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Physico-chemical properties and storage stability of different dairy whitener brands available in Bengaluru market

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Abstract
Physico- chemical characteristics of dairy whitener brands available in Bengaluru market were investigated for determine the quality of powder. The five different brands (B_1, B_2, B_3, B_4 & B_5) from three different outlets were purchased and obtained results in this investigation were compared to Indian standards for acceptability criteria. B_1 sample showed significantly (P=0.05) high moisture content (3.20%), lower total solid content (96.80%) and lower sucrose content (17.60%). B_2 sample had showed significantly (P=0.05) preeminent fat content (20.40%), total ash content (5.5%), acid insoluble ash content (0.05%) and acidity (1.20%) content. B_4 dairy whitener had showed significantly (P=0.05) higher protein content (20.70%) and lactose content (39.80%). Scorched particles content in B_5 and B_3 dairy whiteners was showed superior (7.42 & 7.30 mg) as compared to other brands. Storage stability of B_4 dairy whitener showed significantly exceptional stability in terms of solubility, free fat, moisture, total solids and titratable acidity as compared to other brands during 6 months of storage.

Keywords: Dairy whitener, chemical properties, physical properties, storage stability of dairy whitener

1. Introduction
Milk converted into milk powder extends its shelf life and allows it to be stored for longer periods of time without losing quality, even at room temperature [1]. Drying technologies such as drum drying, spray drying and freeze drying are used to producing milk powders. Drying procedures affects the physico-chemical and functional qualities of the finished product. Spray drying is used commercially for the manufacturing of milk powder since it is less expensive than freeze-drying and provides moderate functional characteristics [2]. The choice of drying method is determined by the milk powder's final qualities and the ultimate goal of the industry is to produce powder that, when recombined with water; show little or no difference from the original liquid product.
Tea or coffee is consumed by the majority of Indians. Milk is the most commonly used additive used in the preparation of coffee. When milk is added to coffee, the milk proteins can interact with the polyphenols in the coffee and form a complex, which can impact a variety of coffee attributes including structural, functional and nutritional properties [3]. Milk preservation for these purposes is challenging all of the time, especially in the absence of refrigeration in many homes. As a result, a convenient and ready-to-reconstitute powder with a long shelf life at room temperature is required.
Dairy whiteners are available in ready to use for preparation of tea or coffee beverages. The physico- chemical properties might vary due to several factors such as quality of the raw milk is one of the most important aspects that affect the powder quality, while processing procedures such as drying and storage conditions also have an impact on the dairy whitener physicochemical properties. The shelf life and commercial value of the dairy whitener may deteriorate due to these factors. To address the growing demand for high-quality dairy products, manufacturers are willing to offer nutritious and fresh flavoured milk powders and better physicochemical properties. The current investigation deals with the physicochemical properties of dairy whiteners and changes during storage period.

2. Materials and Methods
2.1 Sample collection
Five dairy whiteners such as B_1, B_2, B_3, B_4 and B_5 were purchased from three different outlets at local markets in Bengaluru. The powder samples were aseptically opened and analysed physicochemical properties. These powder samples were stored in air tight containers for analysis of microbial quality during six months of storage period.

2.2 Methods

Physicochemical properties of dairy whitener including moisture and total solids was determined by gravimetric method, fat determined by Mojonnier Fat extraction tube method, protein determined by Kjeldahl method, lactose determined by Lane - Eynon method, sucrose determined by Volumetric (Lane - Eynon) method, Titratable acidity and Total ash were determined as per the method mentioned in (IS: SP: 18: (Part XI) 1981) [4]. Acid insoluble ash content of dairy whitener was measured as per the method mentioned in (FSSAI, 2015) [5]. Water activity of dairy whitener was determined by Novasina Lab swift- a_w system. Free fat of dairy whitener was measured as per the method mentioned in (Kumar 1999) [6].

Scorched particle of dairy whitener is measured by as per the method mentioned in Meena *et al*. 2017 [7]. 25 g of milk powder and 250 ml of 60 ºC warm water were combined in a blender. After mixing for 60 sec, the sample was immediately filtered through filter paper. The blender was rinsed with 50 ml of distilled water and then filtered through the same filter paper. Finally, the filter paper was dried at 35 ºC and compared to a scorched particle standard disc.

Particle size of dairy whitener is measured by as per the method mentioned in Khatkar *et al*. 2014 [8]. 0.2 g of dairy Whitener is added to 5 ml of paraffin oil and one drop of prepared sample place on microscope slide and covered with a cover slip. Measurement is made by calibration of ocular disc with stage micrometer and 20- 30 particles are measured.

Total bacterial count, Coliform count, Spore count and Yeast & mold count of dairy whitener were determined as per the method mentioned in (FSSAI, 2016) [9].

Significant difference between the values was verified by one way analysis of variance (ANOVA) and comparison between means was made by critical difference value by using R software [R. version 4.1.2 (2021-11-01), copyright © 2021, R foundation].

3. Results and discussion

3.1 Chemical composition of dairy whiteners

Brand B_1 had showed significantly (P=0.05) high moisture (3.2%) content and the B_2 had a less moisture content (2.80%) as compared to other brands (Table 1). Statistically there was a non-significant (*p*=0.05) difference with respect to the moisture content among five dairy whitener brands. Our results were well correlated with the results of Tan *et al*. 2011 [10] found that whole milk powder produced at increased inlet air temperatures of 165 ºC, 175 ºC and 185 ºC with decreased outlet temperatures of 83.7 ºC, 91.8 ºC and 93.8 ºC and decreased relative humidity of 13.1 per cent, 9.7 per cent and 9.6 per cent had a moisture content of 4.33 per cent, 3.11 per cent and 2.99 per cent, respectively. Masum *et al*. 2020 [11] observed that the moisture content of the infant milk formula powder was decreased (2.14 to 2.46% at 80 ºC and 0.83 to 1.28 at 90 ºC) with increasing the inlet air temperature from 180-200 ºC and outlet air temperature from 80 – 90 ºC. The moisture content in milk powder is mainly affected by the relative humidity of outlet air, inlet and outlet air temperatures and concentrate mass flow rate (Schuck *et al*. 2008) [12]. The B_1 sample had lower total solid content (96.80%) as compared to other brands and statistically non-significant (*p*=0.05) difference occurred with respect to total solids for all brands. The variation in the total solids content in milk powder is mainly affected by the relative humidity of outlet air, inlet and outlet air temperatures and concentrate mass flow rate (Schuck *et al*. 2008) [12]. On par with the present study Kajal *et al*. 2012 [13] reported that the all six different brands of whole milk powder had total solids content in the range of 95.51 – 96.63 per cent.

B_2 sample had a higher fat content (20.40%) while the B_4 had a lower fat content (15.20%) as compared to other brands (Table 1). Statistically there was a significant (*P*=0.05) difference with respect to the fat content for all dairy whitener samples. The results obtained in the present study were similar to the Narendrabhai. 2008 [14] who reported that the fat content in medium fat liquid dairy whitener and full fat liquid dairy whitener was about 2.9% and 6.6% as compared to market powdered dairy whitener samples A and B, which contained 19 per cent and 20 per cent. Khatkar *et al*. 2014 [8] reported that the milk fat levels in the UF dairy whitener was 20.16% as compared to two different types of market dairy whiteners which contained 20% and 19%.

The B_4 sample contained more protein content (20.70%) while the B_5 contained lower protein content (17.80%) as compared to other brands and statistically there was a significant (*p*=0.05) difference with respect to the protein content among five dairy whitener samples. Similar values were observed in medium fat liquid dairy whitener and full fat liquid dairy whitener was about 10.89% and 37.85% as compared to market powdered dairy whitener samples A and B, which contained 20.5% and 20% Narendrabhai 2008 [14]. Khatkar *et al*. 2014 [8] reported that the protein content in the UF dairy whitener was 40.07% as compared to two different types of market dairy whitener, which contained 20% and 20.5%.

The B_4 sample showed higher lactose content (39.80%) as compared to other brands (Table 1). Statistical analysis revealed that significant (*P*=0.05) difference existed with respect to the lactose content for all the brands. Similar values were reported by Khatkar *et al*. 2014 [8] who reported that the lactose level in the UF dairy whitener was 13% as compared to two different types of market dairy whitener, which contained 37% and 37.5%. The B_1 sample contained less sucrose content (17.60%) as compared to other brands and statistically there was a significant (*p*=0.05) difference with respect to the sucrose content among five brands. Our results are corroborating well with the results of Khatkar *et al*. 2014 [8] and they reported that the sucrose content in UF dairy whitener was 17% as compared to two market powdered dairy whitener samples, which contained 18% sucrose content.

The B_2 dairy whitener had higher total ash content (5.50%) as compared to other brands and statistically there was a significant (*p*=0.05) difference with respect to the total ash content for all the brands. Identical values were observed by Kajal, *et al*. 2012 [13] who reported that the all six different brand whole milk powders had total ash content in the range of 5.34 - 5.48 g / 100 g. The B_2 dairy whitener had higher acid insoluble ash content (0.05%) as compared to other brands and statistically there was a non-significant difference with respect to the acid insoluble ash content for all samples (Table 1).

The B_2 sample had higher acidity content (1.20% LA) and B_5 had a less acidity content (0.73% LA) as compared to other brands (Table 1). Statistically there was a significant (*P*=0.05) difference with respect to the acidity content among five dairy whitener brands. On par with the present study Kajal *et al*. 2012 [13] reported that the all six different brands of whole milk powder had titratable acidity content in the range of 0.10 – 0.15% LA.

As a result, it was inferred that the chemical composition of five brands of dairy whiteners met the FSSAI, 2017 [15] standards, which specifies maximum 4% moisture content, maximum of 34% protein content, maximum of 18% of added sugar, maximum ash content of 9.3 percent, maximum 1.5% LA content, maximum 0.1 per cent acid insoluble ash content in dairy whitener. The fat content in medium fat dairy whiteners such as B_4, B_1 and B_5 and high fat dairy whiteners such as B_3, B_2 was confirmed with FSSAI standards, which specify a minimum of 10% and less than 20% fat for medium fat dairy whiteners and a minimum of 20% fat for high-fat dairy whiteners.

Table 1: Physical and chemical properties of five different dairy whiteners

Parameters/ Brands	B_1	B_2	B_3	B_4	B_5
Moisture	3.20^a	2.80^a	3.00^a	2.90^a	3.10^a
Fat	18.10^b	20.40^a	19.80^a	15.20^c	18.10^b
Protein	20.60^b	20.10^b	20.00^b	20.70^a	17.80^c
Lactose	36.80^d	38.00^c	33.90^e	39.80^a	38.70^b
Sucrose	17.60^b	18.01^a	18.10^a	17.70^b	18.00^a
Total ash	5.00^c	5.50^a	5.30^b	4.60^d	4.60^d
Acidity (%LA)	0.93^a	1.20^a	1.10^a	1.03^a	0.73^b
Total solids	96.80^a	97.20^a	97.00^a	97.10^a	96.90^a
Acid insoluble ash	0.02^a	0.05^a	0.02^a	0.04^a	0.03^a
Scorched particles (mg)	7.22^a	7.18^a	7.30^a	7.20^a	7.42^a
Particle size (µm)	109.38^b	101.32^d	109.23^b	112.57^a	105.31^c
Water activity (a_w)	0.30^a	0.35^a	0.27^a	0.25^a	0.33^a

All the values are average of three trails.
Same superscripts with in the column indicate non-significant difference at p=0.05

3.2 Physical properties
3.2.1 Scorched particles
The B_5 and B_3 showed higher scorched particles (7.42 mg and 7.30 mg, respectively) as compared to other brands and statistically there was a non-significant (p=0.05) difference with respect to the scorched particles. Similar values were reported by Cristina *et al*. 2008 [20] reported that whole milk powder stored at room temperature (25 ºC) and 15 ºC for 18 months, scorched particle content did not exceed Disc A. Kalhoro *et al*. 2014 [16] found that scorched particles in half cream milk powder contained a mean of 10.5 mg per 25 g of powder and full cream milk powder contained 9.75 mg per 25 g of powder, which indicated Disc A. Scorched particle content in five powder brands was classified as disc A (7.5 mg) as per USDEC, 2006 [17] standards. So, it was concluded that the scorched particles in five powder brands met the FSSAI scorched particle requirement, which specifies dairy whitener should not be more than disc B (15 mg).

3.2.2 Particle size
The B_4 sample had higher particle size and B_2 had lower particle size as compared to other brands. Statistically there was a significant (p=0.05) difference with respect to the particle size for all the brands. On par with the study Keogh *et al*. 2004 [18] reported that the WMP produced through nozzle diameters of about 0.57, 1.01, 1.19, 1.77, 1.93, 2.18 mm produces powder with 40.8, 56.4, 67.5, 91.2, 172.1 and 184.6 µm particle sizes. Khatkar *et al*. 2014 [8] reported that the particle size in the UF dairy whitener was 74.93 µm as compared to market dairy whitener samples, which contained 91.56±18.68 µm and 98.48±14.21 µm, respectively. Pugliese *et al*. 2017 [19] reported that the average particle size of skim and whole milk powders was 83.87 µ and 128.76 µ, respectively. It was concluded that the, particle size of B_4 dairy whitener was higher as compared to other brands could be due to the drying system used for drying, feed rate of concentrate, velocity of concentrate through orifice, temperature difference between the drying droplet and the hot air in the dryer and size of orifice used for spraying milk (Khatkar, *et al*. 2014) [8].

3.2.3 Water activity
The B_2 had a higher water activity as compared to other brands and statistically (p=0.05) non-significant than other brands. Similar to the present study Schuck *et al*. 2008 [12] reported that water activity of skim milk powder increased from 0.23 to 0.27 with a decreasing outlet temperature from 87 to 82 ºC. The outlet air temperature increased from 77 to 87 ºC by varying the inlet air temperature (178 to 210 ºC) and the concentrate flow rate (97±5 to 110±5 kg/h) did not affect water activity (0.27 to 0.28). Water activity of skim milk powder increased from 0.28 to 0.33 as the relative humidity of the outlet air increased from 7.0 to 9.0%. Similar values were obtained for whole milk product ranged from 0.30 to 0.39 Weerasingha *et al*. 2019 [21]. Masum *et al*. 2020 [11] reported that the water activity of the infant milk formula powder was decreased from 0.19 to 0.05 by increasing the outlet air temperature from 80-100 ºC at 180 ºC inlet air temperature. The obtained values of the water activity of dairy whitener brands were favourable for their preservation (Fournaise *et al*. 2021) [22].

3.3 Storage stability of selected dairy whiteners
3.3.1 Effect of storage stability on physicochemical properties of dairy whitener
Moisture content of B_1, B_2, B_3, B_4, and B_5 dairy whiteners on the 1st month of storage was 3.20%, 2.80%, 3.00%, 2.90% and 3.10%, respectively and it was increased to 6.90%, 7.20%, 6.30%, 6.00% and 6.20% on 6th month of storage, respectively. Total solid content of B_1, B_2, B_3, B_4, and B_5 dairy whiteners on the 1st month of storage were 96.80%, 97.20%, 97.00%, 97.10% and 96.90%, respectively and it decreased to 93.10%, 92.80%, 93.70%, 94.00% and 93.80% on 6th month of storage, respectively. Titratable acidity content of B_1, B_2, B_3, B_4, and B_5 dairy whiteners on the 1st month of storage were 0.93%, 1.20%, 1.10%, 1.03% and 0.73% LA, respectively and it was increased to 1.26%, 1.35%, 1.32%, 1.17% and 1.29% LA on 6th month of storage, respectively.

Table 2: Effect of storage period on physicochemical properties of dairy whiteners

Brands/ parameters	Storage days in months	Moisture (%)	Total solids (%)	Titratable acidity (% LA)	Solubility (%)	Free fat (%)
B_1	1	3.20^{a}	96.80^{a}	0.93^{d}	99.30^{a}	0.02^{a}
	2	3.70^{d}	96.30^{a}	1.06^{c}	99.10^{b}	0.08^{a}
	3	5.00^{c}	95.00^{b}	1.11^{d}	98.40^{a}	0.09^{a}
	4	5.20^{b}	94.80^{c}	1.11^{d}	98.00^{a}	0.13^{a}
	5	5.80^{b}	94.20^{a}	1.20^{c}	97.50^{b}	0.53^{a}
	6	6.90^{a}	93.10^{c}	1.26^{c}	96.10^{c}	1.25^{a}
B_2	1	2.80^{e}	97.20^{a}	1.20^{a}	99.30^{a}	0.05^{a}
	2	3.50^{e}	96.50^{b}	1.20^{a}	99.10^{b}	0.07^{a}
	3	5.40^{b}	94.60^{b}	1.30^{a}	98.80^{a}	0.07^{a}
	4	5.60^{a}	94.40^{d}	1.30^{a}	98.40^{a}	0.29^{d}
	5	6.30^{a}	93.70^{a}	1.33^{a}	98.00^{a}	0.60^{a}
	6	7.20^{a}	92.80^{c}	1.35^{a}	96.00^{d}	1.29^{b}
B_3	1	3.00^{c}	97.00^{a}	1.10^{b}	99.40^{a}	0.02^{a}
	2	4.60^{c}	95.40^{b}	1.17^{b}	99.10^{b}	0.06^{a}
	3	4.70^{a}	95.30^{b}	1.26^{b}	98.60^{a}	0.08^{a}
	4	5.70^{a}	94.30^{d}	1.26^{b}	98.20^{a}	0.10^{c}
	5	5.20^{c}	94.80^{c}	1.32^{b}	97.60^{b}	0.60^{c}
	6	6.30^{b}	93.70^{e}	1.32^{b}	96.10^{c}	1.12^{c}
B_4	1	2.90^{d}	97.10^{a}	1.03^{c}	99.60^{a}	0.03^{a}
	2	4.10^{c}	96.90^{c}	1.05^{d}	99.30^{a}	0.04^{a}
	3	4.50^{d}	95.50^{b}	1.12^{c}	98.20^{a}	0.09^{a}
	4	5.00^{b}	95.00^{c}	1.12^{c}	97.80^{a}	0.37^{b}
	5	5.30^{c}	94.70^{a}	1.15^{d}	97.20^{c}	0.75^{a}
	6	6.00^{b}	94.00^{b}	1.17^{d}	96.80^{a}	1.02^{e}
B_5	1	3.10^{b}	96.90^{a}	0.73^{e}	99.50^{a}	0.05^{a}
	2	4.30^{b}	95.70^{c}	0.74^{e}	99.10^{b}	0.07^{a}
	3	4.40^{d}	95.60^{a}	0.74^{e}	97.90^{a}	0.08^{a}
	4	4.60^{c}	95.40^{a}	0.82^{e}	97.80^{a}	0.13^{a}
	5	5.00^{d}	95.00^{a}	1.02^{e}	97.00^{c}	0.63^{b}
	6	6.20^{c}	93.80^{a}	1.29^{e}	96.40^{b}	1.06^{d}

- All the values are average of three trails.
- Same superscripts with in the column indicate non-significant difference at p=0.05.

Solubility of B_1, B_2, B_3, B_4, and B_5 dairy whiteners on the 1st month of storage were 99.30%, 99.30%, 99.40%, 99.60% and 99.50%, respectively and it was decreased to 96.10%, 96.00%, 96.10%, 96.80% and 96.40% on 6th month of storage, respectively. Free fat content of Brand B_1, B_2, B_3, B_4, and B_5 dairy whiteners on the 1st month of storage were 0.02%, 0.05%, 0.02%, 0.03% and 0.05%, respectively and it was increased to 1.25%, 1.29%, 1.12%, 1.02% and 1.06% on 6th month of storage, respectively. Similar values were reported by Cristina *et al*. (2008) WMP stored for 18 months at 15 and 25 ºC exhibited an increase in titrable acidity and moisture content (2-4%), but a decrease in total dry matter (98-96%).

As a result it was concluded that the moisture content and titratable acidity of all five different types of dairy whiteners were increased during six months of storage while total solids are decreased. Free fat content was increased from the first to six months of storage and it forms a layer on the surface of powder particles resulting in solubility being decreased due to the hydrophobic characteristics. B_4 dairy whitener showed better storage stability in terms of solubility, free fat, moisture, total solids and acidity as compared to other brands.

Table 3: Effect of storage stability on microbial quality of dairy whitener

<table>
<tr><th rowspan="4">Brand</th><th colspan="6">Total bacterial count</th><th colspan="6">Coliform count</th><th colspan="6">Yeast and Mold count</th><th colspan="6">Spore count</th></tr>
<tr><th colspan="24">Log10 CFU/g</th></tr>
<tr><th colspan="24">Storage in months</th></tr>
<tr><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th><th>1</th><th>2</th><th>3</th><th>4</th><th>5</th><th>6</th></tr>
<tr><td>B1</td><td>2.42^{a}</td><td>2.86^{b}</td><td>3.01^{a}</td><td>3.06^{a}</td><td>3.38^{b}</td><td>3.62^{a}</td><td colspan="6" rowspan="5">Nil</td><td colspan="4" rowspan="5">Nil</td><td>Nil</td><td>1.60</td><td colspan="4" rowspan="5">Nil</td><td>Nil</td><td>1.60</td></tr>
<tr><td>B2</td><td>2.42^{a}</td><td>3.07^{a}</td><td>3.21^{a}</td><td>3.33^{a}</td><td>3.47^{b}</td><td>3.83^{a}</td><td>1.47</td><td>1.84</td><td>1.0</td><td>1.30</td></tr>
<tr><td>B3</td><td>2.43^{a}</td><td>3.05^{b}</td><td>3.12^{a}</td><td>3.59^{a}</td><td>3.88^{a}</td><td>3.91^{a}</td><td>1.60</td><td>1.90</td><td>Nil</td><td>1.47</td></tr>
<tr><td>B4</td><td>2.40^{a}</td><td>2.83^{b}</td><td>2.91^{a}</td><td>3.07^{a}</td><td>3.34^{b}</td><td>3.58^{a}</td><td>1.30</td><td>1.60</td><td>Nil</td><td>Nil</td></tr>
<tr><td>B5</td><td>2.33^{a}</td><td>2.73^{b}</td><td>3.02^{a}</td><td>3.47^{a}</td><td>3.58^{b}</td><td>3.71^{a}</td><td>Nil</td><td>1.82</td><td>Nil</td><td>1.30</td></tr>
</table>

All the values are average of three trails

Same superscripts with in the column indicate non-significant difference at p=0.05

3.3.2 Effect of storage stability on microbial quality of dairy whitener

Total bacterial count (log_{10} cfu/g) of five different dairy whitener brands were evaluated during six months of storage. Total bacterial count of B_1, B_2, B_3, B_4, and B_5 dairy whiteners on the 1st month of storage were 2.42, 2.42, 2.43, 2.40 and 2.33 log_{10} cfu/g and it was increased to 3.62, 3.83, 3.91, 3.58, 3.71 log_{10} cfu/g, respectively on 6th month of storage. Statistically there was significant difference (P=0.05) with respect to total bacterial count. The coliform count of five different dairy whiteners during six months of storage was nil. The yeast mould count in five different dairy whitener brands during four months of storage was nil and counts appeared in 5th and 6th month storage. Yeast and mold count in 4th month storage of B_2, B_3 and B_4 were 1.47, 1.60 and 1.30 log_{10} cfu/g, respectively and these count increased in 6th month storage of B_1, B_2, B_3, B_4, and B_5 dairy whiteners about 1.60, 1.84, 1.90, 1.60 and 1.82 log_{10} cfu/g, respectively. Spore count of B_4 during six months of storage shown nil and spore count in B_1, B_3 and B_5 was appeared in 6th month storage about 1.60, 1.47 and 1.30 log_{10} cfu/g, respectively. Spore count of B_2 showed nil during four months of storage and it was increased to 1.0, 1.30 log_{10} cfu/g during 5th and 6th months of storage. Similar values were observed by Khier *et al*. 2009 [23] studied on the microbial quality of different commercial milk powders purchased from Sudan and compared those powders with imported milk powder (Nido brand). The total bacterial count in locally produced milk powders (3×10^2 to 3×10^3 cfu/g) are same as compared to imported Nido brand milk powder (3×10^2 cfu/g) and coliform count is nil in all milk powders. The microbial count of all milk powders was low and safe for consumption.

Conclusion

Dairy whiteners used for preparation of tea or coffee beverages. The physicochemical properties might vary due to several factors such as quality of the raw milk, drying techniques and storage conditions. The shelf life and commercial value of the dairy whitener might also deteriorate due to these factors. The purpose of this study was to investigate the physico-chemical and storage stability of dairy whitener brands available in Bengaluru. Chemical properties such as moisture, total solids, fat, protein, lactose, sucrose, total ash and acid insoluble ash of all five different dairy whitener brands complied with FSSAI standards. Scorched particle in five different dairy whitener brands were met Disc B. Storage stability of B_4 dairy whitener showed higher stability in terms of solubility, free fat, moisture, total solids and acidity as compared to other brands during 6 months of storage. Total bacterial count of five different dairy whitener brands was increased from first month to six months of storage stability. Coliform count in five different dairy whitener brands showed nil. Yeast and mold and spore count appeared in fifth and sixth months of storage in all dairy whitener brands.

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