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STUDY OF HIGH NUTRITIVE VALUE OF ALMOND MILK BEVERAGE

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ABSTRACT

This study found that almond milk has a high nutritive value and has a high proportion of protein and oil. It also incorporates abundant antioxidants from the diet. In both free and attached forms, almonds contain phenolic and flavonoids and are abundant in tocopherol, phytosterols, and squalene. Milk with 10% almond was the highest protein content when fresh and after 7 days during cold storage (6 ± 1 °C) 5.22 and 5.38% respectively. Milk with 10% almond was the highest fat content when fresh and after 7 days during cold storage (6 ± 1 °C) 9.4 and 9.5 % respectively. Milk with 10 % almond was the highest total score of sensory evaluation when fresh and after 7 days during cold storage (6 ± 1 °C). The apparent protective benefits of these compounds are due to their antioxidant and antiproliferative functions, which are associated with a lowered chance of developing atherosclerosis and cancer.

Keywords: Almond milk beverage, Nutritive value.

Introduction

Daily consumption of Nuts such as walnuts, almonds, and Brazil results a very effective health benefits. It enhances lipids and oxidative stress with walnut consumption compared to usual dietary intake without walnuts. It is lower blood pressure, lower serum total cholesterol and low-density lipoprotein (LDL) cholesterol, superior endothelial function such as (flow mediated dilation), and minor risk of rising type 2 diabetes (Steffen *et al.*, 2020).

Growing occurrence of cardiovascular disease (CVD) has become a main challenge to human health (Lozano *et al.*, 2012), So Food variation has been regarded to be effective way in decreasing the risk of Cardiovascular disease (Yu, *et al.*, 2018). It also improves insulin resistance, obesity (Park, *et al.*, 2020) and diabetes (Chiavaroli *et al.*, 2018).

There are many health benefits of nuts consumption that contain unsaturated fats, phytoestrogens, and fiber content and etc. (Ghanavati *et al.*, 2020). The refined almond [*Prunus amygdalus* (Batsch) syn. *P. dulcis* (Miller) Webb] is an old farm tree species that has developed with human cultivation. This fruit tree species is mostly used for its comestible seeds. (Gradziel *et al.*, 2016). Around 95% from almond is concentrated in California, Australia and the Basin of Mediterranean. It used fresh and processed in food industry and used also as a functional food because of its

nutritional and medical properties such as anti-inflammatory and hypocholesterolaemia properties. (Musa-Veloso, *et al.*, 2019 and Zimorovat, *et al.*, 2020).

Almond was common and popular nut that knew the king of nuts. It was full of nutritive value such as proteins, fats, minerals and vitamins (Yousefi, *et al.*, 2015). Almond is an effective healthy food, for the body and the mind. Almonds have many health benefits and considered good sources of bioactive compounds as anti-oxidant, proteins, minerals as calcium and magnesium. It is a source of vitamin E, dietary fiber, B-vitamins such as B17, mono-unsaturated fatty acids and phytosterols which have lower cholesterol (Smeets *et al.*, 2020).

Almonds are a useful food for anemia, beneficial in the treatment of numerous skin sicknesses such as eczema. Almonds are also useful in treating gastroenteritis, kidney pains, diabetes, head lice, facial neuralgia and gastric ulcers (Tan and Mattes, 2013). Almond consumption provided us with most of healthy nutrients that decrease risk of cardiovascular diseases, prevention of anemia and cancer and protection against free radicals (Pardo *et al.*, 2016). Almond skins contain healthy components such as phenolic compounds (Chen, *et al.*, 2005).

It also contains numerous antioxidant bioactive phenolic compounds, mainly composed of flavonoids, hydrolysable and condensed tannins and phenolic acids.

These phenolic compounds inhibit lipid oxidation by scavenging free radicals, chelating metals, activating antioxidant enzymes, reducing tocopherol radicals and inhibiting enzymes that cause oxidation reactions. phenolic compounds in almond skins containing quercetin glycosylated to glucose, galactose and rhamnose, kaempferol, naringenin, catechin, protocatechuic acid, vanillic acid and a benzoic acid derivative (Ben Mohamed, *et al.*, 2020).

Health benefits of Almonds

1. Lowering cholesterol

Almond play avital role in LDL-cholesterol lowering effect and diabetes. It is low in saturated fatty acids and rich in unsaturated fatty acids and contain fiber, phytosterols, plant protein, α -tocopherol, arginine, magnesium, copper, manganese, calcium and potassium (Berryman, *et al.*, 2011).

2. Hypoglycemic Action

Almonds has lowered post-prandial glycaemia, insulinaemia and oxidative stress effect (Jenkins *et al.*, 2006 and Megalli, *et al.*, 2006).

3. Immunostimulant Action

Interferon- α (INF- α), interleukins (IL-12), INF-gamma and tumour necrosis factor (TNF- α) were have great levels of cytokine formed by almonds. Almonds effect of The immune surveillance of the peripheral blood mono nuclear cells near viral infections were better and persuade a major reduction in the Herpes simplex virus (HSV-2) replication (Arena *et al.*, 2010).

4. In Amnesia

Almonds played a key role in lowering serum cholesterol in rats, raise the Ach level in the brain and in the end enhance the memory of rats and valuable memory-restorative agent and play an important role in the management of Alzheimer's disease (Kulkarni, *et al.*, 2010).

5. Prebiotic Potential

"Prebiotics are non-digestible-food ingredients that stimulate the growth and activity of bacteria in the digestive system, in ways which are claimed to be beneficial to health"

Pre-Biotic almond activity belongs to carbohydrates such as oligosaccharides. The most predominant forms of prebiotics are nutritionally classified as soluble fibers. It has been shown that almonds different in composition of gut bacteria by inspiring the growing of bifid bacteria (Gibson and Roberfroid, 1995; Mandalari, *et al.*, 2008).

6. Antimicrobial properties

Almond skins flavonoid-rich fractions resulting antimicrobial properties against *L. monocytogenes* and *S. aureus*. Flavonoids was able to inhibit Gram-negative *S. enterica* var. Typhimurium. (Arena *et al.*, 2010 and Gyawali and Ibrahim, 2014).

7. Alzheimer

Almond plays great role as defensive agents against brain atrophy and memory loss. It is full of macronutrients, micronutrients, and phytochemicals which affect numerous ways such as amyloidogenesis, tau phosphorylation,

oxidative stress, cholinergic pathways, and some non-target mechanisms containing cholesterol depressing and anti-inflammatory properties, as well as neurogenesis affect (Gorji *et al.*, 2018).

8. Antioxidant Action

The regular consumption of mono unsaturated fatty acids rich nuts such as almonds may converse defensive antioxidant benefits and possibly decline oxidative stress. There has been distress that consuming walnuts, which are rich in pro-oxidative poly unsaturated fatty acids may result in improved LDL-oxidation. It has been suggested that the higher amounts of bioactive phenolic compounds in walnuts may respond the pro-oxidant effect of PUFA on LDL. (Bitok and Sabate, 2018; Mayr *et al.*, 2018; Schwingshackl and Hoffmann, 2014).

Materials and Methods

Materials

Cow milk: Cow milk was obtained from Animal production research institute.

Almond and Sucrose Sugar: Almond and Sucrose Sugar were derived from local market.

Methods

Preparation of Almond milk beverage:

Almond prepared by mixing in a blinder for 3 mins. Fresh cow milk was heated at 80°C for 10 minutes. Such milk was divided into 3equal portions. The 1st considered as control, 5 % and 10 % almond was added to the 2 nd and the 3 rd portions respectively. then added 5% sugar for each portion. The prepared Almond milk beverage and their control were assessed for chemical properties when fresh and after refrigerated storage at 6± 1 °C for 1 week.

Total lipids: Total lipids content was determined according to AOAC (2000).

Total protein: Total protein content was determined according to AOAC (1995).

Fiber: The content of crude fiber of sample was determined according to AOAC (2000).

Calcium and Magnesium: Samples analyzed using advanced microwave digestion system. Determination of Calcium, magnesium and potassium used by inductively Coupled Plasma (ICP-AES), ThermoSci, model: Icap6000 series. element atom excited by Argon gas. The blank values were assumed by the sample values for each element.

Total phenolics: Total phenolics determined according to (Singleton, and Rossi, 1965).

Total flavonoids: Total flavonoids determined according to (Zhishen, *et al.*, 1999).

Sensory evaluation

Beverage samples were organoleptically assessed by 10 staff members of Dairy Department Fac. of Agri., Cairo University and dairy chemistry research department, Animal production research institute, Agric. Res. Center, Ministry of Agric., Egypt according to (Balthazar *et al.*, 2018)

Results and Discussions

Acidity of almond milk beverage:

Table 1 showed significant acidity increased during cold storage at 6 ± 1 °C for 7 days.

Treatments	Acidity %	
	Fresh	After 7 days
control	$0.16 \pm 0.1a^{**}$	$0.17 \pm 0.1a^*$
5% Almond	$0.16 \pm 0.1b^{**}$	$0.17 \pm 0.1b^*$
10% Almond	$0.17 \pm 0.1a^{**}$	$0.18 \pm 0.1a^*$

Table 1- Acidity of almond cow milk and during cold storage (6 ± 1 °C) for 7 days.

Each value represents the mean \pm S.E (Standard Error) and mean of three replicates.

Values in the same row with star (*) are significant at $p \geq 0.05$.

Chemical composition of Almond

This table stated chemical composition of almond. Chemical composition was similar to results according to (Sundaram, *et al.*, 1990).

	Almond (g/100gm)
Total phenols	1.17 ± 0.001
Total flavonoids	0.022 ± 0.001
Total protein	17.63 ± 0.02
Total lipid	55.82 ± 0.01
Total fiber	25.42 ± 0.01
Calcium	0.1294 ± 0.002
Potassium	0.8820 ± 0.012
Iron	0.0030 ± 0.001
Zinc	0.0013 ± 0.001

Each value represents the mean \pm S.E (Standard Error) and mean of three replicates.

Total protein content of almond milk beverage:

Table 3 illustrated that protein content in fresh almond milk beverage due to the percentage of almond added and during storage for 7 days at 6 ± 1 °C according to water evaporation.

Treatments	Protein %	
	Fresh	7 days
Control	$3.43 \pm 0.01c$	$3.45 \pm 0.01 c$
5% Almond	$4.23 \pm 0.01b^{**}$	$4.3 \pm 0.01 b^*$
10% Almond	$5.22 \pm 0.01a^{**}$	$5.38 \pm 0.01 a^*$

Table 3 Effect of adding 5% and 10% Almond on protein content of milk beverage treatments during cold storage (6 ± 1 °C) for 7 days

Each value represents the mean \pm S.E (Standard Error) and mean of three replicates.

Values in the same column with the same letter are not significant at $p \leq 0.05$.

Values in the same row with star (*) are significant at $p \geq 0.05$.

Fat milk beverage content:

Table 4 showed that fat content increased during cold storage (6 ± 1 °C) for 7 days according to Almond addition and during storage for 7 days at 6 ± 1 °C according to water evaporation.

Treatments	Fat %	
	Fresh	7 days
Control	$3.9 \pm 0.01c^*$	$3.9 \pm 0.02c^*$
5% Almond	$6.7 \pm 0.01b^*$	$6.8 \pm 0.01b^{**}$
10% Almond	$9.4 \pm 0.01a^*$	$9.5 \pm 0.01a^{**}$

Table 4 Effect of adding 5% and 10% Almond on fat content of milk during cold storage (6 ± 1 °C) for 7 days.

Each value represents the mean \pm S.E (Standard Error) and mean of three replicates.

Values in the same column with the same letter are not significant at $p \leq 0.05$.

Values in the same row with star (*) are significant at $p \geq 0.05$.

Sensory evaluation of almond milk beverage

All samples were evaluated according to (Balthazar, *et al.*, 2018). Table showed that milk with 10 % almond was the highest total score of sensory evaluation when fresh and after 7 days during cold storage (6 ± 1 °C).

Table 5-sensory evaluation of almond milk beverage milk treatments during cold storage (6 ± 1 °C) for 7 days.

Treatments	Fresh					
	Acceptability (20)	Appearance (20)	Aroma (20)	Flavor (20)	Texture (20)	Total scores (100)
Control	18 ± 1	18 ± 1	18 ± 1	18 ± 1	17 ± 1	89
5% Almond	16 ± 1	17 ± 1	19 ± 1	16 ± 1	18 ± 1	86
10% Almond	19 ± 1	18 ± 1	19 ± 1	19 ± 1	17 ± 1	92
Treatments	After 7 days					
Control	17 ± 1	18 ± 1	17 ± 1	17 ± 1	17 ± 1	86
5% Almond	17 ± 1	16 ± 1	17 ± 1	16 ± 1	16 ± 1	82
10% Almond	18 ± 1	18 ± 1	18 ± 1	18 ± 1	18 ± 1	90

Each value represents the mean \pm S.E (Standard Error)

Conclusion

This study concluded that almond milk has a great nutritive value according to fat, protein, fiber, minerals, and vitamin content.

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