



Functional Food Product Development and Quality Analysis of Whey Based Fruit Herbal Beverage

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Article History	Abstract
Received: 06 June 2023 Revised: 05 Sept 2023 Accepted: 15 Nov 2023	<p>This study focuses on development of herbal fruit beverage based on whey. Whey was mixed with pineapple juices along with mentha flavor in the ratio 8:2:1. This study evaluated the physicochemical, sensory and microbial analysis of the developed product periodically till a period of 20 days. The analyzed physico-chemical parameters in the product reported a decline from 0.02 to 2% as the storage period increased. 0.18% of fat reduced to 0.16% during the study period. Protein content reduced up to 0.13%. Lactose content was reduced to 0.2% at the end of 20 days. Sensory evaluation had a high reading of 8.32 for taste and a least value of 6.64. The hedonic scale reading drastically decreased after ten days of storage. Whey based pineapple beverage can serve as a best alternative functional food in the present-day scenario.</p>
CC License CC-BY-NC-SA 4.0	Keywords: Whey-Fruit- Herbal- Beverage

1. Introduction

Whey is the watery part of milk that remains after separation of curd / coagulated products that result from acid or proteolytic enzyme mediated coagulation of milk. It is major by-product of dairy industry and is considered to be reliable source of number of high quality and biological active proteins, carbohydrates and minerals. The current world production of whey is estimated at about 165 million tones. in which about 68 per cent is produced in European countries and 24 per cent in north America. Whey is a good source of protein, minerals, and lactose. Although the whey that is sloughed out is 90% water and only 0.6% of it is actually protein, processes such as ultra filtration and ultracentrifugation convert whole liquid whey to whey concentrate, which is about 90% protein (Huffman 1996). Incorporation of fruit with whey combines the nutrients from both whey and fruit for a dietetically valuable, thirst-quenching beverage that has a balanced mineral content and a high level of calcium. The inclusion of fruit extracts in a beverage would possibly increase healthful benefits. (Nordin 2000). The manufacture of whey-based beverage 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 (Singh *et al.*,2005).

Krishanaveni *et al.*, (2001) prepared a RTS beverage from two varieties of jackfruit and packed it in colored (green) and colorless bottles and stored at room temperature to study the storage stability months at room temperature. Chakraborty *et al.* (1991) reported that there was not any change in TSS of canned mango nectar stored at temperature 23-28°C for 4 months. (Sethi 1992). Gagrani *et al.*, (1987) developed a fruit-flavored whey beverage with 0.5 per cent acidity and 20 brix using mango, orange, pineapple and guava juices at 10, 15, 20 and 25 per cent of whey. Highest sensory scores were obtained for the products containing 10 per cent orange juice, 15 per cent pineapple juice, 15 per cent mango juice and 25 per cent guava juice. Among these, mango flavoured whey beverage received maximum score for color, sedimentation, turbidity and viscosity. Yalcin *et al.*, (1994) observed that in

chhana whey beverage, increased concentration of mango juice (due to colour) into the drink increased its acceptability. Shukla *et al.*, (2000) developed a ready to serve beverage from whey by the addition of 10 per cent sugar and 30 per cent litchi juice. Suresha and Jayaprakasha (2003) reported that whey blended with orange juice in the ratio of 70:30 (whey: orange juice) was more acceptable by the panel compared to other combinations and he also concluded that out of three juices i.e., mango, orange and pineapple juice, the pineapple juice blended sample was highly acceptable by the panel of judges. Djuric *et al.*, (2004) studied the effect of quality of whey fruit juice (orange, pear, peach and apple) and they concluded that peach. Whey beverage containing 6 per cent of dry matter and 2 per cent of sucrose as well as having pH 3.6 was best. The formulated whey drink not have only excellent nutritional properties but will also possess therapeutic, antibacterial and organoleptic properties.

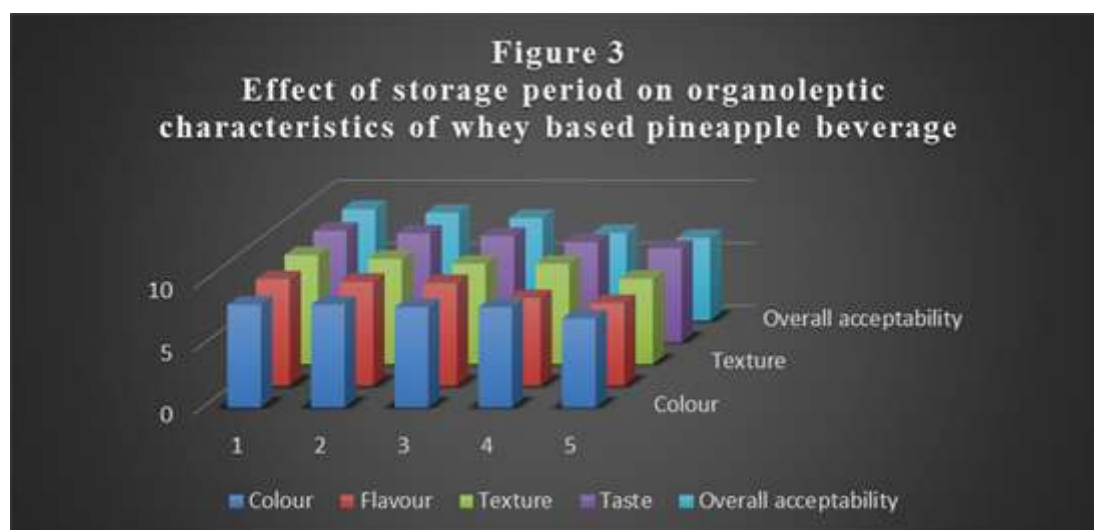
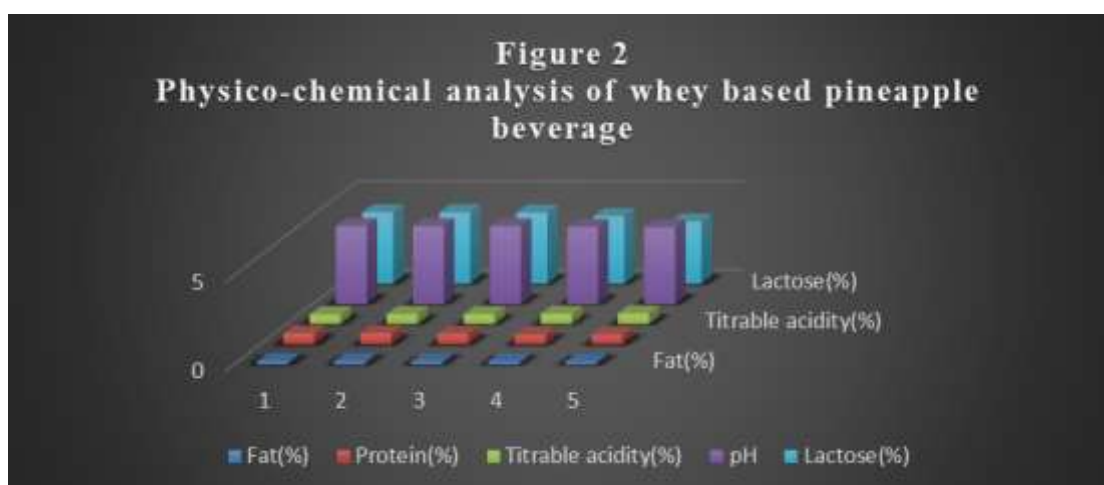
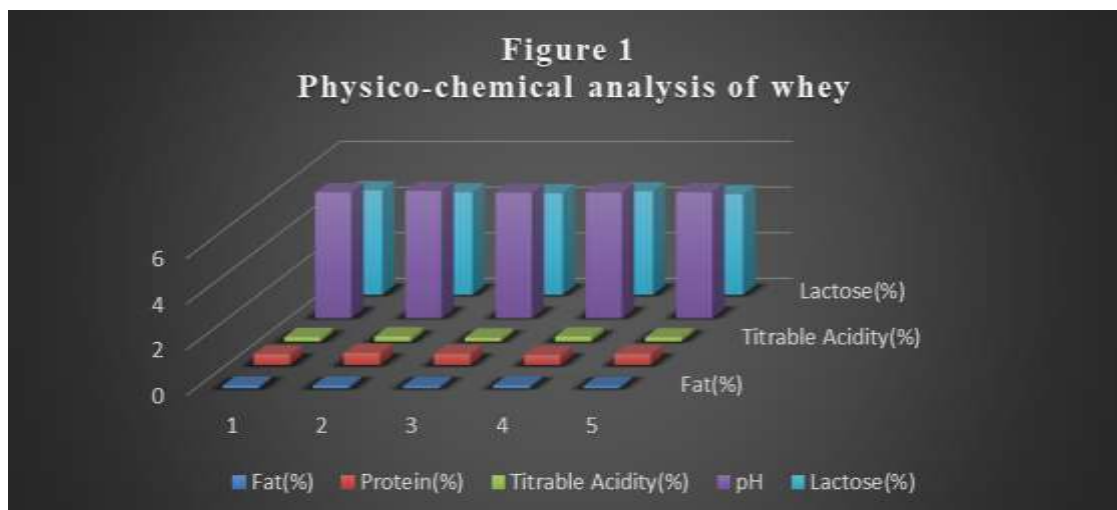
2. Materials And Methods

This study has been conducted during December 2016- March 2017 in the Microbiology laboratory, Department of Rural Development Science, Arul Anandar College, Karumathur, Madurai-625514. The required raw materials namely cow's milk, fruits and mentha leaves were purchased from dairy farm and market at Theni respectively. The prepared and in-bottle sterilized beverages were kept under refrigerated condition for twenty days, during which these were analyzed for evaluation of their keeping quality on the basis of physico chemical, sensory properties. The milk whey was prepared following the procedure suggested by De (2001) with slight modification in the temperature according to local conditions. The pineapple juice was extracted by the juicer and filtered as per mentioned (Sharma *et al.*, 2010). The extract of *Mentha arvensis* was as suggested by Tsen and King (2002). The method described by Sirohi *et al.*, (2005) was followed in the preparation of whey fruit beverages. The proportion of fruit juices, *M. arvensis* extract and milk whey was 20ml, 2 drops and 80ml respectively. The ground sugar powder was added at the rate of 8 gram per 100 ml. In each lot about 500ml of beverage was prepared and the experiment was replicated five times. The prepared beverages were filtered and filled into glass bottles (200 ml) and sealed by crown corking. Then, the bottles were sterilized at 121°C for 10 min followed by cooling at room temperature.

Physico chemical properties were estimated using methods as prescribed by Ranganna (2002). Sensory evaluation was done for fresh as well as stored beverages using 9 – point standard hedonic scale by a panel of judges. The microbial quality was analyzed using methods as prescribed by Shukla *et al.*, (2013). The fat content in the whey sample and whey-based pineapple beverage sample was determined by Gerber method as per manual in dairy chemistry (1982 reprint) N.D.R.I. The protein content was determined by formal titration (pyne's method) as per Manual in the Dairy Chemistry (1982) N.D.R.I. The content of lactose in the whey based fruit beverage was determined at the specified intervals by method described by Ranganna (2002). pH of the whey-based fruit beverages was determined using a digital pH meter. Titratable acidity of the whey fruit beverage was determined according to IS:1949, Part I (1960). Sensory evaluation of whey beverage was done by a panel of three judges following 5 Hedonic ratings (Luckow *et al.*, 2006).

3. Results and Discussion

Analysis of the physico-chemical parameters of whey water revealed that the fat percentage was between 0.10-0.13 in the five different milk samples (Figure 1). The range of protein was found between 0.43 – 0.52%. With reference to sugar (lactose) content the range was found between 4.40 – 4.57. The range for pH was reported between 5.49 -5.57 (Figure 1). Among the selected five milk samples, one (Sample1) was selected for the study based on the clearness of the whey water. Figure 2 depicts the analytical data of the physico- chemical parameters of the whey-based pineapple beverage. There was a reduction in fat percentage (0.18% to 0.16%) during the storage period. Higher reduction was reported for lactose (4.02% to 3.50%). The reduction of pH of the beverage was not significant when compared to lactose. Similar trend was observed in protein content. The interaction effect of acidity and storage period was significant ($p < 0.05$). The increase in acidity with storage period was recorded in whey pineapple beverage. The increase in acidity was due to conversion of lactose to lactic acid and formation of organic acid by ascorbic acid present in banana juice. The increase might also have been attributed to polyphenols present in mentha extract and their degradation. The conversion of proteins into amino acids during storage is also possible. The results are in agreement with the findings reported by Sikder *et al.*, (2001). The sensory characteristics of the prepared beverages were analyzed and it is inferred that overall acceptability reduces as the storage period extended.



4. Conclusion

The sensory parameters recorded a high hedonic scale of 8 and above on 0 day and 1.1 hedonic scale reduction was recorded for pineapple beverage on 20th day (Figure 3). The interaction effect of acidity and storage period was significant ($p < 0.05$). The increase in acidity with storage period was recorded in whey pineapple beverage. The increase in acidity was due to conversion of lactose to lactic acid and formation of organic acid by ascorbic acid present in banana juice. The increase might also have been attributed to polyphenols present in menthe extract and their degradation. The conversion of proteins into amino acids during storage is also possible. The results are in agreement with the findings reported by Soliman *et al.*, (1995) and Sikder *et al.*, (2001). After formulation of beverage, acidity, pH and TSS values did not change appreciably and no sensory changes were found during the first 15 days of storage but after those changes in samples during storage was observed. Whey is a nutritious by product from

cheese, chhana and paneer industry containing valuable nutrients like lactose, proteins, minerals and vitamins, thus the researchers conclude that whey drink is a byproduct utilization of milk industry.

References:

1. Chakraborty, S., Bisht, H.C., Agrawal, M.D., Verma, L.N., Shukla, I.C., Madaih, N.Krishnaprakash, M.S. and Najundawwamy, A.M. (1991).Studies on the varietal screening of mangoes of Uttar Pradesh for their suitability for production of canned nectar, juice and pulp.Ind. Fd. Packer., 45(5): 49-56.
2. Đurić, M., Carić, M., Milanović, S., Tekić, M., Panić, M. (2004): Development of whey based beverages, European Food Research and Technology, 219, 321-328.
3. Gagrani, R.L., Rathi ,S.D. and Ingle, U.M. (1987). Preparation of fruit flavored beverage from whey. J. Food Sci. Technol., 24, March- April.
4. Huffman, LM. 1996. Processing whey protein for use as a food ingredient. Food Tech.50:49-52.
5. Kalra, S.K. and Tandon, O.K., Gargh, N. and Singh, B.P. (1991). Quality evaluation of some market drinks.Ind.F d.packer.,45(3) :40-53
6. Krishnaveni, A., Manimegalai G. and Saravanakumar, R. (2001).Storage stability of jack fruit (*Artocarpus heterophyllus*) RTS beverage.J. Food Sci. Technol., 38(6): 601-602
7. Nordin, BEC. (2000.) Calcium requirement is a sliding scale. Am. J. Clin. Nutr. 71(6):1381-3.
8. Pandey, A.K. and Singh, D.P. (2002).Shelf-life of carbonated soft beverage from Chhana whey. Parekh, J.V. (2006). Emerging new technologies in the dairy industry in India.
9. Ranganna, S. (2002).Handbook of Analysis and quality control for fruit and vegetable products. Tata Mc. Graw Hill Publication, New Delhi.
10. Sethi, V. (1992). Preparation and storage study of lime ginger cocktail at room temperature. Bev. Food World, 15:51-52.
11. Sharma, H. P., Singh, S. K. and Sharma, R. (2010).Development of Mixed fruit Squash of Pineapple and Pomegranate.Beverage & Food World.37(4):55-56.
12. Shukla. M , Yogesh Kumar Jha and Shemelis Admassu 2013. Development of probiotic beverage from whey and pineapple juice.J.Food Process Technol.4:2.1-4
13. Sikder, B., K. Sarkar, P.R. Ray and P.K. Ghatak, 2001.Studies on shelf life of whey-based mango beverages. Beverage Food World, 28: 53-54.
14. Singh S, Singh AK, Patil GR (2005) Whey utilization for health beverage.Indian Food Industry 21: 38-41.
15. Sirohi, D., Patel S., Choudhary P.L. and Sahu C. (2005). Studies on preparation and storage of whey based mango herbal Pudina(*Menthaarvensis*) beverages. J.FoodSci.Technol., 42 (2):157
16. Soliman, M.A. Emava, E.A. and Okasha, A.E. (1995). Studies on the browninginhibitorsin Banana butter-milk and whey beverages. Egy. J. Dairy Sci., 23:11-19
17. Soliman, M.A. Emava, E.A. and Okasha, A.E. (1995). Studies on the browninginhibitorsin Banana butter-milk and whey beverages. Egy. J. Dairy Sci., 23:11-19.
18. Suresha, K.B. and Jayaprakasha, H.M. (2003). Utilization of ultrafiltration whey permeates for preparation of beverage. Indian J.Dairy Sci., 56(5): 278-284.
19. Tsen, J.H. and King, V.A.E. (2002).Density of banana puree as a function of solublsolids concentration and temperature. Journal of Food Engineering, 55: 305-308.
20. Yalcin, S., Wadem V.N., Hassan and Md, N. (1994).Utilization of chhana whey for the manufacture of soft drinks. J Food 19:351-355.