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EXPLORING THE FUNCTIONAL, MICROBIAL, NUTRITIONAL AND SENSORIAL PROPERTIES OF WHIPPING CREAMS PREPARED FROM DIFFERENT FAT SOURCES

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Abstract
The current study sought to examine a variety of quality and safety features associated with whipped cream (WC) made from various milk fat derivatives, including buffalo, cow, camel, and anhydrous named BMF, CMF, CaMF, and AMF. All the creams had their pH, microbiological examination, and acidity, (total plate count [TPC], yeast [YC], and coliform count [CC]) analyzed using AOAC standards. To determine the quality, functional properties were evaluated followed by sensory examination. The non-dairy whipped cream offered at the neighborhood store was compared to all the findings. All analyses were replicated on the 1st, 3rd, and 5th days of the study. The Duncan multiple range test and a factorial design were adopted to estimate the combined significance. Numerous qualitative parameters showed that dairy WC performed comparably to a non-dairy product. Buffalo milk cream received the best overall acceptability ratings when compared to all other creams, except AMF cream, which had the greatest amounts of potassium, sodium, and calcium (9.48 mg, 47.43 mg, and 71.15 mg, respectively). Whipping creams made with AMF, BMF, and CMF had the highest overrun and roset times. Viscosity ratings for dairy-whipped creams ranged from 1001.42±9.39 for dairy-based creams to 1008.42±11.2 for non-dairy creams. Since dairy creams include more unsaturated fatty acids than non-dairy creams, they are a better alternative to the standard diet.

Keywords: Non-dairy and dairy, whip creams, free-fatty acids, anhydrous milk fat

1. Introduction

The cream is an animal byproduct made by separating the milk into its components and then using a centrifuge or a home separator to remove the dense fat layer at the top. The type of splitter or centrifugation speed is primarily determined by the estimated fat percentage of the cream produced. A mixture of air bubbles and fat that has been considerably integrated at the air/serum border and is held together by its firm viscosity in the liquid stage is what we call whipped cream [1]. Adding air to food mixtures improves both the texture and the mouthfeel. Networks of slightly distributed fat droplets adsorb over the surfaces of air bubbles thus gives goods like ice cream, artificial and natural whipped cream a frothy look. These structures were aerated thanks to the whipping of oil-in-water emulsions [2]. The USDA reports that heavy WC contains 36.1% lipids, including a high concentration of saturated fats, 2.84% protein, and 57.7% water. FAOSTAT reports that between 2000 and 2018, global production of cream increased considerably, from 2869381 to 3557471 metric tonnes. In line with predictions from the International Dairy Federation (2.2% increase in output and consumption), Pakistan's annual cream production increased from 600 to 3365 tonnes between 2003 and 2018. WC suspension is a complex system that, before freezing, should be in a state of quiescent constancy due to the occurrence of substantial coalescence upon clipping [3]. WC isn't purchased daily but is frequently used for special events [4]. Un-whipped cream is commonly used to make soups or Western cuisine, among other things [5]. Natural, compound (combination of dairy fat and oil), and non-dairy creams are the most prevalent forms of WC, with fat contents ranging from 35% to 40%. The velvety texture that characterizes conventional dairy WC is the result of microstructure disruptions that occur after the firm linkage of rather complicated fat globules with a very brief yielding strain (0.1%) breaks down [1]. Creams that are low in fat and those that are light include between 25 and 18% fat, whereas rich or double-fat creams contain around 48% fat. Cream with a low-fat crystal percentage is preferred over cream with a high-fat crystal percentage, which might cause low viscosity and significant serum leakage. Many different kinds of milk fats can be used to create whip, including but not limited to camel, goat, buffalo, sheep, and cow [6]. The fat globules in whipped cream capture air cells, resulting in an air-in-water froth. By raising the fat content and cutting down on the time needed to beat the cream, the foaming capability can improve the standard of whipped cream [7]. Different milk fats can have an impact on foaming capacity, which can change the resulting WC's quality criteria. The following research set out to compare the fatty acid composition, shelf life, functional attributes (overrun, foaming, viscosity, and roset time), and sensorial evaluation of whipped creams made with various milk fats (MF) such as BMF, CMF, CaMF, and AMF. The study's findings were compared to those of a local store selling a dairy-free alternatives of whip cream.

2. Resources and Techniques

2.1.Milk Procurement

Plans for this study were made at the University of Veterinary and Animal Sciences (UVAS) in Patokit, Pakistan, in the dairy technology department. Buffalo milk was collected from Pattoki Buffalo Research Institute (BRI). The UVAS's Dairy Animals Training and Research Centre (DATRC) provided cow milk, while camel milk was purchased from stalls in Lahore, Pakistan. Until analysis could be completed, samples were marked, transported in an icebox, and stored at 4 °C. The reagents and chemicals were all acquired from a local store in Lahore, Pakistan, and were of high enough grade for analytical use.

2.2. Preparation of whipped cream

With the help of a cream separator, fat was separated from milk samples. After separation, skim milk was used to standardize the cream's fat content up to 30%. After that, the cream received 0.3% carrageenan along with 0.025% hydroxypropyl methylcellulose. Before whipping, the cream was stored at 4 degrees for a day and a night after being pasteurized in a water bath for 30 minutes at 60 degrees. A combination of 10% warm water and powdered skim milk was made. Next, 0.025% hydroxypropyl methylcellulose and 0.3% carrageenan were added to the mixture. The solution was maintained at heating temperature for 5 min. The mixture was then blended with anhydrous milk fat.The cream was pasteurized in a water bath at 60 ^{o}C for 30 min.

The mixture was then held at 4 ^{o}C for 24 h before whipping. Whipping was done with a home mixer (KVL8300S, RPM 250) using the method established by Fredrick and his colleagues in 2013. It was first whipped at a slow pace, but after one minute, the speed was increased [8].

2.3. Assessment of proximate composition

Following the procedure outlined in AOAC Method No. 920.39, the fat content was measured using the Soxhlet equipment [9]. After sample digestion, distillation, and titration, the protein levels were assessed using the Kjeldahl technique, under the steps outlined in AOAC method no. 984.13 [9].

The methods 934.01 and 942.05 described in AOAC were used to determine the contents of both ash and moisture respectively [9]. For the ash analysis, Muffle Furnace was used (from Galenhamp, England).

2.4. Treatment Plan

Buffalo, cow, camel, and anhydrous milk fat were used to make four different types of creams, T1, T2, T3, and T4, respectively. T1 (control) was whipped cream (non-dairy), T2 was BMF (Buffalo), T3 was (CMF) cow, and T4 was anhydrous (AMF).

2.5. Functional properties

Perceived viscosity, roset time, foaming stability, and overrun were among the functional aspects tested in the whipped creams.

2.5.1.Overrun

It was evaluated using the method outlined in [8]. It can be achieved by determining the weight difference between comparable quantities of whipped and un-whipped emulsion.

2.5.2. Foam stability (FS)

The following formula was employed as a syneresis indicator and to test foaming stability, according to the method outlined in Liu (2022) [10] :

$$\text{FS \%} = \frac{\text{collected serum mass}}{\text{initial weight of WC}} \times 100$$

2.5.3 Roset Time and Viscosity

The method for measuring viscosity and Roset time is explained in [10]. Numerical viscometerDV2TL-VTJO (USA) at 20 ^{o}C, spindle no. 2, 100 RPM, yielded the predicted viscosity.

2.6. Physicochemical analysis

2.6.1. pH

A pH metre (Model: HI 2210 Hanna, China) calibrated with buffer solutions with pH values of 7.1 and 4.1 was used to measure the pH of whipped cream.

2.6.2. Total soluble solids

Using methods outlined by [11] the total solids contents of whipped cream were evaluated.

2.6.3. Acidity determination

To assess the acidity of different whipped creams made from buffalo, cow, and camel, along with anhydrous milk fats, a similar approach to that outlined in AOAC protocol No. 942.15 was employed [9].

2.7. Microbiological analysis

The total number of colonies (method no. 990.12/aerobic plate count), yeast (method no. 2014.05), as well as coliform count (method no. 966.24) of whipped creams manufactured using various milk fat sources on different days were analyzed micro-biologically following the protocols specified [9].

2.8. Fatty acid profile (Free fatty acids & iodine value)

GC-MS (7890-B, Agilent Technologies) was utilized to compare the fatty acid compositions of whipped creams produced with different types of milk fats. The higher fat bed of whipped cream was homogenized with n-hexane and di-ethyl ether (50:50) to remove the fat after centrifuging at 4000 revolutions per min for 10 to 15 min. The excess solvent was then removed, leaving the extracted fat for fatty acid analysis. The test tube contained precisely 0.5 mg of isolated fat, which was then exposed to methanolic HCL. Both sodium sulfate and n-hexane were employed for drying and extraction. The auto liquid sampler was injected with exactly 1 L of the sample. This was accomplished using a fused silica capillary column (SP 2560; 100 m, 25 m film thickness). The detector's temperature was 250 °C, whereas the intake was 200 °C. Utilizing flow 1, 4, and 40 mL/min for helium, hydrogen, and oxygen, respectively, results in a split ratio of 1:50. The measurement of fatty acids was done using FAME-37 standards [12].

Free fatty acids

The technique outlined in [13] was used to determine free fatty acids.

Iodine value

The cream sample's iodine content was measured using the Wijs technique (method no. 993.20A) asdescribed in [9].

2.9. Mineral and energy analysis

Mineral content in whipped cream was analyzed using an atomic absorption spectrophotometer. For mineral content measurement, we used the wet ashing method described by Abulude (2010) [14], and for total energy analysis, we followed the procedure described in [15].

2.10. Sensory analysis

The evaluator rated the whipped cream created with varying milk fats on a hedonic scale of 1 to 9 depending on how it looked, tasted, and felt [16].

2.11. Statistical Analysis

All of the collected data were entered, examined, and expressed as mean±SD using SPSS version 26. The combined effect of the treatment and study days on important study parameters was assessed using a complete factorial analysis. To evaluate the substantially different groups and significantly different parameters for different treatments and days, a one-way analysis of variance and the Duncan multiple range test (DMRT) were employed. There was a 5% significance limit.

3. Results and Discussion

The purpose of this research was to determine the proximate chemical makeup (moisture, protein, ash, and fat), pH, acidity, functional properties and mineral composition (viscosity, foaming, roset time, and overrun), fatty acid composition, and sensory evaluation of buffalo, cow, and camel milk fat for use in a variety of dairy products, including anhydrous milk fat (AMF).

3.1. Proximate composition

Table 1 displays the shared impact of treatment and time and provides non-significant results for proximate analysis of several whipping creams made with various milk fat resources. In comparison to the other groups, the T2 (cow's milk) groups for treatment groups had the lowest levels of fat. Comparing the third and fifth days to the baseline and first day, a substantial decrease in the fat level was noticed overall. For the control group of milk cream, like buffalo (BMC), cow (CMC), camel (CaMC), and anhydrous (AMC), respectively, the protein levels were 1.98 ± 0.07, 3.85 ± 0.04, 3.47 ± 0.08, 2.95 ± 0.08, and 1.98 ± 0.07.

Table 1. Proximate composition (Mean ± SD) of various dairy whipped creams at different levels of study

		T_0	T_1	T_2	T_3	T_4
Protein %	**Day 0**	$2^{D} \pm 0.1$	$3.8^{aA} \pm 0.03$	$3.5^{aB} \pm 0.05$	$3^{C} \pm 0.1$	$2^{D} \pm 0$
	Day 1	$2^{D} \pm 0$	$3.88^{a} \pm 0.03$	$3.48^{abB} \pm 0.03$	$2.97^{C} \pm 0.06$	$2^{D} \pm 0.1$
	Day 3	$2^{D} \pm 0.1$	$3.82^{bA} \pm 0.03$	$3.4^{abB} \pm 0.03$	$2.93^{C} \pm 0.08$	$2^{D} \pm 0.1$
	Day 5	$1.95^{D} \pm 0.05$	$3.82^{bA} \pm 0.03$	$3.42^{bB} \pm 0.03$	$2.88^{C} \pm 0.08$	$1.93^{D} \pm 0.03$
	Overa	$1.99^{d} \pm 0.07$	$3.85^{a} \pm 0.04$	$3.47^{b} \pm 0.04$	$2.95^{c} \pm 0.08$	$1.98^{d} \pm 0.07$
Moisture %	**Day 0**	46 ± 0.5	$45.5^{b} \pm 0.5$	45 ± 1	45.17 ± 0.76	45 ± 1
	Day 1	45.87 ± 0.15	$45.87^{b} \pm 0.$	45.13 ± 0.9	45.67 ± 0.58	45.1 ± 0.95
	Day 3	46.2 ± 0.1	$46.03^{ab} \pm 0.2$	45.37 ± 0.85	45.8 ± 0.53	45.37 ± 0.85
	Day 5	46.2 ± 0.1	$46.67^{a} \pm 0$	45.63 ± 0.71	46.17 ± 0.71	45.57 ± 0.9
	Overa	$46.07^{a} \pm 0.27$	$46.02^{a} \pm 0.54$	$45.28^{b} \pm 0.78$	$45.7^{ab} \pm 0.67$	$45.26^{b} \pm 0.8$
Fat %	**Day 0**	30 ± 0	30 ± 0	$30^{a} \pm 0$	30 ± 0.5	30 ± 0.5
	Day 1	30 ± 0.5	30 ± 0.5	$30^{a} \pm 0.5$	30 ± 0.5	29.9 ± 0.1
	Day 3	$29.9^{A} \pm 0.1$	$29.8^{A} \pm 0.1$	$29^{bB} \pm 0.5$	$29.9^{A} \pm 0.1$	$29.8^{A} \pm 0.1$
	Day 5	$29.83^{A} \pm 0.06$	$29.77^{A} \pm 0.06$	$29^{bB} \pm 0.3$	$29.8^{A} \pm 0.1$	$29.7^{A} \pm 0.1$
	Overall	$29.93^{a} \pm 0.23$	$29.89^{a} \pm 0.25$	$29.5^{b} \pm 0.62$	$29.93^{a} \pm 0.32$	$29.85^{a} \pm 0.$
Ash %	**Day 0**	0.68 ± 0.03	0.7 ± 0.01	0.7 ± 0.02	0.67 ± 0.02	$0.67^{a} \pm 0.01$
	Day 1	$0.68^{AB} \pm 0.01$	$0.69^{A} \pm 0.01$	$0.69^{A} \pm 0.01$	$0.67^{AB} \pm 0.02$	$0.66^{abB} \pm 0.01$
	Day 3	0.67 ± 0.01	2.69 ± 3.47	0.68 ± 0.02	0.66 ± 0.02	$0.65^{bc} \pm 0.01$
	Day 5	$0.66^{AB} \pm 0.01$	$0.67^{A} \pm 0.01$	$0.67^{A} \pm 0.01$	$0.65^{AB} \pm 0.02$	$0.65^{cB} \pm 0.01$
	Overa	0.67 ± 0.02	1.19 ± 1.74	0.68 ± 0.02	0.66 ± 0.02	0.66 ± 0.01

T0 is non-dairy whipped cream from the neighbourhood market; T1, T2, T3, and T4 are anhydrous milk fat (AMF) from buffalo, cow, and camel milk, respectively.
Duncan multiple range test (DMRT): bold heterogeneous superscripts in rows or columns indicate overall significant different groups in intervals and treatments; heterogeneous small superscripts in rows present significant differences between different intervals in the research in each treatment; while heterogeneous capital superscripts indicate significant differenceamong treatments at each interval.

Comparing dairy cream to non-dairy (plant-based) creams, Oduro et al. found that cream from dairy contains greater moisture (87.85%), protein (3.77%), fat (2.50%), and ash (0.72%) contents [17]. The study's results were equivalent to dairy WC made with 75% skim milk fat and a 30% fat adjustment [3]. The study revealed that the protein content in dairy whipped creams was 3.85 ± 0.04,
3.47 ± 0.04, 2.95 ± 0.08, and 1.98 ± 0.07 in whipped creams based on buffalo, cow, camel, and anhydrous milk fat, whereas nondairy creamers had a protein concentration of 1.99 ± 0.07. The protein in the whipped cream may give it a beautiful texture and solidity [18]. Maximum protein concentrations have been found in whipped cream made from camel milk, while minimal quantities have been found in AMF and non-dairy whipped cream. The functional qualities, foaming ability, and structural aspects of the prepared cream can all be improved by adding more minerals or ash to it [19]. All of the dairy whipped cream formulations had ash amounts that were equivalent to non-dairy whipped cream. The whipped cream's capacity to hold onto moisture is correlated with both improved foam stability and its foaming structure [20]. In comparison to all other categories, buffalo milk fat-based whipped cream and non-dairy whipped cream reported the highest moisture levels, with camel milk-based whipped cream coming in last.

3.2 Physicochemical analysis

Cow/AMF cream had the highest total solids content, whereas control/buffalo milk cream had the lowest. A considerable drop in the total solid of all the produced creams and control was seen as the trial's length increased. The shift in pH, acidity, together with total soluble solids concentration during storage duration in different varieties of whipped creams is shown in Figure 1. Compared to all other research groups the control group and AMF cream group had the highest pH. The pH gradually decreased significantly from the first day of the study through the third and fifth days. For different treatment groups, acidity was not significant. On the other hand, from the first day of the study to the 3rd and 5th days, a steady, considerable improvement in the acidity of different creams was seen generally. The results reported in [21] ranged from 42-44% and were less favorable than those found in the current research. Dairy whipped creams with total solids of 53.98±0.54, 54.72±0.78, 54.3±0.67, and 54.74±0.83 were made from the fats from buffalo, cow, camel, and AMF milk, whereas non-dairy whipped cream contained total solids of 53.93±0.27. Since a low pH can strengthen the foam's structure as well as a rise in pH can disrupt it and give the whipped cream a fluid feel, the pH may be crucial for preserving the capacity to foam [4]. The whipped creams made from buffalo, cow, and camel milk fat had the lowest pH when measured against AMF and thenondairy variety found at the local store.

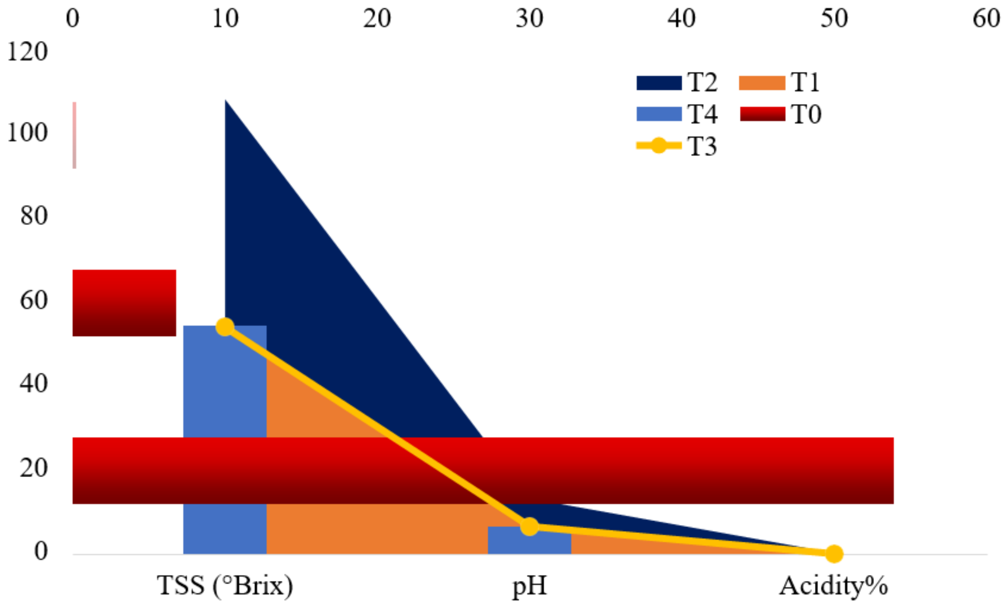

Figure 1. Physicochemical examination of dairy whipped creams made with various milk fat sources:T0 = Non-Dairy Whipped Cream (Local Market); T1 = Buffalo Milk Fat; T2 = Cow Milk Fat; T3 = Camels Milk Fat; T4 = Anhydrous Milk Fat (AMF)

3.3 Fatty acid profile and microbial assessment

The combined impact of the therapy and days was not significant based on microbiological examination. The means±SD from the factorial analysis and Duncan multiple range test (DMRT) related to microbial count and free fatty acids in whipped creams are displayed in Table 2. Total plate count (TPC) was the only impact that was shown to be statistically significant; the least TPC count was found on the baseline (348.35d ± 34.63), and the most was found on day 5. The microbial count was consistent with Bellassi et al.'s findings [22]. Dairy WC made with many species of milk fats had free fatty acid (FFA) levels that were equivalent to those of the local non-dairy whipped cream. In comparison to 0.17 ± 0.01, 0.17 ± 0.01, 0.18 ± 0.01, and 0.18 ± 0.02, the FFA levels of dairy whipped creams based on anhydrous milk fat were reported to be 0.17 ± 0.01, 0.17± 0.01, 0.18
± 0.01, and 0.18 ± 0.02, respectively. The combined impact of treatment with days was not significant on free fatty acid levels. Furthermore, Table 2 indicates free fatty acids remained rather constant in each treatment group. In comparison to days 0, 1, and 3, the fifth day of the study saw the trial's overall highest free fatty acid levels. When compared to the other study groups, the camel milk-based whipped cream had the highest amount of unsaturation (as evaluated by the iodine value), and it was equal to the nondairy whipped cream.

Table 2. Evaluation of the microbiological & fatty acid composition (Mean ± SD) for dairywhipped creams produced from different milk fat sources during different study intervals

ample		Day 0	Day 1	Day 3	Day 5
Yeast/Colifom	T0	<10 ± 0			
	T1				
	T2				
	T3				
	T4				
Free Fatt	T0	0.16^{b}±0.01	0.16^{b}±0.01	0.17^{b}±0.01	0.19^{a}±0.01
	T1	0.17± 0.02	0.17±0.02	0.18±0.02	0.18±0.01
	T2	0.17^{bc}±0.01	0.16^{c}±0.01	0.18^{ab}±0.01	0.19^{a}±0.01
	T3	0.17^{b}± 0.01	0.17^{b}±0.01	0.18^{b}±0.01	0.19^{a} ± 0
	T4	0.17± 0.01	0.17±0.01	0.18±0.01	0.18±0.01
Total Plate Count(TPC)	T0	330^{cC}±26.46	356.67^{bcAB}±2	393.33^{abBC}±1.55	420^{aBC}±17.32
	T1	376.67^{cAB}±25.1	396.67^{bcAB}±25.1	423.33^{abAB}±25.17	446.67^{aAB}±
	T2	385^{cA} ± 15	406.67^{cA}±11.55	436.67^{bA}±11.55	463.33^{aA}± 11.55
	T3	310^{bC}± 26.46	346.67^{abB}±45.09	373.33^{abC}±40.41	416.67^{aBC}±32.15
	T4	0.17± 0.01	0.17±0.01	0.18±0.01	0.18±0.01

T0 is nondairy whipped cream (from the neighbourhood shop); T1 is fat from buffalo milk; T2 is fat from cow milk; T3 is fat from camel milk; and T4 is anhydrous milk fat (AMF). While heterogeneous capital superscripts indicate significant variations between treatments at each period of research, heterogeneous tiny superscripts in rows imply significant differences over many intervals throughout the study in each treatment.

The highest functional qualities of whipped cream can be supported by the physical stability of monounsaturated fatty acids (C-18). They can create more stable foam because they can bind more water and sugar. According to the current analysis, the C-18 content of whipped cream based on anhydrous milk fat from buffalo, cow, camel, and other sources was 35.7%, 38.2%, 39%, and 44.5%, in that order. In contrast to all other dairy creams, which were reported to have saturated fatty acids ranging from 50.3-57.1%, nondairy whipped creams had the highest levels of saturated fatty acids. For whipped cream that has been made with dairy or without dairy, lower free fatty acid levels can offer excellent quality [23]. Using whipped creams manufactured with buffalo, cow, camel, along with anhydrous milk fat, it was shown that dairy whipped cream had iodine at concentrations of 30, 33, 42.7, and 31 while non-dairy whipped cream possessed an iodine level of 44. Compared to all other groups, the iodine levels were lowest in the cream produced from camel milk and highest in the control group. The lowest iodine concentration was seen in the cream from cow and buffalo milk. The primary fatty acids found in the control cream were myristic acid (16.4%), linoelaidic acid (15.6%), elaidic/oleic acid (12.3%), palmitic acid (24.1%), and lauric acid (28.2%).

3.4 Functional characteristics

The period of storage and the lifespan of an item are also factors in overrun [24]. Protein increases foaming stability positively [25]. Non-dairy whipped cream, whipped cream produced from buffalo, cow, camel, and AMF were all found to have foaming stability ratings of 3.42±0.79, 2.83±0.86, 3.21±0.89, 2.63±1.05, and 2.92±1.6. When dairy and non-dairy whipped creams were developed for the current investigation, the viscosity ratings reported in [21] were greater. In comparison to non-dairy whipped cream, the viscosity ratings for dairy whipped creams were recorded as 1008.42±11.2, 1000.42±15.41, 993.83±17.68, 1005.33±7.94, and 1001.42±9.39. Comparing the control and AMF creams to all other creams, the greatest overrun score was found in these two. On day five of the investigation, the highest foaming capacity was noted. Except for camel cream, the buffalo and cow milk, categories had the highest values for roset time. In comparison to the first and baseline readings, the trial's maximum viscosity was found on the third and fifth days. Energy content per 100 g of cream varied from 305 Kcal for the control cream to 300 Kcal for the BMF, 298 Kcal for the CMF, 287 Kcal for the camel milk fat cream, and 286 Kcal for the AMF cream.

Table 3. Mean±SD for the functional characteristics of dairy whipped creams made with different types of milk fat

	T0	T1	T2	T3
Foaming	3.42±0.79	2.83±0.86	3.21±0.89	2.63±1.05
Viscosity	1008.42±11.2	1000.42±15.41	993.83±17.68	1005.33±7.94
Overrun	313.75^{a}±7.11	212.5^{b}±30.41	218.75^{b}±6.44	222.92^{b}±6.2
Roset Time	42.13^{bc}±2.02	44.29^{a}±1.96	44.96^{a}±2.63	43.21^{ab}±1.9

Significant differences between numerous intervals are shown by heterogeneous capital superscripts, while significant differences between treatments at each interval are represented by heterogeneous tiny superscripts in rows. T0: Non-dairy whipped cream from the neighbourhood market; T1, T2, T3, and T4: anhydrous milk fat (AMF),buffalo, cow, and camel milk dairy creams.

3.5 Mineral analysis

There was 9.38 mg of sodium in the control cream, 27.74 mg in the BMF, 33.18 mg in the CMF, 47.43 mg in the camel milk fat cream, and 9.38 mg in the AMF cream. 5.63 mg, 26.74 mg, 38.71 mg, 45 mg, and 71.15 mg of potassium were found in the placebo, BMF, CMF, camel milk fat, and AMF creams, respectively. Control cream had 2.92 mg of calcium, while BMF cream had 3.46 mg, CMF cream had 5.53 mg, camel milk fat had 10.12 mg, and AMF cream had 9.48 mg. The analysis's findings allowed for comparison with [26]..

3.6 Sensory analysis

For all of the sensory evaluation's characteristics, the cumulative impact of treatment and days was non-significant (Figure 2). The sensory results were equivalent to Amiri's investigation [27]. All of the parameter scores for the study period considerably fell as the research duration increased. Compared to cow's milk cream, camel milk cream received the highest appearance ratings. Color ratings for treatment groups remained non-significant. Taste ratings for the control, buffalo, cow, camel, and AMF milk fat creams were assessed as 6.75 ± 0.45, 8.33 ± 0.65, 7.5 ± 0.52, and 7.75 ± 0.75, respectively. The highest and lowest scores were found in the cream made from buffalo and camel milk, respectively. In comparison to cow's milk cream, camel milk cream received much superior texture ratings. Buffalo milk cream had the highest overall acceptance ratings when compared to all other creams, except for AMF cream.

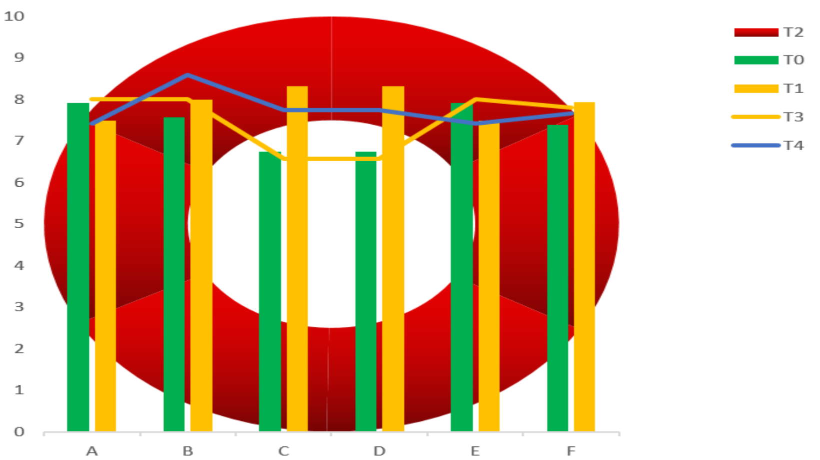

Figure 2. The average for evaluating the appearance, flavour, texture, taste, and overall acceptability of dairy whipped creams made with different sources of milk fat is as follows: T0 = Non- Dairy

Cream (Local Marketplace), T1 = Buffalo milk fat, T2 = Cow milk fat, T3 = Camel milk fat, and T4 = Anhydrous milk fat (AMF).

Conclusion

In conclusion, many quality indicators showed a comparison between various dairy whipped creams and nondairy product. For the control group of milk cream, like buffalo (BMC), cow (CMC), camel (CaMC), and anhydrous (AMC) the protein levels were 1.98 ± 0.07, 3.85 ± 0.04, 3.47 ± 0.08, 2.95 ± 0.08, and 1.98 ± 0.07. Whipping cream prepared from buffalo milk fat was rated as having the highest sensory attribute ratings. For both AMF whipped cream and buffalo/cow fat whipped cream, overrun and roset phases peaked. Therefore, dairy creams are a good alternative to the standard American diet since they include more healthy unsaturated fatty acids.

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