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STUDY ON EFFECT OF LEVELS OF FAT AND SUGAR ON THE PHYSICAL QUALITY OF FLAVOURED MILK PREPARED FROM BLEND OF COW AND GOAT MILK USING VANILLA AND STRAWBERRY ESSENCE

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ABSTRACT

In the investigation entitled "Study on effect of levels of fat and sugar on the physical quality of flavoured milk prepared from blend of cow and Goat milk using Vanilla and Strawberry" was conducted in the laboratory of department of Animal Husbandry and Dairying, C.S.A. University of Agriculture and Technology, Kanpur. In this experiment, three levels of sugar combination ratio (6%,7%,8%) were taken three levels of fat (3.2%, 3.6%, 4.0%) and two types of essence strawberry and vanilla. The effects of various attributes on quality of flavoured milk were analyzed and determine for physical quality flavour, colour and appearance, sweetness and overall acceptability were determined. The study revealed that the physical quality of flavoured milk prepared from blend of cow milk and goat milk with strawberry essence, 6% sugar level and 3.2% fat level of flavoured milk was found better as compared to other treatment combinations with in fresh day. The physical qualities of flavoured milk prepared from optimum level of Strawberry essence with 6% sugar and 3.2% fat level, treatment combination found better as compared to the treatment combinations. It is therefore commended that the good quality of flavoured milk can be prepared by using Strawberry essence with 3.2% fat level and 6% sugar level.

Key words : Flavoured milk, Cow milk, Goat milk, Strawberry essence, Vanilla essence.

Introduction

Milk is the whole, fresh, clean, lacteal secretion obtained by the complete milking of one or more healthy milch animals, excluding that obtained within 15 days before and 5 days after calving or such period as may be necessary to render the milk practically colostrums – free and containing the minimum prescribed percentages of milk fat and milk solid not fat. Milk is an almost ideal food. It has high nutritive value. It supplies body- building proteins, bone-farming minerals and health giving vitamins and furnishes energy giving lactose and milk fat. Besides supplying certain essential fatty acids, it contain the above nutrients in an easily digestible. Milk is also a good source of folic acid. Vitamin A deficiency is a major cause of widespread blindness among children in India. 50 ml serving of cow milk contains Vitamin A sufficient to meet 75 per cent daily Vitamin A requirement of a preschool child (Kensal, 1999). The pH of normal, fresh, sweet milk usually varies from 6.4 to 6.6 for cow.

Production and per capita availability of milk in India as follows

India currently produces 239.30 million tonnes of milk, making it the greatest producer in the world. India is the largest producer of milk globally with 25 percent share in total milk production in the world. The milk production has increased by 3.78% over the previous year which was 230.58 million tonnes. The per capita availability of milk in India 471 grams per day. Top five milk producing states are: Uttar Pradesh (16.21%), Rajasthan (14.51%), Madhya Pradesh (8.91%), Gujrat (7.65%), Maharashtra (6.71%) and they together contribute 53.99% of total milk production in India (DAHD, 2024).

General characteristics of goat milk

Several nutrition is recommend goat's milk over cow's milk to people with mild lactose in tolerance as goat milk has comparatively less sugar. It doesn't cause acidity or other stomach ailments and gets digested easily. If you are someone who loves milk but cannot digest cow milk then instead, give goat milk a shot. It is said to be twice as healthy as your regular milk. Raw goat milk helps in healing a lot of diseases. It is used to improve platelets count in the blood during dengue and other viral diseases. It has antibodies and is considered as a natural cure for jaundice as well. India occupies the first position in global goat milk production (6.09million tonnes) and in India goat is 3rd (2.93% of total milk) largest milk contributing species**.** Goat milk contains 3.8% fat, 3.4% protein, 4.1% lactose, 0.8% ash, 8.9 % SNF (Park *et al*., 2007) and 87% water (Iqbal *et al*., 2008). Goat milk differs from cow or human milk in having better digestibility, alkalinity, buffering capacity and certain therapeutic values in medicine andhuman nutrition (Heinlein and Cassese, 1984; Park and Chukwu, 1989; Park, 1994). Density of goat milk is comparable to that of cow milk, while it has higher specific gravity, viscosity, titratable acidity, but lower refractive index and freezing point than cow milk (Parkash and Jennens, 1968; Hoenlein and Wendorff, 2006).The freezing point of goat milk is about - 0.580°C, viscosity 13.4 MP at 27°C, titrable acidity as lactic acid ranges from 0.11 to 0.18 per cent (Roy and Vadodara, 2006). Surface tension of goat milk is within the range of cow milk (Juarez and Ramos, 1986). The mean pH value ranges from 6.5 to 6.9. The curd tension of goat milk is much lower than that of cow milk. The average value with pepsin - HCL test was 36 (Roy and Vadodara, 2006).

General characteristics of Cow milk

Cow's milk is a good source of calcium. Researchers from the Harvard School of Public Health revealed that more consumption of milk and other calcium-rich foods appears to be myth to prevent the chances of osteoporosis and easy bone fractures in adult humans. Milk consumption causes more health risks to young ones, to whom whole cow's milk can contribute to deficiencies in several nutrients, including iron, essential fattyacids and vitamin E. But it is very high in vitamin D and may result in hyper vitaminosis. Cow's milk products are very low in iron (one-tenth of a milligram (mg) per eight-ounce) which do not meet the recommended daily allowance. In addition, GIT disorders further reduce iron absorption which can be linked with anaemia and intestinal bleeding in young. There are various paediatric literature articles which showed erosions and inflammations in intestinal mucosa, bleeding and abdominal pain, diarrhoea and vomiting in infants which are sensitive to cows' milk. It could be observed that the major constituent of milk is water which ranges from 85.5% to 88.7%. Lactose, the milk sugar, is high in its concentration ranging from 3.8% to 5.3%. There is considerable variation in fat content and it ranges from 2.4% to 5.5%. The building block of the living cells, the proteins, range between 2.3% and 4.4%. The concentration of the major protein of milk, casein ranges from 1.7% to 3.5%. The remaining constituents although less in their concentration play an important role in maintaining the suitable balance among the various constituents in milk. A highly concentrated flavour called strawberry essence is either created chemically using chemical substance or taken from fresh strawberries and put on an alcohol basis. It's a light straw colour or occasionally watery with a delicious strawberry pure aroma. The strawberry or *Fragaria ananassa*, is a fruit that originated in Europe in the18th century. It is a great source of vitamin C, manganese and potassium, as well as folate (vitamin B9). Strawberries are extremely high in antioxidants, which may be beneficial for the heart, general health and blood sugar regulation. One of the New Idea drinks is flavour-infused milk (Grimes, 1979).

Materials and Methods

Materials mainly included the ingredients required for optimization of compositional and processing parameters of flavoured milk, these were:

Raw milk- Cow milk and goat milk were obtained from the University Dairy of C. S. Azad University of Agriculture & Technology, Kanpur.

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

Colour- Pink colour and lemon- yellow colour of food grade.

Essence- Strawberry and Vanilla purchased from Nawabganj Market, Kanpur.

Sugar- clean crystal sugar purchased from Raina market company bagh Kanpur.

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

Methods

Preparation of Flavoured milk

To prepare flavoured milk containing 6%, 7%, 8% sugar by W/V of milk i.e. 60, 70 and 70g of sugar per litre 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 litre 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.

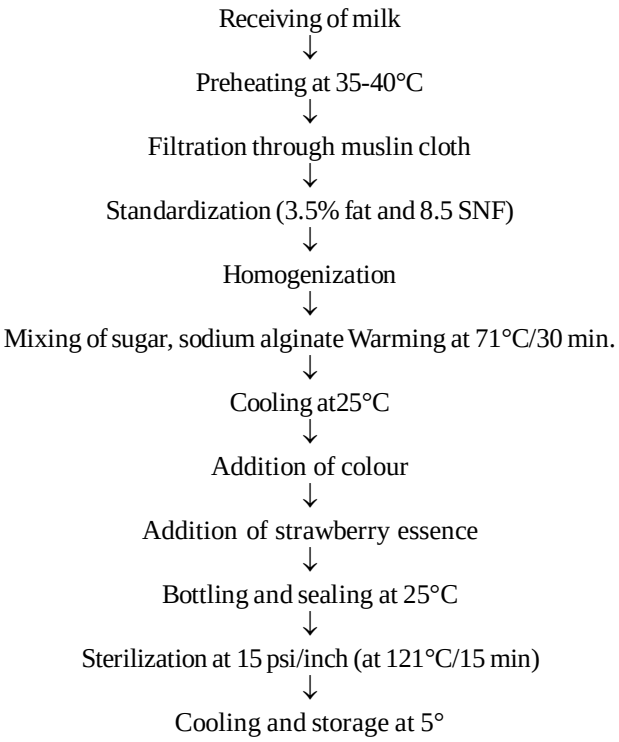

Fig. 1 : Flow Diagram of Manufacture of Flavoured Milk.

Heat treatment

Following thorough mixing, the milk was heated for 30 minutes at a temperature of 71°C before being cooled to 25°C immediately. Following production, the product was put into 200 ml glass bottles that had been thoroughly cleaned and sterilized before being filled with flavor- in fused milk and corked with a crown-cork by a corking machine. All bottles were sterilized in an autoclave for ten minutes at a temperature of 121°C at a pressure of 15 Ibs/inch and then they were moved to a room for storage at refrigeration temperature of between 5 and 10°C. This was done to watch the period of each bottle and conduct various parameter analyses. The method shown in Fig. 1 was used to create flavour-infused milk.

Examination of Flavoured Milk

Sensory Evaluation

A panel of Judges conducted the sensory assessment of the flavoured milk samples. According to Maroney (1975), samples were graded using a9-point hedonic scale. The samples were assessed according to the schedule for a variety of sensory factors, including flavour, colour and appearance, sweetness and overall acceptability. Evaluation form for the numerical test of flavoured milk quality attributes-The samples were scored for quality aspects using the grade description and scoring system (Table I).

Hedonic Score

Hedonic Rating	Score
Excellent	9
Very Good	8
Good	7
Fair	6
Neither good nor bad	5
Slightly undesirable	4
Poor	3
Very Poor	2
Unacceptable	1

Results and Discussion

The present investigation entitled, “Study on effect of levels of fat and sugar on the physical quality of flavoured milk prepared from blend of cow and Goat milk using Vanilla and Strawberry” was carried out in the department of Animal Husbandry and Dairying, Chandra Shekhar Azad University of Agriculture and

Table I :

Treatment	Perfect Score	A1C1			A2C2			A3C1			A1C2			A2C2			A3C2		
Cow and Goat blend milk		B1	B2	B3	B1	B2	B3	B1	B2	B3	B1	B2	B3	B1	B2	B3	B1	B2	B3
Flavour	9																		
Colour and Appearance	9																		
Sweetness	9																		
Overall acceptability	9																		

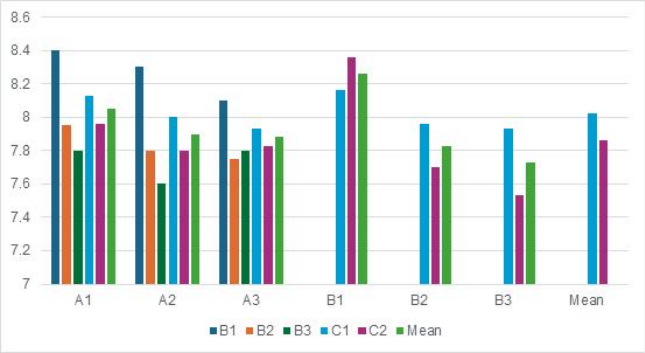

Fig. 1 : Mean effect of A, B and C on flavour score of flavoured milk.

Table 1 : Effect of various levels of fat level (A), sugar levels (B) and essence type (C) on flavour score of flavoured milk.

Treatment	B_1	B_2	B_3	C_1	C_2	C_3
A_1	8.100	7.750	7.800	7.933	7.833	7.833
A_2	7.900	7.900	7.6500	7.933	7.700	7.817
A_3	8.000	7.700	7.400	7.800	7.600	7.700
B_1				7.867	8.133	8.000
B_2				8.000	7.567	7.783
B_3				7.800	7.433	7.617
Mean				7.889	7.711	

Table 2 : Effect of various levels off at level (A), sugar levels (B) and essence type (C) on colour and appearances score of flavoured milk.

Treatment	B_1	B_2	B_3	C_1	C_2	Mean
A_1	7.50	7.2	7.20	7.33	7.26	7.30
A_2	7.70	7.4	7.40	7.53	7.46	7.50
A_3	7.60	7.3	7.31	7.44	7.36	7.40
B_1				7.50	7.70	7.60
B_2				7.30	7.30	7.30
B_3				7.51	7.10	7.30
Mean				7.43	7.36	

Technology, Kanpur. The cow milk and goat milk were obtained from C.S.A. University dairy at Kanpur. In order to study the effect of three fat levels (A) - 3.2%, 3.4%, and 4.0%, three sugar levels (B) - 6%, 7% and 8% and two of essence (C) - Strawberry and Vanilla for preparation of flavoured milk. The effect of various factors on flavoured milk was analyzed for organoleptic qualities flavour, colour and appearances, sweetness and overall acceptability. The data thus obtained were analyzed in Factorial Completely Randomized Design (CRD). The result drawn and their interpretation were presented systematically in the Tables.

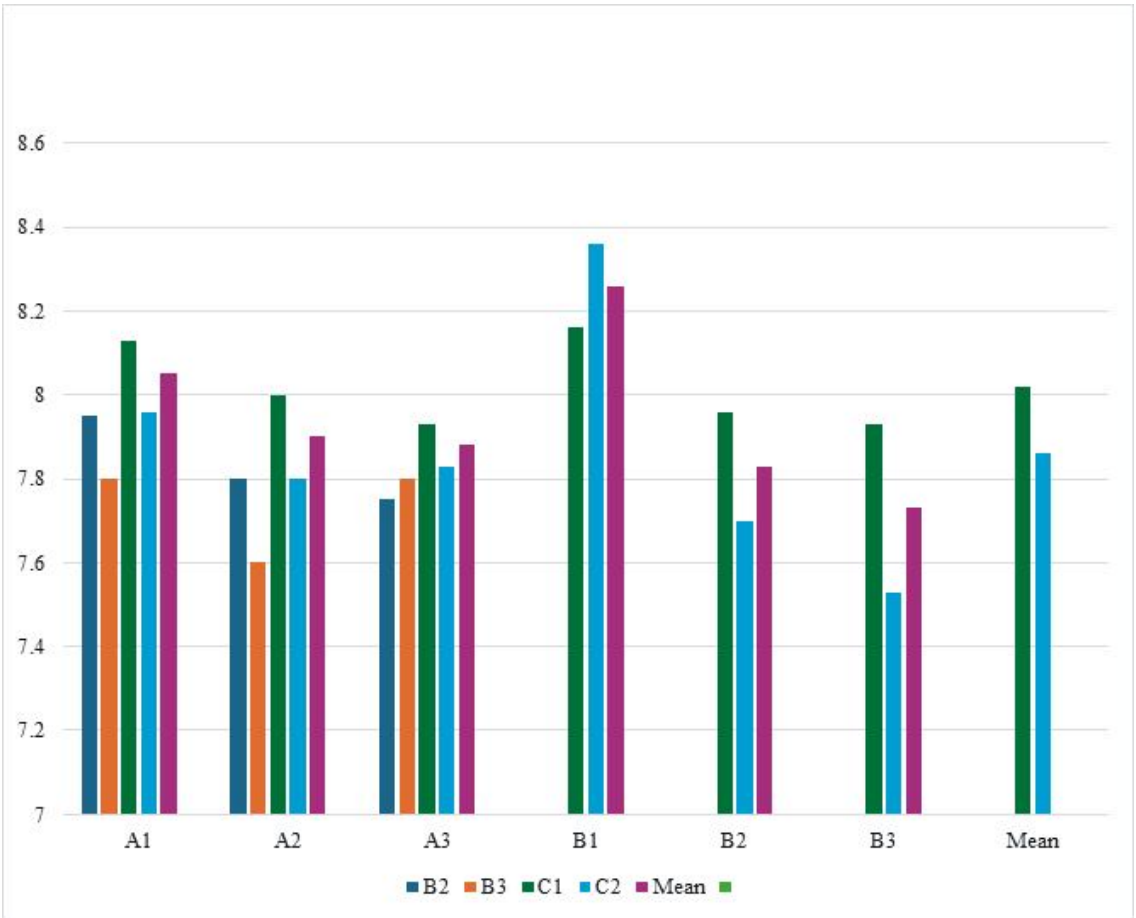

Fig. 2 : Mean effect of A, B and C on Colour and appearances score of flavoured milk.

Sensory evaluation of flavoured milk

Flavour

The most crucial quality factor for flavour-infused milk is its flavour score. For extended durations of preservation, a nice, sweet scent should be preserved. Curdling and a mildly acidic taste are undesirable traits of flavour milk. It should be devoid of any off flavours, bitterness, saltiness or alien substances.

Among the treatment combinations of A × B on flavour score of flavoured milk, it was observed that the maximum flavours core of flavoured milk (8.10) was noted in A_1B_1 sample followed by A_3B_1 and minimum flavour score of flavoured milk (7.40) was found in A_3B_3. The results varied highly significant at 0.1% level of significance. Among the treatment combination of sugar levels and type of essence (B×C), it was observed that maximum flavour score of flavoured milk (8.133) was noted in B_1C_2 combinations followed by B_2C_1 combinations the minimum flavour score of flavoured milk (7.433) was noted in B_3C_2 combinations. From interactions (A×C) it was observed that maximum flavours core of flavoured milk (7.93) was noted in A_1C_1 samples followed by $A1C_2$ and minimum score (7.60) was noted in A_3C_2 samples.

Colour and appearances

Flavoured milk should have a consistent, agreeable colour and look with no discernible extraneous objects. In addition to allowed colours, permissible fruit flavours and essences are employed. The flavour of the milk was reddish and yellowish. The fat should not be deposited on the bottle's upper neck. The look and consistency of flavouring in milk should be consistent. Table 2 shows the look and colour of flavour-infused milk as influenced by several variables. In Table 2, the flavour of milk at various fat percentages (A), sugar percentages (B) and essence levels (C) is measured.

Among the treatment combinations of A× B on colour and appearances score of flavoured milk, it was observed that the maximum colour and appearances score of flavoured milk (7.70) was noted in A_2B_1 sample followed by A_3B_1 and minimum colour and appearances score of flavoured milk (7.20) was found in A_1B_2 and A_1B3.

The results varied highly significant at 0.1% level of significance. Among the treatment combination of sugar levels and type of essence (A×C), it was observed that maximum colour and appearances score of flavoured milk (7.53) was noted in A_2C_1 combinations followed by A_2C_2 combinations the minimum colour and appearances score of flavoured milk (7.26) was noted in A_1C_2 combinations.

Table 3 : Effect of various levels of fat level (A), sugar levels (B) and essence type (C) on sweetness score of flavoured milk.

Treatment	B_1	B_2	B_3	C_1	C_2	Mean
A_1	8.40	7.95	7.80	8.13	7.96	8.05
A_2	8.30	7.80	7.60	8.00	7.80	7.90
A_3	8.10	7.75	7.80	7.93	7.83	7.88
B_1				8.16	8.36	8.26
B_2				7.96	7.70	7.83
B_3				7.93	7.53	7.73
Mean				8.02	7.86	

Table 4 : Effect of various levels of fat level (A), sugar levels (B) and essence type (C) on overall acceptability of flavoured milk.

Treatment	B_1	B_2	B_3	C_1	C_2	Mean
A_1	8.100	7.600	7.400	7.800	7.600	7.700
A_2	7.900	7.500	7.500	7.733	7.533	7.600
A_3	7.700	7.450	7.450	7.567	7.500	7.533
B_1				7.800	8.000	7.900
B_2				7.600	7.433	7.517
B_3				7.700	7.200	7.450
Mean				7.700	7.544	

From interactions (B×C), it was observed that maximum colour and appearances score of flavoured milk (7.51) was noted in B_3C_1 samples followed by $B1C_1$ and minimum score (7.10) was noted in B_3C_2 samples.

Sweetness

Comparing the flavouring milk to other dairy products, the former has less sugar. Overly sugary foods should be avoided. Table 3 shows how the sweetness of flavour-infused milk is influenced by several variables.

Among the treatment combinations of A × B on sweetness score of flavoured milk, it was observed that the maximum sweetness score of flavoured milk (8.40) was noted in A_1B_1 sample followed by A_2B_1 and minimum sweetness score of flavoured milk (7.60) was found in A_2B_3. The results varied highly significant at 0.1%level of significance. Among the treatment combination of sugar levels and type of essence (B×C), it was observed that maximum sweetness score of flavoured milk (8.36) was noted in B_1C_2 combinations followed by B_1C_1 combinations the minimum sweetness score of flavoured milk (7.53) was noted in B_3C_2 combinations. From interactions (A×C) it was observed that maximum sweetness score of flavoured milk (8.13) was noted in A_1C_1 samples followed by A_2C_1 and minimum score (7.80) was noted in A_2C_2 samples.

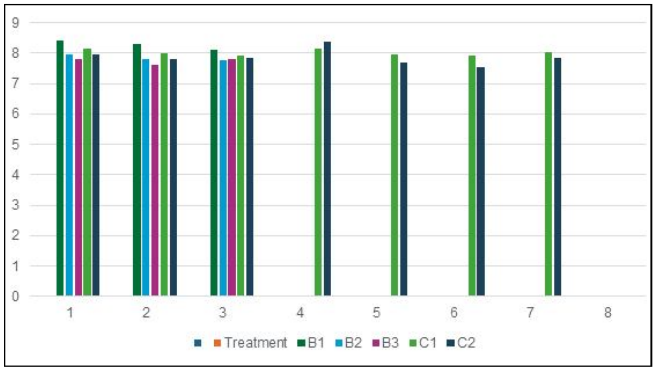

Fig. 3 : Mean effect of A, B and C on colour and appearances score of flavoured milk.

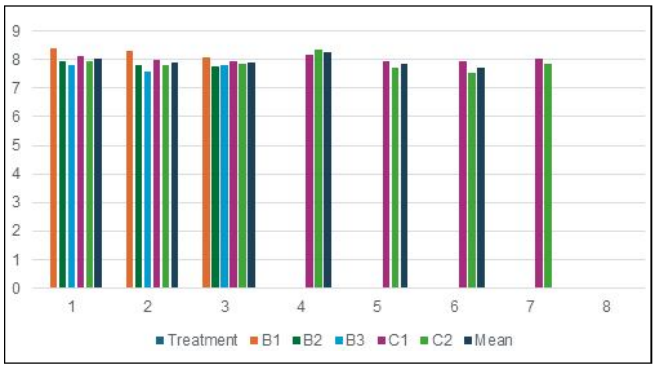

Fig. 4 : Mean effect of A, B and C on overall acceptability score of flavoured milk.

Overall acceptability

Compares the flavours of milk with varying amounts of sugar and essence with varying amounts of fat in the Table 4.

Among the treatment combinations of A×B on overall acceptability score of flavoured milk, it was observed that the maximum overall acceptability score of flavoured milk (8.10) was noted in A_1B_1 sample followed by A_2B_1 and minimum overall acceptability score of flavoured milk (7.40) was found in A_1B_3. The results varied highly significant at 0.1% level of significance. Among the treatment combination of sugar levels and type of essence (B×C), it was observed that maximum overall acceptability score of flavoured milk (8.00) was noted in B_1C_2 combinations followed by B_1C_1 combinations the minimum overall acceptability score of flavoured milk (7.20) was noted in B_3C_2 combinations. From interactions (A×C), it was observed that maximum overall acceptability score of flavoured milk (7.80) was noted in A_1C_1 samples followed by A_2C_1 and minimum score (7.50) was noted in A_3C_2 samples.

Conclusion

The data obtained on the basis of sensory, physico-chemical qualities of flavoured milk prepared from blend of cow and goat milk with different level of sugar, different level of fat and two types of essence strawberry and vanilla. Overall suitability of the flavoured milk was found in sample 6% with strawberry essence, which is the best as compared to other treatment combination.

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