



# Preparation of whey based custard apple (*Annona squamosa* L.) pulp beverage

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**ABSTRACT :** The present investigation was carried out in the laboratory of Department of Animal Husbandry and Dairy science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2016-2017. During present investigation beverage was prepared with different combinations of whey and custard apple pulp as 97:03 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 91:9 (T<sub>3</sub>), 88:12 (T<sub>4</sub>) and 85:15 (T<sub>5</sub>). For sensory evaluation the results revealed that overall acceptability scores obtained were 7, 7.5, 8.75, 7.75 and 7.25 for the treatment T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. The treatment T<sub>3</sub> scored significantly highest scores for flavour, colour, consistency and overall acceptability which were found superior amongst all the treatments. The beverage prepared from all combinations of whey and custard apple pulp was found acceptable. The cost of production per kg of beverage was increased with increase in the rate of addition of custard apple pulp. *i.e.* Rs.15.17 (T<sub>1</sub>), Rs. 21.14 (T<sub>2</sub>), Rs. 27.11 (T<sub>3</sub>), Rs. 33.08 (T<sub>4</sub>) and Rs. 39.05 (T<sub>5</sub>).

**KEY WORDS :** Whey, Custard apple, Beverage, Blending, Sensory evaluation, Cost of production

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## INTRODUCTION

Beverages are consumed by 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 stress. At present fruit beverages are generally synthetic flavoured, bottled and sold in the market. If this could be substituted with fruit juice and dairy whey, it will be more beneficial to the consumer, dairy industries and beverage manufacturers as well as fruit growers (Sakhale *et al.*, 2012).

Whey is a nutritious by product obtained from

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Cheese, *Chhana* and *Paneer* industry containing valuable nutrients like lactose, proteins, minerals, vitamins, etc., which have indispensable value as human food. In India, there has been a substantial increase in the production of paneer, resulting in an increased accessibility of whey. India's annual production is estimated at 1,50,000 tones of paneer and concerning 2 million tones of whey, containing about 1,30,000 tonnes of valuable milk nutrients produced per annum (Goyal and Gandhi, 2009). Whey constitutes 45-50 per cent of total milk solids, 70 per cent of milk sugar (lactose), 20 per cent of milk proteins and 70-90 per cent of milk minerals and most importantly, almost all the water soluble vitamins originally present in milk. Nearly 70-80 per cent of minerals present in milk pass on to the whey (Sachdeva *et al.*, 1998). It also contain significant amount of vitamins such thiamine (B1), riboflavin (B2), pantothenic acid, folic acid and ascorbic acid (vitamin C) (Puranik and Rao, 1996).

During flush season surplus quantities of milk is

diverted in the production of *Paneer*, *Chhana*, chakka, casein and shrikhand, thus, producing enormous quantities of whey as by product. Improper disposal of whey increase problem of pollution, thus, utilization of whey for the production of beverages, soft drinks and wines are some of the solutions to minimize the intensity of pollution problem. (Parekh, 2006).

Custard apple (*Annona squamosa* L.) is mostly used as desert fruit for its delicious taste with sweet, slight acidic and pleasant flavor and nutritive value. The pulp of custard apple is sweet. The fruit contain 45 per cent edible portion, 100 g of which has a composition of 70.5 g moisture, 23.5 g carbohydrate, 1.6 g protine, 0.4 g fat, 17mg calcium, 47mg p, 1.5mg iron (Bose and Mitra, 1990). The custard apple contains various vitamins *i.e.* vitamin C 35.9 g, Thiamine 0.10 g, Riboflavin 0.06 g and Niacin 0.89 g (Bose *et al.*, 2002). The custard apple is still not used for the preparation of whey beverage. Therefore, in present investigation the emphasis has given to develop the whey based custard apple beverage and evaluate for its sensorial quality and cost of production.

### MATERIAL AND METHODS

The present investigation was carried out in the laboratory of Department of Animal Husbandry and Dairy Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during the year 2016-2017. Good quality fresh milk was procured and then strained through muslin cloth. The milk was transferred to stainless steel vessel and brought to boil by heating at 82°C. The vessel was then removed from the fire. The coagulant *i.e.* citric acid @ 2% was added slowly and stirred to have uniform mixing. Then the mass was poured over stretched piece of clean muslin cloth over another vessel to drain of the whey and press in paneer presser to remove excess whey from mass. The clear drained whey was collected in the 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 yellowish green whey was then used for preparation of whey beverage. (De, 2009). The pulp was obtained from fully ripened custard apple fruit by using the procedure given by Dhumal *et al.* (1996). The method described by Panghal *et al.* (2007) was used for preparation of whey based custard apple beverage with slight modification. Beverage was prepared with different combinations of whey and custard apple pulp as 97:03 (T<sub>1</sub>), 94:06 (T<sub>2</sub>), 91:9 (T<sub>3</sub>), 88:12 (T<sub>4</sub>) and 85:15 (T<sub>5</sub>) with

five replications. Good quality, clean crystalline cane sugar was used @ 8 % by weight of whey and custard apple pulp. Beverage samples were analyzed for Sensory evaluation of the beverage sample prepared with varying levels of whey and pulp was evaluated by a panel of judges with respect of colour and appearance, flavour, consistency and overall acceptability by using 9 points hedonic scale described in IS:6273 (Part-II) 1971. Cost structure of beverage was calculated by considering market cost of ingredients used for preparation of beverage. The data obtained in the present investigation was statistically analyzed by Completely Randomized Design (CRD) as per suggested by Panse and Sukhatme, (1989).

### RESULTS AND DISCUSSION

The results of the present study as well as relevant discussions have been presented under following sub heads:

#### Sensory evaluation of whey based custard pulp beverage:

The whey based custard pulp beverage was subjected to sensory evaluation for colour and appearance, body and texture, flavour, taste and overall acceptability attributes by a panel of expert judges using 9 point hedonic scale and the data obtained was statistically analyzed, tabulated and presented in Table 1.

#### Colour:

Table 1 shows that mean colour score for whey beverage were 6.25, 7.75, 8.5, 8.00, and 7.75 for treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. The highest score 8.5 for colour was recorded in treatment T<sub>3</sub> with 9 per cent addition of custard apple pulp. The results obtained are in agreement with Baljeet *et al.* (2013) who found that the mean colour score of whey based pineapple and bottle gourd mixed herbal beverage was 7.0 to 7.30. Ingale *et al.* (2009) also reported same trend for whey based custard apple beverage. Bothe (2013) reported that the sensory score for colour of whey based mango herbal beverage in treatment T<sub>2</sub> showed higher score 7.46, while treatment T<sub>0</sub> and T<sub>3</sub> scored minimum score 7.45.

#### Flavour:

The highest score 9 for flavour was recorded in treatment T<sub>3</sub> with addition of 9 per cent custard apple

pulp, while the lowest score 7 for flavour was recorded in treatment T<sub>1</sub> with 3 per cent addition of custard apple pulp. The result obtained are in agreement with Ingale *et al.* (2009) also reported same trend for whey based custard apple beverage. Naik *et al.* (2009) found that the flavour score of fresh whey based watermelon beverage with 2 per cent betel leaves distillate concentration was 8.5 per cent. Pandiyan *et al.* (2011) reported that the mean flavour score of mango flavoured sweetened whey drink was 7.56 (T<sub>0</sub>), 8.17 (T<sub>1</sub>), 8.17 (T<sub>2</sub>), 8.16 (T<sub>3</sub>). Baljeet *et al.* (2013) found that the flavour score of whey based pineapple and bottle gourd mixed (*Mentha arvensis*) herbal beverage was 7.0 to 8.0. Whereas, Bothe (2013) reported sensory score for flavour of whey based mango herbal beverage, treatment T<sub>2</sub> showed higher score 8.29, while sample T<sub>0</sub> scored minimum score 7.76.

**Consistency of beverage:**

Table 1 indicates that; mean consistency score for

whey beverage were 6.75, 7, 8.5, 7.5 and 7.75 for treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, respectively. The result obtained are in agreement with Bothe (2013) who reported sensory score for consistency of whey based mango herbal beverage, in treatment T<sub>2</sub> showed higher score 8.17, while treatment T<sub>0</sub> scored minimum score 7.60. Ingale *et al.* (2009) also reported same trend for whey based custard apple beverage. Deepa and Krishnaprabha (2014) also reported that the mean consistency score of musk melon and whey water and probiotic incorporated squash was 8.4 (T<sub>0</sub>), 7.04 (T<sub>1</sub>), 7.28 (T<sub>2</sub>), 7.44 (T<sub>3</sub>).

**Overall acceptability of beverage:**

The highest score 8.75 for overall acceptability was recorded in treatment T<sub>3</sub> with 9 per cent addition of custard apple pulp while the lowest score 7 for overall acceptability was recorded in treatment T<sub>1</sub> with 3 per cent addition of custard apple pulp. Ingale *et al.* (2009) studied the development of whey based custard apple

**Table 1: Sensory evaluation of whey based custard pulp beverage**

Treatments	Mean values of scores obtained for five replications (out of 9 marks)			
	Colour and appearance	Flavour	Body and texture/ consistency	Overall acceptability
T <sub>1</sub>	6.25	7.00	6.75	7.00
T <sub>2</sub>	7.75	7.50	7.00	7.50
T <sub>3</sub>	8.50	9.00	8.50	8.75
T <sub>4</sub>	8.00	7.75	7.50	7.75
T <sub>5</sub>	7.75	7.25	7.75	7.25
'F' test	Sig.	Sig.	Sig.	Sig.
S.E.±	0.46993	0.45644	0.44528	0.44402
C.D. (P=0.05)	1.41622	1.37555	1.34197	1.32727

**Table 2 : Cost of production of whey based custard apple beverage prepared by blending with different levels of custard apple pulp (Rs./kg)**

Sr. No.	Particular	Treatment combinations									
		T <sub>1</sub>		T <sub>2</sub>		T <sub>3</sub>		T <sub>4</sub>		T <sub>5</sub>	
		Qty. (lit)	Amount (Rs.)	Qty. (lit)	Amount (Rs.)	Qty. (lit)	Amount (Rs.)	Qty. (lit)	Amount (Rs.)	Qty. (lit)	Amount (Rs.)
1.	Whey (lit) (1Rs./lit)	970	0.97	940	0.94	910	0.91	880	0.88	850	0.85
2.	Custard apple pulp (200 Rs./kg)	30	06	60	12	90	18	120	24	150	30
3.	Sugar@ 8% (40Rs./kg)	80	3.2	80	3.2	80	3.2	80	3.2	80	3.2
4.	Other(fuel, labour, citric acid, miscellaneous)	-	5	-	5	-	5	-	5	-	5
5.	Total cost (Rs./1lit)	-	15.17	-	21.14	-	27.11	-	3.08	-	39.05
6.	Cost /200ml (Rs./200ml)	-	3.03	-	4.22	-	5.42	-	6.61	-	7.81
7.	Expected market cost (Rs./200ml)	-	15	-	15	-	20	-	20	-	20
8.	Profit per bottle of 200ml	-	11.97	-	10.78	-	14.58	-	13.39	-	12.19
9.	Profit per bottle of 1000ml	-	59.85	-	53.9	-	72.9	-	66.95	-	60.95

(*Annona squamosa* L.) beverage. Whey based custard apple beverage were prepared with different combination of whey and pulp i.e. 90:10, 85:15 and 80:20. The prepared beverages were evaluated for the different sensory parameters by using 9- point hedonic scale. Out of all combinations the beverage prepared from 90 per cent whey and 10 per cent pulp was superior in all most all sensorial and physico-chemical properties. Gaikwad *et al.* (2010) found that the overall acceptability score of fresh whey based watermelon beverage with 2 per cent betel leaves distillate concentration was 8.5. Baljeet *et al.* (2013) found that the overall acceptability score of whey based pineapple and bottle gourd mixed (*Mentha arvensis*) herbal beverage was 7.62 to 8.37. Bothe (2013) reported the sensory score for overall acceptability of whey based mango herbal beverage in treatment T<sub>2</sub> showed higher score 8.24, while treatment T<sub>0</sub> scored minimum score 7.68.

#### Cost structure of whey based custard pulp beverage:

The data pertaining to the cost of production of whey beverage prepared by blending with different levels of custard apple pulp is presented in Table 2. It is revealed from Table 2 that cost of production of one kg whey beverage under various treatments T<sub>1</sub>, T<sub>2</sub>, T<sub>3</sub>, T<sub>4</sub> and T<sub>5</sub>, were Rs. 15.17, 21.14, 27.11, 33.08 and 39.05, respectively. Increase in the level of custard apple pulp showed the increasing trend in cost of production of whey beverage. Based on 200 ml beverage bottle, the cost of production of treatment T<sub>3</sub> was only Rs.5.42, which seems to be very cheaper as compared to different soft drinks or beverages sold in market. The results obtained are in agreement with Patel *et al.* (2007) who prepared techno-economically feasible whey based mango-herbal (Ginger) beverage with the cost Rs.5.35 for 250 ml of beverage containing 2 per cent Ginger extract. Ingale *et al.* (2009) also reported same trend for whey based custard apple beverage. Bothe (2013) also reported that the cost of production of Chhana whey orange based beverage and whey based mango herbal beverage increase with increase in level of blending of orange and lemongrass extract in the beverage. Mundphane (2016) studied that the cost of production of one kg chhana whey based watermelon beverage was increased due to increase in the rate of addition of watermelon juice.

#### Conclusion:

From the results of present investigation it is concluded that, best quality of whey based custard apple pulp beverage can be prepared by addition of 9 per cent custard apple pulp and 91 per cent whey. Whey based custard apple pulp beverage prepared by addition of custard apple pulp had significantly superior sensory scores for flavour, colour, consistency and overall acceptability. The cost of production of beverage was increased with increase in custard apple pulp percentage, which can be compensated with acceptability and higher sensory score.

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