

Short Communication

**ANALYSIS OF PHYSICO CHEMICAL PROPERTIES OF
LOW CALORIE HERBAL FLAVOURED MILK***

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ABSTRACT

Herbal flavoured milk was prepared by incorporating Aloe vera pulp extract at different concentrations viz. 3, 5 and 7 per cent. Based on the sensory evaluation, herbal flavoured milk with 5 per cent Aloe vera pulp extract was found to be the best. Different low calorie herbal flavoured milk were prepared using artificial sweeteners like aspartame and sucralose at different levels of sugar replacement and stored at 5° C up to 5 days for further analysis. Based on the sensory evaluation, dietetic herbal flavoured milk up to 75 per cent replacement of sugar with aspartame and 100 per cent replacement of sugar with sucralose were found to be ideal. Among the various physico chemical properties analysed in dietetic herbal flavoured milk, the mean pH and titratable acidity were within the normal range. When the level of artificial sweeteners was increased to replace the sugar, the specific gravity, viscosity, SNF and total solids content decreased. There was no significant difference ($P > 0.05$) between the control and various treatments with regard to fat, lactose, total ash, minerals like calcium, phosphorus, sodium, potassium and iron contents. On the contrary, there was a highly significant ($P < 0.01$) difference in SNF and total solids content.

Key words: Flavoured milk - *Aloe vera* – artificial sweeteners – physico chemical properties

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INTRODUCTION

Nowadays, more and more people are adopting herbal way of life for their health benefits. There is also a need to find diverse technologies for value addition of milk. *Aloe vera* is one of the oldest known medicinal plants gifted by nature. Flavoured milk is a delicious, nutritious, healthy and relatively inexpensive thirst quenching drink consumed by all categories of people. Herbal flavoured milk was prepared by incorporating 5 per cent *Aloe vera* pulp extract. Artificial sweeteners have an important role in preparing diets for people with diabetes and obesity. A search for a more versatile and better tasting sweetener is ongoing to yield improved products. This would find improved palatability and acceptability by the consumers (Modi and Borges, 2005). The discovery of many sweeteners during the last decade has triggered the development of new sugar free food products particularly for diabetic and obese people (Ozdemir and Sadikoglu, 1998). In the present study, different dietetic herbal flavoured milk were prepared using *Aloe vera* pulp extract and artificial sweeteners like aspartame and sucralose and the products were analysed for their physico-chemical properties and chemical composition.

MATERIALS AND METHODS

Fresh skim milk was obtained by separating the fresh cow milk using cream separator immediately after receiving at model dairy plant, Department of Dairy Science, Madras Veterinary College, Chennai. Fresh, clean and leafy *Aloe vera*, good quality cane sugar, apple green colour (Bush Boak Allen - IH 8925) and cardamom flavour (Bush Boak Allen - MC 1919) were used in this study.

Aspartame (Sugar Free Natura, Cadila Health Care Ltd., Ahmadabad, India) and sucralose (Ensigns Health Care Pvt. Ltd., Pune, Maharastra, India) were used as artificial sweeteners.

Aloe vera pulp extract was prepared as per the procedure outlined by Ramachandra and Rao, 2008. For the preparation of dietetic herbal flavoured milk, the procedure given by De (1980) was followed. Trials were conducted to assess the level of addition of *Aloe vera* pulp extract to prepare herbal flavoured milk. Among 3, 5 and 7 per cent *Aloe vera* pulp extracts tried, 5 per cent was found to be ideal based on sensory evaluation and was used as control (A₂) for further studies. Low calorie herbal flavoured milk using 5 per cent *Aloe vera* pulp extract was prepared by replacing 25, 50, 75 and 100 per cent of sugar either with aspartame (TA₁, TA₂, TA₃ and TA₄ respectively) or with sucralose (TS₁, TS₂, TS₃ and TS₄ respectively).

Using standard procedures outlined in BIS: SP: 18 (Part XI) – 1981, AOAC, Vol. II, 16th Edition, 1995, AOAC, 18th Edition, 2006 and Sommer, 1951, physico-chemical properties and chemical composition of low calorie herbal flavoured milk were estimated. The data were tabulated and subjected to statistical analysis by means of analysis of variance (ANOVA) as per the procedure given by Snedecor and Cochran (1994).

RESULT AND DISCUSSION

Physico chemical properties of low calorie herbal flavoured milk

The mean values of physico chemical properties viz. pH, titratable acidity, specific gravity and viscosity of different low calorie

herbal flavoured milk with their statistical analysis were presented in Table 1. There was no significant ($P > 0.05$) difference in pH, titratable acidity of different low calorie herbal flavoured milk and control. The mean values of pH and acidity of dietetic herbal flavoured milk ranged from 6.71 to 6.75 and 0.14 - 0.15 % respectively. These results were in accordance with the findings of De, (1980) who interpreted the same range of pH and acidity in flavoured milk.

Whenever the level of artificial sweeteners was increased, the specific gravity and viscosity decreased. Statistical analysis showed that there was highly significant ($P > 0.01$) difference in specific gravity between different dietetic herbal flavoured milk and control. The mean values of viscosity of different dietetic herbal flavoured milk were lower than the control. This was in concurrence with the findings of Mittal and Bajwa (2011) who reported that sugar replacement in low calorie cardamom milk drinks considerably decreased total solids and viscosity.

Chemical composition of dietetic herbal flavoured milk

Table 2 shows the mean values of chemical constituents in control (A_2) as well as different low calorie herbal flavoured milk. There was no significant ($P > 0.05$) difference between various low calorie herbal flavoured milk and control with regard to fat, lactose, total ash and mineral content. On the contrary, highly significant ($P > 0.01$) difference was noticed in SNF and total solids content. The values obtained were within the legal standards of flavoured milk (De, 1980). The highest SNF and total solids in control were due to high sugar level, which were similar to the findings

of Bhardwaj and Beniwal (2009) who also reported that the increased levels of the replacement of sugar by artificial sweeteners decreased the SNF and total solids of the low calorie flavoured milk.

The mean protein content of dietetic herbal flavoured milk ranged from 3.02 to 4.03 %. This variation might be due to the various levels of added aspartame which is protein in nature. As the level of aspartame increases, the protein content also increased which was in agreement with Lasekan *et al.* (2007). Statistical analysis revealed that there was a highly significant ($P > 0.01$) difference in dietetic herbal flavoured milk containing aspartame, whereas, no significant ($P > 0.05$) difference was observed in sucralose containing flavoured milk with that of the control.

The mean lactose content of the prepared products ranged from 4.8 to 4.9 per cent. Lactose is a constituent available only in the milk which was carried over at the same level in prepared flavoured milk also. Hence, there was no significant ($P > 0.05$) difference with regard to lactose content. Mittal and Bajwa (2011) observed almost similar range in control as well as low calorie flavoured drinks, they prepared. The mean values of total ash, calcium, phosphorus, sodium, potassium and iron levels were within the normal range as indicated in BIS: SP: 18 (Part XI) – 1981. But, there was a slight increase in the mentioned mineral content, which may be due to the minerals present in *Aloe vera* pulp itself ([http://www.Aloe vera's nutritional fact.com](http://www.Aloe-vera's-nutritional-fact.com)). Mittal and Bajwa (*Loc cit.*) 2011 found that the total ash content of control as well as low calorie flavoured drink was 0.67 per cent which confirms the results obtained in this study.

Table 1
Physico chemical properties of different low calorie herbal flavoured milk (Mean±SE)[@]

Treatments	Physico chemical properties			
	pH	Titrateable acidity (% L.A)	Specific gravity	Viscosity (Centipoises)
A ₂	6.71±0.009	0.14±0.003	1.065 ^a ±0.011	320.35 ^a ±0.758
TA ₁	6.72±0.012	0.14±0.002	1.058 ^b ±0.020	299.33 ^b ±0.802
TA ₂	6.72±0.006	0.14±0.005	1.052 ^c ±0.022	281.16 ^c ±0.307
TA ₃	6.73±0.014	0.15±0.005	1.048 ^d ±0.013	260.83 ^d ±0.307
TA ₄	6.73±0.002	0.15±0.005	1.043 ^c ±0.010	254.16 ^c ±0.307
TS ₁	6.71±0.007	0.14±0.003	1.057 ^b ±0.010	299.50 ^b ±0.763
TS ₂	6.73±0.002	0.15±0.004	1.052 ^c ±0.016	281.33 ^c ±0.494
TS ₃	6.74±0.021	0.15±0.006	1.048 ^d ±0.011	261.00 ^d ±0.365
TS ₄	6.74±0.003	0.15±0.002	1.042 ^c ±0.012	254.66 ^c ±0.333
F value	1.49^{NS}	1.85^{NS}	111.28^{**}	1928.82^{**}

@ - Average of six trials (Different superscripts in a column differ significantly)

** - Highly significant; NS- Non significant

A₂ - Control (Flavoured milk with 5 % *Aloe vera* pulp extract)

TA₁, TA₂, TA₃, TA₄, TS₁, TS₂, TS₃ and TS₄ - Dietetic herbal (5 % *Aloe vera*) flavoured milk containing 25, 50, 75 and 100 per cent replacement of sugar with aspartame, sucralose respectively.

Table 2 Chemical composition of different low calorie herbal flavoured milk with artificial sweeteners (Mean±SE)[@]

Treatments	Chemical composition										
	Fat (%)	SNF (%)	Protein (%)	Lactose (%)	Total solids (%)	Total ash (%)	Calcium (%)	Phosphorus (%)	Sodium (mg/100g)	Potassium (mg/100g)	Iron (µg/l)
A ₂	2.02±0.018	14.22 ^a ±0.024	3.22 ^c ±0.025	4.88±0.018	16.59 ^a ±0.041	0.75±0.008	0.20±0.003	0.11±0.003	55.24±0.023	130.76±0.212	290.27±0.033
TA ₁	2.03±0.022	14.07 ^b ±0.003	3.42 ^d ±0.023	4.91±0.012	16.00 ^b ±0.019	0.76±0.007	0.21±0.008	0.11±0.004	55.44±0.222	130.40±0.214	289.82±0.024
TA ₂	2.03±0.033	13.05 ^c ±0.008	3.63 ^c ±0.046	4.85±0.016	15.26 ^c ±0.020	0.76±0.011	0.21±0.002	0.12±0.002	55.34±0.018	130.41±0.220	290.21±0.304
TA ₃	2.07±0.055	12.62 ^d ±0.015	3.83 ^b ±0.024	4.86±0.127	14.50 ^d ±0.057	0.78±0.007	0.20±0.002	0.12±0.004	55.23±0.041	130.48±0.214	290.37±0.334
TA ₄	2.11±0.057	11.70 ^e ±0.036	4.03 ^a ±0.036	4.85±0.016	13.75 ^e ±0.034	0.77±0.011	0.22±0.003	0.13±0.004	55.17±0.032	130.51±0.224	290.23±0.024
TS ₁	2.12±0.039	14.06 ^b ±0.003	3.22 ^c ±0.026	4.84±0.126	16.01 ^b ±0.028	0.76±0.007	0.21±0.001	0.12±0.007	54.89±0.022	130.28±0.244	290.31±0.250
TS ₂	2.11±0.061	13.04 ^c ±0.017	3.23 ^c ±0.016	4.91±0.013	15.29 ^c ±0.025	0.75±0.005	0.21±0.002	0.12±0.001	55.02±0.036	130.22±0.237	290.27±0.104
TS ₃	2.08±0.023	12.62 ^d ±0.003	3.23 ^c ±0.016	4.85±0.014	14.49 ^d ±0.049	0.78±0.004	0.20±0.002	0.11±0.004	55.03±0.019	129.76±0.217	289.86±0.126
TS ₄	2.01±0.027	11.68 ^e ±0.040	3.23 ^c ±0.015	4.87±0.119	13.74 ^e ±0.020	0.75±0.008	0.22±0.005	0.13±0.001	55.17±0.029	129.77±0.227	290.32±0.046
F value	1.21 ^{NS}	2670.11 ^{**}	3001.17 ^{**}	1.92 ^{NS}	609.25 ^{**}	2.61 ^{NS}	1.50 ^{NS}	1.10 ^{NS}	1.62 ^{NS}	1.28 ^{NS}	1.63 ^{NS}

@ - Average of six trials (Different superscripts in a column differ significantly)

** - Highly Significant; NS- Non significant

A₂ - Control (Flavoured milk with 5 % *Aloe vera* pulp extract)

TA₁, TA₂, TA₃, TA₄, TS₁, TS₂, TS₃ and TS₄ - Dietetic herbal (5 % *Aloe vera*) flavoured milk containing 25, 50, 75 and 100 per cent replacement of sugar with aspartame, sucralose respectively.

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