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Development of buttermilk with fruit juices and appraisal of their nutritional qualities

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Abstract

The experiment was conducted at the department of home science, Banasthali Vidyapeeth, Tonk, Rajasthan in 2006. This study was carried out with the objective of developing beverages using fruit juices (apple and orange) and incorporating buttermilk at various percentage levels and to conduct chemical analysis. Nutritional evaluation results revealed that the overall acceptability of orange beverages was good. Apple juice buttermilk was least preferred by the panel. Total solids were high in apple juice beverage that was 20.71 in 10% beverage, least value was 11.60 in orange juice 10% beverage. Protein value was varied between 2.05 – 2.95. Fat content was 0.80-2.10. Ascorbic acid level in the juices ranged between 3.65- 5.99 and it was found to be decreasing with increasing amount of whey. Acidity ranged was 0.45 - 0.74, it was increasing with the increase amount of whey. Ash content level was also increased, the range was 0.10-5.60. The storage of the juices was also carried out for a 15 days, acceptability declined on storage. Orange juice was highly in acceptable.

Keywords: Buttermilk, orange, apple, beverages, sensory

Introduction

It is important to eat, with foods from each of the major food groups. In each food group, different foods provide more of some nutrients than others. If a variety of foods is eaten from each group, one will probably get all the nutrients provided by the foods in that group. Most of the variety of the food should come from plant foods. Fruits, available in multiple colors add variety in diet and provide pleasure not only to the sense of sight but also to that of smell and taste. Fruits are nutritionally important because they contain large amount of certain minerals and vitamins. There has been a considerable increase in the consumption of fruit juices in the world and there are possibilities of its further increase. Oranges constitute a significant source of antioxidants (mainly vitamin c), and sufficient amount of folacin, thiamin, niacin, calcium, potassium and magnesium (Angew, 2007) [2]. Fruit juices are generally poor source of protein. This inherent lack of protein can be made up by addition of an ingredient which provides protein and does not negatively affect the color and flavor. Milk and dairy products have been an important part of human diet from ancient times in many parts of world. (Erzen N *et al.* 2014) [7] Buttermilk is by product obtained during the manufacture of butter, which is commonly consumed in all parts of India. The beneficial aspects of yoghurt and other fermented dairy product are well documented in the literature. (Aneja RP *et al.* 2002) [1]. A very popular refreshing summer beverage produced from curd is commonly used in the manufacture or production of many foods products. Buttermilk is a good source of proteins, carbohydrates, minerals, vitamin A and cholesterol. Cultured buttermilk is an ancient dairy beverage with high nutritive and therapeutic value (Mudgil *et al.* 2016) [5, 12, 13]. Therapeutic properties of buttermilk are well known hence it is used in several of Ayurvedic formulations which is a traditional Indian medicinal system. (Devi *et al.* 2010) [6]. In India both dairy and fruit sectors face problems of lack of basic infrastructure for handling peaks in production. In dairy industry, buttermilk a by-product of butter production is mostly left utilized. Buttermilk is a good source of valuable milk proteins and lactose. Therefore, in order to make the use of dairy by products, present study was proposed to supplement them with fruit juices to prepare a delicious, drink and full of nutrients.

Hence, the major objectives of the study were:

1. To develop beverages using fruits and incorporating buttermilk at various percentage levels.
2. To devise a means for the preservation of these highly perishable drinks.
3. To evaluate these beverages for nutritional qualities.

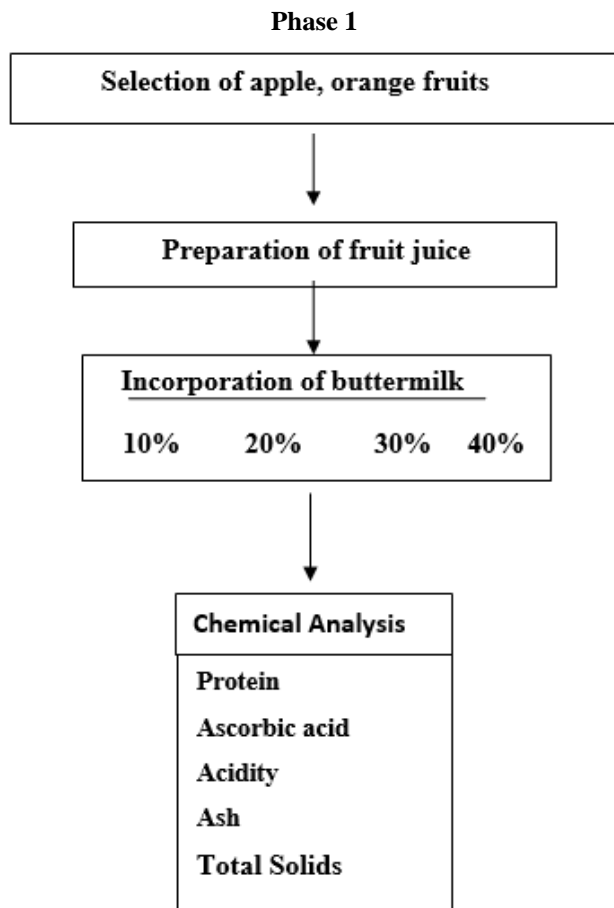
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Methods and Materials

Flow Chart Elucidating the Experimental Plan



This study was an attempt to develop beverages based on fruit juice with nutritive ingredients like incorporated in them. These had to be processed to enhance shelf life and evaluated for nutrient composition.

In primary processing we made fruit juice, whey and sugar syrup. Household methods were used for preparation of juices, whey and sugar syrup.

Preparation of Apple Juice

- Fresh apple were procured from the local greengrocer.
- These were washed thoroughly and peeled.
- The juice was extracted using a semi automated juicer.
- Yield: 3kg apples= 700ml juice

Preparation of Whey

- Milk (1 Lt) was brought to a boil.
- A pinch of citric acid was added to it.
- It was allowed to simmer for five minutes.
- The whey was collected by straining and was immediately cooled.

Preparation of sugar syrup

- 400g of sugar was taken.
- 250ml of water was added to it and the mixture was put on a flame.
- It was heated with continuous stirring for 15 minutes.

In order to come up with a standard product the pre measured ingredients were mixed in the ratios. These were blenderized in a semi-automated food processor. In totality four recipes were standardized.

List of ingredients of the product –

S.NO.	Ingredients	Amount (ml)			
		10%	20%	30%	40%
1.	Apple Juice	80	70	60	50
2.	Whey	10	20	30	40
3.	Sugar syrup	10	10	10	10

Processing for Preservation

The beverages thus obtained were heated to 80 °C for 2-3 seconds. These were immediately cooled and bottled in pre sterilized bottles. These bottles were placed in a water bath and subjected to the heat of boiling water for 30 minutes. The bottles were cooled immediately and stored.

The beverages were analyzed for total solids, fat, protein, ascorbic acid, acidity, ash content.

Apple juice with buttermilk (30% and 40%) had to be dropped owing to the settlement of particulate matter on exposure to heat and the consequent poor acceptability. Thus, further analysis was done for six beverages.

Chemical Analysis

Chemical analysis was done for total solids (Sharma 1993), fat content was estimated by blorr method. Biuret method was used for protein estimation. Ascorbic acid by titrametric method, titrable acidity and mineral ash content (NIN,2003) were also done.

Statistical analysis

The statistical methods used for analysis of data regarding the present investigation were: Mean, Standard Deviation.

Results and Discussion

All the beverages were tested for chemical analysis.

Chemical analysis

Chemical analysis was done for total solids (Sharma 1993), fat content was estimated by blorr method. Biuret method was used for protein estimation. Ascorbic acid by titrametric method, titrable acidity and mineral ash content (NIN, 2003) were also done.

The six buttermilk added fruit beverages made as a part of this study were analyzed fresh for total solids, fat, protein, ascorbic acid, acidity, ash. The result has been discussed below:

Total Solids

Apple juice + buttermilk

With the increasing proportion of buttermilk the value of TS decreased. Only 10 and 20% beverage were tested, 30% and 40% buttermilk could not be analyzed because their acceptability was poor. Highest value was 20.7 in 10% sample. Values have been tabulated in table 1.

Orange juice + buttermilk

With the increasing proportion of buttermilk an increase in TS was observed. Highest value was 17.8 for 40% beverage that can also be seen in table 2.

Fat

All the basic ingredients of these beverages are inherently low fat.

Apple juice + buttermilk

Much difference was observed in 10% and 20% buttermilk

beverage. (Table1). Higher fat content was 1.7 for 20%.

Orange juice + buttermilk

As evident from table 2, fat content of orange juice buttermilk rose with increase in the concentration of buttermilk. Highest fat content was found in 40% buttermilk incorporated orange juice that is 2.1 and the lowest was 1.1 for 10% beverage.

Though there was an increase in fat content on the addition of buttermilk in orange and apple juice but the fat content of juices was low because the ingredients used were low in fat.

Protein

Addition of milk based products adds to protein content.

Apple juice + buttermilk

Highest value was observed in 20% beverage. The value was 2.95 which was slightly lower is 10% beverage.

Orange juice + buttermilk

In this beverage protein value varied between 2.05-2.84 with the increasing proportion of buttermilk an increased value was noticed. There was difference in all beverages. Highest mean value was observed in 40% beverage (2.84).

Addition of buttermilk increments the protein content of juices which is evident from a linear rise in protein with an increase in proportion of buttermilk. Apple juice with buttermilk 20% and orange juice with 40% buttermilk are the ones with fair protein value.

Ascorbic acid

The ascorbic acid values of six beverages varying in the percentage of buttermilk incorporated are being discussed here.

Apple juice + buttermilk

In 10% beverage mean value was 4.7 that have been presented in table1. 20% beverage had a lower value of 3.65mg%.

Orange juice + buttermilk

Amongst all beverages in this category highest value was observed in 10% beverage that is 5.9. There was difference in 20%, 30% and 40% beverage. The lowest content was 4.2 for 40% beverage.

The results show that the highest content was observed in orange juice buttermilk (10%) beverage and the lowest was seen in apple juice 10% beverage. With the increasing proportion of buttermilk, a receding value was noticed. Fruits, particularly the citrus ones are a rich source of vitamin c while milk products are not.

Acidity

The acidity values of beverages varying in the percentage of buttermilk in table1 and 2.

Apple juice + buttermilk

Highest mean score was seen in apple juice buttermilk beverages. That was 0.74 in 20% beverage and 0.56 in 10% beverage.

Orange juice + buttermilk

Same value was observed in 20%, 30%, 40% beverage that was 0.6. Lowest was 0.4 for 10%beverage.

The results indicate that acidity is higher in orange beverage

owing to its citrus nature.

Ash content

sh content scores of six beverages varying in the percentage of buttermilk incorporate is being discussed here.

Apple juice + buttermilk

The highest mean value was observed in apple juice buttermilk content that was 5.6, and that for 10% beverage was 4 (table1).

Orange juice + buttermilk

The highest value was 2.7 for 40% beverage, there was slight difference in 30% and 40% beverage. The ash value was increased the lowest value was 0.1 for 10% beverage.

Ash signifies the mineral content of the food. Apple beverages had ash content in the range of 4.00 to 5.60g% whereas it was 0.10 to 2.70g% in orange juice. Increased proportion of buttermilk, led to inferior sensory quality but superior content of ash as reflected from the values estimated for 40% buttermilk containing apple and orange juice.

The chemical analysis reveals that addition of buttermilk brings about an increment in fat and protein but the overall content of these macronutrients in these beverages remain low. These beverages are poor source of ascorbic acid but the ash content varies from poor to good with buttermilk containing beverage having relatively high ash content.

Summing up the results, it could be inferred that the orange beverage has fair nutritional composition and good acceptability, therefore, this set of beverages are likely to be accepted by the consumers as a health drink.

Summary and Conclusion

Chemical analysis

Total solids: Total solids content was highest in apple juice +buttermilk (10%) product which was 20.71%. Lowest value was seen in orange juice buttermilk (10%) product which was 11.60%. the buttermilk content varied between 20.71% to 11.60%. the score decreased with the increase in the concentration of buttermilk.

Fat: All the beverages were low in fat. The content rose with an increment in the concentration of buttermilk. Highest value was found in orange juice + buttermilk 40% beverage that was 2.10g%. The lowest value was 0.80g% in 10% apple beverage. The fat content was in the range of 0.5 to 2.10.

Protein content: increased with an increase in the concentration of buttermilk. Highest protein content was analyzed in apple juice beverages. Where the range was 2.05-2.95%. The highest value was 2.95 in 20% apple beverage; and the lowest value 2.05 was seen in orange beverage 10%.

Ascorbic acid: content was highest in (5.99%) in orange juice + buttermilk beverage. With the increasing proportion of buttermilk ascorbic acid content decreased. The lowest value was seen in (3.65) 20% apple beverage. The ascorbic acid content was in the range was between 5.99 to 3.65.

Acidity: was higher in orange beverages. The highest value was observed in apple juice + buttermilk (0.74%), and the lowest value (0.45%) was seen in 10% orange beverage. Acidity content in buttermilk was varied between 0.45 to 0.74%.

Ash: content was highest in apple juice + buttermilk (20%) beverage. Content was higher in apple beverages as compared to orange beverages. In apple beverage the score range varied between 4.00 to 5.60% and in orange juice the range was variate between 0.10 to 2.70%.

Thus the following conclusions could be drawn from the results of the study.

1. Acceptability declined on storage and the beverages with buttermilk had poor acceptability on storage.
2. All the beverages were low in fat.
3. The ascorbic acid level was low and the content decreased as the amount of buttermilk increased.
4. Orange beverages have good acceptability fair protein and low fat, therefore, these can be judged as better than the remaining combination.

It was interpreted that orange juice with buttermilk 10% and 20% was of good nutritional composition, which could be recommended to consumers as health and refreshing drink.

Table 1: Nutrient Analysis: Apple Juice with buttermilk

	10%	20%
Total solids (%)	20.71	17.79
Fat (g %)	0.80	1.70
Protein (g %)	2.66	2.95
Ascorbic acid (mg %)	4.70	3.65
Acidity (%)	0.56	0.74
Ash (g %)	4.00	5.60

Table 2: Orange Juice with buttermilk

	10%	20%	30%	40%
Total Solids (%)	11.60	14.90	15.00	17.80
Fat (g %)	1.40	1.10	1.70	2.10
Protein (g %)	2.05	2.12	2.30	2.84
Ascorbic acid (mg%)	5.99	4.68	4.45	4.22
Acidity (%)	0.45	0.67	0.68	0.68
Ash (g %)	0.10	1.40	2.40	2.70

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