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Sensory quality of drumstick (*Moringa oleifera* L.) whey beverage

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Abstract

On the basis of sensory evaluation the process for preparation of drumstick whey beverage was standardized. Firstly pre experimental trials were conducted. The slandered method was used for sensory evaluation. The experimental treatments prepared without drumstick pod powder as control (T₀), incorporation of 0.5 per cent drumstick pod powder (T₁), 1 per cent drumstick pod powder (T₂) and 1.5 per cent drumstick pod powder in the whey beverage (T₃), and 8 per cent sugar was kept constant for all treatments. The mean sensory score for colour and appearance, consistency, flavour and overall acceptability ranged from 7.2 to 8.1, 7.4 to 7.9, 7.5 to 8.2 and 7.4 to 8.2 on day 0, respectively for the treatments T₀, T₁, T₂ and T₃.

Keywords: Whey, beverage, Drumstick pod powder, RTS, Sensory quality.

Introduction

Whey drinks can stabilize the osmolar system in the body and have a thirst quenching effect. Whey proteins also have special reference to biological activities such as appetite suppression, antioxidant activity, anticarcinogenic activities, and therapeutic value (Bajaj and Sangwan, 2002) ^[1]. Whey contains approximately half of the total solids of the original milk (Gupta, 2000) ^[6]. 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 base for the preparation of beverage like products. *Cheese* whey contains about 20 per cent of total milk protein (Khamrui and Rajorhia, 1998) ^[10]. The whey is an excellent source of high quality proteins, minerals and easily digestible carbohydrates.

Increased awareness in health issues leads to increase the consumption of fruit juices and other natural products as an alternate to the traditional caffeine containing beverages such as tea, coffee or other soft drinks. Accompanying the increase in quantity of consumption, there has been a parallel increase in the variety of fruit juices and beverages offered for sale in the market (Gagrani *et al.*, 1987) ^[5]. Soft beverage industry has made significant progress during the last two decades in terms of rise in production and consumption; however, there is a limited range of fruit juice based RTS beverages available in the Indian market. Many types of syrups and soft drinks containing artificial fruit flavors are well known throughout the world. The basic factor considered is the nutritive and therapeutic values, which make them popular and acceptable. At present fruit beverages are generally synthetic flavored, bottled and sold in the market. If this could be substituted with natural fruit pulp, dairy whey, it will be more beneficial to the consumer, dairy industries and beverage manufacturers as well as fruit growers (Sakhale *et al.*, 2012) ^[11].

Moringa oleifera (Drumstick) is called miracle vegetable and is valued as medicinal and functional food. *Moringa* is an underutilized vegetable crop in India and almost all parts of the tree are edible. In literature, moringa is often called the Power house of minerals and Mother's best friend. Traditionally, besides being a daily used vegetable, it is also widely known for its health benefits. *Moringa* provides a rich and rare combination of nutrients, amino acids, antioxidants, anti aging and anti-inflammatory properties for nutrition and healing. Since 1998, the World Health Organization has promoted moringa as an alternative to imported food supplies to treat malnutrition (Johnson 2005) ^[8].

Materials and Methods

Whey beverage sample were prepared as per the procedure described by Bhavsagar *et al.* (2010) [2] with slight modifications. The samples of Whey beverage under preliminary and experimental trials were subjected to the sensory evaluation by adopting 9 point hedonic scale as per IS: 6273 part I and part II (1971). A panel of 5 semi 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.

Preliminary trials

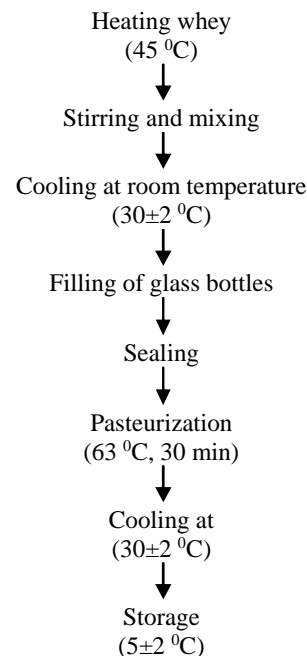
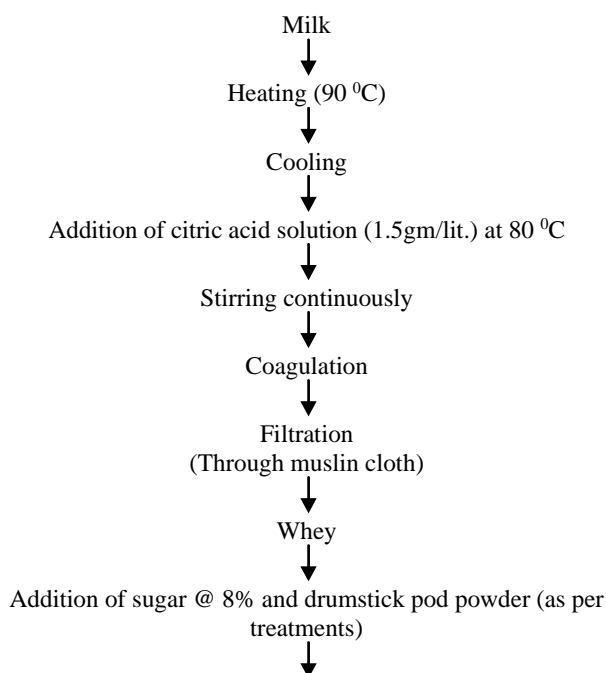
Whey beverage sample were prepared as per the procedure described by Bhavsagar *et al.* (2010) [2] with little modifications. Initially, preliminary trials were conducted to finalize the levels of drumstick pod powder in the whey beverage. Following levels of drumstick pod powder were tried.

- M₀ : Control (without drumstick pod powder) + 8% sugar
 M₁ : 0.5% Drumstick pod powder (w/v) of whey + 8% sugar
 M₂ : 1.0% Drumstick pod powder (w/v) of whey + 8% sugar
 M₃ : 1.5% Drumstick pod powder (w/v) of whey + 8% sugar
 M₄ : 2.0% Drumstick pod powder (w/v) of whey + 8% sugar
 M₅ : 2.5% Drumstick pod powder (w/v) of whey + 8% sugar
 M₆ : 3.0% Drumstick pod powder (w/v) of whey + 8% sugar

Table 1: Sensory evaluation of whey beverage prepared by addition of drumstick pod powder

Sensory quality	Colour and appearance	Consistency	Flavour	Overall acceptability
Treatments				
M₀ (0.0%)	8.0 ^a	8.5 ^a	7.9 ^b	7.4 ^c
M₁ (0.5%)	7.8 ^b	8.0 ^b	8.3 ^a	7.6 ^b
M₂ (1.0%)	7.8 ^b	7.8 ^b	8.3 ^a	8.0 ^a
M₃ (1.5%)	7.7 ^b	7.5 ^c	8.1 ^a	7.3 ^c
M₄ (2.0%)	7.0 ^c	7.4 ^c	7.7 ^b	6.9 ^d
M₅ (2.5%)	6.4 ^d	7.1 ^d	7.1 ^c	6.8 ^d
M₆ (3.0%)	6.3 ^c	6.9 ^d	6.7 ^d	6.4 ^c
S.E. ±	0.04	0.09	0.06	0.05
CD at 5%	0.14	0.29	0.19	0.17

(Sensory score out of 9)



Flow chart for preparation of whey beverage

On the basis of results of preliminary trials three levels i.e. 0.5, 1.0 and 1.5 per cent of moringa pod powder were chose for experimental trials. Control sample prepared from *channa* whey without drumstick pod powder.

Experimental Treatment details

- T₀ : Control (without drumstick pod powder) + 8% sugar
 T₁ : 0.5% Drumstick pod powder (w/v) of whey + 8% sugar
 T₂ : 1.0% Drumstick pod powder (w/v) of whey + 8% sugar
 T₃ : 1.5% Drumstick pod powder (w/v) of whey + 8% sugar

Sensory Evaluation

The samples of Whey beverage under experimental trials were subjected to the sensory evaluation by adopting 9 point hedonic scale as per IS: 6273 part I and part II (1971). Sensory evaluation was carried out with 5 semi trained judges. The samples were coded every time to conceal their identity and were offered to the judges for evaluation of the quality attributes.

Statistical Analysis

Experiment was laid out in Completely Randomized Design (CRD) with 3 replications for preliminary trials and 5 replications for experimental trials. The data was tabulated and analyzed according to Snedecor and Cochran (1994) [14].

Result and Discussion

Colour and appearance

The results for colour and appearance presented in the Table 2. The mean colour and appearance score for the treatments T₀, T₁, T₂ and T₃ were 7.5, 8.1, 7.7 and 7.2, respectively. It was 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 drumstick pod powder in the whey beverage influenced the colour and appearance of the product. It become more dense with increased levels of drumstick powder which adversely affected sensory score. All the treatments differed significantly among themselves. The treatment T₁ had 8.1 colour and appearance score which was

superior among other treatments in term of its colour and appearance under study. Whereas treatment T₃ (7.2) had the lowest but sensorily acceptable sensory score.

Table 2: Sensory quality of fresh Drumstick Whey Beverage (DWB).

Treatments	Sensory quality			
	Colour and appearance	Consistency	Flavour	Overall acceptability
T ₀ (0.0%)	7.5 ^c	7.9 ^a	7.5 ^c	7.5 ^c
T ₁ (0.5%)	8.1 ^a	7.9 ^a	7.8 ^b	7.9 ^b
T ₂ (1.0%)	7.7 ^b	7.6 ^b	8.2 ^a	8.2 ^a
T ₃ (1.5%)	7.2 ^d	7.4 ^c	7.5 ^c	7.4 ^c
S.E. ±	0.03	0.04	0.03	0.06
CD at 5%	0.11	0.14	0.09	0.19

(Sensory score out of 9)

Bhavsagar *et al.* (2010) [2] prepared fruit beverage from *chhana* whey by adding 5, 10 and 15 per cent pineapple juice and recorded the average colour and appearance score as 7.64. Singh *et al.* (2014) [13] worked on whey guava beverage and noted the sensory score for colour as 6.02 to 7.82 in the different blends studied. Kumar and Peter (2015) [19] 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). Devi *et al.*, (2017) [4] development, chemical analysis and sensory evaluation of whey based pineapple juice beverages and reported the colour and appearance was obtained in the treatment T₃O₃ (8.66) and the lowest average value of colour and appearance was obtained in the treatment T₂O₁ (6.33).

Consistency

The mean consistency score for the whey beverage samples were 7.9, 7.9, 7.6 and 7.4, respectively (Table 2.) The consistency of the whey beverage significantly ($P < 0.05$) differed due to addition of drumstick pod powder in whey beverage samples. The treatment T₀ and T₁ had highest consistency score where as the treatment T₃ had lowest consistency score. It indicated that the whey beverage become more thick with increased level of drumstick pod powder. The treatment T₀ and T₁ were at par with each other.

Devi *et al.* (2017) [4] studied the develop, chemical analysis and sensory evaluation of whey based pineapple juice beverages and reported the highest average value of consistency was obtained in the treatment T₃O₃ (8.00) and the lowest average value of consistency in the treatment T₁O₁ (5.00). Dande *et al.* (2018) [3] studied on overall acceptability of whey beverage by using different levels of grape juice and reported that body and texture score in treatments T₁, T₂, T₃ and T₀ were 8.50, 8.25, 7.50 and 6.88, respectively. Satpute *et al.* (2018) [12] studied on preparation of herbal whey based beverage using menthol and reported consistency of herbal whey beverage in treatments T₁, T₂, T₃ and T₄ was 8.0, 8.35, 8.40 and 8.60, respectively.

Flavour

The flavour score for whey beverage in present study for different treatments were 7.5 (T₀), 7.8 (T₁), 8.2 (T₂) and 7.5 (T₃), respectively (Table 2). The flavour of drumstick whey beverage significantly ($P < 0.05$) influenced due to addition of drumstick pod powder in the product. All the treatments significantly differed among themselves. The treatment T₂ had highest score 8.2 as compare to rest of the treatments. The treatment T₀ and T₃ had lowest score 7.5 the treatments T₀ and

T₃ were at par with each other. The flavour score of the product increased up to 1% level of drumstick pod powder in the whey. Afterword the flavour score declined. It might be due to the total phenolic and flavonoid compounds of drumstick pod powder.

Devi *et al.* (2017) [4] studied the development, chemical analysis and sensory evaluation of whey based pineapple juice beverages and reported the highest average value of flavour and test was obtained in the treatments T₃O₃ (8.00) and the lowest average value T₁O₁ (5.66) and T₂O₁ (5.66). Dande *et al.* (2018) [3] studied on overall acceptability of whey beverage by using different levels of grape juice and reported that flavour score of whey beverage in the treatments T₁, T₂, T₃ and T₄ was 8.62, 8.50, 7.50 and 6.75, respectively. 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. Satpute *et al.* (2018) [12] studied on preparation of herbal whey based beverage using menthol and reported scores for flavour of herbal whey beverage in treatments T₁, T₂, T₃ and T₄ was 8.10, 8.40, 8.50 and 8.60, respectively.

Overall acceptability

The overall acceptability of any food product depends on mainly sensory attributes i.e. colour and appearance, body and texture, consistency, flavour and taste of particular product. The overall acceptability score for whey beverage sample was 7.5 (T₀), 7.9 (T₁), 8.2 (T₂) and 7.4 (T₃), respectively (Table 2). The overall acceptability of whey beverage sample was significantly ($P < 0.05$) influenced due to incorporation of drumstick pod powder in the product. The treatment T₂ (8.2) had highest overall acceptability score followed by T₁ (7.9), T₀ (7.5) and T₃ (7.4), respectively. All the treatments significantly differed among themselves.

Devi *et al.* (2017) [4] studied the development, chemical analysis and sensory evaluation of whey based pineapple juice beverages and reported the highest average value of overall acceptability was obtained in the treatments T₃O₃ (8.66) and the lowest average value T₁O₁ (6.00) Dande *et al.* (2018) [3] studied on overall acceptability of whey beverage by using different levels of grape fruit juice and reported overall acceptability score of whey beverage in the treatments T₁, T₂, T₃ and T₄ was 8.62, 8.33, 7.58 and 6.96, respectively. Bhavsagar *et al.* (2010) [2] reported the overall acceptability score for different blends of pineapple flavoured *chana* whey beverage as 7.7 to 7.9.

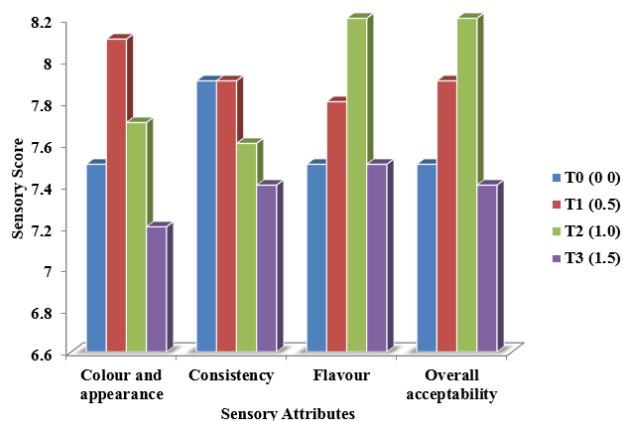


Fig 1: Sensory quality of fresh Drumstick whey beverage

Conclusion

The most acceptable whey beverage can be prepared by using 1.0 per cent drumstick pod powder and 8.0 per cent sugar. The prepared whey beverage from 1.0 per cent drumstick pod powder had 7.7 colour and appearance score, consistency 7.6, flavour score 8.2 and overall acceptability score 8.2.

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