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QUALITY AND MICRIOBIOLOGICAL EVALUATION OF AFRICAN YAM BEAN YOGHURT SUPPLEMENTED WITH COW MILK

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ABSTRACT

The utilization of African yam bean for the production of yoghurt substituted with cow milk was studied. African yam bean milk was extracted from dehulled seed, pasteurized and fermented with Yoghurmet® in ratios with reconstituted cow milk powder in the ratios 50:50, 70:30, 90:10, 100:0 and 0:100 (African yam bean milk:Cow milk). Sample 0:100 which was 100% cow milk yoghurt served as the control. The samples were stored for 14 days at 4°C and 3 days at room temperature. The results of the proximate composition of the fresh samples in percentages are; Moisture: 82.76, 81.62, 83.62, 86.53 and 85.42. Total solids: 17.25, 18.47, 16.35, 13.47and14.57. Protein: 5.93, 4.27, 5.87, 5.57 and 5.14. Ash: 0.94, 0.83, 0.91, 0.90 and 0.87. Fat: 1.07, 2.53, 1.18, 1.45 and 1.75. Carbohydrate: 9.09, 10.73, 8.33, 5.53 and 6.78 for the samples 100:0, 0:100, 90:10, 70:30 and 50:50 respectively. The moisture, total solids, fat and carbohydrate contents differed significantly ($p \leq 0.05$) in all the samples. The protein content of 100:0 and 90:0 did not differ significantly but differs in other samples. 0:100 differ significantly from other samples in ash content. There was no fiber in the samples. The total viable microbial count was highest in 70:30 (1×10^7cfu/ml) for refrigerated storage samples while 50:50 (9.5×10^6cfu/ml) had the highest count in room temperature storage samples. There were no yeasts/moulds enumerated in the refrigerated storage samples while yeast/moulds appeared in 100:0 (3×10^6cfu/ml) and 70:30 (1×10^6cfu/ml) on the 3rd day of room temperature storage. The titratable acidity of all the samples increased gradually throughout the storage period while their pH decreased. The specific gravity of the samples also decreased gradually throughout the storage period. The anti-nutritional composition of the samples containing African yam bean was also determined. The sensory properties showed that samples stored at refrigeration temperature maintained good quality up to 14 days of storage and that sample 50:50 was most preferred.

Keywords: Watermelon, orange, juice, blends

INTRODUCTION

African Yam Bean (AYB) contains complex sugars such as oligosaccharides which cannot be digested by humans. Oligosaccharides have been known to be prebiotics; a food for the probiotics. Hence enriching milk with prebiotic supplements enhances the growth of yoghurt starters. Legumes including African yam bean (*Sphenostylis sternocarpa*), lentil (*Lens culinaris*), chick pea (*Cicer arietinum*) and soybeans (*Glycine max*) are excellent food sources with numerous health promoting benefits. Yogurt is one of the oldest fermented milk products known. It is usually taken as a desert. Fermented products from milk also include cheese, acidophilus milk, kefir and buttermilk. Yogurt is among the most common dairy products consumed around the world (**Saint-Eve *et al.*, 2006**). There are two major types; set and stirred yogurt. Set yoghurt is formed in retail pots as lactic acid bacteria ferment lactose into lactic acid giving a continuous gel structure in the consumer container. In stirred yogurt, the acid gel formed during incubation in large fermentation tanks is disrupted by agitation and the stirred product is usually pumped through a screen which gives the
Concerted efforts have been made to protect species of African yam bean from extinction through diversification of uses to promote utilization. Few fermented products developed from African Yam Bean include a cheese-like product, vegetable milk and a yoghurt-like product (**Amakoromo *et al.*, 2012**). The aims of this study were to produce yoghurt samples from dehulled AYB seeds supplemented with cow milk in the ratios, 50:50, 70:30, 90:10,100:0 (AYB: MILK) and un-substituted cow milk yoghurt (0:100) will be used as the control, determine the quality/microbiological status of all the samples at 0, 1, 3, 7 and 14 days of storage.

(a) (b) (c)

Figure 1 a: black variety of AYB seeds; b: cream variety of AYB seeds; c: flat cream variety of AYB seeds

MATERIAL AND METHODS

Materials

Source of materials

- AYB seeds (the cream coloured variety) was purchased from the Iddo market, Oyingbo Lagos state.
- Partially skimmed Dano® milk powder was purchased at Oba market, Akure, Ondo state.
- Yogourtmet freeze dried yoghurt starter (Lyo-San Inc. Canada) was purchased at Oke-arin Market, Lagos Island, Lagos state.
- All reagents used were of analytical grade.

Methods

Yoghurt production from cow milk

A 100% cow milk yoghurt was produced using partially skimmed Dano® milk powder. The milk powder was reconstituted as described by **Tammine and Robinson** (1999) as referenced by Muhammad *et al.* (2009). 1 kg of the milk powder was mixed with 3 liters of clean water at room temperature (25-30^{o}C) until a smooth paste was obtained followed by the addition of 5 liters of water at 85^{o}C and mixed continuously. The mixture was cooled and innoculated with starter cultures (*Lactobacilus delbrueckii ssp.bulgaricus* and *Streptococcus thermophilus)* and incubated at room temperature for 12 hours. After incubation, sucrose was added to the yoghurt and stirred, packaged and stored at room temperature and at 4^{o}C for 14 days.

1. Reconstitution of milk powder
2. Inoculation with starter cultures (5g/liter)
3. Incubation (Ambient temperature for 12 hours)
4. Addition of stabilizer and sweetener
5. Stirring
6. Packaging
7. Storage (room temperature at 4^{o}C).

Figure 2 A flow procedure of the production of 100% cow milk yoghurt

Yoghurt production from AYB milk

The AYB yoghurt was prepared as described by Amarokomo *et al*. (2012) except that skimmed milk was used and sucrose was added after the incubation period (Figure 3). The AYB seeds were sorted to remove extraneous materials. The seeds were soaked in 4% NaCl for 12 hours, rinsed and heated for 5 minutes at 100^{0}C and left to cool. The seeds were manually dehulled and blended with water in the ratio 1:4 (seed:water) until a smooth slurry was obtained. The slurry was filtered through double folded cheese cloth. The slurry was substituted with reconstituted Dano® milk powder in the ratio 50:50, 70:30, 90:10 (AYB: MILK). 1.25% sucrose was added to all the mixtures.

1. AYB Seeds/sorting
2. Soaking (4% Nacl for 12hrs)/Rinsing
3. Heating (5Mins at 100^{o}C
4. Cooling
5. Manual dehulling
6. Blending with water/Filtration
7. Supplementation with milk
8. Heating (95^{o}C for 20) mins
9. Cooling (43^{o}C)/Inoculation with starter culture
10. Incubation (ambient temperature for 24 hrs)
11. Addition of stabilizer and sweetener
12. Stirring/Cooling (4^{o}C
13. Packaging
14. AYB Yoghurt
15. Storage

Figure 3 A flow procedure for the production of yoghurt from AYB milk

The mixtures were heated with stirring to 95^{0}C for 20 minutes, cooled to 43^{0}C and inoculated with starter cultures (*Lactobacilus delbrueckii ssp.bulgaricus, Streptococcus thermophilus* and *Lactobacillus acidophilus)* (5g/liter).The mixtures were incubated at ambient temperature for 12 hours, packaged and stored at room temperature and at 4^{o}C for 14 days.

RESULTS AND DISCUSSION

Effects of refrigeration and room temperature storage on microbial counts

The effects of refrigeration and room temperature storage on total viable microbial counts, lactobacilli counts and yeasts/moulds count are presented in Tables 1, 2, 3, 4 and 5 respectively.

Total viable counts of yoghurt samples stored at 4^{o}c and room temperature

The results of the total viable microbial counts of samples stored at 4^{o}C and room temperature storage are presented in Tables 1 and 2 respectively. In the samples stored at 4^{o}C,the total viable count was highest in 70:30 (1×10^{7}cfu/ml) yoghurt sample which may be due to the synergistic effect of the presence a high amount of AYB (contains oligosaccharides which are prebiotic) while 100:0 had the lowest count. The high total viable count of the samples is as a result of the presence of the fermenting microorganisms. According to **Tammime and Robinson (1999),** yoghurt may contain up to 10^{7} viable cells of *Lactobacillus bulgaricus* and *Streptococcus thermophilus* per ml. High total viable bacteria count shows the acidity of a yoghurt sample and most of the bacteria are lactic acid bacteria (**Amakoromo *et al*., 2012**). The total viable counts of the refrigerated samples decreased during storage. This may be as a result of the low temperature storage. **Panoff *et al.* (1998) and Pavlova (2007)** reported that damage in cell membranes and DNA denaturation are probable causes for death of bacterial cells during low temperature storage.

Table 1 Total viable microbial counts of yoghurt samples stored at 4^{o}c

		Storage time (days)				
Sample		0	1	3	7	14
AYB:SKM	100:0	$6x10^{6}$	$3.0x10^{6}$	$3x10^{6}$	$2.8x10^{6}$	$2.5x10^{6}$
AYB:SKM	0:100	$7.2x10^{6}$	$4.6x10^{6}$	$3.6x10^{6}$	$2.0x10^{6}$	$1x10^{6}$
AYB:SKM	90:10	$7x10^{6}$	$6.8x10^{6}$	$5.5x10^{6}$	$4.1x10^{6}$	$3x10^{6}$
AYB:SKM	70:30	$1x10^{7}$	$7x10^{6}$	$6.2x10^{6}$	$2x10^{6}$	Nil
AYB:SKM	50:50	$9.5x10^{6}$	$5.0x10^{6}$	$4.0x10^{6}$	$2x10^{6}$	$1.7x10^{6}$

Legend: AYB = African Yam Bean, SKM= Skim Milk

Table 2 Total viable microbial counts of yoghurt samples stored at room temperature

		Storage time (days)		
Sample		0	1	3
AYB:SKM	100:0	$6x10^{6}$	$3.8x10^{6}$	$6.7x10^{6}$
AYB:SKM	0:100	$7.2x10^{6}$	$3.0x10^{6}$	$2x10^{6}$
AYB:SKM	90:10	$7x10^{6}$	$3.6x10^{6}$	$5.1x10^{6}$
AYB:SKM	70:30	$1x10^{7}$	$7.5x10^{6}$	$3.0x10^{6}$
AYB:SKM	50:50	$9.5x10^{6}$	$7.5x10^{6}$	$3.0x10^{6}$

Legend: AYB = African Yam Bean, SKM= Skim Milk

The total viable counts of samples stored at room temperature also decreased during storage. The control which was 100% cow milk yoghurt (0:100) had the lowest total viable counts (2×10^{6}cfu/ml) at day 3 of storage. This is as a result of the high accumulation of metabolites which are toxic to the microorganisms since fermentation continued and was uncontrolled.

Lactobacilli counts of yoghurt samples stored at 4^{o}c and room temperature

The results of the lactobacilli counts of samples stored at 4^{o}C and room temperature storage are presented in Tables 3 and 4 respectively.

Table 3 Lactobacilli counts of yoghurt samples stored at 4^{o}c

		Storage time (days)				
Sample		0	1	3	7	14
AYB:SKM	100:0	$1x10^{7}$	$8.7x10^{6}$	$8.2x10^{6}$	$2x10^{6}$	Nil
AYB:SKM	0:100	$3.2x10^{7}$	$1.0x10^{7}$	$8.2x10^{6}$	$4.0x10^{6}$	$1x10^{6}$
AYB:SKM	90:10	$1x10^{7}$	$9.0x10^{6}$	$7.6x10^{6}$	$4.5x10^{6}$	$2x10^{6}$
AYB:SKM	70:30	$8x10^{6}$	$6.1x10^{6}$	$5.5x10^{6}$	$3x10^{6}$	$1x10^{6}$
AYB:SKM	50:50	$9.4x10^{6}$	$8.0x10^{6}$	$8.0x10^{6}$	$3.0x10^{6}$	$1.5x10^{6}$

Legend: AYB = African Yam, Bean, SKM= Skim Milk

Table 4 Lactobacilli counts of yoghurt samples stored at room temperature

		Storage time (days)		
Sample		0	1	3
AYB:SKM	100:0	$1x10^{7}$	$6.8x10^{6}$	$3.0x10^{6}$
AYB:SKM	0:100	$3.2x10^{7}$	$8.8x10^{6}$	$6.0x10^{6}$
AYB:SKM	90:10	$1.0x10^{7}$	$7.2x10^{6}$	$4.0x10^{6}$
AYB:SKM	70:30	$8x10^{6}$	$6.0x10^{6}$	$2.8x10^{6}$
AYB:SKM	50:50	$9.4x10^{6}$	$6.5x10^{6}$	$4.0x10^{6}$

Legend: AYB = African Yam Bean, SKM= Skim Milk

The lactobacilli counts of the samples stored at 4^{o}C were highest in the 0:100 yoghurt sample (3.2×10^{7}cfu/ml) followed by 50:50 (9.4×10^{6}cfu/ml). This is as a result of the higher ratio of cow milk in the sample compared to others. Lactobacilli counts decreased in all the samples throughout the storage period while there was a total decline on the 14th day of storage in the 0:100 sample. There was also a decrease in lactobacilli counts in samples stored at room temperature. Decrease in lactobacilli counts in yoghurt samples stored for 15 days was also reported by **Eissa *et al.*** (2010).

Yeasts/Moulds counts of yoghurt samples stored at 4°c and room temperature

The results of the yeast/moulds counts of samples stored at 4°C and room temperature storage are presented in Tables 5 and 6 respectively.

Table 5 Yeasts/Moulds counts of yoghurts stored at 4°c

		Storage time (days)				
Sample		0	1	3	7	14
AYB:SKM	100:0	Nil	Nil	Nil	Nil	Nil
AYB:SKM	0:100	Nil	Nil	Nil	Nil	Nil
AYB:SKM	90:10	Nil	Nil	Nil	Nil	Nil
AYB:SKM	70:30	Nil	Nil	Nil	Nil	$1x10^6$
AYB:SKM	50:50	Nil	Nil	Nil	Nil	Nil

Legend: AYB = African Yam Bean, SKM= Skim Milk

Table 6 Yeasts/Moulds counts of yoghurt samples stored at room temperature

		Storage time (days)		
Sample		0	1	3
AYB:SKM	100:0	Nil	Nil	$3x10^6$
AYB:SKM	0:100	Nil	Nil	Nil
AYB:SKM	90:10	Nil	Nil	Nil
AYB:SKM	70:30	Nil	Nil	$1x10^6$
AYB:SKM	50:50	Nil	Nil	Nil

Legend: AYB = African Yam Bean, SKM= Skim Milk

Yeasts/moulds were absent in all the samples throughout the storage period in the samples stored at 4°C except for the 70:30 which had 1×10^6 $cfuml^{-1}$ on the 14th day of storage. This might be due to the presence of contaminating microorganism in the inoculums. Yeasts/moulds appeared on the 3rd day of storage in 100:0 and 70:30 yoghurt samples stored at room temperature, 3×10^6 and 1×10^6 $cfuml^{-1}$ respectively. This indicates spoilage and may be due to increase in acidity of the samples and uncontrolled fermentation.

Proximate Composition of Fresh Yoghurt Samples

The result of the proximate composition of the fresh yoghurt samples are presented in Table 7.

Table 7 Proximate composition of yoghurt samples

Sample (AYB:SKM)	Moisture content	Total solids	Protein	Ash	Fiber	Fat	Carbohydrate
100:0	82.76±0.02^{d}	17.25±0.02^{b}	5.93±0.30^{a}	0.94±0.02^{a}	0	1.07±0.01^{e}	9.09±0.01^{b}
0:100	81.62±0.11^{e}	18.47±0.21^{a}	4.27±0.02^{d}	0.83±0.02^{d}	0	2.53±0.02^{a}	10.73±0.02^{a}
90:10	83.62±0.08^{c}	16.35±0.03^{c}	5.87±0.02^{a}	0.91±0.02^{ab}	0	1.18±0.01^{d}	8.33±0.02^{c}
70:30	86.53±0.01^{a}	13.47±0.04^{e}	5.57±0.03^{b}	0.9±0.02^{bc}	0	1.45±0.02^{c}	5.53±0.02^{e}
50:50	85.42±0.02^{b}	14.57±0.04^{d}	5.14±0.02^{c}	0.87±0.02^{c}	0	1.75±0.02^{b}	6.78±0.02^{d}
Total	83.99±1.84	16.02±1.87	5.36±0.64	0.89±0.04	0	1.60±0.54	8.09±1.87

Legend: AYB = African Yam Bean, SKM= Skim Milk .*Means±SD. Values are means of three replicates in percentage. Mean values having different superscript letters in a row for each sample are significantly different ($p\leq0.05$).

Moisture Content of Fresh Yoghurt Samples

Significant differences exist between the moisture contents of all the samples. This is due to the different ratios of the AYB milk used for the fermentation.

Total Solids Contents of Fresh Yoghurt Samples

A significant difference also exists between the total solids content of all the samples and this is due to the significant difference between the moisture contents of the samples. The total solids content range from 13.47% - 18.47% which is higher than the range of 12.4% - 14.5% reported by **Oshundahunsi *et al.*** (2007) for soy yoghurt but the total solids content of 18.47% of the 0:100 (pure cow milk yoghurt) sample compares with the value of 18.7% reported by **Mohammad *et al.*** (2009) for cow milk yoghurt.

Protein Contents of Fresh Yoghurt Samples

There is no significant difference between the protein content of samples 100:0 and 90:10.This is due to the higher percentage of AYB milk in the two samples while significant difference exists between the remaining samples.

Ash Contents of Fresh Yoghurt Samples

There is no significant difference in the ash content of samples 100:0 and 90:10. The ash content of sample 0:100 is significantly different from all other samples. This may be due to the absence of AYB milk in the sample. The ash content of 0:100 (pure cow milk yoghurt) which is 0.83% is higher than the ash content of 0.75% reported by **Eissa *et al.*** (2010) for cow milk yoghurt. The difference might be due to variation in the mineral content of the milks used.

Fiber Contents of Fresh Yoghurt Samples

There was no fiber in the sample which might be as a result of the sieving of the AYB slurry to obtain the milk during the sample preparation.

Fat Contents of Fresh Yoghurt Samples

All the samples differ significantly in their fat contents. The fat composition of the yogurt samples (1.07% - 2.93%) in this study indicates that the yogurts could be classified as medium fat yogurts as suggested by **Robinson and Tamime** (1999) for yogurts containing 0.5% - 2.9% fat.

Anti-nutritional Components in Fresh Samples of African Yam Bean Yoghurt

The anti-nutritional components in fresh samples of AYB yoghurt samples are presented in Table 8. Sample 100:0 had the highest tannin content compared to others. This is as a result of the higher percentage of AYB milk in the sample. Sample 100:0 has the lowest quantity of trypsin inhibitors while 50:50 has the highest. This might be as a result of the lactic acid fermentation which has reduced the anti-nutrient faster in 100:0. **Betsche *et al.*** (2005) reported that lactic acid fermentation reduced the anti-nutrients in AYB. Sample 100:0 had the highest cyanogenic glucoside content which might be due to high percentage of AYB milk in the sample.

Table 8 Anti-nutritional components in fresh samples of African yam bean yoghurt

Sample (AYB:SKM)	Tannin (mg/g)	Trypsin inhibitors (mg/g)	Cyanogenic Glucosides (mg/g)
100:0	0.0216	2.4100	0.4050
90:10	0.0176	3.0800	0.1350
70:30	0.0064	3.0950	0.1350
50:50	0.0125	5.1150	0.1350

Legend: AYB = African Yam Bean, SKM= Skim Milk

Sensory Evaluation of Yoghurt Samples Stored at Refrigeration Temperature

The result of the sensory evaluation of the yoghurt samples stored at refrigeration temperature is presented in Table 9. There was a significant difference in the taste of sample 100:0 on day 0 and days 3, 7 and 14 days of storage. There was no significant difference in taste of all other samples during the storage period. No significant difference existed between the aroma of sample 100:0 on day 0 and 3rd of storage but significant difference occurred on the 7th and 14th day compared to day 0.There was no significant difference in aroma of sample 0:100 and also sample 70:30 and 50:50 throughout the storage period. A significant difference occurred between the aroma of sample 90:10 on day 0 and all other days of storage. There was no significant difference in the appearance of sample 100:0 on

day 0 and 3rd of storage but differs on the 7th and 14th day. There was no significant difference in the overall acceptability of sample 100:0 throughout the storage period and also in sample 0:100. Significant difference occurred in the general acceptability of sample 90:10 on the 3rd day of storage. There was no significant difference in the general acceptability of sample 70:30 throughout the storage period while significant difference occurred in the overall acceptability of sample 50:50 on the 3rd and 14th day of refrigerated storage at ($p \leq 0.05$).The results of the sensory evaluation showed that sample 50:50 was the most acceptable of all the samples containing AYB milk apart from the control (0:100) which was 100% cow milk yoghurt.

The samples stored at room temperature were not evaluated for sensory qualities due to the production of high carbon (iv) oxide in the samples as a result of continued fermentation resulting in spoilage and non-palatability.

Table 9 Sensory Evaluation of Yoghurt samples stored at 4°C

Storage Days	Taste				Aroma				Appearance				Overall acceptability			
	0	3	7	14	0	3	7	14	0	3	7	14	0	3	7	14
Sample (AYB:SKM)																
100:0	5.00^{c}	5.17^{b}	6.00^{b}	6.17^{ab}	5.33^{b}	5.33^{bc}	4.17^{c}	4.15^{c}	5.83^{a}	4.5^{a}	6.67^{b}	4.67^{b}	5.67^{b}	5.83^{bc}	6.33^{ab}	5.17^{b}
0:100	8.67^{a}	7.30^{a}	8.00^{a}	7.83^{a}	8.67^{a}	7.50^{a}	7.83^{a}	8.00^{a}	8.30^{a}	6.50^{a}	7.33^{a}	8.33^{a}	8.67^{a}	6.01^{a}	7.83^{a}	8.50^{a}
90:10	5.83^{bc}	4.17^{b}	6.17^{b}	5.83^{b}	5.33^{b}	4.33^{c}	4.17^{c}	4.13^{c}	5.67^{c}	5.0^{a}	6.67^{b}	5.00^{b}	6.00^{b}	4.00^{c}	6.00^{b}	5.17^{b}
70:30	6.30^{bc}	5.00^{b}	6.17^{b}	5.67^{b}	6.17^{b}	5.00^{bc}	6.00^{b}	5.50^{b}	6.67^{bc}	5.67^{b}	6.67^{b}	5.50^{b}	6.83^{b}	5.67^{bc}	6.50^{ab}	5.83^{b}
50:50	7.17^{ab}	5.67^{ab}	7.17^{ab}	7.00^{ab}	7.00^{ab}	6.33^{ab}	6.70^{b}	7.0^{ab}	7.17^{a}	6.50^{b}	6.67^{b}	7.33^{a}	7.17^{a}	5.92^{b}	7.17^{ab}	7.50^{a}

Legend: AYB = African Yam Bean, SKM= Skim Milk. Mean values having different superscript letters in a row for each sample are significantly different ($p \leq 0.05$).

pH of Yoghurt Samples Stored at 4°C and Room Temperature

The results of the pH of the yoghurt samples stored at 4°C and room temperature are presented in figures 4 and 5 respectively. The pH of all the samples decreased gradually throughout the storage period. The pH of 5.2-3.5 obtained for refrigerated samples and 5.2 -3.3 for room temperature samples is similar to values reported by **Farinde *et al.*** (2010) for stored soy and cow milk yoghurts 5.5-3.2. The difference in the rate of decrease in pH during yoghurt production is due to production of lactic acid using *Lactobacillus* (**Adams and Moss, 1995**) and other lactic acid bacteria and reflection of the souring activity of lactic acid produced during fermentation. The production of lactic acid after fermentation has the effect of lowering pH and thereby arresting any further development of pathogens and other toxic microorganisms apart from having lethal and destructive effect on bacteria and arresting bacterial multiplication (**Jayeola *et al.*, 2010**). There was however no direct relationship observed between pH values and titratable acidity as it has been reported by other workers such as **Tamime and Robinson** (1999) and this has been attributed to the presence of milk powder which increases the buffering capacity of the product

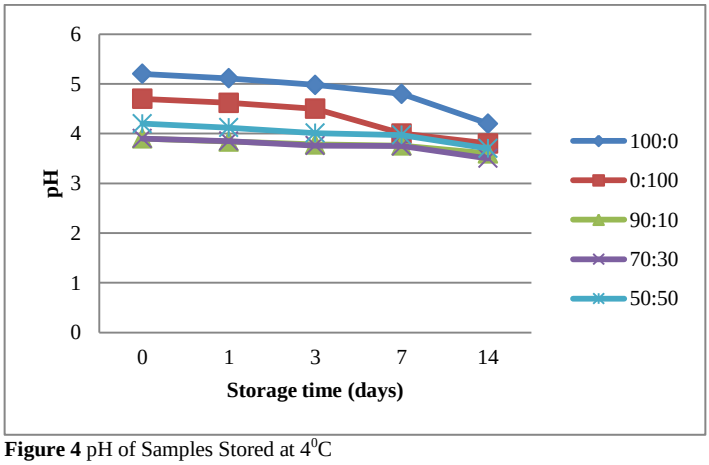

Figure 4 pH of Samples Stored at 4°C

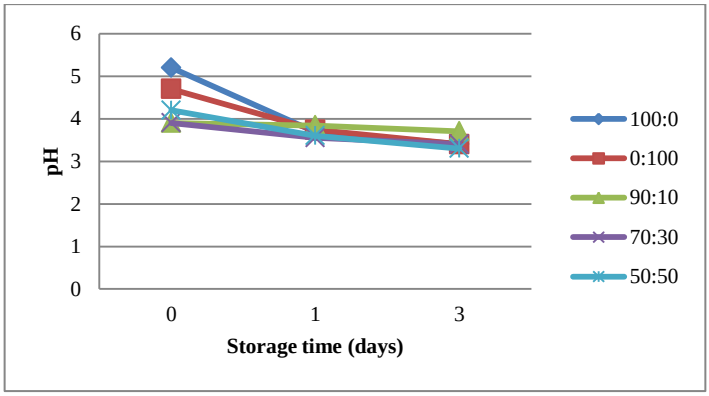

Figure 5 pH of Samples Stored at Room temperature

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Titratable Acidity of Yoghurt Samples Stored at 4°C and Room Temperature

The results of the titratable acidity of the yoghurt samples stored at 4°C and room temperature are presented in figures 6 and 7 respectively. The titratable acidity of all the samples increased gradually throughout the storage period. The gradual increase in titratable acidity during storage was also observed in Sudanese yoghurt (**Manhal and Kamal, 2010**). The titratable acidity values of 0.72-1.85 obtained during storage at refrigeration temperature is comparable to the values of 0.83-2.50 reported by **Manhal and Kamal (2010)** for refrigerated storage yoghurts

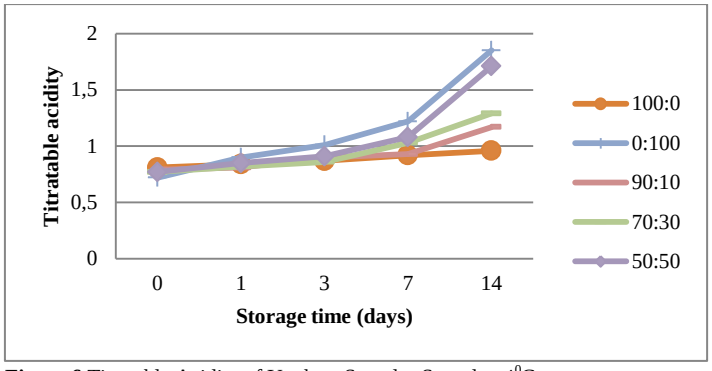

Figure 6 Titratable Acidity of Yoghurt Samples Stored at 4°C

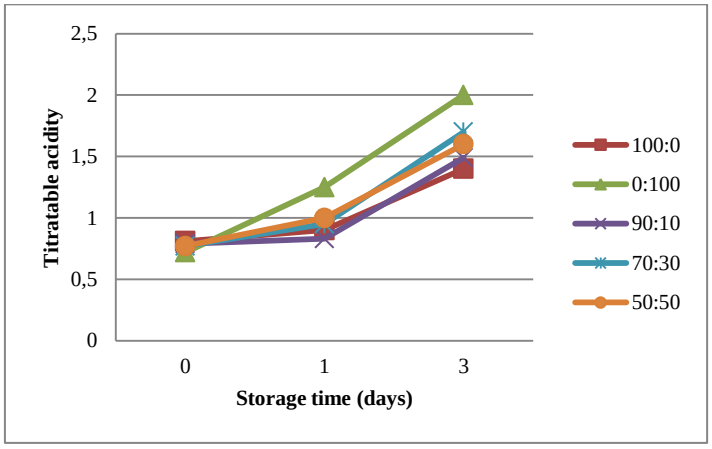

Figure 7 Titratable Acidity of samples Stored at Room Temperature

Specific Gravity of Yoghurt Samples Stored at 4°C and Room Temperature

The results of the specific gravity of the yoghurt samples are presented in figures 8 and 9.

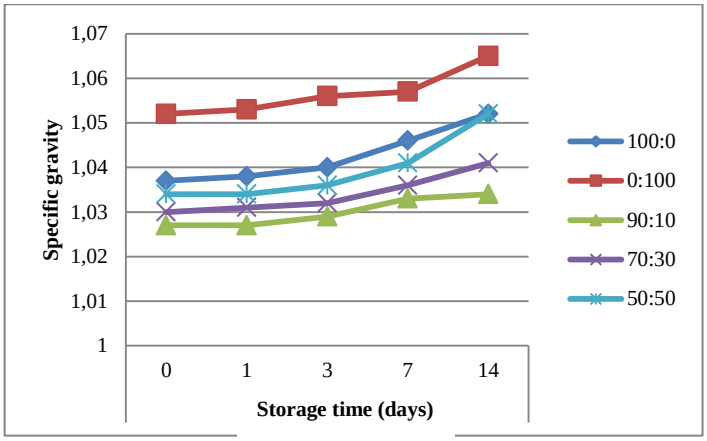

Figure 8 Specific Gravity of Yoghurt Samples Stored at 4^0C

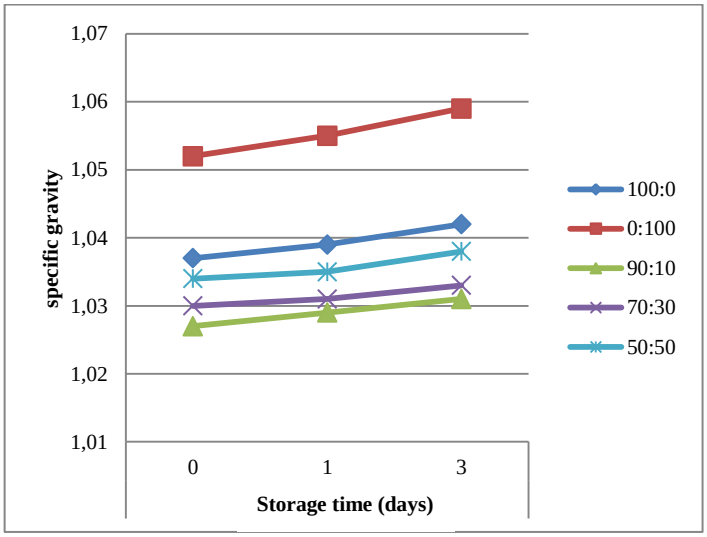

Figure 9 Specific Gravity of Yoghurt Sample Stored at Room Temperature

There was an increase in the specific gravity of all the samples stored at room temperature and 4°C throughout the storage period. Sample 0:100 had the highest specific gravity throughout the storage period for samples stored at 4°C and room temperature while sample 90:10 had the lowest value for samples stored at 4°C and room temperature.

CONCLUSION

The study showed that it is possible to prepare yogurt samples with varying percentages of African yam bean milk as a substitute. Cow milk yoghurt samples substituted with African yam bean milk prepared from dehulled seeds and stored at 4^0C for up to 14 days had a good quality especially 50:50 (African yam bean milk:Skim milk) while that stored at room temperature got spoilt after two days of production. Contamination by yeast characterized the samples stored at room temperature. The pH, titratable acidity and specific gravity of the yoghurt samples changed during storage. Lesser ratio of substitution of milk with African yam bean milk enhanced the acceptability of the samples.

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