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## Research Article

### PREPARATION OF PANEER FROM COCONUT MILK, ITS QUALITY CHARACTERISTICS AND SHELF LIFE

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#### ABSTRACT

The coconut is truly one of nature's natural wonders. Coconut milk is immensely rich in vitamins and minerals. The objective of the study is to develop paneer using coconut milk and evaluate its quality characteristics and shelf life. The present study was undertaken with different proportions of cow's milk and coconut milk. The product was analyzed for organoleptic characteristics (colour, texture, taste, flavour and overall acceptability) using a 5 point Hedonic scale. Physicochemical, microbial and nutrient analysis were carried out on prepared paneer. Results showed that there was a significant difference in the flavour, taste and overall acceptability between the paneer made with coconut milk and cow's milk. The paneer prepared with 50:50 ratio of cow's milk and coconut milk was found to be the best. The paneer prepared at 50:50 ratio cow's milk and coconut milk is a value added product and recommended to be manufacturing in large scale.

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#### INTRODUCTION

Coconut milk is extracted from freshly grated coconut meat. Coconut milk contains 3.01% calcium, 332 Kcal energy, 56.23% lauric acid, 54% moisture, 35% fat and 11% solid non fat (Tansakul and Chaisawang, 2006). Coconut milk is immensely rich in vitamins and minerals. Coconut milk contains high levels of some of the crucial minerals like, iron, calcium, potassium, magnesium and zinc. It also contains a significant amount of vitamin C and E. Coconut milk also contains several antioxidant compounds, which can provide protection against the harmful free radicals and their damaging effects on the body cells and tissues. Paneer is an acid-coagulated cottage cheese type product prepared by curdling heated milk (normally from a cow or buffalo) with lemon juice or food acids. It has a mild acidic, sweet, nutty flavour with a firm body and smooth texture (Paril and Gupta, 1987). Paneer is popular throughout South Asia, used in raw form or in preparation of several varieties of culinary dishes and snacks. The production of paneer is now spreading throughout the world. The ability of paneer to be deep fried is one feature that has led to its wider acceptance and a favourite for making snacks, pakoras or fried paneer chunks (Aneja, 2007). Paneer is a rich source of animal protein available at a comparatively lower cost and forms an important source of animal protein for vegetarians. In the present study, coconut milk is used for the

preparation of paneer in various combinations with cow's milk for making value added product. The objective of the study is to develop paneer using coconut milk and to evaluate its quality characteristics and its shelf life.

#### MATERIALS AND METHODS

##### Preparation of Paneer from Coconut Milk

Coconut milk was prepared from fresh coconut kernels. Cow's milk was blended with coconut milk in the ratio of 75:25, 50:50, 25: 75 and 0:100 (Table-I). The blended milk was then heated to 82°C and cooled to 72°C. It was then coagulated with vinegar. Whey was drained off from the curd and pressed. The paneer was dipped in chilled water (4-5°C) for 2-3 hours and it was then kept for draining for 10 minutes to drain off loose water (Plate-1). Four variants of the paneer were developed using the cow's milk and coconut milk blend as per Table I and with 100% coconut milk. They were coded as variant 1 (VP1), variant 2 (VP2) variant 3 (VP3) and variant 4 (VP4). Paneer was wrapped in butter paper and packaged in polyethylene pouches, heat sealed and stored under refrigerated conditions. The samples were then organoleptically evaluated by 10 semi trained panellists using a five point hedonic scale. The most acceptable variant and standard paneer (S) were analyzed in triplicates for physicochemical characteristics, nutrient content, microbial and organoleptic qualities on storage period.

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Plate -1 Coconut Milk Paneer

### Shelf Life Study

The shelf life namely microbial analysis and organoleptic evaluation of the most acceptable variant and SP were analysed on the 0<sup>th</sup> day and periodically every alternate day. The physicochemical properties and nutrient content were analysed on the 0<sup>th</sup> day and on the last day of storage.

### Physicochemical Analysis of Paneer

The paneer (SP and the most acceptable variant) was analysed for pH (using digital pH meter, AOAC, 1990), total solids (gravimetric method, AOAC, 2000), moisture (hot air oven method, AOAC, 1980), protein (microkjeldhal method, AOAC 2000) and fat (Soxhlet Method, AOAC, 1970) in triplicates on the 0<sup>th</sup> day and on the last day of storage.

### Nutrient Analysis of Paneer

Nutrients namely energy (differential calculation, AOAC, 1980), carbohydrate (Anthrone method, 1962), calcium (titrimetric method, AOAC, 1980) and iron (Wong's method, 1928) were analysed in triplicates for SP and the most acceptable variant on the 0<sup>th</sup> day and on the last day of storage.

### Microbial Analysis of Paneer

Total plate count of the prepared samples namely SP and the most acceptable variant was determined (Harrigan and Mc Lance, 1966).

### Organoleptic Evaluation of Paneer

The packed samples were evaluated organoleptically for sensory attributes by a semi trained panel for colour and appearance, flavour, taste, texture, and overall acceptability using 5-point Hedonic Scale on every alternate day.

Table- I Composition of Paneer/100g

Ingredient	Standard Paneer (SP)	Variants (Coconut Milk Paneer)			
		VP1	VP2	VP3	VP4
Cow's milk(ml)	100	75	50	25	-
Coconut milk(ml)	-	25	50	75	100
Vinegar (ml)	2	2	2	2	2

On the 17<sup>th</sup> day of evaluation, the panel members were of the opinion that the acceptability of the paneer had reduced to such an extent that further organoleptic evaluation could not be

carried out. Therefore the shelf life study was terminated on the 17<sup>th</sup> day.

## RESULTS AND DISCUSSION

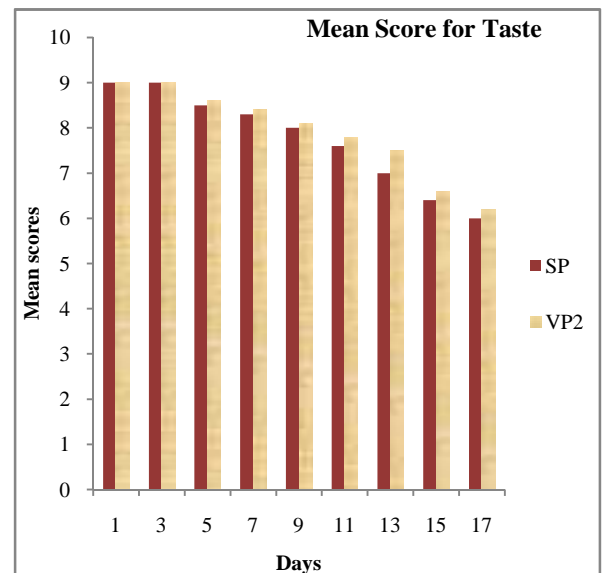
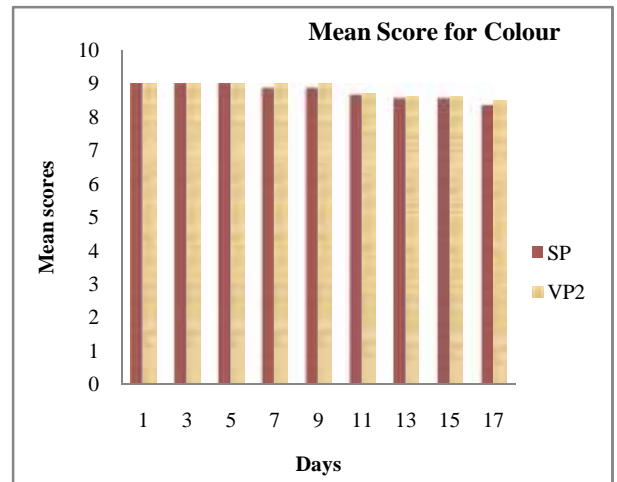
### Results of Organoleptic Evaluation

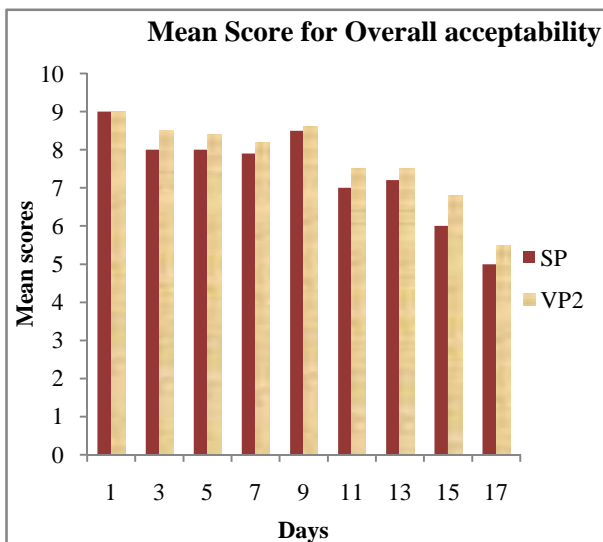
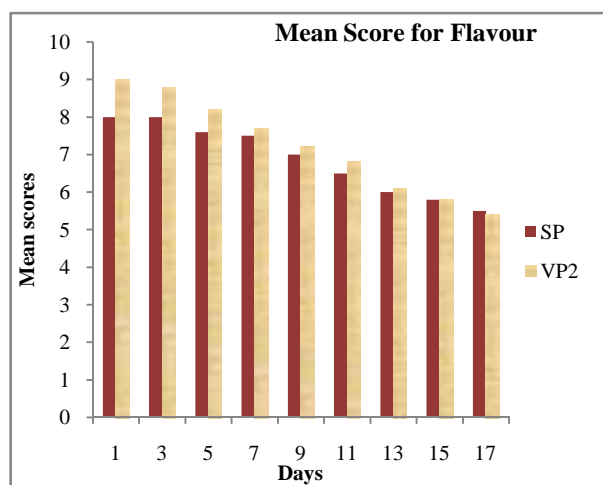
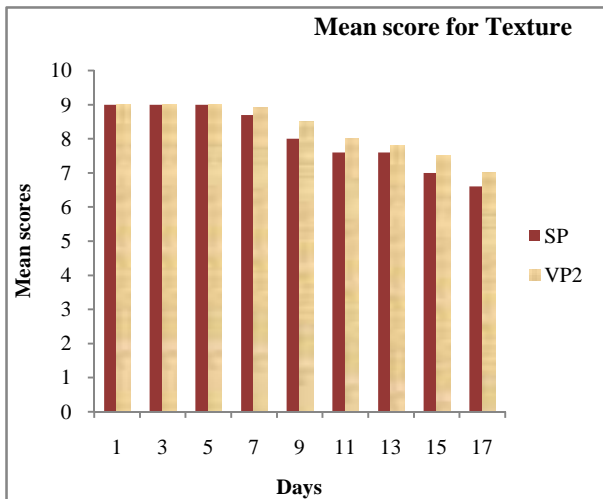
The four variants (VP1, VP2, VP3 and VP4) and SP were organoleptically evaluated (Table II). From the scores, it is clear that VP2 had obtained the maximum mean score for colour, texture, taste, flavour and overall acceptability. Therefore the variant VP2 was selected for the shelf life study and compared with SP.

### Results of Shelf Life Study

#### Organoleptic parameters

Figure 2 Mean Organoleptic Scores of Paneer on Different Storage Period





The mean organoleptic scores obtained by SP and VP2 (Figure 2) for colour upto 5<sup>th</sup> day were the same (9.0) and on storage a decreasing trend in the mean scores of both the food samples was observed. On the 17<sup>th</sup> day, the mean scores of SP (8.3) was lower than VP2 (8.5). Same trend was also observed by Bhadekar *et al.* (2008) in paneer made from buffalo milk added with sago powder of varying levels. Sachdeva and Singh (1988) had recorded the score for appearance to be between 7.4 to 7.6 for the paneer with addition of pregelatinized potato

starch. SP and VP2 had obtained the same mean scores of 9.0 upto 5<sup>th</sup> day for texture and on the 17<sup>th</sup> day the mean score of SP (4.0) was lower than VP2 (4.2). Sachdeva and Singh (1988) who studied the incorporation of hydrocolloids on paneer reported the scores between 7.50 to 8.10 for body and texture. The mean scores for taste of SP and VP2 was same till 3<sup>rd</sup> day (9.0) which gradually decreased to 6.0 and 6.2 respectively. Gadhve (2000) who prepared paneer from safflower milk incorporated with buffalo milk also found a decrease in taste score. The mean scores for flavour of SP and VP2 were 8.0 and 9.0 respectively on 0<sup>th</sup> day. Similar score of 8.50 for flavour was also reported by Roy and Singh (1994) in their study on production of filled paneer. On storage a decreasing trend was observed, and on the 17<sup>th</sup> day it was as low as 5.5 and 5.4 in SP and VP2 respectively. This decrease in score on the final day for paneer sample may be due to loss of flavour components and with the advancement of storage period a pronounced coconut flavour was also observed in VP2, which is the prime reason for the lower score obtained by VP2. In SP, the release of slight acidic flavour reduced the mean scores on storage. The mean scores for overall acceptability of VP2 and SP was the same (9.0) on 0<sup>th</sup> day. On storage a decrease in the mean scores was seen in both the food samples (SP- 5.0, VP2- 5.5), yet VP2 was more acceptable than SP. Thus in terms of sensory quality, the study revealed that paneer made with coconut milk at a level of 50% incorporation was almost as acceptable as control samples. The addition of coconut milk for the production of paneer is more acceptable. Similar results have been reported by Shahnawaz *et al.* (2012) in paneer made from milk powder of varying levels. However Gadhve (2000) has reported a decrease in acceptability in paneer prepared from buffalo milk and safflower milk blend. From the above results, it is clear that the organoleptic scores for flavour, taste and overall acceptability had considerably reduced on the 17<sup>th</sup> day. The panel members opined that a characteristic coconut flavour emanated from VP2 on the 17<sup>th</sup> day. Therefore, the shelf life study was terminated on the 17<sup>th</sup> day.

Statistical analysis indicate a significant difference (p 0.01) observed between groups and group Vs days for taste, texture, flavor and overall acceptability. However colour Vs day was not statistically significant.

#### Physico-Chemical Properties

As per the Table-II the TS content of SP was higher than VP2 on 0<sup>th</sup> day and the same was observed on 17<sup>th</sup> day but there was no significant difference observed on storage. The total solids are an indication of the dry matter content of the paneer. The total solids results of this study are in agreement with the findings of Chauhan *et al.* (2016) in paneer enriched with coconut milk powder. The pH of SP and VP2 was 5.20 and 5.18 respectively on 0<sup>th</sup> day, on storage it decreased significantly to 3.90 and 4.18 for SP and VP2 respectively. The moisture content of SP (52.19%) was higher than VP2 (47.61%) on 0<sup>th</sup> day. On storage the increase in the moisture level of SP was higher; however a decrease was found in VP2 but not statistically significant. The moisture content of VP2 was similar to the findings of David (2012) who reported 51.94 - 52.92% for paneer made from coconut milk and buffalo milk blends.

**Table-II** Physicochemical Properties of Standard and VP2

Parameter	0 <sup>th</sup> Day		17 <sup>th</sup> Day		‘t’ Value		0 <sup>th</sup> day SP Vs VP2	17 <sup>th</sup> day SP Vs VP2
	SP	VP2	SP	VP2	SP 0 <sup>th</sup> day Vs 17 <sup>th</sup> day	VP2 0 <sup>th</sup> day Vs 17 <sup>th</sup> day		
Total solids (TS)	46.32	45.0	46.1	44.80	0.341 <sup>NS</sup>	0.572 <sup>NS</sup>	1.864 <sup>NS</sup>	5.060**
pH	5.20	5.18	3.90	4.18	12.109**	83.482**	0.573 <sup>NS</sup>	2.782*
Moisture	52.19	47.6	52.5	47.05	1.268 <sup>NS</sup>	1.792 <sup>NS</sup>	14.626**	19.918**

\*\*-Significance at p 0.01, NS-Not Significant

**Table III** Nutrient Content of Paneer/100g

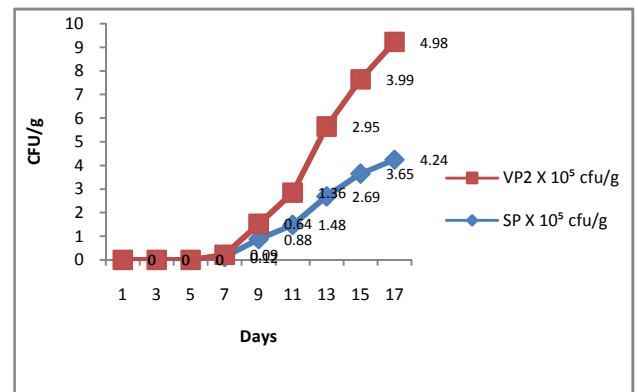
Nutrients	0 <sup>th</sup> Day		17 <sup>th</sup> Day		‘t’ Value	
	SP	VP2	SP	VP2	SP 0 <sup>th</sup> day Vs 17 <sup>th</sup> day	VP2 0 <sup>th</sup> day Vs 17 <sup>th</sup> day
Energy (Kcal)	319.84	322.38	316.7	318.85	6.300**	14.195**
Carbohydrate (g)	1.09	1.00	1.06	0.64	1.591 <sup>NS</sup>	10.392**
Protein (g)	21.00	21.86	20.56	21.72	0.412 <sup>NS</sup>	0.691 <sup>NS</sup>
Fat (g)	25.72	25.66	25.58	25.49	0.141 <sup>NS</sup>	0.209 <sup>NS</sup>
Iron (mg)	0.33	0.40	0.32	0.37	0.142 <sup>NS</sup>	0.735 <sup>NS</sup>
Calcium (mg)	208.00	212.00	207.34	210.15	1.116 <sup>NS</sup>	3.042**

\*\*Significance at p 0.01, NS-Not Significant

The energy content of SP (319.84 Kcal) (Table III) was lower than VP2 (322.38 Kcal) on 0<sup>th</sup> day and also on 17<sup>th</sup> day (SP-316.7 Kcal, VP2- 318.85 Kcal). The energy content increased with the increase of the storage period and it was statistically significant. The carbohydrate content was 1.09g and 1.00g for SP and VP2 respectively on 0<sup>th</sup> day which decreased in both SP and VP2 on 17<sup>th</sup> day. The carbohydrate content of VP2 was significantly (p 0.01) higher than SP on both 0<sup>th</sup> day and 17<sup>th</sup> day. The fat content was 25.72g and 25.66g for SP and VP2 respectively on 0<sup>th</sup> day. On comparing its level between 0<sup>th</sup> day and 17<sup>th</sup> day a marginal decrease was observed and was not significant on storage. The protein content of VP2 (21.86g) was slightly higher than SP (21.00g) on the 0<sup>th</sup> day. A loss in protein content was observed on storage in both SP and VP2 and there was no significant difference seen between groups. The values of SP are similar to the findings of Masud *et al.* (1992) who also reported a protein level of 21.23g in the paneer made from cow’s milk. Babje *et al.* (1992) also reported that paneer prepared by blending soymilk showed higher protein content than cow’s milk paneer. Biswas *et al.* (2002) also reported that cow’s milk and soymilk blended paneer to have higher protein and low fat and carbohydrate content than the paneer with cow milk. The iron content of VP2 (0.40mg) was higher than SP (0.33mg) on 0<sup>th</sup> day and in both there was a decrease on 17<sup>th</sup> day. The calcium content of VP2 (212.00mg) was higher than SP (208.00mg), on 0<sup>th</sup> day and on 17<sup>th</sup> day (SP-207.34mg, VP2-210.15mg). On storage, a small decrease in the calcium content of both SP and VP2 was observed.

The calcium content of VP2 was significantly (p 0.01) higher than SP on both 0<sup>th</sup> day and 17<sup>th</sup> day.

**Microbial Analysis**



**Figure-1** Total Plate Count

The microbial count of SP and VP2 (Table IV) was too low to count upto 5<sup>th</sup> day of storage. On 7<sup>th</sup> day, the microbial count SP and VP2 was 0.12 X10<sup>5</sup> cfu/g and 0.09 X 10<sup>5</sup> cfu/g respectively. From 13<sup>th</sup> day of storage, the microbial count of SP and VP2 showed a sharp increase and on 17<sup>th</sup> day of storage the microbial growth of SP and VP2 was 4.24 X 10<sup>5</sup> cfu/g and 4.98 X 10<sup>5</sup> cfu/g respectively. The microbial count of SP and VP2 was within the level given by Bureau of Indian Standards (BIS 1983) limits (<5×10<sup>5</sup>/g). Thus the product proved to be of good quality upto 17 days of storage.

Results of one way ANOVA showed significant difference in the microbial count of SP and VP2 on comparison between 0<sup>th</sup> day and 17<sup>th</sup> day.

**CONCLUSION**

Paneer made with Coconut milk had higher protein, calcium and iron as compared to standard paneer and can therefore be helpful for people suffering from malnutrition. From the present investigation it may be concluded that an acceptable paneer can be prepared by using cow’s milk and coconut milk blend (upto 50% substitution). This product will have a good

**Table-IV** Microbial Count of Paneer

Days	SP X 10 <sup>5</sup> cfu/g	VP2 X 10 <sup>5</sup> cfu/g
1	TLTC	TLTC
3	TLTC	TLTC
5	TLTC	TLTC
7	0.12	0.09
9	0.88	0.64
11	1.48	1.36
13	2.69	2.95
15	3.65	3.99
17	4.24	4.98

TLTC-Too Low To Count

market potential for Indian market. This in turn will promote the economy of the country by providing revenue for farmers.

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