

DEVELOPMENT OF POMEGRANATE BLENDED WHEY BEVERAGE

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Abstract: An attempt was made to develop pomegranate-whey based beverage. In the process of optimization of pomegranate extract level, various levels such as 5, 7 and 10 percent were tried and 7 percent pomegranate extract level was adjudged best. Similarly, out of three levels of sugar incorporation tried (6, 8 and 10%), 8% was found to be optimum. The final formulation included 85 per cent whey, 8 per cent sugar and 7 per cent of pomegranate extract. The final optimized beverage samples were pasteurized and were stored at ambient ($30\pm 1^{\circ}\text{C}$) and refrigerated temperatures ($7\pm 1^{\circ}\text{C}$) to study the shelf life of the beverage. Results revealed that pomegranate blended whey beverage had a keeping quality of nine days at ambient temperature and at refrigeration temperature it was found to be thirteen days.

Keywords: Whey Beverage, Pomegranate.

Introduction

Whey is the by-product obtained during the preparation cheese, paneer and chhana. Whey contains about half of the milk solids in which nutritional components such as lactose, whey proteins and minerals are the major ones. In spite of its nutritional value, whey is not being utilized properly and it can be used for the production of thirst quenching value added beverages. Similarly, herbal products are gradually gaining popularity in the world market due to the presence of rich natural antioxidants and functionally active ingredients. Pomegranate is a member of the monogeneric family, Punicaceae. Pomegranate and its chemical components possess various pharmacological and toxicological properties including antioxidant, anti-inflammatory (by inhibiting pro-inflammatory cytokines), anti-cancer and anti-angiogenesis activities. Hence, in the present investigation an attempt has been made to incorporate pomegranate extract in whey and develop a nutritional beverage.

Material and Methods

Milk: Procured from Students Experimental Dairy Plant (SEDP), Dairy Science College, Bangalore.

Whey: Paneer whey was prepared at SEDP, Bangalore

Sugar: Parry's Sugar was obtained from local market

Fruit Pomegranate: Pomegranate was obtained from the local market.

Chemicals: AR grade chemicals were used throughout the investigation.

Production of paneer whey:

Standard milk was heated to 90°C/hold, and then cooled to 70°C. Two per cent citric acid solution was added to milk with vigorous stirring initially then gently stirring till the completion of coagulation and the coagulation was left undisturbed for 5 min. Whey was separated from the coagulum and clarified whey was used for further studies.

Preparation of Pomegranate Extract

Fresh matured, ripened pomegranate of medium size free from rinds was selected for extraction of fruit extract. The fruit was washed with clean water initially to remove extraneous matter then the outer skin/peel was removed and the seeds were separated. The seeds collected were ground in a grinder and the fruit extract was collected by filtering it in a clean muslin cloth.

Analytical methods

Standard analytical methods were employed for the chemical analysis of the product. Fat was estimated as per Mojonnier's method as per IS: 1224 (1958). Total Solids (TS) were estimated by gravimetric method as per IS: SP: 18 (Part XI) - 1981. Protein content in the samples was estimated by Micro-Kjeldal method and protein content was computed by multiplication of nitrogen with 6.38 as per IS: SP: 18 (Part XI) - 1981. Similarly, ash and moisture contents were estimated as per the procedure given under IS: SP: 18 (Part XI) - 1981.

Sensory evaluation

A panel of five trained judges was selected for judging the whey beverage. Each judge was provided with a 9 point Hedonic scale score card to assess the quality of pomegranate - whey beverage with respect to various sensory attributes.

Microbiological quality

The samples were analyzed for standard plate count (SPC), coliform count, yeast and mold count and aerobic spore count using various agar medium (Hi-media Laboratories Pvt. Ltd. Bombay) by following standard methods as described in IS: 1479 (Part III), 1962.

Statistical analysis

The experimental results obtained in the study were statistically analyzed using ANOVA technique

Results and Discussion

Effect of various levels of addition of sugar on the sensory quality of whey beverage

Effect of various levels of sugar on the sensory quality of the whey beverage is given in the Table 1. The overall acceptability scores for colour and appearance, consistency and flavour scores showed significant difference between the control and treated samples. The maximum overall acceptability score of 7.64 was awarded to 8 per cent sugar level when compared to other treated samples. Product with 6 per cent sugar level secured less score which could be due to less sweetness. Again at 10 per cent sugar level the sample secured low score which could be due higher sweetness in the product. Addition of sugar at 8 per cent level yielded significantly a better product with highest sensory scores. Babar *et al.* (2008)^[1], standardized pomegranate juice blended with *chakka* whey beverage by the addition of 15 per cent Pomegranate juice and 10 per cent sugar.

Table 1: Effect of various levels of addition of sugar on the sensory quality of whey beverage*

Level of sugar	Colour and Appearance	Consistency	Flavour	Overall Acceptability
Control	7.26 ^a	7.31 ^a	6.50 ^a	6.60 ^a
T ₁	7.50 ^b	7.60 ^c	7.20 ^b	7.51 ^b
T ₂	7.53 ^a	7.66 ^b	7.61 ^a	7.64 ^c
T ₃	7.32 ^c	7.59 ^c	7.53 ^b	7.56 ^b
CD (P<0.05%)	0.06	0.05	0.17	1.64

*All values are average of three trails.

Where, Control= 0% sugar T₁= 6% of sugar T₂= 8% of sugar T₃= 10% of sugar

Effect of various levels of pomegranate extract on the sensory quality of whey beverage

Effect of various levels of Pomegranate on the sensory quality of the beverage is given in the Table 2. The overall acceptability scores for colour and appearance, consistency and flavour scores showed significant difference between the control and treated samples. The maximum overall acceptability score of 7.62 was awarded to 7 per cent pomegranate extract level when compared to other treated samples. Product with 10 per cent pomegranate extract level secured less score due to pomegranate extract proportion higher level of addition might have resulted in unacceptable colour properties of the beverage and also might have induced strong

flavour and thus decreasing its acceptability, further at 5 percent level of addition the decrease in scores is due to decrease in colour and appearance and also decrease in the consistency. Ranade *et al.*, (2003)^[2] concluded that the chakka whey beverage with incorporation of pineapple juice increased its flavour acceptability with increase in proportion upto 20 per cent. Similarly, Babar *et al.*, (2008)^[1], reported that during the preparation of chakka whey beverage using pomegranate extract with different levels of addition had a definite effect on improving the sensory quality of the beverage, and found that addition of 15 per cent pomegranate extract found to be optimum.

Table 2: Effect of various levels of addition of pomegranate extract on the sensory quality of whey beverage*

Pomegranate Level	Colour and appearance	Consistency	Flavour	Overall acceptability
Control	7.70 ^a	7.73 ^a	7.08 ^a	7.54 ^a
T ₁	7.45 ^a	7.63 ^a	7.07 ^a	7.56 ^a
T ₂	7.50 ^b	7.70 ^b	7.51 ^b	7.62 ^b
T ₃	7.30 ^b	7.65 ^b	7.46 ^b	7.50 ^b

*All values are average of three trails.

Control= Whey. T₁= 5% of Pomegranate Juice T₂= 7% of Pomegranate Juice T₃= 10% of Pomegranate Juice

Composition of whey beverages

The composition of samples is given in Table 3. The Pomegranate-whey based beverage used had an average total solids content of 12.2 per cent which comprised of protein 1.16 per cent, ash 0.59 percent, moisture 87.8 percent and fat 0.35 per cent. When compared to the control, there was significant increase in the total solids content and increased protein content, which could be due to the higher level of total solids of which mainly protein and fat in the pomegranate extract. Protein content in pomegranate extract was found to be 1.42%. Due to the increased protein content in the extract the Pomegranate blended whey based beverage recorded more protein percentage. Babar *et al.*, (2008)^[1] reported during their study on chemical composition of pomegranate juice, the protein content was found to be 1.46% and fat of about 0.46%. Similarly Singh *et al.*, (1994)^[3] in their study on development of whey based beverages, observed that the protein content in different fruit beverages varied from 0.51 to 0.61 per cent.

Table 3: Composition of whey beverages

Samples	Fat (%)	Protein (%)	Ash (%)	Total solids (%)	Moisture (%)
Control (whey beverage)	0.14	0.66	0.80	11.40	88.20
Pomegranate extract	0.41	1.42	0.006	12.69	87.31
Pomegranate-whey based beverage	0.35	1.16	0.59	12.20	87.80

Storage studies

The final products of control, Pomegranate-whey-based beverage samples were stored at ambient temperature and at refrigeration temperature by using glass bottles as packaging material and are pasteurized at 75 C for 15 seconds in order to check the storage stability and microbiological quality of developed whey based beverage.

Microbiological quality of the whey beverage (control) stored at ambient temperature (30±1°C):

In case of TBC, Coliforms and aerobic spore showed no growth till 5th day, whereas on the 5th day mold colonies were noticed in the plates indicating the spoilage of the product. The stability of the product was found to be for three days at ambient temperature. Shareef (2013)^[4] in his microbiological study on pasteurized whey beverage, showed shelf stability of raw paneer whey is only for one day.

Microbial quality of fruit juice blended whey beverage in cfu/ml stored at ambient temperature (30±1°C)

In case of TBC, Coliforms and aerobic spore showed no growth till 9th day, whereas on the 11th day mold colonies were noticed in the plates indicating the spoilage of the product. The stability of the product was found to be for nine days at ambient temperature. This increase in shelf life as compared to the control is may be due to the antibacterial/antimicrobial activity of Pomegranate resulting in depressing the growth of microorganisms this may be due to the presence compounds such as tannins and polyphenols. Prakash and Indra (2011)^[5] reported that the pomegranate has got antimicrobial activity. Similarly Duman *et al.* (2009)^[6] indicated the importance of the physicochemical properties of pomegranate on the antimicrobial activity was related to their phenolic and anthocyanin content of fruits.

Microbiological quality of the whey beverage (control) stored at refrigeration temperature (07±1°C)

In case of TBC, Coliforms and aerobic spore no growth was observed till 7th day whereas, yeast and mold count was 3 cfu/ml and the keeping quality of the sample was found to be five days. This increase in shelf-life is mainly due to the well-established fact that lowers temperature results in inhibition of the microbial growth, and also because of added sugar which might have resulted in plasmolysis of the micro-organisms leading to microbial inhibition.

Microbiological quality of the fruit juice blended whey beverage stored at refrigeration temperature (07±1°C)

In case of TBC, Coliforms and aerobic spore no growth was observed till 15th day whereas, yeast and mold count was 2 cfu/ml and the keeping quality of the sample was found to be thirteen days. This increase in shelflife is mainly due to the well-established fact that lower temperature results in inhibition of the microbial growth, and also because of added Pomegranate which has got the antibacterial/antimicrobial property mainly due to the presence of compounds such as tannins and polyphenols which resulted in increasing the shelf-life from nine days to thirteen days as compared to sample at ambient temperature. Prakash and Indra (2011)^[5] reported that the pomegranate has got antimicrobial activity. Similarly, Duman *et al.*, 2009^[6] indicated the importance of the physicochemical properties of pomegranate on the antimicrobial activity was related to their phenolic and anthocyanin content of fruits.

Final formulation of the developed beverage

From the results it was concluded that in case of pomegranate blended whey beverage, whey contributed to 85 per cent, sugar 8 per cent and pomegranate extract to 7 per cent.

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