Original Research Article

PHYSIOCHEMICAL STUDY OF YOGHURT-LIKE PRODUCT FROM BREADFRUIT, COCONUT AND SOYBEAN EXTRACTS STORED AT DIFFERENT TEMPERATURE.

ABSTRACT

Yoghurt-like products was produced from a blend of soybean, coconut and breadfruit extract in the ratio B20:C20:S60, B20:C30:S50, B30:C20:S50 and B30:C30:S40 using *Lactobacillus acidophilus* from the substrates. Two sets of yoghurt-like products from these composites blend was produced and stored at refrigeration (5 ^oC) and ambient temperature (29±2 ^oC) for 4 weeks and 5 days, respectively. They were examined for changes in physicochemical properties against commercial (100% cow milk) dairy yoghurt as control. The changes in total solids (mg/L) reveals the following ranges for B20:C20:S60 (6.14 -14.00), B20:C30:S50 (4.10-13.10), B30:C20:S50 (4.02-12.04), B30:C30:S40 (3.20-12.42) and control (8.01- 20.00) and B20:C20:S60 (4.22-14.00), B20:C30:S50 (3.20-13.10), B30:C20:S50 (2.80-12.04), B30:C30:S40 (3.10-12.42) and control (8.10-20.00) for refrigeration and ambient temperature, respectively. The changes in pH ranges are as follows for B20:C20:S60 (3.80-5.40), B20:C30:S50 (3.60-5.00), B30:C20:S50 (3.60-5.00), B30:C30:S40 (3.20-4.80) and control (2.80-4.60) and B20:C20:S60 (3.90-5.60), B20:C30:S50 (3.60-5.20), B30:C20:S50 (3.40-5.00), B30:C30:S40 (3.40-4.80) and control (2.78-4.80) for refrigeration and ambient temperature, respectively. The titratable acidity (g/L) reveals the following ranges for B20:C20:S60 (0.42-1.20), B20:C30:S50 (0.32-1.00), B30:C20:S50 (0.34- 0.80), B30:C30:S40 (0.30-0.9) and control (0.50-1.40), and B20:C20:S60 (0.40-1.20), B20:C30:S50 (0.32-1.00), B30:C20:S50 (0.32-0.80), B30:C30:S40 (0.30-0.70) and control (0.52- 1.80) for refrigeration and ambient temperature, respectively. The viscosity (Ns/m^2) ranges are as follows for B20:C20:S60 (300-500), B20:C30:S50 (355-470), B30:C20:S50 (350-480), B30:C30:S40 (340-475) and control (400-600), and B20:C20:S60 (340-500), B20:C30:S50 (330-470), B30:C20:S50 (315-480), B30:C30:S40 (300-480) and control (430-600) for refrigeration and ambient temperature, respectively. The non-dairy yoghurt produced shared common keeping characteristics with the dairy yoghurt.

Keyword: Yogurt-like product, breadfruit, coconut, *Lactobacillus acidophilus* and soybean extract

1. Introduction

Yoghurt is known to be a popular fermented dairy product relatively accepted worldwide due its nutritional and medicinal benefits. It is believed to have evolved empirically some centuries, as a result of naturally contaminated milk souring at a warm temperature, in the range of 40-50 °C (Ihekoronye and Ngoddy, 1985). The microorganisms often used in this process of fermentation include *Lactobacillus delbrueckii subsp. Bulgaricus and Streptococcus thermophilus* (Rasic and

Kurmann, 1978). Presently, yoghurt is produced commercially into different varieties with a wide range of flavors, forms and textures (Birollo *et al*., 2000) owing to the nutritional properties and medicinal benefit of milk constituents and live lactic acid bacteria (Birollo *et al*., 2000; Park *et al*., 2005). The lactic acid bacteria (LAB) present in milk fermentation is known to be either inoculated or spontaneous starter culture, because milk is well known natural habitat for LAB (Delavenne *et al*., 2012).

Yoghurt is produced by action of *Streptococus thermophilus* and *Lactobacillus bulgaricus*, through lactic acid fermentation of the milk and the viability and activity of yoghurt bacteria are important commercial consideration so that they survive throughout shelf life, transit through acidic conditions in the stomach as well as enzymes and bile salts in the small intestine (Delavenne *et al*., 2012). Due to the high cost of dairy products in developing countries and some developed countries, non-intake of cow milk by vegetarians and people who are allergic to cow milk, efforts are being towards producing yogurt-like products from other variety of food resources/plants (Walia *et al*., 2013; Park *et al*., 2005). Yoghurt-like products have been produced from several plant sources, namely: soybeans (Buono *et al*., 1990), peanut (Isanga and Zhang, 2009), corn (Supavititpatana, *et al*., 2010) singly or a combination of two or more plant products like tiger nut-coconut (Belewu *et al*., 2010) and soybean-corn (Olakunle, 2022). It has also been produced from blend of plant and dairy milk such as in soy and milk solids yoghurt (Zanhi and Jideani 2012) and soy –peanut-cow milk yoghurt (Kpodo *et al*., 2014).

Soymilk is an aqueous extract of soya beans (*Glycine max*) and has close similarity in appearance to cow milk (Lal *et al*., 2006) except from the beany flavor, which studies has reportedly proven can be enhanced by lactic acid fermentation, as in yogurt-like product (Agure-Dam 1996). The yoghurt is protected from spoilage by microorganisms and attack of pathogens, as a result of mild acidification of the milk, which result to mild acid taste and pleasant fresh fermented milk produced as yoghurt and cheese. Bacteriocins and acids and are known to be good food preservatives, which are considered as safe natural preservatives (Moon *et al*., 2012)

Studies has it that yoghurt from coconut milk has been observed to be a product that is delicious and nutritious (Imele and Atemnkeng, 2001). Research on the combination of soymilk (50%) and coconut milk (50%) in the preparation of soy-coconut yoghurt has also been documented (28). There has been also a reported work on the successful production of yoghurt-like product from aqueous extracts of African breadfruit and corn (Ifediba and Nwafor, 2017).

Non-dairy yoghurts have several nutritious advantages when compared to cow milk yoghurt, owing to limited or absence of cholesterol and saturated fats (Lee *et al*., 1990). This composite of yoghurt-like blend from soybean, coconut and breadfruit will contribute to developing dairy free yoghurts that will satisfy religious, health and economic challenges of our time. This study is to evaluate the shelf-life, the physicochemical properties and microbiological qualities of the yoghurt-like products comparable with that of cow milk yoghurt.

2. MATERIALS AND METHODS

Source of Raw materials

Soybean seeds and Coconut were purchased from Choba Market, while breadfruit was purchased from Oil-mill market.

Preparation of raw materials

The coconuts were cracked, and the kernel/meat removed by the use of sterile knife, followed by careful removal of the brown skin by scrapping to prevent dis-colorization of the milk. The coconut kernel/meat were then washed with clean water and grated with hot water (above 90^oC) in a ratio of 1:8 (meat/water; w/v). The coconut milk obtained finally was pasteurized at 72^oC for 5 min. The coconut milk was subsequently cooled and refrigerated at 4^oC.

Four hundred grams (400 g) of soybean was soaked in 1200 ml of clean distilled water for 12 h, obtaining a bean to water ratio of (1:4). The soybean was thereafter blanched in two liters of boiling 0.05% $NaHCO_3$ in a cooking pot for 15 min. The blanched soybean was then dehulled and subsequently removed by floatation and decanted. The blanched soybean cotyledons were grated with hot water (100^oC) in a blender at a ratio of 1:8 (beans/water; w/v). The slurry obtained was then filtered using a clean muslin cloth, the soymilk was finally pasteurized at 100^oC for 5 min to deactivate spoilage enzymes. The soymilk was subsequently cooled and refrigerated at 5^oC used for soymilk extraction.

The breadfruit seeds were washed in excess portable water to ensure that foreign materials and damaged seeds are easily detected and removed. This was followed by filtration and boiling for 1 h. The seeds were subsequently air dried, dehulled and soaked for 6 h in water (The water was replaced every 2 h interval, this is to prevent fermentation, foul odor and greasy substances). At the end of the soaking, the seeds were repeatedly washed in water before wet-milling using in a variable speed blender (SB-736, Sonic, Japan), with intermittent addition of distilled water. The slurry was then filtered through clean double layer linen cloth, wet-milled and filtered repeatedly to final seeds to water ratio of 1:3 (w/v). The filtrate was again boiled for 20 min with continuous stirring, re-filtered to obtain plain breadfruit milk (Chien *et al*., 2006).

The breadfruit seeds were washed in excess portable water.

Table 1: Yoghurt Formulation

Yoghurt Ratio	Description
B20: C20: S60	Breadfruit extract 20%, Coconut extract 20% and Soybean extract 60%
B20: C30: S50	Breadfruit extract 20%, Coconut extract 30% and Soybean extract 50%
B30: C20: S50	Breadfruit extract 30%, Coconut extract 20% and Soybean extract 50%
B30: C30: S40	Breadfruit extract 30%, Coconut extract 30% and Soybean extract 40%
Cow milk 100	Cow milk 100%

Four yoghurt formulation was carried out by varying the proportion of breadfruit, coconut and soybean. The proportion was carried out in line to give a good nutritive protein intake. Formulation five (5) has 100% cow milk.

Storage of the Yoghurt-like blend and Control Sample

The Yoghurt-like sample blend were produced and stored at refrigeration temperature of 5^{o}C and ambient temperature of 29±2^{o}C and changes in selected microbiological and physicochemical parameters were monitored during storage as described by (Gacula, 1975; Marshall, 1992).

Production of Composite yogurt drink

Breadfruit extract, Coconut Extract and Soybean milk

↓

Homogenize

↓

Pasteurize (95^{o}C at 15 min)

↓

Cooling

↓

Inoculated at 42^{o}C with 2% *Lactobacillus acidophilus*

↓

Fermentation (24 h)

↓

Cooling and refrigerator

Fig 1: The production of the composite yogurt drink.

Physicochemical analysis

Total solids

Total solid was obtained by differential method.

% Total solids = 100 – Moisture content

pH

The samples pH was measured by electrometric method using Laboratory pH Meter (Hanna model HI991300) (Udeozor, 2012).

The pH electrode was first rinsed with distilled water and was blot dry then rinsed in a small beaker with a small portion of the sample. Reasonable quantity of the sample was poured into a small beaker to allow the tips of the electrode to be immersed to a depth of at least 2 cm. The electrode was at least 1 cm away from the sides and bottom of the beaker. The pH meter was turned on and the pH of sample recorded.

Titratable acidity

The method described by AOAC (2006) was employed. Ten milliliters (10 ml) of yoghurt-like samples were mixed with 100 ml of distilled water.

Phenolphthalein (1%) indicator was added and then titrated with 0.1N NaOH to a persistent pink color. The titratable acidity was reported as % lactic acid by weight using 1ml 0.1N NaOH = 0.0090g lactic acid (AOAC, 2006).

Apparent viscosity

Approximately 30 ml of sample was filled into a 50 ml beaker. Viscosity was measured using Oswald type viscometer.

Syneresis

Syneresis was measured using the method described by Supavititpatana *et al*. (2010). Twenty grams (20 g) of yoghurt-like samples was spread on Whatman filter paper and was filtered under vacuum. The filtrate was weighed and expressed as a percentage of the yoghurt weight.

Statistical Analysis

Data obtained from the proximate were analyzed using Single factor analysis of variance (ANOVA). The degree of association between microbial counts and physicochemical and sensory changes during storage was analyzed by spearman's rank correlation test (Gacula and Singh, 1984) using SPSS Statistical Software (2000).

3. RESULTS AND DISCUSSION

Physicochemical properties

Chemical properties

The results of the total solids content reveals that the commercial milk yoghurt had higher values (8.01-20.00mg/L) compared to any of the yoghurt-like blend yoghurt, with yogurt like blend of B20:C20:S60 recording the highest of 14.00 mg/L while B30:C20:S50 recorded the lowest of 12.02 mg/L at both ambient and refrigerated temperature (Fig. 2 and 3). The higher value of total solids in the commercial milk yoghurt may be attributed to the skimmed milk powder from which it was produced, in agreement with the findings of Elsamani *et al* (2014) who reported an increase in total solids of peanut milk-based yogurt with addition of skimmed milk powder. This equally agrees with findings by Rehman *et al*. (2007) who reported an increase in total solids of lathyrus sativus L-bovine milk with the addition of skimmed milk powder.

At both ambient and refrigerated temperatures, the pH of all the yoghurt-like blend products was observed to be higher than that of the commercial milk yoghurt, as shown in Fig 4 and 5 respectively. Elsamani *et al.* (2014) also reported a lower pH in sample with highest skimmed milk powder addition as such the lower pH of the commercial milk may be attributed to the presence of skimmed milk powder. The reduction in pH in both the ambient and refrigerated temperature equally agrees with the findings of Supavititpatana *et al.* (2010) who reported similar trend in pH reduction during 35 days of corn milk yoghurt and commercial milk yoghurt storage.

The titratable acidity of the commercial yoghurt is higher (0.52 – 1.80 g/L) than any of the yoghurt-like blend (B20:C20:S60 (0.42 – 1.20 g/L) B20:C30:S50 (0.32 –1.00 g/L), B30:C20:S50 (0.34 – 0.80 g/L), B30:C30:S40 (0.30 – 0.90 g/L) for refrigerated temperature and B20:C20:S60 (0.40 – 1.20 g/L), B20:C30:S50 (0.32 – 1.00 g/L), B30:C20:S50 (0.32 – 0.80 g/L), B30:C30:S40 (0.30 – 0.70 g/L) and control (0.52 – 1.80 g/L) for ambient temperature, as shown in Fig. 4 and 5. This can be attributed to the presence of the skimmed milk as reported by Adeiye *et al*. (2013) that milk sample with highest skim milk content has highest acidity. The increase in acidity observed during storage equally agrees with the reports of Adeiye *et al*. (2013) and Supavititpatana *et al.* (2010) for studies involving groundnut milk and corn milk yoghurt, respectively. Anaerobic microbial activities must have contributed to the increase in the titratable acidity which results in the production of lactic acid; which also depends on the type of lactic acid bacteria employed (Bucker *et al*., 2008).

All the yoghurt-like blends showed lower apparent viscosity (Ns/m^2) for B20:C20:S60 (300-500), B20:C30:S50 (355-470), B30:C20:S50 (350-480), B30:C30:S40 (340-475) when compared with commercial yoghurt (430-600) for refrigerated temperature while at ambient temperature we have B20:C20:S60 (340-500), B20:C30:S50 (330-470), B30:C20:S50 (315-480), B30:C30:S40 (300-480) and control (430-600) as shown in Fig. 8 and 9 at both ambient and refrigerated temperature. Changes in microbial and biochemical activities leading to reduction in total solids and sugar will certainly lead to loss in viscosity. Result of the viscosity agrees with the work of Ifediba and Ozor (2017) on breadfruit-corn yoghurt production.

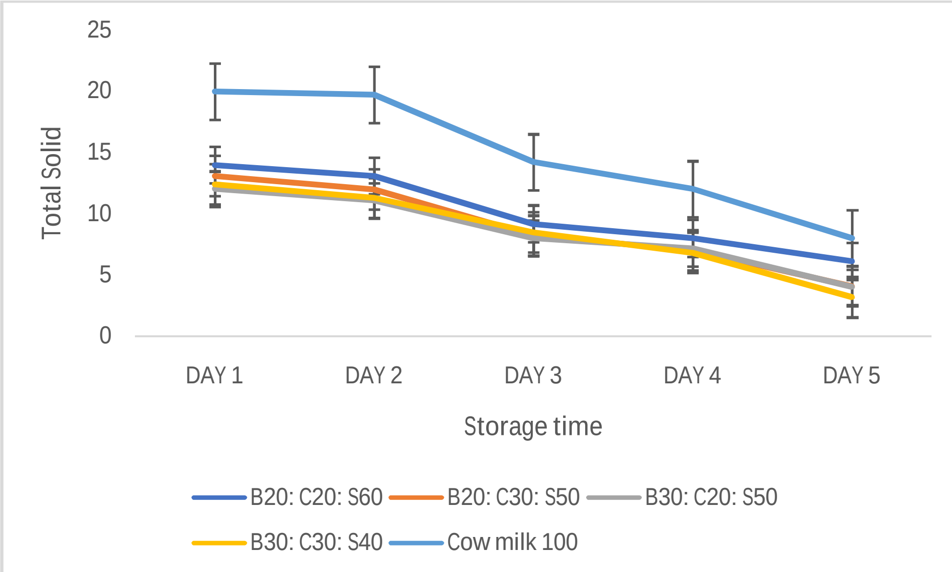

Fig. 2: Changes in total solids of yoghurt samples during storage at ambient temperature.

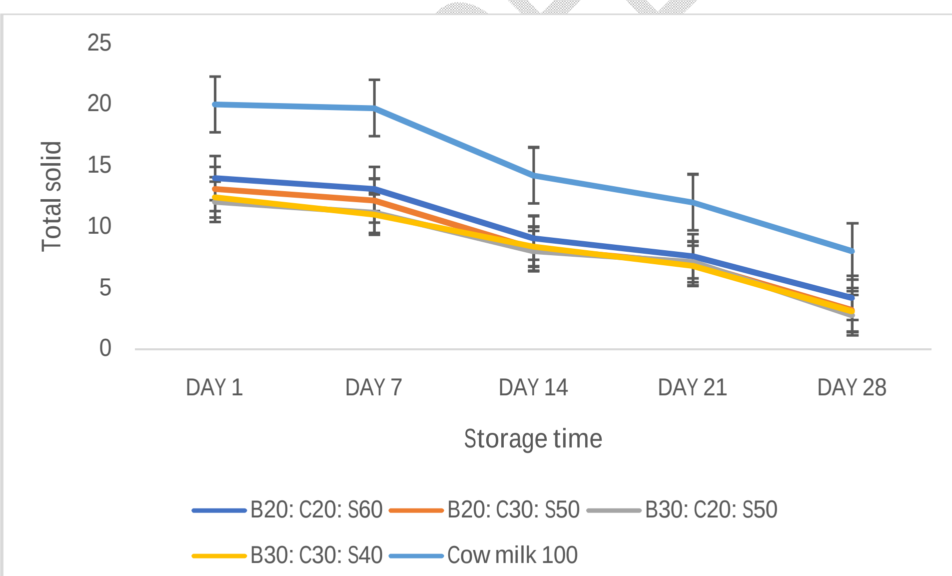

Fig. 3: Changes in total solids of yoghurt samples during storage at refrigeration temperature.

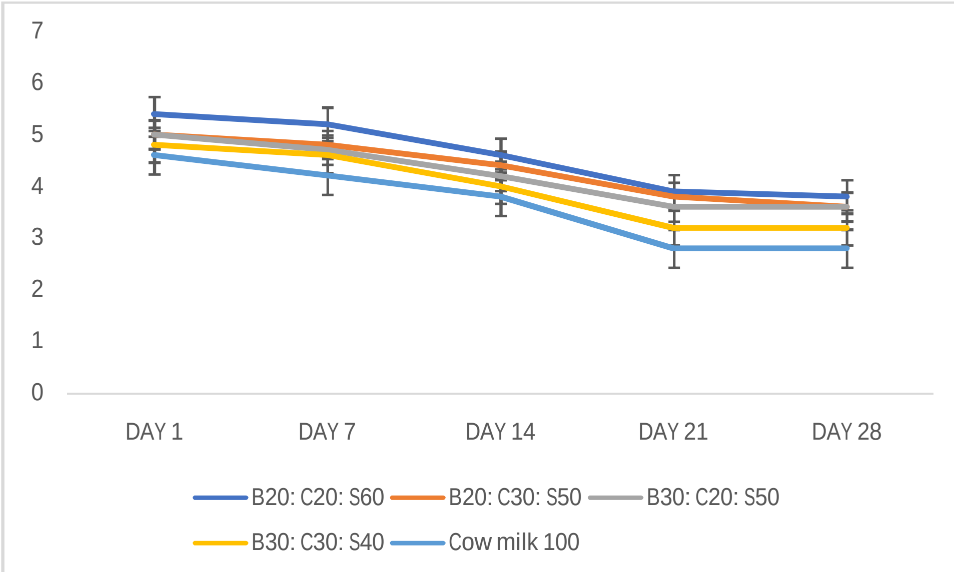

Fig 4: Changes in pH of yoghurt samples during storage at ambient temperature.

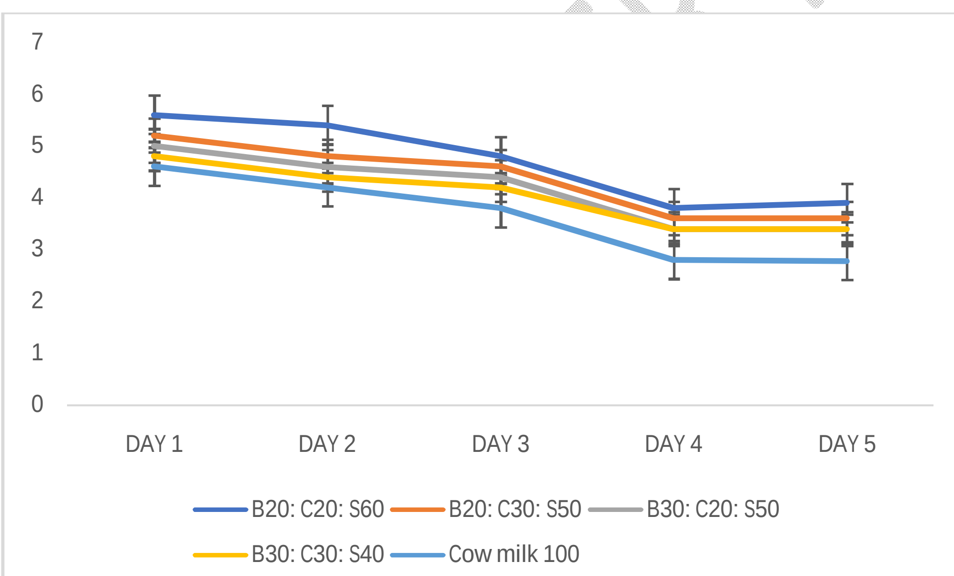

Fig 5: Changes in pH of yoghurt samples during storage at refrigeration temperature.

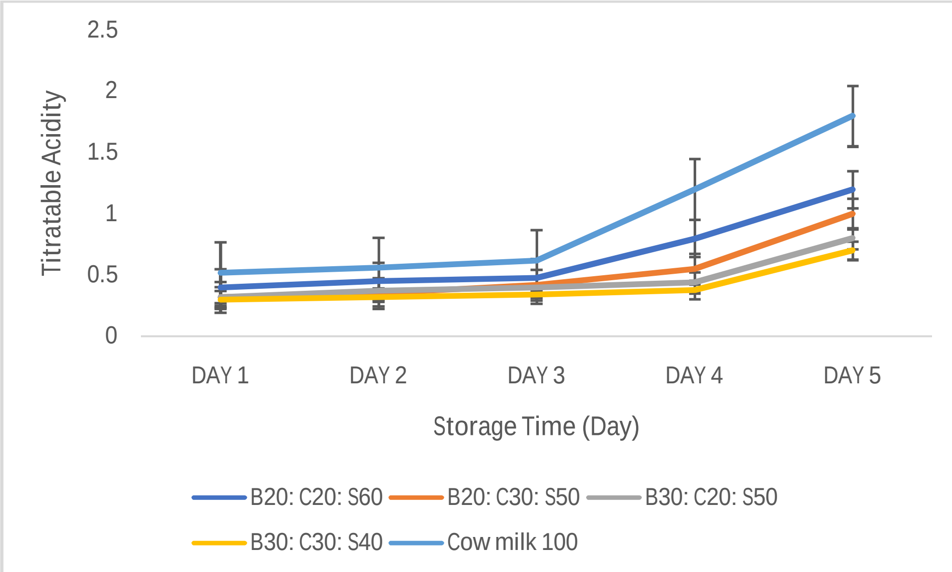

Fig 6: Changes in titratable acidity of yoghurt samples during storage at ambient temperature.

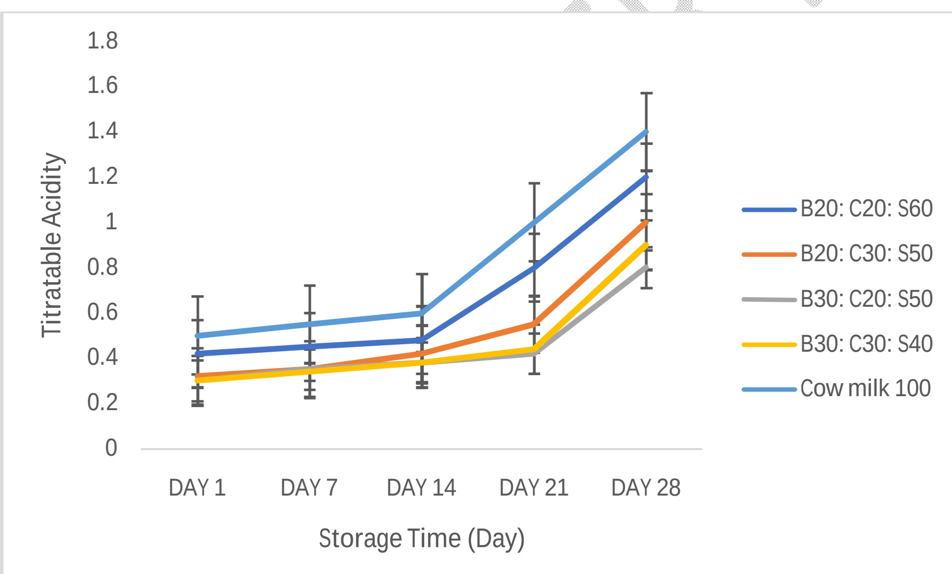

Fig 7: Changes in titratable acidity of yoghurt samples during storage at refrigeration temperature.

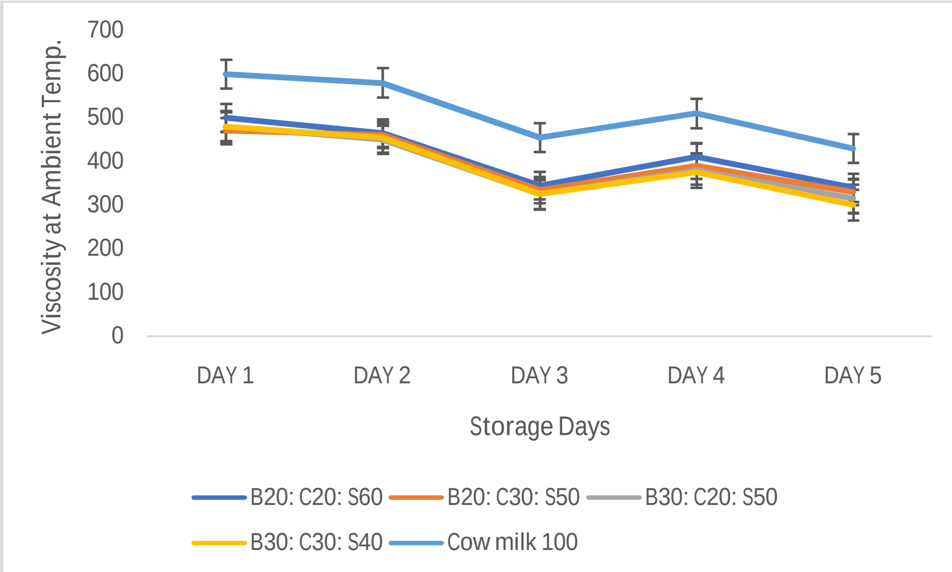

Fig 8: Changes in viscosity of yoghurt samples during storage at ambient temperature.

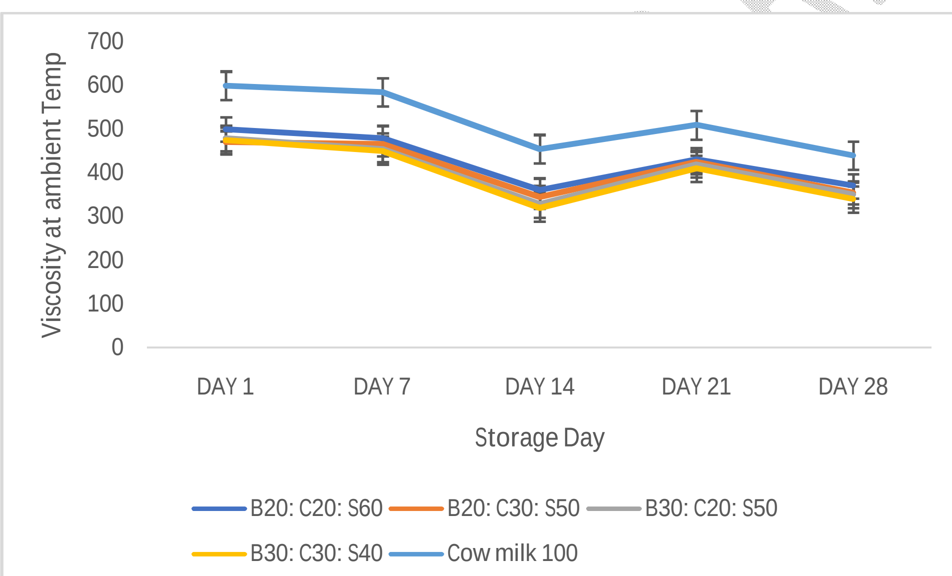

Fig 9: Changes in viscosity of yoghurt samples during storage at refrigeration temperature.

Physical properties

All the yoghurt-like blends were observed to have a higher syneresis when compared to commercial milk yoghurt during ambient and refrigerated shelf-life study. This can be attributed to relative catabolic activities leading to degradation of gel network, which expectedly increased syneresis. Belewu *et al*. (2010) reported that the gel structure of corn milk yoghurt was harder than that of the cow milk yoghurt, adding that the hardness and springiness of both yoghurts were reduced with storage time, while adhesiveness increased, which could be mainly due to degradation of gel.

Table 2: **Syneresis quality of yoghurt composite product blend (%) at refrigeration temp.**

Yogurt ratio	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
B20:C20:S60	37.02±0.41^{a}	38.04±0.24^{a}	38.92±0.13^{a}	39.00±0.03^{b}	39.42±0.14^{a}
B20:C30:S50	30.05±0.25^{b}	31.07±0.16^{b}	31.85±0.23^{b}	33.80±0.24^{b}	34.09±0.12^{b}
B30:C20:S50	32.01±0.01^{b}	34.04±0.15^{b}	35.01+0.11^{b}	35.92±0.35^{b}	37.01±0.12^{a}
B30:C30:S40	34.04+0.01^{b}	36.06±0.15^{a}	36.08±0.11^{a}	36.91±0.35^{a}	39.01 ±0.12^{a}
Cow 100%	27.49±0.04^{c}	27.50±0.05^{c}	27.99±0.04^{c}	28.02+0.1^{c}	28.49±0.02^{c}

Values are means ± standard deviation of triplicate determinations. Mean values in the same column with different superscript are significantly different ($p<0.05$).

Table 3: **Syneresis quality of yogurt composite product blend (%) at ambient temp.**

Yogurt ratio	DAY 1	DAY 2	DAY 3	DAY 4	DAY 5
B20:C20:S60	38.02±0.02^{b}	39.14±1.11^{b}	40.12±0.23^{a}	39.00±0.03^{b}	39.42±0.14^{b}
B20:C30:S50	32.02±0.15^{c}	34.12±10^{c}	35.05±0.03^{b}	36.85±0.14^{b}	39.15±0.02^{b}
B30:C20:S50	35.07±0.65^{b}	37.05±0.05^{b}	38.04+0. 11^{b}	39.14±0.45^{b}	42.22±0.15^{a}
B30:C30:S40	35.04+0.65^{b}	37.06±0.07^{b}	38.09±0. 11^{b}	39.01±0.35^{d}	41.01 ±0.02^{a}
Cow 100%	29.09±0.05^{d}	30.64±0.05^{c}	30.99±0.04^{c}	31.02+0.1^{c}	33.49±0.12^{c}

Values are means ± standard deviation of triplicate determinations. Mean values in the same column with different superscript are significantly different ($p<0.05$).

Conclusion

This research has shown that non-dairy yoghurt derived from blend of soybean, coconut and African breadfruit extracts, possessed relevant characteristics similar to dairy yoghurt. The shelf-life study shows that the physicochemical properties of all the yoghurt-like blends correlated with that of cow milk yoghurt. This product will help to reduce the level of underutilization of soybean, coconut and African breadfruit seeds and thereby form a basis for new product to the dairy industry

References

1. Adeiye, O.A., Gbadamosi, S.O., and Taiwo, A.K. (2013). Effects of some processing factors on the characteristics of stored groundnut milk extract. African Journal of Food Science, 7(6): 134 – 142.
2. AOAC. (2006) Official Methods of Analysis, Association of Official Analytical Chemists, Washington D.C. 18(1): 808, 831 – 835, 1113.
3. Belewu, M.A., Belewu, K.Y., and Bamidele, R.A. (2010). Cypercoconut yoghurt preparation, compositional and organoleptic qualilities. African Journal of Food Science and Technology, 1 (1): 010 -012.
4. Birollo, G.A., Reinheinmer, J.A., and Vinderola, C.G. (2000). Viability of lactic acid microflora in different types of yoghurt. Food Research International, 33: 799-805.
5. Buono, M., Larry, E., Fung, D., and Jeon, I.J. (1990). Carbohydrate utilization and growth kinetics in the production of yoghurt from soymilk part 1: experimental methods. Journal of Food Processing and Preservation, 13: 135-153.
6. Bucker, J.R., Mitchell, J.H. and Johnson, M.G. (2008). Lactic acid fermentation of peanut milk. Journal of food Science, 44(5): 1534 – 1538.
7. Chien, H.L, Huang, H.Y and Chou, C.C (2006). Transformation of isoflavone phytoestrogens during the fermentation of soymilk with lactic acid bacteria and bifidobacteria. Journal of Food Microbiology 23, 772- 778.
8. Delavenne, E., Mounier, J., Deniel, F., Barbier, G. and Le Blay, G. (2012). Biodiversity of antifungal lactic acid bacteria isolated from raw milk samples from cow, ewe and goat over one-year period. International Journal of Food Microbiology, 155(3): 185-190.
9. Elsamani, M.O., Isam, A. and Ahmed, M. (2014). Physicochemical characteristics and organoleptic properties of peanuts milk-based yoghurt fortified with skimmed milk powder. Journal of Research in Applied Sciences, 4: 78:82.
10. Gacula, Jr., M. C., and Singh, J. (1984). Statistical methods in food and consumer research. New York: Academic Press. 2:42 – 48.
11. Gacula Jr., M. C. (1975). The design of experiments for shelf life study. Journal of Food Science, 40, 400–403
12. Ifediba, D. I. and Nwafor E.C. (2017). Nutritional and sensory evaluation of African breadfruit corn yoghurt. African Journal of Food Science. 12(4): 73-79.
13. Ifediba, D. I. and Ozor C.N. (2017). Effects of Storage on Physicochemical Properties and Microbiological Qualities of African Breadfruit-Corn Yoghurt. European Scientific Journal. 14(6) pp. 172-191.
14. Ihekoronye, A.I. and P.O. Ngoddy, (1985). Integrated Food Science and Technology for the Tropics. Macmillan Education Ltd, London and Oxford, 106-112, 189-190, 343-351.2.
15. Imele, H. and Atemnkeng, A. (2001). Preliminary study of the utilization of coconut in yoghurt production. The Journal of Food Technology in Africa, Vol. 6(1): 11-12.
16. Isanga, J. and Zhang, G. (2009). Production and evaluation of some physicochemical parameters of peanut milk yoghurt. Food Science and Technology, 42(6): 1132 – 1138.
17. Kpodo, F.M.K., Afoakwa, E.O., Amoa, B.B., Busdu, A.S. and Saalia, F.K. (2014b). Effect of ingredient variation on microbial acidification, susceptibility to syneresis, water holding capacity and viscosity of soy-peanut-cow milk yoghurt. Journal of Nutritional Health and Food Engineering, 1(2): 1-6.

18. Lal S.N.D, O'Connor, C.J. and Eyres L (2006). Application of emulsifiers/stabilizers in dairy products of high rheology. Advance Colloid Interface Science. 123:433-437.
19. Lee, S.Y., Morr, C.V. and Seo, A. (1990). Comparison of milk based and soymilk-based yoghurt. Journal of Food Science, 55(2): 532 – 536.
20. Lestiyani, A.D., Susano, T.I. and Srianta, I. (2014). Characteristics of soy-corn yoghurt. Journal of Food and Nutritional Disorders, 3(2): 1 – 3.
21. Marshall, T. R. (1992). Standard methods for the examination of dairy products. Washington, DC: American Public Health Association.
22. Moon, S.K., Wee, Y.J. and Choi, G.W. (2012). A novel lactic acid bacterium for the production of high purity lactic acid. Journal of Bioscience and Bioengineering, 114(2): 155-159.
23. Park DJ, Oh S, Ku K.H, Mok C, Kim, S.H and Imm J.Y. (2005). Characteristics of yoghurt-like products prepared from the combination of skim milk and soymilk containing Saccharified–rice solution. International Journal of Food Science Nutrition. 56(1):23-3.
24. Rasic, J.L, Kurmann, J.A (1978). Yogurt: scientific grounds, technology manufacture and preparations vol. 1 of Rasic J.L, Kurmann J.A, eds. Fermented fresh milk products and their cultures. Technical dairy publishing house.
25. Rehman, S.,Hussain, H.,Nawaz, H.,Ahmad, M.M.,Huma,N. and Virk, W.A. (2007). Preparation and quality evaluation of Lathyrus sativus L bovine milk blend. Pakistan Journal of Nutrition, 6: 134-137.
26. Supavititpatana, P., Wirjantoro, T. and Raviyam, P. (2010). Characteristics and shelf-life of corn milk yoghurt. CMU Journal of Natural Science, 9(1): 133-147.
27. SPSS User's Guide: Statistics, Version 10. Chicago: SPSS Inc., 2000.
28. Udeozor, L.O. (2012). Tiger nut-soy milk drink: Preparation, proximate composition and sensory qualities. International Journal of Food and Nutrition Science, 1(4): 18-26.
29. Walia, A., Mishra HN, Kumar P (2013). Effect of fermentation on physicochemical, textural properties and yoghurt bacteria in mango soy fortified yoghurt. Africa Journal for Food Science. 7(6):120-127.
30. Zanhi, N.K. and Jideani, I.A. (2012). Physicochemical and sensory qualities of soy and milk solids fortified low fat yoghurt. African Journal of Agricultural Research, 7(38): 5336-5343.