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Standardization and sensorial evaluation of condensed milk from almond milk

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Abstract
Almond milk rich in Magnesium and rich in antioxidant vitamin E, from almond milk prepared the condensed milk. This study proposes a novel method of producing sweetened condensed milk, offering a sustainable alternative to traditional dairy – based condensed milk. This process involves concentrating almond milk by removing excess water and natural sweeteners to achieve the desired sweeteners and viscosity characteristics of condensed milk. Various techniques such as evaporation, vacuum concentration, and ultra filtration can be employed to be achieving the desired concentration level while preserving the nutritional qualities and flavor profile of almond milk. This innovation addresses the growing need for diary-free alternatives in the food industry and offers consumers healthier, cruelty-free options without compromising taste or texture. Nutrionally, Almond milk is lower in calories compared to cow or buffalo milk High in unsaturated fats like monounsaturated and polyunsaturated fats fortified with vitamins and minerals, dairy- free and lactose -free and it is also suitable for vegans. It also contains source of vitamin E, low in saturated fat and cholesterol and contains protein. The developed and finalized product will be evaluated for physio-chemical, textural, functional and sensory attributes.

Keywords: Almond milk, sugar.

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Introduction

Almonds are a type of tree nut native to the middle East and south Asia. Scientifically known as Prunus Dulcis, the almond tree is part of Rosaceae family. Almond is a valuable health benefiting food, as it is rich in antioxidants. It contains flavonoids, fatty acids, vitamins, proteins, and essential minerals. Cholesterol lowering effects of almonds are due to the presence of polyesters [1].

The characteristics of Almond with a brownish skin and creamy white interior. It is known for its sweet, nutty flavor and crunchy texture.The varieties of Almonds are sweet Almonds and Bitter almonds. Sweet almonds are the most commonly consumed type, used in culinary applications, snacks, and food products. Bitter almonds containamygdalin, which can produce toxic cyanide. Bitter almonds are used primarily for extracting almond oil after removing the toxins [2].

Nutritional Profile of Almonds are highly nutritious, providing rich source of healthy fats, protein, vitamins, minerals and fiber aids in digestion and helps to maintain healthy cholesterol levels. Health benefits of almonds are to reduce the bad cholesterols levels and lower risk of heart disease and also manage the weight due to high protein and fiber content. Almonds can control blood sugar because they have a low glycemic index and can help to stabilize the blood sugar levels.Almonds are processed into different various products such as almond milk, almond butter, almond flour, and almond oil. Now, we are discussing almond milk [3-4] .

Non-diary milk alternative serves as substitute for traditional milk for individuals with intolerance or allergies. The current study aimed to standardize the process for developing a plant-based milk alternative using almond milk.The formulations for producing almond milk were optimized based on their sensory and nutritional properties. The Almond milk sample had a distinct white color and yielded 82.5% [5].

Almond milk is a plant-based alternative made from almonds, featuring a watery texture and nutty flavor. Some types or brands are flavored to mimic the taste of cow's milk. It is free of cholesterol and lactose, and low in

saturated fat. Almond milk is often consumed by people who are lactose-intolerant, as well as vegans and others whoavoid dairy products. Commercial almond milkis available in sweetened, unsweetened, vanilla and chocolate flavors, and is usually fortified with micronutrients. It can also be made at home using a blender, almonds and water [6].

Condensed milk made from almond milk offers avegan and lactose-free alternative to traditional dairy condensed milk. It retains the creamy texture and sweet flavor characteristic of condensed milk while being entirely plant-based [7-9]. This alternative is ideal for those following a vegan diet or with lactose intolerance, providing a versatile ingredient for a variety of desserts,beverages, and recipeswith its rich consistency and nutritional benefits, almond milk condensed milk opens up new possibilities for enjoying classic treats without compromising dietary preferences or restrictions [10-11].

The important nutritional values of almond milk condensed milk per 100g. The given table focuses on key nutritional aspects such as calories, fats, sugars, protein, and essential minerals [12-17].

Table:1 Approximated Nutritional values per 100g

Nutritional values	Approximately amount per 100g
Calories	120 - 150 kcal
Total fat	5 - 8 g
Saturated fat	0.5 - 1 g
Sugars	12 - 20 g
Protein	2 - 4 g
Calcium	100 - 200 mg
Potassium	100 – 200 mg

Literature Review

1.Almond (Purunus amygdalus L.): A review on health benefits, nutritional value and therapeutic applications

Ayesha Mushtaq1*, Marium Khaliq1, Aasma Saeed1, Muhammad Waqar Azeem1, and Jihene Ben Ghania

Almond is a product of popular medicinal plant Purunus amygdalus L. which has been used to cure and prevent ailments from millennia. Almond trees are native to Asian countries. Almond is a valuable health benefiting food, as it is rich in antioxidants. It contains flavonoids, fatty acids, vitamins, proteins, and essential minerals. Cholesterol lowering effects of almonds are due to the presence of phytosterols. Almond has been used traditionally for curing wounds, anaemia, insomnia, headache, sore throat, brain infections, kidney disorders, urinary infections, uteralgia, pityriasis, hysteria. Major pharmacological properties of almond include hepatoprotective, anti-depressant, antioxidant, memory enhancing, and anti-aging effects. Present review describes phytochemistry, health benefits and medicinal properties of almond.

2.The nutritional and health benefits of almonds: a healthy food choice

David P. Richardson1, Arne Astrup2, Arnaud Cocaul3 and Peter Ellis4

Over the last decade, the research on the effects of almonds on reducing blood cholesterol levels and reduction of risk of heart disease has grown significantly. Emerging research on almonds also shows promising health benefits linked to body weight control and diabetes. Almonds naturally contain high levels of monounsaturated and polyunsaturated fatty acids, protein and dietary fibre, as well as a variety of essential nutrients including vitamin E and several trace elements. Almonds are very low in sodium and high in potassium, and they contain a range of phytoprotective constituents. The available evidence also indicates that weight gain may not be a concern when nuts are consumed in moderation, and that regular consumption of nuts can be recommended in the context of a healthy balanced diet.

3. Development of non-dairy milk alternative using soymilk and almond milk

Preeti Kundu, Jyotika Dhankar, Asha Sharma

Non-dairy milk alternative represents the milk substitute for people suffering from milk intolerance and allergy. The present study was carried thus out to standardize the process for development of plant-based milk alternative using soy milk and almond milk. Formulations for manufacture of soy milk and almond milk were optimised on the basis of their sensory as well as nutritional properties. Optimized milks were thereafter blended for the preparation of different non-dairy milk alternatives in different ratios as T01 (soy milk), T02 (almond milk), T1(60% soy milk + 40% almond milk),T2 (50% soy milk + 50% almond milk), T3 (40% soymilk + 60% almond milk) while cow milk (T0) served as control. The soymilk, almond milk and the blends of both were analysed for their proximate as well as sensory properties. Among the plant-based milks, soymilk displayed higher moisture, pH and protein content while the values of total solids, titratable acidity, ash, fat, iron, and calcium were higher for almond milk. Sensory score revealed that soy- almond milk and 40% soymilk was recorded highest of all the milks analyzed. The selected milk blend (T3) though had lower sensory score that control but rated quite good in terms of acceptability. With regards to nutrient profile of milk blend in comparsion to control, the results indicated that concentration of all the nutrients were higher in milk blend (T3) except for Ca & protein which were recorded higher in control. Therefore, based on nutrient and sensory profile, it can be implied that soy almond milk blend suits well as a candidate for use as non-dairy milk alternative.

Materials and Methods

Procurement of Raw materials

Almonds, Almond milk, buffalo milk, sugar, water

Method of preparation

To make condensed milk from almond milk, collect the almonds and soak for 7-8 hours. Peel the husk of almonds and blend the almonds by adding some water. After blending filter the almond milk with muslin cloth. Now boil and stir the almond milk continuously at low temperature. Heat until the water gets evaporated and then the milk thickens. Add some sugar and buffalo milk to it and mix it well until the thick consistency obtained. Now the the condensed milk obtained is transferred into a jar. Now store the condensed milk in refrigerator.

Development of value added condensed almond milk

To standardize the condensed milk different formulations were taken namely T1, T2, T3 in comparison to standard control sample (T0). The formulationweregiven in table below respectively organoleptic scores of developed condensed almond milk

Table 2: Development of value added condensed almond milk

parameters	T0	T1	T2	T3
Colorand appearence	8	8	8	8
Taste	8	7	7.3	9
Flavor	7	6.5	6.8	9
Texture	8	7.5	7.5	8
Odour	7	6.8	7.4	8
Overall acceptability	8	7	7.5	8.5

Values are given by nine hedonic scale independent determinations nutritional evaluation prepared condensed milk we were analyzed for moisture, protein, fat, ash, carbohydrates, crude fiber, and minerals. Result and discussion organoleptic evaluation of developed condensed almond milk.

Color and Appearance

The mean sensory score for color and appearance was highest for T2 and T3, itincreasein supplementation of sweeteners develop thickness in condensed milk which makes less acceptable. According to mean scores of panelist T3 had best acceptable color and appearance compared to other products.

Taste

According to the mean scores the panelists, T3 has better taste than T1and T2. T1 is less acceptable due to less sweetness.

Texture

Texture of condensed milk made from almond milk should be thick, smooth, and syrupy. The desired texture ofT3 is smooth, thick, and syrupy. T1 and T2 has less acceptability of texture compared to T3.

Flavour

The flavor of condensed milk made from almond milk is rich, creamy, and mildy sweet, similar to traditional sweetened condensed milk but with a subtle nutty undertone from the almonds. The flavor of T3 is acceptable with high creamy and mildy sweet compared to T1 and T2.

Odour

The odour of condensed almond milk is characterized by its mild nutty and sweet fragrance. T3 has the pleasant, sweet and nutty odour makes a good choice of for enhancing the sensory appeal of desserts and beverages compared to T1 and T3.

Overall acceptability

The mean sensory score for overall acceptability was highest for T3 and lowest T1. The evaluation suggested that the T3 was most acceptable as it did noteffect the quality and also improved the product of in terms of taste, texture, and flavor.

Physical characterstics of developed condensed almond milk

The physical characterstics of condensed almond milk are essential to understanding its suitability for various applications. The characterstics of condensed milk are consistency, color, smoothness, viscosity, glossiness and density. The average thickness of T1, T2, and T3 were 11.0, 12.0, 13.5m. The width ranging from 16.89 to 17.16mm.The width of control of condensed milk was 16.80 which increased the level of supplementation of almond milk with sugar. The changes in width and thickness are reflected in spread ratio which was calculated by dividing the width (w) by thickness (T) of the condensed almond milk.

Nutritional composition of acceptable condensed almond milk

Moisture content

Moisture content of control condensed almond milk was 25% which was observed in T3 condensed almond milk and low moisture content in T1. The moisture content of T1, T2, T3 were 25%, 27%, 29% respectively.

Fat content

Fat content of control condensed milk was 12.5% fat content of condensed almond milk was found to be near to control sample. Maximum fat content was found to T3 and minimum fat content in T1. The fat content in T1, T2, T3 are 11.6%, 12.4%, 15% respectively.

Ash content

Ash content of control condensed milk was 1.83% was found to be near to control sample. The ash content of T1, T2, T3 were 1.85%, 2%, 4%.

Protein content

Protein content of condensed almond milk is observed to be 7.96% per 100 grams. Protein content of T1, T2, T3 are 6%, 7.5%, 8% respectively.

Carbohydrate content

Carbohydrate content of the control sample was 55% of condensed almond milk. The carbohydrate content of T1, T2, T3, are 45%, 50%, 57% respectively.

Table 3: Composition of condensed almond milk

S.no	Ingredients	Trail 1	Trail2	Trail 3
1.	Almond milk	250 ml	500ml	750ml
2.	Buffalo milk	100 ml	150ml	200 ml
3.	Sugar	50gms	50gms	50gms
4.	Water	100gms	100gms	100gms

Results and Discussion

Sensory analysis:

After collecting all scores, the results were proved that variation T3 is the most liked variation among all the 3 variations. The statistical analysis of the sensory evaluations is :

Table 4: Descriptive sensory attributes

s.no.	Sensory attributes	control	Trail 1	Trail 2	Trail 3
1.	Color	8	7	7	8
2.	Taste	8	8	8	9
3.	Flavor	7	7	7	8
4.	Texture	8	7.5	8	9
5.	Overall acceptability	8	7	7.5	8.5

Hedonic scale: 9- Excellent, 8- very good, 7- good, 6- slightly like, 5- neither like nor dislike, 4- dislike slightly, 3- dislike moderately, 2- dislike very much, 1- dislike

Result

Formulation	Moisture	Fat	Ash	Protein	Carbohydrate
Control	25%	12%	1.83 %	7.96 %	55%
T1	22%	11.6 %	1.85 %	6%	45%
T2	23.5%	12.4 %	2%	7.5%	50%
T3	27%	15%	4%	8%	57%

Conclusion

Condensed almond milk provides a versatile and nutritious substitute for dairy-based condensed milk, catering to the growing demand for plant-based alternatives. It is suitable for use in various recipes, including desserts, beverages, and baked goods, offering similar taste and texture to its dairy counterpart. With its health benefits and compatibility with various diets, condensed almond milk represents a valuable addition to the range of non-dairy milk products.

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Conflict of interest

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Author Contribution

All authors are contributed equally

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