J. Agric. Sci. Mansoura Univ., 33 (7): 5141 - 5151, 2008

EFFECT OF COLD STORAGE AND MIXING VARIOUS LACTATIONS OF BUFFALOE'S AND COW'S MILK ON SOME PROPERTIES OF YOGHURT

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ABSTRACT

In this study yoghurt was made from cold stored buffaloe's or cow's milk for 24 or 48 hours. Also, the effect of addition of morning and evening milk to refrigerated stored milk on some properties of yoghurt was studied.

Results showed that yoghurt made from buffaloe's milk possessed higher acidity, TS, fat, ash and TN while had lower WSN, WSN/TN, NPN, NPN/TN and TVFA values than those of made from cow's milk.

Blending various lactations milks with cold stored milk raised the acidity and TVFA values and lowered the pH values of the resultant yoghurt and had no clear effect on TS, fat, ash, TN, TN/DM, WSN, WSN/TN, NPN and NPN/TN.

Refrigerated storage of buffaloe's or cow's milk increased the acidity and TVFA values of yoghurt and had no clear effect on TS, fat, ash, TN, TN/DM, WSN, WSN/TN, NPN and NPN/TN.

Yoghurt made from buffaloe's milk contained higher numbers of total viable bacterial count (TVBC), lactic acid (LAB), psychrophilic bacteria, proteolytic, lipolytic, colifom, sporoformers, moulds and yeast. Mixing evening and morning milk with cold stored milk or cooling milk for 24 or 48 hours increased the mentioned microbial groups numbers of yoghurt.

Yoghurt prepared from buffaloe's milk had higher score point than that of cow's milk. Adding various lactations buffaloe's or cow's milk to refrigerated stored milk and storing milk at 4°C for 24 and 48 hours had no clear effect on sensory evaluation of yoghurt.

INTRODUCTION

Milk is one of the most important products for human consumption. Its high quality is vital, and cooling is one of the most efficient and effective ways to maintain milk's freshness. The demand of milk producers is to produce milk with a composition that meets the needs of consumers. It is also the perfect growing medium for micro-organisms, although at 4 °C micro-organisms cannot duplicate and the microbiological spoilage of milk is avoided. After having followed the right milking and hygienic procedures, quickly cooling milk to 4 – 3 °C is the best way to avoid microbiological growth and chemical changes.

On the other hand, yoghurt is a fermented milk product in which milk is inoculated with a starter culture containing two different types of bacteria, called lactic acid bacteria. Although milk of various animals has been used for yogurt production in various parts of the world, most of the industrialized yogurt production uses cow's milk. Whole milk, partially skimmed milk, skim milk may be used.. Because it has been consumed in many Asian / central

European countries for thousands of years, there are several regional varieties to be found.

This study aimed at investigaton the effect of cold storage and mixing various lactations of buffaloe's and cow's milk on some properties of yoghurt.

MATERIALS AND METHODS

Materials:

Fresh cow's milk which used in this study were obtained from El-Serw Animal Production Research Station, whereas fresh buffaloe's milk was obtained from Mahalet Moussa Animal Production Research Station, Ministry of Agriculture. Used starter was obtained from Ch. Hansen's Laboratories, Denmark. Lyophilized starter cultures of *Streptococcus salivarius* subsp. *thermophillus* and *Lactobacillus delbruckii* subsp. *bulgaricus* were separately activated by culturing in 15% sterilized reconstituted skimmilk, and mixed (1:1) directly before using.

Methods:

Yoghurt manufacture:

Ten treatments of yoghurt were made as fallow:

- Yoghurt made from morning buffaloe's milk (Treatment A).
- Yoghurt made from mixed buffaloe's milk (morning, evening and next morning day milkings- mixing between 3 milkings within 24 hours) and stored at 4°C (Treatment B).
- Yoghurt made from mixed buffaloe's milk (mixing between morning and evening 5 milkings within 48 hours) and stored at 4°C (Treatment C).
- Yoghurt made from buffaloe's milk stored at 4°C for 24 hours (without mixing)

(Treatment D).

- Yoghurt made from buffaloe's milk stored at 4°C for 48 hours (without mixing)

(Treatment E).

- Yoghurt made from morning cow's milk (Treatment F).
- Yoghurt made from mixed cow's milk (morning, evening and next morning day milkings- mixing between 3 milkings within 24 hours) and stored at 4°C

(Treatment G).

- Yoghurt made from mixed cow's milk (mixing between morning and evening 5 milkings within 48 hours) and stored at 4°C (Treatment H).
- Yoghurt made from cow's milk stored at 4°C for 24 hours (without mixing)

(Treatment I).

- Yoghurt made from cow's milk stored at 4°C for 48 hours (without mixing)

(Treatment J).

Buffaloe's or cow's milk were heated at 90°C/5 min, then cooled to 45°C; inoculated with yoghurt starter, *Streptococcus salivarius* subsp. *thermophillus* and *Lactobacillus delbruckii* subsp. *bulgaricus.* Each milk was distributed into 100 mL in plastic cups, the cups incubated at 45°C until a firm curd was formed. The resultant yoghurt was kept in a refrigerator (4-5°C) for

15 days. Samples were collected from each fresh, 7 and 15 days for chemical, microbial and organoleptic analysis.

Total solids of milk and yoghurt were determined according to the British Standard Institution's (B.S.I.) bulletins no. 1741 (1951) and 770 (1952). Titratable acidity, fat, total nitrogen (TN), water soluble nitrogen (WSN), non-protein-nitrogen (NPN) and ash of milk and yoghurt were estimated yoghurt starter according to Ling (1963). TVFA was determined according to Kosikowiski (1978). Yoghurt samples were analyzed for total viable bacterial count (TVBC), lactic acid (LAB), proteolytic, lipolytic, colifom, sporeformers, psychrophilic bacteria, moulds and yeast counts according to the methods described by the American Public Health Association (1992). Samples were organoleptically scored by the staff of the El-Serw Animal Production Research Station, Ministry of Agriculture. The score points were 45 for flavour, 40 for body and texture, 5 for colour and 10 for appearance, which give a total score of 100 points reference. The obtained results were statiscally analyzed using software package (SAS, 1991) based on analysis of variance. When F-test was significant, least significant difference (LSD) was calculated according to Duncan (1955) for the comparison between means. The data were presented, in the tables, as the mean of 3 replicates.

RESULTS AND DISCUSSION

Chemical composition of milk used in yoghurt manufacture:

Table (1) shows the chemical composition of buffaloe's and cow's milk used in yoghurt making. It is observed from this Table that buffaloe's milk had higher acidity, total solid (TS), fat and total protein contents than those of cow's milk. Fat ratios of raw buffaloe's and cow's milk (treatments A and F) were 7.0 and 4.1% respectively. On the other hand, adding different lactations milk to buffaloe's or cow's milk stored in cooling tank slightly increased fat, TS and TP of milk.

Table (1): Chemical composition of buffaloe's and cow's milk used in yoghurt manufacture.

Treatments	pH values	Acidity %	Fat %	TS %	TP %
	Buffaloe's milk				
A	6.65	0.17	7.0	16.81	4.31
B	6.64	0.17	7.0	16.84	4.33
C	6.62	0.18	7.1	16.90	4.37
D	6.62	0.18	7.0	16.90	4.33
E	6.58	0.19	7.1	16.86	4.36
	Cow's milk				
F	6.66	0.15	4.1	12.25	3.42
G	6.65	0.15	4.1	12.30	3.40
H	6.65	0.15	4.2	12.41	3.46
I	6.61	0.16	4.1	12.26	3.45
J	6.60	0.16	4.1	12.28	3.47

Because buffaloe's or cow's milk were stored in cooling tank without pasteurization thus the acidity percentages increased and pH values decreased after 24 and 48 hours. The rates of acidity increasing were higher in buffaloe's milk than that of cow's milk.

Chemical composition of yoghurt:

Data of acidity and pH values of different treatments were tabulated in Table (2). Titratable acidity values of various yoghurt treatments gradually increased during storage period 15 days. Statistical analysis of variance (Table 6) showed that the changes in acidity due to different treatments during storage were significant (P<0.001). pH value was of opposite behavior of titratable acidity for all treatments of yoghurt made from buffaloe's and cow's milk during storage time, whereas, it was gradually decreased.

Table (2): Effect of mixing morning and evening milk and cold storage on chemical composition of yoghurt made from buffaloe's or cow's milk .

Treatments	Storage Period (days)	Acidity %	pH values	TS %	Fat %	Ash %
	Buffaloe's milk					
A	0	0.75	4.71	18.93	7.3	0.93
	7	1.08	4.35	19.05	7.4	0.97
	15	1.20	4.24	19.18	7.4	1.05
B	0	0.81	4.63	18.88	7.3	0.95
	7	1.14	4.29	19.06	7.4	1.01
	15	1.25	4.18	19.20	7.5	1.06
C	0	0.83	4.60	18.94	7.4	0.94
	7	1.16	4.25	19.03	7.5	0.99
	15	1.28	4.14	19.17	7.6	1.05
D	0	0.88	4.51	18.90	7.4	0.91
	7	1.21	4.20	19.10	7.5	0.98
	15	1.32	4.09	19.25	7.6	1.04
E	0	0.91	4.47	18.92	7.4	0.93
	7	1.25	4.17	19.13	7.5	0.98
	15	1.34	4.03	19.30	7.6	1.06
	Cow's milk					
F	0	0.69	4.79	14.60	4.5	0.87
	7	1.01	4.47	14.75	4.7	0.90
	15	1.12	4.27	14.91	4.9	0.96
G	0	0.73	4.74	14.64	4.4	0.86
	7	1.06	4.42	14.77	4.7	0.91
	15	1.16	4.23	14.90	4.9	0.97
H	0	0.87	4.68	14.67	4.5	0.88
	7	1.10	4.33	14.76	4.6	0.90
	15	1.22	4.19	14.95	4.9	0.98
I	0	0.84	4.61	14.63	4.6	0.87
	7	1.17	4.29	14.74	4.8	0.92
	15	1.24	4.14	14.90	5.0	0.97
J	0	0.90	4.53	14.65	4.6	0.86
	7	1.23	4.13	14.73	4.7	0.91
	15	1.30	4.08	14.92	4.9	0.97

Acidity value of sample A at zero time was 0.75 and reached 1.20 % at the end of storage period. Similar results were found by Ammar (1997) and Salama (2001).

Osman and Ismail (2004) stated that titratable acidity % and pH values significantly increased and decreased respectively during refrigerated storage of the bio- yoghurt. This may be due to fermentation of lactose, which produces the lactic and acetic acids during fermentation and storage period.

Yoghurt made from buffaloe's milk possessed higher acidity values than those of made from cow's milk. Acidity ratios of treatments A and F after 7 days of storage were 1.08 and 1.01% respectively.

Blending various lactations milk with cold stored milk raised the acidity values and lowered the pH values of the resultant yoghurt.

Because of increasing of acidity contents of buffaloe's and cow's milk through the refrigerated storage, therefore, it was not surprising that the acidity values of yoghurt made from these stored milk were significantly higher than those of yoghurt made from fresh milk. Our results are in agreement with those of Ghaleb and Rashed (1983).

Table (2) show the average of total solids (TS), fat and ash values of various yoghurt treatments during storage period. As a general, TS, fat and ash contents of all yoghurt treatments significantly ($P< 0.001$) increased as storage period progressed. This may be attributed to moisture evaporation during yoghurt storage. These results are in disagreement with Vaini and Horman (1973) who showed that the decrease in total solids of yoghurt within storage might be largely due to the fermentation of lactose with the production of lactic acid, acetaldehyde and acetone.

As, it is expected, buffaloe's milk yoghurt had higher TS, fat and ash contents than those of yoghurt made from cow's milk. On the other side, no clear differences could be seen in TS, fat and ash contents of yoghurt samples as a result of addition of evening and morning milk to cold stored milk or preservation of buffaloe's or cow's milk at 4°C for 24 or 48 hours.

Data of total nitrogen (TN), TN/DM, WSN, WSN/TN, NPN and NPN/TN% of fresh yoghurt and during storage period were tabulated in Table (3). The above values of control yoghurt, and all treatments made from buffaloe's or cow's milk significantly increased during storage period 15 days. WSN content of sample 4 at zero time was 0146% and increased to 0.178% at the end of storage period. This results suggest some degradation in yoghurt protein during storage, Safinaz El-Shibiny *et al.,* (1979) , Mehanna and Hefnawy (1988).

In spite of TN content of buffaloe's milk yoghurt was higher than that of cow's milk yoghurt, but WSN, WSN/TN, NPN and NPN/TN% of the later were higher than those of the former at zero time and during storage period. Also, the rates of development of WSN, WSN/TN, NPN and NPN/TN were higher in cow's milk yoghurt comparing with buffaloe's milk yoghurt.

Mixing evening and morning milk with cold stored milk had no pronounced effect on TN, TN/DM, WSN, WSN/TN, NPN and NPN/TN% of resultant yoghurt. Cold storage of milk for 24 or 48 hours had the same trend.

Total volatile fatty acids (TVFA) are taken as a measure of the degree of fat hydrolysis during storage.

Table (3): Effect of mixing morning and evening milk and cold storage on TN, nitrogen fraction and TVFA of yoghurt made from buffaloe's or cow's milk.

Treatment	Storage Period (days)	TN %	TN/DM %	WSN %	WSN/TN %	NPN %	NPN/TN %	TVFA* %
Buffaloe's milk								
A	0	0.762	0.040	0.140	0.183	0.091	0.119	6.2
	7	0.773	0.040	0.156	0.201	0.098	0.127	6.8
	15	0.781	0.040	0.173	0.221	0.105	0.134	8.0
B	0	0.759	0.040	0.136	0.179	0.090	0.119	6.0
	7	0.768	0.040	0.151	0.197	0.096	0.125	6.4
	15	0.780	0.040	0.167	0.214	0.103	0.132	7.8
C	0	0.764	0.040	0.132	0.173	0.088	0.115	6.0
	7	0.774	0.040	0.148	0.191	0.96	1.240	6.6
	15	0.783	0.040	0.163	0.208	1.02	1.300	7.6
D	0	0.765	0.040	0.146	0.190	0.095	0.124	6.4
	7	0.775	0.040	0.160	0.206	0.103	0.133	7.2
	15	0.782	0.040	0.178	0.227	0.109	0.139	8.4
E	0	0.764	0.040	0.150	0.196	0.099	0.130	6.6
	7	0.773	0.040	0.166	0.215	0.107	0.138	7.4
	15	0.782	0.040	0.182	0.233	0.112	0.143	8.8
Cow's milk								
F	0	0.651	0.045	0.159	0.244	0.101	0.155	7.0
	7	0.664	0.045	0.175	0.264	0.112	0.169	7.8
	15	0.675	0.045	0.184	0.273	0.121	0.179	8.4
G	0	0.649	0.044	0.154	0.237	0.098	0.151	6.6
	7	0.662	0.045	0.170	0.257	0.108	0.163	7.8
	15	0.673	0.045	0.181	0.268	0.118	0.175	8.0
H	0	0.653	0.045	0.152	0.233	0.096	0.147	6.6
	7	0.667	0.045	0.170	0.254	0.105	0.157	7.4
	15	0.677	0.045	0.180	0.266	0.117	0.183	8.0
I	0	0.652	0.045	0.162	0.248	0.105	0.161	7.2
	7	0.665	0.045	0.178	0.268	0.115	0.173	8.0
	15	0.678	0.045	0.189	0.279	0.124	0.183	8.6
J	0	0.650	0.044	0.165	0.254	0.108	0.166	7.4
	7	0.665	0.045	0.181	0.272	0.117	0.176	8.4
	15	0.675	0.045	0.194	0.287	0.127	0.188	9.0

*** expressed as ml 0.1 NaOH 100 g $^{-1}$ yoghurt**

TVFA values of yoghurt at zero time and during storage period were tabulated in Table (3). As storage time increased, TVFA contents significantly ($P< 0.001$) increased in all yoghurt treatments. These increase may be due to small degree of lipolysis and also may be due to oxidative deamination and decarboxylation of amino acids, which convert the amino acids into its corresponding volatile fatty acids (Tamime and Robinson, 1999).

TVFA of yoghurt manufactured from cow's milk was slightly higher than those of yoghurt made from buffaloe's milk. TVFA contents of treatments A and F after 15 days of storage time were 8.0 and 8.4 ml NaOH 0.1 N / 100 g yoghurt respectively. Adding various lactation milk to cold storage milk slightly lowered the TVFA contents of yoghurt.

Microbial profile of yoghurt :

Table (4) shows that the total viable bacterial count (TVBC) of fresh control yoghurt gradually increased from 30 and 23 x 10^6 to 410 and 372 x

10^6 cfu g^{-1} after 15 days of storage for buffaloe's and cow's milk yoghurt respectively. Moulds and yeast of different yoghurt treatments had nearly the same trend of TVBC. Lactic acid (LAB), psychrophilic bacteria, proteolytic, lipolytic, colifom and sporeformers bacteria followed the opposite trend of TVBC. Results showed also that yoghurt made from buffaloe's milk contained higher number of various groups of microorganisms than those of cow's milk yoghurt for all treatments when it was fresh as well as during storage period. Similar results were found by Ammar (1997).

Table(4): Effect of mixing morning and evening milks and cold storage on some microbial groups of yoghurt made from buffaloe's or cow's milk.

Treatments	Storage period (days)	Microbial groups cfu g-1							
		TVBC ($x10^6$)	Lactic acid bacteria ($x10^4$)	Psychrophilic bacteria ($x10^4$)	Proteolytic bacteria ($x10^3$)	Lipolytic bacteria ($x10^3$)	Coliform bacteria ($x10^2$)	Spore-forms bacteria ($x10^3$)	Moulds & Yeast ($x10^3$)
		Buffaloe's milk							
A	0	30	5	2	2	2	3	6	31
	7	115	2	1	1	1	1	4	103
	15	410	1	0	0	0	0	-	563
B	0	56	6	3	2	12	3	6	149
	7	175	4	2	1	1	1	3	280
	15	523	2	1	0	0	0	1	591
C	0	75	6	5	3	2	4	7	62
	7	191	3	3	1	0	2	4	311
	15	562	2	1	2	0	0	2	616
D	0	73	7	6	3	3	3	9	77
	7	210	4	3	1	1	2	5	340
	15	558	2	1	1	0	0	3	850
E	0	86	8	7	4	3	4	11	93
	7	243	5	4	2	1	2	8	371
	15	578	3	2	1	1	0	5	916
		Cow's milk							
F	0	23	4	1	2	2	2	5	25
	7	93	1	0	1	1	1	3	89
	15	372	0	0	0	0	0	0	546
G	0	31	6	3	2	2	2	6	34
	7	116	3	1	1	1	1	4	96
	15	396	1	0	0	0	0	1	561
H	0	40	6	3	2	2	3	6	47
	7	124	3	1	1	0	1	4	108
	15	419	1	0	0	0	0	1	579
I	0	37	7	5	3	2	4	7	62
	7	104	4	3	2	1	2	5	122
	15	411	1	1	0	0	0	2	593
J	0	46	7	6	3	2	4	7	80
	7	133	4	4	2	1	2	5	137
	15	432	1	1	0	0	0	3	619

Mixing evening and morning milk with cold stored milk or cooling milk for 24 or 48 hours increased the mentioned microbial groups numbers of yoghurt.

Organoleptic properties:

Results of the organoleptic judging (Table 5) indicated that sensory evaluation scores of different treatments of yoghurt significantly decreased ($P<0.001$) within storage period. Also, yoghurt prepared from buffaloe's milk of different treatments had higher score point than that of cow's milk. The total score was 92 and 84 points for control buffaloe's and cow's milk yoghurt (Treatments A and F) at zero time respectively.

Adding various lactations buffaloe's or cow's milk to refrigerated stored milk and storing milk at 4°C for 24 and 48 hours had no clear effect on color, appearance, body, texture and flavor of the resultant yoghurt.

From the above results, it could be concluded that yoghurt with good chemical, microbial and organoleptic properties successfully produced from cold preserved buffaloe's or cow's milk to 24 or 48 hours. Pasteurization of milk before cold storage rasied the keepnig quality of the resultant yoghurt.

Table(5): Effect of mixing morning and evening milk and cold storage on organoleptic properties of yoghurt made from buffaloe's or cow's milk

Treatments	Storage period (days)	Color& Appearance (15)	Body& Texture (35)	Flavor (50)	Total (100)
Buffaloe's milk					
A	0	14	32	46	92
	7	13	28	42	83
	15	11	26	39	76
B	0	13	33	45	91
	7	12	31	42	85
	15	10	29	39	78
C	0	13	32	46	91
	7	11	29	41	81
	15	10	26	38	74
D	0	14	34	46	94
	7	12	32	43	87
	15	10	30	40	80
E	0	13	33	45	91
	7	10	30	43	83
	15	10	27	38	75
Cow's milk					
F	0	11	29	44	84
	7	9	26	41	76
	15	6	23	36	65
G	0	11	30	44	85
	7	9	27	42	78
	15	7	23	36	66
H	0	11	30	44	85
	7	8	27	42	77
	15	7	23	37	67
I	0	11	30	43	84
	7	9	26	41	76
	15	6	24	35	65
J	0	11	29	43	83
	7	9	26	40	75
	15	8	24	35	67

Table (6): Statistical analysis of yoghurt treatments.

Analysis	Effect of milk treatments										
	A	B	C	D	E	F	G	H	I	J	LSD
Acidity%	1.008^{F}	1.066^{D}	1.090^{C}	1.136^{B}	1.166^{A}	0.940^{H}	0.983^{G}	1.033^{E}	1.083^{C}	1.143^{B}	0.0165***
pH	4.433^{C}	4.366^{E}	4.330^{F}	4.266^{G}	4.223^{I}	4.510^{A}	4.463^{B}	4.400^{D}	4.346^{F}	4.246^{H}	0.0167***
TS%	19.053^{C}	19.046^{C}	15.713^{D}	19.083^{B}	19.116^{A}	14.753^{F}	14.770^{F}	14.793^{E}	14.756^{F}	14.766^{F}	0.0167***
Fat%	7.366^{A}	7.400^{A}	7.500^{A}	7.500^{A}	7.500^{A}	4.700^{B}	4.666^{B}	4.666^{B}	4.800^{B}	4.733^{B}	0.3458***
Ash %	0.983^{b}	1.00^{a}	0.993^{ab}	0.976^{b}	0.990^{ab}	0.910^{c}	0.913^{c}	0.920^{c}	0.920^{c}	0.913c	0.017***
TN%	0.772^{b}	0.769^{c}	0.774^{ab}	0.774^{a}	0.773^{ab}	0.663^{e}	0.661^{f}	0.666^{d}	0.665^{de}	0.663^{e}	0.002***
WSN%	0.156^{g}	0.151^{h}	0.147^{i}	0.161^{f}	0.166^{e}	0.173^{c}	0.168^{d}	0.167^{de}	0.176^{b}	0.180^{a}	0.002***
NPN%	0.098^{g}	0.405^{b}	0.689^{a}	0.102^{fg}	0.106^{ef}	0.111^{de}	0.108^{e}	0.106^{ef}	0.115^{cd}	0.117^{c}	0.006***
TVFA	7.0^{cd}	6.7^{d}	6.7^{d}	7.3^{bcd}	7.6^{abc}	7.7^{abc}	7.2^{bcd}	7.3^{bcd}	7.9^{ab}	8.3^{a}	0.834***
TVBC	185.0^{g}	251.3^{d}	276.0^{c}	280.3^{b}	302.3^{a}	162.7	181.0^{h}	194.3^{f}	184.0^{g}	203.7^{e}	1.67***
Lactic acid bacteria	2.7^{cd}	4.0^{abc}	3.7^{bc}	4.3^{ab}	5.3^{a}	1.7^{d}	3.3^{bc}	3.3^{bc}	4.0^{abc}	4.0^{abc}	1.64***
Psychrophilic bacteria	1.0^{cd}	2.0^{bc}	3.0^{ab}	3.3^{ab}	4.3^{a}	0.333^{d}	1.3^{cd}	1.3^{cd}	3.0^{ab}	3.7^{a}	1.52***
Proteolytic bacteria	1.0^{a}	1.0^{a}	2.0^{a}	1.7^{a}	2.3^{a}	1.0^{a}	1.0^{a}	1.0^{a}	1.7^{a}	1.7^{a}	1.46***
Lipolytic bacteria	1.0^{a}	1.0^{a}	0.667^{a}	1.3^{a}	1.67^{a}	1.0^{a}	1.0^{a}	0.667^{a}	1.0^{a}	1.0^{a}	1.32***
Coliform bacteria	1.3^{a}	1.3^{a}	2.0^{a}	1.7^{a}	2.0^{a}	1.0^{a}	1.0^{a}	1.3^{a}	2.0^{a}	2.0^{a}	1.36***
Spore forms bacteria	4.0^{cde}	3.3^{de}	4.3^{bcd}	5.7^{b}	8.0^{a}	2.7^{e}	3.6^{cde}	3.6^{cde}	4.7^{bcd}	5.0^{bc}	1.64***
Moulds &yeasts	232.3^{h}	306.6^{d}	329.6^{c}	422.3^{b}	460.0^{a}	220.0^{j}	230.3^{i}	244.6^{g}	259.0^{f}	278.6^{e}	1.67***
Appearance &color	12.7^{a}	11.7^{ab}	11.0^{abc}	12.0^{ab}	10.3^{bcd}	8.7^{d}	9.0^{d}	8.7^{d}	8.7^{d}	9.3^{cd}	1.67***
Body & Texture	28.7^{cde}	31.0^{ab}	29.0^{cd}	32.0^{a}	30.0^{bc}	25.7^{f}	27.0^{ef}	27.3^{def}	26.7^{f}	26.3^{f}	1.67***
Flavour	42.3^{ab}	42.0^{abc}	41.6^{abc}	43.0^{a}	42.0^{abc}	40.3^{cde}	40.7^{bcde}	41.3^{abcd}	39.7^{de}	39.3^{e}	1.67***

	Effect of storage time (days)			
	0	7	15	LSD
Acidity%	0.812^{c}	1.141^{b}	1.24^{a}	0.009***
pH	4.63^{a}	4.29^{b}	4.16^{c}	0.009***
TS%	15.8^{c}	16.9^{b}	17.0^{a}	0.009***
Fat%	5.9^{b}	6.0^{ab}	6.2^{a}	0.189***
Ash %	0.900^{c}	0.947^{b}	1.0^{a}	0.009***
TN%	0.706^{c}	0.718^{b}	0.728^{a}	0.0009***
WSN%	0.149^{c}	0.165^{b}	0.179^{a}	0.0009***
NPN%	0.097^{c}	0.192^{b}	0.298^{a}	0.003***
TVFA	6.6^{c}	7.4^{b}	8.2^{a}	0.457***
TVBC	49.7^{c}	150.4^{b}	466.1^{a}	0.913***
Lactic acid bacteria	6.2^{a}	3.3^{b}	1.4^{c}	0.898***
Psychrophilic bacteria	4.1^{a}	2.2^{b}	0.700^{c}	0.834***
Proteolytic bacteria	2.6^{a}	1.3^{b}	0.400^{c}	0.799***
Lipolytic bacteria	2.2^{a}	0.800^{b}	0.100^{b}	0.727***
Coliform bacteria	3.2^{a}	1.5^{b}	0.000^{c}	0.746***
Spore forms bacteria	7.0^{a}	4.5^{b}	2.0^{c}	0.898***
Moulds &yeasts	56.0^{c}	195.7^{b}	643.4^{a}	0.913***
Appearance &color	12.2^{a}	10.2^{b}	8.2^{c}	0.913***
Body & Texture	31.2^{a}	28.2^{b}	25.7^{c}	0.913***
Flavour	44.6^{a}	41.7^{b}	37.4^{c}	0.913

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

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تأثير حفظ اللبن الجاموسي و البقري بالتبريد و كذلك خلط ألبان من حلبات مختلفة على بعض خواص الزبادي

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تم في هذه الدراسة تصنيع زبادي من لبن جاموسي أو بقري محفوظ بالتبريد على درجة حرارة ٤°م . أيضا تم دراسة تأثير إضافة لبن من حلبة الصباح و المساء إلي اللبن المحفوظ بالتبريد على بعض خواص الزبادي. و تشير النتائج المتحصل عليها إلي:

كان للزبادي المصنع من لبن جاموسى قيم أعلى من الحموضة والمادة الصلبة والدهن والرماد و النيتروجين الكلى وقيم أقل من النيتروجين الذائب فى الماء و النيتروجين الذائب فى الماء / النيتروجين الكلى والنيتروجين الغير بروتينى والنيتروجين الغير بروتينى / النيتروجين الكلى و الأحماض الدهنية الكلية الطيارة عن ذلك الزبادى المصنع من لبن بقرى .

أدى إضافة لبن من حلبات مختلفة الى اللبن المحفوظ بالتبريد الى زيادة قيم الحموضة و الأحماض الدهنيه الكلية الطيارة فى حين أدت الى انخفاض قيم الرقم الهيدروجينى للزبادى الناتج ولم يلاحظ تأثير واضح لهذه الاضافة على قيم المواد الصلبة والدهن والرماد والنيتروجين الكلى والنيتروجين الكلى/ المادة الصلبة و النيتروجين الذائب فى الماء و النيتروجين الذائب فى الماء / النيتروجين الكلى والنيتروجين الغير بروتينى والنيتروجين الغير بروتينى / النيتروجين الكلى للزبادى .

حفظ اللبن الجاموسى أو اللبن البقرى بالتبريد أدى الى زيادة قيم الحموضة و الأحماض الدهنيه الكلية الطيارة فى حين لم يكن له تأثير واضح على المواد الصلبة والدهن والرماد والنيتروجين الكلى/ المادة الصلبة و النيتروجين الذائب فى الماء و النيتروجين الذائب فى الماء / النيتروجين الكلى والنيتروجين الغير بروتينى والنيتروجين الغير بروتينى / النيتروجين الكلى بالزبادى الناتج.

احتوى الزبادى المصنع من اللبن الجاموسى على قيم أعلى من العد الكلى للبكتيريا وأعداد بكتيريا حمض اللاكتيك والمحبة للبرودة والمحللة للبروتين والمحللة للدهن وبكتيريا الكلوروفورم والبكتيريا المكونة للجراثيم والفطريات والخمائر كما أدت اضافة لبن المساء والصباح الى اللبن المحفوظ بالتبريد أو تبريد اللبن لمدة ٢٤ أو ٤٨ ساعه الى زيادة أعداد هذه المجاميع البكتيرية .

كان الزبادى المصنع من اللبن الجاموسى نتائج أعلى للتقييم الحسى مقارنة بذلك الزبادى المصنع من اللبن البقرى فى حين لم يلاحظ تأثير واضح لاضافة لبن من حلبات مختلفة الى اللبن الجاموسى أو البقرى المحفوظ للتبريد أو حفظ اللبن بالتبريد لمدة ٢٤ أو ٤٨ ساعه على نتائج التقييم الحسى للزبادى الناتج.