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Effect of incorporation of herbs on physico-chemical properties of flavoured milk

Priyanka Hingne and SD Chavan

Abstract

Herbal flavoured milk was prepared from double toned milk with 3% Tulsi juice (T₁) and 3% Tulsi juice in combination with different levels of *Aloe vera* juice i.e 2% (T₂), 4% (T₃), 6% (T₄), 8% (T₅) and 10% (T₆), respectively. Sugar was added @ 8 per cent of milk. Sensory evaluation showed that the herbal flavoured milk prepared from blending of 3% Tulsi juice and 6% *Aloe vera* juice (T₄) was found superior and was liked very much by the panel of judges. Data on the physico-chemical changes occurred in the fresh herbal flavoured milk revealed that the moisture and the titratable acidity increased with increase in the level of *Aloe vera* juice whereas, the fat, SNF, protein, TS, ash, specific gravity, viscosity and total sugar decreased with increase in the level of *Aloe vera* juice.

Keywords: *Aloe vera*, Tulsi, flavoured milk

Introduction

Milk has long been considered as a wholesome food. Though known for its richness in calcium and thus being important for bones milk also contains more than nine other vital nutrients including proteins, carbohydrates, vitamins, minerals and fats. The perfect composition of milk not only recommends itself for growing children but also suited to satisfy energy needs of adults. The calcium found in milk is readily absorbed by the body. Phosphorous plays a role in calcium absorption and utilization. Milk provides these two minerals in approximately the same ratio as found in bone. Milk is also a significant source of riboflavin (vitamin B₂) which helps to promote healthy skin and eyes as well as vitamins A and D.

According to FSSAI, "flavoured milk, by whatever name called may contain nuts (whole, fragmented or ground), chocolate, coffee or any other edible flavour, edible food colours and cane sugar. Flavoured milk shall be pasteurized, sterilized or boiled. The type of milk shall be mentioned on the label". Flavoured milk has gained substantial popularity and is a healthy beverage targeted to children as a snack at home or at school. Flavoured milk can help to close the nutrition gap because children prefer it and will drink more milk when it's flavoured than plain milk. Indian consumers slowly moving from carbonated soft drinks to healthier options, flavoured milk represents one of the fastest growing segments in the Indian dairy market.

Herbs have been used as food and medicine from centuries. Medicinal plants serve as therapeutic alternative, safer choices, or in some cases, for effective treatment. Ancient medicinal systems are mainly dependent on medicinal plants.

Aloe plant is very much prevalent in hot and dry climates. It is one of the oldest known medicinal plants gifted by nature and hence often called 'miracle plant'. The plant is a coarse looking perennial with short, thick somewhat divided stem, 30-60 cm high. The leaves are glaucous green, sessile, crowded, erect spreading rather than concave, spiny toothed at margin, about 30-60 cm long, 10 cm broad and 1.8 cm thick full of juice. The scape is longer than leaves and is scaly and branched. The plant reaches maturity after four years and has leaves with a length averaging between two and three feet and a base width from three to five inches. The plant's complete life cycle is twelve years (Itrat and Zarnigar, 2013) [13].

Tulsi "Queen of herbs" is described as sacred and medicinal plant in ancient literature. The name Tulsi is derived from 'Sanskrit', which means "matchless one". It belongs to the *Ocimum* genus and family Lamiaceae identified for their medicinal significance. Tulsi has square stems, fragrant opposite leaves and whorled flower on spiked inflorescence.

Today, industry is showing a great deal of interest in utilizing herbal bioactives for functional foods manufacture. Ayurveda has mentioned several ways in which the medicinal benefits of herbs could be conveyed via certain foods as carriers. Milk is one of the most important of such carriers (Sawale *et al.*, 2012) [29]. Herbs have been used as a food and medicine for centuries. From 1960, an interest in "natural health" and the use of herbs and its products

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has been increasing. It plays a significant role in the maintenance of the quality of human life through offering an abundant source of antioxidants and medicinal constituents (Jhansi and Manjula, 2015) [19].

In recent years, *Aloe vera* has become a subject of interest because of its beneficial effects on human health. This novel herb has anti-inflammatory, antioxidant, antimicrobial, anticancer, antidiabetic, immune boosting and hypoglycaemic properties. This promotes human health without any side effects. The liver and spleen function are stimulated by the use of this herb. Research work carried out over many years points conclusively to a toxic colon being the cause of a very wide range of illness (Collin and Collin, 1935) [6].

The interest in herbal food continues to grow, powered by progressive research efforts. In view of this, the research work was planned to determine the physico-chemical properties of herbal flavoured milk.

Materials and Methods

Materials

The fresh, clean cow milk was procured from livestock instructional farm, Department of Animal Husbandry and Dairy Science, Dr. P.D.K.V., Akola. Clean crystalline commercial grade cane sugar was purchased from local market. Fresh Tulsi leaves were collected from the field of Department of Animal Husbandry and Dairy Science, Dr. P.D.K.V., Akola. Fresh *Aloe vera* leaves of variety (*barbadensis* miller) were collected from the Nagarjuna Medicinal Plants Garden, Dr. P.D.K.V., Akola.

Methods

Preparation of *Aloe vera* juice

Aloe vera juice was prepared as per procedure outlined by (Ramchandra and Rao, 2008) [28].

Preparation of Tulsi juice

Fresh Tulsi leaves were collected and washed with lukewarm water. The leaves were grinded in mixer grinder and then it was filtered and Tulsi juice was obtained.

Preparation of herbal flavoured milk blended *Aloe vera* and Tulsi juice

During the preliminary trials 3% Tulsi juice of variety *Ocimum sanctum* was selected as best for blending with (0, 2, 4, 6, 8 and 10%) levels of *Aloe vera* juice in the final experimental trials.

The flavoured milk was prepared as per the procedure outlined by (De, 2001) [8] with slight modification. The milk after its receipt was filtered through muslin cloth and then standardized to 1.5% fat using Pearson's square method. The standardized milk was pre-heated at (60 °C) and then homogenized at (2500 psi). To the homogenized milk *Aloe vera* juice as per treatments, Tulsi juice, and sugar 8% was added. This mixture was blended and filtered through muslin cloth. The prepared flavoured milk was pasteurized at 71 °C for 15 sec. The pasteurized flavoured milk was cooled at

room temperature and then filled in bottles and stored at refrigeration temperature (5 °C).

Analysis

Physico-chemical analysis of *Aloe vera* and Tulsi juice

The moisture, fat was calculated using (A.O.A.C. 2000) [1]. Percent acidity was determined by titrating against 0.1 N NaOH according to A.O.A.C method (A.O.A.C. 2000) [1]. Specific gravity was determined using hydrometer.

Physico-chemical analysis of Herbal flavoured milk

The herbal flavoured milk was analyzed for its physico-chemical properties i.e moisture, total solids, fat, SNF, protein, ash, titratable acidity, specific gravity, viscosity and total sugar. Moisture content in the milk was determined by subtracting the total solids content from 100. The total solids content in milk was determined by gravimetric method as described by IS 1479 (part II) 1961. Fat content of milk was estimated by Gerber's method. The fat percentage was directly read at the lower point of meniscus in Gerber's butyrometer as per the procedure recommended by the ISI bulletin no IS: 1224 (part I) 1977. The percentage of solids not fat (SNF) was determined by procedure described in ISI Handbook of food analysis (part XI) 1981. Protein was determined by estimating the per cent nitrogen by micro-kjeldahl method as prescribed in IS: 1479 (part II) 1961. The ash content was determined by procedure recommended in IS: 1479 (part-I) 1960. The titratable acidity percentage was determined as per the procedure recommended in IS: 1479 (part-I) 1960. The specific gravity was determined by the procedure described in BIS Handbook of food analysis in SP: 18 part XI (1981). The viscosity of the samples was determined using the Brookfield viscometer. Total sugar of flavoured milk samples was determined as per Lane-Eynon's method given in IS:SP (Part-XI) 1981.

Statistical analysis

The data obtained in respect to sensory evaluation was statistically analyzed by completely randomized design.

Results and Discussion

Proximate composition of Tulsi juice and *Aloe vera* juice

Table 1 reveals that the Tulsi juice had 96.13% moisture with 3.87% dry matter (TS) and 0.62% fat. The titratable acidity and specific gravity of the juice were 0.17% and 1.0096 respectively. This juice was also watery and slightly acidic in nature in comparison to milk. According to USDA nutrient data base, the Tulsi juice was containing 92.06, 0.64 and 3.15% moisture, fat and protein respectively. While Vidhani *et al.* (2016) [37] observed 20.64 and 3.60% protein and fat in Tulsi leaves on dry matter basis respectively. Moreover, Trivedi *et al.* (2014) [35] noticed the content of 5.0, 0.05 and 0.05% dry matter (TS), protein and ash respectively in Tulsi juice. These observations are partially supportive to present values of Tulsi juice.

Table 1: Proximate composition of Tulsi juice and *Aloe vera* juice (%)

| Sr. No. | Constituents | Tulsi juice Percent | <i>Aloe vera</i> juice Percent |
|---------|--------------------|---------------------|--------------------------------|
| 1 | Moisture | 96.13 | 99.13 |
| 2 | Dry matter (TS) | 3.87 | 0.87 |
| 3 | Fat | 0.62 | 0.10 |
| 4 | Titratable acidity | 0.17 | 0.24 |
| 5 | Specific gravity | 1.0096 | 1.0001 |

The *Aloe vera* juice was watery containing 99.13% moisture with hardly 0.87% dry matter (total solids). This logic gets confirmed from the specific gravity of the juice (1.0001) which was practically matching with the specific gravity of water (1.00). Moreover, the fat content of juice was very less (0.1%) however, the juice appeared acidic on the basis of titratable acidity (0.24%) which seems to be more than that of titratable acidity of fresh milk.

It appears from the literature that majority of the past workers like Eshun and He (2004), Boureau and Beland (2006), Bhandari (2010), Ahlawat and Khatkar, (2011), Kaur *et al.* (2015) and Shrikanth *et al.* (2017) [9, 4, 3, 2, 21, 33] reported the moisture content of *Aloe vera* between 96.4 to 99.45% which supports the present value. The variation in moisture content of *Aloe vera* of present study than that of literature value may be attributed to variety of the *Aloe vera*, stage of harvesting and method of juice extraction.

Physico-chemical properties of herbal flavoured milk

Moisture (% water)

The effect of incorporation of Tulsi and *Aloe vera* juice on moisture content of flavoured milk is shown in Table 2. It was observed that the moisture content of flavoured milk ranged from 87.11 to 87.42% being significantly highest (87.42%) and lowest (87.11%) in flavoured milk with 3% Tulsi +10% *Aloe vera* juice (T₆) and 3% Tulsi juice control (T₁) respectively. The mean moisture content of other treatments were 87.18, 87.24, 87.29, 87.34% in 3% Tulsi juice in combination with *Aloe vera* juice at 2% (T₂), 4% (T₃), 6% (T₄) and 8% (T₅) respectively. Thus the trend did indicate as the level of *Aloe vera* increased the moisture content in flavoured milk goes on increasing. This might be due to higher moisture content in *Aloe vera* juice (99.13%).

The observations of Singh *et al.* (2012) [31] do agree with present trend as they reported non-significant effect on moisture content of lassi as a result of blending with 15% *Aloe vera* juice, though there was numerical increase in moisture content due to addition of *Aloe vera* juice. On the other hand majority of the past workers like Shrikanth *et al.* (2017), Mukhekar and Desale (2018), Verma *et al.* (2018) and Yadav *et al.* (2018) [35, 24, 36] opined that fortification of peda, yoghurt, ice cream and probiotic yoghurt with *Aloe vera* juice respectively exhibited increase in moisture content with increased level which are supportive to present trend.

Total solids (%)

The dilution effect of sole 3% Tulsi juice and its combination with *Aloe vera* juice at different levels were found to exercise significant influence on TS content, being slightly but significantly lower for Tulsi + *Aloe vera* juice combination compared to sole Tulsi juice treatment. The average TS content was 12.89, 12.82, 12.76, 12.71, 12.66 and 12.58% in sole 3% Tulsi juice (T₁), 3% Tulsi juice in combination with *Aloe vera* juice at 2% (T₂), 4% (T₃), 6% (T₄), 8% (T₅) and 10% (T₆) respectively. In general TS content of T₁ was significantly higher over rest of the treatments while it was significantly lower in T₆.

With regards to TS content within the combination treatments it was noticed that incorporation of 2% *Aloe vera* juice with 3% Tulsi juice (T₂) recorded significantly more content as compared to rest of the combination (T₃ to T₆) while it was significantly lower in 10% *Aloe vera* juice + 3% Tulsi juice treatment (T₆) and rest of the treatments occupied intermediate position. This trend therefore indicates that there was proportionate decrease in TS content with increasing

level of incorporation of *Aloe vera* juice with Tulsi juice in flavoured milk. Perhaps the lower TS content of Tulsi juice (3.87%) and *Aloe vera* juice (0.87%) and higher moisture content than that of milk used for the preparation might be the reason to decrease the TS content of herbal milk.

It appears from literature that TS content of different milk products decreased with the incorporation of different herbals. Kaur *et al.* (2013), Trivedi *et al.* (2014) [35] and David (2015) [7] reported decrease in TS content of ice cream, ice cream and shrikhand respectively with the incorporation of Tulsi juice extract at different levels (2-8%). Whereas, Singh *et al.* (2012) [31], Pugazhenthii and Jothylingam (2013) [27], Mukhekar and Desale (2018) [24], Verma *et al.* (2018) [36], Yadav *et al.* (2018) and Chaudhary *et al.* (2019) [5] opined that there was decrease in TS content with increased level of *Aloe vera* juice in lassi, dietic flavoured milk, yoghurt, ice cream, probiotic yoghurt and burfi respectively. These findings are collaborative to present results though the products studied by them are different from that of present flavoured milk.

Fat (%)

Fat content showed reduction in all the treatments from that of fat content of double toned milk used for the preparation of herbal flavoured milk. Amongst the treatments 3% Tulsi herbal milk (T₁) contained significantly higher (1.46%) fat over that of other treatments while 3% Tulsi juice +10% *Aloe vera* juice (T₆) had significantly lower fat (1.32). The other treatments recorded fat content between (1.35 to 1.43%). The results further revealed that the degree of decrease in fat content from that of base level (1.5%) in milk used for the preparation of herbal milk was more at higher concentration of *Aloe vera* along with Tulsi juice. Thus the results clearly demonstrated that blending of flavoured milk either with sole Tulsi juice or in combination with *Aloe vera* at higher concentration had adverse effect on fat content of final product.

Majority of the past workers like Kumar *et al.* (2013) [22], Palthur *et al.* (2014) [25], Trivedi *et al.* (2014) [35], David (2015) [7], Gaur *et al.* (2019) [11] opined that incorporation of Tulsi juice in ice cream, flavoured milk, ice cream, shrikhand and herbal milk respectively, decreased the fat content with the increased level of juice due to dilution effect. These views are in agreement with present results of T₁ with 3% Tulsi juice and in general to the results of other treatments.

Solids not fat (%)

The SNF content in treatments (T₁ to T₆) were 11.43, 11.39, 11.36, 11.33, 11.31 and 11.26% respectively. The differences were significant indicating that flavoured milk with 3% Tulsi juice (T₁) contained significantly higher SNF than that of milk blended with 3% Tulsi +10% *Aloe vera* juice (T₆). Increased level of *Aloe vera* from 2-10% in combination with Tulsi juice decreased the SNF content of the product. The results of the present investigation are comparable to the findings of Mane *et al.* (2019) [23] who studied the effect of carrot juice on the chemical composition of flavoured milk using double toned milk and observed the SNF content of carrot flavoured milk within the range of 9.86 to 9.16 and reported that as the level of carrot juice increased in the flavoured milk, the SNF content showed a decreasing trend.

Protein (%)

The treatment (T₁) with 3% Tulsi juice contained significantly more protein (3.40%) in relation to other treatments. The

increase in protein content of flavoured milk may be attributed to the fact that protein content of Tulsi juice is comparable with that of double toned milk (3.39%). David (2015) [7] opined that protein content was more due to inclusion of 3% Tulsi juice in shrikhand, against provision of 4% juice. This trend thus support the present results on 3% Tulsi juice (T₁) used in the study.

With regards to effect of blending 3% Tulsi juice + *Aloe vera* juice at different levels 2 to 10% on protein content of flavoured milk it was observed that protein content decreased significantly in comparison to (T₁) control with sole 3% Tulsi juice. The protein content was 3.33, 3.25, 3.18, 3.12 and 3.06% in T₂, T₃, T₄, T₅ and T₆ treatments respectively, against a protein content of 3.40% in (T₁). This means the protein content decreased progressively with the increased concentration of *Aloe vera* juice in flavoured milk. Amongst the *Aloe vera* treatments significantly lowest protein content was noticed in 3% Tulsi +10% *Aloe vera* juice T₆ as compared to rest of the treatments. The decreased content of flavoured milk might be due to substantially lower protein content in *Aloe vera* juice than that of milk used for the preparation (3.39%) and higher moisture content of *Aloe vera* (99.13%) might have resulted into dilution of the product. The present findings are in agreement with Mukhekar and Desale (2018) [24] and Verma *et al.* (2018) [36] where they reported decrease in protein content with increased level of *Aloe vera* from 12 to 18 and 8 to 10% in yoghurt and ice cream respectively. The protein content (3.22%) reported by Pugazhenthii and Jothylingam (2013) [27] for flavoured milk fortified with 5% *Aloe vera* juice supports the present value of protein content (3.18 to 3.24%) of 4 and 6% *Aloe vera* juice fortified flavoured milk (T₃ and T₄).

Ash (%)

The ash content of the product indicates the mineral content of the product. In view of this it was observed that the incorporation of 3% Tulsi juice and its combination at different levels (2-10%) with *Aloe vera* juice caused decrease in ash content of flavoured milk in comparison to ash content of milk (0.71%) used for the preparation. The ash content of herbal flavoured milk varied from 0.64 to 0.69% indicating a decrease from that of original milk.

The lower ash content of Tulsi juice (0.8%) and *Aloe vera* juice (0.20%) along with higher moisture content in both herbals might be the reason to cause decrease in ash content of flavoured milk after its incorporation in it. The findings of Chaudhary *et al.* (2019) [5] are collaborative to present trend where they noticed decreasing trend in ash content with increased level of *Aloe vera* juice (5-20%) in burfi. While Singh *et al.* (2012) [31] did not observe significant change in ash content of 15% *Aloe vera* juice addition in lassi as well as Yadav *et al.* (2018) reported slight change in the ash content of probiotic yoghurt. In contrast David (2015) [7], Mukhekar and Desale (2018) [24], Verma *et al.* (2018) [36] observed increase in ash content of Shrikhand, yoghurt and ice cream respectively with increased level of *Aloe vera* juice incorporation in products. Perhaps the basic difference between fermented milk products and fresh flavoured milk might be the reason to have the variation between their observations and present trend.

Titrateable acidity (%)

The titrateable acidity was ranging from 0.141 to 0.151%, indicating that flavoured milk was slightly acidic in nature as a result of incorporation of Tulsi and *Aloe vera* juice.

However, it was numerically higher (0.151%) in 3% Tulsi + 10% *Aloe vera* juice (T₆) than that of sole 3% Tulsi juice treatment (T₁). Moreover, it was also noted that there was slight increase in acidity with the increased concentration of *Aloe vera* juice in combination with Tulsi juice in flavoured milk. This may be attributed to the fact that acidity of *Aloe vera* juice (0.24%) and Tulsi juice (0.17%) are higher than that of toned milk (0.14%) used for the preparation of flavoured milk. Similar views were expressed by Chaudhary *et al.* (2019) [5] where they noticed decrease in pH of burfi from (6.69 to 6.46) due to addition of *Aloe vera* juice which was justified on account of acidic nature of *Aloe vera* juice. While Sonwalkar *et al.* (2017) [32] opined that the increase in acidity of flavoured milk after blending with jackfruit pulp was due to high level acidity (0.24%) in jackfruit pulp. Besides this Singh *et al.* (2005) [30], Hassan *et al.* (2015) [12], Tayade *et al.* (2018) [34] and Kamble *et al.* (2019) [20] observed increase in acidity of carrot flavoured milk, fruit flavoured milk, black carrot flavoured milk and piper betel flavoured milk respectively. This means inclusion of any herbals in dairy products would cause increase in acidity value. Hence inspite of difference in herbals used by them and in the present study, which justifies the present trend.

Specific gravity

The specific gravity was ranging from 1.034 to 1.039. The highest (1.039) specific gravity was found in T₁ with only 3% Tulsi juice. While the lowest (1.034) was found in T₆ with 3% Tulsi juice + 10% *Aloe vera* juice. The specific gravity decreased with increase in the level of *Aloe vera* juice. The decrease in specific gravity might be due to the less specific gravity of *Aloe vera* juice (1.0001) and higher moisture content (99.13%) which might have resulted to the dilution effect. The results of the present investigation are comparable to the findings of Singh *et al.* (2005) [30] who noted that the specific gravity of flavoured milk beverage at 10 per cent level of incorporation of juice was highest for both buffalo milk (1.065) and cow milk (1.064) and was lowest at 30 per cent level of incorporation for both buffalo milk (1.063) and cow milk (1.061). Similar findings were also reported by Jayalalitha *et al.* (2012) [18] who developed a novel biobeverage and observed the specific gravity as (1.060±0.02) which was higher than that of milk. The higher specific gravity was attributed to the value addition by incorporating beetroot juice, carrot juice and dates extract. Moreover, Pugazhenthii and Jothylingam (2013) [27] prepared dietetic herbal flavoured milk and reported the specific gravity of control (5% *Aloe vera* pulp) flavoured milk as 1.065. Palthur *et al.* (2014) and Palthur *et al.* (2014) [25, 26] reported the specific gravity values of Tulsi flavoured milk and ginger flavoured milk as (1.085±0.02) and (1.078±0.02). The findings of the past workers are similar to the present study which shows that the specific gravity of T₁ (with 3% Tulsi juice) was higher than rest of the treatments i.e T₂, T₃, T₄, T₅ and T₆, respectively which indicates that the specific gravity of Tulsi juice blended flavoured milk was more than that of *Aloe vera*.

Viscosity

It was noticed that the viscosity of herbal flavoured milk differed significantly between the treatments. The viscosity of flavoured milk with 3% Tulsi juice blending (T₁) was significantly more over rest of the treatments except (T₂) which was at par with (T₁). This means incorporation of 2% *Aloe vera* juice along with 3% Tulsi juice did not influence

significantly on the viscosity of milk i.e comparable with that of single dose of Tulsi juice incorporation.

In contrast the viscosity of milk exhibited decreased trend with the increased level of *Aloe vera* juice in combination of Tulsi juice. As significantly lower viscosity value was recorded for T₆ containing 3% Tulsi +10% *Aloe vera* juice in flavoured milk. The average viscosity of herbal flavoured milk was 1.69, 1.67, 1.65, 1.63, 1.61 and 1.59 cP for T₁, T₂, T₃, T₄, T₅ and T₆ respectively.

The addition of herbal juice might have resulted into dilution of milk due to more moisture content with less total solids, thereby decrease in TS content of flavoured milk, consequently reflecting on the viscosity of the product. The views expressed by Kamble *et al.* (2019) [20] are supportive to this contention where they reported negative correlation between level of blending piper betel juice in flavoured milk and viscosity, indicating increasing the level from 3-7% there was decrease in viscosity of piper betel juice blended flavoured milk.

Moreover, Singh *et al.* (2005) [30], Singh *et al.* (2012) [31], Pugazhenthithi and Jothilingam (2013) [27] and Hassan *et al.* (2015) [12] noticed decrease in viscosity of milk enriched with 10-30% carrot juice, 15% *Aloe vera* lassi, 3-7% *Aloe vera* dietetic herbal flavoured milk and 10-20% fruit flavoured milk respectively, which supports the present trend.

Total sugar (%)

It was observed that incorporation of 3% Tulsi juice and its combination at different levels (2-10%) with *Aloe vera* juice caused decrease in the total sugar content of the flavoured milk. The total sugar content of herbal flavoured milk varied from 12.74 to 12.29%. Moreover, the total sugar percentage differed significantly between the treatments, indicating significantly highest (12.74%) in sole 3% Tulsi juice (T₁) and lowest (12.29%) in 3% Tulsi juice+10% *Aloe vera* juice (T₆). While, 12.65, 12.55, 12.46 and 12.36% total sugar was found in 3% Tulsi juice in combination with 2% (T₂), 4% (T₃), 6% (T₄) and 8% (T₅) *Aloe vera* juice respectively. The total sugar percentage in herbal flavoured milk decreased with increase in the level of *Aloe vera* juice which might be due to the less percentage of total sugar present in the *Aloe vera* juice. The findings of Hassan *et al.* (2015) [12] are collaborative to the present trend where they noticed decreasing trend from (10.83 to 10.75%) in total sugar percentage with increased level of apple juice (10-20%) in fruit flavoured milk based beverage. Besides, Sonwalkar *et al.* (2017) [32] noticed increasing trend in the total sugar percentage of flavoured milk with increase in the concentration of jackfruit pulp, do not match the present results which might be due to the different concentration of total sugars in *Aloe vera* juice and jackfruit pulp.

Table 2: Effect of incorporation of 3% Tulsi juice and different levels of *Aloevera* juice on physico-chemical properties of fresh herbal flavoured milk (Mean values of replications)

| Treatments | Moisture (%) | TS (%) | Fat (%) | SNF (%) | Protein (%) | Ash (%) | T. Acidity (%) | Specific gravity | Viscosity (cP) | Total sugar (%) |
|----------------|--------------|--------|---------|---------|-------------|---------|----------------|------------------|----------------|-----------------|
| T ₁ | 87.11 | 12.89 | 1.46 | 11.43 | 3.40 | 0.69 | 0.141 | 1.039 | 1.69 | 12.74 |
| T ₂ | 87.18 | 12.82 | 1.43 | 11.39 | 3.33 | 0.68 | 0.143 | 1.038 | 1.67 | 12.65 |
| T ₃ | 87.24 | 12.76 | 1.40 | 11.36 | 3.25 | 0.67 | 0.145 | 1.037 | 1.65 | 12.55 |
| T ₄ | 87.29 | 12.71 | 1.38 | 11.33 | 3.18 | 0.66 | 0.147 | 1.036 | 1.63 | 12.46 |
| T ₅ | 87.34 | 12.66 | 1.35 | 11.31 | 3.12 | 0.65 | 0.149 | 1.035 | 1.61 | 12.36 |
| T ₆ | 87.42 | 12.58 | 1.32 | 11.26 | 3.06 | 0.64 | 0.151 | 1.034 | 1.59 | 12.29 |
| F-test | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig | Sig |
| S.E (m) ± | 0.006 | 0.006 | 0.005 | 0.006 | 0.005 | 0.003 | 0.0003 | 0.0006 | 0.005 | 0.004 |
| C.D at 5% | 0.018 | 0.019 | 0.015 | 0.019 | 0.014 | 0.008 | 0.0010 | 0.0018 | 0.015 | 0.014 |

*Treatments

| | | | | | |
|--------------------------------|--|--|--|--|---|
| T ₁ :3% Tulsi juice | T ₂ :3% Tulsi juice + 2% A.V. juice | T ₃ :3% Tulsi juice+4% A.V. juice | T ₄ :3% Tulsi juice + 6% A.V. juice | T ₅ :3% Tulsi juice + 8% A.V. juice | T ₆ :3% Tulsi juice+10% A.V. juice |
|--------------------------------|--|--|--|--|---|

Conclusion

On the basis of the results obtained by sensory evaluation, the flavoured milk prepared by blending 3% Tulsi juice+ 6% *Aloe vera* juice had good overall acceptability and was sensorily most acceptable. The flavoured milk prepared by blending 3% Tulsi juice+ 6% *Aloe vera* juice had moisture (87.29%), TS (12.71%), fat (1.38%), SNF (11.33%), protein (3.18), ash (0.66%), titratable acidity (0.147), specific gravity (1.036) viscosity (1.63 cP) and total sugar (12.46%).

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