

Original Research Article

Studies on Sensory/Organoleptic Properties of Beetroot Whey Beverage

R. D. Kamate* and P. V. Padghan

Department of Animal Husbandry and Dairy Science, College of Agriculture, Latur, Vasantrya Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra, India

*Corresponding author

ABSTRACT

In present study beetroot whey beverage was prepared by using beetroot extract at different levels i.e. 15%, 20% and 25%. It was observed that the overall acceptability score for treatment T₀, T₁, T₂ and T₃ was 7.90, 8.33, 8.51 and 8.37, respectively. It may therefore, be concluded that the using of 20 per cent beetroot extract in 80 per cent *paneer* whey for preparation of beetroot whey beverage is acceptable, comparatively cheaper and adaptable as far as processing technology is concerned.

Keywords

Paneer whey,
beetroot extract

Introduction

Whey is the valuable by-product obtained during the manufacture of cheese, *paneer*, *chhana*, casein and *shrikhand* in dairy industries. Studies revealed that whey contains 45-50 per cent of total milk solids, 70 per cent of milk sugars, and 20 per cent of milk proteins, 70-90 per cent of milk minerals and almost all water soluble vitamins present in milk. By realizing the functional properties of whey, many industries targets upon utilizing whey as the functional food ingredient. Whey protein concentrates, whey protein isolates and whey powder are prepared and widely marketed all over the world but all these process incurs sophisticated equipment and techniques like concentration, isolation and drying by using vacuum/freeze drying, high pressure techniques, filtration through different membrane, ultracentrifugation, ultrafiltration, diafiltration, nano filtration

and reverse osmosis, etc. Hence the conversion of whey into beverage is one of the most attractive avenues for utilizing whey for human consumption (Goyal and Gandhi, 2009). Many scientist developed different bio functional food drink by using whey ingredients like pomegranate juice for the preparation of *chakka* whey beverage (Babar *et al.*, 2008), development and storage studies on whey-based banana herbal (*Mentha arvensis*) beverage. (Yadav *et al.*, 2010).

Beetroot (*Beta vulgaris*) is botanically classified as an herbaceous biennial from *Chenopodiaceae* family and has several varieties with bulb colours ranging from yellow to red. Deep red-coloured beetroots are the most popular for human consumption, both cooked and raw as salad or juice. There is growing interest in the use

of natural food colours, because synthetic dyes are becoming more and more critically assessed by the consumer. But in food processing, as compared with anthocyanin and carotenoids, betalains are less commonly used, although these water-soluble pigments are stable between pH 3 and 7. To improve the red colour of tomato pastes, sauces, soups, desserts, jams, jellies, ice creams, sweets and breakfast cereals, fresh beet/beet powder or extracted pigments are used. It also contributes to consumer's health and wellbeing because it is known to have antioxidants because of the presence of nitrogen pigments called betalains, mainly comprise of red-violet-coloured betacyanins (betanin, isobetanin, probetanin and neobetanin) and yellow-orange-coloured betaxanthins (Singh & Hathan 2014).

Many attempts have been done on utilization of whey in the formulation of various dairy products but, still there is a lot of scope to explore the possibilities for its utilization in beverage industries. Now a day's Indian dairy industries looking for new product ideas and technologies to meet the consumer's requirement and to increase the profitability of the products. Product diversification is quite feasible using whey as water replacer without much change in the composition. In order to make the use of whey, present study is contemplated by supplementing with beetroot. The beetroot increase the deliciousness of the product and provides preventive and curative properties to the product along with its extended shelf-life.

This developed functional cold drinks/beverage hope to find alternative for different cold drinks used in market today like thumps-up, different coca drinks etc. which having hazardous effect on health. (Das and Rajput, 2013).

Materials and Methods

Materials

The following materials were used for the present investigation.

***Paneer* whey**

The *paneer* was in laboratory of department of Animal Husbandry and Dairy Science from standardized buffalo milk having 6 per cent fat and 9 per cent SNF purchased from Natural milk Pvt. Ltd. The whey obtained was used to develop the beverage.

Collection of beetroot

Fresh beetroots (Variety, Rubi-3 hybrid) were purchased from local market of Latur city.

Treatment combinations

For preparation of *paneer* whey as a nutritional beverage by using beetroot extract the treatment combination were as follows.

T₀ - 100 parts *paneer* whey beverage from buffalo milk

T₁ - 85 parts *paneer* whey + 15 parts of beetroot extract

T₂ - 80 parts *paneer* whey + 20 parts beetroot extract

T₃ - 75 parts *paneer* whey + 25 parts beetroot extract

(7 per cent cane sugar maintained in all treatments)

The different levels were tried and compared with control (T₀).

Sensory properties

Sensory evaluation of beetroot whey beverage will be done by semi expert panel of judge by 9 point hedonic scale. The sensory properties such as colour and appearance, flavor, taste, consistency and overall acceptability will be studied.

Statistical analysis

The data obtained will be analyzed statistically by using completely randomized design (CRD) as per Panse & Sukhatme (1985)

Results and Discussion

Colour and appearance character of beetroot whey beverage

The score secured by beetroot whey beverage in terms of colour and appearance. The critical difference (CD) was calculated and treatment differences were tested at 5% level of significance. It was observed that, the mean score of beverage in treatments T₀, T₁, T₂ and T₃ were 8.00, 8.50, 8.20 and 8.10, respectively. The treatment T₁ was significantly superior over treatments T₀, T₂ and T₃. The treatments T₂ and T₃ were at par with each other. It may be concluded that, 15 per cent beetroot extract adding to the whey beverage was preferred by the judges, as far as colour and appearance character was concerned. It was observed in treatment T₂ and T₃ in which 20 and 25 per cent beetroot extract was mixed that the intensity and sedimentation was found more as compared to T₁.

Babar *et al.*, (2008) studied the utilization of pomegranate juice for the preparation of *chakka* whey beverage (CWB). In the preparation of beverages the volume of pomegranate juice 0 (T₁), 10 (T₂), 15 (T₃)

and 20 (T₄) per cent with 10 per cent sugar was mixed in *chakka* whey. They reported the average sensory score of *chakka* whey beverage for colour were 8.71, 8.62, 8.82 and 8.35 for treatment T₁, T₂, T₃ and T₄, respectively.

Bhavsagar *et al.*, (2010) studied the manufacture of pineapple flavoured beverage from *chhana* whey. This beverage was prepared with the addition of 5, 10 and 15 per cent of pineapple pulp in *chhana* whey. They reported that the average score of pineapple flavoured beverage for colour were 7.5, 7.6, 7.7 and 7.7 for treatment T₀, T₁, T₃ and T₄, respectively.

The results recorded in the present investigation for colour were comparable with the findings of above mentioned research workers.

Flavour character of beetroot whey beverage

It was observed that the mean scores for flavour of beverage for treatment T₀, T₁, T₂ and T₃ were 7.60, 8.25, 8.50 and 8.00, respectively. All three trial treatments were scored high point than control. It indicates that beetroot provide immense flavour to drink which was not observed in control sample. The treatment T₂ was significantly superior over all the treatment. It clearly indicated that the adding of beetroot extract @ 20 per cent in preparing beetroot whey beverage was preferred in respect of flavour by the panel of judges.

The results recorded in the present investigation for flavour were comparable with the findings of Bhavsagar *et al.*, (2010) studied the manufacture of pineapple flavoured beverage from *chhana* whey. This beverage was prepared with the addition of 5, 10 and 15 per cent of pineapple pulp in

chhana whey. They reported that the average score of pineapple flavoured beverage for flavour were 7.7, 7.6, 8.0 and 7.3 for treatment T₀, T₁, T₃ and T₄, respectively.

Landge *et al.*, (2013) studied on preparation and sensory evaluation of whey beverage. Three level of sugar combinations were used for the standardization of whey beverage i.e. S (10 per cent), S1 (12 per cent) and S2 (14 per cent). Mean score for flavour ranged from 6.50 to 7.83.

Consistency character of beetroot whey beverage

The average sensory score for consistency of beetroot whey beverage in treatment T₀, T₁, T₂ and T₃ was 8.00, 8.45, 8.60 and 8.75, respectively. It was observed that, Treatment T₃ was significantly superior over T₀, T₁ and T₂.

All the beetroot extract mixed treatment was shown good consistency than control, higher in T₃ (8.75) and lower in T₀ (8.00).

The above observation clearly indicates that, the highest liking was towards T₃. In fresh drink treatment T₃ secured high score but in storage the layer was form in T₃ treatment which is not good for any type of drinks. This separation of layer might be reduced by using suitable stabilizer which is needed to investigate in future.

As far as consistency is concerned, the treatment T₃ beverage blends with 25 per cent of the beetroot extract was acceptable by panel judges.

Babar *et al.*, (2008) studied the utilization of pomegranate juice for the preparation of *chakka* whey beverage (CWB). In the preparation of beverages the volume of

pomegranate juice 0 (T₁), 10 (T₂), 15 (T₃) and 20 (T₄) per cent with 10 per cent sugar was mixed in *chakka* whey. The mean score for consistency of CWB prepared with different levels of pomegranate juice are 8.47, 8.65, 8.82 and 8.36 in treatment T₁, T₂, T₃ and T₄, respectively.

Bhavsagar *et al.*, (2010) studied the manufacture of pineapple flavoured beverage from *chhana* whey. This beverage was prepared with the addition of 5, 10 and 15 per cent of pineapple pulp in *chhana* whey. The consistency score recorded was the highest for T₂ as 7.8 followed by 7.7 for T₁ and lowest for T₃ as 7.4.

The results and trends recorded in the present investigation for consistency were in comparable with the results obtained by above mentioned research workers.

Taste/mouthfeel character of beetroot whey beverage

From the above observations it was clearly indicated that the highest liking was towards the treatment T₂ i.e. beverage blended with 20 per cent beetroot extract.

The feelings at the time of taste of product when food are chewing or lysing in mouth are the responsible for real acceptance and rejection of product.

The results recorded for taste were comparable with the results obtained by Pandiyan *et al.*, (2011) studied on the development of mango flavoured sweetened whey drink. The treatments were divided into control, T₁ using 4 per cent, T₂ using 5 per cent and T₃ using 6 per cent mango pulp. They reported that the sensory score of mango flavoured sweetened whey drink for tastes were 7.62, 8.14, 8.28 and 8.36 for treatment T₀, T₁, T₂ and T₃, respectively.

Table.1 Overall acceptability of beetroot whey beverage

Treatment	Colour and appearance	Flavour	consistency	Taste	Overall acceptability
T _{0-A}	8.00	7.60	8.00	8.00	7.90 ^a
T _{1-A}	8.50	8.00	8.45	8.10	8.26 ^a
T _{2-A}	8.20	8.50	8.60	8.75	8.51 ^{ab}
T _{3-A}	8.10	8.25	8.75	8.38	8.37 ^{abc}
S.E. \pm 0.1208 C.D. at 5% 0.3722					

The values with different small letters superscripts row wise differ significantly at 5 per cent level of significance.

Fig.1 Flow diagram for preparation of *paneer* whey (Aneja *et al.*, 2002)

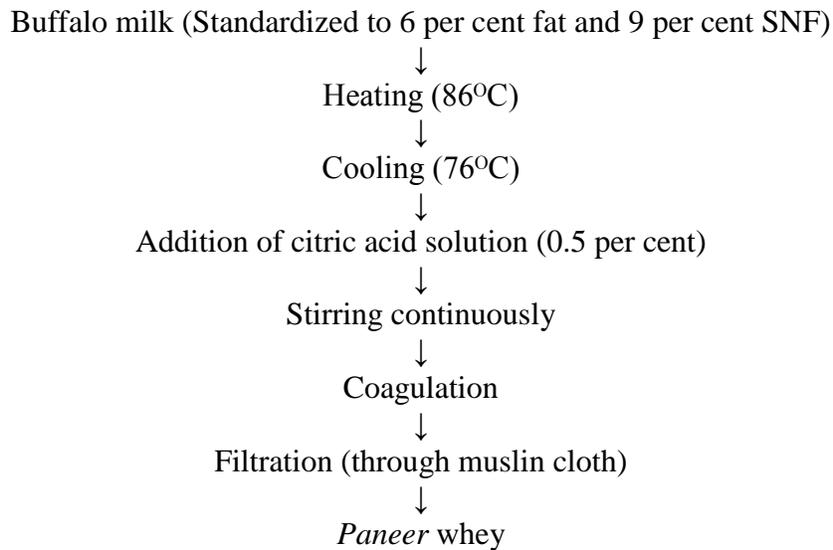


Fig.2 Flow diagram for preparation of beetroot extract

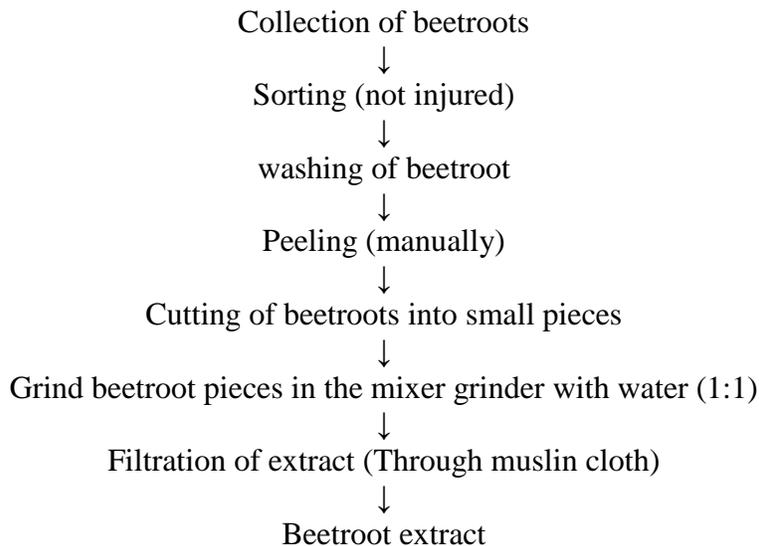
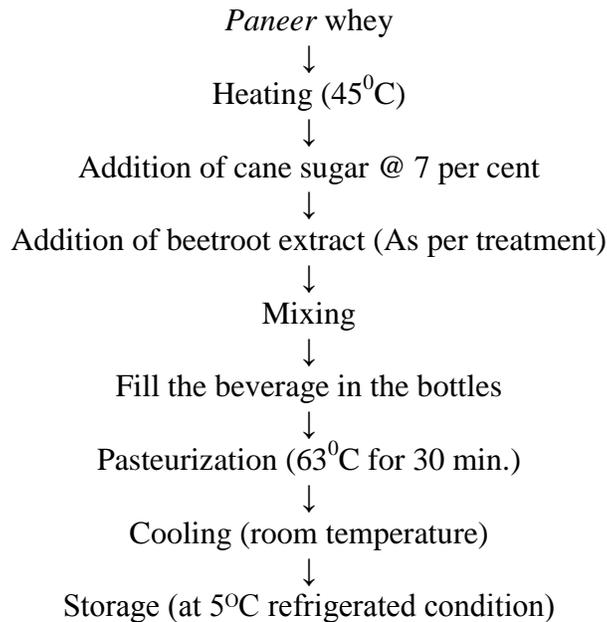


Fig.3 Flow diagram for Preparation of *whey based beetroot beverage*



Overall acceptability

Table 1 show that the mean overall score of acceptability of beetroot whey beverage for treatments T₀, T₁, T₂ and T₃ were 7.90, 8.33, 8.51 and 8.37, respectively. It was observed that, Treatments T₂ was significantly superior over others treatments which had the highest mean score of whey beverage prepared using 20 per cent beetroot extract. Treatment T₁ and T₃ was obtained high score for colour and appearance and consistency but overall acceptance was towards treatment T₂ due to the high score preference in flavour and taste. The treatment T₀ had least mean overall score i.e. 7.90.

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

Babar *et al.*, (2008) studied the utilization of pomegranate juice for the preparation of *chakka* whey beverage (CWB). In the

preparation of beverages the volume of pomegranate juice 0 (T₁), 10 (T₂), 15 (T₃) and 20 (T₄) per cent with 10 per cent sugar was mixed in *chakka* whey.

They reported for the mean score for overall acceptability of pomegranate whey beverage were 8.56, 8.65, 8.81 and 8.14 for treatment T₁, T₂, T₃ and T₄, respectively.

Landge *et al.*, (2013) studied on preparation and sensory evaluation of whey beverage. Three level of sugar combinations were used for the standardization of whey beverage i.e. S (10 per cent), S1 (12 per cent) and S2 (14 per cent). The overall acceptability score of whey beverage for various treatments varied between 6.61 to 7.50.

The results recorded for overall acceptability were comparable with the results obtained by said research workers.

It was observed that the overall acceptability score for treatment T₀, T₁, T₂ and T₃ was 7.90, 8.33, 8.51 and 8.37, respectively.

The using of 20 per cent beetroot extract of treatment T₂ was more acceptable in beetroot whey. The study indicated that good quality beetroot whey beverage could be prepared from 20 per cent beetroot extract used with 80 per cent of *paneer* whey.

References

- Aneja, R. M., Mathur, B. N., Chandan, R. C. and Banerjee, A. K. (2002). Heat acid coagulated products in technology of Indian milk products. A dairy Indian publ., pp 133-142.
- Babar, R. B., Salunkhe D. D., Chavan K. D. and Thakare V. M. (2008). Utilization of pomegranate juice for the preparation of *chakka* whey beverage. *J. Dairying, Foods & H.S.*, 27 (2): 87-93.
- Bhavsagar, M. S., Awaz Hassan Bin and Patange U. L. (2010). Manufacture of pineapple flavoured beverage from *chhana* whey. *J. Dairying, Foods & H.S.*, 29 (2): 110-113.
- Das Sanjita and Rajput Sunita singh, (2013). Toxic level of soft drink and sports drink on health status. *International J. of advances in pharmacy, biology and chemistry*. 2 (4): 591-594.
- Goyal Nupur and Gandhi D.N. (2009). Comparative analysis of Indian *paneer* and cheese whey for electrolyte whey drink. *World J. Dairy & Food Sci.*, 4 (1): 70-72.
- Landge, S. N. and Gaikwad S. M (2013). Studies on preparation and sensory evaluation of whey beverage. *International J. of Food, Agriculture and Veterinary Sci. ISSN: 2277-209X* 3 (3) pp.27-29.
- Pandiyans C., Villi R. Annal and Chandirasekaran V. (2011). Development of mango flavoured sweetened whey drink. *JIVA*, 9 (3): 35-37.
- Panse, V. G. and Sukhatme, P. V. (1985). Statistical methods for Agricultural workers. I.C.A.R. publication 4th ed.
- Singh Bhupinder & Hathan Bahadur Singh (2014). Chemical composition, functional properties and processing of Beetroot a review. *International J. of Scientific & Engineering Res.*, 5 (1): 679-684.
- Yadav Ritika, B., Yadav Baljeet. S and Kalia Navneet (2010). Development and storage studies on whey-based banana herbal (*mentha arvensis*) beverage. *American J. Food Technol.*, Pp 1-9.