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## Evaluate the effect of different levels of fat & sugar on physical quality of flavoured milk using strawberry essence

**Rahul Tiwari, PK Upadhyay, Praveen Sahu, Pooja Yadav and Brajpal Singh**

### Abstract

In this experiment three levels of Fat combinations (2.8%, 3.0%, 3.2%) and Sugar combinations ratio (5%, 6%, 7%) were taken three levels of Strawberry essence (0.15%, 0.20%, 0.25%) and stabilizer (Sodium alginate 0.2%) are used to prepared it with 3 times replication. In the method of preparation, first, standardized milk is heated at 35-40 °C and filtered & heated to 60 °C. Later sugar is slowly mixed in the heated milk, after that sodium alginate and food colour is added in milk and this milk is pasteurized at 71 °C for 30 minutes. Now this milk is cold to 25 °C and strawberry essence is added to it. Now the strawberry flavoured milk thus prepared is filled in glass bottle and kept in the refrigerator till it is used. The effects of various attributes on quality of flavoured milk were analyzed and determine for physical quality flavour (colour and appearance, sweetness, over all acceptability). The study revealed that the physical quality of flavoured milk prepared from cow milk, 0.20% essence with 7% sugar levels of flavoured milk was found better as compared to other treatment combinations with in fresh day.

**Keywords:** Strawberry essence, sodium alginate, flavour, colour & appearance, sweetness and overall acceptance

### Introduction

Flavored milk/drink is a dairy product which has some flavors such as chocolate, cocoa powder, fruits and sugar often enriched with vitamins and calcium. There is a difference between “flavored milk drink” and “the flavored milk” is owing to their fat contents. While “the flavored milk” term is used for the product which contained a milk fat percentage at least equal to the minimum legal requirement for market milk, but when the fat level is low (1%–2%), “The milk drink” term is used. Flavored milk or milk drinks have mainly been aimed at children. In several countries such as the United States and India, school meal plans contain flavored milks/drinks due to their high nutritional values. Flavoured milk is milk mixed with cocoa powder, coffee, fruit juice or flavoring. Additional ingredients include thickeners (polysaccharides) to stabilize the casein, and sometimes pH-stabilizing agents, such as citrate or phosphate. Flavored milks with a high percentage of fruit juice are stabilized with 0.3% (w/w) high-methoxy pectin to avoid the flocculation of milk proteins. For the stabilization of flavored milk drinks of normal pH (6.7), 0.01%–0.05% κ-carrageenan is most commonly used as a thickening agent; it forms a weak three-dimensional gel, within which, e.g., cocoa particles of size 10 to 30 μm may be entrapped and prevented from settling. Meal plans contain flavored milks/drinks due to their high nutritional values. “According to FSSAI” Flavoured milk means the product prepared from milk or other products derived from milk, or both, and edible flavouring with or without addition of sugar, nutritive sweeteners, other non-dairy ingredient including, stabilizers and food colour. The addition of some food additives as stabilizers (e.g., alginate, carrageenan) and emulsifiers (e.g., soy lecithin, mono- and diglycerides of fatty esters) in flavored milk and milk drinks is a common procedure. The stabilizer maintains stability of milk proteins to prevent the phase separation and enhanced body and viscosity while the emulsifier reduces tendency of the fat globule to rise and also improves the creamy texture and mouthfeel of the product during storage and transport. Flavoured milk originally consisted of cow's milk combined with sugar; flavouring & coloring flavour milk is the “New Idea” drinks. According to the latest report by International Market Analysis Research and Consulting (IMARC) Group, flavoured milk market in India size reached INR 41.6 Billion in 2022.

Looking forward, IMARC Group expects the market to reach INR 158.6 Billion by 2028, exhibiting a growth rate (CAGR) of 25.8% during 2023-2028.

### Material and Methods

**Material:** Materials mainly included the ingredients required for optimization of compositional and processing parameters of flavoured milk. These were:-

**Raw milk:** The required quantity of fresh cow milk was obtained from the dairy farm, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur. The milk was collected in a clean sterilized stainless steel bucket, taking into account all hygienic precaution and brought to the laboratory for immediate separation, standardization and processing.

**Muslin cloth:** Clean new muslin cloth used for the purpose of milk filtration.

**Colour:** Pink colour Purchased from Nawabganj Market Kanpur city.

**Strawberry Essence:** Purchased from Nawabganj Market Kanpur city.

**Skim milk:** To get a required quantity of skim milk for preparation of Flavoured milk fresh cow milk was separated carefully in a cream separator in the Dairy Technology Laboratory. The skim milk thus obtained was tested for its fat content by Gerber's method as described in IS: 1223 (Part I-1970).

**Sugar:** Commercial grade white crystalline cane sugar was used as a sweetening agent which was obtain from the market of Kanpur city. It was ensured that the sugar was free from dust, dirt or any other foreign impurities.

**Stabilizer:** Sodium alginate was used as stabilizer in the preparation of Flavoured milk. Only pure form of this chemical obtained from local market of Kanpur city.

**Flavouring agents:** Strawberry flavour, this synthetic flavour purchased from local market of Kanpur.

**Packaging material used:** 200 ml. capacities of glass bottle were used for flavoured milk making during the investigation.

### Methods

#### Examination of milk

**Sampling of milk:** To carry out the further analysis, milk samples were prepared as per the method prescribed in *BIS Hand Book of Food Analysis part (XI) 1981*. Milk was warmed up to about 38-40 °C followed by mixing it thoroughly until a homogenous mixture was obtained. Milk was then cooled down to 15-20 °C.

**Preparation of Flavoured milk:** To prepare flavoured milk containing 5%, 6%, 7% sugar by W/V of milk i.e. 50, 60, and 70 g of sugar per liter of milk was dissolved in some amount of warmed milk in a beaker and mixed well to the milk used for the preparation of flavoured milk. To dissolve the sugar, the milk was taken from the same lot used for the manufacture of flavoured milk. Separately the required amount of flavour with matching colour at the rate of 1 ml per liter milk was taken in a beaker, with 50 ml warmed milk and mixed well the milk was taken from the same lot used for manufacture of flavoured milk. Like sugar and flavour, 2g of sodium alginate were weighted separately and transferred to a beaker, made a solution with 100 ml warmed milk (35-40 °C) and heated until the sodium alginate was completely dissolved and mixed well in the boiling milk with constant stirring.

**Heat treatment:** After through mixing the milk was heated at temperature of 71 °C for 30 minutes and cooled to 25 °C. Immediately after manufacturing the product was filled in 200 ml glass bottles which were properly cleaned and sterilized before filling the bottles were filled to the neck with flavoured milk and sealed with crown-cork using corking machine. All bottles were sterilized in a autoclave at a pressure of 15 lbs/inch at a temperature of 121 °C/10 minutes and transferred to room for storage at refrigeration temperature (5 to 10 °C) for various length of time to observe its period and analysis for various parameter.

### Results and Discussion

The present investigation Entitled, "Technology of Flavoured milk preparation using strawberry essence." was carried out in the Department of animal Husbandry and Dairying, C. S. A. University of Agriculture and Technology, Kanpur. The flavoured milk was prepared from cow milk. The cow milk was obtained from University dairy campus at Kanpur was fat levels are 2.8%, 3.0% and 3.2%, sugar levels is 5%,6%,7% flavorings agents (strawberry essence) are 0.10%, 0.15%, 0.20%, used for the preparation of flavoured milk. The effect of various factor on flavoured milk were analysed for organoleptic-qualities (flavour, colour and appearance, sweetness and overall acceptability).

### Physical Quality

**Flavour:** The flavour score of flavoured milk is the most important quality attributes. A pleasant sweetish aroma should be maintained for along storage periods. The mild acidic taste and curdling are not desirable characteristic of flavour milk. It should be free from foreign material, bitterness, saltiness and any other off flavour. The flavour score of flavoured milk as affected by different factors has been given Table no.1.

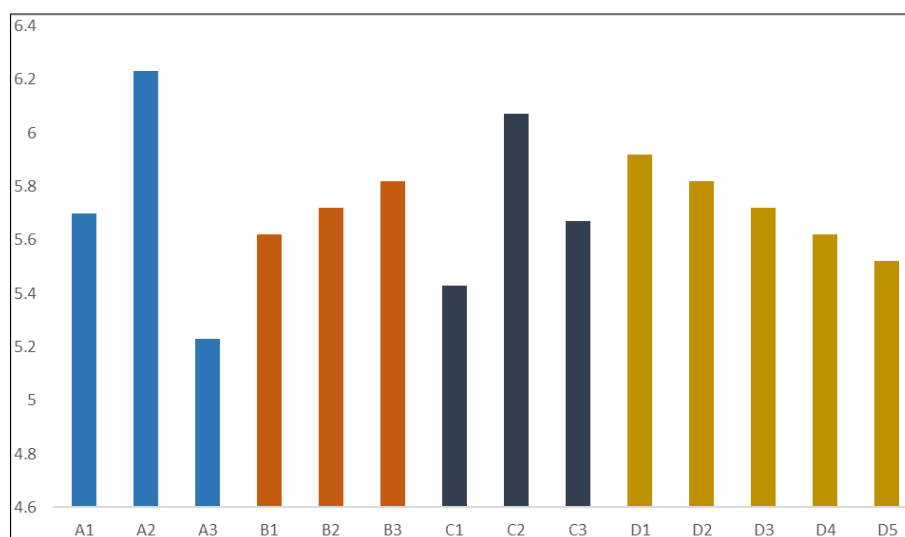
The comparison of flavoured milk at different levels of fat percent (A), Sugar percent (B), Strawberry essence (C) and Storage periods (D) has been given in Table 1. It is represented the mean different levels of all factors with regard to flavour score in which revealed the following fact.

**Table 1:** Average Effect of fat levels (A), sugar levels (B), flavouring agents (C) and storage periods (D) on flavour score of Flavoured milk.

Treatment	B1	B2	B3	C1	C2	C3	D1	D2	D3	D4	D5	Mean
A1	5.60	5.70	5.80	5.40	5.70	6.00	5.90	5.80	5.70	5.60	5.50	5.70
A2	6.13	6.23	6.33	5.60	6.90	6.20	6.43	6.33	6.23	6.13	6.03	6.23
A3	5.13	5.23	5.33	5.30	5.60	5.80	5.43	5.33	5.23	5.13	5.03	5.23
B1				5.33	5.57	5.97	5.82	5.72	5.62	5.52	5.42	5.62
B2				5.43	5.67	6.07	5.92	5.82	5.72	5.62	5.52	5.72
B3				5.53	5.77	6.17	6.02	5.92	5.82	5.72	5.62	5.82
C1							5.63	5.53	5.43	5.33	5.23	5.43
C2							6.27	6.17	6.07	5.97	5.87	6.07
C3							5.87	5.77	5.67	5.57	5.47	5.67
Mean	5.70	5.72	5.82	5.43	5.86	6.03	5.92	5.82	5.72	5.62	5.52	

From Table 1 the main effect of different levels of all the factors of flavoured milk of flavour score, the following facts were observed. The maximum flavour score (6.90) was recorded in A<sub>2</sub> samples of 3.0 fat percent and minimum flavour score (5.03) was recorded in A<sub>3</sub> samples of 3.20 fat percent. The mean differences of flavour score varied significantly from one another when compared with CD at 5%. As the main effect of sugar percent on flavour score of flavoured milk, it was observed that maximum flavour score (6.33) was recorded in B<sub>3</sub> samples, while minimum flavour score (5.13) was recorded in B<sub>1</sub> samples. It shows significant difference at 5% level. Above result indicate that 7% sugar levels were most suitable as compare to 5 percent and 6 percent sugar levels. The findings closely agreed with findings of Badie *et al.* (1998) [2] who was found that sugar concentration influence the flavour and rheological quality of milk. The main effect of strawberry essence on flavour score of flavoured milk, it was observed that maximum flavour score (6.90) was recorded in C<sub>2</sub> samples, while minimum flavour score (5.33) was recorded in C<sub>1</sub> samples. It shows significant difference at 5% level. In case of storage periods (D), the maximum significant flavour score (6.43) in flavoured milk was observed in D<sub>1</sub> samples and minimum flavour score (5.03) in D<sub>5</sub> samples. It shows significant

difference at 5% in storage periods. The present findings collaborates with the finding of Hossin *et al.* (2021) [7] who reported that the product showed a decreasing trend during storage. From the interactions effect of A×B, the maximum flavour score (6.33) was found to be in A<sub>2</sub>B<sub>3</sub> combination while minimum flavour score (5.03) was recorded in A<sub>3</sub>B<sub>1</sub> samples non-significant. From the interactions effect, In case of A×C, the maximum flavour score (6.90) was observed in A<sub>2</sub>C<sub>2</sub> samples and minimum flavour score (5.30) was recorded in A<sub>3</sub>C<sub>1</sub> samples, it was significant at 5% level. From the interaction effect, In case of A×D, the maximum flavour score (6.43) was observed in A<sub>2</sub>D<sub>1</sub> samples and minimum flavour score (5.03) was recorded in A<sub>3</sub>D<sub>5</sub> samples non-significant. The findings fall in the line of Hossin *et al.* (2021) [7]. From the interactions effect of B×C, the maximum flavour score (6.17) was recorded in B<sub>3</sub>C<sub>3</sub> samples, and minimum flavour score (5.33) was recorded in B<sub>1</sub>C<sub>1</sub> samples non-significant. From the interactions effect of B×D, the maximum flavour score (6.02) was recorded in B<sub>3</sub>D<sub>1</sub> samples, and minimum flavour score (5.33) was recorded in B<sub>1</sub>D<sub>5</sub> samples non-significant. Among the interactions effect of C×D, the maximum flavour score (6.27) was recorded in C<sub>2</sub>D<sub>1</sub> samples, while minimum flavour score (5.23) was recorded in C<sub>1</sub>D<sub>5</sub> samples non-significant.

**Fig 1:** Mean effect of A, B, C and D on Flavour score of flavoured milk

**Colour and Appearance:** The colour and appearance of flavoured milk should be pleasing attractive and uniform without showing any sign of visible foreign matter. Permitted fruit flavours/essence together with permitted colours is used. The colour of flavoured milk was yellowish, pinkish. The fat

deposition should not be on top neck of the bottle. Flavoured milk should have uniform liquidity of appearance. The colour and appearance of flavoured milk as affected by different factors has been presented in table 2. The comparison of flavoured milk at different levels of fat percent (A), Sugar

percent (B), Strawberry essence (C) and Storage periods (D) has been given in Table 2. its represented the mean different

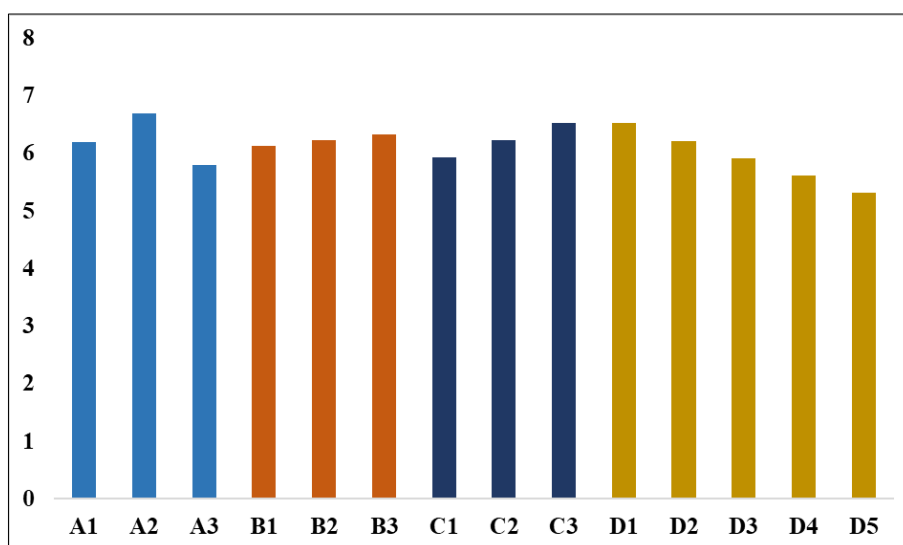
levels of all factors with regard to colour and appearance score in which revealed the following fact.

**Table 2:** Effect of fat levels (A), sugar levels (B), flavouring agents (C) and storage periods (D) on colour and appearance score of flavoured milk.

Treatment	B1	B2	B3	C1	C2	C3	D1	D2	D3	D4	D5	Mean
A1	5.78	5.87	5.97	5.90	6.20	5.50	6.47	6.17	5.87	5.57	5.27	5.87
A2	5.77	5.87	5.97	5.70	6.30	5.60	6.47	6.17	5.87	5.57	5.28	5.87
A3	5.90	6.00	6.17	5.70	6.00	6.37	6.62	6.32	6.02	5.72	5.42	6.02
B1				5.67	6.07	5.70	6.41	6.11	5.81	5.51	5.21	5.81
B2				5.77	6.17	5.80	6.51	6.21	5.91	5.61	5.31	5.91
B3				5.87	6.27	5.97	6.63	6.33	6.03	5.73	5.43	6.03
C1							6.37	6.07	5.77	5.47	5.17	5.77
C2							6.77	6.47	6.17	5.87	5.57	6.17
C3							6.42	6.12	5.82	5.52	5.22	5.82
Mean	5.87	5.87	6.02	5.77	6.17	5.82	6.52	6.22	5.92	5.62	5.32	

From Table 2 the main effect of different levels of all the factors of flavoured milk of colour and appearance, the following facts were observed. The maximum colour and appearance score (6.62) was recorded in A<sub>3</sub> samples of 3.2 percent fat and minimum colour and appearance score (5.27) was recorded in A<sub>1</sub> samples of 3.0 percent fat. The mean differences of colour and appearance score varied significantly from one another when compared with CD at 5%. As the main effect of sugar percent on colour and appearance of flavoured milk, it was observed that maximum colour and appearance score (6.63) was recorded in B<sub>3</sub> samples while minimum colour and appearance score (5.21) was recorded in B<sub>1</sub> samples. It shows significant difference at 5% level. The main effect of strawberry essence on colour and appearance of flavoured milk, it was observed that maximum colour and appearance score (6.77) was recorded in C<sub>2</sub> samples, while minimum colour and appearance score (5.17) was recorded in C<sub>1</sub> samples. It shows significant difference at 5% level. In case of storage periods (D) the main effect of storage period on colour and appearance of flavoured milk, the maximum colour and appearance score(6.77) of flavoured milk was observed in D<sub>1</sub> samples and minimum colour and appearance score (5.17) in D<sub>5</sub> samples. It shows significant difference at 5% in storage periods. The present findings collaborates with the findings of Hossin *et al.* (2021) [7], Vijaylakshmi and Tamilarasi (2001) [12] who reported that

the product showed a decreasing trend in sensory quality during storage. From the interaction effect of A×B, the maximum colour and appearance score (6.17) was found to be in A<sub>3</sub>B<sub>3</sub> combination while minimum colour and appearance score (5.77) was recorded in A<sub>2</sub>B<sub>1</sub> samples which was non-significant. From the interaction effect, In case of A×C, the maximum colour and appearance score (6.37) was observed in A<sub>3</sub>C<sub>3</sub> samples and minimum colour and appearance score (5.50) was recorded in A<sub>1</sub>C<sub>3</sub> samples, it was significant at 5% level. From the interaction effect in case of, A×D, the maximum colour and appearance score (6.62) was observed in A<sub>3</sub>D<sub>1</sub> samples and minimum colour and appearance score (5.27) was recorded in A<sub>2</sub>D<sub>5</sub> samples non-significant. The findings fall in the line of Hossin *et al.* (2021) [7], Vijaylakshmi and Tamilarasi (2001) [12]. From the interaction effect of B×C, the maximum colour and appearance score (6.27) was recorded in B<sub>3</sub>C<sub>2</sub> samples, and minimum colour and appearance score (5.67) was recorded in B<sub>1</sub>C<sub>1</sub> samples non-significant. From the interaction effect of B×D, the maximum colour and appearance score (6.63) was recorded in B<sub>3</sub>D<sub>1</sub> samples and minimum colour and appearance score (5.21) was recorded in B<sub>1</sub>D<sub>5</sub> samples non-significant. From the interactional effect of C×D, the maximum colour and appearance score (6.77) was recorded in C<sub>2</sub>D<sub>1</sub> samples while minimum colour and appearance score in (5.17) was recorded in C<sub>1</sub>D<sub>5</sub> samples non-significance.



**Fig 2:** Mean effect of A, B, C, and D on colour and appearance score of Flavoured milk

**Sweetness:** The flavoured milk contains less sugar than other dairy foods. The excessively sweetness should be avoided. The sweetness of flavoured milk as affected by different factors has been presented in table 3. The comparison of

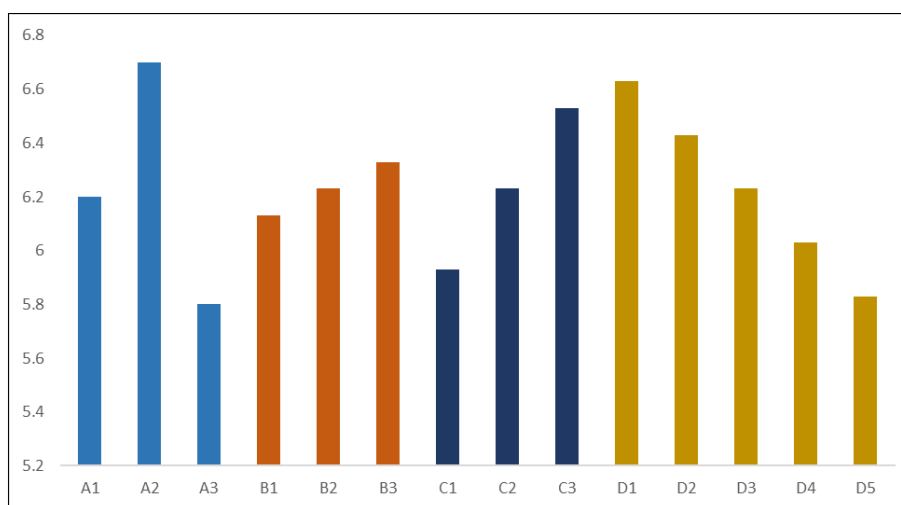
flavoured milk at different levels of Strawberry essence and sugar levels with different fat levels has been given in Table 3, its main effect with A×D, B×D, C×D, A×B, B×C and A×C in which revealed the following fact.

**Table 3:** Effect of fat levels (A), sugar levels (B), flavouring agents(C) and storage periods(D) on sweetness score of flavoured milk.

Treatment	B1	B2	B3	C1	C2	C3	D1	D2	D3	D4	D5	Mean
A1	6.10	6.20	6.30	6.00	6.20	6.50	6.60	6.40	6.20	6.00	5.80	6.20
A2	6.60	6.70	6.80	6.40	6.70	7.0	7.10	6.90	6.70	6.50	6.30	6.70
A3	5.70	5.80	5.90	5.50	5.80	6.10	6.20	6.00	5.80	5.60	5.40	5.80
B1				5.83	6.13	6.43	6.53	6.33	6.13	5.93	5.73	6.13
B2				5.93	6.23	6.53	6.63	6.43	6.23	6.03	5.83	6.23
B3				6.03	6.33	6.63	6.73	6.53	6.33	6.13	5.93	6.33
C1							6.33	6.13	5.93	5.73	5.53	5.93
C2							6.63	6.43	6.23	6.03	5.83	6.23
C3							6.93	6.73	6.53	6.33	6.13	6.53
Mean	6.13	6.23	6.33	5.94	6.23	6.53	6.63	6.43	6.23	6.03	5.83	

From Table 3 the main effect of different levels of all the factors of flavoured milk on sweetness, the following facts were observed. The maximum sweetness score (7.10) was recorded in A<sub>2</sub> samples of 3.0 percent fat and minimum sweetness score (5.40) was recorded in A<sub>3</sub> samples of 3.2 percent fat. The mean differences of colour and appearance score varied significantly from one another when compared with CD at 5%. As the main effect of sugar percent on sweetness of flavoured milk, it was observed that maximum sweetness score (6.73) was recorded in B<sub>3</sub> samples, while minimum sweetness score (5.73) was recorded in B<sub>1</sub> samples. It shows significant difference at 5% level. The main effect of strawberry essence on sweetness of flavoured milk, it was observed that maximum sweetness score (6.70) was recorded in C<sub>2</sub> samples, while minimum sweetness score (5.5) was recorded in C<sub>1</sub> samples. It shows significant difference at 5% level. In case of storage periods (D) the main effect of storage period on sweetness of flavoured milk. The maximum sweetness score (7.10) in flavoured milk was observed in D<sub>1</sub> samples and minimum sweetness score (5.40) noticed in D<sub>5</sub> samples. It shows significant difference at 5% in storage periods. The present findings collaborates with the findings of Hossin *et al.* (2021) [7]. From the interaction effect of A×B, the maximum sweetness score (6.80) was found to be in A<sub>2</sub>B<sub>3</sub>

combination while minimum sweetness score (5.70) was recorded in A<sub>3</sub>B<sub>1</sub> samples non-significant. From the interaction effect, in case of A×C, the maximum sweetness score (7.00) was observed in A<sub>2</sub>C<sub>3</sub> samples and minimum sweetness score (5.50) was recorded in A<sub>3</sub>C<sub>1</sub> samples, it was non-significant. From the interaction effect, in case of A×D, the maximum sweetness score (7.10) was observed in A<sub>2</sub>D<sub>1</sub> samples and minimum sweetness score (5.40) was recorded in A<sub>3</sub>D<sub>5</sub> samples which are non-significant when the interaction between fat level and storage periods were compared. The findings fall in the line of Hossin *et al.* (2021) [7], Vijaylakshmi and Tamilarasi (2001) [12]. The interaction between B×C, the maximum sweetness score (6.63) was recorded in B<sub>3</sub>C<sub>3</sub> samples, and minimum sweetness score (5.83) was recorded in B<sub>1</sub>C<sub>1</sub> samples non-significant. The interaction between B×D, the maximum sweetness score (6.73) was recorded in B<sub>3</sub>D<sub>1</sub> samples and minimum sweetness score (5.73) was recorded in B<sub>1</sub>D<sub>5</sub> samples when compared statistically non-significant. From the interaction combination of flavouring agents and storage periods (C×D) for sweetness score of flavoured milk. It was observed that maximum score (6.93) was recorded in C<sub>3</sub>D<sub>1</sub> samples while minimum sweetness score in (5.53) was recorded in C<sub>1</sub>D<sub>5</sub> samples, these value differed non-significant at 5% level of significance.



**Fig 3:** Mean effect of A, B, C, and D on sweetness score of Flavoured milk



**Overall Acceptability:** The comparison of flavoured milk at different levels of strawberry essence and sugar levels with different fat levels has been given in Table 4 its main effect

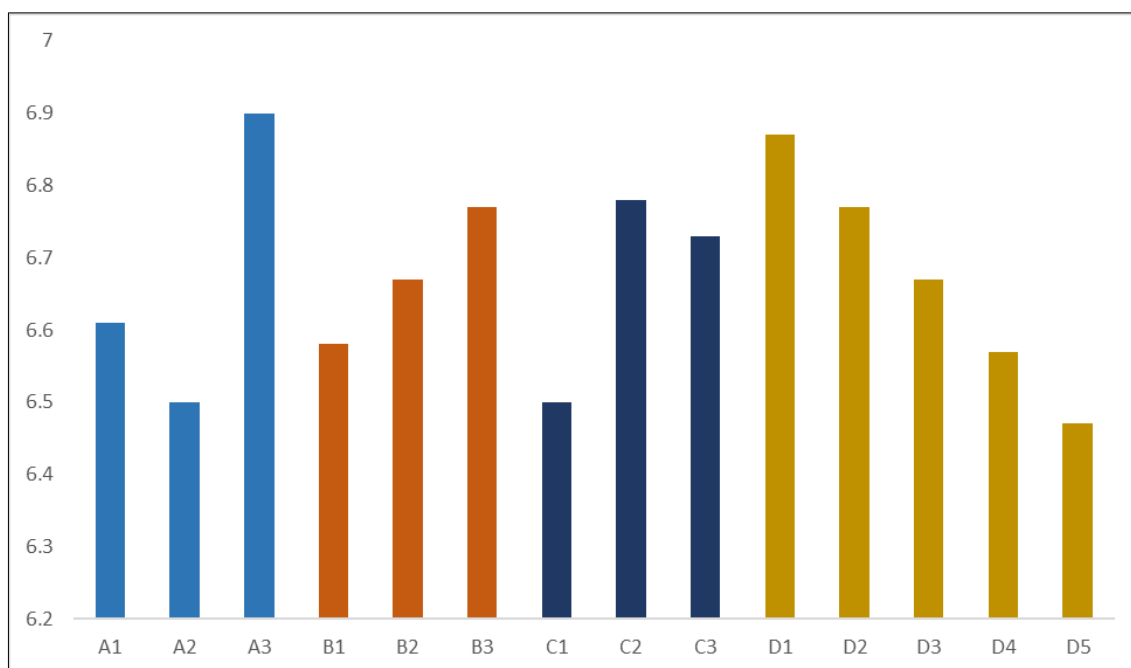
with A×D, B×D, C×D, A×B, B×C and A×C in which revealed the following fact.

**Table 4:** Effect of fat levels (A), sugar levels (B), flavouring agents (C) and storage periods (D) on overall acceptability score of flavoured milk.

Treatment	B1	B2	B3	C1	C2	C3	D1	D2	D3	D4	D5	Mean
A1	6.53	6.60	6.70	6.70	6.93	6.21	6.81	6.71	6.61	6.51	6.41	6.61
A2	6.40	6.50	6.60	6.20	6.50	6.80	6.70	6.60	6.50	6.40	6.30	6.50
A3	6.80	6.90	7.00	6.60	6.90	7.20	7.10	7.00	6.90	6.80	6.70	6.90
B1				6.40	6.70	6.63	6.78	6.68	6.58	6.48	6.38	6.58
B2				6.50	6.77	6.73	6.87	6.77	6.67	6.57	6.47	6.67
B3				6.60	6.87	6.83	6.97	6.87	6.77	6.67	6.57	6.77
C1							6.70	6.60	6.50	6.40	6.29	6.50
C2							6.98	6.88	6.78	6.68	6.58	6.78
C3							6.99	6.83	6.73	6.63	6.53	6.73
Mean	6.58	6.67	6.77	6.50	6.78	6.73	6.87	6.77	6.67	6.57	6.47	

From Table 4 The main effect of different levels of all the factors of flavoured milk of overall acceptability, the following facts were observed. The maximum overall acceptability score (7.20) was recorded in A<sub>3</sub> samples of 3.2 percent fat and minimum overall acceptability score (6.20) was recorded in A<sub>2</sub> samples of 3.00 percent fat. The mean differences of overall acceptability score varied significantly from one another when compared with CD at 5%. As the main effect of sugar percent on overall acceptability of flavoured milk, it was observed that maximum overall acceptability score (6.97) was recorded in 7% of sugar level (B<sub>3</sub>) samples, while minimum overall acceptability score (6.38) was recorded in 5% sugar level (B<sub>1</sub>) samples. It shows significant difference at 5% level. These findings agreed with the findings of Badrie *et al.* (1998) [2] who observed that sugar concentration influenced the flavour and rheological acceptability. The main effect of strawberry essence on overall acceptability of flavoured milk, it was noticed that maximum overall acceptability score (7.20) was recorded in C<sub>3</sub> samples, while minimum overall acceptability score (6.20) was recorded in C<sub>1</sub> samples. It shows significant difference at 5% level. In case of storage periods (D) the main effect of storage period on overall acceptability of flavoured milk the maximum overall acceptability score (7.10) in flavoured milk was observed in zero days storage (D<sub>1</sub>) samples when product was fresh and minimum overall acceptability score (6.29) noticed in 16 days storage (D<sub>5</sub>) samples. It shows significant difference at 5% in storage periods. The present finding collaborates with the findings of Hossin *et al.* (2021), Vijay Lakshmi and Tamilarasi (2001) [7, 12] who reported that the product showed a decreasing trend during storage. The interaction effect between Fat level (A) and Sugar level (B),

A×B, the maximum overall acceptability score (7.00) was found to be in A<sub>3</sub>B<sub>3</sub> combination while minimum overall acceptability score (6.40) was recorded in A<sub>2</sub>B<sub>1</sub> samples with non-significant when compared with CD at 5% level of significance. The interactional effect due treatment combinations of fat level (A) and flavouring agents (C) showed, the maximum overall acceptability score (7.20) was noticed in A<sub>3</sub>C<sub>3</sub> samples and minimum overall acceptability score (6.20) was recorded in A<sub>1</sub>C<sub>3</sub> samples which was non-significant at 5% level of significance. Among the treatment combinations of Fat(A) and storage periods(D) the maximum overall acceptability score (7.10) was observed in A<sub>3</sub>D<sub>1</sub> samples and minimum was recorded in B<sub>3</sub>C<sub>3</sub> samples score (6.30) was recorded in A<sub>2</sub>D<sub>5</sub> samples which was non-significant when the interaction between fat level and storage periods were compared. So far as the interaction of the sugar levels and flavouring agents are concerned the treatment B<sub>3</sub>C<sub>2</sub>, exhibited the maximum overall acceptability score (6.87) and minimum overall acceptability score (6.40) was recorded in B<sub>1</sub>C<sub>1</sub> samples with non-significance when compared with CD at 5% levels of significance. The interaction between B×D, the maximum overall acceptability score (6.97) was recorded in B<sub>3</sub>D<sub>1</sub> samples, and minimum overall acceptability score (6.38) was recorded in B<sub>1</sub>D<sub>5</sub> samples with non-significant when compared statistically. Among the treatment combination of flavouring agents and storage periods (C×D) of overall acceptability score of flavoured milk, it was observed that maximum score (6.98) was recorded in C<sub>2</sub>D<sub>1</sub> samples, while minimum overall acceptability score in (6.29) was recorded in C<sub>1</sub>D<sub>5</sub> samples, these value differed non-significant at 5% level of significance.



**Fig 4:** Mean effect of A, B, C, and D on overall acceptability score of Flavoured milk

### Conclusion

On the basis of present investigation, it was concluded that Very good quality flavored milk could be prepared by using 0.20% strawberry essence and 7% sugar in flavored milk. The effects of various attributes on quality of flavoured milk were analyzed and determine for physical quality flavour (colour and appearance, sweetness, over all acceptability), The study revealed that the physical quality of flavoured milk prepared from cow milk, 0.20% essence with 7% sugar levels of flavoured milk was found better as compared to other treatment combinations with in fresh day.

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