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Comparison of the proximate composition of peanut milk and milk powder using different methods

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Abstract
Peanuts (*Arachis hypogaea*) are good food for infants suffering from various forms of malnutrition and for individual with lactose intolerance allergies. Peanut milk does not contain any lactose and is therefore suitable for people with lactose intolerance. In this research study, peanut milk was prepared by three different methods namely, by normal soaking, soaking in 1% $NaHCO_3$, and roasting. The proximate composition of peanut milk consists of moisture content, protein content, carbohydrate content, fat content, ash content, total solids and pH values. The peanut milk was then converted into powder by spray drying technology. Finally the nutritive value of peanut milk and powder were compared. In normal soaking method of peanut milk preparation the values of proteins, carbohydrates, fat and ash were 3.68%, 4.70%, 2.16% and 0.24% respectively. In soaking in 1% $NaHCO_3$ method of peanut milk preparation, the values were 3.11%, 5.58%, 1.86% and 0.26% respectively. In roasting method of peanut milk preparation the values were 3.23%, 3.78%, 3.53% and 0.18% respectively. Peanut milk powder prepared by normal soaking, soaking in 1% $NaHCO_3$, and roasting the values of proteins, carbohydrates, fat, ash and crude fiber in peanut milk powder were; 27.05%, 18.22%, 45.89%, 2.86% and 1.11%; 29.97%, 18.79%, 42.18%, 2.45% and 1.31%; 27.44%, 15.25%, 48.35%, 2.12% respectively. On comparison between peanut milk and peanut milk powder, it was noticed that nutritionally peanut milk powder was superior.

Keywords: Peanut milk, milk powder, spray drying

Introduction
Peanuts (*Arachis hypogaea)* originated in South America where the crop existed for thousands of years. Peanuts played an important role in the diet of the Aztecs and other native Indians in South America and Mexico. India is one of the largest producers of oilseeds in the world and occupies an important position in the Indian agricultural economy. It is estimated that nine oilseeds namely groundnut, rapeseed-mustard, soybean, sunflower, safflower, sesame, niger, castor and linseed, accounted for an area of 23.44 million hectares with the production of 25.14 million tons (Madhusudhana, 2013) [7]. Groundnut is called as the 'King' of oilseeds. Groundnut is also called as wonder nut and poor men's cashew nut. Groundnut is one of the most important cash crops of our country.

Peanut production in the India
Gujarat is the single largest as well as the best quality peanuts producer accounting for over 40% of total groundnut produced in the country. Groundnut production, within the country, is mainly concentrated in five states including Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Rajasthan and Maharashtra accounting for nearly 90 % of the total production of peanut in the country (Madhusudhana, 2013) [7].

Peanuts have been used as a major source of edible oil and protein meal and considered highly valuable for human and animal nutrition in developing countries (Fekria *et al*., 2012) [4]. Peanuts are rich source of multiple nutrients and their consumption is associated with various health benefits, including reduced cardiovascular disease risk (Mattes *et al*., 2008) [8]. Peanuts have been developed into a food for infants suffering from various forms of malnutrition and for individual with lactose intolerance allergies (Considine & Considine, 1997) [3].

Peanut milk is a non-dairy beverage created using peanuts and water. Recipe variations include salt, sweeteners, and grains. It does not contain any lactose and is therefore suitable for people with lactose intolerance (Isanga and Zhang, 2009) [5].

Nutrient rich non-dairy extract of peanut kernel can substitute dairy milk powder for preparation of any sweets. It is ideal for ice cream, thick shakes, beverages and other protein rich preparations. Water extract of healthy electronically sorted peanut kernels, free from redskin, treated at particular temperature and pH to make it similar to cow milk. The milk prepared is filtered and pasteurized to avoid any microbial contamination. This milk is free from cholesterol, lactose and any Trans-fatty acids. It contains peculiar phytochemicals and herbal nutrients of peanut (Aidoo *et al*., 2010) [1]. Milk is subjected to dehydration and drying at strict temperature level and time. The powder is fortified to enrich it with various nutrients. Powder is packed in food grade prescribed material and stored in cool conditions.

Materials and methods

All the research work has been done in the laboratory of College of Agricultural Engineering, Bapatla, Guntur, and Post Harvest Technology Centre, Bapatla, (Andhra Pradesh).

Preparation of peanut milk

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

Normal soaking

Peanut milk was prepared by a method reported by Jain (2013) [6] with slight modifications. 100g of peanuts were soaked in water in a ratio of 1:3 (kernel: water) for 18 hours and they were be dehusked. The dehusked kernels were washed with water and ground with hot water in a ratio of 1:6 (kernels to water) in the grinder. The slurry formed was sieved by muslin cloth and peanut milk was produced (Fig.1).

Soaking in 1% $NaHCO_3$

As per the method of Saio (1986) [9] with slight modification.100 g of peanuts were soaked for 18 h in 1% $NaHCO_3$ (1:3 ratio kernels to 1% $NaHCO_3$). After soaking, peanuts were dehusked. The dehusked kernels were washed with water and ground with hot water in a ratio of 1:6 (kernels to water) in the grinder. The slurry formed was sieved by muslin cloth and peanut milk was produced. $NaHCO_3$ was used to the removal of beany flavour in the final product, and to help soften the peanuts (Isanga and Zhang, 2009) [5].

Fig 1: Prepared peanut milk

Roasting

Peanut milk was prepared by a method reported by Salunkhe and Kadam (1989) [10] with slight modifications. Sorted peanut seeds were roasted at 130°C for 20 min in an oven. The seeds were de-skinned and weighed before being soaked in 1% $NaHCO_3$ for at least 14 h. The de-skinned peanut kernels were washed with clean water. The kernels were mixed with water in a ratio of 1:6 [peanuts (g): water (ml)] and transferred to a blender where they were blended for 5 min. The slurry formed was sieved by muslin cloth and peanut milk was produced.

Preparation of peanut milk powder using spray dryer

The spray drying process was carried out in Post Harvest Technology Center, Bapatla using (S.M. Science Tech., India). The spray dryer works on the principle of co-current flow atomization. Spray dryer consisted of feed pump, atomizer, air heater, air disperser, drying chamber, and systems for exhaust air cleaning and powder recovery. The maximum capacity of the dryer was 1.30 l/h with the nozzle fits to 1 mm size. The peanut milk was fed in to the drying chamber with feed flow rate of 20 ml/min and inlet air temperature was maintained at 130°C temperature. The obtained powder was stored in LDPE covers under ambient conditions (Fig.2).

Fig 2: Prepared peanut milk powder

Powder recovery:

Powder recovery is expressed as the weight percentage of the final product compared to the total amount of the materials sprayed (Sansone *et al.*, 2011).

$$\text{Powder recovery (\%)} = \frac{\text{Obtained spray dried powder}}{\text{Peanut milk}} \text{X100}$$

Proximate composition

Moisture, Ash, Fat, Protein, Crude fibre, Carbohydrate and Total solids was analyzed by following the AOAC (2000) [2] methods.

Results and Discussion

Proximate Analysis of peanut milk based on different methods of preparation

The proximate analysis of peanut milk was carried out in the laboratory of College of Agricultural Engineering, Bapatla. The proximate composition of peanut milk consists of moisture content, protein content, carbohydrate content, fat content, ash content, total solids and pH values. Various treatments for peanuts were given before peanut milk preparation and the physic-chemical characteristics of milk were determined.

Comparison between peanut milk and milk powder

The proximate composition of the peanut milk and powder prepared by different methods was compared to study the effect of process parameters on milk and powder quality.

Normal soaking

The protein, carbohydrate and fat contents of peanut milk powder were considerably higher than those of the peanut Milk i.e. 3.68 and 27.05; 4.70 and 18.22; 2.16 and 45.89% respectively (Fig.3). The moisture content in peanut milk (89.20%wb) was higher than the moisture content (4.84%wb) in peanut milk powder. The ash content (2.86%) and crude fibre (1.11%) were also reported to be higher for peanut milk powder than peanut milk.

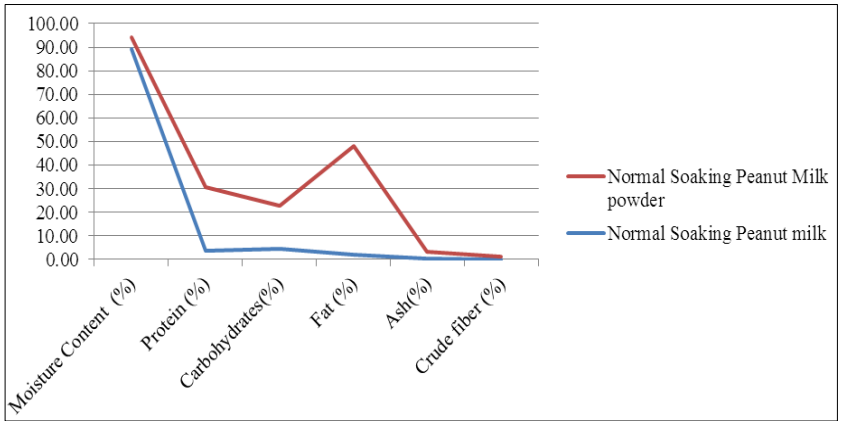

Fig 3: Comparison of proximate composition of peanut milk and powder

Soaking in 1% $NaHCO_3$

The protein, carbohydrate and fat contents of peanut milk powder were considerably higher than those of the peanut milk i.e. 3.11 and 29.97; 5.58 and 18.79; 1.86 and 42.18% respectively (Fig.4). The moisture content in peanut milk (89.00%wb) was higher than the moisture content (5.30%) in peanut milk powder (5.30%). The ash content (2.45%) and crude fibre (1.31%) were also reported to be higher for peanut milk powder than peanut milk.

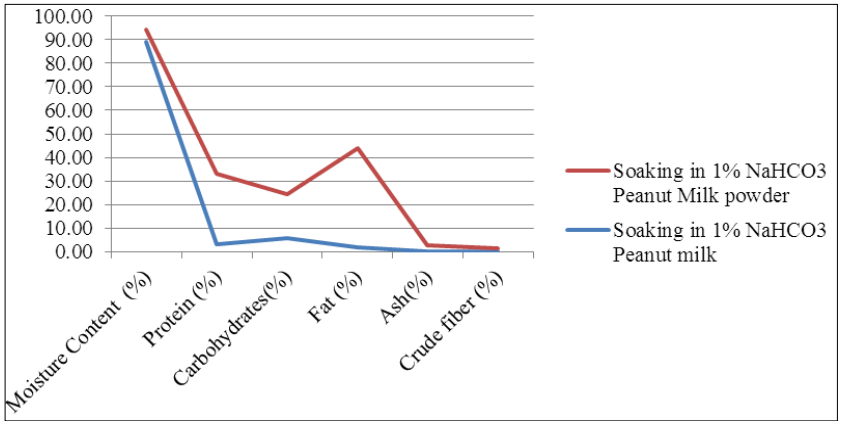

Fig 4: Comparison of proximate composition of peanut milk and powder

Roasting

The protein, carbohydrate and fat contents of peanut milk powder were considerably higher than those of the peanut milk i.e. 3.23 and 27.44; 3.78 and 15.25; 3.53 and 48.35% respectively (Fig.5). The moisture content in peanut milk (89.26%wb) was higher than the moisture content (5.43%wb) in peanut milk powder. The ash content (2.12%) and crude fibre (1.26%) were also reported to be higher for peanut milk powder than peanut milk.

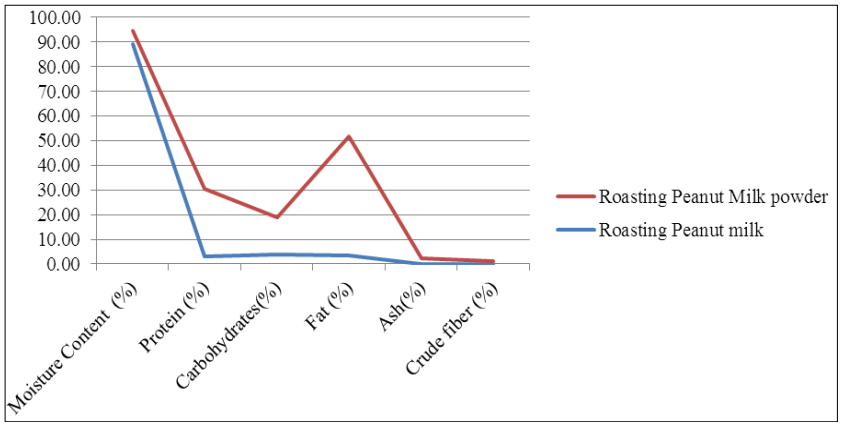

Fig 5: Comparison of proximate composition of peanut milk and powder

Conclusions

Based on the above results, it was observed that the proteins, carbohydrates, fat and ash increased when the milk was converted into powder by spray drying. On comparison between peanut milk and peanut milk powder, it was noticed that nutritionally peanut milk powder was good.

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