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Studies on antioxidant properties of pear fruit (*Pyrus communis*) juice mixed with chhana whey beverage

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Abstract

The present research was undertaken with object to studies on antioxidant properties of pear fruit (*Pyrus communis*) juice mixed with chhana whey beverage. The chhana whey beverage prepared by using chhana whey and pear juice in proportion of 100:00 (T₁), 90:10 (T₂), 80:20 (T₃) and 70:30 (T₄). The product obtained was subjected for antioxidant properties analysis. on an average antioxidant properties for treatment 0.483 (T₁), 1.275 (T₂), 1.351 (T₃) and 1.440 (T₄) TEAC $\mu\text{mol}/\text{mg}$ protein respectively. It was revealed that trolox equivalent antioxidant capacity (TEAC) was increased as level of pear fruit juice increase in chhana whey beverage.

Keywords: Antioxidant properties, pear juice, chhana whey beverage

Introduction

Milk is considered as the most satisfactory and almost complete food, it is also referred to as 'Bank of nutrients'. It is also essential food for newly born young ones and equally important to the expectant mother for supply of most essential element like calcium and phosphorus along with other essential major and minor component. Nowadays, milk and milk products are available world-wide being one of the favourite foods consumed by all ages groups.

Cow's milk contains about twice as much protein as human milk, it contains less carbohydrate and about the same amount of fat. Thus predominant type of protein is not the kinds of milk. Thus the curd formed by human milk is soft in the baby's stomach, whereas that of cow's milk is more tenacious and elastic. Cow milk contains 87.2 water, 3.8 fat, 4.95 sugar, 3.35 protein, 2.78 casein, 0.6 albumin and ash 0.7 percent (Singh and Sachan, 2014) [10].

Pear fruit consumed throughout the world and one of the oldest plants cultivated by human. It most commonly enjoyed as fresh fruit but also respond well to being cooked, canned, juiced, dried and fermented into pear cider (Martin *et al.*, 2015) [7]. Pear belong to the family rosaceae and is very closely related to apple, with it was paced in the same genus by *Linnaeus*. The present day pear cultivars, mostly belong to *Pyrus communis*, originating in the western Asian region (Bose and Mitra., 1988) [2].

Pear is a nutritious fruit which due to their botanical relationship to apples much resemblance in their nutritional properties, pear good source of dietary fibre 4.1 g, energy 233 kg, protein 0.3 g, fat 0.03 g, carbohydrate 12.4 g, sugar 9.8 g, vitamin c 4mg and potassium 112 mg. Pear also contain a number of phytonutrients or phytochemicals such as triterpenes, flavonoids, stilbenes/lignans and phenolic acid. Phytonutrient are substances in plant foods that have health benefits but unlike traditional vitamins and minerals, particularly the pear skin have phenolic acid which have been associated with multiple health benefits like reduce blood alcohol level, diabetes, cardiovascular disease and obesity. Due to having antioxidant properties of pear help in relation to wound healing and liver protection and cured allergic disease like a rhinitis, asthma and eczema. Pear contains a unique combination of fructose and sorbitol as well as bosting high fibre content. This nutritional composition may have an important role in the prevention and treatment of constipation (Martin *et al.*, 2015) [7].

Whey is the liquid that remains after manufacturing chhana, *paneer*, *shrikhand* and cheese. Use of whey as a beverage in human nutrition, especially for therapeutic purpose can be traced back to an ancient Greeks. Hippocrates in 460 B.C. prescribed cheese whey for assortment of human ailments (Holsinger *et al.*, 1974) [4]. The chhana whey constitutes water 93.6, protein 0.4, fat 0.5, lactose 5.1, ash 0.4 percent (Singh and Sachan., 2014) [10].

Materials and Methodology

Collection of Milk

Fresh Cow milk was procured from local market of Latur city (Natural Milk Pvt. Ltd. with 4 percent fat and 8.5 percent SNF)

Collection of pear fruit

Fresh pears were purchased from local market of Latur city and juice was prepared in laboratory.

Ingredients

Good quality, clean, crystalline, white sugar was purchased from local market of Latur city.

Chemicals and Reagents

Analytical reagents were used in the chemical analysis (citric acid, copper sulphate) of whey beverage.

Packaging Material

Glass bottles used for packaging were purchased from local market of Latur city.

Equipment and accessories

Stainless steel vessels, gas stove, fruit extractor (mixer grinder), muslin cloth, standard weighing balance, thermometer and knives etc. used for preparation of pear chhana whey beverage was available in the Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur. Equipments such as fruit extractor, knives was properly cleaned and washed with detergent solution. All the precautionary measures were taken during the conduct of trials to avoid contamination.

Methodology

Procedure for preparation of chhana whey beverage using with pear juice

The chhana whey was heated at 45 °C for 10 min. then 8 percent cane sugar was added and maintained in all treatment combinations. Then pear juice was added in the chhana whey as per the treatment combinations, mixed properly with constant stirring, then after filtrated through muslin cloth. The prepared pear juice whey beverage was filled in glass bottles and sealed. After sealing, bottles were pasteurized at 63 °C temperature for 30 minutes, cooled and stored at 5 °C.

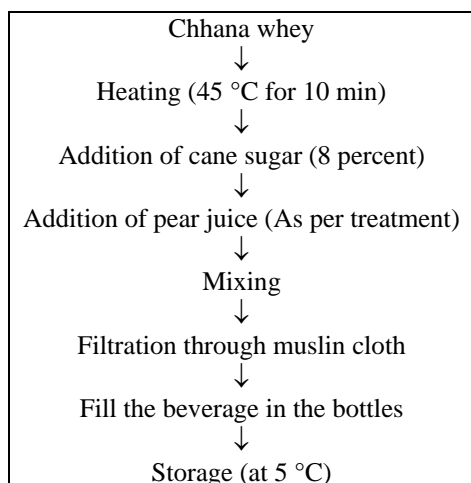


Fig 1: Flow chart for preparation of chhana whey beverage with pear juice (Kamte, 2015) [5].

Treatment combinations

For preparation of whey beverage by using pear (*Pyrus communis*) juice, 8 percent cane sugar was used on weight basis of chhana whey and pear juice with following treatment combinations.

T₁ - 100 Parts of chhana whey

T₂ - 90 Parts of chhana whey and 10 Parts of Pear juice

T₃ - 80 Parts of chhana whey and 20 Parts of Pear juice

T₄ - 70 Parts of chhana whey and 30 Parts of Pear juice

The four replication of different levels were tried and compared with control (T₁).

Determination of antioxidant properties by ABTS method

The antioxidant activity of pear whey beverage samples was determined by ABTS (2, 2'-Azinobis (3 ethylene benzothiazoline 6-sulphonic acid) method. The antioxidant activity of pear whey beverage was checked for fresh samples at room temperature. ABTS Assay was used by the food industry and agricultural researchers to measure the antioxidant capacities of foods. In this assay, ABTS is converted to its radical cation by addition of potassium per sulphate. This radical cation is blue in colour and absorbs light at 734 nm. The ABTS radical cation is reactive towards most antioxidants including phenolics, thiols and ascorbic acid. During this reaction, the blue ABTS radical cation is converted back to its colourless neutral form Raghavendra *et al.* (2013) [9]. The procedure followed during present research as per the following flow diagram.

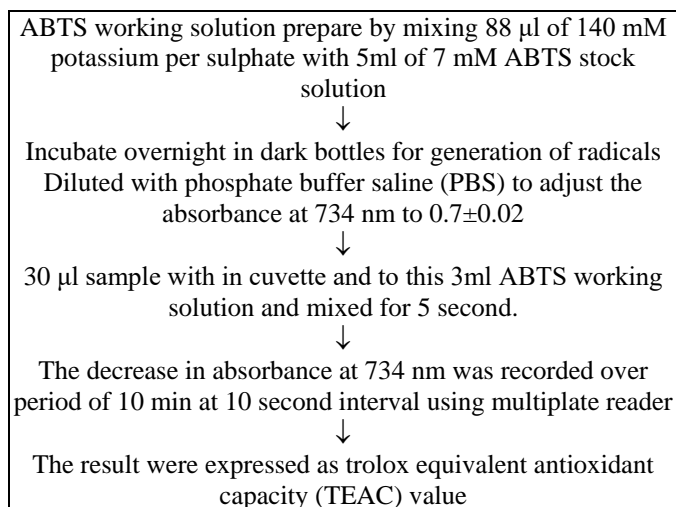


Fig 2: Flow chart of ABTS method.

Reagents

A. Potassium persulfate solution (140 mM)

1.892 gm of potassium persulfate was dissolved in double distilled water and made the volume to 50 ml.

B. ABTS [2, 2'-azinobis (3 ethyl benzothiazoline)-6-sulfonic acid] stock solution

19.2 mg of ABTS (Sigma-Aldrich) was dissolved in 5 ml of double distilled water; added 88 µl of 140 mM potassium persulfate solution and the mixture was kept in an amber colour bottle in dark for 12-16 hours for production of sufficient free radicals.

C. Phosphate buffered saline (PBS, pH 7.4)

PBS was prepared by dissolving 8.0 g of NaCl, 0.2 g of KCl,

1.44 g of Na_2HPO_4 and 0.24 g of KH_2PO_4 in 800 ml distilled water, pH was adjusted to 7.4 with 1N HCl and made the volume to 1 litre with distilled water.

D. ABTS working solution

1 ml of ABTS stock solution was diluted with phosphate buffer saline (approx 1:70) till it give an absorbance of 0.70 ± 0.02 , before that absorption spectra of ABTS was analysed and maxima was taken at 734 nm.

E. Trolox solution

12.5 mg of Trolox [6-hydroxy. 2, 5, 7, 8 - tetramethyl chroman-2-carbocyclic acid] (Sigma-Aldrich) was dissolved in 10 ml of ethanol. The resulting solution was 5 mM trolox solution. It was diluted with distilled water to 2000 μM

Table 1: Antioxidant property of chhana whey and pear juice TEAC (μmol)/mg protein

| Replication Treatment | R ₁ | R ₂ | R ₃ | R ₄ | Mean TEAC (μmol)/mg protein |
|-----------------------|----------------|----------------|----------------|----------------|--|
| Chhana whey | 0.479 | 0.487 | 0.481 | 0.485 | 0.481 ± 0.005 |
| Pear juice | 1.807 | 1.802 | 1.809 | 1.814 | 1.81 ± 0.005 |

The average antioxidant property TEAC were observed 0.481 (μmol)/mg protein of chhana whey and 1.81 (μmol)/mg protein of pear juice, respectively. It was observed that the antioxidant property in the pear juice

Manzoor *et al.* (2013) [6], who studied the antioxidant activity of pear peel and pulp and found that The total phenolic contents and total flavonoid contents in peel and pulp parts the fruits varied from 601.50-619.25, 333.90- 355.80 mg GAE/100 g and 543.50-561.30, 270.50-290.50 mg CE/100 g, respectively.

Ahmet *et al.* (2015) [1], who carried out the phenolic compounds and chemical characteristics at flesh and peel in some pears (*Pyrus communis*) cultivars and found that arbutin and chlorogenic acid were detected as major phenolic

Table 2: Antioxidant property of chhana whey beverage with pear juice TEAC (μmol)/mg protein

| Replication Treatment | R ₁ | R ₂ | R ₃ | R ₄ | Mean TEAC (μmol)/mg protein |
|--------------------------------------|----------------|----------------|----------------|----------------|--|
| T ₁ | 0.479 | 0.487 | 0.481 | 0.485 | 0.483 ^d |
| T ₂ | 1.262 | 1.280 | 1.278 | 1.283 | 1.275 ^c |
| T ₃ | 1.362 | 1.390 | 1.328 | 1.335 | 1.351 ^b |
| T ₄ | 1.412 | 1.440 | 1.388 | 1.387 | 1.440 ^a |
| S.E. \pm 0.001 C.D. at 5% 0.030 | | | | | |

The values with different small letters superscripts row wise different significantly at 5 % level of significance.

The average antioxidant content of control T₁ and chhana whey beverage using pear juice T₂, T₃ and T₄ was (0.483), (1.275), (1.351) and (1.440) TEAC (μmol)/mg protein respectively. The antioxidant content T₄ (1.440) was higher than control T₁ (0.483) and treatment T₂ (1.275) and T₃ (1.351) TEAC (μmol)/mg protein and differ significantly.

The significantly increase in antioxidant content of developed product was due to higher addition of pear juice in chhana whey beverage which had antioxidant (1.81 ± 0.005 TEAC (μmol)/mg protein) in pear juice.

The results of present study was similar with Gore, (2016) [3], who reported addition of beetroot juice in *paneer* whey and found increase in antioxidant content from 0.37 to 0.98 TEAC (μmol)/mg protein. Similarly Waychal, (2022) [11], prepared strawberry based whey beverage and found increased in antioxidant content from 0.543 to 1.515 TEAC (μmol)/mg protein respectively.

concentration.

Statistical analysis of data

The data obtained in the present research was tabulated and analysed statistically using Completely Randomized Design (CRD) as per Panse and Sukhatme (1985) [8].

Result and Discussion

Antioxidant properties of chhana whey beverage and pear juice

Before evaluation antioxidant property of pear whey beverage the raw materials used to prepared beverage was subjected for its evaluation of antioxidant property. The antioxidant property of chhana whey and pear juice was determined. The results obtained are presented in following table.

compounds in the peel and flesh, while rutin hydrate and rutin-tri-hydrate were detected as minor in the peel and flesh. Pear content Catechin ranged from 40.0 to 543.8 mg kg^{-1} in flesh and 42.4 to 695.2 mg kg^{-1} in peel, Epicatechin varied from 11.47 to 243.1 mg kg^{-1} in flesh and 12.6 to 315.4 mg kg^{-1} in peel and Vitamin C content 9.1 to 29.7 mg 100^{-1} in flesh and 9.5 to 35.9 mg 100^{-1} in peel respectively.

Antioxidant property of chhana whey beverage with pear juice

The average antioxidant content of control (T₁) and chhana whey beverage with pear juice 10, 20 and 30 percent (T₂, T₃ and T₄) was given in table.

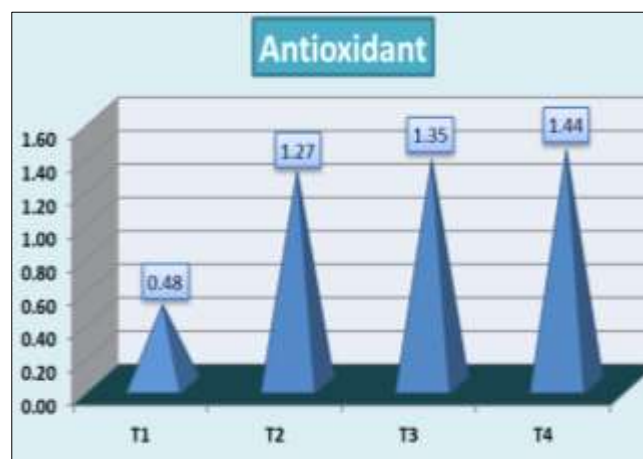


Fig 1: Graphical presentation of antioxidant property of chhana whey beverage with pear Juice

Conclusion

From the present study it was concluded that chhana whey beverage using pear juice at 10, 20 and 30 percent level was found suitable on the basis of antioxidant properties. The antioxidant property of chhana whey beverage using pear juice showed increased in antioxidant content were 0.483, 1.275, 1.351 and 1.440 TEAC(μmol)/mg protein respectively.

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