



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(4): 2076-2080

© 2019 IJCS

Received: 07-05-2019

Accepted: 09-06-2019

Hande AM

M. Sc. Agri. Student from
Department of Animal
Husbandry & Dairy Science,
MPKV, Rahuri Dist,
Ahmednagar, Maharashtra,
India

Chavan KD

Associate Professor of Animal
Husbandry and of Dairy
Science, Directorate of Research,
MPKV, Rahuri Dist.
Ahmednagar, Maharashtra,
India

Sensory quality of whey based kiwi (*Actinidia deliciosa*) fruit beverage

Hande AM and Chavan KD

Abstract

The present investigation was planned to prepare the kiwi fruit pulp blended with *Chhana* Whey Beverage (CWB). The beaker trials were conducted with 0, 5, 6, 7, 8, 9, 10, 11 and 12% levels of kiwi fruit pulp and 8% sugar in *chhana* whey to optimize the experimental treatments. On the basis of sensory evaluation, the treatments viz; no of kiwi fruit pulp (T₀), 8% kiwi fruit pulp (T₁), 9% (T₂) and 10% (T₃) kiwi fruit pulp with 8% constant sugar level were selected for experimental trials. The experimental samples were analyzed for sensory, chemical and microbiological qualities on day 0, 5 and 10 during storage at temperature of 5 ± 2 °C. The sensory score for colour and appearance, consistency, flavor and overall acceptability of the fresh (day 0) CWB samples significantly ($P < 0.05$) differed due to the blending of kiwi fruit pulp in the *chhana* whey. The mean sensory score for colour and appearance, consistency, flavour and overall acceptability ranged from 7.58 (T₀) to 8.34 (T₂), 7.54 (T₀) to 8.46 (T₂), 7.66 (T₀) to 8.38 (T₃) and 7.69 (T₀) to 8.40 (T₂) for fresh CWB samples, respectively. The sensory score for stored samples ranged from 6.36 (T₀) to 8.18 (T₃), 6.42 (T₀) to 8.46 (T₂ and T₃), 6.26 (T₀) to 8.02 (T₂) and 4.71 (T₀) to 8.14 (T₃), respectively for 10 days storage period.

Keywords: Chhana whey, kiwi fruit, Sensory quality

Introduction

Whey is highly nutritious by-product obtained during coagulation of milk by using acid and / or physico-chemical processes for the preparation of *cheese*, *panner*, *chhana*, *chakka*, *casein* and co-precipitates.

Whey contains approximately half of the total solids of the original milk (Gupta, 2000). The total solids content of whey ranges between 6.5 – 7.0 per cent of which lactose comprises 75 per cent in addition to water soluble vitamins, minerals and proteins. Presence of all these ingredients makes whey a highly nutritious food to human beings. It serves as the most potent pollutant of all the dairy wastes, it content high amount of organic matter (6-7%) comprising of fat, protein, sugar, minerals and water soluble vitamins.

In recent years there has been a significant increase in different varieties of soft drinks and beverages available in the market and this could probably be directly connected to the changed life-style of the people. The fast growth of soft-drinks and beverage industry has also provided good profit margin to the producers. However, with the growing awareness of balanced diet and nutrition among the health conscious consumer, whey based beverages would find its due place as refreshing and nourishing drink.

Recently the value addition of whey is being done by using various fruit pulp (juice) such as mango (Zhang *et al.*, 1994)^[11], guava (Singh, 1999)^[7] and preparation of soup using whey along with fruits and vegetables such as beet root and kokum (Kamat *et al.*, 1999)^[5].

Whey based drinks currently available in the market are yet to gain appreciable commercial success due to shorter shelf life. Therefore, a great potential to produce whey based drinks with longer shelf life (Saradha Devi *et al.*, 2004).

Kiwi fruit (*Actinidia deliciosa*) is rich in many vitamins (especially, vitamin C), flavonoids and minerals. Kiwi fruit is native to South Asia. There are more than 60 species in Actinidias and many have commercial potential. It is commercially cultivated in countries; Italy, New Zealand, Turkey, Chile, France, China, Iran and Greece (Ferguson, 1999). In India Kiwi is mostly grown in the mid hills of Himachal Pradesh, Uttar Pradesh, Jammu & Kashmir, Sikkim, Meghalaya, Arunachal Pradesh and Kerala.

Correspondence**Hande AM**

M. Sc. Agri. Student from
Department of Animal
Husbandry & Dairy Science,
MPKV, Rahuri Dist,
Ahmednagar, Maharashtra,
India

Materials and Methods

1. Milk

The composite samples of fresh milk of crossbred cow were obtained from Research-Cum-Development project (RCDP) on cattle, Mahatma Phule Krishi Vidyapeet, Rahuri, Dist. Ahmednagar (Maharashtra) for preparation of chhana whey.

2. Ingredients

Sugar were purchased from the local market, while kiwi fruit pulp was procured from M/S Malvis Food Products, Mahabaleshwar, Dist. Satara. MS (India).

Method

Preparation of *chhana whey*:

The *chhana whey* samples were prepared as per the procedure given by Bhavsagar (2010) [1].

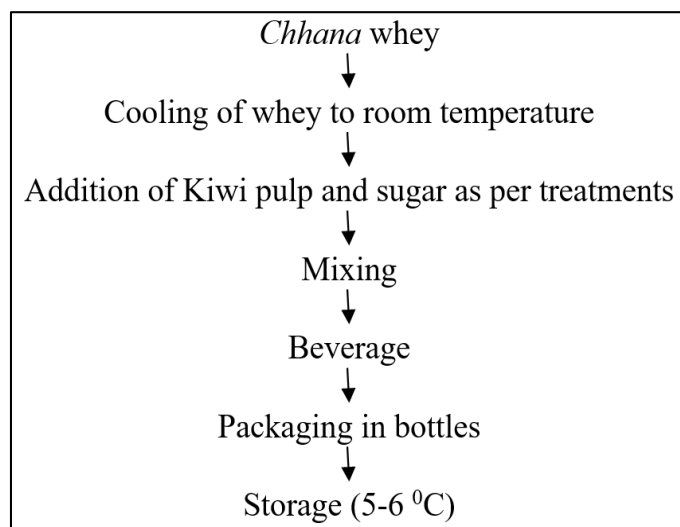


Fig 1: Flow chart for preparation of *chhana whey* beverage using Kiwi pulp

Pre-experimental trials were conducted to decide the levels of addition of kiwi fruit pulp in the whey using 0, 5, 6, 7, 8, 9, 10, 11 and 12 percent kiwi fruit pulp and constant 8 % sugar level for all treatments. The prepared samples of whey beverage were subjected to sensory evaluation by panel of six trained judges.

On the basis of the results of sensory evaluation of pre-experimental trials 0, 8, 9 and 10 % kiwi fruit pulp levels were finalized for inclusion in the final experimental trials.

Treatments Details

Levels of kiwi fruit pulp (w/v)

T₀ - Control (Without addition of kiwi fruit pulp).

T₁ - 8 per cent kiwi fruit pulp of *chhana whey*.

T₂ - 9 per cent kiwi fruit pulp of *chhana whey*.

T₃ - 10 per cent kiwi fruit pulp of *chhana whey*.

Constant sugar @ 8 per cent of whey was used for all treatments.

Sensory evaluation

Samples of whey beverage prepared under different pre-experimental and experimental treatments were subjected to sensory evaluation using the method described in the IS:6273, Part-I and Part- II (1971) adopting 9point Hedonic scale. A panel of five trained judges was formulated for this purpose. The samples were coded every time to conceal their identity and were offered to the judges for evaluation of the quality attributes.

Statistical Design

Experiment was laid out in completely randomized design (CRD) with five replications. The data was tabulated and analyzed according to Snedecor and Cochran (1994) [9]

Results and Discussion

Deciding the levels of addition of kiwi fruit pulp in the *chhana whey* beverage

Table 1: Sensory evaluation of CWB (Pre-experimental trials) (Mean of 3 trials)

Sensory quality		Colour and appearance	Consistency	Flavour	Overall acceptability
Treatment	Kiwi fruit pulp %	(Sensory score out of 9)			
T ₀	0	6.83 ^a	6.77 ^a	7.00 ^a	6.77 ^a
T ₁	5	7.70 ^c	7.33 ^b	7.30 ^b	7.10 ^b
T ₂	6	7.77 ^c	7.70 ^b	7.70 ^c	7.13 ^b
T ₃	7	8.10 ^d	8.03 ^c	8.20 ^e	7.53 ^c
T ₄	8	8.23 ^d	8.37 ^d	8.30 ^e	8.27 ^e
T ₅	9	8.43 ^d	8.53 ^d	8.50 ^f	8.40 ^f
T ₆	10	8.43 ^d	8.47 ^d	8.50 ^f	8.27 ^e
T ₇	11	7.43 ^b	7.73 ^b	7.90 ^d	7.77 ^d
T ₈	12	7.27 ^b	7.23 ^b	7.70 ^c	7.27 ^b
SE (±)		0.07	0.04	0.05	0.05
CD at 5%		0.22	0.14	0.14	0.14

All different superscripts are statistically different.

The CWB samples were prepared with 0, 5, 6, 7, 8, 9, 10, 11, and 12 per cent (Table 1). The samples were subjected to sensory evaluation by 5 trained panel of judges.

Colour and appearance

The mean sensory score for colour and appearance ranged from 6.83 to 8.43 (Table 1). Treatments T₀ secured lowest score. While T₁ and T₂, T₃, T₄, T₅ and T₆ and also T₇ and T₈ at a par to each other.

Consistency

The consistency of the product significantly influenced ($P < 0.05$) due to blending of different levels of kiwi fruit pulp in *chhana whey* (Table 1). All the treatments differed significantly. The treatment T₀ had lowest score. Whereas T₁, T₂, T₇ and T₈ and T₄, T₅ and T₆ were at a par to each other. From these results, it envisaged that with addition of levels of kiwi fruit pulp there was increase up in consistency level of the product or in other words the product become more thicker.

Flavour

The mean flavour score ranged from 6.77 to 8.53 (Table 1). The flavour score in different samples was categorized as "like moderately to like very much". From these observations it is seen that the addition of kiwi fruit pulp improves the flavour attribute of the product. The addition of kiwi fruit pulp in the *chhana* whey significantly influenced the flavor of the product. Treatment T₃ and T₄ and Treatment T₅ and T₆ were on a par.

Overall acceptability

The levels of addition of kiwi fruit pulp to the *chhana* whey significantly ($P < 0.05$) influenced the overall acceptability of the product (Table 1). The mean score was ranged from 6.77 (T₀) to 8.40 (T₅). It was inferred that better colour and appearance, consistency, Flavour and overall acceptability were observed in the *Chhana* Whey Beverage (CWB) samples prepared by addition of 7, 8, 9, 10 and 11 % kiwi fruit pulp and constant 8 % sugar level. The product prepared with these levels liked very much by the panel of judges.

On the basis of pre-experimental trials results of sensory evaluation 0, 8, 9 and 10 per cent levels were finalized for inclusion in experimental trials.

After conducting pre-experimental trials the *Chhana* Whey Beverage (CWB) was prepared by addition of 0 (T₀), 8 (T₁), 9 (T₂) and 10 (T₃) per cent kiwi fruit pulp and 8% constant sugar level.

Sensory quality of fresh *chhana* whey beverage.

Table 2: Sensory quality of fresh *chhana* whey beverage.

Sensory quality Treatment	Colour and appearance	Consistency	Flavour	Overall acceptability
T ₀	7.58 ^a	7.54 ^a	7.66 ^a	7.69 ^a
T ₁	7.82 ^b	8.24 ^b	7.80 ^a	7.97 ^a
T ₂	8.34 ^c	8.46 ^c	8.34 ^b	8.40 ^b
T ₃	8.26 ^d	8.42 ^c	8.38 ^b	8.36 ^b
SE (±)	0.05	0.03	0.05	0.14
CD @ 5%	0.16	0.08	0.15	0.42

Nine-point hedonic scale

Immediately after preparation of CWB samples subjected to the sensory evaluation for testing their sensory attributes. From consumer's point of view the sensory quality of the product holds highest position in marketability. Therefore, it was intended to study this aspect of sensory quality.

Colour and Appearance

The colour and appearance is one of the important attribute of the sensory evaluation from Table 2, it is revealed that the mean sensory score for colour and appearance of the product under different treatments was significant ($P < 0.05$). It means that the addition of different levels of kiwi fruit pulp in the CWB influenced the colour and appearance of the product. The all treatment differed among themselves. Treatment T₂ with colour and appearance score 8.34 was superior in terms of its colour and appearance among all other treatments studied. Whereas treatment T₀ scored lowest but sensorily acceptable.

Kumar and Peter (2015) prepared whey based Indian Goose Berry (Aonla) Beverage and reported the colour and appearance score for samples of whey beverage was 7.92 (T₀), 6.66 (T₁), 7.14 (T₂) and 8.24 (T₃).

Bhavsagar *et al.* (2010) [1] prepared fruit beverage from *chhana* whey by adding 5, 10 and 15% pineapple juice and

recorded the average colour and appearance score as 7.64. Singh *et al.* (2014) worked on whey guava beverage and noted the sensory score for colour as 6.02 to 7.82 in the different blends studied.

Consistency

The treatment differences in the mean scores of consistencies were found to be significant ($P < 0.05$) (Table 2). The mean score ranged from 7.54 (T₀) to 8.46 (T₂). All the treatments also differed significantly ($P < 0.05$) among themselves. The treatment T₂ had thicker and more acceptable consistency as compared to Treatment T₀, T₁ and T₃. However, T₂ and T₃ were at par to each other indicating that too higher level of kiwi fruit pulp was not have any added advantage.

Flavour

The flavour is the most important component of sensory attributes. The mean score for flavor was 7.66, 7.80, 8.34, 8.38 for the treatment Samples T₀, T₁, T₂ and T₃, respectively (Table 2). Which differed significantly ($P < 0.05$). The highest sensory score received to the CWB sample (T₃) prepared by addition of 10 % kiwi fruit pulp in the *chhana* whey followed by T₂ (9%), T₁ (8%) and T₀ (Control) samples. However, there were significant difference among the treatments but T₀ and T₁, then T₂ and T₃ were at par. Therefore, same inference is Overed as in case of consistency.

Bhavsagar *et al.* (2010) manufactured pineapple flavoured beverage from *chhana* whey and reported the flavour score in the range of 7.3 (T₃) to 8.0 (T₂) treatment combinations. These results are in agreement with results reported in this investigation.

Overall acceptability

From Table 2, it is seen that the addition of different levels kiwi fruit pulp in the *chhana* whey samples significantly ($P < 0.05$) influenced the overall acceptability of the product. The mean sensory scores of experimental CWB samples under different treatments were ranged from 7.69 (T₁) to 8.40 (T₂). The highest sensory score 8.40 was observed in treatment T₂ over the rest of sample treatments. The treatment T₀ & T₁ and T₂ & T₃ were on a par. Indicating that higher level of kiwi fruit pulp is not improved the overall acceptability statistically.

Bhavsagar *et al.* (2010) [1] reported the overall acceptability score for different blends of pineapple flavoured *chhana* whey beverage as 7.7 to 7.9.

Influence of addition of kiwi pulp on sensory quality of CWB during storage

Colour and appearance

The influence of addition of kiwi fruit pulp in the *chhana* whey significantly ($P < 0.05$) influenced the colour and appearance (Table 3) of the product during storage period. The mean values for colour and appearance score ranged from 6.36 (T⁰) to 8.32 (T²). The colour and appearance of the product varied from light yellowish to greenish. The colour and appearance of the treatment T² was more attractive than other treatment on day 0, but the colour of the product on 5th and 10th disappeared as storage period progressed.

The colour and appearance score of CWB samples differed significantly ($P < 0.05$) during storage. The mean colour and appearance score for T₀, T₁, T₂ and T₃ ranged from 6.36 (T₀) to 7.36 (T₂ and T₃). The treatment T₂ scored highest (8.34) on among all the treatments on a day 0 and treatment T₂ and T₃ were on a par on 10 day of storage.

Yadav *et al.*, (2010) [10] noted colour score 7.60 on day 0 and 6.80 on 10th day of storage while studying the development and storage studies on whey based banana herbal (*Mentha arvensis*) beverage. Chavan *et al.*, (2015) reported that colour and appearance score 8.5 on day 0 and also 8.5 on 10th day of storage in development of whey based mango beverage.

Table 3: Colour and appearance of CWB during storage

Storage period Treatment	0 day	5 th day	10 th day
T ₀	7.58 ^a	7.14 ^a	6.36 ^a
T ₁	7.82 ^b	7.34 ^b	6.68 ^a
T ₂	8.34 ^c	8.10 ^c	7.36 ^b
T ₃	8.26 ^d	8.18 ^c	7.36 ^b
SE (±)	0.05	0.05	0.03
CD @ 5%	0.16	0.14	0.10

Consistency

The influence of addition of kiwi fruit pulp (Table.3) in the *chhana* whey significantly ($P<0.05$) influenced the consistency of CWB during storage period. The addition of kiwi fruit pulp in CWB yhe consistency of the product significantly differed among each other on all the days of storage period. As ghe addition of kiwi fruit pulp in the *chhana* whey the consistency also become thicker in the treatment samples. As storage period increases the consistency become thinner in the sample treatments, On 10th days of storage period.

The results of consistency of refrigerated stored CWB are presented in Table 4. The consistency of CWB samples during storage period shown significant difference among the treatments during all the days of storage.

There was significant ($P<0.05$) difference among all treatment samples on all days of storage period. The treatment T₂ score highest among all the treatments on day 0 and day 10 of storage.

Kumar *et al.*, (2014) reported the sensory score for consistency on day 0 was 4.50 and 4.40 on 10th day in formulation of whey sweet orange based RTS fruit beverage.

Table 4: Consistency of CWB during storage

Storage period Treatment	0 day	5 th day	10 th day
T ₀	7.54 ^a	7.34 ^a	6.42 ^c
T ₁	8.24 ^b	8.22 ^b	6.66 ^b
T ₂	8.46 ^c	8.46 ^c	7.86 ^a
T ₃	8.42 ^c	8.46 ^c	7.82 ^a
SE (±)	0.03	0.03	0.05
CD @ 5%	0.08	0.10	0.16

Flavour

The flavour is one of the important components of sensory quality, from the Table 5, it is revealed that, influence of addition of kiwi pulp on flavour of the CWB samples was significant ($P<0.05$), during all the days of storage. The mean sensory score of the samples under different experimental treatments were ranged from 7.66 (T₀) to 8.34 (T₂), 7.14 (T₀) to 8.02 (T₂) and 6.26 (T₀) to 7.26 (T₂ and T₃), respectively during storage period.

Although the treatments have significant differences, the scores obtained by the samples under treatments T₂ and T₃ were at par on day 10 of storage. The highest sensory score was received to sample treatments T₃(8.38), whereas sample T₂ received 8.02 on a 5th day and 7.26 (T₃) on a 10th day of storage.

Yadav *et al.*, (2010) [10] noted sensory score for flavor was 7.20 on day 0 and 6 and 10th day of storage while studying the

development and storage studies on whey based banana herbal(*Mentha arvensis*) beverage. Chavan *et al.*, (2015) reported that sensory score for flavor was 8.5 on day 0 and also 8.5 on 10th day of storage in development of whey based mango beverage.

Table 5: Flavour of CWB during storage

Storage period Treatment	0 day	5 th day	10 th day
T ₀	7.66 ^a	7.14 ^a	6.26 ^a
T ₁	7.80 ^a	7.40 ^b	6.52 ^b
T ₂	8.34 ^b	8.02 ^c	7.26 ^c
T ₃	8.38 ^b	8.00 ^c	7.26 ^c
SE (±)	0.05	0.02	0.03
CD @ 5%	0.15	0.07	0.07

Overall acceptability

From the Table 6, it is revealed that, the influence of addition of different level of kiwi pulp in the *chhana* whey samples significantly ($P<0.05$) influenced the overall acceptability of the product during all the days of storage. The mean sensory scores of the CWB samples under various treatments ranged from 7.69(T₀) to 8.36(T₃) on day 0. While 6.94 (T₀) to 8.14(T₃) on day 5 and 4.17 (T₀) to 7.12 (T₃) on day 10 of storage. The results suggest that the product under the various treatments viz; T₀ became unfit for acceptance sensorily from 10th day of storage.

Treatment T₀ and T₁, treatment T₂ and T₃ on a day 5th and 10th day were on a par during storage period. Similarly, the treatment T₀ and T₁ on 10th day of storage were on par.

Chavan *et al.*, (2015) reported that sensory score for overall acceptability was 8.5 on day 0 and also 8.4 on 10th day of storage in development of whey based mango beverage.

Table 6: Overall acceptability of CWB during storage

Storage period Treatment	0 day	5 th day	10 th day
T ₀	7.69 ^a	6.94 ^a	4.71 ^a
T ₁	7.97 ^a	7.14 ^b	5.80 ^a
T ₂	8.40 ^b	8.12 ^c	7.08 ^b
T ₃	8.36 ^b	8.14 ^c	7.12 ^b
SE (±)	0.14	0.05	0.10
CD @ 5%	0.42	0.14	0.29

Conclusion

Better quality Channa Whey beverage can be prepared by blending of 9 per cent kiwi fruit pulp and 8 % sugar in the *chhana* whey. The prepared kiwi fruit pulp CWB can remain in good acceptable condition up to 10th day at refrigerated temperature of 5-6 °C

References

1. Bhavsagar MS. Manufacture of pineapple flavoured beverage from *chhana* whey. J Dairying, Foods and HS. 2010; 29(2):110-113.
2. Chavan RS, Nalawade T, kumar A. Studies on the development of whey-based mango beverage. Research and Review: J. of Food and Dairy Technology. 2015; 3.
3. Gupta VK. Over view of production, processing and utilization of dairy by products. Course Compendium: Technological advances in the utilization of dairy products. 15-16, Dec 2008 NDRI Karnal, India, 2000, 1-7.
4. IS: 6273, Part-I and Part-II. Guide for sensory evaluation of food. Methods and Evaluation cards, Indian Standard Institution, Manak Bhavan, New Delhi, India, 1971.

5. Kamat RP, Toro VA, Joshi SV, Burte RG, Dandekar VS. Whey utilization for manufacture of soups. *Indian J Dairy Sci.* 52(6): 396-399. Karnal, 53. Cited: *Indian Dairyman.* 1999; 35(10):598.
6. Kumar PA, Bangaraiah P. Formulation of whey sweet orange based RTS fruit beverage. *International J.of Pharma and Bio Sciences.* 2014; 5(4):1101-1111.
7. Singh W, Kapoor CM, Srivastava DN. Standardization of technology for the manufacture of Guava whey beverage. *Indian J. Dairy Sci.* 1999; 52(5):268-271.
8. Ferguson AR. New temperate fruits: *Actinidia chinensis* and *Actinidia deliciosa*. In: J. Janick (ed.). *Perspectives on new crops and new uses.* ASHS Pres. Alexandria, VA, 1999.
9. Snedecor WG, Cochran GW. *Statistical methods.* East-West Press Pvt. Ltd., New Delhi, 1994.
10. Yadav RB, Yadav BS, Kalia N. Development and storage studies on whey-based Banana Herbal (*Mentha arvensis*) Beverage. *American J of Food Technology.* 2010; 5(2):121-129.
11. Zhang HP, Zheng HW. Deligelsang. Manufacture of whey polypeptide beverage using trypsin hydrolysis. *J Food Sci.* 1994; 2(5):27-31.