International Journal of Veterinary Sciences and Animal Husbandry

ISSN: 2456-2912
VET 2024; SP-9(1): 613-616

www.veterinarypaper.com
Received: 05-10-2023
Accepted: 09-11-2023

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Studies on sensory qualities of *chhana* whey beverage with pear (*Pyrus communis*) juice

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Abstract
The present research was undertaken with object to studies on sensory evaluation in *chhana* whey beverage by utilization of pear (*Pyrus communis*) juice. The *chhana* whey beverage was prepared by using *chhana* whey: pear juice in proportion of 100:0, 90:10, 80:20 and 70:30 (T_1, T_2, T_3 and T_4). The different treatment product was evaluated for its sensory qualities by using 9 point hedonic scale. The score was recorded for colour and appearance (7.42, 7.82, 8.60 and 7.66), flavour (7.46, 7.81, 8.40 and 7.74), taste or mouth feel (7.00, 7.60, 8.55 and 7.70), consistency (7.50, 7.75, 8.40 and 7.70) and overall acceptability (7.40, 7.58, 8.38 and 7.80). From the results it was concluded that 20 percent pear juice in 80 percent *chhana* whey beverage was highly acceptable.

Keywords: Sensory evaluation, pear juice, *chhana* whey beverage

Introduction
Milk is considered as the most satisfactory and almost complete food. 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 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) [7].

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) [10]. 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) [1].

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) [10].

Whey is the liquid by product of dairy industry 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) [5]. The *chhana* whey constitutes water 93.6, protein o.4, fat 0.5, lactose 5.1, ash 0.4 percent (Singh and Sachan., 2014) [7].
Hence, considering the market demands and consumer preference, conservation of whey into beverage is one of the most important avenues for utilization of whey in human food chain. Keeping in view the nutritional and functional qualities of whey, attempts were made to utilize the *chhana* whey for the preparation of palatable refreshing beverage with addition of pear juice.

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 grade 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.

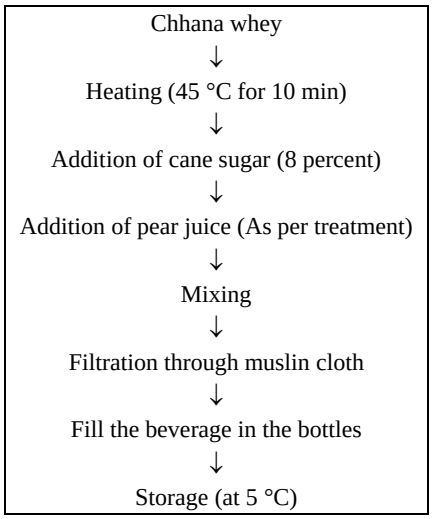

Fig 1: Flow chart for preparation of *chhana* whey beverage with pear juice (Kamte, 2015) [6].

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.
T_1 - 100 Parts of *chhana* whey
T_2 - 90 Parts of *chhana* whey and 10 Parts of Pear juice
T_3 - 80 Parts of *chhana* whey and 20 Parts of Pear juice
T_4 - 70 Parts of *chhana* whey and 30 Parts of Pear juice

The four replication of different levels were tried and compared with control (T_1).

Sensory evaluation

The acceptability of whey beverage was measured in terms of sensory attributes such as colour and appearance, flavour, taste or mouth feel, consistency and overall acceptability using 9 point hedonic scale by a panel of semi-expert judges. The received data was examined by using Completely Randomized Design (CRD).

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) [9].

Result and Discussion

Sensory evaluation of *chhana* whey beverage with pear juice

Table 1: Colour and appearance score of *chhana* whey beverage with pear juice

Replication / Treatment	R_1	R_2	R_3	R_4	Mean
T_1	7.28	7.46	7.44	7.56	7.42^d
T_2	7.80	7.86	7.82	7.80	7.82^b
T_3	8.40	8.80	8.60	8.60	8.60^a
T_4	7.60	7.66	7.68	7.70	7.66^c
S.E. ± 0.121	C.D. at 5% 0.374				

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

The colour and appearance score of control (T_1) and *chhana* whey beverage with pear juice T_2, T_3 and T_4 was 7.42, 7.82, 8.60 and 7.66 respectively. The colour and appearance score of T_3 (8.60) was higher and differ significantly from control T_1 (7.42) and treatments T_2 (7.82) and T_4 (7.66) respectively.
The result of present study are similar with Babar *et al*. (2008) [2] who reported the addition of pomegranate juice in *chakka* whey beverage at 10, 15 and 20 percent and found that decreased in colour and appearance was 8.71, 8.62, 8.82 and 8.35 for the treatment T_1, T_2, T_3 and T_4 respectively.
Borkar *et al*. (2020) [3] who reported addition of watermelon juice at 5, 10 and 15 percent in *chakka* whey beverage and observed that decreased in colour and appearance was 7.37, 7.68, 8.30 and 7.93 for treatment T_1, T_2, T_3 and T_4 respectively.

Table 2: Flavour for flavour score of *chhana* whey beverage with pear juice

Replication / Treatment	R_1	R_2	R_3	R_4	Mean
T_1	7.20	7.40	7.60	7.65	7.46^d
T_2	7.80	7.84	7.82	7.80	7.81^b
T_3	8.20	8.60	8.20	8.60	8.40^a
T_4	7.72	7.78	7.76	7.70	7.74^c
S.E. ± 0.446	C.D. at 5% 0.973				

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

The mean score for flavour for the control (T_1) and treatment (T_2), (T_3) and (T_4) was 7.46, 7.81, 8.40 and 7.74 respectively. The flavor score of T_3 (8.40) was significantly superior over control (7.46) as well as treatments T_2 (7.81) and T_4 (7.74) and differ significantly.
Borkar *et al*. (2020) [3] who reported addition of watermelon juice at 5, 10 and 15 percent in *chakka* whey beverage and obtained score 7.20, 7.61, 8.27 and 8.01 for the treatment T_1, T_2, T_3 and T_4 respectively.

Table 3: Taste or mouth feel score of *chhana* whey beverage with pear juice

Replication / Treatment	R_1	R_2	R_3	R_4	Mean
T_1	6.00	7.40	7.40	7.20	7.00^d
T_2	7.20	8.00	7.60	7.60	7.60^c
T_3	8.80	8.60	8.40	8.40	8.55^a
T_4	7.60	7.60	7.80	7.80	7.70^b
S.E. ± 0.195	C.D. at 5% 0.602				

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

The mean score for taste or mouth feel for the control (T_1) and treatment (T_2), (T_3) and (T4) was 7.00, 7.60, 8.55 and 7.70 respectively. The treatment T_3 (8.55) was significantly superior over other control T_1 (7.00), and treatment T_2 (7.60) and T_4 (7.70).
The results of present study are similar with Satpute *et al*. (2018) [8] who reported addition of *mentha arvensis* at 2, 4 and 6 percent in beetroot extracted *paneer* whey and found taste score for the treatment T_1, T_2, T_3 and T_4 were 7.90, 8.30, 8.50 and 8.45 respectively, the treatment T_3 was superior over other treatments.
Waychal, (2022) [11] who reported addition of strawberry pulp at 6, 8 and 10 percent in whey beverage for the treatment T_1, T_2, T_3 and T_4 were mean score of taste or mouth feel 6.35, 7.35, 8.90 and 7.60 respectively and found that treatment T_3 was superior than other treatments.

Table 4: Consistency score of *chhana* whey beverage with pear juice

Replication / Treatment	R_1	R_2	R_3	R_4	Mean
T_1	8.00	7.00	7.20	7.80	7.50^d
T_2	8.00	7.80	7.60	7.60	7.75^b
T_3	8.40	8.00	8.60	8.60	8.40^a
T_4	7.60	7.60	7.80	7.80	7.70^c
S.E. ± 0.149	C.D. at 5% 0.460				

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

The mean scores of consistency for control (T_1) and *chhana* whey beverage with pear juice for treatments T_2, T_3 and T_4 was 7.50, 7.75, 8.40 and 7.70 respectively. The treatment T_3 (8.40) was significantly superior than control T_1 (7.50) and treatment T_2 (7.75) and T_4 (7.70).
The results of present study are in agreement with Darade *et al*. (2011) [6] who reported addition of pineapple juice at 10, 20 and 30 percent in *chhana* whey beverage and observed decreased in consistency were 8.27, 8.33, 8.65 and 8.00 respectively. The treatment T_2 had superior score than other treatment.
Waychal, (2022) [11] who reported addition of strawberry pulp at 6, 8 and 10 percent in whey beverage and found that decreased in consistency were 7.70, 8.40, 8.80 and 8.00 respectively and observe T_3 had superior score than other treatment.

Table 5: Overall acceptability score of *chhana* whey beverage with pear juice

Replication / Treatment	R_1	R_2	R_3	R_4	Mean
T_1	7.6	7.4	7.2	7.4	7.40^d
T_2	7.9	7.2	7.8	7.4	7.58^c
T_3	8.5	8.4	8.2	8.4	8.38^a
T_4	7.8	8.0	7.6	7.8	7.80^b
S.E. ± 0.106	C.D. at 5% 0.325				

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

The mean scores of overall acceptability for control (T_1) and *chhana* whey beverage with pear juice for the treatment T_2, T_3 and T_4 were 7.40, 7.58, 8.38 and 7.80 respectively. The

treatment T_3 (8.38) was significantly superior than control (7.40) and treatments T_2 (7.58) and T_4 (7.80) and differ significantly from each other.

The results of present study are in agreement with Satpute *et al*. (2018) [8] who reported addition of *mentha arvensis* at 2, 4 and 6 percent in beetroot extracted *paneer* whey and stated decreased in overall acceptability score for the treatment T_1, T_2, T_3 and T_4 were 7.7, 7.7, 7.9 and 7.4 respectively and the treatment T_2 had higher score among other treatment.

Waychal, (2022) [11] who studied the sensory evaluation of strawberry whey beverage with addition of strawberry pulp at 6, 8 and 10 percent in *Paneer* whey beverage and noticed the score for the overall acceptability for the treatment T_1, T_2, T_3 and T_4 were 6.85, 7.33, 8.36 and 8.23 respectively and the treatment T_3 had higher score among other treatment.

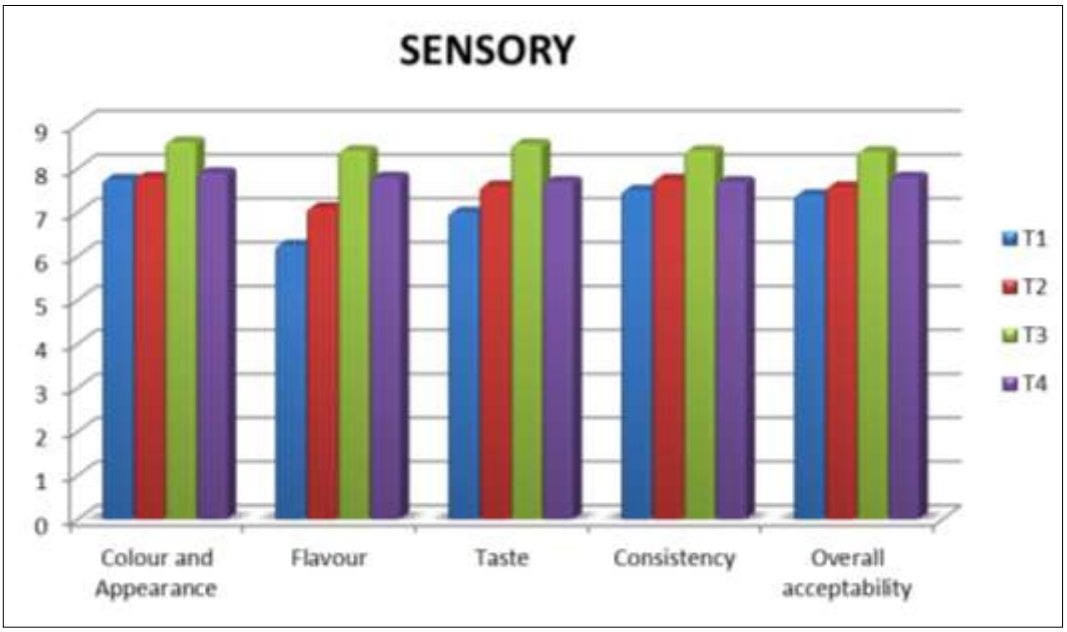

Fig 2: Graphical presentation of sensory evaluation of *chhana* whey beverage with pear Juice

Conclusions

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 sensory quality of finished product, it was observed that addition of pear juice at 20% level improved all sensory parameters such as colour and appearance (8.60), flavour (8.40), taste (8.55), consistency (8.40) and overall acceptability (8.38) respectively.

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