

Phytochemical and mineral content of pulp drink and analogue yoghurt from pretreated balanites aegyptiaca fruit pulp

Abstract

Production, phytochemical characteristics and mineral contents of pulp drink and analogue yoghurt from pretreated balanites aegyptiaca fruit pulp were investigated. Production of pulp drink from balanite fruit via boiling sifting, water elution to make pulp drink. A yoghurt stock was prepared with pulp drink sample at 50:50 dilution and allowed to ferment overnight to make analogue yoghurt from balanites pulp. Results revealed that tannin, saponin, flavonoids and alkaloid were present in pulp drink qualitatively. Tannin and saponin were not found in yoghurt samples except flavonoids and alkaloids. The mineral content was favorable in the drink, for Zn at (0.0306mg/L), Cu at (0.6328mg/L), Fe at (2.796mg/L), Mg at (18.5767mg/L) and Ca at (6.6783mg/L) compared with the control; (Zn, 0.0250mg/L) (Cu, 0.0103mg/L) (Fe, 1.3001mg/L), (Mg 17.1005mg/L), (Ca, 46.3778mg/L). Only Zn and Cu were found abundant in balanites analogue yoghurt at 50:50 blend ratios compared with the control. Production of balanites juice and analogue yoghurt are possible and could fight age related nutrition, hidden hunger and alternative to imported black currant drink and expensive powdered milk base which are not affordable by our rural society.

Keywords: production, balanite drink, analogue yoghurt, phytochemical, minerals, nutrition

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Introduction

There has been significant use of plants, for food and as animal protein substitutes, this is arousing interest among consumers, dieticians and nutritionists. Plants are now being used in the preparation of food of high energy value by dietetics: yoghurt, flour for babies, jams, marmalades. It has been reported that dates products have been developed including Ketchup,¹ biscuits,² ice,³ Tamarheep (a mixture of flour of dates and milk),⁴ flour of dates and yogurt with extract of dates.⁵ Fresh fermented dairy products such as yoghurt are widely consumed foods in many countries.⁶ Yogurt is one of the most dairy products sold on the market because of the diversification of its constitution, such as fat yoghurt, probiotic yoghurt, yoghurt mousse, ice cream yoghurt, liquid yoghurt for drinking⁷ yoghurts are healthy food because of its beneficial live bacteria. However, in competition with pathogenic bacteria in both food and the environment.⁸ The extract of balanites such as pulp, leaves, juice had been reported to be rich in micro and macro nutrients especially proteins and vitamins.¹ Dates are rich in fiber and pectin minerals such as (Ca, P, K, Fe) and other biological active substances like Group B vitamins, essential amino acids and polyphenols.⁹ The purpose of this research is to make yoghurt analogue from balanites pulp drink, as a functional food base material that may meet consumers' expectations in the modern day of infection, diseases and age related issues. These potentials, balanites polyphenols contents has.^{1,6} This research work seeks to establish the best analogue yogurt and juice products from balanites pulp produce at various pretreatments for children and adult that depends on milk, milk intolerance people as well as ovo-lacto vegetarians. The bioactive, minerals and vitamins contents may help against hidden

hunger.

Materials and methods

Balanites pulp: The fruit from balanites were picked from the floor from and around the university campus, Sorting was done on pulp made by boiling. The pulp was sieved and diluted with an equal amount of water to make a balanites pulp drink

Milk used for the manufacture of yoghurt

The milk used was full cream dehydrated powdered peak brand milk.

Starter organism: Raw fresh cow milk was used for dilution culture preparation or as operation culture. Milk contains lactic acid fermenters with dominant species containing *Streptococcus thermophilus* and *Lactobacillus bulgaricus* as natural sourced starter.

The balanites drink used for manufacture of yoghurt: The drink was obtained after heating fruit to pulping at 80°C for one hour, followed by hot sifting there after diluting with equal amount of water to make balanites drink. This drink was also used as base for the analogue yoghurt preparation (Figure 1) (Figure 2).

Yoghurt making: The preparation of the balanites yoghurt analogue was done at the science laboratory of the Federal University Gashua. Standard yoghurt with a modification concerning the substitution of balanites was prepared. This was simmered with pulp drink on combination. The culture sample was allowed to stay for 24 hours for maturation of the yoghurt analogue. This is shown in Figure 1.

Phytochemical screening of fresh yoghurt

Analogue yoghurt, currant drink and pulp drink of *Balanites aegyptiaca* fruits were carried out according to the methods of (Figure 1) (Figure 2).^{10,11}

Alkaloids

0.5g extracts from pulp drink and pulp yoghurt were diluted with 10mL of acid alcohol, boiled and filtered. To 5ml of the filtrate was

added 2mL of dilute ammonia, 5mL of chloroform was added and shaken gently to extract the alkaloid base. The chloroform layer was extracted with 10mL of acetic acid. This was divided into two parts each of the samples. Mayer's reagent was added to one portion of the sample and Dragendoff's reagent was added to other portion of the sample. The formation of cream (with Mayer's reagent) or reddish brown precipitate (with Dragendoff's reagent) indicates the presence of alkaloid.

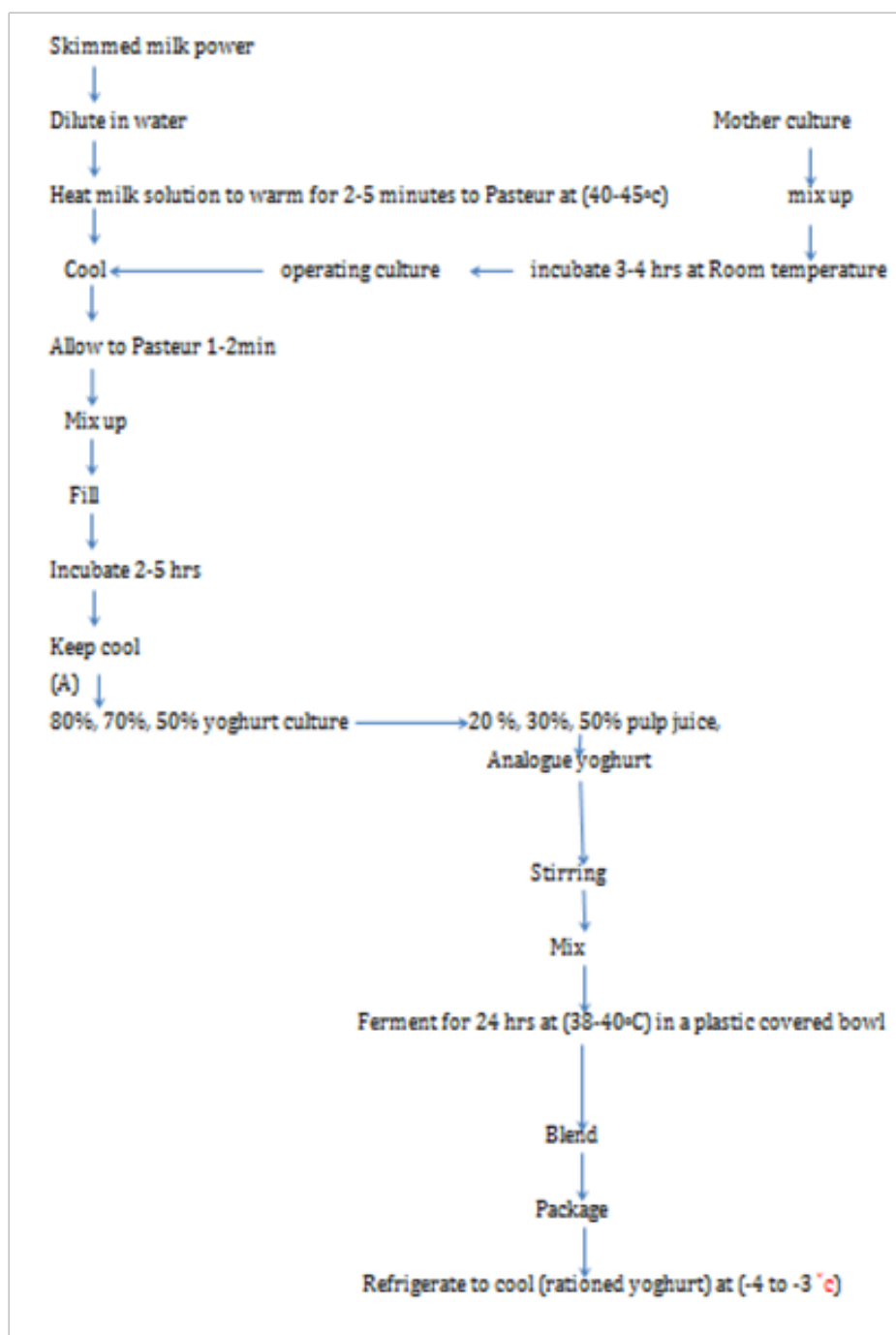


Figure 1 Making of Analogue ration Yoghurt.

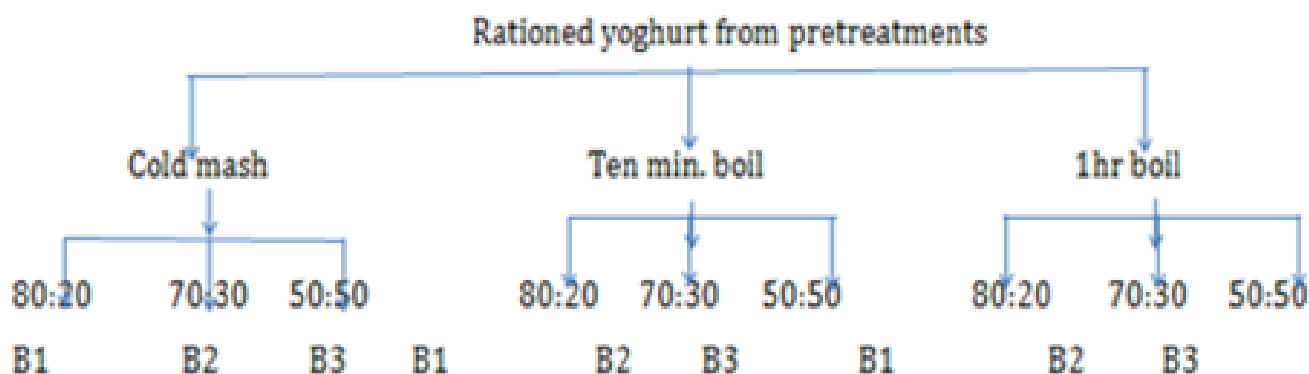


Figure 2 Ration yoghurt from Pre treatments.

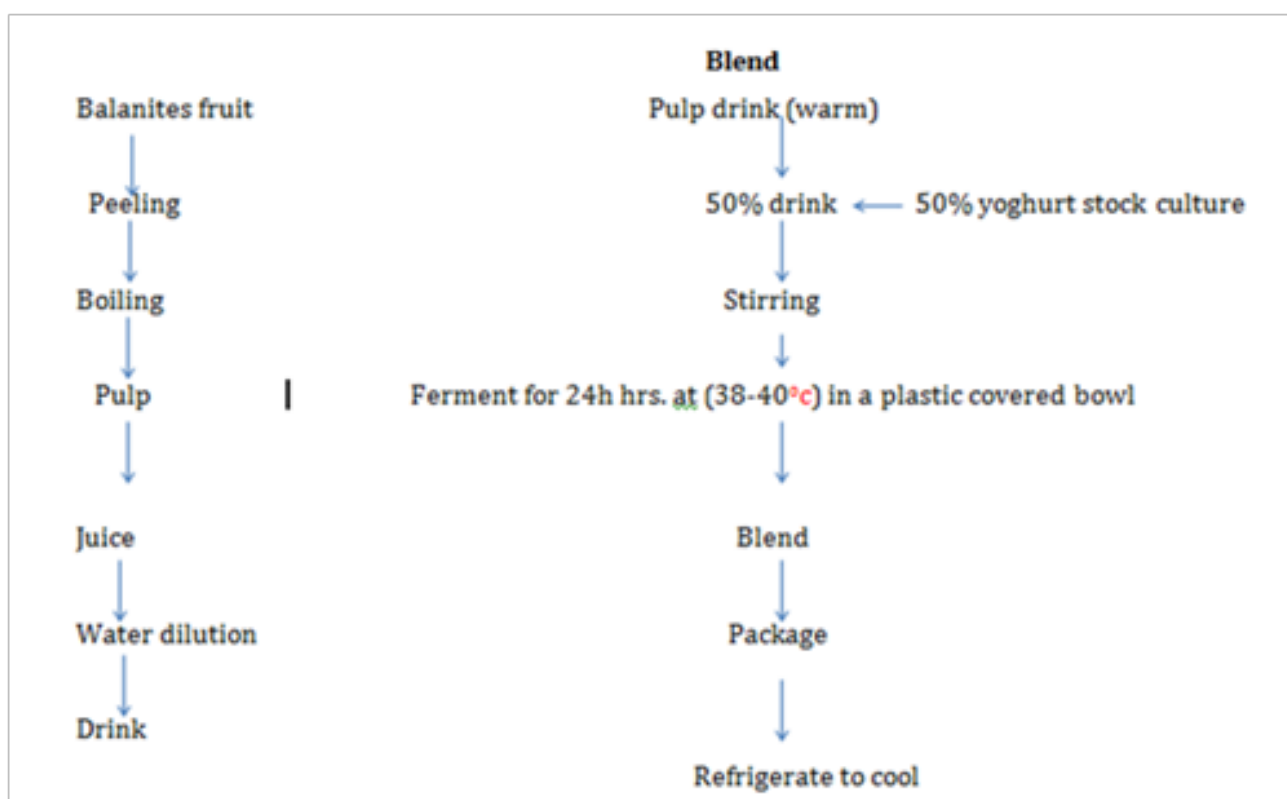


Figure 3 Flow diagram for making balanaites pulp drink and (50%:50%) yoghurt analogue.

Saponins

To 0.5g of pulp drink and analogue yoghurt were added 5mL of distilled water in a test tube. The solutions was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and is shaken vigorously. An appearance of creamy mass of small bubbles indicates the presence of saponins.

Tannins

0.5g of the samples (pulp drink and pulp yoghurt) were boiled for 5minutes separately in 10mL of water in a test tube and then filtered. Drops of 0.1% ferric chloride was added and was observed. Coloration indicted the presence of tannins.

Flavonoids

On the sample of pulp drink and yoghurt, fragments of magnesium ribbon were added to the test the drink and yoghurt solution followed by adding Hydrochloric acid, pink scarlet, crimson red or occasionally green to blue colour appears after few minutes.

Analysis of minerals

The mineral elements of Zn, Cu,mg, Fe and Ca were determined.

Flame photometer test

About 2g of liquid drink and control sample were weighed and placed in acid-washed test digestion tubes respectively. TenmL of

concentrated nitric acid (AnalaR grade, BDH 69%) was added to the digestion tube.¹² They were placed in a hot-block digester first at low temperature (40°C) for 1 hour and then were fully digested at high temperature (130°C) for 2hours. The digested samples were then diluted to 40mL with double distilled water. After filtration, the metals were determined by using an air-acetylene flame photometer (fp). The data were presented inmg/l. Standard solutions for Cu, Fe and Zn were prepared from 1000mg/L stock solutions (MERCK Titrisol). To avoid possible contamination, all glassware and equipment used were washed with acid and the accuracy of the analyses was checked against the blank. Quality control samples made from the standard solutions for Cu, Fe and Zn were analyzed in every 2 samples to check for sample accuracy.

Calcium and magnesium determinations by automated method

Using Lanthanum interference suppressant solution: About 200mL. of hydrochloric acid (concentrated, AR grade) were slowly and carefully (fume cupboard) added to 68g lanthanum oxide (AR grade) in a 2 l pyrex beaker. Stir the mixture until the lanthanum oxide is completely dissolved, cool, and add it to 200ml deionized distilled water. Dilute to 1liter with deionized distilled water. This solution contains 58,6g/i. La, equivalent to 5g/i in the aspirate. Standard solutions were prepared no addition of caesium-lanthanum solution here. 2g Manifold dilution of sodium and magnesium was set and fill into plates. The standard solutions was aspirated and samples, under the conditions stimulated.¹³ The automation operated and record from absorbance values obtained as peaks on a chart recorder. The concentration of each metal ion calculated by reference to the calibration curves obtained by plotting concentrations of the standard solutions versus the corresponding peak heights.

Discussion

Table 1 shows phytochemical Characteristics of *Balanites aegyptiaca* Pulp drink revealed the presence of taninin, saponin, flavonoids and alkaloid bio actives. These bioactive were present in all the pulp drink treated samples, however not strongly present. Alkaloid and flavonoids had been associated with anti-microbial and anti-oxidants function in human system.¹⁶ Tannin and flavonoids may still posse nutritional hindrances in balanites pulp drink. Their presences may have being resuscitated by water dilution on drink making process which might have allowed infinite dilution of the bio ionic material of the phytochemicals especially on the one the hour sample pulp drink treatment.

Table 1 Phytochemical characteristics of *Balanites aegyptiaca* pulp drink

Sample	Tannin	Saponin	Flavonoid	Alkaloid
Control	+	+	+	+
A1	+	+	+	+
A2	+	+	+	+
A3	+	+	+	+

A1=10minutes heating
A2=boiled for 1hour
A3=cold juice

Table 2 shows Phytochemical Characteristics of *Balanites Aegyptiaca* Pulp yoghurt revealed the presence of some bio-active. Tannin, saponin were absent in the entire sample treated. Flavonoids and alkaloids were observed to be present in all the samples. The masking of these anti-nutritional substances may have come from ration dilution of 50:50 yoghurt stocks to drink solution.¹⁴ The period for fermentation and the microbial culture successions may have allowed the reuse of the tannin and saponin bioactives. Fermentation generates bio ionic material since redox function comes to play during fermentations. This may have allowed the buildup of this anti-microbial and anti -oxidant flavonoid and alkaloid bio-actives.⁶

Table 2 Phytochemical characteristics of *Balanites Aegyptiaca* pulp yoghurt

Sample	Tannin	Saponin	Flavonoid	Alkaloid
Control	-	-	+	+
A1	-	-	+	+
A2	-	-	+	+
A3	-	-	+	+

Key,A1= 50:50 zero cold temperature yoghurt

A2= 50:50 one hour boiled yoghurt

A3= 50:50 boiled pulp for 10minutes

Table 3 shows Mineral Analysis of *Balanites aegyptiaca* Pulp drink Product at 50:50 pulp juice and water dilution showed that Zn at(0.0306mg/L), Cu(0.6328mg/L), Fe(2.796mg/L), mg(18.5767mg/L) and Ca(6.6783mg/L) were present. Zinc mineral ions, copper, iron and magnesium in pulp rink were higher than the control sample this revealed that minerals element was made available at these treatment and dilutions. These could be inferred that balanites pulp drink can compete with black currant drink esteemed nutritionally important to fight age and cancer related illnesses. The low presence of Ca⁺ might have come from inhibitory action of saponin which is confirmed present in the pulp drink (Table 3).¹

Table 4 shows mineral Analysis of *Balanites aegyptiaca* Pulp Yoghurt Product showed that (Zn 0.6020mg/L), (Cu 0.326mg/L), (Fe 2.252mg/L), (Mg, 14.73mg/L) and (Ca, 6.6783mg) were present. Zinc mineral ions and copper were high in the analogue yoghurt samples compare to control. However Iron, magnesium, and calcium were lower comparing to control. This high content of Zn⁺ and Cu⁺ observations and low F⁺, mg⁺ and Ca⁺ in the yoghurt samples may have come from fermentation process that allows the use and generation of certain mineral ions (Appendixes).

Table 3 Some mineral analysis of *Balanites aegyptiaca* pulp drink product

Sample	Zn(mg/L)	Cu(mg/L)	Fe(mg/L)	Mg(mg/L)	Ca(mg/L)
Control(Black Currant Drink)	0.025	0.0103	1.3001	17.1005	46.3778
A1	0.0206	0.6328	2.796	18.5767	6.6783

Key, A=Drink from 1 hour boiling

Table 4 Some mineral analysis of *Balanites aegyptiaca* pulp yoghurt product

Sample	Zn(mg/L)	Cu(mg/L)	Fe(mg/L)	Mg(mg/L)	Ca(mg/L)
Control(Natural Yoghurt)	0.3501	0.1067	5.2603	132.6	195.614
B1	0.602	0.3267	2.2526	14.73	6.6782

Key, B₁=50:50 blend ration yoghurt

Conclusion

Phytochemicals were present in the pulp drink and analogue yoghurt, which may have effect on nutrient absorption or metabolism. The mineral contents were abundant especially zinc. Zinc is one critical mineral element for healthy living therefore analogue yoghurt and pulp drink from *Balanites* fruits are good sources. Because of the presences of certain pro-bio actives the yoghurt products will be an excellent anti-oxidant, anti-microbial and mineral substances as well as reduce the burden on dry milk stock which is very expensive in Nigeria. The products are easy to make and abundant hence can alleviate hidden hunger in our rural society as well help against protein energy malnutrition.

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Conflict of interest

Author declares that there is no conflict of interest.

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