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Rice- Coconut Yoghurt: Preparation, Nutritional and Sensory Qualities

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Abstract

The efficacy of using rice milk and coconut milk in the preparation of yoghurt was evaluated in a completely randomized design model. Commercial yoghurt was the control Treatment (A) while other Treatments were B (25% rice milk plus 75% coconut milk), C (50% rice milk plus 50% coconut milk) and D (75% rice milk plus 25% coconut milk) .The various yoghurt samples were analyzed for their proximate composition and sensory value. Higher crude protein content and solids not fat were recorded for Treatment C. The overall acceptability was greatest for Treatment C, greater for Treatment B, great for Treatment D and least for Treatment A (control). This type of yoghurt is recommended for weight watcher and lactose intolerance persons.

Keywords: Rice milk, coconut milk, chemical analysis, sensory value, yoghurt

Introduction

There are about 925 million hungry people in the world in 2010 with 239 million from sub-Sahara Africa. Children and the vulnerable groups are the most victims. Protein-calorie malnutrition has been implicated as the deadly form of malnutrition/hunger. This deadly form of malnutrition could be solved if people could have least cost and balanced nutrition on their table.

Yoghurt which is a semi fermented milk food is likened and consumed by people all over the world. The food can be used to prevent / control diarrhea due to its therapeutic effect. It can help in modulating the inflammatory response produced by carcinogen through increasing apoptosis. Yoghurt protein is more digestible than cow milk.

There are different types of yoghurt and variations may probably be due to the various types of live and active culture used , plain or fruit flavor and most importantly the different sources of milk (animal/plant) (Belewu *et al.*, 2005; Belewu , 2006). Rice milk is considered the best hypoallergenic form of milk. It is better to drink rice milk if allergic to soymilk and cow milk. Those with lactose intolerance are advised to drink rice milk since it is cholesterol free with unsaturated fat. The milk enhances immune system and provides resistances to bacteria and viruses invading the body due to high content of selenium and magnesium. (http;//www.healthiro.com/diet.food/rice-milk).

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Coconut milk is rich in phosphorus; the milk supplies the body with nearly a quarter of daily value of iron thereby resulting in the prevention of anaemia. The milk helps to decrease the risk of joint inflammation due t o its high selenium content. The health of prostate gland could be promoted due to the presence of zinc in coconut milk (Belewu *et al*., 2005). Therefore, this study evaluates the preparation and nutritional qualities of yoghurt from cheap, locally and readily available materials-Rice milk and Coconut milk.

Materials and methods

Study area

The study was carried out at the Microbial Biotechnology and Dairy Science Laboratory, Department of Animal Production, University of Ilorin, Nigeria.

Preparation of coconut milk

Coconut milk was prepared by shelling the nut and the meat was separated using a dull knife. The brown skin of the meat was removed with sharp knife while the meat was washed in clean water and later grated. The grated meat was kept in a bowl of warm water and left for 45 minutes so as to allow the extract of the oil and the aromatic compound. It was later filtered using a sieve of 0.18mm size and the chaff was discarded. The result obtained was a milky-opaque emulsion of about 17% fat and with a sweet coconut flavor. After a while, fat and water were separated and a thick coconut cream was obtained (Belewu and Belewu, 2007).

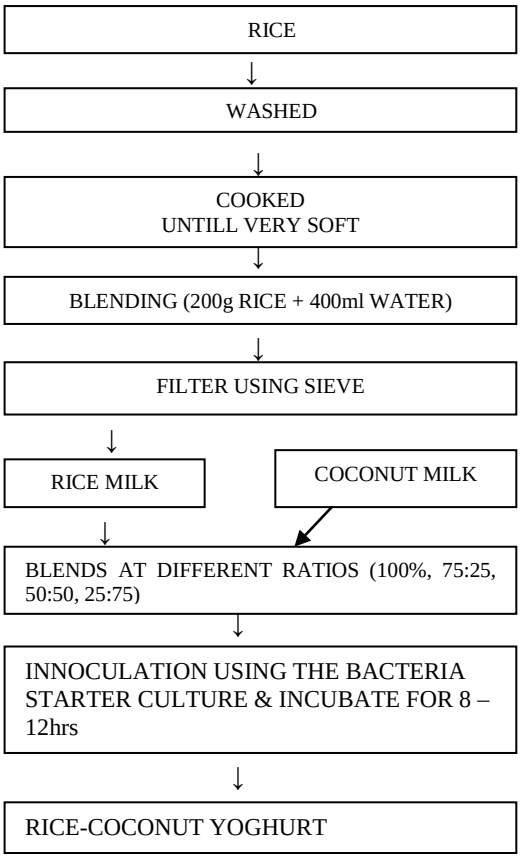
Preparation of Rice milk

The rice (one cup) was washed thoroughly and kept in a big pot. About eight cups of water was added and the whole content was placed on heating mantle. The temperature was lower and boiled for three hours and a soupy rice pudding was obtained. The content was later blended twice till a smooth content was obtained. The blended rice was sieved twice so as to have good texture.

Preparation and inoculation of rice –coconut milk

Rice -Coconut yoghurt was prepared by mixing coconut milk and rice milk in ratios 25:50, 50:50, 75:25 representing Treatments B and C . While the Control Treatment was the commercial yoghurt (A).

The various mixtures of the coconut milk and rice milk were heated between 85 and 95^{OC} for 30 minutes. The milk was rapidly cooled to 40^{OC} and then inoculated with 2 % mixed culture of *Streptococcus thermophillus* and *Lactobacillus bulgaricus* (Belewu, 2006) at ratio 1:1 , the mixture was thoroughly mixed and later incubated at between $43^{O}C$ and $45^{O}C$ for between 8 and 12 hours till the curd was formed.



Flow chart of rice-coconut yoghurt

Chemical analysis

The chemical composition of the Treatments was determined according to the method of A.OA.C. (1990) while the energy was estimated

using the method of Carpenter and Clegg (1956). The major and minor mineral elements were determined using Atomic absorption emission spectrophotometer (AAS) model 200A. The sensory qualities of the yoghurt samples were determined using a 9 point hedonic scale (flavor, taste, consistency, colour and overall acceptability) with 9 indicating like extremely and 1 representing dislike extremely.

Statistically analysis

All data collected were subjected to analysis of variance (ANOVA) of a Completely Randomized design model while significant treatment means were separated using Duncan (1955) multiple range test.

Results and discussion

The proximate composition of the rice milk and coconut milk samples are shown in Table 1. The crude protein, fiber, energy, lipid and carbohydrate contents of rice milk corroborates the result reported elsewhere http://www.faqs.org/nutrition/Pre-sma/Ricebased. The crude protein content of rice milk was twice that of coconut milk, additionally, the carbohydrate was poorer in coconut milk (2.79g) compared to rice milk (57.3g).

Table 1: Proximate composition of coconut milk and rice milk

Composition (%)	Coconut milk	Rice milk
Moisture	85.60	18.75
Protein	7.50	15.55
Carbohydrate	2.75	57.30
Lipid	24.00	0.79
Fiber	0.70	1.45
Total energy/100g (calories)	554	340
Calorie	198	260
Calcium (mg)	16.0	6.5
Phosphorus (mg)	98.0	130.0
Potassium (mg)	230.0	100.0
Sodium (mg)	14.0	7.0
Magnesium (mg)	47	70

The calorie content of coconut milk noted in this study was in line with the report of USDA nutrient database and National Institute for Health and Welfare. The total fiber content was higher in rice milk (1.40) compared to 0.7 of coconut milk.

It is interesting to note that the fat content of coconut milk was twenty times that of rice milk. The mineral content (calcium, potassium and sodium) was higher in coconut milk compared to rice milk. The result obtained concurs with the report of National Institute for Health and Welfare (http://www.fineli.fi/food.php).

Table 2 revealed the proximate qualities of the experimental yoghurt. The protein content in Treatment C (4.36%) was similar to Treatment D (5.2%) while the least was recorded for Treatment A (control). The poor crude protein in Treatment A showed the poor nutritional content of commercial yoghurt. The solid non fat content was highest in Treatment C compared to other Treatments. The overall result showed increasing crude protein as the inclusion level of rice milk was increased in the Treatments.

Table 2: Physico-chemical properties of the experimental yoghurt

Parameters (%) /Treatments	A (Control)	B {25%Rice milk+75% Coconut milk}	C {50% Rice milk +50% Coconut milk}	D {75% Rice milk +25% Coconut milk}
Protein	2.45^{c}	3.73^{c}	4.36^{a}	5.20^{a}
Fat	2.90^{c}	5.85^{a}	4.16^{a}	3.50^{b}
Carbohydrate	73.85^{a}	43.15^{b}	29.20^{d}	59.00^{c}
Fiber	0.20	0.20	0.20	0.20
Energy(K.cal/kg)	202.0^{d}	213.5^{b}	269.0^{a}	500.30^{c}
pH	6.30	6.40	6.20	6.15 NS
Lactose	3.15	3.10	2.98	2.95
Solids not fat	4.15	5.79^{a}	5.90^{a}	4.35^{b}
Lactic acid	0.11	0.23	0.23	0.23
Ash	0.48	0.56	0.55	0.55
Carbohydrate	55.00	28.00^{a}	30.00^{a}	45.00^{b}
Density	15.78	18.70	18.71	18.69
Temperature	20^{OC}	25^{OC}	25^{OC}	24^{OC}
Freezing point	$- 0.33^{OC}$	$- 0.34^{OC}$	$- 0.35^{OC}$	$- 0.35^{OC}$

Means with similar superscripts are not significantly different from each other (p>0.05)
NS = Not significant (p>0.05)

The highest significant lipid content recorded for Treatments B and C could be due to the inclusion level of coconut milk at 50 and 75% levels as the milk contains 24.00% lipid compared to between 2.89% and 3.00% found in cow milk. The least lipid content of Treatments A and D could be due probably to the poor inclusion level of coconut milk in Treatment D and non in Treatment A. The importance of coconut based yoghurt could be related to the presence of lauric acid which helps boost immune system due to its anti- fungal, anti-bacterial, anti-viral and anti-microbial properties.

There was no significant difference in the level of the crude fiber content for all treatments due to the fact that all the yoghurt samples are in a liquid form with only their soluble contents. The energy content of the yoghurt was highest for Treatment D followed by C and B while the least was A. The carbohydrate content of the yoghurt samples supported the report of Belewu et *al*. (2005). The highest carbohydrate recorded for coconut milk confirmed the assertion that Zeatin and Zeatriniboside are associated with coconut carbohydrate (Van-Staden and Drewes, 1975). The pH and the lactic acid contents of the yoghurt samples were similar to the reports of Zubeir *et al*. (2012) it is less acidic and could be tolerated by everybody. This confirmed the assertion that many fermented milk products are better than non fermented products.

Table 3 shows the sensory evaluation of the drink. The highest acceptability of the drink was noted in Treatments B and C compared to A and D. The colour, consistency and flavour of Treatments B and C were preferred to others. Treatments with the inclusion of coconut milk were rated higher due probably to stimulating odour of coconut milk which was impacted into the coconut milk based yoghurt and this could have enhanced the mood of the panelists. It is worth noting that the linoleic acid and lactose of aliphatic hydro carboxylic acid found in coconut milk will help in boosting immune system and also useful for people who are lactose intolerant or allergic to animal milk.

Table 3: Sensory evaluation of the rice –coconut yoghurt

Parameters (%) /Treatments	A	B	C	D
Taste	4.10	6.12	6.10	5.19
Flavor	3.74	5.29	5.10	4.12
Consistency	Watery	Thick	Thick	Thick
Colour	5.15	Whitish	Whitish	whitish
Overall acceptability	5.23	7.91	8.90	6.10

Conclusion and implications

This study revealed that a combination of rice milk and Coconut milk (50:50) could be used for the preparation of dairy free and cholesterol free yoghurt The high nutrient content makes it a perfect dairy free alternative food.

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