

Original Research Article

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Studies on Sensory Analysis of Goat Milk Whey based Herbal Beverage

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ABSTRACT

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The Sensory quality of herbal whey beverage such as flavour and taste, colour and appearance, consistency and overall acceptability was carried out on 9 point hedonic scale by the trained panellist. Treatment T₀, T₁, T₂ and T₃ were formulated in the present investigation of Herbal whey beverages by using goat milk whey was prepared by using whey, carrot and beetroot extract(1:1), tulsi leaf extract and sugar was in the ratio of (93:00:00:7), (82:9:2:7), (77:14:2:7) and (72:19:2:7) respectively. The score for overall acceptability of Herbal whey beverages by using goat milk whey to the treatment T₀, T₁, T₂ and T₃ was found 6.96, 7.13, 7.33 and 7.74. Among all the treatment, the combination T₃ with 72% whey, 19% beetroot and carrot (1: 1), 2% tulsi leaf extract and 7% sugar was observed to be the best overall acceptability.

Introduction

Total milk produced in India the share of cow, buffalo and goat milk are 45.16 per cent, 51.10 per cent and 3.74 per cent respectively. Therefore, goat milk comes on third position after cow milk and buffalo milk (Raducuta *et al.*, 2010). Goat milk production in India is 4 MT (FAOSTAT, 2008). India occupies the first position for the number of goats in the world which is around 154 million constituting about 16.7 percent of world's goat population (Dar, 2012). Goat milk is popular

because of its delicious taste and extremely nutritious. Goat milk contains proteins, fatty acids, vitamins, minerals, trace elements and enzymes that are easily assimilated by the body. Lactoperoxidase (LP) enzyme present in goat milk is different than bovine milk due to its antibacterial activity against a variety of bacteria causing cholera, pneumonia, typhoid, dysentery and food poisoning (Anonymous, 1998 and Ohiokpehai, 2003). Goat milk has predominance of smaller fat globules so it is easier to digest than cow milk (Chandan *et al.*, 1992).

Whey is the largest by-product of the world dairy industry. It has greenish yellow colour in watery part of milk remaining after curd separation and that results from coagulation or fermentation carried out by acid, microbes or enzymes during manufacture of paneer, cheese, casein, chakka and chhana. The nutritive value of whey is higher due to presence of soluble nutrients in milk, particularly lactose, whey proteins, vitamins and minerals (Goyal and Gandhi, 2009). Whey obtained from goat milk has higher levels of alpha lactalbumin but is often discarded, or given to animals as nutritional supplement (Pandya and Ghodke, 2007). The conversion of whey into variety of beverages has an economic advantage, as the whole quantity is being used and there is no problem of left over residues. Whey also improves the economic viability of dairy plant (Shaikh *et al.*, 2001).

Carrot is a cool season crop grown as an annual. It is an inexpensive and highly nutritious vegetable. Carrot contains appreciable amounts of vitamins B₁, B₂, B₆ and carotenes. Dietary carotenes are associated with lower risk of many cancers. Vitamin A is an antioxidant and it plays a key role in growth and repair of tissues in addition to help the body to fight with infections. It keeps eyes healthy and nourish epithelial tissues in the lungs and skin (Singh *et al.*, 2006). Carrot juice also helps to cleanse the liver and excrete fats and bile from body. It improves gastrointestinal health. Carrot juice is an effective food remedy in appendicitis, colitis, peptic ulcer, heart disease and bronchitis (Singh *et al.*, 2006).

Beetroot (*Beta vulgaris*) is 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 for both cooked and raw as salad

or juice. Beetroot is use of natural food colours, because synthetic dyes are becoming more and more critically assessed by the consumer. In food processing, as compared with anthocyanin and carotenoids, betalains are less used. Beetroot powder or extracted pigments are used to improve the red colour of tomato pastes, sauces, soups, desserts, jams, jellies, sweets, ice creams and breakfast cereals. It also contributes to consumers health and wellbeing because it have antioxidants, because of the presence of nitrogen pigments called betalains, it is mainly comprise of red-violet-coloured betacyanins (betanin, isobetanin, probetanin and neobetanin) and yellow-orange-coloured betaxanthins (Singh and Singh, 2014).

Tulsi is also known as 'Sacred Basil' or 'Holy Basil'. The botanical name of tulsi is *Ocinum tenuiflorum* or *Ocinum santum*. *Ocinum tenuiflorum* is a biennial (Kothari *et al.*, 2004). It primarily occurs in green (Sri or Lakshmi tulsi) and purple (Krishna tulsi) morphotypes. In India tulsi are used for religious and medicinal purposes. The essential oil has either phenolic constituents such as eugenol, thymol alcohols as single major oil ingredients and terpene compounds as minor constituents (Kothari, 2004).

Materials and Methods

The experiment “Studies on sensory analysis of goat milk whey based herbal beverage” was carried out in research lab, Warner College of Dairy Technology, Sam Higginbottom University of Agriculture Technology and Sciences, Prayagraj-211007, U.P. (India).

Procurement and collection of ingredients

- a) Milk: Milk was purchased from near village of Prayagraj.
- b) Beetroot Carrot: Beetroot Carrot was

purchased from local market of Prayagraj.

- c) Tulsi: Tulsi was purchased from local market of Prayagraj.
- d) Sugar: Sugar was purchased from local market of Prayagraj.

Treatment combination

T₀ -Control prepared from whey and sugar (93:7)

T₁ -Experimental sample prepared from whey, beetroot carrot, tulsi and Sugar (82:9:2:7)

T₂ -Experimental sample prepared from whey, beetroot carrot, tulsi and Sugar (77:14:2:7)

T₃ -Experimental sample prepared from whey, beetroot carrot, tulsi and Sugar (72:19:2:7)

Preparation of paneer whey

Goat milk heating at 85° and cooling at 70° and addition of 1% coagulant, continuously stirring and then coagulation at 70°C filtration it through Muslin cloth and obtained paneer whey.

Preparation of herbal whey beverage

Paneer whey heating at 45° for 3 min. and addition of sugar at 7% in each treatment then further add beetroot carrot extract with tulsi (2% in each treatment) and mixing as per treatment combination of whey, beetroot carrot, tulsi and sugar and fill beverage in glass bottles, pasteurized at 63° for 30 min then cool and storage at 5°.

Organoleptic quality: (9 Point hedonic scale)

Sensory evaluation of goat milk whey based herbal beverage

The sensory evaluation of goat milk whey based herbal beverage samples was done by a panel of judge using a 9 point hedonic scale.

The experienced Technical staff members of the Warner college of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj served as a judging team and evaluated the samples of different treatment of goat milk whey based herbal beverage. Numerical score were allocated for flavour and taste, colour and appearances, consistency and overall acceptability of herbal whey beverage.

Statistical analysis

The data will be analyzed statically by Analysis of variance (ANOVA) at 5% level of significance and Critical Difference (C.D) in WASP software and excel software.

Results and Discussion

The results obtained from the analysis of goat milk whey based herbal beverage are presented on the sensory characteristics (9 point Hedonic scale) such as flavour and taste, colour and appearances, consistency and overall acceptability (Table 1–5).

Flavour and taste of herbal whey beverage

Flavour and taste score in control and experimental herbal whey beverage are presented in Table 2, The score for flavour and taste of herbal whey beverage sample of T₀, T₁, T₂ and T₃ was 7.12, 7.30, 7.52 and 8.10 respectively. It was observed that highest mean of flavour and taste was recorded in the sample of T₃(8.10) followed by T₂(7.52), T₁(7.30) and T₀(7.12).

It was observed from the result of ANOVA, F (Cal) value (9.451) was greater than the table of F tab (3.23) at 5% level of significance. It indicates significant effect of treatment on flavour and taste. The significant difference was further analyzed statistically to find out the C.D. between and within the different

treatment combinations. The difference between the mean values of T₀-T₁ (0.18), T₀-T₂ (0.40) and T₁-T₂ (0.22) less than the C.D. value, 0.415. Therefore, the difference was non significant and the difference between the mean values of T₀-T₃ (0.98), T₁-T₃ (0.80) and T₂-T₃ (0.58) greater than the C.D. value, 0.415. Therefore, the difference was significant.

Colour and appearance of herbal whey beverage

Colour and appearance score in control and experimental herbal whey beverage reveals in Table 3, the mean score for colour and appearance of herbal whey beverage sample of T₀, T₁, T₂ and T₃ was to be 7.00, 7.14, 7.42 and 7.66 respectively. It was observed that highest mean of colour and appearance was recorded in the sample of T₃(7.66) followed by T₂(7.42), T₁(7.14) and T₀(7.00). This indicates that, increased in proportion of beetroot carrot in the blend increased the score for consistency of treatment of herbal whey beverage has significant effect (p<0.05).

As evident from the result of ANOVA result indicates that the F (Cal) value (3.819) was greater than the table of F (3.23) at 5% level of significance.

The significant difference was further analyzed statistically to find out the C.D. between and within the different treatment combinations.

The difference between the mean values of T₀-T₁ (0.14), T₀-T₂ (0.42) and T₁-T₂ (0.28) less than the C.D. value, 0.451. Therefore, the difference was non significant and the difference between the mean values of T₀-T₃ (0.66), T₁-T₃ (0.52) and T₂-T₃ (0.24) greater than the C.D. value, 0.451. Therefore, the difference was significant.

Consistency score of herbal whey beverage

The data pertaining to consistency in control and experimental herbal whey beverage sample of different treatments are presented in Table 4. The mean value of treatment T₀, T₁, T₂ and T₃ was found to be 6.78, 6.96, 7.08 and 7.36 respectively. Highest mean score of consistency was recorded in the sample of T₃(7.36) followed by T₂(7.08), T₁(6.96) and T₀(6.78).

The result of ANOVA indicates that the F (Cal) value (5.391) was greater than the table of F (3.23) at 5% level of significance. The significant difference was further analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₁ (0.18), T₀-T₂(0.30), T₁-T₂ (0.12) and T₂-T₃ (0.28) less than the C.D. value, 0.314. Therefore, the difference was non significant and the difference between the mean values of T₀-T₃ (0.58), T₁-T₃ (0.40) and T₂-T₃ (0.28) greater than the C.D. value, 0.314. Therefore, the difference was significant.

Overall acceptability score of herbal whey beverage

Overall acceptability score in control and experimental herbal whey beverage are shown in Table 5. The mean score for overall acceptability of herbal whey beverage sample of T₀, T₁, T₂ and T₃ was 6.96, 7.13, 7.33 and 7.74 respectively. It was observed that highest mean of overall acceptability score was recorded in the sample of T₃(7.74) followed by T₂(7.33), T₁(7.13) and T₀(6.96). This indicates that, increased in proportion of beetroot carrot and tulsii in the blend, increased the score for overall acceptability of herbal whey beverage has significant effect (p<0.05) between treatments (Fig. 1).

Table.1 Sensory parameters of control and experimental goat milk whey based herbal beverage

Particulars	T ₀	T ₁	T ₂	T ₃
Flavour and taste	7.12±0.29	7.30±0.27	7.52±0.28	8.10±0.33
Colour and appearance	7.00±0.12	7.14±0.21	7.42±0.40	7.66±0.47
Consistency	6.78±0.44	6.96±0.23	7.08±0.27	7.36±0.23
Overall acceptability	6.96±0.13	7.13±0.17	7.33±0.30	7.74±0.22

Table shown Mean ±S.D.

Table.2 Flavour and taste score in control and experimental goat milk whey based herbal beverage

Replication	Treatment			
	T ₀	T ₁	T ₂	T ₃
R1	6.80	7.00	7.00	7.70
R2	7.60	7.00	7.50	8.50
R3	7.10	7.50	7.50	8.40
R4	7.00	7.50	7.80	8.00
R5	7.10	7.50	7.80	7.90
Mean	7.12	7.30	7.52	8.10
Max	7.60	7.50	7.80	8.50
Min	6.80	7.00	7.00	7.70
CD value (5%)	0.415			

Table.3 Colour and appearance score in control and experimental goat milk whey based herbal beverage

Replication	Treatment			
	T ₀	T ₁	T ₂	T ₃
R1	7.20	7.20	7.00	7.30
R2	7.00	7.00	7.00	7.50
R3	6.90	7.50	7.50	7.50
R4	7.00	7.00	7.80	8.50
R5	6.90	7.00	7.80	7.50
Mean	7.00	7.14	7.42	7.66
Max	7.20	7.50	7.80	8.50
Min	6.90	7.00	7.00	7.30
C.D. value (5%)	0.451			

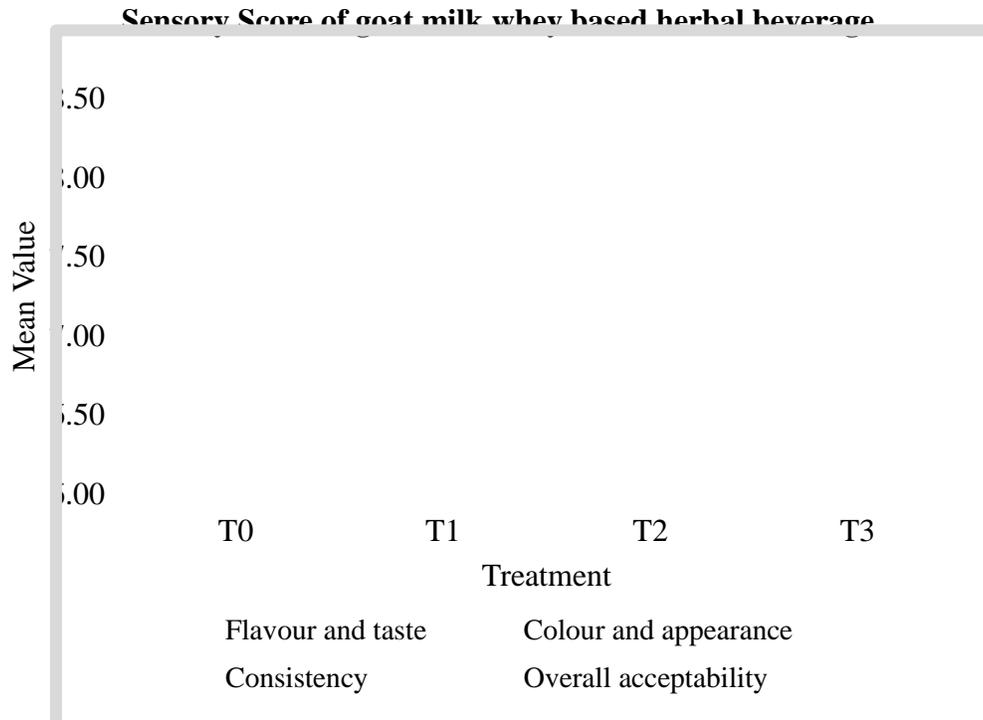
Table.4 Consistency score in control and experimental goat milk whey based herbal beverage

Replication	Treatment			
	T0	T1	T2	T3
R1	6.80	6.60	6.60	7.30
R2	6.90	7.10	7.20	7.00
R3	6.70	7.20	7.20	7.60
R4	7.00	7.00	7.10	7.50
R5	6.50	6.90	7.30	7.40
Mean	6.78	6.96	7.08	7.36
Max	7.00	7.20	7.30	7.60
Min	6.50	6.60	6.60	7.00
C.D. value (5%)	0.314			

Table.5 Overall acceptability score in control and experimental goat milk whey based herbal beverage

Replication	Treatment			
	T0	T1	T2	T3
R1	6.93	6.93	6.86	7.43
R2	7.16	7.03	7.23	7.86
R3	6.90	7.40	7.39	7.83
R4	7.00	7.16	7.56	8.00
R5	6.83	7.13	7.63	7.60
Mean	6.96	7.13	7.33	7.74
Max	7.16	7.40	7.63	8.00
Min	6.83	6.93	6.86	7.43
C.D. value (5%)	0.294			

Fig.1 Graphical representation of Sensory characteristics of mean value of goat milk whey based herbal beverage



The result of ANOVA observed in the F (Cal) value (11.775) was greater than the table of F (3.23) at 5% level of significance. It indicates significant effect of treatment on flavour and taste. The significant difference was further analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T₀-T₁ (0.17), T₁-T₂ (0.20) less than the C.D. value, 0.314. Therefore, the difference was non significant. The difference between the mean values of T₀-T₂ (0.37), T₀-T₃(0.78), T₁-T₃(0.61) and T₂-T₃(0.41) greater than the C.D. value, 0.314. Therefore, the difference was significant.

In conclusion, the highest mean score of flavour and taste of herbal whey beverage was recorded in the sample of T₃(8.10) and lowest score was recorded T₀(7.12). Similarly, the highest mean of colour and appearance was recorded in the sample of T₃(7.66) and lowest

mean score was recorded in T₀(7.00). This indicates that, increased in proportion of beet root in the blend increased the score for flavour and taste of herbal whey beverage. The highest mean of consistency was recorded in the sample of T₃(7.36) and lowest was recorded in control sample T₀(6.78) and also highest mean of overall acceptability was recorded in the sample of T₃(7.74) and lowest was recorded in sample T₀(6.96). It was concluded that highest score was observed in T₃ among the all sensory characteristics of flavour and taste, colour and appearance, consistency and overall acceptability.

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