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Sensory evaluation of beverages by incorporation of aonla and beet root juice in paneer whey

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Abstract
Beverage industry is currently seeking to expand its products range, but also to constitute a way of maintain and improving people's health. Beverage products are mainly prepared from whey as its main ingredient. Whey beverages are widely consumed and are an ideal vehicle for functional delivery. The use of whey, aonla juice and beet root juice blends as a source of high protein, rich in vit C and minerals in production of whey beverages was studied. The present study was undertaken with objective of studying the standard procedure on quality evaluation of beverages by incorporation of Aonla juice and Beet root juice in Paneer whey and studied for its sensory properties. In the present investigation treatment T_0, T_1, T_2 and T_3 were formulated in which whey beverage was prepared by using whey, beet root juice and aonla juice was in the ratio of (100:00, 93:3:4, 92:4:4 and 91:5:4) respectively. The sensory score for overall acceptability of whey beverage of treatments T_0, T_1, T_2 and T_3 was found to be 7.40, 7.60, 8.60 and 7.00 respectively. Overall acceptability score on quality evaluation of beverages by incorporation of beet root juice and aonla juice in paneer whey and control milk, highest mean score of overall acceptability was recorded in T_2 (8.60) followed by T_1 (7.60), T_0 (7.40) and T_3 (7.00). It was found that among all treatments T_2 (8.60) higher score in sensory evaluation and it considered as optimized product of whey beverage.

Keywords: Paneer whey, aonla, beet root, honey, sensory score

Introduction

Dairy beverages are produced from milk or its derivatives, with or without the addition of other ingredients and the dairy base represents at least 51% (vol/vol) of the formulation and Dairy beverage can be submitted to a fermentation process using yogurt cultures (Brazil, 2005). The consumption of dairy beverages is mainly associated with the consumption of yogurt, due to their similar sensory properties and the healthy habits of consumers (Zhu *et al*, 2009). From the technological view point, the main difference between yogurt and fermented dairy beverages is the addition of whey to the latter, which results in lower viscosity.

Whey is a byproduct from cheese, chhana and paneer industry and they are containing valuable nutrients like lactose, protein, minerals, vitamins etc., which have indispensable value as human food. Whey is resulted in unraveling the secrets of why protein and other components and established a sound basis for their nutritional as well as functional value. In the case of cheese production, ten parts of milk gives nine parts of whey and one part of cheese (Bylund, 2003) [4]. Whey and its preparations may serve as substitutes. Use of whey can have a positive impact not only on the consumers' health but also on the finances of many companies by reducing the costs of raw materials and thus lowering production costs (Bozanic *et al*., 2014; Singh and Singh, 2012) [2, 12]. Cost reduction is achieved by the use of whey preparations as partial or complete replacements of milk powder (De Wit, 2001) [6].

Aonla or Indian gooseberry is the fruit of deciduous tree mainly found in India. Aonla plant belongs to the family *Euphorbiaceae*. The fruit of this plant is round shaped with vertical stripes. It is greenish yellow in color and sour taste. This fruit is fibrous in nature. Fruit juice extract of Aonla has antioxidant and anti-inflammatory activities and create positive effects on glycemia, dyslipidemia, insulin, blood pressure and foam cell formation and additionally some mechanisms of these effects (Singh *et al*., 2004) [13]. Fresh fruit of aonla is very rich source of ascorbic acid and appreciable source of total sugar, calcium, iron, phosphorus and also has great potential for processing (Khan, 2009) [9].

The beet root (*Beta vulgaris* L. var. crassa L.) is a vegetable that is cultivated in many countries around the world. The beet produces a leafy top and a swollen root and both are used as food. The root of the beet plant is used as a cooked vegetable is manufactured into sugar and is also processed into pharmaceuticals, while the tops of the beet plant are used as a leafy

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green vegetable. The beet is also an important component in animal feeds (Belal, 2007) [1]. Beet root is important in the sugar industry and providing above 40% of the raw materials used in the world for the manufacture of raw sugar (Koljajic, *et al*., 2003) [10]. The sugar beet is an important alternative to sugarcane. Consumption of red beet are beneficial, because which are rich source of antioxidants can contribute to protection from age related diseases. Red beet is one of the most potent vegetables with respect to antioxidant activity (Vinson *et al.*, 1998; Zitnanova *et al*., 2006)) [16, 18]. Red beet also can be used as antioxidants (Georgiev *et al.,* 2010) [8]. Colors are important quality indicators of foods and that determine the Consumer acceptance of foods. Betalains are water-soluble nitrogen-containing pigments and found in high concentrations in red beet. It consists of two sub-classes such as betacyanins (red-violet pigments) and betaxanthins (yelloworange pigments) (Delgado Vargas *et al*., 2000; Stintzing *et al*., 2004) [14]. They have antimicrobial and antiviral effects (Strack *et al*., 2003) [15]. Betalains are particularly suited for use colouring of food products (Cai *et al*., 2001; Roy *et al*., 2004) [5, 11].

There was a great demand of Beverage drink in the market. So, the investigation was planned with a view to standardize techniques of manufacturing for beverage drink blend with beet root, honey, aonla and whey. It aims to improve the nutritional value of traditional Beverage drink.

Materials and Methods
The experiment **"Sensory evaluation of beverages by incorporation of Aonla and Beet root juice in Paneer whey"** was carried out in the research lab of "Cyto Gene Research & Development" B - Block Chauraha, Indra Nagar, Lucknow, India - 226016

Materials required
Paneer whey, aonla juice and beet root were collected from the local market Bhoothnath, Indra Nagar, Lucknow (U.P.). All the equipment's and glassware were procured from Cyto Gene Research & Development" B – Block Chauraha, Indra Nagar, Lucknow, India – 226016. All the chemicals were used AR and GR grade for analysis.

Treatment combination
T_0 -Control prepared from whey (100%)
T_1 –Experimental sample prepared from whey, beet root juice and aonla juice (93:3:4)
T_2 –Experimental sample prepared from whey, beet root juice and aonla juice (92:4:4)
T_3 –Experimental sample prepared from whey, beet root juice and aonla juice (91:5:4)
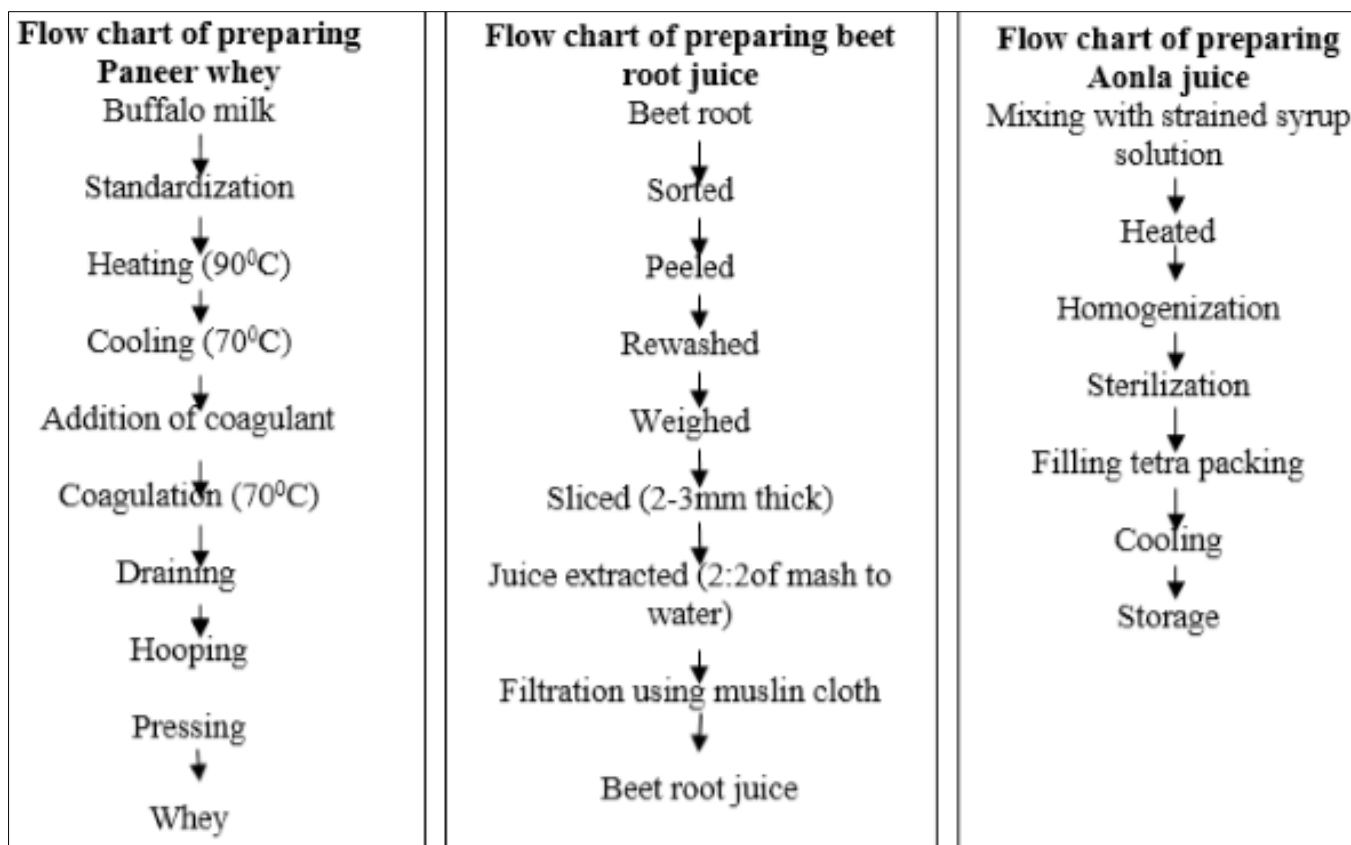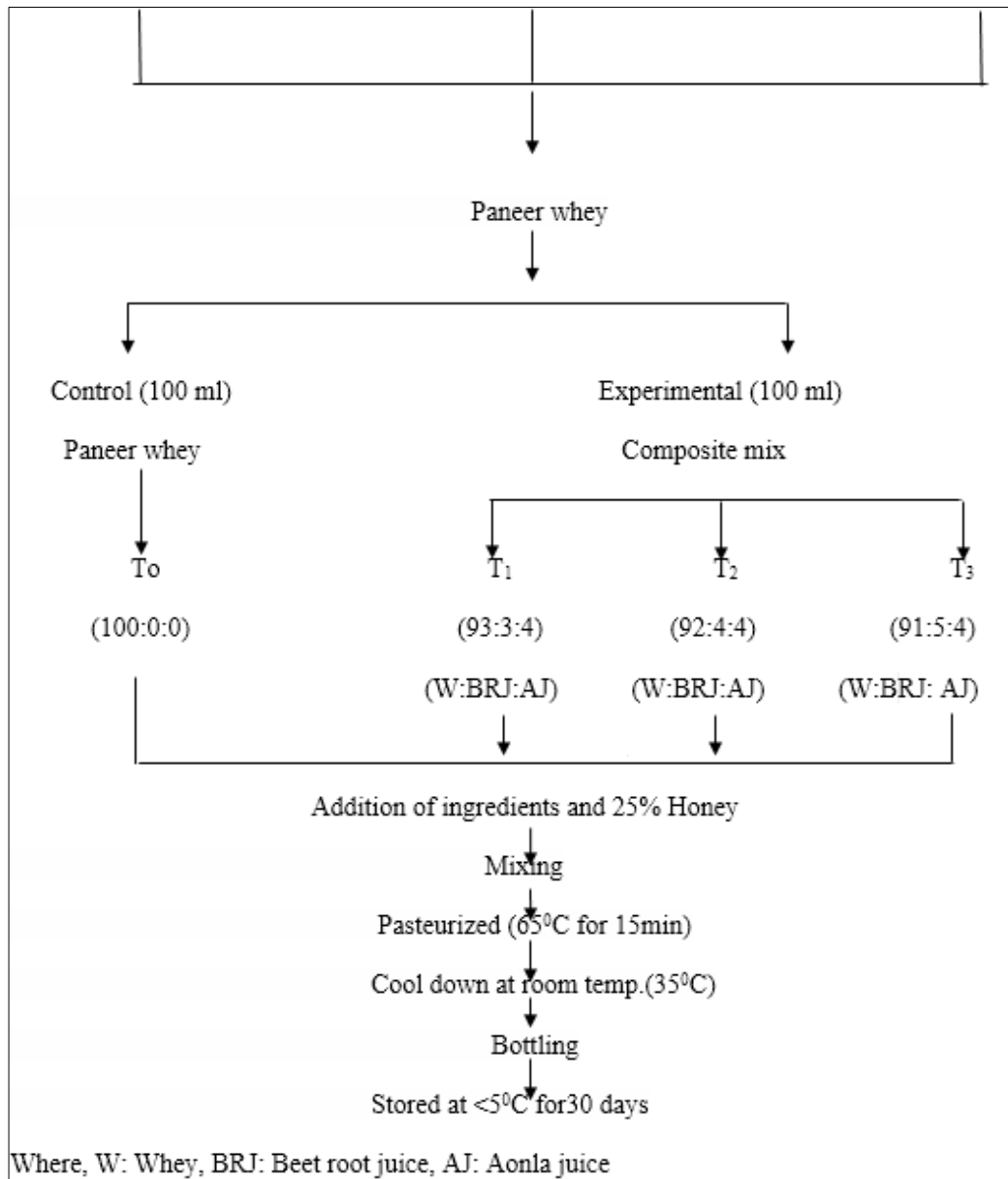

Fig. 1 Flow diagram for preparation of whey beverage

Where, W: Whey, BRJ: Beet root juice, AJ: Aonla juice

Technical Programme
The following analysis will be conducted during the Investigation
Sensory evaluation
The representative samples of beverages where evaluated by five judges. The panel of the judges of constituted on the basis of interest, performance, motivation, willingness and reliability. The samples were presented to the penalist for sensory evaluation using 9 point hedonic scale on colour & appearance, flavour & taste, consistency and overall acceptability.

Statistical Analysis
The Data was analyzed using Analysis of Variance (ANOVA) technique and Critical difference (C.D) in WASP software and excel software.

Results and Discussion
Sensory evaluation is a scientific discipline used to evoke, analyze, measure and interpret results of those characteristics of foods, as they are perceived by the sense, smell, taste, touch and hearing. The sensory evaluation is very important in product evaluation with various advantages.

The data collected on the different aspects were tabulated and analyzed statistically using the method of analysis of variance and critical difference technique. The significant and non-significant differences observed have been analyzed critically within and between the treatment combinations. The results obtained from the analysis are presented on the basis of Sensory evaluation of on quality evaluation of beverages by incorporation of Aonla and Beet root juice in Paneer whey.

Table 1 Average data for different parameters of control and experiments (in percent) of whey beverage

Parameters	Treatment						
	T_0	T_1	T_2	T_3	F Cal 5% level	Result	C.D.
Colour and Appearance	7.80±0.24	7.60±0.50	8.60±0.06	7.40±0.37	4.05	S	0.81
Consistency	7.00±0.00	7.40±0.55	8.20±0.53	7.80±0.24	3.56	S	0.84
Flavour and Taste	7.00±0.00	7.20±0.34	8.60±0.06	7.60±0.45	6.20	S	0.88
Overall Acceptability	7.40±0.24	7.60±0.00	8.60±0.00	7.00±0.00	6.47	S	0.82

"Sensory evaluation of beverages by incorporation of Aonla and Beet root juice in Paneer whey" (9 point Hedonic scale):

Colour and appearance in sample of different treatments
The mean value for colour and appearance score of whey beverage in different sample of T_0, T_1, T_2, and T_3 was found to 7.80, 7.60, 8.60 and 7.40 respectively. The sensory properties on quality evaluation of beverages by incorporation of beet root juice and aonla juice in Paneer whey was ranked between like very much to like extremely. Colour and appearance in samples of different treatments and control, highest score was obtained in case of T_2 (8.60) followed by T_0

(7.80), T_1 (7.60) and T_3 (7.40).
On statistical analysis, the result of ANOVA observed that the F (Cal) value (4.05) was greater than the table value of F (3.49) at 5% level of significance. Therefore; the difference was significant, indicating significant effect of treatments on colour and appearance content. It was further analyzed that the difference between the mean values of T_1-T_2 (1.00) and T_2-T_3 (1.2) was greater than the C.D. value, 0.81 Therefore, the difference was significant. The difference between the mean values of T_0-T_1 (0.2), T_0-T_3 (0.4) and T_1-T_3 (0.2) was lower than the C.D. value, 0.81 Therefore, the difference was non-significant.
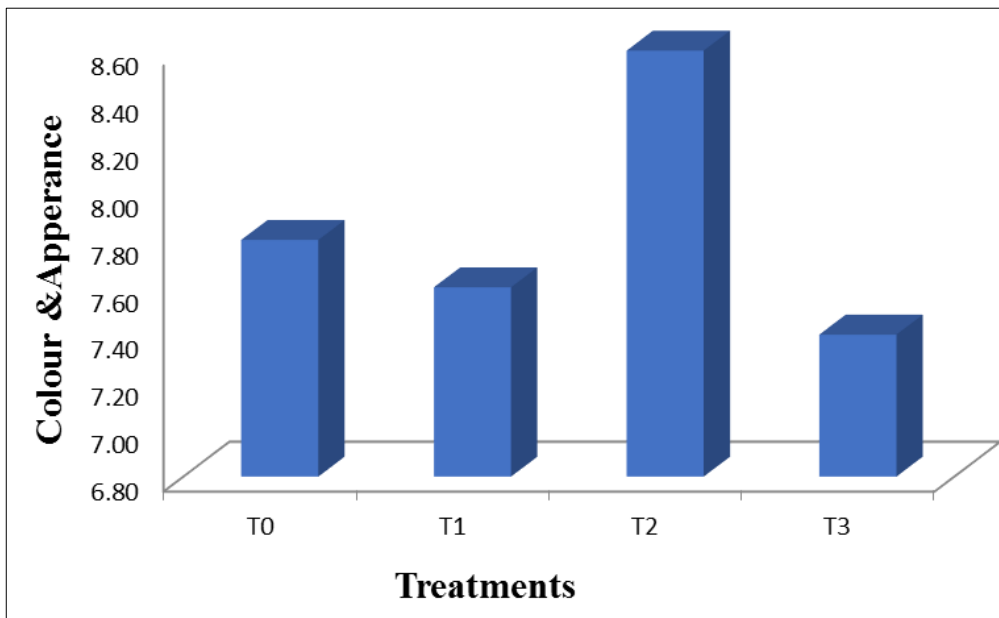

Fig 2: Average score of colour and appearance in the samples of control and experimental samples of whey beverage.

Consistency in sample of different treatments
The mean value for consistency score of whey beverage in different sample of T_0, T_1, T_2, and T_3 was found to 7.00, 7.40, 8.20 and 7.80 respectively. Consistency score in samples of different treatments and control, highest score was obtained in case of T_2 (8.20) followed by T_3 (7.80), T_1 (7.40) and T_0 (7.00). The C.D. Value at 5% level was observed 0.84.

The significant difference thus obtained was further analyzed statistically to find out the C.D between and within the different treatment combinations. The difference between the mean values of T_0-T_2 (1.2) was greater than the C.D. value, 0.84 Therefore, the difference was significant. The difference between the mean values of T_0-T_1 (0.4), T_1-T_2 (0.8), T_1-T_3 (0.4) and T_2-T_3 (0.4) was lower than the C.D. value, 0.84 Therefore, the difference was non-significant.
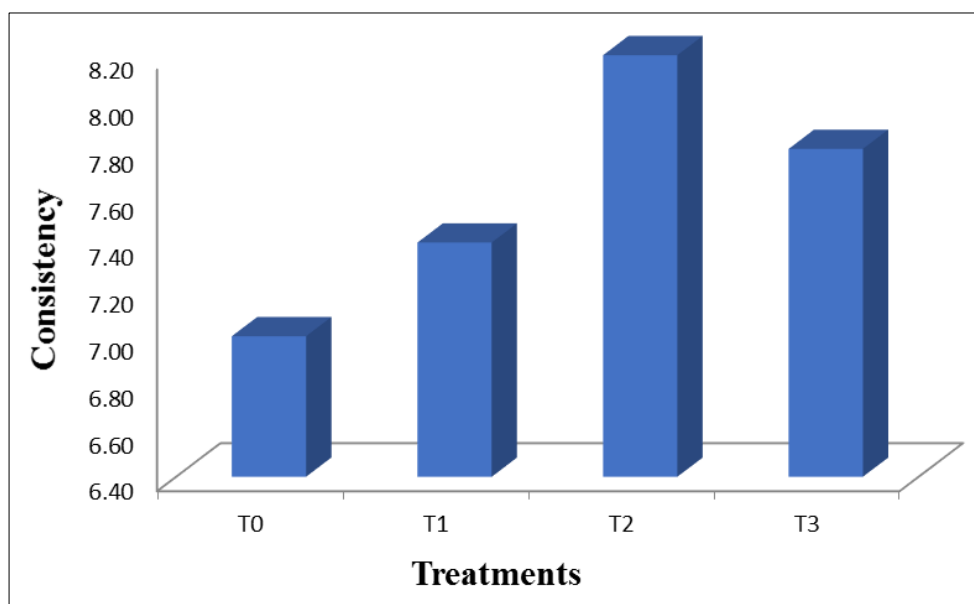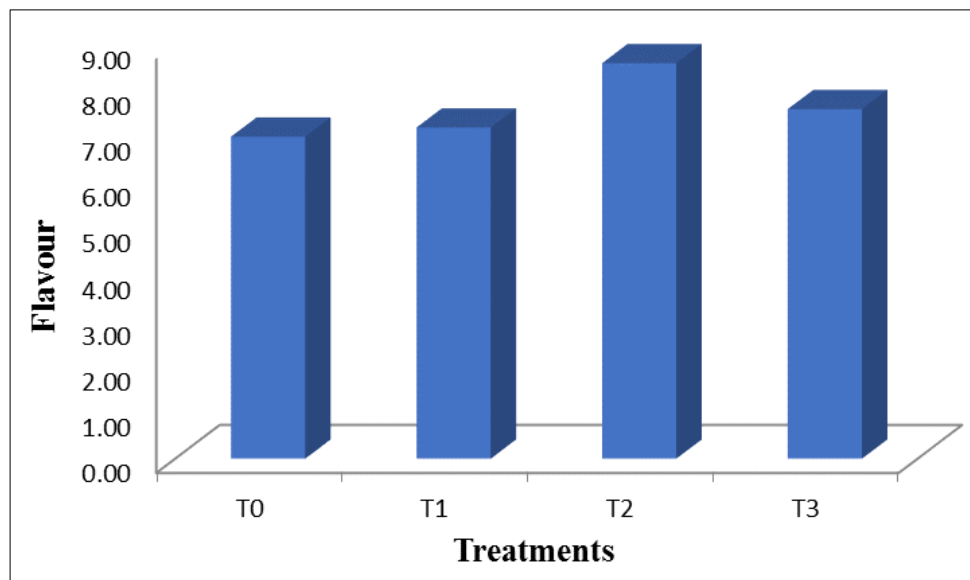

Fig. 3 Average score of consistency in the samples of control and experimental samples of whey beverage.

Flavour and taste in sample of different treatments

The mean value for flavour and taste score of whey beverage in different sample of T_0, T_1, T_2, and T_3 was found to 7.00, 7.20, 8.60 and 7.60 respectively. Flavour and taste score in whey beverage samples of different treatments and control, highest score was obtained in case of T_2 (8.60) followed by T_3 (7.60), T_1 (7.20) and T_0 (7.00). The C.D. Value at 5% level was observed 0.88.

The result of ANOVA observed that, the F (Cal) value (6.20) was greater than the table value of F (3.49) at 5% level of significance. Therefore; the difference was significant, indicating significant effect of treatments on Flavour and taste percent. It was further analyzed that the difference between the mean values of T_0-T_2 (1.6), T_1-T_2 (1.4) and T_2-T_3 (1.0) was greater than the C.D. value, 0.88 Therefore, the difference was significant. The difference between the mean values of T_0-T_1 (0.2) and T_1-T_3 (0.4) was lower than the C.D. value, 0.88 Therefore, the difference was non-significant.
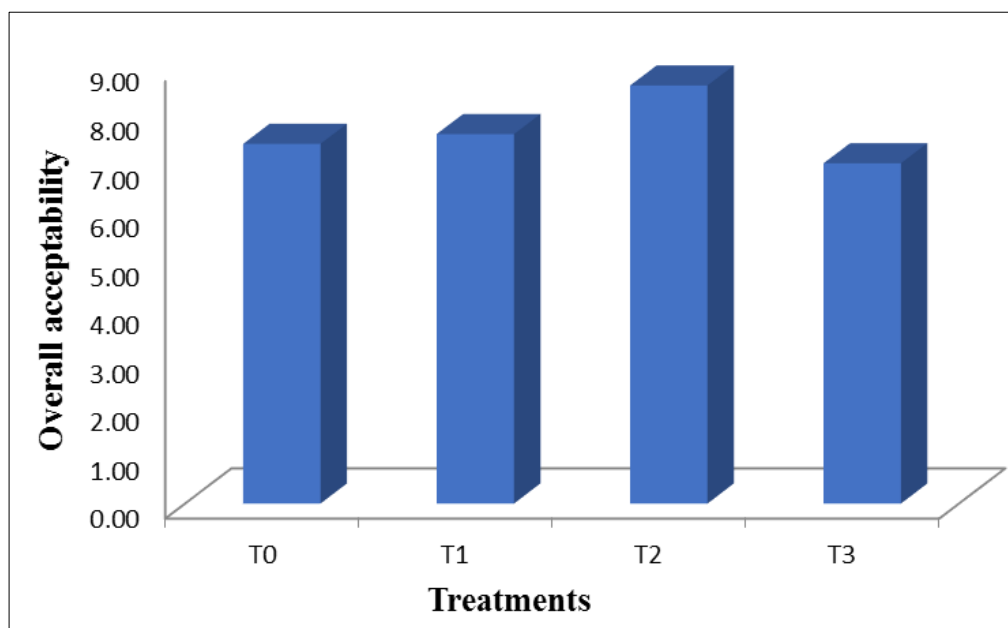

Fig 4: Average score of flavour and taste in the samples of control and experimental samples of whey beverage.

Overall acceptability in sample of different treatments

The mean value for Overall acceptability score of whey beverage in different sample of T_0, T_1, T_2, and T_3 was found to 7.40, 7.60, 8.60 and 7.00 respectively. Overall acceptability score in samples of different treatments and control, highest score was obtained in case of T_2 (8.60) followed by T_1 (7.60), T_0 (7.40) and T_3 (7.00). It was observed from ANOVA, the F (Cal) value (6.47) was greater than the table value of F (3.49) at 5% level of significance. Therefore; the difference was significant, indicating significant effect of treatments on overall acceptability. The significant difference thus obtained was further analyzed statistically to find out the C.D. between and within the different treatment combinations. The difference between the mean values of T_0-T_2 (1.2), T_1-T_2 (1.0) and T_2-T_3 (1.6) was greater than the C.D. value, 0.82 Therefore, the difference was significant. The difference between the mean values of T_0-T_1 (0.2), T_1-T_3 (0.6) was lower than the C.D. value, 0.82 Therefore, the difference was non-significant.

Fig 5 Average score of overall acceptability in the samples of control and experimental samples of whey beverage.

Conclusion

The Colour and appearance scores in samples of different experimental treatments and control, the highest mean colour and appearance of whey beverage was recorded in the sample of T_2 (8.60) followed by T_0 (7.80), T_1 (7.60) and T_3 (7.40). The differences in these values of colour and appearance scores all treatment were significant. Similarly, the consistency in samples of different experimental treatments and control, the highest mean consistency of whey beverage was recorded in the sample of T_2 (8.20) followed by T_3 (7.80), T_1 (7.40) and T_0 (7.00). The differences in these values of consistency scores all treatment were significant. The flavour and taste in samples of different experimental treatments and control, the highest mean flavour and taste was recorded in the sample of T_2 (8.60) followed by T_3 (7.60), T_1 (7.20) and T_0 (7.00). The differences in these values of flavour and taste scores all treatment were significant. and the overall acceptability in samples of different experimental treatments and control, the highest mean overall acceptability of whey beverage was recorded in the sample of T_2 (8.60) followed by T_1 (7.60), T_0 (7.40) and T_3 (7.00). The differences in these values of overall acceptability scores all treatments were significant. In view of the experimental result obtained during the present investigation, it may be concluded that whey beverages can be successfully prepared by using beet root juice and aonla juice with paneer whey. Beverage made with beet root juice and aonla juice in treatment T_2 (92:4:4) was found best in terms of organoleptic attributes, since it received the highest score among all the treatments in terms of colour & appearance, consistency, flavour & taste and overall acceptability.

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