International Journal of Trend in Scientific Research and Development (IJTSRD)
Volume 7 Issue 1, January-February 2023 Available Online: www.ijtsrd.com e-ISSN: 2456 – 6470

Development and Physio-Chemical Analysis of Flavoured Milk from *Chenopodium* Quinoa

Nidhi Jain, Prof. Nisha M Wagh

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

ABSTRACT

The study of vegan milk flavoured vegan milk development was carried out at the Department of Food Technology, Parul Institute of Applied Science, Parul, University Vadodara. Quinoa is a good choice for those with hormone imbalance like PCOS and PCOD since it is strong in protein and has a great amino acid balance. is packed with nutrients. Protein and fibre are good for people with diabetes and celiac disease because they assist to regulate blood sugar levels. The main idea of study was to develop a vegan milk as it can be served to the lactose intolerance people. Naturally free from sugar. Proper and ideal packaging along with refrigeration storage makes the quinoa milk fit and in sound condition for up to 3 days. Flavoured quinoa milk was produced by extracting milk from sprouted soaked quinoa. Extract milk blended with dark chocolate, cocoa-powder, cashew nut and dates. The blending of the milk improves its creaminess and smoothness. Three distinct dilutions were created using quinoa milk and water ratios (1:4, 1:6, 1:8) for further milk formulations. The optimum formulation is employed for additional organoleptic analyses, including taste, colour, mouth feel, and general acceptability. The evaluation of microbiological parameters and proximal analysis came next. The quinoa milk had a 75.3% of moisture content and 0.52% of ash content in addition it was found to have 3.53% of protein content 17.25% of carbohydrates content and 3.67% of fat content and energy 166.15 kcal. The results show that quinoa milk is a vegan product with a high nutritional value that lactose intolerant individuals should consider.

How to cite this paper: Nidhi Jain | Prof. Nisha M Wagh "Development and Physio-Chemical Analysis of Flavoured Milk from Chenopodium Quinoa" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-7 | Issue-1, February 2023, pp.1368-1373, URL: www.ijtsrd.com/papers/ijtsrd53830.pdf

IJTSRD53830

KEYWORDS: *Quinoa, Cashew nuts, Chocolate, Dates, Vegan milk*

1. INTRODUCTION

Many scientific studies back up the benefits of nutrient-rich flavoured milk as part of a balanced diet. Those who drink flavoured milk get additional calcium, phosphorus, magnesium, potassium, and vitamin A (Murphy, M. M. et al., 2008). Because of its palatability, nutritional content, and ease of accessibility, plain milk is the most widely consumed liquid dairy product in the world. If various components such as colour, flavour, and sugar are added to this milk, the modified form is known as flavoured milk. Milk-flavored beverages are prevalent around the world, and they are popular among a variety of consumer groups, including children and the elderly, due to their nutritional and sensory qualities, as well as their convenience (Yanes, Durán, & Costell, 2002). Among flavoured milks, chocolate milk is the one that people are most familiar with (Thompson, Drake, Lopetcharat, & Yates, et.al. 2004).

Cocoa powder, a key component in chocolate milk, is insoluble in water, giving the drink a grainy feeling. Hydrocolloids are commonly used to minimise graininess, boost creaminess, and improve the stability of chocolate milk (Kazemalilou & Alizadeh, 2017; Prakash, Huppertz, Karvchuk, & Deeth, et.al. 2010).

Dates are known for being very nutritive, well-mineralized, flavorful, and high in calories. They are also an excellent source of dietary fibre (A. Chandra, A. Chandra A, I.C. Gupta, et.al. 1992). Ayurveda claims that some dietary combinations are healthy, such as milk and dates. Dates are an excellent source of iron and offer a useful way to supplement for iron deficiency anaemia throughout children, pregnancy, and adolescence (N. Fazal, V. Lakshmi, K. Sreedevi, et.al. 2012). Dates are a fantastic source of quick energy and high nourishment. Dates are high in

dietary fibre, vitamins, and carbs (44–88%), fat (0.2-1%), protein (2.3–5.6%), and protein (2.3–5.6%). (6.4-11.5 percent) (W. Al-Shahib, R.J. Marshall, et.al.2003). Date is recognised to have antioxidant, antimutagenic, and antibacterial effects (Ashraf Z, Z Hamidi Esfahani, et.al. 2011).

Cashew and its products are beneficial to many human health issues and provide several benefits to the human body. Cashew nut, in particular, helps to lower blood cholesterol levels, regulate diabetes, and reduce the risk of coronary heart disease (Desai et al., et.al. 2017; Ros, et.al. 2010). Cashew nuts are abundant in magnesium, which is necessary for bone formation and the prevention of high blood pressure (Dendena and Corsi, et.al. 2014).

2. Materials and Methodology:

2.1. Materials

The research work was conducted in the Food Processing Laboratory, at Parul Institute of Applied Science, Parul University, Vadodara, Gujarat. Quinoa, Dark Chocolate, Cocoa powder, Cashew nuts, and Dates were obtained from a local supermarket in Vadodara, Gujarat.

2.2. Processing Equipment:

Processing equipment is anything required to treat or process a raw material or finished item using mechanical, thermal, or chemical procedures. It has a refrigerator, a mixer/processor, a digital thermometer, and a weighing scale. Vessels, spoons, plates, and muslin cloth are necessary for the preparation of Quinoa Milk.

2.3. Analyzing Equipment:

For the formulation and preparation of Flavoured Buckwheat milk, there is a requirement of Soxh let apparatus for fat estimation, Kjeldhal's apparatus for protein estimation, a Muffle furnace for ash estimation, a Digital ph meter for measuring the ph of the sample, Laminar Air Flow for the determination of T.P.C. count, T.P.C. plates are incubated in an incubator, and crude fibre 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.

2.4. Product Manufacturing Process:

2.4.1. Preparation of Flavoured Quinoa Milk:

Quinoa, cocoa powder, dark chocolate, cashew nuts, and dates were bought because they were of good, consistent quality. Each raw element was precisely measured in accordance with the calculated milk ratio. Quinoa that has been sprouted is used to make milk. Quinoa is immersed in somewhat warm water for 24 hours, at which point it is sprouted. The concentration of starch is further decreased as a result of this procedure. The quinoa was then mashed with different amounts of water, and the milk was then filtered through a muslin cloth. Blend of extracted milk, dates, cashews, cocoa powder, and dark chocolate. The temperature of the filtered milk was then raised to 70 °C. The completed vegan milk was chilled further after being placed in a glass bottle.

1. **Cleaning -**After obtaining the raw material, it was cleaned to remove undesirable elements such as stones, dirt, immature beans, broken beans, etc.
2. **Weighing**-The required quantity of cleaned quinoa was weighed in preparation for soaking.
3. **Soaking** -For 24hr, Lukewarm water was used to soak the quinoa. After soaking in lukewarm water, quinoa completely loses all of its anti-nutritional qualities.
4. **Germination**-The quinoa was then further ground to extract the milk after being tied in a cotton cloth for six hours to encourage germination and reduce the starch content of the grain.2.4.7**Filtration**-. The milk is physically separated from the processed quinoa using muslin cloth.
5. **Grinding**- Date, cashew, cocoa powder, and dark chocolate are all ground together after being extracted from milk. The creaminess and smooth texture are improved by the blended milk.
6. **Filtration-** again filtered the milk.
7. **Heating**- Added according to the ratio and continuous stirring of milk was carried out to avoid lump formation. After filtration, heating was carried out, and the temperature was checked every few minutes until it reached 70 °C using a glass tube thermometer.
8. **Bottling**-After the milk had been placed in a glass container and allowed to cool, the bottles were sealed.
9. **Storage**-The milk was bottled and kept in the refrigerator at 4°C.

3. METHODS

3.1. Physio-Chemical Analysis

Quinoa, cocoa powder, dark chocolate, cashew nuts, and dates were utilised, and vegan flavoured quinoa milk was evaluated for proximate composition, including moisture, ash, protein, fat, carbohydrate, and calorie content, using the standard operating procedure.

3.1.1. Moitsure content

The moisture content was evaluated by drying the empty dish and weighing and grinding 5 g of the sample in the dish. The dish was then dried in an oven at 105 C for 4 hours. It was weighed again after cooling in a desiccator until it reached a steady weight. The consequent weight loss was calculated as moisture content.

Moisture % = Initial weight (W1) -final weight (W2) / Initial weight (W1) × 100

3.1.2. Ash content

The (AOAC 1980) technique was used to determine the ash content. 5g of sample was weighed into the pre-weighed crucible and burned at a low flame until entirely charred (smokeless) and cooled. The sample was then maintained at 5500C in the muffle furnace for roughly 4 hours. A desiccator cooling process was followed by weighing. The tor method was continued until the weights of two successive trials were constant. The percent ash was estimated by subtracting the initial and final weights.

Ash %=Weight before heating – Weight after heating/ weight of sample × 100

3.1.3. Determination of Protein content (By Micro-Kjeldhal Method)

% N = (Sample – blank N of HCL vol. of digest 0.014) / Aliquot taken Wt. of sample

3.1.4. Determination of Carbohydrates

The carbohydrate content was estimated by subtracting the sum of the moisture, fat, protein, total ashand crude fibre values. The NFE was calculated using the formula below.

CP = crude protein.CF= crude fat. CF= crude fiber.

NFE % = 100 – (CP% + CF% + CF% + TOTAL ASH%)

3.2. Microbial Analysis

Microbial inspection is the perfect quality evaluation approach for food product quality analysis. The microbiological quality of the newly produced vegan milk was evaluated. Many microbiological properties, including total plate count, yeast, and mould as well as sample preservation at room temperature, were assessed in the current study. Microbial tests were carried out in compliance with APHA recommendations (1992).

3.2.1. Total Plate Count Determination

The nutritional agar medium was created by combining 28 g of nutrient agar with 1000 ml of distilled water and boiling the mixture until the agar was completely dissolved. It was sterilised in an autoclave for 20 minutes at 120°C and 15 pounds of pressure.

The sample solution (serial dilution) was generated by numbering nine sterile test tubes. Each tube received 9 ml of distilled water. The test tubes were sterilised in an autoclave at 121 °C for 15 minutes with cotton plugs under 15 lbs of pressure. A sterile test tube holding 9 ml of distilled water received 1 ml of material serially. Pipettes and Petri plates were sterilised in an autoclave (moist heat treatment) or a hot air oven (dry heat treatment). A sterile petri dish was placed in the laminar airflow cabinet, and the UV light was turned on for 30 minutes. After 30 minutes, the UV light was turned off, the fan was switched on, and 70% ethanol was used to clean the work area. Before adding 1 cc of samples to each plate, plates were suitably labelled. Each plate got 15-20 mL of molten material. This was done close to a flame to avoid microbiological contamination of the plate. The plates were vigorously agitated and left to solidify. The plates were removed from the incubator after 48 hours at 37°C to be examined for colonies.

3.2.2. Yeast and mould count determination

Potato dextrose agar medium preparation: 39g of Potato dextrose agar medium was dissolved in 1000ml of distilled water. The mouth was sealed with a cotton plug and sterilised in an autoclave at 121 C for 15 minutes at 15 pounds pressure.

Preparation of the sample solution (serial dilution): 9 sterile test tubes were obtained and numbered accordingly. 9ml of pure water was poured into each tube. The test tubes were sterilised in an autoclave at 121°C for 15 minutes under 15 pounds of pressure using cotton plugs. In a sterile test tube, 1 ml of the sample was serially added to 9 ml of distilled water.

Plate preparation: Petri plates and pipettes were sterilised in a hot air oven (dry heat treatment) or an autoclave (moist heat treatment). Sterilized Petri plates were put in a laminar airflow cabinet and exposed to UV radiation for 30 minutes. After 30 minutes, the UV light was shut off, the blower was turned on, and the working surface was cleaned with 70% alcohol. Before loading 1 ml of samples onto plates, they were properly labelled. Each plate received 15- 20ml of the molten liquid. This was done near a flame to prevent microbiological contamination of the plate. The plates were vigorously spun and then permitted to harden.

Table: 3.2.3.1 Formulation of Quinoa flavored vegan milk.

Formulation	Quinoa (gram)	Dark chocolate (gram)	Cocoa Powder (gram)	Cashew Nuts (gram)	Dates (gram)
C1	50	60	10	20	100
C2	50	20	20	20	120
C3	50	50	10	20	80

4. Result and Discussion

The result obtained during the investigation "Development and physio-chemical Analysis of Flavored vegan milk from using Quinoa" is discussed here. The final product was analysed for physio-chemical analysis, microbial-analysis sensory evaluation. Research experiments undertaken to standardized the method manufacturing of Flavored milk has been discussed under heading:

Table 4.1: Proximate composition of Quinoa Flavoured vegan milk

Characteristics	Values
Moisture Content	75.03
Ash Content	0.52
Protein	3.53
Carbohydrate	17.25
Fat	3.67
Calorific Value	166.15 Kcal

Quinoa milk was 75.03 percent moisture. Ash content was 0.52%, Protein was 3.53%, Carbohydrate was 17.25%, Fat was 3.67%, and Calories found were 166.15Kcal.

4.1. Sensory Evaluation

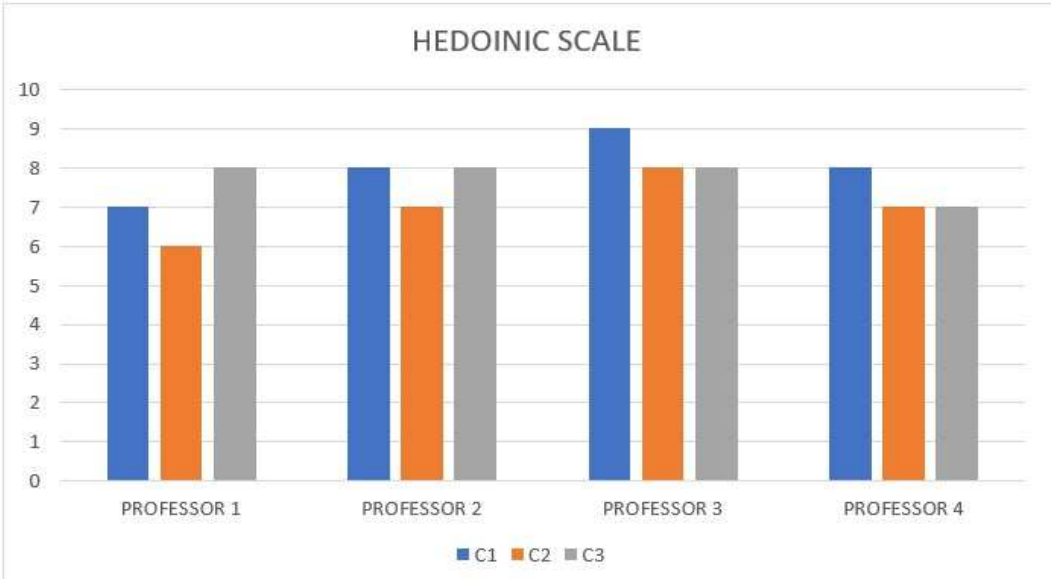
F1 **F2** **F3**

Table 4.3: Sensory evaluation of produced Quinoa flavored vegan milk

Sample code	F1	F2	F3
Appearance	8	6	8
Colour	8	8	9
Texture	8	6	8
Taste	7	6	8
Overall Acceptability	7.5	6.5	8.5

The quality of Quinoa Milk was greatly influenced by their flavour, texture, and taste. There were significant changes in texture and taste of Quinoa milk due to different concentration Dark chocolate, Cocoa Powder and Dates. The Quinoa Milk with F1 formulation got 8 hedonic score appearance, 8 hedonic score on Color, 8 hedonic score on Texture, 7 hedonic score on taste and its overall acceptability was 7.5. The milk with F1 formulation got 7.5 for overall acceptability which indicates that the Quinoa Flavored milk is Liked very moderately according to 9-point hedonic scale. It can be because of dull taste, poor texture and appearance and taste. F2 formulation got 6 hedonic score appearance, 8 hedonic score on Color, 6 hedonic score on Texture, 6 hedonic score on taste and its overall acceptability was 6.5. The milk with F2 formulation got 6.5 for overall acceptability which indicates Like slightly. The F3 formulation got 8 hedonic score appearance, 9 hedonic score on Color, 8 hedonic score on Texture, 8 hedonic score on taste and its overall acceptability was 8.5. The milk with F3 formulation got 8.5 for overall acceptability which indicates the milk to be like very much Therefore, Quinoa flavored milk with F3 formulation was selected as the best quinoa flavored milk.

Table 4.4: Hedonic Scale



4.2. Packaging and Storage

Packaging can be thought of as a socio-scientific discipline that serves society by ensuring that goods are delivered to their final customers in the best condition possible. The materials most frequently used in packaging are plastics, paper boards, metals, glass, and wood. It also makes use of the cellulose, or wood fibre, that is utilised to create cardboard boxes for sale. The objectives of packing include convenience, barrier protection, physical protection, and information transfer. (Nakade et al.,2020).

In this experiment, we chose glass bottles for the packaging of quinoa milk. A definite advantage of transparency is the customer's ability to see the products. Glass surfaces can be readily washed, cleaned, and dried before filling, maintaining their cleanliness. Glass containers offer returnable, reusable, and recyclable environmental benefits. Technical advancements in design, construction, and handling have resulted in significant weight savings for containers.

4.2.1. Cost Estimation

Table 5: Cost estimation of Quinoa flavored Vegan milk

Ingredients	Cost (Rs)
Raw material	85
Electricity	0.8
Gas	15
Packaging	20
Total (700gram)	121

5. Conclusion

Based on the research results, F3 was determined to be the best treatment out of all the formulations containing varied concentrations of Quinoa, dark chocolate, cocoa powder, cashew, and dates. Quinoa milk with F3 formulation has a moisture content of 75.03%, an ash content of 0.52%, a protein content of 3.53%, a fat content of 3.67%, a carbohydrate content of 17.25%, and an energy content of 166.15 Kcal. The prepared Quinoa flavoured milk can offer the body with enough energy and protein. Quinoa milk gains nutritious value through the addition of nuts. This Quinoa flavoured milk is suitable for people suffering from hormonal imbalances such as PCOS and PCOD, as well as diabetics. It can be a healthy food substitute for unhealthy foods. The Quinoa Milk can be refrigerated for up to three days.

References

[1] Chandra, A. Chandra A, I.C. Gupta. Date Palm Research in Thar Desert. Scientific Publishers. 1992, 2 (3): 103-110.

[2] Bhargava, A., Shukla, S., & Ohri, D. (2006). Chenopodium quinoa - an Indian perspective. Industrial Crops and Products, 23, 73–87.

[3] Dendena B, Corsi S (2014). Cashew, from seed to market: A review. Agronom. Sustain. Dev. 34 (4): 753-772. https://doi.org/10.1007/s13593-014-0240-7.

[4] Desai D, Raorane C, Patil S, Gadgil R, Patkar D (2017). Anacardium Occidentale: Fountain of Phytochemicals; the Qualitative Profiling. World J. Pharm. Res. (May), 585–592. https://doi.org/10.20959/wjpr20175-7822.

[5] Giuliani, A., Hintermann, F., Rojas, W., & Padulosi, S. (2012). Biodiversity of Andean grains: balancing market potential and sustainable livelihoods.

[6] Kazemalilou, S., & Alizadeh, A. (2017). Optimization of sugar replacement with date syrup in prebiotic chocolate milk using response surface methodology. Korean Journal for Food Science of Animal Resources,37, 449–455.

[7] Murphy, M. M., Douglass, J. S., Johnson, R. K., & Spence, L. A. (2008). Drinking flavored or plain milk is positively associated with nutrient intake and is not associated with adverse effects on weight status in US children and adolescents. *Journal of the American Dietetic Association*, *108* (4), 631-639.

[8] N. Fazal, V. Lakshmi, K. Sreedevi. Preparation and utilization of date paste for value added products, 2012, Beverage and Food World 63 (1): 31-33.

[9] Nakade, Vijay P., Rupesh J. Saindane, and Yashodip R. Pawar.2020. "Preparation of Healthy-Vegan flavored Soymilk blended with Peanut."

[10] Nisha M Wagh, Prof. Hanmant Bodhankar, Prof. Todkar Ashish. 2022. Development of Nutri-bar Using Quinoa.

[11] Prakash, S., Huppertz, T., Karvchuk, O., & Deeth, H. (2010). Ultra-high-temperature processing of chocolate flavoured milk. Journal of Food Engineering, 96, 179–184.

[12] Pratik Anant Thakar, Prof. Nisha Wagh 2023. Development of Nachos using Cucurbita (Pumpkin) Seed Powder, Sorghum (Jowar) Flour, Zea Mays (Maize) Flour, and Cicer Arietunum (Besan).

[13] Repo-Carrasco, R., Espinoza, C., & Jacobsen, S. E. (2003). Nutritional value and use of the Andean crops quinoa (Chenopodium quinoa) and kañiwa (Chenopodium pallidicaule). *Food reviews international*, *19* (1-2), 179-189.

[14] Rohit G Jagdale, Prof. Nisha Wagh, Sayali Pawar 2023. Development and Physico-Chemical Analysis of Vegan Lactose-Free Chocolate Milk extracted from Fagopyrumesculentum. (Buckwheat)

[15] Ros E (2010). Health Benefits of Nut Consumption. Nutrients 2 (7): 652- 682. https://doi.org/10.3390/nu2070652.

[16] Thompson, J. L., Drake, M. A., Lopetcharat, K., & Yates, M. D. (2004). S406-S413.

[17] W. 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 Science and Nutrition, 2003, 54: 247-259.

[18] Yanes, M., Durán, L., & Costell, E. (2002). Rheological and optical properties of commercial chocolate milk beverages. *Journal of Food Engineering*, *51* (3), 229-234.

[19] Z. Ashraf Z, Z Hamidi Esfahani. Date and data processing: A Review. Food Review International, 2011, 27: 101-133.