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Effect of storage on sensory and microbiological qualities of flavoured milk blended with beetroot juice as natural colorant

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Abstract

The present study was carried out with objectives to study the sensory and microbiological qualities of flavoured milk blended with beetroot juice as natural colorant during storage. The levels were selected as 100, 90, 80 and 70 per cent cow milk, 10, 20 and 30 per cent soymilk and 2 per cent beetroot juice for further study. All experimental samples were analyzed for sensory and microbiological qualities on day 1st, 3rd day, 5th day and 7th day of storage period at refrigerated temperature (5 °C). The best treatment T₂ (80% cow milk + 20% soymilk + 2% beetroot juice) obtained organoleptically acceptable up to 7th days during storage at refrigerated temperature.

Keywords: flavoured milk, storage study, sensory, microbiology, beetroot juice

Introduction

Flavoured milk is generally made from low fat milk (1.5 per cent fat and 9 per cent SNF). It is flavoured, sweetened and heat treated for extending its shelf life. Few of the brand names of flavoured milk in market are 'Energiee' in Bombay, 'Vita' in Haryana and 'Verka' in Punjab. Now days, there is a trend for health foods. The health conscious consumers show great interest in low calorie milk and milk products. Development of artificially sweetened milk products is related to reduction in the carbohydrate intake. Flavoured milk in which sugar and flavouring agents colouring matters are added in the milk, it contain all the constituents of milk. It is good source of proteins, carbohydrates and minerals. It provides energy and water to digest the food, regulate body temperature and prevent dehydration. Flavoured milk may be pasteurized, sterilized, boiled. The type of milk 1.5 – 3.0 per cent fat is considered highly suitable for the preparation of flavoured milk. From economic point of view this milk is very important because it is prepared milk, more palatable to these who not relish milk as such, to stimulate the sale of milk and economic utilization milk.

Soy based foods may provide additional benefits for the consumer due to their hypolipidemic, anti-cholesterolemic, anti-atherogenic properties and reduced allergenicity. They provide an alternative source of protein for people who are allergic to milk protein (Bean, 1966) [2]. Soy milk based yogurt offers a considerable appeal for a growing segment of consumers with certain dietary and health concerns. It has advantages over milk yogurt including reduced level of cholesterol and saturated fat as well as low level of lactose (Liu, 1997) [5]. Beetroot is a good source of protein, dietary fibre, important vitamins, minerals and rich in carbohydrates and betaine but very low in fat and free from cholesterol (McCance and Widdowson, 1995) [7]. Beetroot has always been a vital source of energy enriched with nutrients and fibre. It's calorific value is 43.0 per 100g. Beetroot is rich source of potassium, iron, Magnesium, Manganese, Phosphorus and Copper. Beetroot consists of Vitamin C, Folate and Betaine in large quantities. It also constitutes traces of Beta Carotene which characterized the beetroot as natural colouring agent. Hence, looking to the importance of soy milk, beetroot juice it was proposed to utilize soy milk in the preparation of flavoured milk and studied the sensory and microbiological qualities during storage.

Materials and Methods

Materials

Fresh cow milk was procured from RCDP on Cattle, MPKV, Rahuri Dist. Ahmednagar. The soybean was obtained from the Central Farm of post graduate institute, Rahuri. The seeds were cleaned and used for preparation of soymilk. Good quality, crystalline, clean sugar was

purchased from Rahuri Local Market. Beetroots were purchased from local market of Rahuri, Dist. Ahmednagar.

Methodology

Preparation of flavoured milk blended with soymilk and beetroot juice

Cow milk was standardized to 3.0 per cent fat. A pre-determined level of soymilk was blended with cow milk as pre-experimental trials and the mixture was heated up to boiling. A sugar was added @ 7 per cent in all treatments and allows cooling at room temperature with continuous stirring. Drops of beetroot juice as natural colorant and flavour were added with stirring for uniform distribution of flavour as per pre-experimental trials. This flavoured milk was filled in 100 ml capacity glass bottle with crown cap and stored in refrigeration condition before sensory evaluation.

Treatment details

Treatments for the preparation of flavoured milk from cow milk blended with different levels of soymilk and beetroot juice were finalized as follows:

T₀- 100% cow milk+2% beetroot juice

T₁- 90% cow milk+10% soymilk+2% beetroot juice

T₂- 80% cow milk + 20% soymilk+2% beetroot juice

T₃- 70% cow milk +30% soymilk+2% beetroot juice

Analytical Methods

Sensory evaluation

The samples of flavoured milk prepared in all treatment combinations were subjected to the sensory evaluation in two days interval by panel of 6 semi-trained judges. It was judged for colour and appearance, flavour, consistency, taste and overall acceptability using “9 point hedonic scale” developed by (Gupta, 1976) [3].

Microbiological analysis

The standard plate count, yeast and mould count and coliform count were enumerated as per procedure described in A.O.A.C. (1999) using standard media of Hi-Media make.

Statistical analysis

The data obtained in the present investigation was tabulated. The data was analysed statistically by using Factorial completely Randomized Design (FCRD) as per Panse and Sukhatme, (1985) [8].

Results and Discussion

Sensory quality of flavoured milk during storage

Colour and appearance

The influence of addition of soymilk and beetroot juice in the flavoured milk were significantly ($P<0.05$) influenced the

colour and appearance of the product during storage period. The mean values for colour and appearance score were ranged from 8.8 to 5.0. The colour and appearance of the treatment T₂ was more attractive than other treatment on day 1st, but the colour of the product on 3rd, 5th and 7th disappeared as storage period progressed.

Table 1: Effect of storage on colour and appearance of flavoured milk

Treatment	Days			
	I st	III rd	V th	VII th
T ₀	8.0 ^b	7.0 ^b	5.4 ^b	-
T ₁	8.2 ^c	7.6 ^c	6.4 ^c	-
T ₂	8.8 ^d	8.6 ^d	8.2 ^d	7.6 ^a
T ₃	7.0 ^a	6.3 ^a	5.0 ^a	-
SE	0.0077	0.0067	0.0064	-
CD @ 5%	0.022	0.019	0.0018	-

Note: - indicated that the product has been spoiled

Flavour

The score obtained for flavour of flavoured milk is tabulated in Table No. 2. The influence of addition of soymilk and beetroot juice in the flavoured milk were significantly ($P<0.05$) differ on 1st, 3rd, 5th days of storage period. The mean flavour score was ranged from 7.0 to 8.8 on days 1st, 6.0 to 8.6 on days 3rd, 4.0 to 8.0 on 5th day, respectively during storage period. As the days of storage increase there was increased in the beany flavour. Thus the score for flavour goes to decrease as per increase in storage days.

Table 2: Effect of storage on flavour of flavoured milk

Treatment	Days			
	I st	III rd	V th	VII th
T ₀	8.0 ^b	7.0 ^b	5.0 ^b	-
T ₁	8.2 ^c	7.4 ^c	6.2 ^c	-
T ₂	8.8 ^d	8.6 ^d	8.0 ^d	7.4 ^a
T ₃	7.0 ^a	6.0 ^a	4.0 ^a	-
SE±	0.006	0.005	0.005	-
CD @ 5%	0.017	0.016	0.015	-

Note: - indicated that the product has been spoiled.

Consistency

The addition of soymilk in the flavoured milk the consistency also becomes thinner in the treatment samples. As storage period increases the consistency become thinner in the sample treatments, on 7th days of storage period. There was significant ($P<0.05$) difference among all treatment samples on all days of storage period except 7th days. The treatment T₀ score highest among all the treatments on 1st, 3rd, 5th and 7th of storage.

Table 3: Effect of storage on consistency of flavoured milk

Treatment	Days			
	I st	III rd	V th	VII th
T ₀	8.5 ^d	8.0 ^d	7.5 ^d	7.0 ^a
T ₁	8.0 ^c	7.0 ^c	6.0 ^c	-
T ₂	7.3 ^b	6.5 ^b	5.0 ^b	-
T ₃	7.0 ^a	6.0 ^a	4.0 ^a	-
SE±	0.008	0.007	0.006	-
CD @ 5%	0.022	0.021	0.019	-

Note: - indicated that the product has been spoiled.

Taste

The score obtained for taste of flavoured milk is tabulated in Table No. 4. Addition of soymilk and beetroot juice in the flavoured milk were significantly ($P<0.05$) influenced the taste of the product during storage period.

Table 4: Effect of storage on taste of flavoured milk

Treatment	Days			
	I st	III rd	V th	VII th
T ₀	8.0 ^a	7.0 ^b	5.0 ^b	-
T ₁	8.1 ^b	7.0 ^b	6.0 ^c	-
T ₂	8.4 ^c	8.0 ^c	7.5 ^d	7.0 ^a
T ₃	8.0 ^a	6.0 ^a	4.5 ^a	-
SE	0.007	0.007	0.006	-
CD @ 5%	0.021	0.020	0.019	-

Note: - indicated that the product has been spoiled.

The mean values for taste were ranged from 8.4 to 4.5. The treatment T₂ was highest score among all the treatments on 1st, 3rd, 5th and 7th of storage. This clearly indicates that as the level of soymilk increases the taste score decreases due to unpleasant chalky taste and level of beetroot juice increases the taste score increases.

Overall acceptability

From the Table 5 it was revealed that, the influence of addition of different level of soymilk and beetroot juice in the flavoured milk samples significantly ($P<0.05$) influence the overall acceptability of the product during all the days of storage. The mean sensory scores of the flavoured milk samples under various treatments ranged from 7.0(T₃) to 8.2(T₂) on day 1st, 5.6(T₃) to 7.7(T₂) day 3rd, 5.0(T₀) to 7.4(T₂) on day 5th, of storage. The results suggest that the product under the various treatments T₃ became unfit for acceptance sensorily from 5th day of storage.

Table 5: Effect of storage on overall acceptability of flavoured milk

Treatment	Days			
	I th	III rd	V th	VII th
T ₀	7.7 ^b	6.7 ^b	5.0 ^a	-
T ₁	8.0 ^c	7.0 ^c	5.8 ^b	-
T ₂	8.2 ^d	7.7 ^d	7.4 ^c	7.1 ^a
T ₃	7.0 ^a	5.6 ^a	-	-
SE±	0.008	0.008	0.006	-
CD @ 5%	0.023	0.022	0.018	-

Note: - indicated that the product has been spoiled.

Microbiological quality of flavoured milk during storage SPC

The influence of addition of soymilk and beetroot juice in flavoured milk on SPC during storage was significant on all days of storage period. The count of SPC ranged from 0.46-0.52 x 10²cfu/ml on day 1st, 1.91-2.10 x 10³ cfu/ml on 3rd day, 1.98-2.21 x 10⁴ cfu/ml on 5th day, 2.06-2.30 x 10⁵cfu/ml on 7th during storage period. SPC increased linearly as compared to the fresh samples with progressive storage period up to 7th day of storage.

YMC

The data on YMC of flavoured milk is reported in Table 6. The influence of addition of soymilk and beetroot juice in flavoured milk on YMC during storage was significant on all days of storage period. The YCM growth was not observed in first three day of storage but YCM count ranged from 1.07 –

1.26 x 10¹cfu/ml on 5th day, 1.80 – 2.16 x 10¹cfu/ml on 7th day during storage period.

Coliform Count

There was no growth of coliform counts in the flavoured milk during total experimental analysis. The similar result was found by Mbaeyi-Nwaoha. (2012) [6] in Yoghurt flavoured with beetroot juice he reported that, there was no coliform growth in all the samples.

Table 6: Effect of storage on Microbiological quality of flavoured milk

Microbial parameter	Treatments	Days			
		I st	III rd	V th	VII th
SPC (cfu/ml)	T ₀	0.52 ^c	2.10 ^c	2.21 ^d	2.30 ^c
	T ₁	0.50 ^b	2.02 ^b	2.15 ^c	2.28 ^c
	T ₂	0.47 ^a	2.00 ^b	2.02 ^b	2.11 ^b
	T ₃	0.46 ^a	1.91 ^a	1.98 ^a	2.06 ^a
YCM (cfu/ml)	T ₀	NIL	NIL	1.26 ^d	2.16 ^d
	T ₁	NIL	NIL	1.20 ^c	2.00 ^c
	T ₂	NIL	NIL	1.12 ^b	1.94 ^b
	T ₃	NIL	NIL	1.07 ^a	1.80 ^a
CC (cfu/ml)	T ₀	NIL	NIL	NIL	NIL
	T ₁	NIL	NIL	NIL	NIL
	T ₂	NIL	NIL	NIL	NIL
	T ₃	NIL	NIL	NIL	NIL

Conclusion

The best quality flavoured milk T₂ (80% cow milk, 20% soymilk and 2% beetroot juice) could be stored in good condition and organoleptically acceptable up to 7 days at refrigerated temperature. The microbial count in all samples showed increasing trend during storage period, however coliform count was nil for all samples during storage period of 7 days.

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References

1. AOAC. Official methods of analysis, 16th Edn. Association of Official Analytical Chemists, Washington, D.C., U.S.A 1995.
2. Bean LH. Closing the world's nutritional gap with animal or vegetable protein. FAO Bull. No. 1966;6:487-492.
3. Gupta SK. Sensory evaluation in food industry. Indian Dairyman 1976;28(7):293-295.
4. Khodke SU, Shinde KS, Yenge GB. Studies on shelf-life of fresh soymilk. International. J. Proc. & Post Harvest Technol 2014;5(2):120-126.
5. Liu K. Soybeans: Chemistry, technology and utilization, book, New York 1997.
6. Mbaeyi-Nwaoha, Ifeoma E, Nwachukwu GO. Production and Evaluation of Yoghurt Flavoured with Beetroot (*Beta vulgaris* L.) Journal of Food Science and Engineering 2012;2:583-592.
7. McCance RA, Widdowson EM. The Composition of Foods. UK: The Royal Society of Chemistry, Cambridge, Ed: 1995, 5.
8. Panse VG, Sukhatme PV. Statistical methods for Agricultural workers, 2nd Edn., ICAR, New Delhi 1985.