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Research Article

Comparative Assessment of the Sensory Acceptability of Soya Bean (*Glycine Max* (*L.*) *Merr*) Yoghurt Flavoured With Graded Levels of Julie Mango Pulp

Ubwa ST[1], Audu SI[2], Ajonye SA[2]*, Amua QM[3] and Ikese OC[1]

[1]*Department of Chemistry, Benue State University Makurdi, Nigeria*
[2]*Department of Chemistry, Nasarawa State University Keffi, Nigeria*
[3]*Department of Chemistry, Federal University of Agriculture Makurdi, Nigeria*

***Corresponding author**
Ajonye Ameh, Department of Chemistry, Nasarawa State University Keffi, Nasarawa State, Nigeria, Email: stevy84aj@gmail.com

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Abstract

Soya bean yoghurt produced from soya milk using standard procedures was flavoured with 0%, 5%, 10% and 15% Julie mango pulp and labeled SC (Control), F1, F2, and F3 respectively. The results from the analysis with a significant difference ($p<0.05$) showed that the pH of the soya bean yoghurt ranged from 3.40 to 3.50. The scores obtained for sensory attributes (colour, smell, taste, sourness and flavor) of the Julie mango pulp flavoured soya bean yoghurt were compared with that of the plain soya bean yoghurt sample. The sensory evaluation result showed a mean score of 5.00 as overall acceptability for sample F3 for all sensory attributes (colour, smell, taste, sourness and flavor) thereby making it the most preferred sample by the panelists. Sample F2 had an overall acceptability mean score of 4.20 for all sensory attributes making it second in overall preference. Sample F1 has an overall acceptability mean score of 4.00, while Sample SC was the least preferred with an overall acceptability mean score of 2.80.

INTRODUCTION

Yoghurt is a derivative of the lactic acid fermentation of milk by addition of a starter culture that is made of *Streptococcus thermophilus* and *Lactobacillus delbrueckii ssp. bulgaricus*. In some countries less conventional microorganisms, such as *Lactobacillus helveticus* and *Lactobacillus delbrueckii ssp. lactis,* are occasionally stirred with the starter culture [1]. Although, fermented milk derivatives such as yoghurts were initially formulated solely as a means of retaining the nutrients in milk, it was shortly realized that, by fermenting with different microorganisms, an opportunity existed to formulate a wide range of derivatives with different flavors, textures, consistencies and more recently, health attributes. The market now provides a broad collection of yoghurts to fit all sense of taste and feast occasions. Yoghurts come with assorted textures (e.g. liquid, set/formed and whisked curd), fat contents (e.g. regular/typical fat, reduced/low-fat and non-fat) and aroma or flavor (e.g. natural, fruit, cereal, chocolate), can be eaten as a snack or part of a dinner, as a sweet or savory food. The protean, jointly with their reception as a healthy and nutritious food, has led to their widespread vogue across all society subgroups [1].

Soya bean is one of the most valuable agricultural commodities because of its unique chemical composition. Among legumes, it has the highest protein content (around 40 %) and the second highest oil content (.20 %). Other valuable components include phospholipids, vitamins and minerals. Furthermore, soya beans include minor substances such as oligosaccharides and isoflavones. Isoflavones are present in just a few botanical families and soya bean is unique in that it contains the highest amount of isoflavones (.3 mg/g) dry weight [2].

Soya bean yogurt is a dairy derivative, which is formulated by fermenting soya bean milk with friendly or unharmful bacteria, namely *Lactobacillus bulgaricus* and *Streptococcus thermophilus*. The process is similar to the production of yoghurt from cow milk. When a sufficient quantity of lactic acid is produced then the soya milk coagulates and this coagulated soya bean milk is called soya bean yoghurt [3].

Soya bean yoghurts or soghurt are becoming more and more popular because of their low levels of cholesterol and saturated fat, and the fact that they are lactose-free [4,5]. Yoghurts produced from soya bean can be flavored with natural fruit such as Julie mango to make them attractive, improve their sensory properties

and nutritional value by providing more micronutrients that help boost human immune system (Figure 1).

MATERIALS AND METHODS

Source of Raw Materials

Soya beans (*Glycine max (L.) Merr*) and Julie mango (*Mangifera indica L.),* were bought from Wurukum market in Makurdi the capital of Benue State. While the starter culture (yogourmet) used was obtained from Garki market in FCT Abuja.

Preparation of Soya milk: Five hundred (500g) gram of soya beans was soaked in 5L of tap water at room temperature for 24hours, after which it was filtered and washed. 5L of fresh water was added to the macerated soya beans and then grounded with a blender. The triturated soybean slurry was filtered with a sieve at a ratio 7:1 of water to slurry. The filtrate was simmered for 20 minutes to obtain soya milk [6].

Preparation of Julie Mango Pulp: Fresh Julie mango obtained was washed and the exocarp was peeled off with a clean knife. The mesocarp was sliced into a blender (Nakai magic blender; model number: 462) and was blended using speed switch of number two (2) for five (5) minutes to obtain the pulp. The pulp was stored in a refrigerator at an ambient temperature until it was required for flavoring.

Preparation of Culture: After heating the soya milk to a temperature of about 82^{0}C to 90^{0}C, 1 cup of the warm milk was fetched and was combined with 5g of the starter culture. It was whisked gently until the powder dissolved completely.

Preparation of soya yoghurts: One litre (1L) of freshly prepared soya milk was pasteurized at a temperature of 82^{0}C for 30 minutes to destroy the undesirable microorganism (pathogenic and spoilage microorganisms) in the raw materials so as to provide a favourable environment free from competition for the growth of the starter culture. It was then cooled to a temperature of 45^{0}C. The pasteurized soya milk was inoculated with starter culture and incubated at a temperature of 40-45^{0}C for 18 hours. The soya yoghurt obtained was stored in the refrigerator at a temperature of 4^{0}C.

Sensory Evaluation of Soya Bean Yoghurt flavored with Julie Mango Pulp

The sensory properties of the formulated soya bean yoghurt flavored with graded levels of Julie mango pulp was evaluated using a similar method reported by (Ubwa et al, 2015) [7]. A 5 point hedonic scale shown below was used to evaluate the sensory parameters (smell, taste, colour, sourness, flavour, and overall acceptability) (Table 1).

Figure 1 Soya bean yoghurts.

Statistical Analysis

Triplicate statistical analyses were carried out on all the samples and the results obtained were expressed as means of three values. Data were analyzed using one-way analysis of variance (ANOVA) and means were compared at significant level ($p<0.05$) using IBM SPSS (Statistical Package for Social Sciences) version 23.

RESULTS AND DISCUSSION

Sensory Scores for Soya Bean Yoghurt Flavoured with Graded Levels of Julie mango Pulp

The scores for sensory evaluation of soya bean yoghurt flavoured with graded levels of Julie mango pulp is presented in Table 2 above.

The mean scores of colour from the analysis ranged from 2.10 in sample SC (100:0) to 3.90 in sample F3 that was flavoured with 15% Julie mango pulp. Sample F3 (85:15) flavoured soya bean yoghurt had the highest score (3.90) for colour, followed by sample F2 with a score of 3.20. Sample F1 and sample SC both have the score of 3.10 and 2.10 respectively. Sample SC had the least value for colour. Statistical analysis reviewed that there was no significant difference ($p < 0.05$) in the colour of the plain soya bean yoghurt (sample SC) and the 5% flavoured soya bean yoghurt with Julie mango pulp (sample F1). However, there was significant difference in the colour of the flavoured samples. The result in this study also shows the same increasing trend for colour as those of [8,9], but do not agree with the finding of [10] as the portion of Julie mango pulp increased.

The mean scores for smell by the panellist from the statistical analysis showed that sample F3 had the highest score (4.10), while sample SC had the lowest score (1.90). Samples F1 and F2 both had mean scores for smell as (2.60) and (3.20) respectively. The preference for the smell of the products by the panellist increased as the percentage of the flavour of Julie mango pulp substitute in the soya bean yoghurt increased. This could be attributed to the fruity aroma produced Julie mango as the concentration increased. The statistical analysis showed that there was significant ($p<0.05$) difference in the smell of the plain soya bean yoghurt sample and the flavoured samples. The result for smell obtained in this study is also similar to the result obtained for 15% mango fruit juice yoghurt reported by Getenesh *et al.,* [11], but fall short of those reported by Ndabikunze *et.al.,* 2017; Mbaeyi *et a.,l* 2017 [12,10]. Ndabikunze *et al*., (2017) stated that plain yoghurt was preferred to flavoured yoghurts in terms

Table 1: Hedonic Scale.

Number	Degree of Liking
1	Extremely Dislike
2	Dislike
3	Neither Like or Dislike
4	Like
5	Extremely Like

Source: (Ubwa *et al.,* 2015)

Table 2: Sensory Scores of Soya Bean Yoghurt flavoured with graded levels of Julie Mango Pulp.

Sample	Colour	Smell	Taste	Sourness	Flavour	Overall acceptability
Sc (100:0)	2.10^{a}±0.74	1.90^{a}±0.88	3.00^{a}±0.00	3.00^{a}±0.00	2.80^{a}±0.42	2.80^{a}±0.42
F1 (95:5)	3.10^{ab}±0.88	2.60^{b}±1.07	4.00^{ab}±0.00	4.00^{b}±0.00	4.00^{ab}±0.00	4.00^{b}±0.00
F2 (90:10)	3.20^{c}±0.79	3.20^{b}±1.03	4.10^{cd}±0.57	4.20^{c}±0.40	4.20^{c}±0.42	4.20^{c}±0.42
F3 (85:15)	3.90^{d}±0.99	4.10^{b}±1.00	4.90^{d}±0.32	4.80^{d}±0.40	4.80^{d}±0.42	5.00^{d}±0.00

Values are mean ± standard deviation of triplicate readings. Values on the same column with different superscript are significantly different ($p < 0.05$). Sc= plain soya bean yoghurt; F1-F3= Julie mango flavoured soya bean yoghurt.

of smell because plain yoghurt is the most common yoghurt consumed by Tanzanians.

The scores for sensory evaluation presented in table 2 showed that the mean scores of taste ranged from 3.00 in sample SC (100:0) to 4.90 in sample F3. The soya bean yoghurt flavoured with 5% Julie mango pulp (sample F1) scored (4.00) for taste, while sample F2 flavoured with 10% Julie mango pulp scored 4.10 for taste. Sample F3 had the highest score for taste, followed by sample F2. Plain soya bean yoghurt (sample SC) had the least score for taste but there was significant ($p < 0.05$) difference in the taste of sample F1 and sample F2. The result of this study is in agreement with those reported by (Osundahunsi *et al.,* 2007; Getenesh *et al.,* 2017). However, it was in contrast with the findings of (Ndabikunze *et.al,* 2017; Mbaeyi *et a.,l* 2017) [13,11]. Vishal *et al.,* (2014) [8] also observed that the scores increased to a certain point, then declined on further addition of the mango pulp.

Table 3.1 showed the scores for sensory evaluation of sourness in all the samples. The mean scores for sourness ranged from 3.00 in sample SC (100:0) to 4.80 in sample F3. The soya bean yoghurt flavoured with 5% Julie mango pulp (sample F1) scored (4.00) for sourness, while sample F2 flavoured with 10% Julie mango pulp scored 4.20 for sourness. Sample F3 had the highest score for sourness, followed by sample F2. Plain soya bean yoghurt (sample SC) had the least score for sourness, which is an indication that sample F3 is the most preferred sample by the panelists as it is the least sour of all the samples and sample Sc the most disliked in terms of sourness. (Duangrutai T. (2014); Abdallah and Mohamed (2017) [14,15] reported similar result. According to Abdallah and Mohamed (2017) mangoes are preferably used as flavouring material in the manufacture of yoghurt. Similarly, (Getenesh *et al.,* 2017) [11] observed the same trend.

The mean scores for flavour by the panelist from the statistical analysis showed that sample F3 had the highest score (4.80), while sample SC had the lowest score (2.80). Samples F1 and F2 both had mean scores for flavour as (4.00) and (4.20) respectively. The preference for the flavour of the products by the panelist increased as the percentage of the flavour of Julie mango pulp substitute in the soya bean yoghurt increased. The statistical analysis showed that there was no significant ($p<0.05$) difference in the flavour of the plain soya bean yoghurt sample and the sample containing 5% Julie mango pulp. However, the result showed a significant difference ($p<0.05$) between the flavours of sample F1 and F2. This agrees with the report of (Getenesh *et al.,* 2017) [11] for 15% and 25% increase in mango pulp substitution in the formulated yoghurt. Dessie *et al*., (1994) [16] reported similar decrease in flavour score for plain yoghurt. However, (Ndabikunze *et.al,* 2017; Mbaeyi *et a.,l* 2017) [12,10] gave a contrasting report. This was observed to be due to the fact that the panelists were used to plain yogurt than flavoured yoghurt.

The mean sensory evaluation scores for overall acceptability presented in **table 3.1** showed that sample F3 had the highest acceptability by the panelists. The mean sensory score for overall acceptability ranged from 2.80 in sample SC (100:0) to 5.00 in sample F3. High mean values (5.00) were obtained for the sample F3 for all five sensory attributes (colour, smell, taste, sourness, and flavour) therefore making it the most preferred sample. Sample F2 with a score of 4.20 was second in overall preference. Statistical analysis showed that the plain soya bean yoghurt labelled sample SC had the least mean score for all five sensory attributes (colour, smell, taste, sourness and flavour) as such, making it the most disliked sample by the panelists with an overall acceptability score of 2.80. The overall acceptability score in this study is in accordance with the reports of (Getenesh *et al.,* 2017; Vishal *et al.,* (2014)) [11,8].

CONCLUSION

The result of this study showed that the use of Julie mango pulp to flavour soya bean yoghurt reduces the beany smell by providing a fruity aroma instead and improves its sensory properties thereby enhancing its acceptability. The work also encourages the consumption of plant based yoghurt for improved healthy living. Furthermore, the use of Julie mango pulp as a natural flavouring agent helps in creating varieties of yoghurt and serves as an alternative for people that are allergic to yoghurt produced from animal source.

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