Effect of pressure blanching on sensory and proximate composition of peanut milk

Parul Jain · Deep Narayan Yadav · Hradesh Rajput ·
Devendra Kumar Bhatt

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Abstract Small scale process for the production of peanut milk was developed from M-522 variety of peanut. Three treatments i.e. traditional, 1% NaHCO₃ soaking and pressure blanching (at 121 °C, 15 psi for 2, 3 and 5 mins) were given for the preparation of peanut milk. The milks so obtained were analyzed for chemical composition and also subjected to organoleptic evaluation using nine point hedonic scale by semi trained panel of judges. Peanut milk prepared by pressure blanching (at 121 °C, 15 psi for 3 min) was found most acceptable method. The proximate composition of the most acceptable peanut milk prepared by pressure blanching (at 121 °C, 15 psi for 3 min) was found to be moisture 88.22%, ash 0.16%, fat 1.65%, protein 3.27%, total solids 11.78%. Based on the results it was concluded that the pressure blanching was found most acceptable method for the preparation of peanut milk beverage although it had the negative effect on the protein and total solid extraction.

Keywords Peanut milk · Pressure blanching · Peanut · Organoleptic evaluation · Proximate composition

P. Jain (✉)
Centre of Food Science & Technology,
Institute of Agricultural Sciences, Banaras Hindu University,
Varanasi, India
e-mail: paruljain13@gmail.com

D. N. Yadav · H. Rajput
Central Institute of Post Harvest Engineering & Technology
(CIPHET),
Ludhiana, India

D. K. Bhatt
Department of Food Science & Technology, Bundelkhand
University Jhansi (U.P.),
Jhansi, India

Introduction

Peanut (*Arachis hypogaea* L), a legume and belongs to the pea and bean family. Peanut is considered to be highly valuable as it is a major source of edible oil and protein meal with high nutritional value. India is rated as the third largest producer of peanut in the world with annual production of over 5–6 million tons (USDA Foreign Agricultural Service, 2008–2009). India along with china accounts for half of the world's peanut production. Peanut is the major oilseed crop in India accounting for 45% of oilseed area and 55% of oilseed production in the country (www.commodityonline.com). Peanut contains about 25.2% more protein than meat and 2.5 times more than eggs. It is a rich source of essential amino acids, minerals, vitamins and has good digestibility in both raw as well as roasted form (Nagaraj 1988).

Peanut has a potential role to play in combating malnutrition. At present its low consumption, especially in the developing countries, should be increased. It is therefore necessary to adequately research to increase the possibility of peanut processing into other useful and edible products such as flavoured beverage, curd, yoghurt, lassi and paneer etc.

Milk supply in most countries of the world specially, in the developing countries is limited. Keeping in view of the shortage of milk, scientist all over the world are working extensively to find out some substitute for milk which is like milk but not from the animal source. Various milk-like beverages has been formulated from aqueous extracts of unroasted peanuts or soyabean (Chompreeda et al., 1989, Galvez et al., 1990, Rustom et al., 1993). Peanut and soybean are two major raw material used for preparation of imitation milks.

Beverages developed from unroasted peanuts or soybeans are potential substitutes for cow's milk but they usually have undesirable characteristics such as beany or

green off-flavours, suspension instability and chalky mouth-feel (Nelson et al., 1976, Beuchat & Nail, 1978, Rubico et al., 1987). There are various processes for the preparation of peanut milk, but all the process includes soaking for 16 to 18 h and cooking at least for 20 min before grinding either in mixer grinder or in colloidal mill and then filtration. Hence, to minimize the time, the process should be altered. Keeping in view the present study was carried out to optimize the suitable method for the preparation of peanut milk and to observe the effect of pressure blanching on sensory and proximate composition of peanut milk.

Materials and methods

All the research work have been done in the laboratory of food grain & oilseed processing division of CIPHET (Central Institute of Post Harvest Engineering & Technology), Ludhiana. Peanut (variety M –522) was procured from Krishi Vigyan Kendra, Ludhiana. Sugar, flavors (vanilla, chocolate and cardamom) were purchased from local market which was used for the investigation.

Preparation of peanut milk

Peanut milk was prepared using two different methods as follows:-

Traditional method

Normal soaking After soaking peanuts (100 g) for 16 to 18 h in (1:3 ratio kernels to water) were dehusked. The dehusked kernels were washed with water and ground with hot water (1:6 ratio kernels to water) in the grinder. The slurry formed was sieved by muslin cloth and peanut milk was produced.

Soaking in 1% NaHCO₃ As per the method of Saio (1986) with slight modification. soaked peanuts (100 g) for 16–18 h in 1% NaHCO₃ (1:3 ratio kernels to 1% NaHCO₃) were dehusked. The dehusked kernels were washed with water and ground with hot water (1:6 ratio kernels to water) in the grinder. The slurry formed was sieved by muslin cloth and peanut milk was produced.

Pressure blanching (2, 3 and 5 min)

Blanching of peanuts (100 g) was done in an autoclave (121°C at 15 psi for 2, 3 & 5 min) then soaked in water for 6 h (1:3 ratio kernels to water). After soaking kernels were dehusked and ground in hot water (1:6 ratio kernels to water) in the grinder. The slurry formed was sieved by muslin cloth and the groundnut milk was prepared.

Proximate composition

Moisture, Ash, Fat, Protein, Crude fibre, Carbohydrate & Total solids was analyzed by following the AOAC (2000) methods.

Material balance

Total solids were calculated during each step of peanut milk preparation and it was calculated by using formula, 100- Moisture (%).

Sensory evaluation

Peanut milk was analyzed for Sensory attributes (i.e. color, appearance, aroma, taste, mouth feel and overall acceptability) by a semi-trained panel consisting of ten members using a nine point hedonic scale.

Statistical analysis

All the experiments were performed in triplicate. Analysis of variance was carried out as per (Snedecor and Cochran 1994) using statistical software version-7 (State Soft Corporation, Tulsa, USA).

Results and discussion

The present investigation was done with an objective to observe the effect of pressure blanching on sensory and chemical composition of peanut milk. The proximate composition of peanut used to prepare peanut milk was

Table 1 Effect of pressure blanching on total solids, protein extraction and sensory quality of peanut milk

	Pressure blanching time (min)				CD (≤ 0.05)
	0	2	3	5	
Physico-chemical ($n=3$)					
Total solids (%)	12.3	11.8	11.6	10.0	0.42
Protein (%)	3.8	3.	3.2	2.6	0.35
Sensory (Score out of 9)					
Color	8.3	8.2	8.2	7.8	0.12
Aroma	6.2	6.5	7.4	7.5	0.08
Taste	6.4	7.1	7.5	7.0	0.09
Appearance	7.5	7.6	7.6	7.5	0.10
Mouth feel	7.5	7.3	7.6	7.0	0.12
Consistency	7.9	7.8	7.6	6.6	0.15
OAA	6.2	6.8	7.6	7.0	0.10

OAA overall acceptability, $n=10$ panelists

Table 2 Proximate composition and sensory quality of peanut milk prepared by different methods

Sample	Normal	1% NaHCO ₃	Pressure blanching (at 121 °C, 15 psi for 3 min)	CD (≤ 0.05)
Physico-chemical ($n=3$)				
Moisture (%)	87.7	89.5	88.2	0.56
Ash (%)	0.28	0.25	0.16	0.08
Fat (%)	2.0	1.6	1.6	0.14
Protein (%)	3.8	3.2	3.3	0.23
Total solids (%)	12.3	10.5	11.8	0.58
Sensory (Score out of 9)				
Color	8.3	8.2	8.2	0.12
Aroma	6.2	6.6	7.4	0.08
Taste	6.4	6.8	7.5	0.09
Appearance	7.5	7.5	7.6	0.10
Mouth feel	7.5	7.5	7.6	0.12
Consistency	7.9	7.8	7.6	0.15
OAA	6.2	7.1	7.6	0.10

OAA overall acceptability, $n=10$ panelists

5.05% moisture, 24.12% protein, 47.7% fat, 1.79% ash, 2.9% crude fiber and 18.44% carbohydrate.

Effect of pressure blanching on sensory attributes

The data pertaining to the effect of pressure blanching on sensory attribute of peanut milk is given in Table 1. Color of the peanut milk is not affected significantly by increasing the pressure blanching time. There was significant effect of pressure blanching time on aroma & taste scores as they both were increasing simultaneously with the increase in pressure blanching time. The average scores for aroma awarded were 6.2, 6.5, 7.4, and 7.5 for 0, 2, 3, and 5 min pressure blanching respectively. There was no significant effect of pressure blanching time on appearance of peanut milk it was same as normal milk. Mouth feel and consistency both were affected by increasing pressure blanching time, because extraction of total solids and protein decreases. The results thus obtained on the basis of organoleptic studies that the peanut milk prepared by pressure blanching (121 °C, 15 psi for 3 min) was liked much as compared to peanut milk prepared by 0 min pressure blanching.

Effect of pressure blanching on protein and total solids extraction

Effect of pressure blanching on total solids and proteins content is given in Table 1. From this table it is found that total solids and protein content both decreased with increased pressure blanching time. Protein content in the peanut milk decreased significantly as pressure blanching time increased. This change is probably due to structural changes of protein or protein denaturation. Since higher total solids and protein contents are desirable to increase nutritional quality of peanut milk. Such decrease in protein content and the cooking time should be reduced to avoid low content of solids in milk (Lee and Beuchat, 1992).

Peanut milk prepared by 0 min pressure blanching contain more protein and total solids i.e. 3.76% & 12.3% respectively as compared to peanut milk prepared by 2, 3 & 5 min pressure blanching, but it was not much liked by the people because it had somewhat nutty or beany flavor that was not liked. There was a significant decrease in the values of protein & total solids content with the increase in pressure blanching time, but the values for protein content and total solids in milk prepared by 2 & 3 min pressure blanching were 3.27%, 3.23% &

Table 3 Loss in total solids during each step of preparation of milk

Steps of milk preparation	Normal	1% NaHCO ₃	Pressure blanching (3 min)
Pressure blanching	—	—	1.1%
After soaking	1.7%	1.9%	1.5%
Dehulling	4.8%	4.6%	3.8%
Filtering	21.8%	20.9%	23.8%
Remaining total solids in milk	12.3%	11.6%	11.5%

$n=3$

11.78%, 11.59% respectively. Peanut milk prepared by 5 min pressure blanching contained comparatively low protein and total solids content i.e. 2.6% and 10.04% respectively.

Based on the physicochemical and organoleptic analysis the best set of processing conditions for preparation of peanut milk was pressure blanching (at 121 °C, 15 psi for 3 min).

Selection of method

Selection of method is a very important aspect of preparation of any food product so, it was required to select most significant method for the preparation of peanut milk. Peanut milk by different three methods and undergo sensory and physicochemical analysis (Table 2). The trend observed regarding color and appearance of peanut milk samples made by normal soaking, soaked in 1% NaHCO₃ and 3 min pressure blanching were not showed any significant difference. In case of aroma the scores awarded had significant difference ($p \leq 0.05$). There was not any significant difference in case of mouth feel but the milk prepared by pressure blanching (121 °C, 15 psi for 3 min). The data regarding consistency of peanut milks was in descending order but not with much difference i.e. 7.9, 7.8, and 7.6 respectively. The reason behind that with increasing blanching time the extraction of total solids and proteins decreased. The peanut milk prepared by pressure blanching (121 °C, 15 psi for 3 min) was much liked by the panelist.

The peanut milk prepared by 3 min pressure blanching had moisture 88.22%, ash 0.16%, fat 1.65%, protein 3.27%, and total solids 11.78%. Which was around the composition of milk prepared by normal soaking i.e. moisture 87.7%, ash 0.28%, fat 2.006%, protein 3.76%, and total solids 12.3% in comparison to milk prepared by soaking in 1% NaHCO₃.

On the basis of sensory and proximate analysis (total solids and protein content) pressure blanching (at 121 °C, 15 psi for 3 min) was selected for preparation of peanut milk.

Material balance

A material balance is an application of conservation of mass to the analysis of physical systems. It was done in terms of the loss in total solids during each step of processing for the preparation of milk (Table 3). The loss in total solids during pressure blanching was 1.13% in milk prepared by pressure blanching (121 °C, 15 psi for 3 min) due to leaching of solids. After soaking of peanuts the loss in total solids in milk prepared by normal soaking, soaked in 1% NaHCO₃ and pressure blanching (121 °C, 15 psi for 3 min) were 1.68%, 1.92% and 1.50% respectively. It was because of soaking time i.e. 16–18 h in case of normal soaking & 1% NaHCO₃ and 6 h for pressure blanching (121 °C, 15 psi for 3 min). During dehulling, the losses were due to removal of husk. During the next step i.e.

filtration, at this step the loss in total solids in milk prepared by normal soaking, soaked in 1% NaHCO₃ were due to residue remained after extraction of milk. The loss in milk prepared by normal soaking and soaked in 1% NaHCO₃ were 21.84% and 20.92% respectively was due to more extraction of protein and total solids as compared to milk prepared by 3 min pressure blanching so, the loss was more i.e. 23.77%. The total solids remained in the milk prepared by normal soaking, 1% NaHCO₃ and pressure blanching (121 °C, 15 psi for 3 min) were 12.30%, 11.58% and 11.49% respectively.

Conclusion

Based on the observations it was concluded that the pressure blanching of peanut had a significant effect in improving the acceptability of the peanut milk on the basis of sensory & proximate analysis. However, the pressure blanching had a negative effect on the protein and total solids extraction. Among three methods of peanut milk preparation i.e. traditional, 1% sodium bicarbonate soaking and pressure blanching (121 °C, 15 psi for 3 min), the pressure blanching was found most suitable. It also reduces the time of soaking i.e. 6 h as compared to 16–18 h in other methods.

References

- AOAC (2000) Methods of analysis, 17th edn. Association of official analytical chemists, Washington
- Beuchat LR, Nail BJ (1978) Fermentation of peanut milk with *Lactobacillus Bulgaricus* and *L. acidophilus*. *J Food Sci* 43:1109–1112
- Chompreeda P, Haruthaithanasan V, Oupadissakoon C, Suknak K (1989) Development of a chocolate flavored peanut beverage. *J Food Sci* 54:1359–1360
- Galvez FCF, Resurreccion AVA, Koehler PE (1990) Optimization of processing of peanut beverage. *J Sens Stud* 5:1–17
- Saio K (1986) Interaction among traditional and emerging food processing technologies observed in Japanese food industries. In: Traditional foods - some products and technologies, central food technological research Institute Mysore, India, p 209–216
- Lee C, Beuchat LR (1992) Chemical, physical and sensory characteristics of peanut milk as affected by processing conditions. *J Food Sci* 57:401–405
- Nagaraj G (1988) Chemistry and utilization. In: Reddy PS (ed) Groundnut. Indian Council of Agricultural Research, New Delhi, pp 554–565
- Nelson AI, Steinburg MP, Wei LS (1976) Illinois process for preparation of soymilk. *J Food Sci* 41:57–61
- Rubico SM, Resurreccion AVA, Frank JF, Beuchat LR (1987) Suspension stability, texture and colour of high temperature treated peanut beverage. *J Food Sci* 52:1676–1679
- Rustom IYS, Lopez-Levia MH, Nair BM (1993) Extraction of peanut solids with water-effect of the process and enzymatic hydrolysis. *LWT Food Sci Technol* 26(1):72–75
- Snedecor GW, Cochran (1994) Statistical methods, 8th edition, Wiley-Blackwell <http://www.commodityonline.com/commodities/oil-oilseeds/groundnutoil.php>