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Evaluation of the sensory properties of yoghurt prepared from dairy milk, and soy milk

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ABSTRACT

Milk products such as yogurt are subject to a variety of safety testing. Some of these include tests for microbial quality, degree of pasteurization, and various forms of contaminant. The final yogurt product is also evaluated to ensure that it meets the specifications set by the manufacturer for characteristics such as pH, rheology, taste, colour, and odour. These factors are tested, using various laboratory equipment such as pH meters and viscometers and also human panellists. The aim of this research was to evaluate the sensory properties of yoghurt prepared from dairy milk, and soy milk. The results showed that the score for the taste of the samples ranged from 4.70 to 6.80. Sample B has the highest score for taste, while sample D had the least score of 4.70. There was no significant (P>0.05) difference among the tested sample. The highest score in B was as a result of the sample B being produced using 100 % dairy milk which gave real taste of yoghurt. Aroma score ranged from 5.45 (90 % SM 10 % DM) to 6.70 % (100 % DM). There was no significant (p>0.05) difference among the tested sample for aroma. Appearance ranged from 5.10 for (100 % SM) to 6.50 (100 % DM). There was no significant (p>0.05) difference among the tested sample for appearance. Mouth feel ranged from 5.15 for (80 % SM 20 % DM) to 6.70(100 % DM). There was no significant (p>0.05) difference among the tested sample for mouth feel. General acceptability score ranged from 5.15 for (80 % SM 20% DM) to 6.80(100 % DM). There was no significant (p>0.05) difference among the tested sample for general acceptability. The findings of the study have revealed that both sensory quality and acceptability of the yoghurt blends were evaluated. Despite the comparative quality and organoleptic properties, the sample B (100 % dairy milk) scored highly in all the sensory attributes, while soy milk yoghurt had the lowest sensory scores. In conclusion, despite the comparative quality and organoleptic properties, the sample B (100 % dairy milk) scored highly in all the sensory attributes, while soy milk yoghurt had the lowest sensory scores.
Keywords:Sensory properties, yoghurt, dairy milk and soy milk.

INTRODUCTION

Yoghurt is a fermented dairy product obtained by lactic acid fermentation of milk by the action of yoghurt starter bacteria [1]. It is more nutritive than milk due to higher milk solids, protein contents, calcium, phosphorous, and range of vitamins in addition to nutrients developed during fermentation [2,3] Levels of some vitamins, such as vitamin B1 and pantothenic acid are reduced as they are utilized by the bacterial culture. Flavour and consistency are its main parameters in yoghurt [4]. Consumer acceptance of yoghurts is based on physical attributes like lack of syneresis and perceived viscosity [5], acidity and aroma perceptions and the textural properties [6,7] crucial for the quality and overall sensory performance. Viscous properties are of primary importance with respect to the quality of products [8]. Yoghurt has non –Newtonian flow properties with strong time dependence on both the thixotropic and viscoelastic types [9]. [10] noticed pseudo plastic behaviour in fermented milks made from dairy milk.

Justification for the study

The following are some inherent setbacks that necessitated the study.

i. High cost of dairy milk, which is the major source of milk for yoghurt production.
ii. High cholesterol content in dairy milk

Considering these outlined limitations in the production and consumption of dairy yoghurt in Nigeria today, there is need to articulate an alternative source, which includes:

(a) Getting raw materials whose cost would be affordable to the small and cottage entrepreneurs.
(b) Considering the health benefit of plant protein

Objective of the research

The objective of this research was to evaluate the sensory properties of yoghurt prepared from dairy milk, and soymilk.

MATERIALS AND METHODS

Sources of materials

Soy beans, powdered milk, sugar, sodium benzoate, flavouring agent and starter culture were purchased from meat market, Abakaliki, Ebonyi State, Nigeria.

Sample preparation

Soy milk production

To produce soy milk with uniform consistency and reduced particle size, 7.0 kg of dried soy beans grain was weighed and soaked in warm water (45°C) for 24hour. At interval of 8 hour, the warm water was drained off and replaced with a new one to reduce the beanie flavour of the soy beans grain. After soaking the dried soy beans overnight, the beans was de-husked, washed with water and poured into a blender with fresh water, which was blended thoroughly into a paste. Three litres of clean tap water was added and thoroughly mixed to give slurry. The soy bean milk was extracted by transferring the slurry to a clean white sieve cloth where filtration by suction took place. The beans dreg on the filter cloth was dried and used as livestock and poultry feed. The extracted milk was transferred into a pot and pasteurized at 85 ^{0}C for an hour and allowed to cool gradually to a temperature of about 42-45 ^{0}C. The yellowish wad appeared on the surface was scooped off using a clean spoon. The cooled homogenised milk was incubated with the already prepared starter culture. The mixture was stirred properly and kept to stand at a temperature of about 30-35 ^{0}C for 24 hour. After this period the yoghurt is produced. Sugar, flavour and preservatives are seldom added.

The yoghurt production

The yoghurt was prepared according to the procedure described by [11]. The milk was first filtered using a clean cheese cloth. The milk was warmed to 43-45 ^{0}C and thereafter 6.5% sugar and 2.5% skimmed milk powder were added and stirred. The milk was further heated to 85 ^{0}C and was held at this temperature for 30 minutes with continuous stirring. After 30 minutes the milk was cooled to 42 ^{0}C after which it was inoculated with freeze dried thermophilic yoghurt starter culture and the amount to be used was based on the manufacturer's specifications. The milk was incubated for 4-6 hours after which the milk was refrigerated for 12 hours to stop the fermentation process. The set yoghurt was stirred by first breaking the curd and presented to panellist in white identical cups for sensory quality evaluation and acceptability determination.

The blends

The method described by [12] with slight modifications was adopted. The fresh soy yoghurt will be produced at different ratios, starting from the 100% un- blended milk sources (100 % DM and 100 %SM) respectively (where DM- represents dairy milk and SM- represents soy milk). For the blends, formulation ratios of 1000 ml of soy milk and 1000 ml of dairy milk was measured out for the proportion in which it is to be blended. 10mls of dairy milk was blended to 90 ml of soy milk, (representing 10 % DM and 90 %SM), 20 ml of dairy milk and 80 ml of soy milk (20 %DM and 80 %SM), 30mls of dairy milk and 70mls of soy milk,(30 %DM and 70 %SM), 40mls of dairy milk and 60mls of soy milk(40 %DM and 60 %SM), 50mls of dairy milk and 50mls of soy milk(50 %DM and 50 %SM), 60mls of dairy milk and 40mls of soy milk(60 %DM and 40 %SM),while 70mls of dairy milk and 30mls of soy milk represents (70 %DM and 30 %SM),80mls of dairy milk and 20mls of soy milk(80 %DM and 20 %SM), 90mls of dairy milk and 10mls of soy milk(90 %DM and 10 %SM). These blends was cultured, inoculated, and processed for yoghurt production, and labelled based on the percentage ratio of mixture of the processed milk sources.

Sensory Evaluation

A twenty man sensory panellist was arranged to carry out a sensory evaluation on each of the product blends produced. They are to determine the organoleptic acceptance of the products in terms of aroma, mouth feel, taste, appearance and overall acceptance. A 7 point hedonic scale was used whereby 7= highly accepted, 6= accepted, 5= moderately accepted, 4= neither accepted/ rejected, 3= moderately rejected, 2= rejected, 1= highly rejected. A product of similar recipe and configuration was used as the control for the evaluation. Mean sensory scores was analysed with analysis of variance (ANOVA) and means separated stundentized test according to the method of Ihekronye and Ngoddy, 1985.

Statistical analysis

The data obtained was analysed using analysis of variance (ANOVA) and means was compared by Duncan's Multiple Range test [12].

RESULTS

Sensory quality

Results in Table 1 shows the Sensory properties of soy yogurt

Table 1: Sensory Quality of Soy Yoghurt Blends

Samples	Aroma	Appearance	Taste	Mouth feel	General Acceptability
100Soy milk	6.50[a]	5.10[a]	5.60[a]	6.60[a]	5.00[a]
100 Dairy milk	6.70[b]	6.50[b]	6.80[b]	6.70[b]	6.80[b]
90SM 10 DM	5.45[a]	5.20[a]	4.90[a]	5.40[a]	5.25[a]
80 SM 20DM	5.55[a]	5.25[a]	4.70[a]	5.15[a]	5.15[a]
70 SM 30 DM	5.65[a]	5.50[a]	4.75[a]	5.50[a]	5.35[a]
60 SM 40 DM	6.00[a]	5.70[a]	5.80[a]	5.70[a]	6.20[a]
50 SM 50 DM	6.55[b]	6.25[a]	6.50[a]	6.00[a]	6.50[a]

Mean in the same subscript had no significant difference (p>0.05)

The score for the taste of the samples ranged from 4.70 to 6.80. Sample B has the highest score for taste, while sample D had the least score of 4.70. There was no significant (P>0.05) difference among the tested sample. The highest score in B was as a result of the sample B being produced using 100 % dairy milk which gave real taste of yoghurt. Aroma score ranged from 5.45 (90 % SM 10 % DM) to 6.70 % (100 % DM). There was no significant (p>0.05) difference among the tested sample for aroma. Appearance ranged from 5.10 for (100 % SM) to 6.50 (100 % DM). There was no significant (p>0.05) difference among the tested sample for appearance. Mouth feel ranged from 5.15 for (80 % SM 20 % DM) to 6.70(100 % DM). There was no significant (p>0.05) difference among the tested sample for mouth feel. General acceptability score ranged from 5.15 for (80 % SM 20% DM) to 6.80(100 % DM). There was no significant (p>0.05) difference among the tested sample for general acceptability.

DISCUSSION

Sensory Quality

The results of the sensory evaluation of the yoghurt samples are shown in Table 1. Attributes such as appearance, flavour, taste, mouth feel and general acceptability evaluated by judges are discussed below.

Appearance

Samples A (100 % Soy milk), C (90 SM/10 DM) and D (80 SM/20 DM) were rated low in terms of appearance. This may be due to the soy bean colour induced by the pigments (carotenoids), which can be attributed to the different level of gel capacity which in turn can be related to the casein ratio and there aggregation level [13] in non-fat dried milk. Milk based yoghurt showed a higher lightness than the soy milk yoghurt [14]. Consumers generally expect a clean white colour in yoghurt [15].

Aroma

The scores for aroma acceptability in sample A (100 % Soy milk), C (90SM/10DM), D (80 SM/20 DM), E (70 SM/30 DM) and F (60 SM/40 DM) in the yoghurt samples were significantly different ($p < 0.05$) from those in sample B and G in the blends. Aroma is a composite attribute involving taste and smell of a product [16]. A beany flavour and astringent taste which is unique to the soy beans as reported by [17], could possibly be the reason for lower acceptability of samples A (100% Soy milk), C (90 SM/10 DM), D (80 SM/20 DM), E (70 SM/30 DM) and F (60 SM/40 DM) of the yoghurt by the consumers. The phenolic compound which may lead to less acceptable aroma in soy milk may have to be extracted before preparing soy milk powder to be used as a fortificant in yoghurt. Polyphenols for example phytates and n-hexanal in soymilk interact with mucoprotein in mouth to contribute to astringent taste [18]. The results further revealed that dairy milk yoghurt was more preferred in terms of aroma and this is in consistent with findings of [19] who reported that cow milk yoghurt was also preferred in aroma and further stated that preference was attributed to higher contents of citrates in cow milk yoghurt.

Taste

Results for the taste scores of yoghurt as a quality attribute are presented in Table 1. The results showed that taste of the yoghurt was significantly ($p<0.05$) affected by the soy milk inclusion. The results further showed that dairy milk yoghurt was more preferred than soy milk yoghurt. these findings are contrary to the findings of [20] who reported that there was no significant difference ($p>0.05$) in terms of taste of soy milk yoghurt and cow milk yoghurt and further reported that soy milk yoghurt can compete favourably with other yoghurts like cow, and goat milk yoghurt, stating that it could be a good substitute for commercial production.

Mouth feel

Results of mouth feel scores as a sensory quality attributes are presented in Table 1. There were no significant difference ($p>0.05$) in mouth feel was observed in soy milk and dairy milk yoghurt. However the dairy milk yoghurt had a higher score as compared to the soy milk yoghurt. There are many reasons that contribute to the difference in mouth feel such as preparation methods as reported by [21] who reported that in order to have a good mouth feel, the best approach is to use traditional Chinese and Japanese methods where soy beans are soaked and are ground with cold water prior to heating and cooking the resulting slurry. The dairy milk yoghurt has more total solid content which improves its mouth feel hence more preferred. There could be contributing factors to these findings such as quality of the milk used which could subsequently be affected by factors like feeding and breeds of the animal.

CONCLUSION

The findings of the study have revealed that both sensory quality and acceptability of the yoghurt blends were evaluated. Despite the comparative quality and organoleptic properties, the sample B (100 % dairy milk) scored highly in all the sensory attributes, while soy milk yoghurt had the lowest sensory scores.

RECOMMENDATION

The fortification of yoghurt with soy solids using stabilizers is however recommended considering the iso flavones and mineral content in soymilk. The discovery of cheaper vitamins in plant protein as alternative to animal protein could solve problem of lactose intolerant individual and increased vitamins demand in developing countries considering their nutritional benefit. The addition of soy solids is advantageous and its uses as vitalized food supplement. The high cost of imported milk and milk production in Nigeria and Africa seen to have made consumers more ready to accept milk produced from plantprotein.

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