

“Development of Whey Based Custard Apple (Annona Squamosa l.) Herbal (Mentha Arvensis) Beverage”

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Abstract- Objectives- The present study entitled as “Development of whey based custard apple herbal beverage” evaluate the use of whey and custard apple in different combinations. To study the physico-chemical properties of whey based custard apple beverage (WCAB) compared with the physico-chemical properties of whey based custard apple herbal beverage (WCAHB).

Method- Firstly, the four combinations of whey, custard apple pulp and sugar were WCAB1 (90% whey, 10% custard apple pulp and 10% sugar), WCAB2 (85% whey, 15% custard apple pulp and 10% sugar), WCAB3 (80% whey, 20% custard apple pulp and 10% sugar) and WCAB4 (75% whey, 25% custard apple pulp and 10% sugar), they were evaluated for sensorial and physico-chemical analysis. The sensorial analysis showed that WCAB2 (85% whey, 15% custard apple pulp and 10% sugar) was rate maximum and proved to be nutritious in all the physico-chemical analysis.

Similarly, herbal beverage were also developed in four combinations of whey, custard apple pulp, sugar in addition with 2% mentha extract were WCAHB1, WCAHB2, WCAHB3 and WCAHB4 respectively, their sensorial analysis showed that WCAHB1 (89% whey, 14% custard apple pulp, 2% mentha and 10% sugar) was rate maximum and proved to be nutritious in all the physico-chemical analysis.

Conclusion- According to sensory and physico-chemical analysis of whey based custard apple beverage and herbal beverage, the beverage prepared with incorporation of mentha extract scored maximum sensorial score in almost all characters. Considering results of physico-chemical analysis beverage prepared from 89% whey, 9% pulp, 2% mentha extract and 10% sugar was a good formulation.

Keywords: Whey, Custard Apple, Mentha, Herbal, Beverage.

I. INTRODUCTION

Beverage industry has made significant progress during last several years, but there is only limited range of flavour available. At present fruit beverage is generally synthetic flourished, bottled and sold in market. The beverages are not having any nutritive value. If these could be substituted with fruit juices and whey, these beverages will be more beneficial to the consumer. (Ingale et al., 2009) Whey is one of the most important byproduct obtained during manufacturing of coagulation milk products like paneer, cheese, chhana, etc. Whey is essentially milk depleted of milk fat and casein so that it is highly nutritious byproduct. Nearly 70-90 percent of minerals are present in milk pass on to the whey. Therefore, conversion of whey into fermented and non-fermented beverages is one of the most attractive avenues for utilization of whey for human consumption. (Ingale et al., 2009) Whey is a genuine thirst quencher, unlike most soft drinks. Whey drinks are light and refreshing but less acidic than fruit juices. The medicinal and nutritive value of sweet and acidic whey can be utilized with fruit juices/pulp and concentrates in developing acceptable long life beverages which appear to be the most obvious and logical avenue for utilizing the nutrients of whey into the human

food chain. The manufacture of whey-based beverages requires the mixing of appropriate fruit juices and minimally processed whey with selection of suitable stabilizers and acidulants to develop acceptable whey based fruit beverages. (Shukla et al., 2013) The pulp of custard apple is sweet with slight acidity and has pleasant flavour. The custard apple contains various vitamins i.e. vitamin C 35.9g, thiamin 0.10g, riboflavin 0.06g and niacin 0.89g. The custard apple is still not used for the preparation of whey based beverage. (Ingale et al., 2009). Custard apple pulp, when exposed to air, turns pink due to peroxidase activity and becomes bitter when heated above 55°C, which renders preservation by heat treatment inapplicable. To preserve the pulp, it is necessary to add 1% of citric acid together with 0.1% of sodium benzoate, while addition of 50–100 p.p.m. of sulphur dioxide checks the pink discolouration due to enzymic activity. (Kolekar et al., 2012) Herbal extract of *Mentha arvensis* (mint) has preventive and curative value. It is used to treat sour throat, gastric problems and other problems related to gastrointestinal tract. Whey based beverage prepared from pineapple & bottle gourd juices in combination with edible herbal medicinal plant extract of *Mentha arvensis* will not have only excellent nutritional and sensory properties but will also possess therapeutic,

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prophylactic, antibacterial and organoleptic properties. The edible herbal medicinal plant extract of mentha will not have only excellent nutritional properties but also possess therapeutic, prophylactic, antibacterial and organoleptic properties. The mentha not only modifies taste and flavour characteristics of the beverage, but it also act as natural preservative, therefore, minimizing the need of chemical or artificial preservatives. (Yadav et al., 2010)

Therefore, keeping in view of the nutritional and functional attributes of custard apple, potential of whey to be used in nutritious and health promoting beverages and efficacy of herbs like *Mentha arvensis* as flavorants and natural preservatives, the present study was undertaken with an objective to develop a value added whey based herbal beverages with following specific objectives.

II. MATERIAL AND METHODS

Present study was carried out at National Agricultural and Food Analysis & Research Institute (NAFARI), Pune. Empathies have given to develop value added whey based custard apple beverage incorporation with mentha extract having nutritional and medicinal values.

2.1 Preparation of whey

According to method described by Yadav et al. (2010), the milk obtained from Katraj Dairy, Pune was heated in stainless steel vessel to 840C. The hot milk was acidified by adding 2% citric acid followed by continuous stirring resulting in complete coagulation of milk protein (casein). The liquid (whey) was filtered using muslin cloth. The prepared whey was again heated to 850C before blending with fruit pulp.

2.2 Preparation of whey based custard apple beverage (WCAB)

The method reported by Ingale et al. (2009), with some modification was carried out to prepare whey based custard apple beverage. Commercially available custard apple pulp was used for all experiments. Fruit pulp with no added preservatives was obtained from local market of Pune. The pulp was stored at 40C prior to use. Then the pulp was brought to room temperature and pressed through sieve to extract juice. The juice was transferred into sterile flasks and heated in the water bath at 65°C for 30 minutes before blending with whey. The whey and custard apple were blended in different combination (Table 1), using a constant sugar level of 10%.

Table 1: Composition of whey based custard apple beverage

Treatments	Whey (%)	Custard apple Pulp (%)	Sugar (%)
WCAB1	90	10	10
WCAB2	85	15	10
WCAB3	80	20	10
WCAB4	75	25	10

The blends were further heated at 820C for 10 minutes by filling into presterilized glass bottles (200 ml) and corking. Pasteurization of filled bottles was done in boiling water for 30 min. and then cooled to room temperature and kept it at refrigeration temperature (70C).

2.3 Sensory evaluation of whey based custard apple beverage

The Sensory analysis was performed according to Shukla et al. (2013) by trained sensory panels using a 9 point hedonic scale for color, consistency, flavor and overall acceptability. The blend that was rated best after sensory evaluation was selected for further study.

2.4 Physico-chemical analysis of whey based custard apple beverage

The physico – chemical analysis of all the blends of whey based custard apple beverage were done for different parameters as described by Ingale et al. (2009). The physico- chemical analysis of best rated whey based custard apple herbal beverage was done for different parameters as described by Ingale et al. (2009). Total soluble solids will determined with hand refractometer and expressed as 0Brix as given by Kolekar et al. (2012), The percent of acidity will calculated in terms of citric acid for whey by titrating against 0.1N NaOH according to Kolekar et al. (2012) method. The total solid content will estimated by A.O.A.C. method, Protein content will determined by Kjeldahl method as described by Kolekar et al. (2012) for nitrogen estimation, using factor of 6.38 for conversion of nitrogen into protein, The total sugar content was determined by the method as described by Kolekar et al. (2012), Fat content was determined by A.O.A.C. method (922.06), whereas pH will measured by pH meter.

2.5 Preparation of whey based custard apple herbal beverage using mentha extract (WCAHB)

The fresh leaves of mentha were obtained from local market of Pune. The leave were washed, ground in mixer grinder and filtered using muslin cloth to obtain mentha extract. The whey based custard apple and mentha extract were blended in different combination according to Yadav et al. (2010) with few modifications and represented in Table 2, using a constant sugar level of 10%.

Table 2: Composition of whey based custard apple herbal beverage

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Treatments	Whey (%)	Custard apple Pulp (%)	Mentha extract (%)	Sugar (%)
WCAHB1	89	9	2	10
WCAHB2	84	14	2	10
WCAHB3	79	19	2	10
WCAHB4	74	24	2	10

The blends were further heated at 820C for 10 minutes by filling into presterilized glass bottles (200 ml) and corking. Pasteurization of filled bottles was done in boiling water for 30 minutes and then cooled to room temperature and kept it at refrigeration temperature (70C).

2.6 Sensory evaluation of whey based custard apple beverage

The sensory analysis was performed according to Shukla et al. (2013) by trained sensory panels using a 9 point hedonic scale for color, consistency, flavor and overall acceptability. The blend that was rated best after sensory evaluation was selected for further study.

2.7 Physico-chemical analysis of whey based custard apple herbal beverage

The physico – chemical analysis of best rated whey based custard apple herbal beverage were done for different parameters. All parameters are carried out as described above in 2.4.

2.8 Comparative analysis of whey based custard apple beverage and whey based custard apple herbal beverage

On the basis of sensory evaluation and physico-chemical analysis both whey based custard apple beverage and whey based custard apple herbal beverage were compared to determine the most nutritive and acceptable beverage among them.

III. RESULT AND DISCUSSION

The experimental findings of present study have been presented in this chapter.

3.1 Sensory evaluation of whey based custard apple beverage

The results for sensory evaluation of whey based custard apple beverage are presented in table 3 as below,

Table 3: Sensory evaluation of whey based custard apple beverage

Treatments	Colour	Consistency	Flavour	Overall Acceptability
WCAB1	7.2	7.3	7.2	7.2
WCAB2	6.8	6.5	6.7	6.7
WCAB3	6.5	6.3	6.2	6.5
WCAB4	6.3	6.1	6	6.1

The data shows that, the highest sensory evaluation observed for colour, consistency, flavour and overall acceptability for whey based custard apple beverage

prepared by using 90% whey, 10% pulp and 10% sugar (WCAB1) with the score 7.2, 7.3, 7.2 and 7.2 respectively. Somewhat similar results were reported by Ingale et al. (2009). Therefore as per sensory evaluation WCAB1 was most acceptable formulation and which was used for further analysis.

3.2 Physico-chemical analysis of whey based custard apple beverage

The physico-chemical analysis of whey based custard apple beverage was done and results are presented in table 4 as below,

Table 4 Physico-chemical analysis of whey based custard apple beverage

Sr. No.	Parameter	WCAB1	WCAB2	WCAB3	WCAB4
1.	Total soluble solids (°Brix)	11.30	11.45	11.65	11.90
2.	Acidity (%)	0.30	0.35	0.40	0.50
3.	Total solids (%)	12.70	12.80	12.95	13.05
4.	Protein (%)	0.30	0.29	0.26	0.22
5.	Total Sugar (%)	19.20	19.80	20.00	20.20
6.	Fat (%)	0.35	0.33	0.32	0.30
7.	pH	4.8	4.5	4.2	4.1

It would be seen from data that there is a gradual increase in TSS of beverage with increase in level of custard apple pulp. As the custard apple pulp increased i.e. 10, 15, 20 and 25 %, the TSS of beverage was observed from 11.30-11.90. Similar result was reported by Patil et al. (2015). There was increasing pattern observed in titrable acidity ranged from 0.30 - 0.50 %. Similar result was reported by Patil et al. (2015). There was gradual increase in total solids ranged from 12.70 - 13.05%. The total solids content increased with increase in level of custard apple pulp. The similar results were reported by Ingale et al. (2009). The protein content percentage was ranged from 0.22 – 0.30%. There was no much variation in protein content with addition of custard apple pulp, this is somewhat variant with the results reported by Patil et al. (2015) but, they are within a range of what was observed in current study. Total sugar percentage was in a range from 19.20- 20.20 % as the level of custard apple pulp increases there was rise in total sugar content. Similar results were reported by Ingale et al. (2009). There is no significant effect of custard apple pulp on fat content. Similar results were reported by Ingale et al. (2009). In case of pH as the acidity increased pH was decreased, it ranged from 4.1-4.8. Similar results were reported by Chatterjee et al. (2015).

3.3 Sensory evaluation of whey based custard apple herbal beverage

Table 5: Sensory evaluation of whey based custard apple herbal beverage

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Treatments	Colour	Consistency (Texture)	Flavour	Overall Acceptability
WCAHB1	8.3	8.2	8.0	8.1
WCAHB2	7.6	7.9	7.7	7.8
WCAHB3	7.4	7.5	7.4	7.4
WCAHB4	7.0	7.1	7.0	7.0

From above data the addition of mentha extract shows variation in colour, consistency, flavour and overall acceptability. The highest score was observed in WCAHB1 with score 8.3, 8.2, 8.0 and 8.1 for colour, consistency, flavour and overall acceptability respectively. This is agreement with Baljeet et al. (2013). Therefore, WCAHB1 (89% whey, 9% pulp, 2% mentha extract and 10% sugar) was most acceptable beverage and was used for further study.

3.4 Physico-chemical analysis whey based custard apple herbal beverage

The physico-chemical analysis of whey based custard apple herbal beverage was done and results are presented in table 6 as below,

Table 6: Physico-chemical analysis of whey based custard apple herbal beverage

Sr. No.	Parameter	WCAHB1	WCAHB2	WCAHB3	WCAHB4
1.	Total soluble solids (°Brix)	13.90	13.75	13.63	13.50
2.	Acidity (%)	0.35	0.37	0.40	0.50
3.	Total solids (%)	13.75	13.90	13.95	14.05
4.	Protein (%)	0.31	0.29	0.27	0.23
5.	Total Sugar (%)	19.15	19.75	19.90	19.98
6.	Fat (%)	0.34	0.31	0.30	0.28
7.	pH	5.02	5.01	4.95	4.9

From above data it can be observed that there is no much variation in total soluble solids ranged from 13.50 – 13.90 Brix. Slight increase in acidity was observed by addition of mentha extract this increase might be due to polyphenols present in mentha extract. Progressively increase in range of total solids was observed ranged from 14.05% – 13.75%. No significant change was observed in case of protein percentage. There was decreasing pattern of total sugar was observed ranging from 19.98% – 19.15% it might be due to effect of mentha extract concentration. No significant change was observed in fat percentage. pH was decreased due to increase in acidity.

3.5 Comparative analysis of whey based custard apple beverage and whey based custard apple herbal beverage

According to sensory and physico-chemical analysis of whey based custard apple beverage and whey based custard

apple herbal beverage. The beverage prepared with incorporation of mentha extract scored maximum sensorial score in almost all characters. Considering results of physico-chemical analysis beverage prepared from 89% whey, 9% pulp, 2% mentha extract and 10% sugar is a good formulation.

IV. CONCLUSION

Primary aim of the study was to develop the whey based custard apple beverage and whey based custard apple herbal beverage and evaluate their physico-chemical and sensorial attributes. The sensorial and physico chemical analysis showed that whey based custard apple beverage with incorporation of 85% whey, 15% custard apple pulp and 10% sugar was most acceptable formulation. Similarly the sensorial and physico-chemical analysis showed that whey based custard apple herbal beverage with incorporation of 84% whey, 14% custard apple pulp, 2% mentha and 10% sugar was most acceptable formulation. And as both beverages were compared with each other, according to sensory and physico-chemical analysis of whey based custard apple beverage and whey based custard apple herbal beverage, the beverage prepared with incorporation of mentha extract scored maximum sensorial score in almost all characters. Considering results of physico-chemical analysis beverage prepared from 89% whey, 9% pulp, 2% mentha extract and 10% sugar was a good formulation.

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