

Nutritional and Quality Assessment of Peanut Milk Blend

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Abstract

Peanut (*Arachis hypogaeae*) is an annual herbaceous plant belonging to family leguminosae. Parachinar variety of peanut was used in this study. Both roasted and raw peanuts were used to prepare milk. To improve taste and overall acceptability, various times and temperatures of soaking were used. It was found that soaking of roasted peanuts in ordinary water with pH 7 for 1 hour at 40°C gave good results. Peanut milk was prepared by grinding the pre-shelled and pre-soaked roasted peanuts in an osterizer with same amount of simple water. The resulting slurry was then diluted with water so that 100 g shelled peanuts produced 100 ml of peanut milk. The peanut milk was then blended with various levels of skim milk powder and sugar. The blending levels of skim milk and sugar @ 10% and 1% on total solid basis of peanut respectively were more stable and acceptable as compared to other treatments. Further for nutritional value, the peanut milk from roasted peanuts so prepared was compared with cow's milk, regarding different nutrients. The results showed that the peanut milk blend had more protein contents and minerals like Mg, K and Fe than cow's milk.

Key words: Peanut milk, Protein, Mg, Fe, Cow's milk, Roasted peanut

Introduction

Peanut (*Arachis hypogaeae*) is an ancient annual herbaceous plant belonging to Popilionaceae, a suborder of the family leguminosae. Arachis is a Greek word for a legume and hypogaeae means underground. So it is also known as groundnut. Peanut is grown in tropical countries and warmer parts of the temperate zone. Major producing countries are Argentina, Brazil, Burma, China, India, Indonesia, Mali, Nigeria, Senegal, South Africa and United States (Lambou *et al.*, 1963).

Total annual production of peanut in Pakistan ranges from 60,000 – 70,000 tones (Hatam and Abbasi, 1994). This plant is of great importance agriculturally because every part of the plant is directly or indirectly useful. Possibly, no other crop in the world has as many combined advantages as peanut. Peanut and its products are consumed by infants, laboring people, under weight people and people without teeth (Woodroof, 1966). Peanut is highly nutritious and it has been found that one pound of peanut butter contains more calories, protein, minerals and vitamins than one pound of beef steak. This is also an excellent source of vitamins B-complex, vitamin E and essential amino acids. One gram of peanut provides 25 kJ energy compared to pure sugar (17kJ), polished rice (15 kJ) and maize (14.7 kJ) (Oyengu, 1968).

Dry roasted, fried or boiled peanuts are excellent when eaten alone and are ideally suited to combine with other commonly used foods. Among these, peanut milk compares favorably well with cow's milk and may be used as substitute. Peanut milk is white in color, can be pasteurized or boiled without any sedimentation. The acceptability of this milk has been found to depend upon the color, absence of undesirable flavor, taste, mouth feel and likeness (Chandrasekhara *et al.*, 1971). Presently, almost the whole crop is being utilized as roasted peanut and practically there is no preparation of peanut milk in Pakistan. The present study was therefore designed to prepare "peanut milk" and to undertake its quality evaluation. The main objectives were to chalk out the best time and temperature and pH level of water for soaking; to carry out the physico-chemical analysis of peanut milk and to determine the acceptability of peanut milk through sensory evaluation.

Materials and Methods

The raw materials used and procedures employed during the research work are described in detail as follows:

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Table 1: Selection of best treatment regarding time and temperature and pH level for soaking of roasted peanut in water separately.

	Different Times and Temperatures of Water	Different pH Levels of Water
T0		Simple water with pH7
T1	40° C temperature for 1 hour	Simple water with pH3 adjusted by adding citric acid
T2	40° C temperature for 2 hours	Simple water with pH4 adjusted by adding citric acid
T3	40° C temperature for 3 hours	Simple water with pH5 adjusted by adding citric acid
T4	50° C temperature for 1 hour	Simple water with pH6 adjusted by adding citric acid
T5	50° C temperature for 2 hours	Simple water with pH8 adjusted by adding NaHCO ₃
T6	50° C temperature for 3 hours	Simple water with pH9 adjusted by adding NaHCO ₃
T7	60° C temperature for 1 hour	
T8	60° C temperature for 2 hours	
T9	60° C temperature for 3 hours	
T10	70° C temperature for 1 hour	
T11	70° C temperature for 2 hours	
T12	70° C temperature for 3 hours	

Table 2: Selection of Best Ratio of Skim Milk Powder and Sugar with Peanut Milk Separately.

Treatments	Peanut milk and Skim milk Ratio		Peanut milk and Sugar Ratio	
	Peanut milk (%)	Skim milk (%)	Peanut milk (%)	Sugar (%)
T0	100	0	100	0
T1	95	5	99	1
T2	90	10	98	2
T3	85	15	97	3
T4	80	20	96	4
T5	75	25	95	5
T6	70	30	-	-

a. Raw Materials

Skim milk powder, citric acid, NaHCO₃, sugar and raw and roasted (var. Parachinar) peanuts were purchased from local market.

b. Chemical Analysis of Roasted and Raw Peanut

Raw and roasted peanuts were chemically analyzed according to the methods of AOAC (1990) for moisture, ash, crude protein, fat and fiber and nitrogen free extract (NFE) contents.

c. Method of Preparation of Peanut Milk

One of the main objectives in launching this project was to prepare highly acceptable and easily drinkable peanut milk. For this purpose, different trials/treatments were conducted (Table-1) to chalk out the best time, temperature and pH level of water for soaking of roasted peanuts.

After soaking, each treatment of both time and temperature was blended in an Osterizer, passed through homogenizer by adding water at peanut water ratio 1:5. Each sample was then evaluated for taste and flavor on 9-point hedonic scale rating by a panel of five judges. The best time and temperature of water were

selected statistically that was; soaking of peanut for one hour at 40°C.

d. Selection for pH level

Peanut was soaked in water at various pH levels at 40°C for 60 minutes; pH of water was adjusted with citric acid and NaHCO₃. Milk was prepared and again evaluated by a panel of judges. The best time, temperature and pH level were; soaking of peanut in water of pH 7 for one hr at 40°C.

e. Blending of Peanut Milk with Skim Milk Powder and Sugar Ratios to increase its Overall Acceptability

After preparing the peanut milk, skim milk powder and sugar were added in different ratios as given in Table 2.

f. Comparison between Peanut milk blend and Cow's milk

Comparative study was carried out by analyzing both peanut milk blend and cow's milk for protein, fat, ash, specific gravity, pH, acidity and mineral elements such as Na, K, Fe, Mg and Ca according to the methods of AOAC (1990). The sensory evaluation was also carried out by applying the methods devised by Land and

Shepherd (1988). Data thus obtained was subjected to statistical analysis by using Analysis of Variance Techniques (Steel and Torrie, 1983)

Results and Discussion

This project was planned to develop the methodology for the preparation of peanut milk blend from roasted peanut with an improved taste and flavor and hence to make vegetable based milk. For this purpose, the following procedures were adopted.

a. Chemical Composition of Roasted and Raw Peanuts

Chemical composition of raw and roasted peanut (Var. Parachinar) has been given in Table 3. The results showed that the roasted peanuts contained crude protein 25%, crude fibre 3%, ash 2.6%, crude fat 42%, moisture 18% and NFE 9.4%, while raw peanuts have protein 21.8%, fat 41%, fibre 3.1%, ash 3.1, moisture 23% and NFE 8.6%. Whole composition is in the range as given by Hoffpauir (1987) who summarized the work of various scientists. However, moisture is more which may be due to the reason that research work was conducted in rainy season. Increase and decrease of nutrients after roasting is supported by the results of Sekhan *et al.*, (1972).

b. Selection of Best Time and Temperature and pH Level for Soaking of Roasted Peanut

Before the preparation of pH 7.0 milk, a trial was conducted to chalk out the best time and temperature and pH level of water required to soak the roasted peanuts. This evaluation was based on the sensory parameters such as taste and flavor, the results of which are given in Table 4.

The data revealed that the highest mean score was awarded to T1 (7.8 and 8.0) while the lowest score was obtained by T12 (.6 and 4.0) for taste and flavor, respectively. Analysis of variance for effect of time and temperature on taste and flavor of peanut milk showed non-significant results among the judges and highly significant among the treatments. Treatment T1 was then selected for further studies i.e. soaking of peanut at 40°C for 1 hour in water.

Similarly, regarding pH level, the results showed that the highest mean values were obtained by T0 (7.8 and 8.2) and the lowest by T3 (5.6) in case of taste and T2 (5.6) in case of flavor. Analysis of variance for the effect of different pH levels showed that the judges are non-significant to each other, whereas, the treatments are highly significant. Similar results were also obtained by Irfan (1993) and Beuchat and Nail (1978).

c. Addition of Skim Milk Powder and Sugar in Peanut Milk to Increase its Overall Acceptability

The scores given by the judges to the peanut milk blended with various percentages of skim milk powder and sugar have been given in Table 5, which showed

that T2 with 10% skim milk has been awarded the highest scores which are 7.8 and 8.2 for taste and flavor respectively. Similarly in case of sugar the highest mean value were obtained by T1 (7.0 and 7.4) with 1% sugar followed by T0 (without sugar) for both taste and flavor respectively. These results are supported by the work of Beuchat and Nail (1978) who added 2% sugar in peanut milk. The analysis of variance data (Table 5) showed that the judges are statistically non-significant, whereas, the treatments are highly significant to each other.

d. Comparison between Peanut milk blend and Cow's milk

i. Physico-chemical Comparison.

The comparison between physico-chemical attributes of cow's milk and peanut milk blend is given in Table 6. The results showed that peanut milk has protein 5.02%, ash 0.62%, and fat 2.16%. While protein content of cow's milk was found to be lesser. Fat contents were slightly higher and ash was almost same. The acidity of peanut milk blend was lesser whereas the pH values for both were almost similar. Peanut milk blend was found to have more Fe, K, Mg while lesser in Ca and Na.

ii. Sensory Comparison

a. Comparison between Colors

The scores given by the judges to peanut milk blend and cow's milk for color, taste, flavor and overall acceptability are given in Table 7. They ranked peanut milk blend as good having mean score 6.60 and cow's milk as very good 8.00.

b. Comparison between Flavors

The scores given by the judges to the peanut milk blend and cow's milk for flavour are given in Table 7. They considered the flavour of peanut milk as good having mean score 6.60 and cow's milk as very good 7.60.

c. Comparison between Tastes

The scores given by the judges to the peanut milk blend and cow's milk for taste are given in Table 7. All the judges have the same opinion about taste of peanut milk blend and cow's milk. They considered peanut milk blend as good having mean score 6.60 and cow's milk as very good 8.00.

d. Comparison between Overall acceptability

The scores given by judges to the peanut milk blend and cow's milk for overall acceptability are given in Table 7. The analysis of variance showed that all the judges have same opinion about overall acceptability of peanut milk blend and cow's milk. They ranked final product second having mean score of 7.40 and cow's milk first with mean score of 8.40.

E. Conclusion

It is concluded from this study that peanut milk made from the soaking of peanut in water at 40°C for 1 hour at pH 7 was selected the best.

Skim milk @ 10% and sugar @ 1% out of various levels were selected the most acceptable. The resulting

peanut milk was then comparable with cow's milk in its chemical composition and sensory characteristics.

Table 3: Composition of Roasted and Raw Peanut

Constituents	Roasted	Raw
Crude Protein %	25.0	21.8
Crude Fat %	42.0	41.2
Ash %	2.6	2.3
Crude Fiber %	3.0	3.1
NFE %	9.4	8.6
Moisture %	18.0	23

Table 4: Effect of soaking time and temperature and pH values on the taste of different treatments of peanut milk

No. of Treatments														
	T0	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	F- value
No. of Judges	Effect of soaking time and temperature on taste of peanut milk													
1		8.0	7.0	8.0	6.0	7.0	6.0	6.0	5.0	4.0	3.0	4.0	3.0	0.9825 N.S. (Judges) 12.9101 ** (Treatments)
2		8.0	8.0	7.0	7.0	7.0	7.0	7.0	5.0	5.0	4.0	3.0	4.0	
3		8.0	7.0	6.0	6.0	7.0	8.0	7.0	6.0	4.0	4.0	4.0	3.0	
4		7.0	7.0	6.0	8.0	7.0	6.0	6.0	7.0	6.0	5.0	4.0	4.0	
5		8.0	8.0	7.0	7.0	6.0	7.0	6.0	6.0	5.0	4.0	4.0	4.0	
Means		7.8a	7.4b	6.8c	6.8c	5.6f	6.8c	6.4d	5.8e	4.8g	4.0h	3.8i	3.6j	
	Effect of pH levels on taste of peanut milk													
1	8.0	7.0	7.0	6.0	8.0	6.0	6.0							0.3500N.S. (Judges) 3.1521** (Treatments)
2	8.0	6.0	6.0	6.0	7.0	7.0	5.0							
3	7.0	7.0	5.0	5.0	6.0	7.0	5.0							
4	7.0	6.0	6.0	6.0	6.0	6.0	7.0							
5	8.0	8.0	8.0	5.0	5.0	7.0	6.0							
Means	7.6a	6.8b	6.4d	5.6f	6.4d	6.6c	5.8e							
	Effect of soaking time and temperature on flavor of peanut milk													
1		8.0	7.0	7.0	6.0	7.0	6.0	5.0	4.0	4.0	4.0	4.0	4.0	0.9866 N.S. (Judges) 12.9201** (Treatments)
2		8.0	7.0	8.0	8.0	8.0	7.0	5.0	6.0	4.0	4.0	4.0	3.0	
3		8.0	6.0	6.0	6.0	7.0	7.0	6.0	5.0	6.0	4.0	5.0	4.0	
4		7.0	7.0	7.0	7.0	7.0	6.0	6.0	7.0	6.0	5.0	4.0	4.0	
5		9.0	7.0	7.0	7.0	7.0	6.0	6.0	5.0	7.0	5.0	4.0	5.0	
Means		8.0a	6.8d	7.0c	6.8d	7.2b	6.4e	5.6f	5.4g	5.4g	4.4h	4.2i	4.0j	
	Effect of pH levels on flavor of peanut milk													
1	9.0	7.0	6.0	7.0	8.0	6.0	7.0							0.3680N.S. (Judges) 3.1531** (Treatments)
2	9.0	7.0	5.0	6.0	8.0	7.0	5.0							
3	9.0	7.0	6.0	6.0	7.0	8.0	7.0							
4	8.0	7.0	6.0	5.0	6.0	7.0	7.0							
5	7.0	8.0	5.0	6.0	6.0	7.0	7.0							
Means	8.2a	7.2b	5.6f	6.0e	7.0c	7.0c	6.6d							

Means sharing the similar letter(s) are non-significant

Table 5: Effect of addition of skim milk powder and sugar on taste and flavor of different treatments of peanut milk:

No of Treatments								
	T0	T1	T2	T3	T4	T5	T6	F- Value
No. of judges	Effect of skim milk powder blending on taste of peanut milk							
1	6.0	5.0	8.0	7.0	8.0	6.0	6.0	0.3540N.S. (Judges)
2	6.0	7.0	9.0	6.0	9.0	5.0	5.0	
3	5.0	7.0	7.0	7.0	6.0	6.0	5.0	
4	6.0	6.0	8.0	6.0	6.0	7.0	6.0	
5	5.0	7.0	7.0	8.0	5.0	6.0	6.0	
Means	5.6e	6.4c	7.8a	6.8b	6.8b	6.0d	5.6e	3.1521** (Treatments)
	Effect of sugar on taste of peanut milk blend							
1	6.00	7.00	6.00	4.00	5.00	6.00		1.2211N.S. (Judges)
2	7.00	8.00	6.00	5.00	6.00	5.00		
3	6.00	7.00	6.00	7.00	5.00	5.00		
4	6.00	6.00	5.00	5.00	5.00	4.00		5.9216** (Treatments)
5	5.00	7.00	7.00	6.00	4.00	4.00		
Means	6.0b	7.0a	6.0b	5.4c	5.0d	4.8e		
	Effect of skim milk powder blending on flavor of peanut milk							
1	7.0	7.0	9.0	7.0	8.0	7.0	7.0	0.3640N.S. (Judges)
2	6.0	7.0	9.0	7.0	9.0	5.0	6.0	
3	6.0	8.0	8.0	7.0	7.0	6.0	6.0	
4	6.0	7.0	7.0	7.0	6.0	7.0	6.0	3.1529** (Treatments)
5	6.0	7.0	8.0	8.0	6.0	7.0	7.0	
Means	6.2d	7.2b	8.2a	7.2b	7.2b	6.4c	6.4c	
	Effect of sugar on flavor of peanut milk blend							
1	6.0	8.0	6.0	4.0	4.0	5.0		1.2219N.S. (Judges)
2	7.0	8.0	7.0	7.0	7.0	5.0		
3	7.0	7.0	6.0	7.0	4.0	4.0		
4	7.0	8.0	7.0	5.0	5.0	5.0		5.9264** (Treatments)
5	6.0	6.0	6.0	5.0	5.0	5.0		
Means	6.6b	7.4a	6.4c	5.6d	5.0e	4.8f		

Means sharing the similar letter(s) are non-significant

Table 6: Physico-chemical analyses of peanut milk blend and cow's milk

	Peanut milk blend	Cow's milk
Protein (g/100 ml)	5.02	3.40
Fat (g/100 ml)	2.16	3.82
Ash (g/100 ml)	0.62	0.70
PH	6.68	6.60
Specific gravity	1.029	1.032
Acidity %	0.016	0.21
Ca (mg/100 ml)	73	120
Mg (mg/100 ml)	25	13
Na (mg/100 ml)	21	72
K (mg/100 ml)	161	139
Fe (mg/100 ml)	0.42	0.4

Table 7: Comparison of sensory evaluation for color, flavor, taste and overall acceptability of Peanut milk blend and cow's milk.

	Number of Judges					Means	F- value
	1	2	3	4	5		
	Color						
Peanut milk blend	7.00	7.00	6.00	6.00	7.00	6.60b	1.000N.S. (Judges)
Cow's milk	8.00	8.00	9.00	7.00	8.00	8.00a	12.250* (Treatments)
	Flavor						
Peanut milk blend	7.00	6.00	8.00	5.00	7.00	6.60b	3.400N.S. (Judges)
Cow's milk	8.00	7.00	7.00	8.00	8.00	7.60a	10.000* (Treatments)
	Taste						
Peanut milk blend	6.00	6.00	7.00	7.00	7.00	6.60b	1.000N.S. (Judges)
Cow's milk	8.00	7.00	9.00	8.00	8.00	8.00a	12.250* (Treatments)
	Overall acceptability						
Peanut milk blend	7.00	7.00	8.00	8.00	7.00	7.40b	1.400N.S. (Judges)
Cow's milk	8.00	9.00	8.00	9.00	8.00	8.40a	10.000* (Treatments)

Means sharing the similar letter(s) are non-significant

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