OVERALL ACCEPTABILITY SCORES WITH EFFECT OF FAT LEVELS, SUGAR LEVELS, FLAVOURING AGENTS AND STORAGE PERIODS OF FLAVOURED COW MILK

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ABSTRACT

Milk has been a part of diet of Indian society since times immemorial. Our scriptures are full of references on importance and value of milk for human life and the only milk, apart from mother's milk, known to Indians was cow milk only which has been equated with Amrita. Numerous characteristics of a food determine its acceptability to consumers and to regulatory officials. The observations with regard to sensory evaluation (flavour, colour and appearance, sweetness and overall acceptability) chemical characteristics (total solids, fat, protein, sucrose, acidity and ash) and microbiological quality (standard plate count, coliform and yeasts and moulds count) were recorded. The data thus obtained were analyzed statistically by using factorial completely randomized design. The Flavoured milk was prepared from cow milk. Cow milk standardized three fat levels *viz.* 2, 2.5 and 3.0%, sugar (4%, 5%, 6% and 7%), flavouring agents (vanilla, pineapple, and mango) and storage periods 0, 3, 6, 9 and 12 days were used for the preparation of Flavoured milk. The overall acceptability score of flavoured milk was affected significantly by different fat levels. The maximum (7.23) was found in A_2 samples and minimum (6.64) was noted in A_1. The overall acceptability score of Flavoured milk was affected significantly by different sugar levels. The maximum (7.30) was noted in B_2 samples, while minimum score (6.57) was noted in B_4. The overall acceptability score of Flavoured milk was also affected significantly by different flavouring agents.

Key words : 　*Sensory evaluation, overall acceptability score, flavoured milk and vanilla*

Milk has been a part of diet of Indian society since times immemorial. Our scriptures are full of references on importance and value of milk for human life and the only milk, apart from mother's milk, known to Indians was cow milk only which has been equated with Amrita.

"Amritan Vai gvam khriramityah tridsh-adhip, *tasmad dadatim yo dhenumamatrim sa Praychhti".* *(Mahabharath Anu.65-46)* This *Shloka* of Mahabharatha means: "Cow's milk is Amrita. This has been stated by India, the King of Gods. Therefore if one donates a cow, he donates Amrita".

Numerous characteristics of a food determine its acceptability to consumers and to regulatory officials. Food must be attractive and have desirable colour & flavour characteristics and possess other quality that have little to do with whether the product is free from pathogenic micro-organism or other potentially harmful agents. The ultimately aims of the control procedure should be provide a product in which the original nutritive qualities, flavour and appearance and substance are present to affect the consumers adversely.

Studied the skim milk as such does not find a good acceptance by the consumers due to lack of fat. However, palatability of the skim milk was improved by converting it into nutritious, cheap flavoured milk fortified with iron and vitamin A. Among the different iron salts used, ferric ammonium citrate was the best for fortification up to the concentration level of 30 mg/100ml whereas, vitamin A up to 9 level of 500 IU/100ml. There were no noticeable changes compared to control with regard to flavour and acceptability during storage at 5^0C for 7 days.

MATERIALS AND METHODS

The different levels of fat, sugar, flavouring agents and storage periods were used for the preparation of Flavoured milk. The observations with regard to sensory evaluation (flavour, colour and appearance, sweetness and overall acceptability) chemical characteristics (total solids, fat, protein, sucrose, acidity

and ash) and microbiological quality (standard plate count, coliform and yeasts and moulds count) were recorded. The data thus obtained were analyzed statistically by using factorial completely randomized design. The Flavoured milk was prepared from cow milk. Cow milk standardized three fat levels *viz.* 2, 2.5 and 3.0%, sugar (4%, 5%, 6% and 7%), flavouring agents (vanilla, pineapple, and mango) and storage periods 0, 3, 6, 9 and 12 days were used for the preparation of flavoured milk. The standard error of difference of two means was calculated with the help of the following expressions, suitable for different comparisons.

(i) S.E. difference $= \sqrt{\dfrac{2V_E}{N}}$

Where,

V_E = Error of M.S.

N = Number of observations on which the means were based.

(ii) $= \sqrt{\left(\dfrac{1}{N_1} + \dfrac{1}{N_2}\ V_E\right)}$

N_1 and N_2 the numbers of observations on which the two means were based.

The critical difference for comparing the two means was calculated with the help of following expression :

C.D. at 5% level = (S.E. of difference) $\times$ t at 5% p level for error d. f.

RESULTS AND DISCUSSION

The overall acceptability scores on account of various treatment combinations were presented in Table (1, 2 and 3) and its analysis of variance in Table 3 and illustrated by Figure-1 which revealed the following facts:

Table 1 represented the means of various levels of all factors with regard to overall acceptability scores. The effect of fat levels (A) on overall acceptability was found to be significant at 0.1% level of significance. The maximum score (7.23) was noted in A_2 (2.5 per cent fat), followed by A_3 (6.97), while minimum score (6.64) was noted in A_1 samples. The scores differed significantly from each other.

The overall acceptability score on account of various sugar levels indicated a highest score (7.30) in B_2 followed by B_3 (7.11) and lowest in B_4 (6.57). The result varied significantly from one another when compared with CD at 5%. These findings agreed with the findings of (2, 3). The overall acceptability scores as influenced by flavouring agent (C) exhibited maximum overall acceptability score (7.16) when treated with vanilla (C_1) followed by pineapple (6.98), while mango scored the least (6.70) statistically these values differed significantly when compared with CD at 5%. The vanilla added samples were significantly superior over pineapple and mango added samples.

The overall acceptability scores due to storage days, irrespective of other parameters, showed a decreasing trend from 7.81, 7.34, 6.95, 6.51 and 6.12 on zero to 12 days storage. The maximum (7.81) score was noted when product was fresh and minimum (6.12) after 12 days storage. The storage days differed significantly within treatments. The results also indicated that overall acceptability scores decreased with increase in storage days, which may be due to bacterial decompositions. These findings fall in line of (4).

From table-1 denoting the mean interactional effects between fat (A) and sugar (B) it was revealed that Flavoured milk prepared by 2.5 per cent fat with 5 per cent sugar expressed maximum score (7.49),while minimum (6.20) was in 2% fat with 7% sugar samples. The differences varied significantly when compared with CD at 5% level. The interactional effect due to treatment combinations of fat level (A) and flavouring agents (C) showed maximum (7.44) overall acceptability scores in A_2C_1 followed by A_2C_2 (7.31), while minimum (6.42) was for A_1C_3 samples. The results varied significantly when compared with CD at 5% level of significance. Among the treatment combinations of fat (A) and storage periods (D) maximum score (8.10) was seen in case of A_2D_1, while a minimum score (5.83) was noted in A_1D_5 samples. The mean differences in overall acceptability score varied significantly when compared with CD at 5% level of significance.

So far as the interaction of sugar levels and flavouring agents are concerned the treatment B_2C_1

Overall acceptability scores of flavoured cow milk

Table-1 : Effect of fat levels (A), sugar levels (B), flavouring agents (C) and storage periods (D) on overall acceptability score of flavoured milk.

	B_1	B_2	B_3	B_4	C_1	C_2	C_3	D_1	D_2	D_3	D_4	D_5	Mean
A_1	6.46	7.05	6.83	6.20	6.86	6.63	6.42	7.46	7.06	6.59	6.24	5.83	6.64
A_2	7.13	7.49	7.36	6.94	7.44	7.31	6.94	8.10	7.58	7.31	6.76	6.38	7.23
A_3	6.82	7.35	7.14	6.57	7.19	6.99	6.74	7.86	7.38	6.94	6.55	6.14	6.97
B_1					7.08	6.80	6.54	7.65	7.20	6.76	6.40	6.02	6.80
B_2					7.52	7.27	7.10	8.23	7.73	7.25	6.84	6.43	7.30
B_3					7.36	7.10	6.85	8.03	7.56	7.06	6.67	6.22	7.11
B_4					6.69	6.43	6.29	7.33	6.87	6.71	6.15	5.80	6.57
C_1								8.05	7.55	7.14	6.73	6.35	7.16
C_2								7.81	7.35	7.06	6.54	6.11	6.98
C_3								7.59	7.12	6.62	6.27	5.89	6.70
Mean								7.81	7.34	6.95	6.51	6.12	

	A	B	C	D	AB	AC	AD	BC	BD	CD
SE(diff.)	0.021	0.025	0.021	0.028	0.043	0.037	0.048	0.043	0.055	0.048
CD at (5%)	0.035	0.041	0.035	0.045	0.070	0.061	0.079	NS	0.091	0.079

exhibited the maximum (7.52) followed by B_2C_2 (7.27), while minimum overall acceptability score (6.29) was noted in B_4C_3 samples. The interactions between (B.D) on overall acceptability score of Flavoured milk showed that fresh samples with 5% sugar scored maximum (8.23) and B_4D_5 exhibited the minimum (5.80) when compared statistically.

The interactions between flavouring agents and storage periods (C.D) for overall acceptability score of Flavoured milk showed that maximum score (8.05) was in case of C_1D_1 sample followed by C_2D_1 (7.81), while minimum score (5.89) was noted in C_3D_5

samples. These values differed significantly when compared with CD at 5%.

Table-1 revealed the interactional effect of different levels of fat, sugar, flavouring agent and storage periods (ABCD) on overall acceptability score of Flavoured milk. The maximum score (8.70) was recorded in samples prepared by in the combination of 2.5 per cent fat, 5 per cent sugar with vanilla flavour at zero day storage ($A_2B_2C_1D_1$), which was followed by $A_2B_3C_1D_1$, $A_3B_2C_1D_1$, $A_2B_2C_2D_1$, $A_2B_1C_1D_1$, $A_3B_3C_1D_1$, $A_2B_3C_2D_1$, $A_3B_2C_2D_1$ and $A_2B_2C_3D_1$ which were statistically at par and were graded excellent in quality

Table-1 : Means of overall acceptability score of flavoured milk as affected by different treatment combinations of ABCD.

		C_1					C_2					C_3				
		D_1	D_2	D_3	D_4	D_5	D_1	D_2	D_3	D_4	D_5	D_1	D_2	D_3	D_4	D_5
A_1	B_1	7.50	7.10	6.70	6.30	5.90	7.30	6.90	6.40	6.10	5.70	7.00	6.60	6.20	5.80	5.50
	B_2	8.10	7.70	7.30	6.90	6.40	7.90	7.50	7.00	6.60	6.10	7.70	7.30	6.70	6.40	6.20
	B_3	7.90	7.50	7.10	6.70	6.20	7.70	7.30	6.80	6.40	5.90	7.50	7.10	6.50	6.20	5.70
	B_4	7.20	6.80	6.40	6.00	5.60	7.00	6.60	6.10	5.90	5.50	6.80	6.40	5.90	5.60	5.30
A_2	B_1	8.30	7.80	7.40	7.00	6.70	8.00	7.50	7.00	6.70	6.30	7.80	7.20	6.80	6.50	6.00
	B_2	8.70	8.10	7.80	7.30	6.90	8.50	7.90	7.40	6.90	6.60	8.30	7.70	7.20	6.80	6.30
	B_3	8.50	8.00	7.60	7.20	6.80	8.30	7.80	7.30	6.90	6.50	8.10	7.60	7.00	6.60	6.20
	B_4	7.80	7.30	6.90	6.50	6.20	7.60	7.20	6.90	6.60	6.20	7.40	6.90	6.50	6.20	5.80
A_3	B_1	7.90	7.50	7.10	6.70	6.30	7.70	7.30	6.80	6.40	6.00	7.40	6.90	6.50	6.10	5.80
	B_2	8.50	7.90	7.50	7.00	6.70	8.30	7.80	7.30	6.90	6.40	8.10	7.70	7.10	6.80	6.30
	B_3	8.30	7.80	7.40	7.00	6.50	8.10	7.60	7.10	6.70	6.20	7.90	7.40	6.80	6.40	6.00
	B_4	7.60	7.10	6.70	6.30	6.00	7.40	6.90	6.70	6.40	5.90	7.20	6.70	6.30	5.90	5.60

Table-3 : Analysis of variance for overall acceptability score of Flavoured milk.

Source	D.F.	M.S.S.	F.
A	2	15.8196	1278.826***
B	3	13.9667	1129.047***
C	2	9.7172	785.519***
0D	4	47.8962	3871.892***
AB	6	0.2163	17.483***
AC	4	0.0963	7.785***
BC	6	0.0002	00.589NS
AD	8	0.0863	6.973***
BD	42	0.1553	12.552***
CD	8	0.0825	6.668***
ABC	42	0.1281	10.358***
ABD	24	0.0006	0.269NS
ACD	16	0.0003	0.028 NS
BCD	24	0.0001	0.170NS
ABCD	48	0.0000	0.054NS
Error	360		

Note :

NS = Non-significant at 5% level of significance

*= Significant at 5% level of significance

**= Significant at 1% level of significance

***= Significant at 0.1% level of significance

and liked extremely, while the combination of $A_1B_4C_3D_5$ scored minimum (5.30) and was graded as fair in quality.

From analysis of variance Table-1 for overall acceptability of Flavoured milk, it was observed that main effects of A, B, C and D were found to be highly significant. The first and second orders (AB, AC, AD, BD, CD) and ABC were also found to be significant, respectively, while all other interactions were observed to be non-significant.

CONCLUSION

Overall acceptability

The overall acceptability score of flavoured milk was affected significantly by different fat levels. The maximum (7.23) was found in A_2 samples and minimum (6.64) was noted in A_1.The overall acceptability score of Flavoured milk was affected

Fig. 1:Effect of A, B, C and D on overall acceptability score of Flavoured milk.
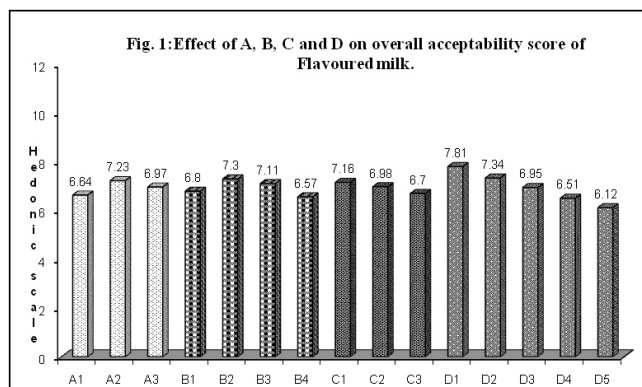
significantly by different sugar levels. The maximum (7.30) was noted in B2 samples, while minimum score (6.57) was noted in B4.The overall acceptability score of Flavoured milk was also affected significantly by different flavouring agents. The maximum (7.16) and minimum (6.70) score were noted in C_1 and C_3 samples, respectively. So far as storage periods of Flavoured milk, envisages that highest score (7.81) was noted at zero day storage, while lowest score (6.12) was in D5 samples. The fat, sugar, flavouring agents and storage periods also influenced the overall acceptability score of Flavoured milk. The maximum (8.70) score was noted inA2B2C1D1 samples which was graded as excellent quality and liked extremely. The lowest score (5.30) was noted in A1B4C3D5 sample and was graded as fair quality.

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