QUALITY EVALUATION OF YOGHURT FROM COWMILK, SOYMILK AND COW/SOYMILK
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Abstract
Proximate analyses carried out on samples of cow milk, soymilk and cow/soymilk Yoghurts showed significant difference (P<0.05) in the % crude protein, crude fat and carbohydrate contents. For crude protein they were 3.49 ± 0.04, 2.78 ± 0.13 and 2.02 ± 0.4 for cow yoghurt, cow/soy yoghurt and soy yoghurt respectively. However, there was no significant difference (P<0.05) in their moisture content and crude fibre. The carbohydrate content of the soy yoghurt had the highest value of 4.79± 0.06 while that of the cow/soy yoghurt and cow yoghurt had lesser values of 4.28± 0.03 and 3.45± 0.46 respectively. Sensory evaluation conducted showed that there was no significant difference (P<0.05) in their tastes and overall acceptability. However, there were significant differences (P<0.05) in colour, aroma and mouth feel. The overall result showed that yoghurt from soy base could compete favourably with the yoghurt from cow base-reference product.

Key words: Soymilk, cowmilk, yoghurt, starter culture, proximate analysis, sensory analysis.

Introduction:
Yoghurt is a cultured milk product that is produced through a fermentation process. Ihekoronye and Ngoddy (1985) defined yoghurt as a fermented milk product that evolved empirically some centuries ago by allowing naturally contaminated milk to sour at a warm temperature, in the range of 40-50°C. The micro-organisms which are used conventionally in this process are referred to as “starter culture”. They include Lactobacillus bulgaricus and Streptococcus thermophilus. Fermentation of the milk sugar i.e. lactose, produces lactic acid which acts on milk protein to give yoghurt its texture and its characteristics tang. The yoghurt is preserved by its acidity (0.85-0.95% acidity) which inhibits the growth of putrefactive or pathogenic bacteria (Stanier et al, 1979). Not only is yoghurt a wonderful quick, easy and nutritious snack, but also research evidence point to the fact that milk and yoghurt may actually add years to life as is found in some countries where fermented dairy products are a dietary staple. Further research showed that regular consumption of these products boosts our immune response; lowers high density lipoprotein, raises low density lipoprotein; lowers body fat (i.e. obesity); protect against ulcers and boosts the body’s ability to build bone (Hilton et al, 1992; Gill et al, 2001; Wang et al, 2004; Fabian and Elmadfa, 2006). Although cow milk is an exceptionally good source of protein acid, it is expensive due to rising cost of cow milk. Thus the development of soy-based milk is a cheap substitute for traditional cow milk yoghurt (Pinthong et al, 1980).

Soymilk is produced form the seed of the leguminous plant, Glycine max. Research has shown that soymilk has beneficial effects on health which include: No cholesterol; No sugar; High isoflavone content; High quality protein etc (Pinthong et al, 1980). In addition, soymilk yoghurt improves bone health, reduces menopausal symptoms and risk of heart disease and certain cancers. These immense benefits have stimulated a lot of researchers on incorporating soybean into indigenous diets (Sipos, 1988).

Materials and methods
Soybean seeds, dried powered milk (miksi), commercially available yoghurt starters and other ingredients were obtained from a large market in Owerri Municipal Council Imo-State, Nigeria.

Preparation of soymilk
500g of soybeans which have been sorted were boiled for about 20 minutes. They were cooled and dehulled before grinding with a kitchen blender (Sorex SHB-510). The milk was extracted after the mixture was poured into a muslin cloth that was placed on plastic jar.
Preparation of cow milk
100g of the powdered milk (miksi) was reconstituted with 1 litre of previously boiled warm water at about 40°C.

Preparation of starter culture
A small quantity of lukewarm pasteurized milk at 43°C was used to dissolve 5g of the starter thoroughly in a sterile beaker. This was used to inoculate the main pasteurized milk for fermentation according to the manufacturer’s instruction.

Preparation of yoghurt
Three different samples were used for the analyses. The cow milk, soymilk and equal mixture of cow and soymilk. The samples were sweetened with 10g of sugar each flavoured with minute quantity of strawberry flavor and pasteurized at 85°C for 15 minutes. The mixture was cooled to 43°C and inoculated with the commercial starter (Yogourmet, a freeze dried yoghurt starter) and crème Bulgare starter, which is a culture of mixed strain of Lactobacillus bulgaricus, Streptococcus thermophilus and Lactobacillus acidophilus. The setup were placed in an oven at 42-43°C for 2hrs, 4hrs, 6hrs and 8hrs and the final yoghurt sample for 12hrs after which they were cooled and refrigerated.

Proximate composition
The moisture, ash and crude fat contents of samples were determined by the AOAC (1990) methods. Crude fibre was determined by the method described by James (1995). Crude protein was estimated by determining the percentage Nitrogen using Kjeldah’s method and converted to crude protein by multiplying by a factor 6.25 (Pearson, 1976). Carbohydrate was estimated by difference from the Nitrogen free extract (AOAC, 1990).

**Determination of pH**
This was carried out by preparing a 10% w/v suspension of the samples in distilled water and mixed thoroughly with a warring microblender. The Ph was measured with JENWAY Ph meter (England).

Sensory Analysis
A 7-point scale was used to evaluate the cow yoghurt, soy yoghurt and cow/soy yoghurt samples organoleptically for acceptability, aroma, taste, colour and mouthfeel. The test was conducted by a 20 member panelist.

Statistical Analysis
The results obtained from proximate and sensory analyses were subjected to analysis of variance (ANOVA). The sensory scores was then subjected to ANOVA using one factor randomized design according to Mahony (1986).

**Results and Discussion**
The results of the proximate analysis of the composition of cow milk/soymilk yoghurt are presented in table 1

<table>
<thead>
<tr>
<th>Samples</th>
<th>CY (Cow yoghurt)</th>
<th>CSY (Cow/soy yoghurt)</th>
<th>SY (Soy yoghurt)</th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude protein</td>
<td>3.49±0.04</td>
<td>2.78±0.13</td>
<td>2.02±0.14</td>
<td>0.20</td>
</tr>
<tr>
<td>% Moisture</td>
<td>90.490.21</td>
<td>91.21±0.03</td>
<td>91.63±0.64</td>
<td>-</td>
</tr>
<tr>
<td>Ash content</td>
<td>0.45±0.20</td>
<td>0.48±0.18</td>
<td>0.51±0.23</td>
<td>-</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>0.25±0.02</td>
<td>0.15±0.01</td>
<td>0.25±0.01</td>
<td>-</td>
</tr>
<tr>
<td>Crude fat</td>
<td>2.31±0.01</td>
<td>1.58±0.17</td>
<td>1.30±0.00</td>
<td>0.20</td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>3.45±0.46</td>
<td>4.28±0.03</td>
<td>4.79±0.06</td>
<td>0.57</td>
</tr>
</tbody>
</table>

Means in the same row with the same superscript are not significantly different at (P<0.05). The results show that the mean values of crude protein and crude fat are significantly different (P<0.05) in the three samples analysed. Cow yoghurt
has the highest crude protein of 3.49% while soy yoghurt has the least value of 2.02%. The samples have high moisture content of above 90.0% though they are not significantly different at P<0.05. Ash content was very minute. This shows that yoghurts need to be fortified with minerals for body maintenance. There is significant difference (P<0.05) between the carbohydrate contents of cow yoghurt i.e. 3.45% and the values for soy yoghurt (4.79%) while cow/soy yoghurt have an average value of 4.28%. The high carbohydrate value for soy yoghurt is because of its plant origin and also the carbohydrate of cow milk of fermented more by the microbes. The values obtained in this study for crude protein, moisture content, ash and carbohydrates fall within the range obtained by Osundahunsi et al (2007) for soy yoghurts.

Table 2 shows pH values for the samples analysed. The table showed that the acidity increased for all samples as the incubation period progressed. Soy yoghurt has the highest pH of 4.15 while cow/soy yoghurt and cow yoghurt has pH of 4.29 and 4.35 respectively. The decreases in pH values from the initial values of 5.7, 5.11 and 5.18 respectively showed that the lactic acid content increased. The pH values of all the samples fall within the range of good quality yoghurt (Tamine, 1977).

Table 2: The pH values for the samples analysed at different hours

<table>
<thead>
<tr>
<th>pH</th>
<th>CY</th>
<th>SY</th>
<th>CSY</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Hours</td>
<td>5.74±1.39a</td>
<td>5.11±0.83a</td>
<td>5.18±1.31ab</td>
</tr>
<tr>
<td>4 Hours</td>
<td>5.20±1.35ab</td>
<td>5.00±0.94a</td>
<td>5.06±1.50b</td>
</tr>
<tr>
<td>6 Hours</td>
<td>4.87±1.35ab</td>
<td>4.31±1.56b</td>
<td>4.68±1.89a</td>
</tr>
<tr>
<td>8 Hours</td>
<td>4.35±1.48a</td>
<td>4.15±1.76a</td>
<td>4.29±1.89a</td>
</tr>
</tbody>
</table>

The results of sensory evaluation are presented in table 3. The results show that there is no significant difference (P<0.05) in taste and general acceptability. But there is significant difference (P<0.05) in colour, aroma and mouthfeel. Although cow milk and commercial milk yoghurt (CMY) have the highest mean scores for tastes (i.e. 5.40 and 5.90) from the panelists, the cow/soy yoghurt and soy yoghurt competed favourably with them presenting soy as a good substitute for commercial production.

Table 3: The sample mean of sensory evaluation attributes

<table>
<thead>
<tr>
<th>Samples/Parameter</th>
<th>CMY (Commercial)</th>
<th>CY (Cow Yoghurt)</th>
<th>CSY (Cow/Soy Yoghurt)</th>
<th>SY (Soy Yoghurt)</th>
<th>LSD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colour</td>
<td>6.35±1.39a</td>
<td>6.20±0.83a</td>
<td>5.60±1.31ab</td>
<td>4.95±1.79bc</td>
<td>0.87</td>
</tr>
<tr>
<td>Aroma</td>
<td>5.60±1.35ab</td>
<td>6.05±0.94a</td>
<td>5.05±1.50b</td>
<td>4.20±1.40c</td>
<td>0.83</td>
</tr>
<tr>
<td>Taste</td>
<td>5.90±1.48a</td>
<td>5.40±1.27a</td>
<td>5.25±1.88a</td>
<td>4.45±2.19a</td>
<td>-</td>
</tr>
<tr>
<td>Mouth feel</td>
<td>5.75±1.02ab</td>
<td>5.25±1.56b</td>
<td>6.00±2.75a</td>
<td>4.20±2.07c</td>
<td>0.61</td>
</tr>
<tr>
<td>Acceptability</td>
<td>5.70±1.89a</td>
<td>5.60±1.76a</td>
<td>5.00±1.89a</td>
<td>4.50±2.04a</td>
<td>-</td>
</tr>
</tbody>
</table>

Means in the same row with the same superscript are not significantly different at P<0.05.

The mean score for colour decreases form both the commercial and cow milk yoghurt to that of cow/soy yoghurt and finally to soy yoghurt. (Cow/soy yoghurt has the highest mean score of 6.00±2.75 in mouth feel which is significantly different (P<0.05) from others. This is got to show that with time, soy milk can be a complement or substitute for nations that cannot afford cow milk for yoghurt production.
Conclusion
This research showed that yoghurt samples produced from purely soy milk and in combination with cow milk will compete favourably with yoghurt produced from pure milk. Nutritionally, the yoghurt samples from the cow milk-soymilk combination met the dietary requirements of pure yoghurt without significant difference. However, flatulence factor and objectionable flavour in soybean products must be reduced or eliminated to enhance acceptability. Despite the findings from this evaluation, there is need for more research on how to mask the beany flavour of soy milk to produce acceptable soy yoghurt. The choice of appropriate flavour or other additive with low side effects would surely enhance acceptability.

References


Sipos, E. f. (1988). Edible uses of Soybean Protein. Presented at Soybean utilization alternatives symposium, University of Minnesota, February 16-18, Minneapolis, MN.
