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## Studies on effect of using kiwi (*Actinidia deliciosa*) fruit extract on sensory properties of fruit based *Chhana* whey beverage

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**Abstract**

In the present study Kiwifruit whey beverage was prepared from different proportions of kiwi extract blended with whey. The product obtained was subjected for organoleptic evaluation by panel of judges. It was observed that colour and appearance score of beverage in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> was 8.00, 8.03, 7.50 and 7.00, respectively. Flavour score was 6.03, 7.25, 8.13 and 8.00, respectively. Consistency was 7.00, 7.38, 8.00 and 7.88, respectively. Taste score was 6.63, 8.00, 8.13 and 7.53, respectively. It was observed that the overall acceptability score was 7.03, 7.66, 7.94 and 7.60, respectively for T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub>.

**Keywords:** *Chhana*, kiwifruit, beverage, sensory

**Introduction**

Whey is the watery part of milk that remains after separation of curd/coagulated product that result from acid or proteolytic enzyme mediated coagulation of milk. Whey is an important by product obtained during the manufacture of cheese, *chhana*, and panner. Whey contains almost all constituent of milk except casein, fat and fat soluble vitamins. Generally whey contains approximately half of the total solid of the original milk. The total solid contain of whey ranges between 6.5-7.0 per cent in addition to water soluble vitamins, mineral and proteins. The whey being a good source of high quality protein, minerals and easily digestible carbohydrates.

In dairy industry it is usually dumped because it has no value, on other hand whey present interesting nutritional value. The whey which is used as waste effluent in the formulation of nutritious palatable and therapeutic beverages presence of Lactose, fat, protein, minerals and water soluble vitamins make the whey a highly nutritious product. Therefore, the utilization of whey in to fermented or non-fermented beverages is one of the most attractive avenues for the utilization of the whey.

Whey contains almost all the nutrients except casein and fat. The whey has greater nutritional and therapeutic values because it contains lactose, thiamine, riboflavin, vitamin B, vitamin C, calcium and phosphorus. The whey solid apart being nutritious also carry excellent functional properties such as solubility, gel formation, emulsification, water blending, whipping etc. beverages are consumed people of all age groups as they are nourishing, pleasant drinks that provides energy, water digest food, regulate body temperature, prevent dehydration and removes physiological tension.

A whey beverage means purified water in which sugar, flavouring, edible acids and colouring matter are present and sometimes carbonated with carbon dioxide gas. But recently the whey beverages are also prepared using various fruit pulp (juice) such as Mango whey beverage Dhawale *et al.* (2009) [7], Guava whey beverage Divya *et al.* (2009) [9], Sapota whey beverage Gaikwad *et al.* (2010) [11], Pineapple whey beverage Bhavsagar *et al.* (2010) [4], Pomegranate whey beverage Babar *et al.* (2008) [2], etc. As like such beverages many attempts have been made by the research workers to utilize whey as base for fruit juice beverages.

Kiwi contains vital substances that are required to maintain good health. The fruit is rich in vitamin C, E, sugars and several minerals such as phosphorus, potassium, magnesium, copper and calcium. It is low in calories and high in ascorbic acid content Singh (2008) [21]. The fruit is rich in antioxidants due to presence of phytonutrients such as, lutein, phenolics, flavonoids, carotenoids and chlorophyll (Cassano *et al.* 2006) [5]. Presence of these beneficial substances helps reducing the risk of cardiovascular disease (Chang *et al.* (2009) [6].

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Kiwi fruit juice are used extensively as fruit ingredients in many food such as dairy products, jams, and jellies, syrups, confectionery, etc.

The market demand for instant food and whey beverage is growing all over the world and consumers are seeing new tastes. The main marketing advantages of whey beverages are healthful combination of fruit based vitamin containing components and the dairy based calcium and whey protein. Hence, taking into account the market demands and consumer preference, conversion of whey into beverages is one of the most important avenues for utilization of whey in human food chain.

Keeping in view the nutritional, biological and functional qualities of whey, attempts have been made to utilize the whey for the preparation of palatable refreshing beverage with addition of Kiwi fruit extract

## Experimental Methodology

### Extraction of *chhana* whey

*Chhana* whey was prepared as per the method given by Shewfelt (1997)<sup>[20]</sup>. Good quality fresh cow milk was strained through muslin cloth. Then milk was transferred to stainless steel vessel and brought to boil by heating at temperature 80 °C. The vessel was removed from the fire and allows cooling at temperature 75 °C. The coagulant i.e. citric acid @ 0.5 per cent was added slowly and stirred so that it was mixed properly. The coagulated milk was poured over piece of clean muslin cloth stretched over another vessel to drain the whey. The clear drained whey was collected in vessel. The whey was again heated to a temperature of 100 °C for 5 minutes, so as to remove the traces of fat and curd particles. The clear yellowish green whey was then used for the preparation of Kiwi fruit (*Actinidia deliciosa*) extract whey beverage.

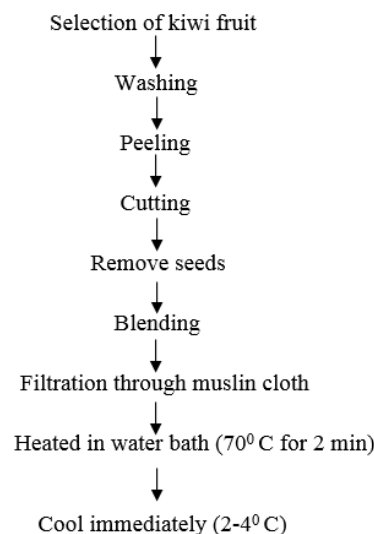
### Selection of Kiwi Fruit (*Actinidia deliciosa*).

Kiwi fruit were collected from fruit market, Latur. During the course of present study while selecting the kiwi fruit, stage of ripening, size, colour and taste were considered so that there should not be any variation in the quality of juice to be extracted from the fruit.

### Preparation of Kiwi Fruit (*Actinidia deliciosa*) extract

Prior to preparation of Kiwi Fruit (*Actinidia deliciosa*) extract,

first kiwi fruits were washed with clean water. The skin was removed. The slices were cut with the help of knife and finally it was converted in homogeneous mass of juice by putting into mixer. Homogenous mass of juice drained with muslin cloth and collect juice in vessel.

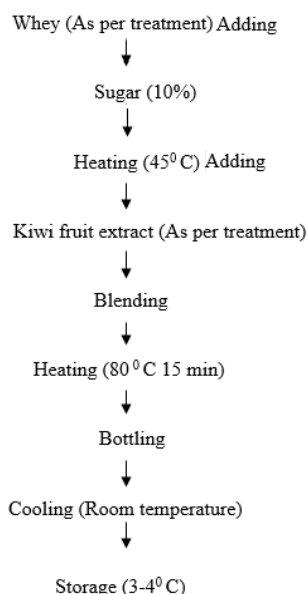


Source: Shewfelt *et al.* 1997; Dubost *et al.* 2003<sup>[20, 10]</sup>.

Fig 1: Flow chart showing preparation of kiwi fruit extract

### Preparation of Kiwi fruit (*Actinidia deliciosa*) extract whey beverage

The standardized milk was transferred to stainless steel vessel and heated to boiling temperature with continuous stirring. Then milk was allow cooling up to 75 °C and added 0.5 per cent citric acid with constant stirring for equal distribution and stirred till coagulation took place. Then whey was strained through muslin cloth. The obtained whey was clear and greenish yellow in colour. The whey was heated to 100 °C and then cooled to room temperature. Sugar was added @ 10 per cent into the whey. Heat the mixture of whey and sugar for 45 °C. Then extract was added as per the treatments and mixed thoroughly by heating at 80 °C, 15 min. The product was filtered, bottled, cooled at room temperature and then stored in refrigerator at temperature 3-4 °C.



Source: Shewfelt *et al.* 1997; Dubost *et al.* 2003<sup>[20, 10]</sup>.

Fig 2: Flow chart for preparation of *chhana* whey beverage by using Kiwi (*Actinidia deliciosa*) fruit extract.

### Treatment combinations

For the preparation of Kiwifruit (*Actinidia deliciosa*) whey beverage from *chhana* whey, the treatment combinations studied were as under.

T<sub>1</sub> - 100 parts whey

T<sub>2</sub> - 90 parts whey + 10 parts of Kiwi fruit extract

T<sub>3</sub> - 80 parts whey + 20 parts of Kiwi fruit extract

T<sub>4</sub> - 70 parts whey + 30 parts of Kiwi fruit extract

### Sensory Evaluation of Kiwi fruit whey beverage

The experimental whey beverage samples were served to a panel of semi trained judges for sensory evaluation such as colour and appearance, flavour, consistency, taste and overall acceptability using "9 point hedonic scale".

### Statistical analysis

The data were analyzed statistically by using Completely Randomized Design (CRD) as per Panse and Sukhatme (1985)<sup>[17]</sup>.

### Result and Discussion

The experimental whey beverage samples were served to a panel of semi trained judges for sensory evaluation such as, colour and appearance, flavour, consistency, taste and overall acceptability using "9 point hedonic scale". The numerical score given by judges for individual attribute was computed to obtain mean and these means were subjected to statistical analysis.

**Table 1:** Effect of using kiwi (*Actinidia deliciosa*) fruit extract on sensory properties of fruit based *chhana* whey beverage

Replication / Treatment	Colour and appearance	Flavour	Consistency	Taste	Overall Acceptability
T <sub>1</sub>	8.00 <sup>a</sup>	6.03 <sup>c</sup>	7.00 <sup>b</sup>	6.63 <sup>b</sup>	7.03 <sup>b</sup>
T <sub>2</sub>	8.03 <sup>a</sup>	7.25 <sup>b</sup>	7.38 <sup>a</sup>	8.00 <sup>a</sup>	7.66 <sup>a</sup>
T <sub>3</sub>	7.50 <sup>ab</sup>	8.13 <sup>a</sup>	8.00 <sup>a</sup>	8.13 <sup>a</sup>	7.94 <sup>a</sup>
T <sub>4</sub>	7.00 <sup>b</sup>	8.00 <sup>a</sup>	7.88 <sup>a</sup>	7.53 <sup>a</sup>	7.60 <sup>a</sup>
SE	± 0.20	± 0.12	± 0.28	± 0.19	± 0.26
C.D. at 5%	0.63	0.37	0.87	0.59	0.81

### Colour and appearance score of kiwi fruit whey beverage

It was observed that mean colour and appearance score of beverage in treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were 8.00, 8.03, 7.50 and 7.00, respectively. The treatment T<sub>2</sub> was significantly superior over treatments T<sub>1</sub>, whereas T<sub>1</sub> and T<sub>2</sub> at par with each other. It may be concluded that, 10 per cent kiwi extract blending to the whey beverage was preferred by the judges, as far as colour character was concerned.

The results obtained were in agreement with finding of Aher (2007)<sup>[1]</sup> stated the average sensory score of papaya whey beverage for colour in ranges from 7.47 to 7.75. Landge *et al.* (2013)<sup>[16]</sup> reported the average sensory score for colour which range from 6.0 to 7.5. Gupta *et al.* (2013)<sup>[13]</sup> reported colour score for fruit based carbonated whey beverage ranged between 7.1 to 7.8. Gond (2015)<sup>[12]</sup> reported that the average sensory score of sweet orange whey beverage for colour ranges between 7.12 to 7.87. Dhumale (2016)<sup>[8]</sup> reported that average sensory score for colour of Nagpur mandarin beverage ranges between 8.13 to 7.72.

### Flavour score of kiwi fruit whey beverage

It was observed that the mean scores for flavour of beverage for treatment T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were 6.03, 7.25, 8.13 and 8.00, respectively. The all treatment T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> was significantly superior over treatment T<sub>1</sub>, whereas T<sub>3</sub> and T<sub>4</sub> were at par with each other. It clearly indicated that the blending of 20 per cent kiwi fruit extract in preparing kiwi fruit whey beverage was preferred in respect of flavor by the panel of judges.

The results recorded in the present investigation for flavour were comparable with the findings of Prasad *et al.* (2001)<sup>[18]</sup> prepared a whey based mango beverage and noted average sensory score for flavour in the range of 6.23 to 8.76. Landge *et al.* (2013)<sup>[16]</sup> reported the flavour score for whey beverage in the ranges of 6.5 to 7.83. Gupta *et al.* (2013)<sup>[13]</sup> reported flavour score for fruit based carbonated whey beverage ranges between 6.8 to 7.8.

### Consistency score of kiwi fruit whey beverage

The average sensory score for consistency of kiwi fruit whey beverage in treatment T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> was 7.00, 7.38, 8.00

and 7.88, respectively. The observation clearly indicates that, the highest liking was towards T<sub>3</sub> and T<sub>4</sub>. As far as consistency is concerned, the T<sub>3</sub> and T<sub>4</sub> beverage blends with 20 and 30 per cent of the kiwi extract were acceptable by panel of judges. Similar finding was also observed by Shaikh *et al.* (2001)<sup>[19]</sup>.

### Taste score of kiwi fruit whey beverage

Mean score of taste for the treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> as, 6.63, 8.00, 8.13 and 7.53, respectively. Treatments T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were significantly superior over treatment T<sub>1</sub>, whereas treatment T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were at par with each other.

From the above observations it was clearly indicated that the highest liking was towards the treatment T<sub>3</sub> i.e. beverage blended with 20 per cent kiwi extract. The results recorded for taste were comparable with the results obtained by Divya and Archana (2009)<sup>[9]</sup> reported score for taste of whey guava beverage is 7.50 to 8.26. Baljeet *et al.* (2013)<sup>[3]</sup> reported the score for taste of whey based pineapple and bottle gourd mixed beverage is 7.0 to 8.0.

### Overall acceptability of kiwi fruit whey beverage

Table 1 shows that the mean overall acceptability score of kiwi fruit whey beverage for treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> was 7.03, 7.66, 7.94 and 7.60, respectively. It was observed that, treatment T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> were significantly superior over treatment T<sub>1</sub>, and T<sub>2</sub>, T<sub>3</sub> and T<sub>4</sub> at par with each other. T<sub>3</sub> had the highest mean score of whey beverage prepared using 20 per cent kiwi fruit extract. The treatment T<sub>3</sub> had comparatively highest mean overall score than treatment T<sub>2</sub> and T<sub>4</sub>. The treatment T<sub>1</sub> had least mean overall score i.e. 7.03.

It was further noted the overall acceptability mean score for likening of the product of 20 per cent blend combination was at higher side.

Prasad *et al.* (2001)<sup>[18]</sup> noted the overall acceptability score for mango beverage varied from 6.96 to 7.95. Aher (2007)<sup>[1]</sup> reported the overall acceptability of papaya whey beverage in the range between 7.31 to 7.95. Landge *et al.* (2013)<sup>[16]</sup> reported the overall acceptability score for whey beverage in

the ranges of 6.61 to 7.50. Gond (2015) <sup>[12]</sup> reported that the average overall acceptability of sweet orange whey beverage ranges between 6.93 to 7.80. Dhumale (2016) <sup>[8]</sup> reported that the overall acceptability of Nagpur mandarin beverage ranges between 8.08 to 7.70.

### Conclusion

From present investigation it can be concluded that the whey beverage prepared by using kiwi fruit extract can be very well utilized for preparation of nutritious, palatable and refreshing beverage by blending 20 per cent kiwi fruit extract with 80 percent *chhana* whey on weight basis.

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