



Harmony in a Glass: "Crafting a Nutrient-Rich Quinoa-Almond Milk Smoothie Infused with Brown Sugar

Authors and Affiliations:

Mr. Naitik Amit Bhandari and Ms. Krupa Sandip Kumar Shah

Department of Food Technology
Parul Institute of Science
Parul University
Vadodara, Gujarat, India

ABSTRACT: This study provides a detailed analysis of a quinoa-almond milk smoothie enhanced with dark chocolate, vanilla essence, brown sugar, and dates, combining indulgence with high nutrition. The investigation's scope has been expanded to include physiochemical and microbiological tests, as well as analysis of beverage safety and composition and harmony of flavors. This meal is very nutritious and only needs quinoa and almond milk. The flavor is enhanced by Brown sugar, vanilla essence, and dark chocolate. The smoothie's promise as a delicious plant-based substitute is supported by the positive findings of the Hedonic Scale-based sensory evaluation. Physiochemical analysis is used to evaluate the complex composition and provides information on a number of properties, including pH, viscosity, and antioxidant concentration. Concurrently, microbiological testing verifies the beverage's safety by looking for any impurities. The assessment of antibacterial activity also considers the potential health benefits of the smoothie. The results of this study contribute to our knowledge of the beverage's nutritional value and safety. Additionally, the interaction effect of all three samples T0(Control), T1(70:20:10), T2(50:30:20) was studied to understand how varying proportions of ingredients affect the final product.

INTRODUCTION

The food industry has entered a creative phase in response to the growing desire for pleasant and nutrient-dense vegan options in the area of modern diets. The smoothie consisting of quinoa, almond milk, dates, brown sugar, vanilla essence, and dark chocolate is a remarkable example of this. It's a unique investigation into enjoyment, health, and flavor. This smoothie's primary ingredient, quinoa, is renowned for its high nutritional content and adaptability. It seems sense that it offers an abundance of vitamins, dietary fiber, and essential amino acids given the increasing emphasis on wholesome eating. Almond milk, known for its creamy texture and nutty flavor, enhances the benefits of quinoa even further. This enhances

the nutritional value and flavor of the smoothie. Beyond just being delicious, the dates used in this symphony have extra health benefits. In line with the growing movement of nutrient-dense and functional drinks, dates provide fiber, vital minerals, and a natural energy boost in addition to their delicious flavor. The addition of dark chocolate, vanilla essence, and brown sugar creates a symphony of flavors that encourages the taste buds and increases the sensory experience. Brown sugar gives a hint of sweetness, and vanilla essence balances and enhances the overall smell. Smoothies gain a layer of decadence and richness with the addition of dark chocolate, which is well-known for its flavor and antioxidant content. This only serves to emphasize how delicious and alluring smoothies are.

Materials and Methods

1. Materials

The quinoa seeds and almond milk were brought from local super market of Vadodara. Brown Sugar, vanilla essence, dates, and dark chocolate were also procured from a superstore of Vadodara city, Gujarat. Potable water and utensils were used from lab of Parul University, Waghodiya, Vadodara, Gujarat throughout the study.

2. Extraction and preparation of Quinoa and Almond milk

Take 50g of quinoa seeds soak it in a water for about 1 hour. Combine the quinoa seeds with 50 ml of water in blender. Blend until smooth.

Almond milk addition: Measure 40 ml of almond milk. Gradually add the almond milk to the quinoa milk, stirring gently to achieve well in-Corop orated blend.

3. Analyzing Equipment

For the formulation and preparation of Quinoa-Almond milk Smoothie infused with brown sugar, Dates, Vanilla Essence and Dark chocolate, there is a requirement of Soxhlet apparatus for fat estimation, Kjeld Hal's apparatus for protein estimation, a Muffle furnace for ash estimation, a Digital pH meter for measuring the

pH of the sample, Incubator for the determination of T.P.C. count, T.P.C. plates are incubated in an incubator, and crude fiber is estimated using a water bath.

Glassware includes petri plates, glass bottles, burettes, bakers, volumetric flasks, glass rods, pipettes, silica crucibles, and measuring cylinders. This glassware is used during the analysis of the product.

4. Vegan smoothie preparation:

To make a delicious and nutritious quinoa milk smoothie, start by carefully soaking 50 grams of quinoa seeds. To make quinoa milk, blend these seeds with 20-30 milliliters of water until a smooth consistency is reached, then filter the mixture. After that, measure out thirty milliliters of almond milk and slowly pour it into the quinoa mixture, stirring to create a creamy, smooth consistency. Add 30 grams of brown sugar and 50 grams of pitted dates to the quinoa-almond milk mixture. Add 2-3 drops of vanilla essence and make sure it goes throughout the entire mixture to bring out the flavor profile. 20 grams of dark chocolate can be melted in a microwave or double boiler. Set aside a tiny amount for the garnish. Keep a tiny amount aside for garnish and mix the remaining chocolate into the quinoa milk until it's completely combined. The next step is to blend the entire mixture until it reaches a smooth consistency and may be poured into a glass. Pour some of the reserved melted dark chocolate over the smoothie to enhance its flavor and appearance.

1. **Rinsing and Soaking:** Rinsing and Soaking 50gm of Quinoa Seeds in water and blending it with water.
2. **Addition of Almond milk:** Addition of 30ml of Almond Milk in it.
3. **Blending:** Blending Quinoa Almond Milk Blend
4. **Addition of Dates and Brown Sugar:** Addition of Dates and brown sugar in it.
5. **Blending Thoroughly:** Blending it till smooth consistency is achieved
6. **Melting Dark chocolate:** Melting dark chocolate in double boiler.
7. **Flavoring:** Flavoring it with 2-3 drops of vanilla essence.
8. **Pouring:** Pour into glass or container.
9. **Storage:** Allow it refrigerate at 4c.

DETERMINATION OF PHYSIO CHEMICAL PROPERTIES

1. Ash content:

Ash content measurement is essential in food analysis because it provides valuable information about the inorganic components present in a given sample. Instead of the usual ash formed by combustion, ash in the context of food refers to the residue left behind from burning organic material. Ash content measurement is a crucial analytical technique used in food science and quality management.

Weigh out a 5-gram test amount into a porcelain crucible and heat it in a temperature-controlled furnace to 600°C. Give it two hours to remain in that state. The crucible in the desiccator should be quickly cooled. Weigh it and note the percentage of ash to the first decimal place.

$$\text{Ash\%} = \frac{W_2 - W_1}{W_s} \times 100$$

W1=Weight of crucible

W2=Weight of crucible with ash

Ws=Weight of Sample

2. Protein content:

The method is used to measure the true protein content by measuring the nitrogen content that comes exclusively from proteins and not from non-protein nitrogen (NPN). This process results in a final TCA concentration of roughly 12% in the mixture after TCA is added to the milk sample to precipitate the protein. The filtrate contains the NPN contents once the precipitated proteins have been filtered. The nitrogen content of the precipitated protein, which is a representation of the true protein nitrogen content of milk, is then determined using the Kjeldahl method.

Calculation:

$$\text{WPN} = 1.4007 \times (V_s - V_B) \times N \div \text{Wt.}$$

3. TSS (Total Suspended solid):

To determine the total soluble solids, use a refractometer. Brix is a measurement of total suspended solids (TSS) in pure sucrose solutions. Brix is a useful indicator of TSS or sugar concentration since fruit juices frequently have higher sugar concentrations than other soluble components.

The reading at the boundary line should be recorded after a few drops of the sample are placed between the prisms of the hand refractometer. To apply temperature correction for data collected at temperatures below 20°C, use the table that follows. Abbe's refractometer requires you to circulate 20°C

If sample is thick, squeeze it through cotton and place the drop in between the prisms.

4. pH:

It is simple to determine the pH of homogeneous (mixed or homogeneous) liquid samples. When the cleaned, standardized electrode is dipped into the midst of a well-mixed sample, it takes the pH meter approximately one minute to stabilize its reading

Microbial Parameter

The term "microbial parameters" describes a variety of aspects related to the presence and functions of microorganisms, including bacteria, viruses, fungi, and parasites. Monitoring these parameters is important to ensure the safety, quality, and shelf life of food products.

• Determination of Total Plate Count

The nutritional agar medium was made by mixing 1000 ml of distilled water with 28 g of nutritious agar and boiling the mixture until the agar was completely dissolved. To disinfect it, it was autoclaved for 20 minutes at 120°C and 15 pounds of pressure. The sample solution (serial dilution) was prepared by numbering nine sterile test tubes. Each tube received nine milliliters of distilled water added to it. The test tubes were autoclaved for 15 minutes at

121 °C under 15 pounds of pressure and with cotton plugs in place. In a sterile test tube with 9 ml of distilled water, 1 ml of substance was successively added. To disinfect, autoclaves (a moist heat treatment method) or hot air sterilizers were utilized. Both a hot air oven and an autoclave were used to sanitize pipettes and Petri plates (dry heat treatment). The laminar airflow cabinet was filled with a sterile petri dish, and the UV light was turned on for a duration of thirty minutes. After 30 minutes, the work area was cleaned using 70% ethanol, the fan was turned on, and the UV light was turned off. Plates were appropriately labeled before 1 cc of samples were added to each plate. Every plate received 15–20 mL of liquid substance. To prevent microbial contamination of the plate, this was done in close proximity to a flame. After giving the plates a good shake, they were allowed to solidify. After 48 hours at 37°C, the plates were taken out of the incubator to check for colonies.

• **Antimicrobial Activity**

Antimicrobial activity is the capacity of a substance or product to inhibit or kill microorganisms, including bacteria, viruses, fungi, and other illnesses. assessment of antimicrobial activity is crucial in a variety of fields, including health, food processing, cosmetics, and medical. It helps assess the effectiveness of antimicrobial medications and their potential applications in preventing or reducing the growth of bacteria.

Agar Diffusion Method: If you're looking for information on a substance's antibacterial activity, you might find the agar diffusion test interesting. For the experiment, an agar plate is divided into wells, and a substance that may have antimicrobial properties is given to each well. The substance causes a gradient in concentration as it penetrates the agar. If the substance has antibacterial properties, it will prevent the growth of bacteria around the well.

Table: Different proportion in ratio of ingredient

Sample code	Quinoa seeds (gm)	Almond milk (ml)	Brown sugar (gm)	Dates (gm)	Melted Dark chocolate (ml)
T1	70	20	40	50	10ml
T2	50	30	30	50	20ml

• **Sensory Evaluation**

The study of how humans respond with their senses to the properties of food and other objects is known as sensory evaluation. It involves assessment of attributes including appearance, taste, flavor, texture, and overall acceptability. The objective of sensory evaluation is to understand consumer experiences and perceptions,

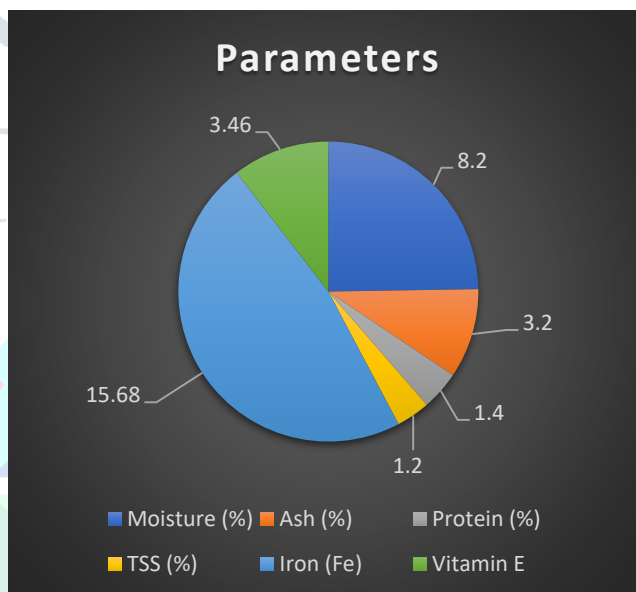
RESULT AND DISCUSSION

The study concludes with "Harmony in a Glass: Crafting a Nutrient-Rich Quinoa-Almond Milk Smoothie Infused with Brown Sugar," which signifies the entry into the Results and Discussion section. This important section summarizes the findings from the experiments and the discussion that follows, highlighting the numerous interactions between the nutritional

which is crucial for product development, marketing, and quality control.

In sensory evaluation and consumer research, hedonic scales a type of subjective rating scale are employed to determine a product's overall likeness or preference. It's a tool used to gauge consumers' satisfaction levels with a product after they use or interact with it. "Hedonic" experiences are those that are pleasurable or emotional.

Physio-chemical analysis of selected sample after sensory evaluation



Parameter	Value
Moisture (%)	58.1
Ash (%)	3.546
Protein (%)	0.84
TSS (%)	16
pH	6.04
Iron (as Fe), mg/kg	15.68
Vitamin E	3.46

components, sensory attributes, physio-chemical analysis, and microbiological analysis responses that are present in the developed smoothie.

A complete investigation of the nutritional landscape of quinoa milk is presented in "A Comprehensive Analysis of Nutritional Composition and Health Impacts." This section provides a comprehensive explanation of quinoa milk as a plant-based nutritional component by revealing the presence of proteins, vital vitamins, minerals, and bioactive substances through a granular

breakdown. The protein profile is highlighted, highlighting its importance as a potential plant-based source of protein.

In-depth discussion is complemented by a comparative analysis that examines functional features, flavor profiles, and nutritional differences with other plant-based milk substitutes. We examine the sensory aspects of quinoa milk, such as flavor, texture, and general consumer acceptance, to reveal the variables that affect how well it integrates into various dietary routines. In order to improve the overall attractiveness of quinoa milk in a variety of contexts, the section looks ahead and examines possible directions for additional research and applications. These include improving production methods, introducing new culinary ideas, and attending to consumer preferences. This part, in short, synthesizes scientific information with interpretive perspectives to advance the conversation about quinoa milk beyond its nutritional composition and into the wider health implications and directions for future research and uses.

Acknowledgments

We thank the **Department of Food Technology, Parul Institute of Science, Parul University**, for providing the necessary facilities and support for this research. We also acknowledge the funding sources and contributions from non-authors.

REFERENCES

- Hosseinpour-Niazi, S., & Alizadeh, M. (2013). Effect of quinoa with purple sweet potato flour on the glycemic response of diabetic patients. *The Open Nutrition Journal*, 7(1).
- Repo-Carrasco, R., Espinoza, C., Jacobsen, S. E., & Hermosín-Gutiérrez, I. (2003). Characterization of lignans and other phenolic compounds in the grain of quinoa (*Chenopodium quinoa* Willd.). *Journal of Agricultural and Food Chemistry*, 51(14), 3958-3964.
- Ruales, J., & Nair, B. M. (1993). Saponins, proteins and phytic acid interactions in quinoa (*Chenopodium quinoa* Willd.). *Journal of Food Science*, 58(2), 461-463.
- Berryman, C. E., Preston, A. G., Karmally, W., Deckelbaum, R. J., Kris-Etherton, P. M. (2011). Effects of almond consumption on the reduction of LDL-cholesterol: A discussion of potential mechanisms and future research directions. *Nutrition Reviews*, 69(4), 171-185.
- Hannuksela, M. L., & Mäkinen, T. (2002). Dairy products, milk and milk constituents in the diet: Their role in the development of eating habits and dental diseases. *Nutrition Research Reviews*, 15(1), 199-211.
- Hollis, J. H., & Mattes, R. D. (2007). Effect of chronic consumption of almonds on body weight in healthy humans. *The British Journal of Nutrition*, 98(3), 651-656.
- Al-Shahib, R.J. Marshall. The fruit of the date palm: its possible use as the best food for the future. *International Journal of Food* 2003, 54: 247-259.
- Filho, A. M., Pirozi, M. R., Borges, J. T., Pinheiro Sant'Ana, H. M., Chaves, J. B. P., & Coimbra, J. S. D. R. (2014). Quinoa: Nutritional, functional, and antinutrient profiles. *Food Chemistry*, 143, 424-431.
- Aluko, Rotimi E., and Emmanuel A. Emesih. "Functional foods and nutraceuticals: Food quality, safety, processing, and ingredients." CRC Press, 2020.
- Foster-Powell, Kaye, Susanna HA Holt, and Janette C Brand-Miller. "International table of glycemic index and glycemic load values: 2002." *The American journal of clinical nutrition* 76.1 (2002): 5-56.
- Jenkins, David JA, et al. "Glycemic index of foods: a physiological basis for carbohydrate exchange." *The American journal of clinical nutrition* 34.3 (1981): 362-366.
- Murray, Michael T., et al. "Encyclopedia of Nutritional Supplements: The Essential Guide for
- Improving Your Health Naturally." Prima Lifestyles, 1996.
- Seal, Chris J., et al. "Processing effects on the glycaemic indices of ten staple foodstuffs of Bangladesh." *British Journal of Nutrition* 92.4 (2004): 545-550.
- ISO 8968-5/IDF 020-5:2001 - Milk - Determination of nitrogen content -Part 5: Determination of protein-nitrogen content. International Organization for Standardization, Geneva, Switzerland.
- Ranganna, S. (1986). Determination of soluble solids by ABBE refractometer. In: *Handbook of quality control for fruit and vegetable products (1st Edition)*. Tata McGraw-Hill. Publishing Company Limited, New Delhi, India
- Shamra, S.K. and Nautiyal, M.C. (2009). *Post-Harvest Technology of Horticulture Crops*. Published by New Indian Publishing Agency, Pitampura, NewDelhi-110 088. Pp. 111-113.
- AOAC Official Method 930.15 (2005) Official Methods of Analysis of AOAC INTERNATIONAL, 18th Ed., AOACINTERNATIONAL, Gaithersburg, MD.
- Nielsen, Suzanne S., et al. (2009). Analysis of inorganic elements in foods: Application of the food-matrix to ash determination and sample preparation. *Journal of Food Composition and Analysis*, 22(6), 533-538. DOI: 10.1016/j.jfca.2009.02.005
- Nielsen, Suzanne S., et al. "Analysis of inorganic elements in foods: Application of the food-matrix to ash determination and sample preparation." *Journal of Food Composition and Analysis* 22.6 (2009): 533-538.
- AOAC International. *Official Methods of Analysis of AOAC International*. AOAC International, 2019.
- McRae, Marc P. "Analysis of minerals and trace elements in milk and dairy products." *Journal of Food Composition and Analysis* 22.6 (2009): 525-530.

Supporting Information for Review Only:**Statement of the problem addressed and originality of the approach:**

The manuscript addresses the problem of creating a nutrient-dense, vegan beverage that combines both taste and health benefits. The originality lies in the unique combination of quinoa and almond milk with added flavors and the comprehensive analysis of its nutritional and sensory properties.

Contribution of the work to create new knowledge in the field:

This work contributes to new knowledge by demonstrating the feasibility of incorporating quinoa and almond milk into a smoothie, providing detailed physio-chemical, microbiological, and sensory analysis. It expands the understanding of how these ingredients can be used innovatively in the food industry.

Relevance of the work to advance research and impact to the field of food science and technology:

The research advances the field of food science by offering a new, healthy beverage option that aligns with current dietary trends. It has the potential to influence further research into plant-based food products and their nutritional impacts.

