges noticed that among all the treatments B10 scored significantly ($p \leq 0.05$) highest for flavour acidity, colour and appearance and colour and appearance. Similarly [10] reported that judges have given highest scores for flavour, aroma, colour and overall acceptability to the yoghurt containing soursop fruit pulp. Amid all the treatment and control container and closure scores were at par.

Selection of strawberry pulp level

Correspondingly, panellists observed that scores for flavour of S10 were significantly ($p \leq 0.05$) higher than treatments S5, S15 and Cst. Between all the treatments, S10 scored significantly ($p \leq 0.05$) highest for flavour. Similarly [8] reported that yoghurt with 10% strawberry pulp has scored better than 15% strawberry pulp for its sensory attributes. The Container and closure score of TB10 were at par with other treatments and control (Csr) Table 4 depicted that panelist scored Cst significantly ($p \leq 0.05$) higher than treatments S5, S10 and S15 for body and texture. As the level of fruit pulp increases body and texture scores decline due to increase in moisture level. As arbitrated by the judges treatment S10 scores for acidity and colour and appearance were significantly ($p \leq 0.05$) higher in judgement to control (Cst), and treatments B5 and B15. Amongst all the treatments S10 scored significantly highest for acidity and Colour and appearance. Container and closure (2.00) scores for all treatments and control were equal. Similarly, [3] prepared fruit Dahi (yoghurt) with addition of strawberry, orange and grapes juice. And reported that yoghurt with 5% strawberry juice concentration was acceptable most

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and yoghurt with 10% orange juice was the optimum in quality among the others [11].

Conclusion

It is concluded that 8% sugar level in yoghurt was preferred by penellist. Probiotic stirred and set type yoghurt enriched with fruits pulp have better flavour as compared to control. Fortification of fruit improved the sensory attributes of the yoghurt. 10% blueberry fruit pulp enriched yoghurt in both set and stirred group was liked the most. Similarly, 10% strawberry fruit pulp enriched yoghurt in both set and stirred type was scored highest for flavour.

Conflict of Interest

All authors do not have any possible conflicts of interest.

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