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Study of physiochemical, nutritional and sensory characteristics of paneer and yoghurt prepared from coconut milk

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Abstract

Coconut is the largely grown nut in the world, the most important palm. Coconut milk is derived from the flesh of the coconut. Coconut milk was used as a raw material for production of coconut paneer and coconut yoghurt with combination to cow's milk. Coconut milk was prepared from fresh coconut kernel and its composition was standardized to match with cow's milk. After that five variants of yoghurt and paneer were prepared by using different proportions of coconut milk and cow's milk i.e. 100% of cow's milk, 40% of coconut milk, 60% of coconut milk, 80% of coconut milk and 100% of coconut milk. The idea of coconut paneer in pure form (100% of coconut milk) was not successful. These variants of coconut milk based paneer and yoghurt, went through sensory evaluation by semi trained panels and 60% of coconut milk based paneer and 40% of coconut milk based yoghurt were most accepted. The nutritional and physico-chemical properties of developed coconut milk, coconut paneer and coconut yoghurt were compared with that of the standard cow milk, cow milk paneer and cow milk yoghurt. The use of coconut milk by replacing cow milk in paneer and yoghurt increases fat content and the fat present as lauric acid in coconut milk known as good cholesterol. Coconut milk had high content of ash, fat, viscosity and total soluble solids than cow's milk. Coconut milk and its products: coconut paneer and coconut yoghurt had high fat content.

Keywords: Fresh coconut kernel, coconut milk, coconut paneer, coconut yoghurt, physico-chemical properties

1. Introduction

Coconut (*Cocos nucifera*) is one of the most important commercial crop in India and other tropical areas of world. According to Sangamitra *et al.*, (2013) ^[1], coconut is known as "tree of abundance" and "tree of heaven". It is commonly used as an important source for coconut oil, milk and cream products it is also used in raw as well as in processed form for various medicinal purposes and eating purpose in different variety of cuisines (Alyaqoubi *et al.*, 2015) ^[2]. Coconut milk is milky-white in color, sweet in taste, natural oil and water emulsion extracted from the endosperm of mature coconut using mechanical force, with addition of water (Narataruska *et al.*, 2010) ^[3]. As per Tansakul and Chaisawang (2006) ^[4], coconut milk contains about 54% moisture, 35% fat, 11% solid not fat, and 56.23% lauric acid. Coconut milk is also rich with vitamins (2.30 mg vitamin C) and minerals (41mg calcium, 497 mg potassium, 104 mg magnesium and 7.46 mg iron) and it can fortify with vitamins A, B and D.

Paneer is among the most nutritious and popular variety of soft cheese and it is extracted out of acid and heat coagulation of casein component of milk (David, 2016) ^[5]. The best quality of paneer is marble white in color, having a sweetish-acidic-nutty flavor, slight spongy body and close-knit texture (Kharadhbajne and Bhoyarkar *et al.*, 2010) ^[6]. Paneer is highly nutritious as it compose of about 90% fat and protein, 10% lactose of the original milk and 50% minerals (Boghra and Mathur, 1995) ^[7].

Yoghurts are semi-solid fermented milk product obtained from lactic acid fermentation by two species of lactic acid bacteria: *Streptococcus thermophiles* and *Lactobacillus delbrueckii ssp. Bulgaricus*. This fermentation leads to acidification and milk coagulation and allows an increase of the shelf life as a result of the low pH (Corrieu and Beal, 2016) ^[8]. Yoghurt has high medical uses because of the probiotic characteristics, in helping out on a variety of gastrointestinal conditions and in preventing antibiotic associated diarrhea (Mazahreh and Ershidat, 2009) ^[9].

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This study is aimed at conducting a nutritional and physiochemical analysis of coconut milk and to development of paneer and yoghurt by incorporating coconut milk with cow milk in pure and blend form. Then, sensory acceptability of developed products was tested. The nutritional and physiochemical analysis of most acceptable products was done.

2. Materials and Methods

2.1 Preparation of coconut milk

Coconut milk was prepared according to the procedure described by Ladokun and Oni, 2014^[10]. Coconut milk was prepared by breaking the shells and taking the nuts by using a dull knife. The brown skin was removed from the nuts with a knife and the average weight of nuts was 293g. 300g coconut nuts were blended with 200ml of warm water and allowed to stand for 15 minutes. The extract was passed through 0.18mm sieve while the residue was discarded and the milk obtained was eventually refrigerated.

2.2 Food product development

Five variants of paneer and yoghurt were prepared by incorporating cow milk and coconut milk (100:00 cow milk and coconut milk, 40:60 coconut milk and cow milk, 60:40 coconut milk and cow milk, 80:20 coconut milk and cow milk and 100:00 coconut milk and cow milk) in different ratio.

- a) **Paneer:** The preparation of paneer was done by addition of citric acid at the strength of 10%. The method employed for the manufacturing of paneer by direct acidification process. 1 litre of coconut milk was taken in the steel bowl. During the heating of coconut milk occasional stirring was done in order to prevent skin formation. The temperature of milk was raised to 85 °C with holding. Then it was cooled to 75 °C and 10% of citric acid was added with constant slow stirring till the completion of coagulation. The time taken for addition of the coagulation was approximately 40-50 seconds. The whey was drained and the coagulated mass collected and filled in a muslin cloth. Pressure was applied on the top of the coconut paneer by placing weight of 4-5kg for about 15 minute. The pressed coconut paneer was then removed from the muslin cloth and after cutting in 7-8 inches size pieces, it was immersed in chilled water (4 °C-6 °C) for two hours.
- b) **Yoghurt:** The coconut milk was homogenized and heated to 90 °C for 3 minute for pasteurization and held for 30 minutes, and then it was cooled to inoculation temperature of 45 °C in closed vessel. It is then inoculated with a commercial starter culture containing *Streptococcus thermophiles* and *Lactobacillus delbueckii subsp. Bulgaricus* at a rate of 2.5%. The inoculated milk is incubated to 45 °C until a pH of 4.4 was attained in approximately 4 hours. When the pH end point was achieved, it was stored in a 6 °C cold temperature

Table 1: Composition of standard paneer and yoghurt and their variants

Ingredient	S	A	B	C	D
Cow Milk (ml)	100 ml	60 ml	40 ml	20 ml	-
Coconut Milk (ml)	-	40 ml	60 ml	80 ml	100 ml

- S- 100% Standard milk Paneer or Yoghurt
 A- 40% Coconut milk Paneer or Yoghurt
 B- 60% Coconut milk Paneer or Yoghurt
 C- 80% Coconut milk Paneer or Yoghurt
 D- 100% Coconut milk Paneer or Yoghurt

The products (coconut paneer and coconut yoghurt) were then ready for analysis and sensory evaluation.

2.3 Sensory evaluation

The sensory evaluation of each variations of coconut paneer and coconut yoghurt were conducted by 15 semi-trained panel members selected by triangle difference test. Each panelist received 5 samples of freshly prepared coconut paneer and coconut yoghurt to taste, evaluate and comment on sensory characteristics. They were asked to evaluate the appearance, flavor, texture, taste, chewiness, mouth feel and overall acceptability based on a 9 point hedonic scale; like extremely=9, like very much=8, like moderately=7, like slightly=6, neither like nor dislike=5, dislike slightly=4, dislike moderately=3, dislike very much=2 and dislike extremely=1.

2.4 Nutrient analysis

Nutrient analysis was done for coconut milk and the most acceptable paneer and yoghurt by sensory evaluation using standard methods of AOAC (2002)^[16]. Moisture content was determined by drying of sample in an oven at 80 °C for 24 hrs. Crude protein was determined by micro kjeldahl method. Fat and ash content were determined by soxhlet method and dry ashing method, respectively.

2.5 Physico-chemical analysis

Physiochemical analysis was done for coconut milk and the most acceptable paneer and yoghurt by sensory evaluation. pH, specific gravity and solid not fat were determined by using standard methods of Sharma (2008)^[11]. Titrable acidity was determined from the procedure as laid down in manual by NIN (2003)^[12]. Whey separation and Yield paneer were determined by using the procedure given by Lee and Lucey (2010)^[13] and Ojha *et al.*, (2014)^[14] respectively.

2.6 Statistical analysis

The data were processed for the analysis of mean and standard deviation by Microsoft office excel.

3. Results and Discussion

3.1 Proximate composition of coconut milk

Moisture Content: The moisture contents of bovine milk and coconut milk were 87.8 and 85.9 percent respectively (table no.-2). The moisture content of coconut milk was found to be slightly lower than bovine milk.

Protein Content: The results revealed that the protein content of coconut milk was found 1.3g/100g which was lower than the standard cow's milk that contain 3.3g/100g protein content.

Fat Content: The results show that fat content of coconut milk was 8.6 g/100g which was higher than the standard cow's milk that contain 3.3 g/100g fat. The main fat that it contains, lauric acid, that raises blood cholesterol levels by increasing the amount of high- density lipoprotein cholesterol, which is also found in significant amounts in breast milk and has been shown to promote brain development and bone health (Amarasiri and Dissanayake, 2006)^[15].

Ash Content: Ash content of coconut milk was 1.1 g/100g found to be higher in comparison to standard cow's milk which contains 0.7g/100g ash. This is because coconut is a good source of iron, potassium, calcium, magnesium and phosphorus with water soluble and B complex vitamins.

Table 2: Nutritional and Physico-chemical composition in coconut milk

Nutrients/100g	Bovine milk	Coconut milk
Moisture (g)	87.8±0.87	85.9±1.00
Ash (g)	0.7±0.15	1.1±0.01
Fat (g)	3.3±0.57	8.6±1.09
Protein (g)	3.3±0.04	1.3±0.06

Values represents in Mean±SD

3.2 Physico-chemical properties of coconut milk

pH: The pH in coconut milk have been found as 6.00±1.00 which was lower to standard cow's milk pH that contain 6.4±0.4.

Specific gravity: Specific gravity of coconut milk and standard cow's milk were found as 1.05±0.1 and 1.030±0.7 respectively.

SNF: Solid-Not-Fat content was found in coconut milk as 1.20±0.01 percent which was lower than the standard cow's milk that contain 8.2±0.89 percent.

Titration acidity: In the study, titration acidity was observed as 0.09±0.1 percent and 0.15±0.1 percent in coconut milk and standard cow's milk collectively.

Viscosity: The viscosity of coconut milk analyzed as 2.40±0.06 which was higher to standard cow's milk that contain 1.5±0.21.

Total soluble solids: The total soluble solids were found high in coconut milk as 14.06±0.30 percent in comparison to standard cow's milk that contain 12.5±0.34.

Table 3: Physico-chemical characteristics of bovine milk and coconut milk

	Bovine milk	Coconut milk
pH	6.40±0.4	6.0±1.00
Specific gravity	1.03±0.7	1.05±0.10
Solid-not-fat (SNF) (%)	8.20±0.89	1.20±0.01
Titration acidity (%)	0.15±0.1	0.09±0.10
Viscosity	1.5±0.21	2.40±0.06
Total soluble solids (%)	12.5±0.34	14.06±0.30

Values represents in Mean±SD

3.3 Sensory analysis of Coconut paneer and coconut yoghurt

(a) Coconut paneer

The idea of the preparation of coconut paneer in pure form (100% of coconut milk) was not successful.

Sensory analysis results show (table no.- 4) that the mean scores of the 40% of coconut paneer (A) made by coconut milk was found slightly varied at all attributes like color, appearance, flavor, texture, taste, mouth feel, chewiness and overall acceptability as compared to 100% cow's milk standard paneer (S). 40% coconut paneer (A) was liked moderately (7.1±0.87-7.8±0.78).

The results of coconut paneer (B) made by 60% coconut milk and 40% bovine milk was liked very much in attributes like color, appearance, flavor, texture, taste, mouthfeel, chewiness and overall acceptability (8.4±0.69-8.9±0.31 as compared to standard paneer.

The mean scores of sensory evaluation of coconut paneer (C) made of 80% coconut milk was in the range of liked moderately to liked very much in attributes like color,

appearance, flavor, texture, taste, mouthfeel, chewiness and overall acceptability (7.4±0.72-8.1±0.93) as compared to standard paneer.

Therefore it can be seen from the results of the mean scores of the sensory evaluation that coconut paneer (B) made of 60% coconut milk and 40% bovine milk was found to be most acceptable paneer and the accepted coconut paneer got highest scores among the all samples and liked extremely in all sensory attributes by the semi trained panel members on 9 point hedonic scale.

Table 4: Mean sensory score of coconut paneer

Attributes	S	A	B	C
Color	7.6±1.57	7.5±1.08	8.6±0.52	8.1±0.93
Appearance	8.4±1.26	7.4±1.07	8.4±0.69	7.7±0.66
Flavor	8.0±1.41	7.6±0.84	8.9±0.31	7.7±0.83
Texture	8.4±1.26	7.6±0.84	8.5±0.70	7.8±0.78
Taste	8.0±1.41	7.6±0.69	8.5±0.20	7.6±0.70
Mouthfeel	8.2±0.42	7.1±0.87	8.6±0.51	7.6±0.70
Chewiness	8.2±0.42	7.2±0.78	8.7±0.48	7.4±0.72
Overall acceptability	7.9±1.37	7.8±0.78	8.9±0.31	7.6±0.70

Values represents in Mean±SD

(b) Coconut yoghurt

Sensory analysis results show (table no.- 5) that the mean scores of the coconut yoghurt (A) made of 40% coconut milk and 60% bovine milk was in the ranges of liked moderately to liked very much in all attributes i.e. color, appearance, flavor, texture, taste and overall acceptability (7.6±1.50-8.3±0.82) as compared to bovine standard yoghurt (S).

The results of coconut yoghurt (B) made by 60% coconut milk and 40% bovine milk was liked slightly to liked moderately in attributes like appearance, flavor, texture, taste and overall acceptability (6.5±1.5-7.6±1.26), whereas in color attribute it was liked very much (8.1±0.73) as compared to standard yoghurt.

The mean scores of sensory evaluation of coconut yoghurt (C) made of 80% coconut milk and 20% bovine milk was in the range of disliked slightly to like slightly in attributes like appearance, flavor, texture, taste and overall acceptability (4.7±1.25-6.5±1.71), whereas in color was liked moderately (7.4±0.69).

Coconut yoghurt (D) made of 100% of coconut milk was disliked slightly to liked moderately (4.2±1.81- 7.0±0.81) in attributes like color, appearance, texture, taste, flavor and overall acceptability.

Therefore it can be seen from the results of the mean scores of the sensory evaluation that yoghurt (A) made of 40% coconut milk and 60% bovine milk is the most acceptable yoghurt and the standard milk yoghurt got highest scores among the all samples and liked extremely by the semi trained panel members on 9 point hedonic scale.

Table 5: Mean sensory score of coconut yoghurt

Attributes	S	A	B	C	D
Color	8.2±1.03	8.1±0.87	8.1±0.73	7.4±0.69	7.0±0.81
Appearance	8.4±0.69	8.3±0.82	7.6±1.26	6.5±1.71	6.3±1.94
Flavor	8.3±0.67	8.0±0.66	7.5±0.97	5.9±0.73	5.2±1.03
Texture	8.5±0.70	7.6±1.50	6.5±1.50	4.7±1.25	4.2±1.81
Taste	8.3±0.67	7.7±0.67	7.0±0.81	4.7±1.25	4.5±1.43
Overall acceptability	8.3±0.82	8.2±0.63	7.3±0.67	5.3±0.82	4.8±1.13

Values represents in Mean±SD

3.4 Proximate composition of coconut paneer and coconut yoghurt

(a) Coconut paneer

Coconut paneer (B) was most accepted by the panelists. So, nutritional analysis and analysis of physico-chemical properties of this variant was done.

Moisture Content: The moisture content of cow milk paneer and coconut milk paneer was 51.0 ± 0.32 and 46.1 ± 1.0 percent respectively. The moisture content of coconut milk paneer was found to be lower than cow milk paneer.

Protein content: The results reveals that the protein content of coconut milk paneer was found 20.5 ± 1.10 g/100g which was lower than the standard cow's milk paneer that contain 15.2 ± 1.0 g/100g protein content.

Fat content: The results show that fat content of coconut milk paneer was 25.6 ± 1.0 g/100g which was higher than the standard cow's milk paneer that contain 24.5 ± 0.43 g/100g fat.

Ash content: Ash content of coconut milk paneer was 0.9 ± 0.1 g/100g found to be lower in comparison to standard cow's milk paneer which contains 1.1 ± 0.12 g/100g ash.

Table 6: Proximate composition of most acceptable variant of coconut paneer

Nutrients/100g	Standard paneer	Coconut paneer
Moisture (g)	51.0 ± 0.32	46.1 ± 1.0
Ash (g)	1.1 ± 0.12	0.9 ± 0.1
Fat (g)	24.5 ± 0.43	25.6 ± 1.0
Protein (g)	20.5 ± 1.0	15.2 ± 1.10

Values represents in Mean \pm SD

(b) Coconut yoghurt

The coconut yoghurt (A) was most accepted by the panel members and since coconut yoghurt (A) was going further chemical testing.

Moisture content: The moisture contents of cow milk yoghurt and coconut milk yoghurt were 86.81 ± 0.30 and 85.2 ± 0.56 percent respectively. The moisture content of coconut milk was found to be lower than cow milk yoghurt.

Protein content: The results reveals that the protein content of coconut milk yoghurt was found 3.1 ± 0.30 g/100g which was lower than the standard cow's milk yoghurt that contain 4.62 ± 0.09 g/100g protein content.

Fat content: The results show that fat content of coconut milk yoghurt was 4.9 ± 0.20 g/100g which was higher than the standard cow's milk yoghurt that contain 3.47 ± 0.2 g/100g fat.

Ash content: Ash content of coconut milk yoghurt was 0.9 ± 0.15 g/100g found to be higher in comparison to standard cow's milk which contains 0.63 ± 0.04 g/100g ash.

Table 7: Proximate composition of most acceptable variant of coconut yoghurt

Nutrients/100g	Standard yoghurt	Coconut yoghurt
Moisture (g)	86.81 ± 0.56	85.2 ± 0.30
Ash (g)	0.63 ± 0.04	0.9 ± 0.15
Fat (g)	3.47 ± 0.2	4.9 ± 0.20
Protein (g)	4.62 ± 0.09	3.1 ± 0.30

Values represents in Mean \pm SD

3.5 Physico-chemical composition of coconut paneer and coconut yoghurt

(a) Coconut Paneer

pH: The pH in coconut paneer have been found as 5.2 ± 0.1 which was lower to standard paneer pH that contain 5.7 ± 0.05 .

SNF: Solid-Not-Fat content was found in coconut paneer as 5.4 ± 0.02 percent which was lower than the standard paneer that contain 7.5 ± 0.1 percent.

Titration acidity: In the study, titration acidity was observed as 0.05 ± 0.01 percent and 0.02 ± 0.2 percent in coconut paneer and standard paneer collectively.

Yield paneer: The quantity of yield paneer of coconut paneer found as 15.79 ± 0.31 which was lower to standard paneer that contain 20.52 ± 0.56 .

Table 8: Physico-chemical characteristics of most acceptable variant of coconut paneer

	Standard paneer	Coconut paneer
pH	5.7 ± 0.05	5.2 ± 0.1
Solid-not-fat (SNF) (%)	7.5 ± 0.1	5.4 ± 0.02
Titration acidity (%)	0.02 ± 0.2	0.05 ± 0.01
Yield paneer (%)	20.52 ± 0.56	12.79 ± 0.32

Values represents in Mean \pm SD

(b) Coconut yoghurt

pH: The pH in coconut yoghurt have been found as 4.5 ± 0.1 which was same as standard yoghurt pH that contain 4.6 ± 0.4 .

Specific gravity: Specific gravity of coconut yoghurt and standard yoghurt were found as 1.02 ± 0.01 and 1.05 ± 0.02 respectively.

SNF: Solid-Not-Fat content was found in coconut yoghurt as 8.3 ± 0.1 percent which was lower than the standard yoghurt that contain 6.28 ± 0.1 percent.

Titration acidity: In the study, titration acidity was observed as 4.5 ± 0.3 percent and 0.44 ± 0.01 percent in coconut milk and standard cow's milk collectively.

Whey separation: Whey separation measured in coconut yoghurt as 4.0 ± 0.67 percent which was higher than standard yoghurt that contain 2.1 ± 0.5 percent.

Table 9: Physico-chemical characteristics of most acceptable variant of coconut yoghurt

	Standard yoghurt	Coconut yoghurt
pH	4.6 ± 0.4	4.5 ± 0.1
Specific Gravity	1.05 ± 0.02	1.02 ± 0.01
Solid-not-fat (SNF) (%)	8.3 ± 0.1	6.28 ± 0.1
Titration acidity (%)	4.5 ± 0.3	0.44 ± 0.01
Whey separation (%)	2.1 ± 0.5	4.0 ± 0.67

Values represents in Mean \pm SD

4. Conclusion

Increasing urbanization has accelerated these demands; concerted research effort in functional and speciality beverages for newer products is the recent trend. Coconut milk and its products: coconut paneer and coconut yoghurt compares well with cow milk and its products in terms of

nutritional, sensory and physico-chemical evaluation. Coconut milk is lactose free and comes from the fruit that is a rich source of fibre, vitamin C, and many minerals. Coconut milk contains medium-chain triglycerides (MCTs) which is easily digestible and it work to reduce body weight. Coconut milk increases the levels of good cholesterol and high-density lipoprotein cholesterol (HDL) which protects the heart. Lauric acid present in coconut milk acts as anti-blenorrhagic, anti-bronchitis, anti-gingivitic, anti-viral and antibacterial agents.

5. References

1. Sangamithra A, Swamy GJ, Sorna PR, Chandrasekar V, Sasikala S, Hasker E *et al.* Coconut: an extensive review on value added products. *Indian Food Industry Magazine.* 2013; 32(6):29-38.
2. Alyaqoubi S, Abdullah A, Samudi M, Abdullah N, Addai ZR, Musa KH *et al.* Study of antioxidant activity and physicochemical properties of coconut milk (Pati santan) in Malaysia. *Journal of Chemical and Pharmaceutical Research.* 2015; 7(4):967-973.
3. Narataruksa P, Pichitvittayakarn W, Heggs PJ, Tia S. Fouling behavior of coconut milk at pasteurization temperatures. *Applied Thermal Engineering.* 2010; 30(11-12):1387-1395.
4. Tansakul A, Chaisawang P. Thermophysical properties of coconut milk. *Journal of Food Engineering.* 2006; 73(3):276-280.
5. David J. Studies on physicochemical quality and microbial parameters of functional coconut paneer. *The Pharma Innovation.* 2016; 5(2):9.
6. Karadbhajne SV, Bhoyarkar P. Studies on effect of different coagulant on paneer texture prepared from buffalo milk. *International Journal Pharm Tech Research.* 2010; 2:1916-192.
7. Boghra VR, Mathur ON. Physico-chemical status of major milk constituents and minerals at various stages of paneer preparation. *Indian journal of dairy science.* 1995; 48:688-692.
8. Corrieu G, Beal C. Yoghurt: The product and its manufacture. *Encyclopedia of food and health.* 2016; 5:617-624.
9. Mazahreh AS, Ershidat OTM. The benefits of lactic acid bacteria in yogurt on the gastrointestinal function and health. *Pakistan Journal of Nutrition.* 2009; 8(9):1404-1410.
10. Ladokun O, Oni S. Fermented milk products from different milk types. *Food and Nutrition Sciences.* 2014; 5:1228-1233.
11. Sharma S. Experiments and techniques in biochemistry. Galgotia publication Pvt. Ltd. New Delhi, 2008, 97-98.
12. Raghuramulu N, Madhavan NK, Kalyanasundaram S. A manual of laboratory techniques, National Institute of Nutrition. Indian Council of Medical Research, Hyderabad, India, 2003, 56-58.
13. Lee WJ, Lucey JA. Formation and physical properties of yogurt. *Asian-Australasian Journal of Animal Sciences.* 2010; 23(9):1127-1136.
14. Ojha P, Karki TB, Maharajan S. Effect of sprouting in physio-chemical properties of tofu. *Journal of Nutritional Health & Food Engineering.* 2014; 1(2):1-8.
15. Amarasiri WA, Dissanayake AS. Coconut fats. *The Ceylon medical journal.* 2006; 51(2):47-51.
16. AOAC. Official method of analysis of the association of official analytical chemists, 20th ed. USA, 2002, 1058-1059.