

Nutritional and Sensory Properties of Cashew Seed (*Anacardium occidentale*) Milk

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Abstract

Plant milk was obtained from cashew seeds and locally prepared soy milk kept as reference standard. The prepared milk samples were analyzed against proximate, minerals and sensory attribute, while sensory evaluation was done according to difference and preference test. Cashew milk sample had an attributes white in color and 81.7% milk yield. Cashew milk was significantly higher in fiber and ash contents. Cashew milk also consist significantly higher amounts of potassium (68.1mg/100ml), calcium (21.9mg/100ml), magnesium (38.2mg/100ml), zinc (0.85mg/100ml) and iron (0.8mg/100ml). Sensory evaluation results show significant differences for both milk samples. Cashew milk (1.91) and soymilk (2.08) were indicate non-significant difference ($p>0.05$) in mouth feel. Cashew milk was highly significant ($p<0.05$) for other sensory attributes. Cashew milk is nutrient dense as compare to soy and dairy milks with low calories. Nutritional benefits of cashew milk promoting cardiovascular health and reduce the deficiencies of trace mineral such as, zinc and iron.

Keywords: Cashew seeds; Milk; Nutritional; Proximate; Sensory evaluation

Abbreviations: AOAC: Association of Official Analytical Chemists; Kcal: kilocalories

Introduction

World population gradually increased but in developing countries insufficient supply of protein leading toward the malnutrition [1]. However, fulfill the demand of protein in developing countries where the protein from animal source inefficient and expensive, researcher are geared up to find the substitute of protein from plant origin [2]. The protein adequacy in normal human diet is very essential for body development and metabolism and nutritionally important for human beings and animals. Milk is known as one of the important part of our daily diet because its balance [3]. Eneobong [4] stated that the uncertain state of food supply in developing countries, the milk and milk products are rarely major items of the normal diets. Although, it must be emphasize that small number of population have ability to afford animal milk, but concern about cholesterol and fat contents always increase. That's why there is gradual shift from animal protein and fat to plant origin, because the plant food have less incidence degenerative and cardiovascular diseases [5]. Importation of milk and milk product cause huge foreign expenditure due to the limited supply of milk from the local milk producers, favor the manufacturing of milk substitute with some functional properties from plants origin. Plant foods especially seeds play an important in our daily diets, but in developing country their importance in the

human diet gradually increase due to different reasons [6]. Plant seeds are excellent source of fats, proteins and edible oils and have potential as a raw material for the manufacturing of food and other ingredients [7].

Plant milk is known as food product that obtained from plant source, have similar appearance like milk but neither contain milk fat and other components [8]. But plant milks used as a substitute of animal milk due their nutritive, functional and sensory characteristics. Milk obtained from seeds, grains and nuts used as animal milk replacer [9]. These milk substitute described by healthy carbohydrates (low glycemic index), fatty acids, vitamins B and E, dietary fiber and antioxidants. They are good sources of mineral such as low sodium and potassium, also good promoters of electrolytes balance. Manufacturing of alternative milks obtained from plants are also serve as substitute to producing nutritious beverages or drink. Cashew (*anacardium occidentale*) is an evergreen tree, belongs to the Anacardiaceae family and native from Brazil and expanded in South American countries. In India and South Africa cashew was introduce during 16th century and spread all over Southeast Asia [10]. In worldwide production, cashew nuts ranked 3rd among all tree nuts. In last 10 years, the average world production of cashew nut 547,300-547,370 metric tons, while in

2014, the total production was 629,668 metric tons (unpublished results from the International Nut and Dried Council database). According to nutritional characteristic of cashew nuts, saturated, unsaturated fatty acid, phenolic lipids, squalenes, tocopherols, phytosterols, bioactive compounds (lutein, α -tocopherol, γ -tocopherol, β -carotene, zeaxanthin, stearic acid, thiamin, linoleic acid and oleic acid) were already determined. The nutritional composition of cashew nuts may vary by origin [11,12]. Cashew nuts are very sweet product, have attained much popularity in Europe and North America due to their health benefits and succulent flavor. Globally increasing the production of cashew nuts but limited utilization and insufficient intake of protein in developing countries, where the animal protein is limited and expensive, the cashew milk is used as source of protein and milk substitute. The purpose of present research to evaluate the potential of cashew nuts as a milk source and determine its chemical and sensory attributes.

Material and Methods

Raw material collection

The mature, ripe cashew nuts were purchased from the dry fruit market of Faisalabad. Soybean, vanilla essence and granulated sugar were also purchased from the local market of Faisalabad.

Cashew milk preparation

After the collection of cashew nuts, infested kernels were separated. Then washing of kernels were done and dried for four days under the sun light. For de-hulling cashew nuts were soaked in hot water, after that soaked in de-ionized water for 5 hours at 4 °C. Then drained, rinsed and wet milling was done by using kitchen blender (Kenwood, England) with 1:3(w/v) ratio. Resultant slurry was filtered by using cheese cloth (double layer). After that, 200ml sugar syrup was added and homogenized. Pasteurization was done for 15min at 120-122 °C. At the end, vanilla flavor (15ml) was added and stored at 4 °C in sterilized screw tight plastic bottles. The control soybean milk sample was manufactured according to the Illinois method described by Iwe [13].

Proximate analysis

Proximate composition of soybean and cashew nuts milk samples such as, moisture, protein, fat, ash, fiber, carbohydrate and energy value were estimated according to the methods described by AOAC [14].

Mineral analysis

Dry ashing method was carried out for mineral analysis. Absorption spectrophotometry was used for the estimation of magnesium, calcium, zinc and iron, flame photometry used for sodium and potassium and molybdo vanadate method was used for the evaluation of phosphorus.

Sensory evaluation

Sensory evaluation of soybean milk and cashew milk for parameters of color, taste, mouth-feel, flavor and overall acceptability were done in two phase. In first phase, Triangle test was conducted according to the method described by we [15].

Twenty members panel of the Department of Home and food Sciences, Government College University Faisalabad were divided into two groups (I and II). All samples of group I and II were coded with three digits. Two cashew milk samples and one soymilk were presented to Group I, two samples of soymilk and one of cashew milk were presented to Group II in a randomized manner. After that, asked them to indicate the odd sample and identify the degree of difference and more acceptable one. In second phase, consumer preference test was conducted by presenting two plant milk sample to judges asked to rate the products on a nine point hedonic scale where 1=Excellent, 5= neither like nor dislike and 9=Very poor.

Statistical analysis

Results for proximate and mineral analysis of soy milk and cashew milk were presented as mean of triplicate. Obtained score for sensory attribute was based on 20 judgments and subjected to Student's t- test. Mean scores were considered significant at 5% probability level.

Results and Discussion

Proximate composition

Table 1: Plant milk samples (Soymilk and Cashew milk) proximate composition.

Parameters	Soymilk	Cashew Milk
Moisture	88.12±0.20a	87.12±0.3a
Protein	2.36±0.24a	2.05±0.20b
Fat	3.20±0.15a	3.30±0.18a
Ash	0.84±0.10b	2.63±0.05a
Fiber	0.70±0.04b	1.15±0.10a
Carbohydrate	4.78±0.14a	4.38±0.20b
Energy value (Kcal)	57.36±0.22b	55.46±0.45a

Mean of ten samples \pm standard deviation significantly different ($p < 0.05$) with different alphabets along same row.

The obtained results for the proximate analysis of all milk samples are presented in Table 1. During this study observed significant variations among all the samples in all parameters except moisture, crude fat and carbohydrate. Cashew milk values for ash, fiber and energy value (kcal) was significantly higher. During this study moisture level for soymilk and cashew milk samples were similar to the cow milk (87.10%) and melon seed milk (88.0%) reported by [16]. Moisture level effect the specific gravity and other nutrients concentration of milk samples [16]. The protein content of cashew milk was significantly lower than that of soymilk. In this study protein value obtained for cashew milk (2.05%) was lower than the benni seed milk (2.86%) and dairy milk protein (3.30 and 3.50%) [16-19]. On the other hand, during this study obtained value for protein content of cashew milk (2.05%) was higher than the value of melon seed milk (1.30%) [16]. Generally, the amino acid balance and composition of milk samples have great importance than protein quantity. According to Codex Alimentarius, cashew milk fat (3.30%) met the minimum requirement level of 3% [19]. Fat obtained in this study in cashew milk and soymilk were similar ($p > 0.05$). The obtained value for ash content of cashew milk was

significantly higher than the values reported for melon seed milk (1.63%), dairy milk (0.71%) and *Treculia africana* seed milk (0.88-0.97%) [16,17,20].

The higher amount of ash content in comparison with dairy milk indicate that the richness of micronutrient in cashew milk samples. The crude fiber content of the cashew milk was significantly higher than the value of soymilk. In this study the carbohydrate content of soymilk and cashew milk samples were lower than the reported values for melon seed milk, human milk and milk dairy milk 5.90%, 6.8% and 5.0% respectively [16,20]. Energy values (kcal) obtained in this study, for the soymilk and cashew milk samples were lower than cow's milk (68.3kcal). The energy value for cashew milk (55.46kcal) was lower ($p < 0.05$) than soybean milk. In given food samples carbohydrate and fats are the vital source of energy. The contribution of fat and carbohydrates component to energy value for cashew milk (47.2kcal) is similar to the value of melon seed milk (50.01kcal) for same components [16].

Mineral composition

Table 2: Plant milk samples (Soymilk and Cashew milk) mineral composition.

Parameters	Soymilk	Cashew Milk
Calcium	3.91±0.02b	21.9±0.05a
Phosphorus	49.02±0.14a	18.3±0.13b
Magnesium	30.03±0.10b	38.2±0.10a
Potassium	50.01±0.15b	68.1±0.03a
Sodium	25.00±0.20a	22.8±0.00b
Iron	0.57±0.12a	0.80±0.05a
Zinc	0.69±0.17a	0.85±0.10a

Mean of ten samples ± standard deviation significantly different ($p < 0.05$) with different alphabets along same row.

The mineral composition of soymilk and cashew milk samples are presented in Table 2. The obtained results in this study of mineral composition indicate that the significant differences ($p < 0.05$) between plant milk samples. The obtained values for cashew milk were generally significantly higher ($p < 0.05$) except phosphorus and sodium. The mineral composition varies in milk samples due to the amount of ash content which was significantly higher in cashew milk [20], reported that the variation in mineral composition of plant milk samples due to the variation in the seed extraction, the method and ratio of extractant among others. Cashew milk sample consist of better amount of calcium, potassium and magnesium. Due to the presence of these minerals in appreciable amount in cashew milk has been reported better flow of blood, nutrients and oxygen due to less resistance of veins and arteries [21]. Cashew milk promoting cardiovascular health, an especially better choice protecting against atherosclerosis and high blood pressure due to the high potassium and low sodium content. In cashew milk samples the trace minerals such as zinc and iron in higher amounts. In cashew milk the obtained results for iron (0.80mg/100ml) was higher than soy milk (0.57mg/100ml) and the previously stated results for African breadfruit (0.40-0.52mg/100ml) [20],

soymilk (0.56 mg/100ml) [8] and dairy milk (0.1-0.3mg/100ml) [19]. The obtained values for zinc (0.85mg/100ml) was also higher as compare to the previous results for plant milk reported by authors such as soy milk (0.7mg/100ml), *Treculia africana* (0.32-0.42mg/100ml) and melon seed milk (0.38mg/100ml) [16,18,20]. The obtained level of zinc in this study for cashew milk suggests that it's will contribute to the reduction of "Hidden hunger" in the developing world. Zinc and iron efficiencies may cause the parasitic and infectious diseases [22].

Sensory attributes

Significant difference observed between the plant milk samples by using difference test. Thirteen of the judges were expert for the identification of odd sample among all of these and to determine the significance at 5%, minimum of eleven correct answers was required Iwe [15]. The degree of difference indicate according to four point scale (where slight =1, moderate=2, much=3 and extreme=4) [23]. The triangle test described that the odd sample was more acceptable. Cashew milk sample was found as odd sample because eleven out the thirteen judges who were able to identify correctly and more acceptable ($p < 0.05$). The mean scores for sensory attributes for preference test presented in Table 3 on the base of nine point hedonic scale. The results obtained for sensory attributes shows significant differences among milk samples. For mean sensory scores of mouth-feel soymilk and cashew milk samples were comparable. Similarity was found in mouth-feel due to the similar fat contents present in both milk samples because fat is well known to be related with better mouth feel. Mean scores for cashew milk were significantly higher, because the values were closer to 1 (Excellent) in color, flavor, taste and overall acceptability. However, in this research both milk samples were acceptable because the mean sensory scores for all characteristic were below the average score (5.0).

Table 3: Sensory qualities of plant milk samples.

Parameters	Soymilk	Cashew Milk
Color	3.20±1.46b	2.12±0.48a
Mouth feel	2.08±0.23a	1.91±0.21a
Flavor	3.88±0.62b	2.52±0.04a
Taste	3.02±1.86b	2.08±0.07a
Overall Acceptability	3.18±0.17b	1.72±0.14a

Mean ± standard deviation significantly different ($p < 0.05$) with different alphabets along same row.

Conclusion

Cashew milk is nutritionally dense if compared with soymilk and its high content of potassium is important for cardiovascular and gastrointestinal health. Cashew milk high level of trace minerals such as zinc and iron of great nutritional importance in the developing countries. In developing countries zinc and iron deficiencies are high and may cause the parasitic and infectious diseases. The fact that dairy milk in these countries has comparatively low levels of these trace minerals.

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Author Contribution

MFM conceptualized and performed the study, AM, RS and NA helped to analyze the data.

Conflicts of Interest

The author declares no competing interest.

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