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Full Length Research Paper

Influence of cold storage and addition of various lactations on properties of buffalo's and cow's milk

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The effect of cold storage (4 - 5°C) with blending different milkings to cold stored milk on some chemical composition, rheological properties and microbiological quality of buffalo's and cow's milk were studied. The results indicated that there are no significant effects on TS, fat and total protein contents of cold stored of buffalo's and cow's milk whereas, the acidity values slightly increased. Cold storage increased the rennet coagulation time (RCT), curd tension and curd syneresis values ($p < 0.001$). In addition, keeping of buffalo's and cow's milk at 4 - 5°C increased total viable bacterial counts (TVBC) with an concomitant increasing in lactic acid bacteria, psychrophilic bacteria, proteolytic and lipolytic bacteria, colifom bacteria, sporeformers, as well as moulds and yeast counts. To add milk from evening and morning milkings to cold stored buffalo's and cow's milk decreases the acidity and curd syneresis values besides promote an increase in pH, TS, fat, total protein, RCT and the curd tension values ($p < 0.001$). Moreover, mixing evening and morning milk with cold stored milk lowered the microbial groups mentioned above. So, cold storage and blending milkings can be used as a strategy to maintain the milk quality for a period until it be consumed without substantial loses in the milk properties.

Key words: Cold storage of milk, different milkings mixing.

INTRODUCTION

Milk storage on farm and the time taken to bridge the gap between producer and consumer give bacteria the chance to acclimatize and grow in this nutritious liquid. It became a problem to maintain milk quality at the same level as just after milking, impairing the milk use. A safe and effective system of raw milk preservation is therefore required by the dairy sector and this preservation should not adversely affect the nutritional characteristics of raw milk. Refrigeration is currently recognized as the preferred milk preservation method (Abd-El-Kader, 1999). At low temperature, chemical processes and microbiological growth will slow down, delaying the reduction in the quality of stored milk (Youssef et al., 1975).

The rate at which milk is cooled has a major influence on the bacterial contents of raw milk. The milk should be cooled to 4°C or less as soon as possible after it leaves the udder. It should be cooled to this temperature within 3.5 h of the start of milking (Ammar, 1999). It is also very important for the milk to be stored at less than 4°C between milkings. Bacterial counts rise rapidly once milk temperatures rise above 4°C. Refrigeration is the single most important factor in maintaining quality after the milk leaves the udder (Abd-El-Kader 1999). On the other hand, many of cheese makers in Egypt believe that the addition of fresh milk to cold stored milk in cooling tank have bad impact on the properties of the resultant cheese. So, the aim of this investigation was to study the effect of cold storage and the diverse mixtures (with equal amounts) between milks submitted to different storage treatments on chemical composition, rheological properties and microbial quality of the buffalo's and cow's milk.

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Abbreviations: TVBC, Total viable bacterial counts; **RCT,** rennet coagulation time; **TS**, total solid; **TA,** titratable acidity.

Table 1. Effect of cold storage and mixing various lactating milk on the chemical composition of buffalo's and cow's milk.

Treatments	Acidity %		pH values		TS %		Fat %		Protein %	
	B*	C**	B	C	B	C	B	C	B	C
A	0.16	0.15	6.38	6.40	16.66	11.62	3.3	7.4	4.84	3.14
B	0.17	0.16	6.36	6.37	16.70	11.65	3.3	7.5	4.81	3.17
C	0.15	0.14	6.43	6.42	16.84	11.89	4.0	7.7	4.94	3.27
D	0.16	0.15	6.39	6.39	16.72	11.71	3.7	7.6	4.85	3.18
E	0.17	0.16	6.35	6.38	16.68	11.74	3.7	7.6	4.86	3.16
F	0.17	0.15	6.36	6.38	16.60	11.71	3.8	7.2	4.77	3.17
G	0.18	0.16	6.33	6.35	16.64	11.69	3.7	7.6	4.82	3.14
H	0.18	0.16	6.32	6.36	16.81	11.77	3.8	7.7	4.85	3.14
I	0.19	0.17	6.30	6.31	16.81	11.75	3.8	7.5	4.83	3.11
J	0.18	0.16	6.32	6.35	16.81	11.69	3.6	7.7	4.85	3.15

* B : Buffalo's milk, **C : Cow's milk . A: Fresh morning milk; B: Cold milk at 4 -5°C for 10 hours; C: Fresh evening milk; D: Mixing milk of treatments B and C; E: Milk of treatment D after storage at 4 -5°C for 24 h; F: Mixed milk of treatments A and E; G: Milk of treatment F after cold storage 4 -5°C for evening next day; H: Mixed milk of treatments C and G; I: Milk of treatment H after cold storage 4 -5°C for 48 h; J: Mixed milk of treatments A and I.

MATERIALS AND METHODS

Materials

Fresh cow's milk which used in this study was obtained from El-Serw Animal Production Research Station, whereas fresh buffalo's milk was obtained from Mahlt Moussa Animal Production Research Station, Ministry of Agriculture. The milking was occurred mechanically.

Methods

Milk samples were analyzed for titratable acidity (TA), total solids (TS), total fat and total protein contents according to Ling (1963). The pH values were estimated using a pH meter type CG 710. The curd tension was determined using the method of Chandrasekhara et al. (1957). The rennet coagulation time (RCT) was determined according to Davies and White (1958) whereas; the curd syneresis was measured as given by Mehanna and Mehanna (1989). Milk samples were analyzed for total viable bacterial count (TVBC), lactic acid bacteria (LAB), proteolytic, lipolytic, coliform, sporeformers, psychrophilic bacteria, moulds and yeast counts according to the methods described by the American Public Health Association (1992). Results were statistically analyzed using software package **(**SAS 1991) based on analysis of variance. When F-test was significant, least difference (LSD) was calculated according to Duncan (1955) for the comparison between means.

RESULTS AND DISCUSSION

Effect of cold storage and mixing various lactating milks on chemical composition of milk

Chemical composition of buffalo's or cow's milk as affected by refrigerated storage and blending different lactation milks are in Table 1. Generally, it is observed that buffalo's milk had higher total solid (TS), total fat and total protein contents than those of cow's milk. Acidity and pH values were similar in both types of milk. However, buffalo's and cow's milk were preserved at 4 - 5°C, but the acidity ratios slightly increased and pH values decreased after 10 h of cold storage (Treatment B). On the other hand, evening milk had lower acidity and higher pH values than those of morning milk so when fresh evening milk (Treatment C) was added to cold stored milk (Treatment B), the acidity value was lowered (Treatment D) but it raised again after storage of milk for the second day morning (Treatment E). This may be due to the growth of lactic acid bacteria. As a general, the changes in acidity and pH values of buffalo's or cow's milk between increasing and decreasing were observed during storage of milk for 48 h at 4 - 5°C with adding fresh morning and evening milks to stored milk.

Ibrahim and Hanafy (1990) reported that cooling of milk at low temperature (8 - 12°C) for 15 - 18 h, increased the acidity of stored milk at about 0.01 - 0.02% and made the milk suitable for cheese making compared with fresh milk. El-Wahsh (1998) showed that a significant increase in acidity % of raw, pasteurized and boiled cow's and buffaloe's milk samples and consequently a significant decrease in their pH values through the cold storage were observed. Abdel-Kader (1999) stated that cooling the cow's milk resulted in an increase of acidity and a decrease of pH; this is may be due to the activity of psychrotrophic bacteria during 48 h. It could be concluded from Table 1 that the rates of increasing of acidity values during cold storage of buffaloe's milk were higher than that of cow's milk. The acidity increasing rates after 48 h of refrigerated storage were 18.75 and 6.67% for buffaloe's and cow's milk, respectively. Similar results were found by Ismail (1997) who represented that lower rate of development of acidity was observed in cow's than those of buffaloe's milk samples. After 8 h of incubation at 30°C the rate of buffaloe's acidity development was 31.7%, while respective value for cow's milk was 15.5%.

Table 2. Effect of cold storage on some rheological properties of buffalo's and cow's milk.

Treatments	RCT (sec.)		Curd tension (gm)		Curd syneresis (gm/15 gm of curd)*							
					Time (min)							
					10		30		60		120	
	B**	C***	B	C	B	C	B	C	B	C	B	C
A	94	160	46.33	27.49	3.54	5.46	5.21	7.51	6.42	8.83	7.51	9.47
B	88	149	47.65	28.56	3.60	5.93	5.41	7.73	6.53	8.91	7.58	9.69
C	90	143	47.11	30.92	2.68	4.35	4.31	6.95	5.46	8.25	6.46	8.97
D	92	150	47.59	29.97	3.32	4.74	4.73	7.18	5.91	8.69	6.75	9.61
E	83	142	43.55	27.05	4.11	5.62	5.74	7.21	6.85	8.77	7.72	9.52
F	91	148	45.14	28.01	3.72	5.62	5.35	7.38	6.57	8.31	7.54	9.41
G	85	140	42.04	26.53	3.74	5.65	5.77	8.55	6.64	8.97	7.64	9.86
H	85	143	45.14	27.70	3.54	5.13	5.31	7.75	6.43	8.61	7.43	9.42
I	79	140	44.09	26.31	3.93	5.28	5.69	9.14	6.81	10.32	7.91	11.07
J	84	150	44.84	26.63	3.36	6.11	5.16	8.68	6.65	9.89	7.73	10.64

*Whey excluded (grams) from 15 gm of curd kept at room temperature after 10, 30, 60 and 120min. ** B : Buffalo's milk; ***C : Cow's milk; A: Fresh morning milk; B: Cold milk at 4 -5°C for 10 h; C: Fresh evening milk; D: Mixing milk of treatments B and C; E: Milk of treatment D after storage at 4 - 5°C for 24 h; F: Mixed milk of treatments A and E; G: Milk of treatment F after cold storage 4 -5°C for evening next day; H: Mixed milk of treatments C and G; I: Milk of treatment H after cold storage 4 -5°C for 48 h; J: Mixed milk of treatments A and I.

No clear effects of cold storage of buffaloe's and cow's milk on TS, fat and total protein contents were observed. Similar results were found by Ghaleb and Rashed (1983). Mixing evening milk to the morning one increased TS, fat and total protein values of the resultant milk. This may be explained by the higher TS, fat and total protein contents of evening milk as compared with that of morning milk.

Effect of cold storage and mixing various lactating milks on some rheological properties of milk

Effect of refrigerated storage and blending different lactating milks on rennet coagulation time (RCT), curd tension and curd syneresis values of buffalo's and cow's milk were in Table 2. Buffalo's milk had lower RCT and curd syneresis and higher curd tension values than those of cow's milk. EL-Shazley et al. (1998) showed that RCT of cow's milk was longer than that of buffaloe's being 185 and 90 s, respectively. El-Senaity et al. (2000) found that the type of milk clearly affected the RCT and curd syneresis. Ewe milk gave the longest RCT, followed by cow milk and buffaloe milk, while goat milk showed the shortest RCT. Ewe and buffaloe milk gave a little amounts of whey (syneresis values) while cow and goat milk gave much amounts of whey. This might be attributed to the higher total solids content of ewe and buffaloe milk, which gave a compact curd and less whey drainage.

Cooling of buffalo's or cow's milk at 4 - 5°C for 10 h slightly decreased the RCT. With prolongation of cold storage, more reduction in RCT values of cow's milk was noticed. This effect could be referred to the developing acidity of milk through cold storage. It is known that development of dissolves colloidal calcium consequently increased Ca^{++} which produce a firm curd and reduced the RCT (Abdel-Kader, 1999). Also, similar trend was found by Farag et al. (1993); Ismail (2005) who reported that increasing acidity value of buffaloe's milk as result of adding sour buttermilk decreased the RCT values. On contrast, the decrease in RCT disagree with those reported by Youssef et al. (1975); Ibrahim et al. (1988), that cold storage caused a noticeable increase in RCT and this increase might be due to the dissociation of casein into the soluble casein, particularly *β*-casein (Fox (1969); Rose (1968); Ali et al., 1980). Casein dissociation from the micellar phase followed by partial re-association was also observed after storage of buffalo's milk at 4°C over 3 days followed by holding at room temperature for 18 h (Mehanna et al., 2008). On the other side, RCT values of evening buffalo's and cow's milk were lower than those of morning milk. Blending of fresh raw milk from various milking with cold stored milk increased its RCT values. With regard to curd tension, cold storage of fresh buffalo's or cow's milk for 10 h slightly raised the curd tension meanwhile, adding fresh morning and evening milk to stored milk and re-storage under 4 - 5°C decreased the curd tension of the resultant milk. El-Wahsh (1998) showed that results obtained from cold-storage raw buffaloe's milk revealed significant increase in curd tension of milk.

Curd tension values of evening milk were always higher than those of morning milk. This may be attributed to the high TS, fat and protein contents in evening milk comparing with morning milk. Because the curd tension values of fresh milk were more than those of stored and mixed milks, adding the former milk to the later one increased its curd tension values. From Table 2, it could

Table 3. Effect of cold storage on some microbial groups of buffalo's and cow's milk.

Treatments	TVBC ($\times 10^6$)		Lactic acid bacteria ($\times 10^3$)		Psychrophilic bacteria ($\times 10^3$)		Proteolytic bacteria ($\times 10^3$)		Lipolytic bacteria ($\times 10^3$)		Coliform bacteria ($\times 10^3$)		Spore forms bacteria ($\times 10^3$)		Moulds and Yeasts ($\times 10^3$)	
	B*	C**	B	C	B	C	B	C	B	C	B	C	B	C	B	C
A	91	68	25	20	37	22	7	4	61	49	42	29	6	2	72	48
B	104	83	34	23	50	43	10	5	72	46	49	35	11	3	78	56
C	83	61	19	18	24	9	3	2	49	37	30	22	5	-	61	39
D	90	79	32	21	40	40	7	4	67	41	42	31	9	2	68	57
E	110	91	40	37	53	68	11	6	77	55	51	46	13	5	75	72
F	105	89	42	38	54	61	10	6	73	50	53	45	12	4	72	74
G	131	115	56	50	67	94	15	9	85	67	62	61	20	9	82	86
H	122	109	51	48	63	88	15	8	80	63	59	55	17	9	84	82
I	194	176	69	74	98	142	24	15	98	89	79	74	25	15	98	98
J	195	172	70	70	100	140	22	14	95	86	75	72	22	13	95	94

*B : Buffalo's milk; **C : Cow's milk; A: Fresh morning milk; B: Cold milk at 4 -5°C for 10 h; C: Fresh evening milk; D: Mixing milk of treatments B and C; E: Milk of treatment D after storage at 4 -5°C for 24 h; F: Mixed milk of treatments A and E; G: Milk of treatment F after cold storage 4 -5°C for evening next day; H: Mixed milk of treatments C and G; I: Milk of treatment H after cold storage 4 -5°C for 48 h; J: Mixed milk of treatments A and I.

be observed that cooled storage of buffalo's or cows' milk markedly increased the curd syneresis values compared with fresh milk. The obtained results agreed with those of Salama et al. (1982) who stated that pasteurization and cold storage increased the rennet coagulation time of milks, whereas, the rate of whey drainage of curd decreased on pasteurization and increased upon storage. Kehagias (1983) showed that curd syneresis of ewes' and cows' bulk milk stored for 0, 1 or 2 days at 4 - 5°C increased with storage time increase. Significant decrease in curd syneresis values of evening buffalo's and cow's milk was found comparing with that of morning one. Adding fresh milk from various lactations to buffaloe's or cow's milk preserved at 4-5°C reduced the curd syneresis. This may be due to increase in the TS content of stored milk by adding evening milk which had reveres effect on curd syneresis. Generally speaking, the amount of whey drained from 15 gm of curd increased as syneresis time increased and in all treatments. Statistical analysis of variance (Tables 4 and 5) showed that the differences in RCT, curd tension and curd syneresis values between treatments were highly significant ($p<0.001$).

Effect of cold storage and mixing various lactating milks on some microbial groups of milk

Effect of cold storage and mixing various lactation milks on total viable bacterial counts (TVBC), lactic acid, psychrophilic bacteria, proteolytic, lipolytic, colifom bacteria, sporeformers and moulds and yeast counts of buffalo's and cow's milk were recorded in Table 3. The numbers of these microbial groups were higher in buffalo's milk than those of cow's milk. As it is expected, all the previous microbial groups numbers increased throw cold storage of milk. Sanjuan et al. (2003) found that significant growth ($p < 0.001$) was detected for mesophiles, Pseudomonas spp. and lactococci after 96 h storage at 6°C; however, numbers of thermodurics, coliforms, lactobacilli and enterococci did not increase ($p > 0.05$).

The counts of total viable bacterial (TVBC), lactic acid, psychrophilic bacteria, proteolytic, lipolytic, colifom bacteria, sporeformers, and moulds and yeast were higher in fresh morning milk than those of fresh evening milk. As a result of reducing numbers of microbial groups in fresh milk compared with cold stored milk, mixing both types of milks decreased the counts of microorganisms of stored buffalo's milk. However, adding fresh third day morning milk to stored milk for 48 h did not lowered microbial group numbers especially total viable bacterial counts (TVBC), lactic acid and psychrophilic bacteria counts. This may be attributed to two reasons: 1) increasing of microbial numbers during cold storage to reach the highest counts after 48 h, 2) because continuous adding of fresh milk to stored milk, the amount of later milk after 48 h became higher than that of the former milk so that the effect of reducing microbial counts of fresh milk was not pronounced.

The numbers of different microorganisms of various buffalo's and cow's milk samples followed the order: total viable bacterial > psychrophilic bacteria >lactic acid bacteria > moulds and yeasts > lipolytic bacteria > coliform bacteria > spore forms bacteria > proteolytic bacteria. The data in Tables 4 and 5 referred to the differences in microbial groups numbers between treatments were highly significant ($p < 0.001$).

Table 4. Statistical analysis of buffalo's milk treatments.

Analysis	Effect of buffalo's milk treatments										
	A	B	C	D	E	F	G	H	I	J	LSD
Acidity	0.16ab	0.17ab	0.15b	0.16ab	0.17ab	0.17ab	0.18ab	0.18ab	0.19a	0.19a	0.3*
pH	6.38bc	6.36bcd	6.43a	6.39a	6.35cde	6.36bcd	6.33def	6.32ef	6.30f	6.30f	0.03***
TS	16.66fg	16.67de	16.84bc	16.72d	16.68ef	16.60h	16.64g	16.81c	16.85b	16.81c	0.03***
Fat	7.40bcd	7.50bc	7.70ab	7.60ab	7.60ab	7.50bc	7.60ab	7.70ab	7.60ab	7.50bc	0.03***
TP	4.84bcde	4.81e	4.94a	4.94ab	4.86bc	4.84bcde	4.82de	4.85bcd	4.87b	4.83cde	0.03***
RCT	94.0ab	88.0de	90.0cd	92.0bc	83.0f	91.0bcd	85.0ef	85.0ef	79.0g	84.0f	3.05***
Curd tension	46.33g	47.65a	47.11d	47.59b	43.55k	45.14h	42.04i	45.14h	44.09i	44.84i	2.16***
Curd syneresis 10 min	3.54f	3.60e	2.68i	3.32h	4.11a	3.72d	3.74d	3.54f	3.93b	3.36g	0.03***
Curd syneresis 30 min	5.21g	5.41d	4.31i	4.73i	5.74a	5.35e	5.77a	5.31f	5.69b	5.16h	0.03***
Curd syneresis 60 min	6.42g	6.53e	5.46i	5.91i	6.85a	6.57d	6.57c	6.43g	6.81b	6.65c	0.03***
Curd syneresis 120 min	7.51e	7.58d	6.46i	6.75h	7.72b	7.54e	7.64c	7.43f	7.91a	7.73b	0.03***
Total bacterial count	91.0f	102.0f	83.0g	90.0f	110.0d	105.0e	131.0	122.0c	194.0a	195.0a	3.05***
Lactic acid bacteria	25.0ij	34.0f	19.0k	32.ofg	40.0e	42.0e	56.0c	51.0d	69.0a	70.0a	3.05***
Psychrophilic bacteria	37.0fg	75.0e	24.0i	40.0f	53.0d	54.0d	97.0b	63.0c	98.0a	100.0a	3.05***
Proteolytic bacteria	7.00ef	10.0de	3.0g	7.00ef	11.0d	10.0de	15.0c	15.0c	24.0a	22.0b	3.05***
Lipolytic bacteria	61.0g	72.0e	49.0i	67.0f	77.0d	73.0e	85.0c	80.0d	98.0a	95.9b	3.05***
Coliforms bacteria	42.0i	49.0e	30.0gh	42.0f	51.0de	53.0d	62.0	59.0c	79.0a	75.0b	3.05***
Spore forming bacteria	6.0gh	11.0def	5.00h	9.0efg	13.0d	12.0de	20.0bc	17.0bc	25.0a	22.0ab	3.05***
Moulds and yeasts	72.0d	78.0c	61.0g	68.0e	75.0cd	72.0d	82.0b	84.0b	98.0a	95.0a	3.05***

Significant different at p< (*0.05, ** 0.01, *** 0.001). For each effect the different letters in the means the multiple comparisons are different from each. Letters a: is the highest means followed by b, c ….. etc.

Table 5. Statistical analysis of cow's milk treatments.

Analysis	Effect of cow's milk treatments										
		B	C	D	E	F	G	H	I	J	LSD
Acidity	0.15^{a}	0.16^{a}	0.14^{a}	0.15^{a}	0.16^{a}	0.15^{a}	0.16^{a}	0.16^{a}	0.17^{a}	0.16^{a}	0.031
pH	6.40^{a}	6.37^{ab}	6.42^{a}	6.39^{ab}	6.38^{ab}	6.38^{ab}	6.35^{ab}	6.36^{ab}	6.31^{b}	6.35^{ab}	0.090*
TS	11.62^{e}	11.65^{e}	11.89^{a}	11.71^{cd}	11.74^{bc}	11.71^{cd}	11.69^{d}	11.77^{b}	11.75^{b}	11.69^{d}	0.031***
Fat	3.30^{a}	3.30^{a}	4.00^{a}	3.70^{a}	3.70^{a}	3.80^{a}	3.70^{a}	3.80^{a}	3.80^{a}	3.60^{a}	0.900
TP	3.14^{de}	3.17^{bcd}	3.27^{a}	3.18^{bc}	3.16^{cd}	3.170^{bcd}	3.140^{de}	3.140^{de}	3.11^{ef}	3.15^{cd}	0.031***
RCT	160.0^{b}	149.0^{d}	143.0^{e}	150.0^{d}	142.0^{e}	148.0^{d}	140.0^{e}	143.0^{e}	140.0^{e}	150.0^{d}	3.055***
Curd tension	27.49^{g}	28.56^{d}	30.92^{a}	29.97^{b}	27.05^{h}	28.01^{e}	26.53^{l}	27.70^{f}	26.31^{m}	26.63^{k}	0.031***
Curd syneresis 10 min	5.46^{e}	5.93^{c}	4.35^{j}	4.74^{i}	5.62^{d}	5.62^{d}	5.65^{d}	5.13^{h}	6.28^{a}	6.11^{b}	0.031***
Curd syneresis 30 min	7.51^{f}	7.73^{d}	6.95^{k}	7.18^{j}	7.21^{j}	7.38^{g}	8.55^{c}	7.75^{d}	9.14^{a}	8.86^{b}	0.031***

Table 5. Contd.

Curd syneresis 60 min	8.83^{d}	8.91^{d}	8.25^{k}	8.69^{g}	8.77^{f}	8.31^{j}	8.97^{c}	8.61^{h}	10.32^{a}	9.89^{b}	0.031***
Curd syneresis 12 0min	9.47^{g}	9.69^{d}	8.97^{i}	9.61^{e}	9.52^{f}	9.41^{i}	9.86^{c}	9.42^{h}	11.07^{h}	10.64^{b}	0.031***
Total bacterial count	68.0^{h}	83.0^{f}	61.0^{i}	79.0^{g}	91.0^{e}	89.0^{e}	115.0^{c}	109.0^{d}	176.0^{a}	172.0^{b}	3.055***
Lactic acid bacteria	20.0^{h}	23.0^{fg}	18.0^{h}	21.0^{fgh}	37.0^{d}	38.0^{d}	50.0^{c}	48.0^{c}	74.0^{a}	70.0^{b}	3.055***
Psychrophilic bacteria	32.0^{g}	43.0^{f}	9.0^{h}	40.0^{f}	68.0^{d}	61.0^{e}	92.0^{b}	88.0^{c}	142.0^{a}	140.0^{a}	3.055***
Proteolytic bacteria	4.0^{de}	5.0^{cde}	2.0^{e}	4.0^{de}	6.0^{bcd}	6.0^{bcd}	9.0^{b}	8.0^{bc}	15.0^{a}	14.0^{a}	3.055***
Lipolytic bacteria	49.0^{i}	46.0^{f}	37.0^{i}	41.0^{g}	55.0^{d}	50.0^{e}	67.0^{b}	63.0^{c}	89.0^{a}	86.0^{a}	3.055***
Coliforms bacteria	29.0^{g}	35.0^{f}	22.0^{h}	31.0^{g}	46.0^{d}	45.0^{d}	61.0^{b}	55.0^{c}	74.0^{a}	72.0^{a}	3.055***
Spore forming bacteria	2.0^{de}	3.0^{cd}	0.0^{e}	2.0^{de}	5.0^{c}	4.0^{cd}	9.0^{b}	9.0^{b}	15.0^{a}	13.0^{a}	2.935***
Moulds and yeasts	48.0^{g}	56.0^{f}	39.0^{i}	57.0^{f}	72.0^{e}	74.0^{e}	86.0^{c}	82.0^{d}	98.0^{a}	94.0^{b}	3.055***

Conclusion

From the above results, it could be concluded that the cooling is one of the most effective ways to preserve buffalo's and cow's milk to 48 h without adverse effect on their properties. Also, adding fresh milk from various lactations to stored milk in cooling tank had a slight effect on its different characteristics. These enable cheese manufacturers to use cold stored milk without deteriorate the quality of their products.

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