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Preparation of antioxidant rich low fat pomegranate frozen yoghurt

Aradhana Verma and Uttam Kumar Tripathi

Abstract
The experiment was replicated three variance (ANOVA) and Critical Difference (CD) techniques. From the results, it is calculated that pomegranate frozen yoghurt increase the nutritive value. The frozen yoghurt was acceptable on the basis of sensory evaluation. Pomegranate fruit frozen yoghurt treatment T_3 (Skimmed Milk 65%, pomegranate seeds15%, SMP 3%, sugar 14.6%, emulsifier 0.2%, stabilizer 0.2%) was highly acceptable in terms of color and overall acceptability. The nutritional composition of all treatment in the pomegranate fruit frozen yoghurt increased energy, carbohydrate, protein, iron, calcium, polyphenols, and flavonoid using standard chemical procedures. The pH and viscosity TSS was analyzed using standard AOAC (2005).

Keywords: Antioxidant rich, prevent heart disease, hypertension, skin disease, nutrient rich

1. Introduction
Yoghurt is regarded to be nutritious than the milk from which is made. Consumption of Yoghurt provides energy through fat and carbohydrates, muscle building protein, bone forming minerals and essential growth factors is terms of vitamins through the action of microorganism. Yoghurt has been derived from a Turkish word "jugurt" that means to be curdled coagulated product obtained from pasteurized or boiled milk by lactic acid fermentation through *Lactobacillus Bulgaricus* and *Streptococcus Thermopiles.* It may contain culture of *Bifido bacterium Bifidus, Lactobacillus Acidophilus* and if added, the declaration to this shall be made on the label. Cultured milk product, particularly yoghurt, is regarded by many as health foods. They have a therapeutic significance particularly with reference to suppression of undesirable bacteria in the human digestive system. The product should have a uniform smooth body, texture characteristic and pleasing flavor with minimum whey separation**.** Weerathilake *et. al.* (2014) [9]
Fruits are an important part of a healthy diet. They are naturally low in calories, fat, sodium, and cholesterol. Fruits play and important role in keeping the body healthy and have many benefits including. The antioxidant activity of pomegranate fruit peels was evaluated using *in vitro* test. 80% methanolic extracts (ME) of peels had higher yield (45.4%) and total phenolics (27.4%) than water (WE) or either extracts (EE). The reducing power of ME was more potent ($P< 0.05$) than either WE or EE. The DPPH radical scavenging activity (%) of ME was stronger than that of α- catechin. pomegranate peels contained phenolics, exhibited DPPH scavenging activity and reducing power Mutahar *et al* (2012) [7]

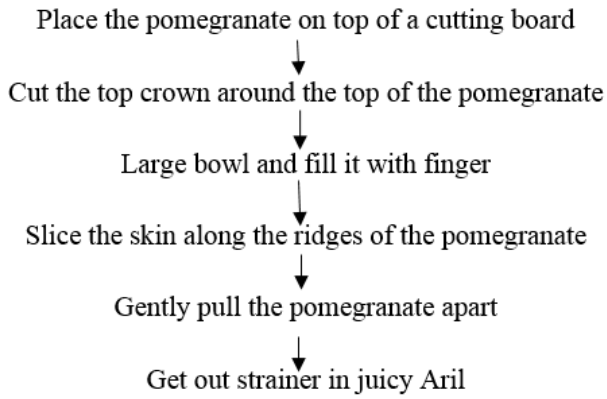
Research Methodology
This present investigation "Preparation of antioxidant rich and low fat pomegranate fruit frozen yoghurt" was conducted in the Nutrition Research Laboratory of the Department of Foods & Nutrition, Ethelind School of Home Science, Sam Higginbottom Institute of Agriculture Technology & Sciences, Allahabad, U.P.

Procurement of Raw Materials
Milk was purchased from Student Training Dairy, Department of Dairy Technology, SHIATS, Allahabad and pomegranates seeds were purchased from local fruits market of Allahabad. Yogurt culture was purchased from National Collection of Dairy Culture, Dairy Microbiology Division of NDRI Kernal Haryana, India. Sugar was purchased from local market of Allahabad.

Site of Experiment
The present investigation was carried out in the Nutrition Research Laboratory of Foods & Nutrition Department, Ethelind School of Home Science and Research Laboratory of Warner

School of Food and Dairy Technology Sam Higginbottom Institute of Agriculture, Technology and science Allahabad.

Preparation of pomegranate Seeds



Source: Srivastava and Kumar (2009).

Fig. Flowchart for preparation of pomegranate juicy Aril Treatment combination

Treatments and replications of value added food products enriched with pomegranate yoghurt were as follows

Treatment of products

The basic frozen yoghurt added skimmed milk (80%), SMP (3%) sugar (14.6%), culture (2%), emulsifier (0.2%), stabilizer (0.2%) which served as control (T_0) for each product. The three value addition treatments were done with pomegranate seed extract at (5%, 10%, 15%) level and referred to as T_1, T_2, and T_3 respectively. The amount of frozen yoghurt was varied at each treatment at 5%, 10%, and 15% in accordance to all the three treatments. The amount of fruit 5%, 10%, 15% for all the products prepared, namely, pomegranate frozen yoghurt. Control and treatments for each preparation were replicated 3 times respectively.

Pomegranate Frozen Yoghurt

Control and Treatments / Products	T_0	T_1	T_2	T_3
Skimmed milk	80%	75%	70%	65%
Sugar	14.6%	14.6%	14.6%	14.6%
Culture	2%	2%	2%	2%
Fruits	-	5%	10%	15%
Stabilizer	0.2%	0.2%	0.2%	0.2%
Emulsifier	0.2%	0.2%	0.2%	0.2%
SMP	3%	3%	3%	3%

Analysis of frozen Yoghurt

The different samples of frozen yoghurt treatments were analyzed for:-

Processing Of Frozen Yogurt

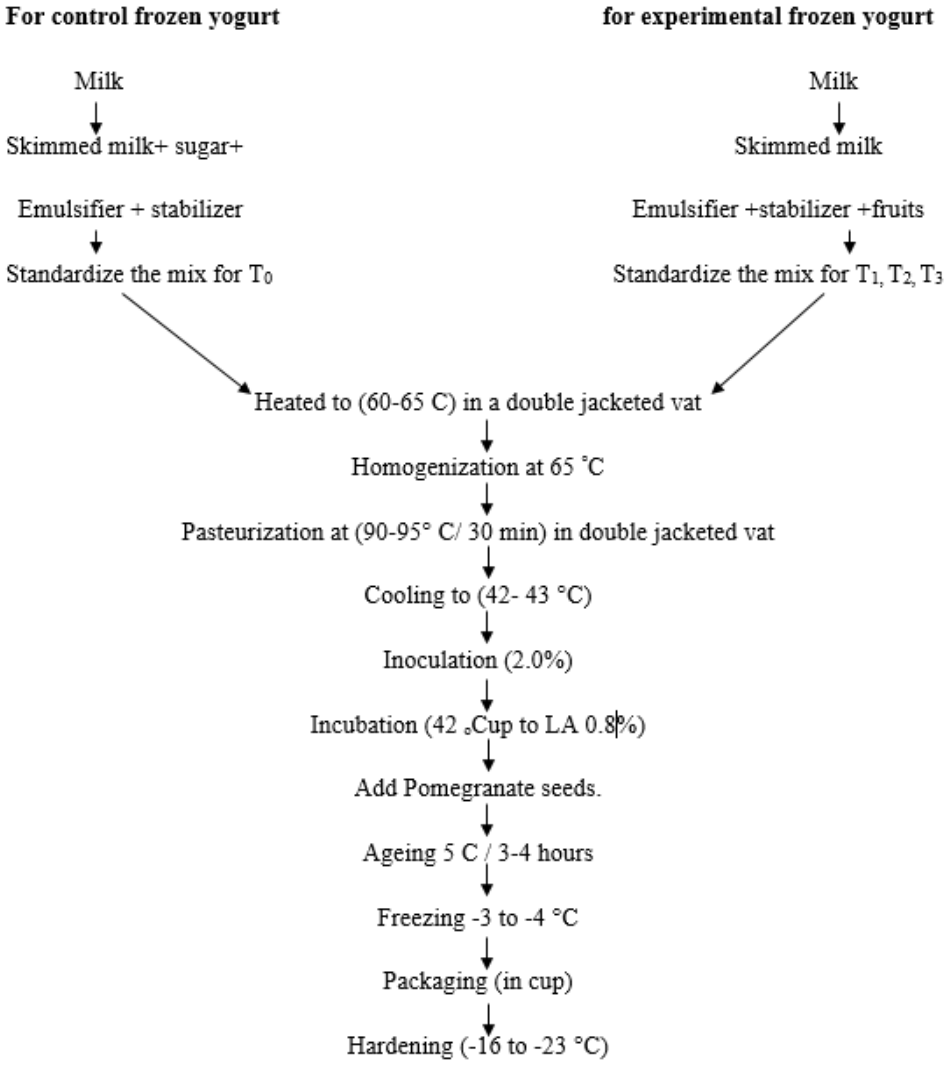


Fig. Flow chart- processing of frozen yogurt

Determination of Total Carbohydrate

Principle: Carbohydrates are first hydrolyzed into simple sugars using dilute hydrochloric acid. In hot acidic medium glucose is dehydrated to hydroxymethyl furfural. This compound forms with anthrone a green colored product with an absorption maximum at 630 nm.

Materials

- 2.5 N HCl
- Anthrone reagent: 200 mg anthrone dissolved in 100 ml of ice-cold 95% H_2 SO_4. It should be prepared fresh before use.
- Standard glucose: Stock—Dissolve 100 mg in 100 ml water. Working standard—10 ml of stock diluted to 100 ml with distilled water. Store refrigerated after adding a few drops of toluene.

Procedure

Calculation

$$\text{Amount of carbohydrate present in 100 ml of the sample} = \frac{\text{mg of glucose}}{\text{Volume of test sample}} \times 100$$

Determination of Vitamin C

Principle: This method was based upon the reduction of the dye 2-6-dichlorophenol indophenols by an acid solution of ascorbic acid. In the absence of interfering substances (Cu^{++}, Fe^{++}, Sn^{++} etc.) the reducing capacity of the extract of the sample is directly proportional to the ascorbic acid content.

Reagents

Standardization

The dye solution needs to be standardized every time it is used. 5 ml of the ascorbic acid standard solution was pipette out. In a small clean conical flask, 5 ml of 1% oxalic acid solution was added and titrated with the dye indicator rapidly to a faint pink color end point that persist for 15 sec from the column of the dye used in the titration. The ascorbic acid equivalent of the dye was calculated in mg/ml.

Procedure

Standardization of dye

Sl no	Vol of Stan. Vit C	Conc. Of Stan. Vit C	Initial vol of the dye(ml)	Final vol of dye(ml)	Difference (ml)
1.					
2.					
3.					

E= mg of ascorbic acid/ml of dye.

Determination of Vit C

Sl no	Vol of sample	Initial vol of dye(ml)	Final vol of dye(ml)	Difference (ml)
1.				
2.				
3.				

Calculation: Calculate the ascorbic acid content in mg/100 ml of the sample as follows:

$$\text{Ascorbic acid mg/100ml} = \frac{EV \times V \times 100}{V2 \times W}$$

Where, E=ascorbic acid equivalent of the dye in mg/ml
V=ml of the dye indicator used in the titration
V1=volume to which the Yoghurt is diluted
V2=Volume of the filtrate taken for the titration
W= Volume of the fruit juice initially taken for the determination

Result: Ascorbic acid content of the sample was mg/ml.

Determination of Antioxidant

The Yoghurt sample were filtered through 4-fold muslin cloth and the Yoghurt was collected in clean containers.

Determination of Total Polyphenol Content

Principle: Polyphenol was extracted with 70% methanol from a test portion of finely ground sample at 70 ^{0}C. The Polyphenol in the extract are determined calorimetrically using Folin-Ciocalteu phenol reagent. The reagent contains phosphor-tungstic acids as oxidants, which on reduction by readily oxidized phenolic hydroxyl groups yield a blue color with a broad maximum absorption at 765nm. This is due to the formation of tungsten and molybdenum blues.

Procedures

Table 1.

Gallic acid standard solution	Volume of Gallic acid stock solution (ml)	Nominal concentration of dilute standard (µg/ml)
A	1.0	10
B	2.0	20
C	3.0	30
D	4.0	40
E	5.0	50

Sample preparation-

Calculation:

Total content of Polyphenolic compounds was calculated by the following formula:

$$X = \frac{5.6450 \times A}{m}$$

Where; X – Total Polyphenolic compounds [%], A – absorbance, m – mass of investigated
Sample [ml].

B. Determination of Total Flavanoid Content

Reagents: Aluminums trichloride, quercetin, ethanol

Calculation

Flavanoid content = quercetin equivalent (µg/ml) × total volume of ethanol extract (ml) + sample weight (ml) × dilution factor × 10^{-6} (g/µg) × 100

Statistical analysis

After tabulating the data obtained from the sensory evaluation, it was statistically analyzed by using two way

Analysis of variance techniques. Significant difference between the treatments was determined by using CD (critical difference) test. **(Gupta *et al.* 2005)**

Results and Discussion

The data of the present studies "Preparation of antioxidant rich low fat Fruit pomegranate fruit frozen Yoghurt" on different aspects as per the methodology was tabulated and analyzed statistically. The results obtained from the analysis are presented and discussed in this chapter:

Nutritional Composition of the Products

Average percentage of nutrients in control and treated samples of "pomegranate frozen yoghurt":-

Control and Treatments / Nutrients	T_0	T_1	T_2	T_3
Energy (kcal)	56	59.4	62.8	66.2
Carbohydrate (g)	7.4	7.51	7.63	7.75
Fat	1.55	1.58	1.61	1.64
Protein (g)	4.8	4.88	4.96	5.04
Vitamin–C (mg)	2.2	3.55	7.1	10.5
Calcium (mg)	162	163.1	164.2	165.3
Iron (mg)	-	0.023	0.046	0.069
Total Polyphenol content (mg)	4.5	111	197	280.1
Total flavonoid content (mg)	3.95	28.5	46	59.5

The above table shows the nutritional composition of the frozen yoghurt skimmed milk (80%), SMP (3%), sugar (14.6%), emulsifier (0.2%), culture (2%), stabilizer (0.2%) as the control T_0. It has an appreciable amount of energy and carbohydrate. The vitamin-C content is good. In the treated samples, where pomegranate frozen yoghurt has been incorporated with skimmed milk (175%), SMP(3%), sugar (14.6%), culture (2%), emulsifier (0.2%), stabilizer (0.2%) has been added to all the treated sample pomegranate seeds as T_1 (5%), T_2 (10%), T_3 (15%).

The table 4.2 shows that average nutritional composition of pomegranate frozen yoghurt with incorporation of juicy Aril shows that the nutrient content i.e. Energy, carbohydrate, protein, calcium, iron, Polyphenol, flavonoid increased with the addition of juicy Aril.

Summary and Conclusion

It is concluded that Skimmed milk and fruit seeds (pomegranate) is a rich source of antioxidant rich, calcium, energy, carbohydrate, vitamin C, Polyphenol and Flavonoids, can be successfully incorporated in the preparation like pomegranate frozen yoghurt. Sensory evaluation of pomegranate frozen yoghurt showed that the treatment T_3 (Skimmed milk+ pomegranate seeds + sugar+ culture+ stabilizer+ emulsifier) was most acceptable and in case of pomegranate fruit yoghurt the treatment T_3 (pomegranate seed + skimmed milk+ stabilizer + emulsifier +sugar) was the most acceptable. And in case of Pomegranate frozen Yoghurt the treatment T_3 (Skimmed milk+ culture+ pomegranate seeds+ emulsifier+ stabilizer) was most acceptable of the prepare product in all treatment increased as the incorporation level was increased in all food product in as well as improve their Nutritional content.

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