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ESSENTIAL AMINO ACIDS AND PHYSICOCHEMICAL DETERMINATIONS OF THERAPEUTIC YOGHURT PRODUCED FROM TIGERNUT AND COCONUT MILK FLAVOURED WITH PINEAPPLE JUICE

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ABSTRACT

Tigernut (*Cyperus esculentus*) and Coconut (*Cocos nucifera*) milk were used to produce Therapeutic Yoghurts in the following percentage blend ratios; 75% Tigernut milk: 25% coconut milk (75% TM: 25%CM), 25% Tigernut milk: 75% coconut milk (25% TM: 75%CM), 50% Tigernut milk: 50% coconut milk (50% TM: 50%CM), 100% Tigernut milk (100% TM), 100% Coconut milk (100%CM), and 100% Cow milk (100% CMY) used as control. Two Qualitative analyses were carried out on the samples: Essential Amino acid and Physico-chemical determinations. After the analyses,100% CMY was generally high in Essential Amino Acids followed by 100% TMY than 75TM:25CM%. Regarding the Physicochemical properties: PH values of the samples were not different from each other whereas the Total Titratable Acidity (TTA) of 75TM:25CM% sample 0.52 was sufficiently different from all the other samples. The Total Soluble Solids (TTS) was highest in 100% CMY 16.52 than other samples, 100% TM 0.69 and 100%CMY 0.66 were different from all the other samples in their level of Viscosity and the Syneresis value of 75TM:25CM% 2.06 was highest compared to all the other samples.

KEYWORDS: Therapeutic, Yoghurt, Tigernut milk, Coconut milk, Fermentation, Essential amino acids, Physico-chemical properties.

INTRODUCTION

Milk is an excellent source of nutrients except iron and ascorbic acid. It has been reported by.[1] to be an important food for infants, teens and adolescents. The high cost of milk in developing countries has led to the development of alternative sources of milk from plant crops.[2] Plant based milk alternatives have been consumed for thousands of years They resemble animal milk, contain food nutrients for infants and adult's growth and development.[3] The increasing love for alternatives plant based milk derivatives is anchored on different factors and consumer demand including some health related problems such as lactose intolerance.[4] and allergies caused by taking non- plant based milk.[5] consumer's fear about cow milk hormones.[6] and cholesterol.[7] ethical disputes concerning the use of animal based products.[8] environmental problems.[9] and changes in life's preferences and styles towards taking quality and healthier foods.[10]

Tigernut, amongst Bambara nut, soya bean, coconut have been shown to rich animal milk alternatives when wet milled, sieved and pasteurized. Tigernut as reported by.[11] has therapeutic properties such as prevention of colon cancer, coronary heart disease, ulcer and infertility as it contains phytonutrients such as quercetin which may boost libido in men.[12] It was also reported by.[13] to be rich in protein content and low fiber.[14] ported that it has starch 86.4 % and moisture content 5.8%. According to.[15] Tigernut contains considerable amounts of essential amino acids. It is rich in mono saturated fatty acids (MUFA) and this makes it an excellent anti-diabetic agent as MUFA diets boosts glycemic tolerance.[16]

Coconut on the other hand describes a liquid obtained by wet milling and sieving matured coconut kernels using a milk bag. The sieviate which is creamy and white in colour contains high fat content, moderate carbohydrate and protein.[17] It helps to prevent cancer and reduce the risk of heart disease.[18] These plant alternatives can be

used for the production of Yoghurt, a fermented healthy food which has gained a worldwide acceptance due to its high digestibility and health conferring properties.[19] Yoghurts are probiotic carriers and are reported by.[20] to possess high nutritional contents of protein, calcium, fat soluble vitamins and major minerals depending on the source of their parent material,[21] Yoghurt is sour and can be taken as dessert, snack or probiotic food or drink to aid digestion and also balance the micro flora within the body intestine.[22,23] This research was aimed at bringing to limelight the therapeutic potentials of tiger nut and coconut milk yoghurts at their different blends as well as their physicochemical and nutritional properties after flavoring the off nutty flavor with pineapple juice.

MATERIAL AND METHODS

Study Site: The study was carried out in the Department of Food Technology, Akanu Ibiam Federal Polytechnic Unwana, Afikpo in Ebonyi State, and also at Science Laboratory of University of Jos Mubi. The analyses were done at the Biochemical Department of the National Root Crops Research Institute (NRCRI) Umudike in Umuahia, Abia state.

The sample collection, preparation and investigation were conducted within six months (January to June 2020).

Raw Materials

Tigernut (*Cyperus esculentus*) tubers, coconut (*Cocos nucifera*) and pineapple (*Ananas comosus*) were purchased in large quantity from Eke market in Afikpo in Ebonyi State.

Sample Preparation. Samples were prepared at the Processing laboratory of the Department of Food Technology, Akanu Ibiam Federal Polytechnic Unwana, Afikpo in Ebonyi State and the analytical grade chemicals used in the bench work for the analysis of this research were from the Science Laboratory of University of Jos, Mubi and the National Root Crops Research Institute (NRCRI) Umudike in Umuahia, Abia state.

Raw material Preparation

The wet samples of tiger nut tubers were sorted to remove spoilt ones, soaked in clean water for 24hours to increase their tenderness. Coconuts were removed from their husks, the kernels separated from the shell. They were washed, diced into cubes to reduce the sizes and aid their milling in the blender. Pineapples were washed and peeled, washed again and reduced into smaller sizes for easier blending.

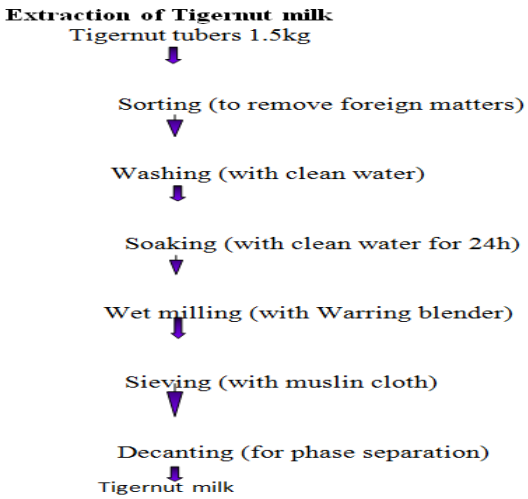

Figure 1: The production of Tigernut milk

Tiger nut milk was prepared by modifying the method described by[24] as shown in Figure 1 below. 1.5kg of wet tiger nut was hand sorted to remove foreign materials. The sorted tubers were washed with clean water and soaked for 24 hours in 3 litres clean water at room temperature to hydrate. The tubers were washed off after 24 hours and wet milled with 1litre of clean water into slurry using a warring blender (Binatone Food Processor Model). The milk was extracted by sieving. The chaff was discarded and the milk was left to separate from the water that was used in milling the tubers. After 4hours the milk was visibly seen to have separated to the point of efficient collection though there was still some water incorporated in the milk. The milk was filled in a sterile container and kept in a refrigerator till fermentation time.

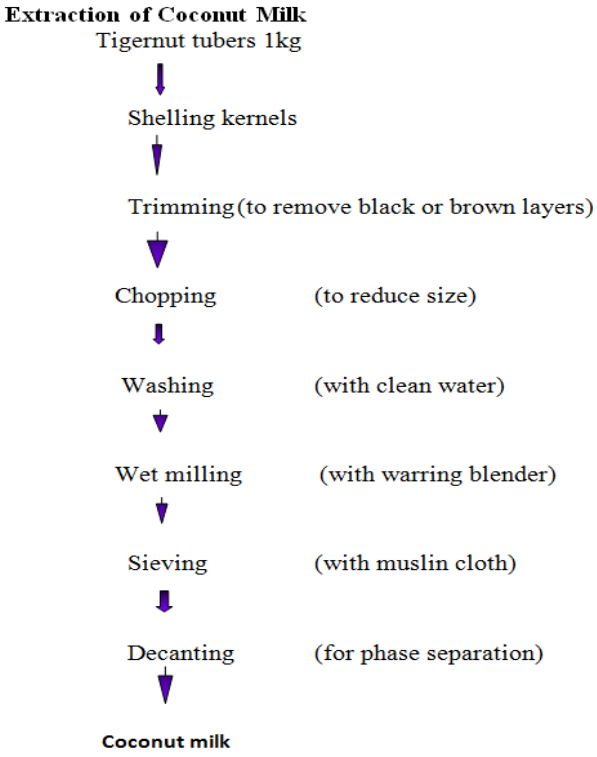

Figure 2: The production of Coconut milk.

Coconut milk was prepared by modifying the method described by.[17] as shown in Figure 2 below. Coconut was removed from the husk and the kernel was de-shelled. The black or brown layer of the kernel was trimmed off with a kitchen knife. They were chopped into cube sizes on a chopping board and washed. They were wet milled with 1litre clean water into slurry using a warring blender (Binatone Food Processor Model).Coconut milk which was a creamy liquid and whitish in colour was separated using a nut milk bag and the chaff discarded. It was left to separate and was collected after 4 hours as an emulsion on top and filled into sterile bottles till fermentation time.

Extraction of Pineapple juice

Pineapple was prepared by peeling off the skin ,washing and dicing it into smaller sizes, washing again and wet milled using a blender (Binatone Food Processor Model), with little amount of water since it contains resident water into slurry. It was sieved with a nut milk bag and the juice collected and filled into sterile bottles till time of use.

Fermentation Processes

Fermentation of Tiger nut Milk, Coconut Milk and their different blend ratios

1 litre each of the tiger nut milk(100TM%), coconut milk (100CM%) and their different blend ratios of 25TM:75CM%**,** 75TM:25CM%, 50TM:50CM% and cow milk(100CWM%) as control were pasteurized at 65^{o}C for 30 seconds. They were cooled in a water bath to 45^{o}C and 10% sugar was added and the sample was stirred to dissolve the sugar. The temperature of the samples dropped to 43^{o}C after the sugar was introduced. 5g starter culture containing *Lactobaccilus bulgaricus*, *Lactobaccilus thermophilus* and *Lactobaccilus acidophilus* was inoculated into the different samples. The samples were covered airtight to avoid the interference with wild yeast and kept in a warm cupboard for 12-48 hours all the samples except the cow milk sample which was kept for 12 hours. At the end of the fermentation, 30ml pineapple juice was added to each of the samples of yoghurt to enhance the taste, flavor and the nutritional properties. The method above was shown in Figures 3,4,5 and 6 below.

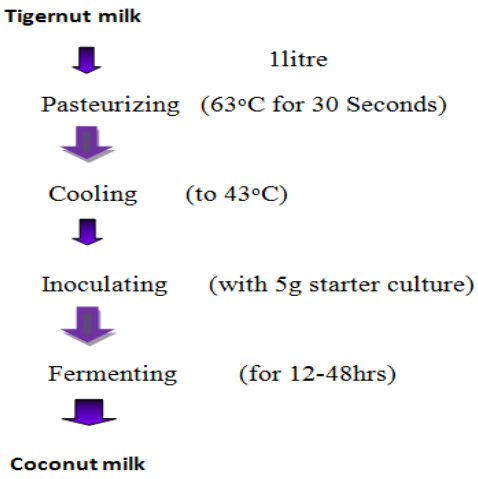

Figure 3: The production of Tigernut yoghurt.

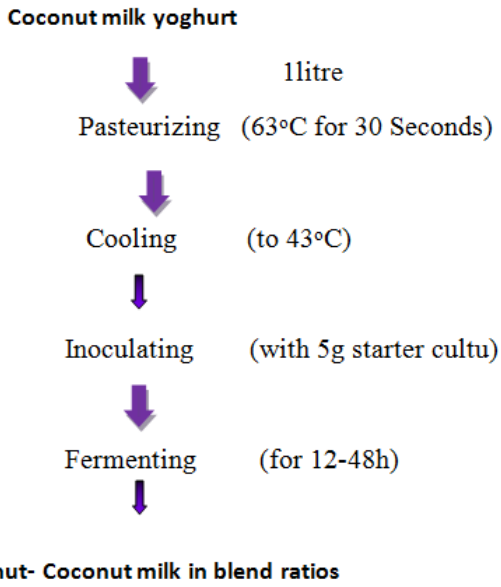

Figure 4: The production of Coconut yoghurt.

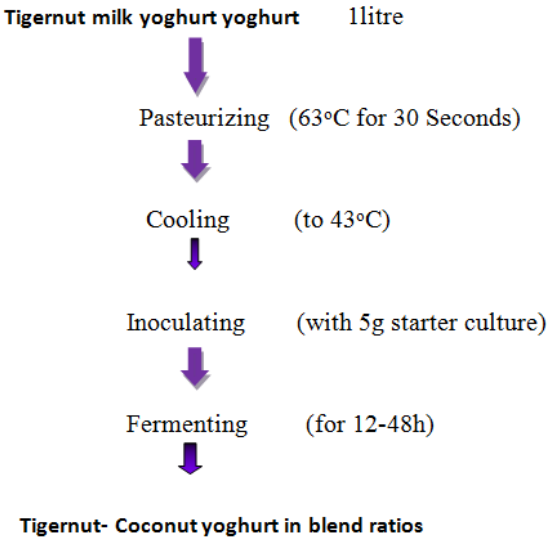

Figure 5: The production of Tigernut-coconut milk blend ratios yoghurt.

Qualitative Analyses Done on the Samples
Amino Acid Determination
The amino acid was determined by using Phenylthiohydantion (PTH) amino acid automatic analyzer (Model 120A, Foster city, CA, USA) which automatically analyses PTH amino acids derived from Edman degradation of proteins and peptides in liquid samples using HPLC. PTH elutes the following amino acids in this sequence: leucine, lysine, isoleucine, phenylalanine, nor-leucine, valine, methionine, proline, arginine, tyrosine, histidine, cystine, alanine, glutamic acid, glycine, threonine, serine and aspartic acid. Tryptophan was destroyed by acid hydrolysis in the process of the determination while nor-leucine was an internal standard used in the analyzer.[25]

Determination of Amino Acid Profile in Liquid Sample
Quantification of amino acids of the liquid samples was carried out using the method outlined by,[23] with little modifications. Precise volume of 50cm^3 was measured into 250mL quick fit round bottom flask and dried using rotary evaporator. A clean spatula was used to remove the dried sample and defatted in soxhlet extraction apparatus using chloroform methanol mixture (2:1). Known weight indicated in the result sheet was hydrolyzed, filtered through non-absorbent cotton wool or glass wool.

Nitrogen Determination
The method used for nitrogen determination was according to.[26] A small amount (115mg) of ground sample was weighed, wrapped in Whatman filter paper (No.1) and put in the Kjeldahl digestion flask. Concentrated sulphuric acid (10mL) was added. Catalyst mixture (0.5g) containing sodium sulphate (Na_2SO_4), copper sulphate ($CuSO_4$) and selenium oxide (SeO_4) in the ratio 10:5:1 was added into the flask to facilitate digestion. Six pieces of anti-bumping granules were added. Flask was then put in Kjeldahl digestion apparatus for 3 hours until the liquid turned light green. The digested sample was cooled and diluted with distilled water to 100mL in standard volumetric flask. Aliquot (10mL) of the dilute solution with 10ml of 45% sodium hydroxide was put into the Markham distillation apparatus and distilled into 10mL of 2% boric acid containing 4 drops of bromo cresol green/methyl red indicator until about 70mL of distillate was collected. The distillate was then titrated with standardized 0.01N hydrochloric acid to grey colored end point.

$$\text{Percentage Nitrogen} = \frac{(a-b) \times 0.01 \times 14 \times V \times 100}{W \times C}$$

Where:
a. = Titre value of the digested sample
b. = Titre value of blank sample
v. = Volume after dilution (100mL)
W. = Weight of dried sample (mg)
C. = Aliquot of the sample used (5mL)
14. = Nitrogen constant in mg.

Hydrolysis of the Sample
The method used for hydrolysis of sample was according to.[26] A known weight of the defatted sample was weighed into glass ampoule. 7mL of 6N HCl was added and oxygen was expelled by passing nitrogen into the ampoule (this is to avoid possible oxidation of some amino acid during hydrolysis e.g. methionine and cystine). Glass ampoule was then sealed with Bunsen burner flame and put in an oven preset at 105^{o}C ± 5^{o}C for 22 hours. The ampoule was allowed to cool before broken open at the tip and the content was filtered to remove the hymens. It should be noted that tryptophan is destroyed by 6N HCl during hydrolysis. Filtrate was then evaporated to dryness using a rotary evaporator. The residue was dissolved with 5mL to acetate buffer and stored in plastic bottles, which were kept in the freezer. The amount loaded was 60 microlitres. This was dispensed into the cartridge of the analyzer. The analyzer is designed to separate and analyze free acidic, neutral and basic amino acids of the hydrolysate. Method of Calculating Amino Acid Values. An integrator attached to the Analyzer calculates the peak area proportional to the concentration of each of the amino acids.

Physico-Chemical Determinatiion
pH
The methods used for pH determination was according to.[27] A 10% w/v suspension of the sample was prepared using distilled water. It was thoroughly mixed using a warring micro blender. The pH of the sample was measured using a digital pH meter (Jenway 3505, UK) calibrated with pH 4 and 7 buffers.

Syneresis
The methods used for syneresis determination was according to.[27,24] A 20g of the yoghurt sample was centrifuged at 500rpm for 5min. The supernatant was collected and weighed. The amount of the supernatant recovered in percentage was calculated thus;

$$\textbf{\% Syneresis} = \frac{\textbf{Volume of supernatant}}{\textbf{Weight of sample}} \times \frac{\textbf{100}}{\textbf{1}}$$

Note: This test shows the susceptibility of yoghurt to storage condition.

Viscosity
The methods used for viscosity determination was according to.[26] A 10% constituted sample was suspended in distilled water and mechanically stirred at room temperature (36^{o}C). The viscosity was measured using Oswald Viscometer.

Total Titratable Acid (TTA)
The methods used for TTA determination was according to.[27] The sample was mixed with 10ml hot distilled water at 90^{o}C and titrated with 0.1N NaOH containing 0.5% phenolphthalein as an indicator to an end point of faint colour.

The percent Lactic acid produced as a result of fermentation was calculated thus;
Titre value X 0.09 X 100%
Titre value = Volume of sample solution used
0.09 = Conversion factor.

Total Soluble Solids (TTS)
The method used for TTS determination was according to.[27] using the refractometer. A 20mL sample of the yoghurt was mixed with 10mL of 10% Lead acetate in a beaker and filtered through Whatman filter paper No. 1 into a 100mL volumetric flask. Two (2) spoons full of sodium hydrogen carbonate were added to the filtrate to precipitate the excess lead and it was filtered again. The filtrate was used to determine the total soluble solids of the sample by dropping 1mL of the prepared filtrate into a refractometer and the sugar content read off directly from the refractometer.

Statistical Analysis
The experimental design used was CRD. The nutritional data was subjected to ANOVA to determine the significant differences that existed between samples ratio blends using SPSS version 20.[28,29]

RESULTS

Table 1: Essential Amino Acid Composition Results Of Tigernut-Coconut Yoghurt And Their Blends.

Samples	Leucine (mg/100g)	Lysine (mg/100g)	Isoleucine (mg/100g)	Phenylalanie (mg/100g)	Tryptophan (mg/100g)	Valine (mg/100g)	Methionie (mg/100g)	Arginine (mg/100g)	Histidine (mg/100g)	Threonie (mg/100g)
100%TM	$1.11^{b} \pm 0.01$	$0.82^{d} \pm 0.02$	$0.70^{b} \pm 0.01$	$0.49^{b} \pm 0.01$	$0.48^{b} \pm 0.01$	$0.78^{c} \pm 0.01$	$0.52^{c} \pm 0.02$	$0.48^{d} \pm 0.01$	$0.53^{a} \pm 0.01$	$0.76^{ab} \pm 0.01$
100%CM	$0.90^{e} \pm 0.01$	$0.93^{a} \pm 0.01$	$0.74^{a} \pm 0.02$	$0.45^{c} \pm 0.02$	$0.48^{b} \pm 0.01$	$1.01^{a} \pm 0.01$	$0.61^{a} \pm 0.01$	$0.98^{a} \pm 0.01$	$0.55^{a} \pm 0.01$	$0.78^{a} \pm 0.01$
75TM:25M	$1.08^{c} \pm 0.01$	$0.93^{a} \pm 0.01$	$0.72^{ab} \pm 0.01$	$0.45^{c} \pm 0.01$	$0.49^{b} \pm 0.01$	$0.95^{b} \pm 0.01$	$0.55^{b} \pm 0.01$	$0.68^{c} \pm 0.01$	$0.55^{a} \pm 0.01$	$0.68^{c} \pm 0.01$
27TM:75CM	$0.85^{f} \pm 0.01$	$0.78^{e} \pm 0.01$	$0.66^{c} \pm 0.02$	$0.43^{c} \pm 0.02$	$0.46^{c} \pm 0.01$	$0.68^{d} \pm 0.01$	$0.47^{d} \pm 0.01$	$0.41^{f} \pm 0.01$	$0.41^{c} \pm 0.01$	$0.67^{c} \pm 0.02$
50TM:50CM	1.03 ± 0.01	$0.90^{b} \pm 0.01$	$0.72^{ab} \pm 0.02$	$0.45^{c} \pm 0.01$	$0.48^{b} \pm 0.01$	$0.54^{e} \pm 0.02$	$0.05^{c} \pm 0.01$	$0.43^{e} \pm 0.01$	$0.44^{b} \pm 0.02$	$0.75^{b} \pm 0.02$
100%CMY	$1.13^{a} \pm 0.01$	$0.86^{c} \pm 0.01$	$0.72^{ab} \pm 0.01$	$0.51^{a} \pm 0.01$	$0.51^{a} \pm 0.01$	$0.96^{b} \pm 0.02$	$0.60^{a} \pm 0.01$	$0.91^{b} \pm 0.01$	$0.55^{a} \pm 0.01$	$0.78^{a} \pm 0.02$

Values are mean ± standard deviation of replicate determination (n=3). Means in the same column followed by different superscripts are significantly ($p<0.05$) different.
Keys: 100% TM (100% Tigernut milk yoghurt)
100% CM (100% Coconut milk yoghurt)
75 TM: 25CM%(75% Tigernut milk + 25% Coconut milk yoghurt)
25 TM: 75CM%(25% Tigernut milk + 75% Coconut milk yoghurt)
50 TM: 50CM%(50% Tigernut milk + 50% Coconut milk yoghurt)
100: CMY% (100% Cow milk yoghurt)

Essential Amino acid Contents Discussions
As shown in Table 3, among the samples, the 100% CMY had 1.13 which served as the control was significantly ($p<0.05$) different from others. 100%TM 1.11 showed the next significant ($p<0.05$) difference **in terms of leucine content**. The least leucine content was seen in 25TM:75CM% at 0.85. Leucine is a branched chain amino acid and it's critical for protein synthesis and repair of muscle tissue.[30]

Among the samples **in terms of Isoleucine**, 100% CM sample 0.74 was significantly ($p<0.05$) different from all the other samples. 75TM:25CM% at 0.72, 50TM:50CM 0.72, 100%CMY 0.72 were not significantly ($p>0.05$) different from each other and were neither significantly ($p\geq0.05$) different from 100%TM at 0.70. According to.[30] the blends of branched-chain amino acid in food such as leucine, isoleucine and valine aid in providing supplementary energy for athletes and also help in muscle growth.

The Phenylalanine content of the following samples; 100%CM, 75TM:25CM%, 25TM:75CM% and 50TM:50CM% at a range of 0.43 - 0.45 were not significantly ($p>0.05$) different from each other whereas 100%CMY at 0.51 was significantly ($p<0.05$) different from all the samples. 100%TM at 0.49 followed closely in phenylalanine content.

The Valine content of 100%CM sample at 1.01 was significantly ($p<0.05$) different from all the other samples. 75TM:25CM% at 0.95 and 100% CMY 0.96 were not significantly ($p>0.05$) different from each other but were significantly ($p<0.05$) different from 25TM:75CM% at 0.68 and 100%TM at 0.78. 50TM:50CM% sample 0.54 showed the least valine content among the samples.

The threonine content of samples 100%CMY and 100%CM at 0.78 were not significantly ($p>0.05$) different from each other. 100%TM with threonine content of 0.76 was neither significantly ($p\geq0.05$)

different from 100%CM and 100%CMY at 0.78 nor different from 50TM:50CM% at 0.75.

The lysine content of 100%CM 0.93 and 75TM:25CM% 0.93 samples were not significantly ($p<0.05$) different from all the other samples, while 25TM:75CM% 0.78 was the least in lysine content among the samples. The range of lysine value 4.16-4.78 reported by ([31]) was higher than what this work 0.78-0.93 reported for lysine content of tiger nut yoghurts. Lysine was reported by.[28] to prevent or relief the infections that can cause herpes sores on the mouth or genital organs.

In terms of Tryptophan content, the following samples; 100%TM, 100%CM, 75TM:25CM% and 50TM:50CM% at a range of 0.48 - 0.49 were not significantly ($p>0.05$) different from each other while 100%CMY at 0.51 was significantly ($p<0.05$) different from all the other samples. The least tryptophan content 0.46 was seen in sample 25TM:75CM%. Tryptophan plays a role as a precursor for brain neurotransmitter and this is an important regulator of sleep, appetite, mood and sensory perception.[30]

The Methionine contents of sample 100%TM at 0.61 and 100%CMY at 0.60 were significantly ($p<0.05$) different from all the other samples. 75TM:25CM% at 0.55 methionine content was significantly ($p<0.05$) different from 100%TM at 0.52 and 50TM:50CM% at 0.50 which were not significantly ($p>0.05$) different from each other. Methionine plays an important role in the metabolism and detoxification. It is also necessary for tissue growth and absorption of zinc and selenium, minerals vital for good health ([30]). Sample 100CM% at 0.98 was highly significantly ($p<0.05$) different from the other samples in terms of Arginine content. 100% CMY followed next with Arginine content of 0.91. However, the least **Arginine content** value was seen to be very significantly ($p<0.05$) different in 100%CM sample,0.98 compared to the other samples while it was least in sample 25TM:75CM% at 0.41. Arginine plays a role in building muscle protein and is known to be children's amino acid.[32]

The Histidine contents of 100%CM, 75TM:25CM%, 100%CMY and 100%TM at 0.55, 0.55, 0.55, 0.53 respectively were not significantly ($p>0.05$) different from each other but was significantly ($p<0.05$) different from all the other samples. The least histidine content was seen in sample 25TM:75CM% at 0.41. Histidine is used to produce histamine, a neurotransmitter which is vital to immune response, digestion, sexual function and sleep-wake cycles. It is also critical for the maintenance of myelin sheath; a protective barrier that surrounds the nerve cells.[32]

However, 75TM:25CM% and 25TM:25CM% samples had the least **Threonine content** at 0.68 and 0.67 respectively and were not significantly ($p>0.05$) different from each other. Threonine is a principal part of structural protein such as collagen and elastin which are important components of the skin and connective tissues. It also plays a role in fat metabolism and immune function.[32]

Table 2: Physico-Chemical Properties Of Tigernut-Coconut Milk Yoghurt Blends.

Samples	pH	TTA (%)	TSS (%)	Viscosity (cP)	Syneresis (%)
100% TM	$3.66^{a} \pm 0.01$	$0.36^{d} \pm 0.01$	$12.85^{d} \pm 0.02$	$0.69^{a} \pm 0.01$	$1.04^{e} \pm 0.01$
100% CM	$4.72^{a} \pm 1.40$	$0.21^{e} \pm 0.01$	$11.53^{e} \pm 0.04$	$0.53^{b} \pm 0.02$	$1.93^{b} \pm .04$
75TM:25CM%	$3.61^{a} \pm 0.01$	$0.52^{a} \pm 0.01$	$13.44^{c} \pm 0.03$	$0.48^{c} \pm 0.02$	$2.06^{a} \pm 0.01$
25TM:75CM%	$3.66^{a} \pm 0.01$	$0.43^{c} \pm 0.01$	$14.13^{b} \pm 0.02$	$0.54^{b} \pm 0.01$	$1.47^{d} \pm 0.01$
50TM:50CM%	$3.68^{a} \pm 0.01$	$0.47^{b} \pm 0.01$	$11.26^{f} \pm 0.01$	$0.42^{d} \pm 0.01$	$1.97^{b} \pm 0.03$
100% CMY	$4.07^{a} \pm 0.01$	$0.48^{b} \pm 0.01$	$16.52^{a} \pm 0.03$	$0.66^{a} \pm 0.01$	$1.82^{c} \pm 0.01$

Values are mean ± standard deviation of replicate determination (n=2). Means in the same column followed by different superscripts are significantly ($p<0.05$) different
Keys: 100% TM (100% Tigernut milk yoghurt)
100% CM (100% Coconut milk yoghurt)
75 TM: 25CM% (75% Tigernut milk + 25% Coconut milk yoghurt)
25 TM: 75CM% (25% Tigernut milk + 75% Coconut milk yoghurt)
50 TM: 50CM% (50% Tigernut milk + 50% Coconut milk yoghurt)
100: CMY% (100% Cow milk yoghurt)

Physico-chemical Properties Discussions

The pH value of the samples were not significantly ($p>0.05$) different from each other. Their pH values were acidic indicating ongoing fermentation. Yoghurt is a product of fermentation which confers health benefit to the consumer because it contains probiotics.[33]

Titratable acidity shows the level of yoghurt's post acidification.[34] The total titratable acidity of 75TM:25CM% sample 0.52 was significantly ($p<0.05$) different from all the other samples as shown in Table 4. 50TM: 50CM% 0.47 and 100% CMY 0.48 were not significantly ($p>0.05$) different from each other while the lowest value 0.21 was seen in 100% CM.

The Total Soluble Solids was significantly ($p<0.05$) different in 100% CMY 16.52 than other samples. 25TM:75CM% came closer with the total soluble solid of 14.13, while 100% CM 11.52 had the least value among others.

It was observed that 100% TM 0.69 and 100% CMY 0.66 were significantly ($p<0.05$) different from all the other samples in their **level of Viscosity**. 25TM:75CM 0.54 and 100% CM 0.53 were not significantly ($p>0.05$) different from each other. The Viscosity of all the samples were sufficiently high as well as their total soluble solids otherwise known as Brix. This agreed with what.[35] reported that the level of solid mix, the greater the viscosity or consistency of the end product.

Syneresis analysis according to.[24] is used to determine the susceptibility of a sample such as yoghurt to spoilage. The syneresis value of 75TM:25CM% 2.06 was significantly ($p>0.05$) different from all the other samples. 50TM:50CM% sample 1.97 and 100%CM 1.93 were significantly ($p>0.05$) different from each other while the least syneresis value 1.04 was seen in 100%TM. Sample 75TM:25CM% had the highest syneresis value and is likely to tend to spoilage before other samples.

CONCLUSION

At the end of this research, it was found out through careful production and analyses that the Essential amino acid content of 100% coconut milk (100%CM) stood out when compared to the other sample ratios while the Physico-chemical properties of 75% Tigernut: 25% coconut milk (75TM:25CM %) blend ratio and 100% cow milk were the best among the sample ratios, although its Syneresis value showed it to be susceptible to spoilage.

Conclusively, this research had exposed the therapeutic potentials of tiger nut and coconut milk in yoghurt production as well as the different percentage blend ratios best for Essential amino acid and Physico-chemical properties determinations. It is recommended that more research be done on other percentage blend ratios of tiger nut and coconut milk for therapeutic yoghurt production.

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