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IMPROVING THE QUALITY OF YOGHURT MANUF ACTURED FROM CAMEL MILK

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ABSTRACT

Camel milk is nearly complete nutritive food. Moreover it contains curative agents against many bacterial and viral diseases. Therefore the current study was preformed to study the effect of using sodium alginate impact as an acid stabilizer at ratios of 0.5, 0.75 and 1.0% and/or blending buffalo's milk at levels of 1:3 and 1:1 without or with adding the stabilizer on the quality of yoghurt made from camel milk. The chemical, physico- chemical, microbiological and sensory evaluations were performed during the cold storage at 5±2°C for 15 days.

Obtained data of the chemical evaluation showed a remarkable decrease in pH values and increase in acidity of the treatments during storage, while the control showed very slowly development in these estimates up to the tenth day of storage then a considerable increase was performed with increasing storage period.

Blending buffalo's milk with camel milk revealed the apparent increase diacetyl and acetyl methyl carbinol during the tent days of storage, then, decreased with progress of up to 15 days. The addition of sodium alginate improved body and texture causing excessive increase in the consistency of the yoghurt imparting it an atypical jelly – like structure increased by increasing the concentration of the stabilizer and less amount in whey synersis. On the other hand, blending the buffalo's milk increased the amount of separated whey. There was fairly decrease in the clotting time by increasing supplemented camel milk by buffalo's milk.

Microbiological evaluation also showed fairly decrease in total microbial, lactic acid bacteria, yeasts and fungal growth in camel yoghurt samples with or without stabilizer. On the other hand, these microbial counts increased by increasing the added amount of buffalo's milk up to the ratio 1: 1 treatment.

On the organolyptic judging; flavor, body and texture were really improved by adding buffalo's milk. The blended and stabilized samples gave the best score with the ratio 1% sodium alginate when blended at the level of 3: 1 and with the ratio 0.75% sodium alginate at the level 1:1 of substituting with buffalo's milk. This trend was much more pronounced that adding stabilizer and/or buffalo's milk in making camel yoghurt improved its organoliptc and physic- chemical properties as a healthy, nutritive and curative product

INTRODUCTION

Recently, there has been tremendous increase of yoghurt consumption as a popular, nutritive and curable product being one of the probiotic foods containing probiotic bacteria, *Hattingh and Viljoen, (2001).* During the last decades, there was a great interest in breading camels and consuming their milks by those whom suffering from hepatitis *(Sharmanov et al.,1978)* and some other suffering from gastrointestinal diseases being contain antibacterial and antiviral activity of their milk protective proteins, such lysozyme (LZ), lactoferrim (LF) lactoperoxidase (LP), immunoglulin G and secretory immunoglobulin A.

The activity of these protective proteins was assayed against *Lactococcus lactis var. cremoris*, *Escherichia coli*, *Staphycoccus aureus*, *Salmonella typhimurium* and rotavirus *(EL- Agamy et al., 1992).* Peptides derived from whey proteins, such as β- lactotensin derived from β- lacto globulin, lactoferroxin from lactoferrin and albutesin A from serum albumin; these other bioactive peptides are used as antimicrobial ingredients in infant foods *(Tomita,et al.,1991& Regester,et al., 1997).*

Camel milk has medicinal and health effects, it is used in the treatment of diabetes. Liver diseases, general fatigue in old people and as a feed supplement to milking mothers. The camel milk is also known for its antimicrobial activity, which is confirmed by its late acidification and good stability. The activity is more important in whey than in casein and is related to the high level of lactoferrin, lactoperoxidase and lysozymes which vary from 280 to 648 mg / liter vs. 13 mg/liter in cows milk *(Mohamed Bengourni et al., 2005).& Konuspayeva et al.,(2005)*

Lactoferrin is an iron-containing protein with a molecular mass of 76 – 80 KDa with 689 amino acids residues and 2 fe 3^{+} binding centers. Lactoferrin has antibacterial, antiviral, antifungal, anti carcinogenic, anti inflammatory, antioxidant and analgestic properties, lactoferrin also raises the immune response of the organism and is involved in Parkinson's and Alzheimer's disease in a comparative survey of lactorrin concentration in different milks showed that the biggest content is in camel milk which has 30 – 100 times higher than that of bovine milk *(Konuspayeav et al., 2005.*Colostrums and milk samples from camel on 2,15 and 30 days post partum contained a concentration of lactoferrin 5.10 and 2.48 mg/ml of colostrum (2 days) and normal milk (15 – 30 days) postpartum and these concentrations were higher than in other colostrums and normal milk from other ruminants *(Abd – El – Gawad et al., 1996).*

Colostrum of camel milk contained a much higher concentration of insulin than that in milk of the other mammals and the camel's caused a temporary decline in blood sugar of the rats. Lactose was converted to glucose and then absorbed, raising blood glucose to normal. On the other hand, camel milk was unaffected by gastric acid allowing the insulin to be absorbed in the small intestine *(Zagorsko et al., 1998), (Agrawal, et al. 2003 and Breitling, 2002)* found that dromedary milk has anti – diabetic activity effect than cow's milk. The incidence of insulin and anti – diabetic activity of camel milk and the curative action of Arabian milk camel on some cancer biomarkers in rat liver intoxicated with aflatoxin β_1 was also studies by *(Breitling & Magjeed, 2004)*.

On the other hand, nutrients from camel milk represent considerable value comparing to those of cow's milk. Camel milk contains 15.9% and 84.1% non protein nitrogen (NPN) and nitrogen protein (NP) of the whole nitrogen in camel milk proteins. The casein nitrogen (CN) and non casein nitrogen (NCN) were 64 and 36% of the total nitrogen (TN) respectively and the whey protein nitrogen (WPN) was 19.9% of nitrogen protein. In Saudi Arabian, (NPN) and (NP) were 10.2 and 89.8% of the TP (total protein), respectively the average values of (CN) and (NCN) were 63.3 % and 36.8%

of (TP) respectively, while this value of the whey nitrogen protein reached 26.4% of (TNP*). (Mehaia and Al- Kanhal, 1989 & Mehaia et al., 1995).*

Nawar et al.,(2001) proved that camel's milk fat contains low levels of saturated fatty acids than that of goats and sheep; hence these fatty acids were 58.65, 71.25 and 74.81% and 41.35, 28.75 and 25.11% respectively for saturated and unsaturated fatty acids in the three mentioned animals. The short chain evaporated fatty acids (C_4- C_{14}) were low 14.44, 36.57 and ones (C16 – C_{20}) were high (44.21, 34.68 and 37.27% respectively, it also contains high levels of polyunsaturated fatty acids (C18: 2 – C_{18}: 3). The camel milk being contains antimicrobial growth factors in high concentrations of lyzosium comparing with cow's milk *(Barbour et al., 1984);* this aids to keep this milk fresh for longer time and prevent the growth of pathogenic bacteria.

The growth of lactic acid bacteria were more active in cow's milk than in camel milk, while the ability of protein proteolysis were higher than those in cow's milk *(Abu–Tarbush, 1996).*Also the low content of casein protein (CP) gives very soft curd when making fermented milks or cheese *(Mehaia, 1993$_a$) and (Mehaia, 1993$_b$).* Therefore, the objective of the present study was to improve the ability of producing healthy fermented curative set yoghurt with good properties from camel milk by using an acidic stabilizer and or supplementing camel milk partially by buffalo's milk.

MATERIALS AND METHODS:

1- The starter culture:

Un activated pure starter culture containing *Streptococcus salivarus sub thermophilus* and *lactobacillus delbruckii sub sp. bulgaricus* (1:1) was obtained from the department of dairy science and technology, Faculty of Agriculture, Kafr El- Sheikh Univ. it was reactivated by transferring in an autoclaved fresh cow's skim milk for two succive transfers.

2- Milks and Other Additives:

Camel milk was purchased from a camel heard in west desert. Buffaloe's milk (6% fat) was obtained from animal science department, faculty of agriculture, Kafr El-Sheikh university .Sodium alginate was obtained from *El-Gomhouria* Company.

***Yoghurt Manufacture*:**

Camel and buffalo's milks were pasteurized at 85°C/20 min.The starter culture was added at a ratio of 3%w/v) of the pasteurized milks. A control of cultured 100% camel milk was poured in plastic cups by 100 ml in each and the rest was used for the samples shown as follows:

Control: 100%Camel milk.
T1a: Camel milk + 0.50 % sodium algi***nate.***
T1b: Camel milk + 0.75% sodium alginate.
T1c: Camel milk + 1.00% sodium alginate.
T2a: Camel milk + Buffalo's milk (3: 1).
T2b: Camel milk + Buffalo's milk (3: 1) + 0.50% sodium alginate.
T2c: Camel milk + Buffalo's milk (3: 1) + 0.75% sodium alginate.
T2d: Camel milk + Buffalo's milk (3: 1) + 1.00% sodium alginate.
T3a: Camel milk + Buffalo's milk (1: 1).

T3b: Camel milk + Buffalo's milk (1: 1) + 0.50% sodium alginate.
T3c: Camel milk + Buffalo's milk (1: 1) + 0.75% sodium alginate.
T3d: Camel milk + Buffalo's milk (1: 1) + 1.00% sodium alginate

Chemical and Physico- chemical analysis:

Camel and buffalo's milks were analyzed for total solids, moisture fat, protein, ash and lactose contents according to *Ling, (1963)*. Acidity for the used milks and prepared fresh and storage samples were also estimated according to *Ling, (1963*). pH values for the control and treatments were measured using digital pH meter. Wheying off or curd synersis was determined according to *(Harwalk and Kalab 1983).*The test was performed at room temp. for 1hr. and the volume of whey was weighed according to 100 gram of yoghurt. Diacetyl and acetone; were determined according to *(Westerfeild, 1945).*

Microbial analysis:

Lactic acid bacterial count was tested according to *Lee et al., (1973)*.Total bacterial count, moulds and yeasts were counted according to *Diffco (1974)* using trepton glucose-yeast extract agar and potato dextrose agar media respectively.

Organoleptic Evaluation of Produced Yoghurt:

The sensory qualities of produced yoghurt were evaluated by eight panelists according to *(El-Shibiny et al., 1979)* with some modifications.(20 points)for appearance,**(50** points) for flavor and (**30** points) for body &texture.

RESULTS AND DISCUSSION

Table (1) illustrates the gross chemical composition of fresh camel and buffalo's milks as percent of total solids, moisture, total protein, fat ash and lactose. The same table also reveals the estimated and measured acidity and pH values, respectively. These results are in close agreement with those of *Farag and Kebary (1992)*, *(Soryal,1985, Wangoh et al.,1998)* Who found that the composition of Somali and Turcana breads were 12- 45 and 13- 44% T-S, 4.20 and 4.81% fat; 3.08 and 3.31% protein, 4.18 and 4.28 % lactose and 0.79 and 0.93% ash respectively.

Table (1) Chemical composition of fresh Camel and Buffaloe's milks

Items	% moisture	%Total protein	% Fat	% Ash	% Lactose	% Total solids	pH
Camel milk	**88.07**	**2.90**	**3.90**	**0.74**	**4.39**	**11.93**	**7.13**
Buffalo's milk	**83.32**	**4.10**	**6.80**	**0.83**	**4.90**	**16.68**	**6.62**

Table (2) demonstrates titratable acidity and pH values of yoghurt made from camel milk supplemented with sodium alginate and /or blended with buffalo's milk. Resultant data show that camel yoghurt (control) and stabilized yoghurt revealed the lowest acidity in fresh and after 5 days storage (5.55 to 5.03) for pH values, and (0.69 to 0.58 %) for acidity.

Blending camel milk with buffalo's milk decreased pH values and increased acidity at remarkable levels in all blended samples that

accumulatively increased by increasing the replacement ratio. This developed acidity in the product during storage periods improved both flavor and body & texture. On the other hand, this concentration of lactic acid in 100% camel yoghurt was very slightly increase during the first period of refrigerated storage up to the tenth day, and then increased at a considerable rate. These findings may be related to the higher pH value of camel milk and containing anti microbial growth factors in higher concentration of lyzosium, lactoferrin and lactoperoxidase comparing with cow's and other milks that keep this milk,(*El-Agamy et al.,1992*), *(Konuspayva et al.,2005*),and (*Mohamed Bengourni et al.,2005*) fresh for long time (*Barbour et al., 1984*). Moreover, the higher protein proteolysis in camel milk inactivates the growth of lactic acid bacteria *(Abu–Tarboush, 1996).*

Table (2): Titratable Acidity and pH Values of Camel Yoghurt Supplemented with Sodium Alginate and / or Blended with Buffalo's milk

Item-mo	Storage in days	Treatments											
		Control	T_{1a}	T_{1b}	T_{1c}	T_{2a}	T_{2b}	T_{2c}	T_{2d}	T_{3a}	T_{3b}	T_{3c}	T_{3d}
PH	Fresh	5.55	5.45	5.33	5.27	4.66	4.60	4.63	4.68	4.53	4.43	4.37	4.33
	5	5.36	5.15	5.11	5.03	4.44	4.40	4.36	4.31	4.30	4.28	4.18	4.13
	10	4.83	4.76	4.70	4.59	4.26	4.10	4.00	3.96	3.88	3.69	4.49	3.36
	15	4.67	4.66	4.56	4.46	3..92	3..68	3.69	3.70	3.40	3..34	3..36	3.26
Acidity	Fresh	0.58	0.60	0.63	0.65	0.72	0.73	0.75	0.76	0.77	0.79	0.81	0.82
	5	0.64	0.68	0.69	0.67	0.76	0.77	0.79	0.81	0.81	0.90	0.83	0.85
	10	0.69	0.71	0.73	0.72	0.4	0.88	0.92	1.05	1.08	1.06	1.13	1.20
	15	0.72	0.73	0.76	0.80	0.98	1.07	1.06	1.03	1.20	1.15	1.21	1.24

Data in Table (3) demonstrates some physico – chemical properties of yoghurt made from camel milk supplemented with sodium alginate and / or blended with buffalo's milk. The rate of whey synersis of stabilized samples of camel yoghurt was steadily decreased when measured at room temp. (25 - 30°C) up to the final storage period, yoghurt made from camel milk blended with buffalo's at the ration 3 : 1 without stabilizer had the highest rate of whey synersis followed by the ratio 1 : 1 whither fresh or after 15 days of cold storage .

The same table demonstrates the clotting time of the studied product which indicated that the cultured camel milk did not coagulate up to the maximum time needed to perform the coagulation. Time needed were 5.25, 5.20 and 5.10 hr. for the treatments stabilized with 0.5, 0.75 and 1.00% **S.A** of all experimented treatment , this often related to the high content of antimicrobial factors, immunoglobulin G and protective proteins such as lysozium (1Z) , lactoferrins (LF) and lactoperoxidase *(Tomita Etal,., 1991)* , *(Regester et al., 1997)* and *(El-Agamy et al., 1992) .*

On the other hand the clotting time of blended camel yoghurt samples showed fairly shorter time compared to the stabilized control (4.50 and 4.00 hr.) for the blended samples with buffalo's milk at level 3: 1 and 1: 1 respectively. This time of coagulation achieved another decrease with supplementing the blended samples with sodium alginate at ratio of 0.5,

0.75 and 1.00% which needed 4.40, 4.30, 4.20, 3.50, 3.30 and 3.20 hr respectively (not tabulated). These results were in accordance with (*Mehia, 1993a)* who found that the low content of casein proteins (CP) and (CN) in camel milk gives very soft curd when making fermented milks or cheeses.

These results of clotting time may be explained by its poorness of casein 6 (the bigger size of micelles , the lower dry matter content, the smaller size of fat globules and low content of colloidal calcium (35% vs. 65%) compared to cow's milk as found by *(Mohammed –Bengoumi, 2005).* He also discovered that the spontaneous acidification and clotting of raw milk at 35°C is longer in camel milk with a latent phase ranging from 4-8°hr.compared to cow milk (2-3hr.) enzymatic coagulation of camel adjunction 50 to 100 times than that used in other ruminant milk.

Table (3) Some Physico – Chemical Properties of Yoghurt Made from Camel Milk Supplemented by Sodium Alginate or / and Blended with Buffalo's Milk.

Itemo	Storage in days	Treatments											
		Control	T_{1a}	T_{1b}	T_{1c}	T_{2a}	T_{2b}	T_{2c}	$T_{2\,d}$	T_{3a}	T_{3b}	T_{3c}	T_{3d}
Clotting time(hr.)		-	5.25	5.20	5.10	4.50	4.40	4.30	4.20	4.00	3.50	3.30	3.20
Synersis% at 25--30°C	Fresh	-	29.93	27.60	25.45	22.92	20.37	18.26	15.33	20.95	18.15	13.40	1.43
	5	-	28.70	27.53	25.02	22.80	20.75	18.28	14.67	20.87	17.13	13.65	11.33
	10	-	27.60	27.33	24.55	24.76	20.85	18.26	14.33	21.09	18.38	13.60	10.73
	15	-	25.00	24.89	24.33	25.72	21.90	19.67	13.33	23.39	19.06	13.87	11.67
Synersis% at 5°C	Fresh	-	15.03	14.36	1.56	13.62	12.96	11.08	10.33	10.36	9.63	9.06	9.00
	5	-	14.63	14.16	11.37	13.29	12.76	10.79	10.00	10.99	9.46	8.89	8.33
	10	-	14.00	14.00	10.69	13.36	11.83	10.13	9.76	12.43	9.27	8.56	7.00
	15	-	13.33	13.46	10.63	14.43	12.43	10.89	9.66	15.56	9.92	8.76	7.67
Dyacelyl aceteyl methyl carbiol mg/100gr	Fresh	7.50	8.00	8.50	9.00	11.50	12.50	13.50	15.00	17.50	20.00	21.00	21.50
	5	8.00	8.60	9.30	10.70	12.70	13.60	14.30	16.60	18.70	21.30	22.50	22.70
	10	9.00	9.30	9.70	11.30	13.00	13.30	14.60	16.70	19.90	22.00	22.90	23.00
	15	10.50	10.30	10.70	11.60	12.60	11.0	12.60	14.00	17.00	20.00	21.00	21.00

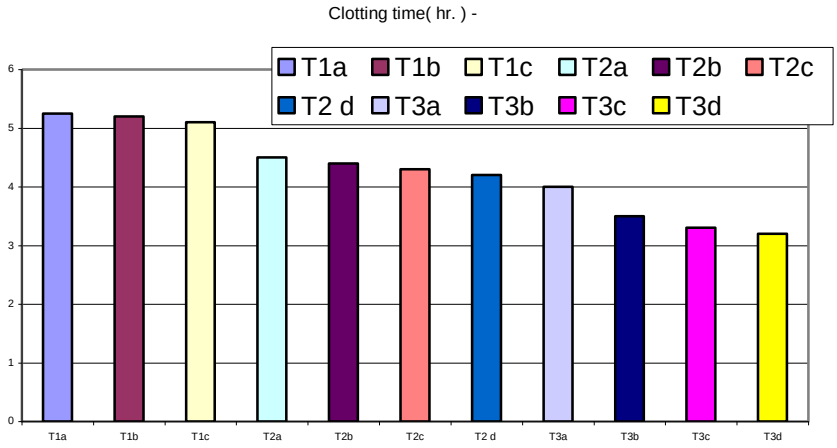

Figure (1) : Clotting Time (hr.)

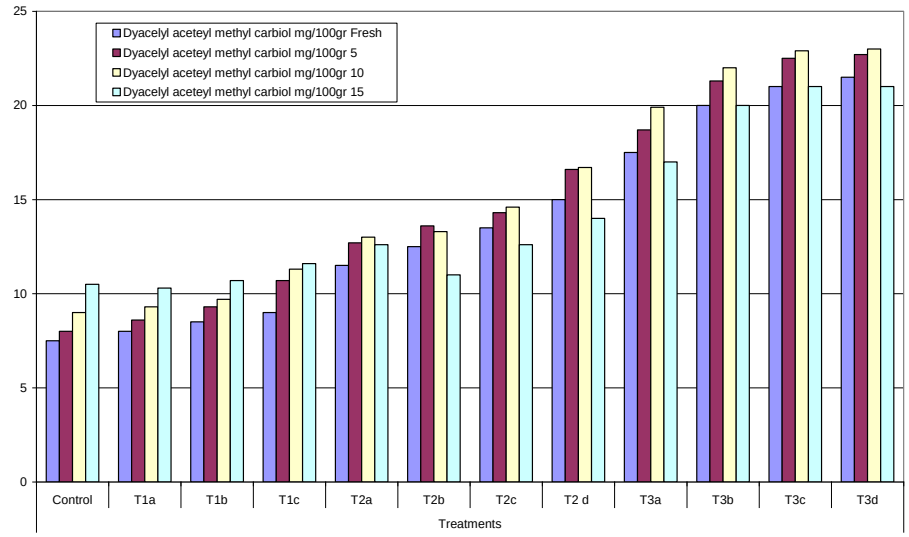

Figure (2):Relationship between storage time and the amount of DA and AMC

Resultant data in table (4) reveals the effect of the applied sodium alginate and buffalo's milk supplemented to camel milk on total viable count, lactic acid bacterial count , spore-forming bacteria , yeasts and fungi .results appeared that preferring bacteria, yeasts and fungi. Results appeared that there was a great inhibition for the spore – forming bacteria and yeasts & fungi in the control and stabilized camel sample whither fresh or stored up to the tenth day.

Table (4) Microbial Evaluation of Camel Yoghurt Supplemented by Stabilizer and / or Buffalo's Milk as cfu / ml

Items		Storage in days	Treatments											
			CControl	T_{1a}	T_{1b}	T_{1c}	T_{2a}	T_{2b}	T_{2c}	T_{2d}	T_{3a}	T_{3b}	T_{3c}	T_{3d}
Total viable as count X10 ^{3}/ml		Fresh	0.15	0.19	0.18	0.19	1.56	1.765	1.780	1.680	4.150	4.280	4.565	4.365
		5	1.65	2.12	2.19	2.26	4.65	4.27	4.425	4.560	9.480	9.696	9.761	9.963
		10	3.18	3.79	3.825	3.94	7.98	8.28	7.685	7.542	13.690	13.927	14.1921	13.998
		15	4.64	5.35	4.995	5.245	5.445	5.930	5.375	5.090	9.000	9.260	8.939	8.730
Lactic acid bacteria as count x10 ^{3}		Fresh	0.10	0.16	0.16	0.16	1.2	1.3	1.32	1.33	3.5	3.7	4.0	4.10
		5	1.6	2.0	2.10	2.12	3.5	3.5	3.6	3.7	8.9	8.9	9.0	9.2
		10	2.9	3.3	3.8	3.9	6.7	6.9	6.5	6.5	12.9	13.0	13.2	13.0
		15	4.6	4.9	4.95	5.15	6.12	5.0	4.30	4.20	8.2	8.3	8.10	8000
Spore forming bacteria cfu\ ml		Fresh	-	-	-	-	-	-	-	-	20.0	20.0	20.0	20.0
		5	-	-	-	-	5	5	5	5	10.0	10.0	10.0	-
		10	-	-	-	-	-	-	-	-	-	-	-	-
		15	-	-	-	-	-	-	-	-	-	-	-	-
Yeasts & fungi as cfu /ml	Yeasts	Fresh	-	-	-	-	100	100	100	100	220	210	200	235
		5	-	-	-	-	150	150	200	200	260	276	240	260
		10	10	10	10	10	180	180	185	182	320	397	450	480
		15	10	10	10	10	240	230	240	230	380	450	430	410
	Fungi	Fresh	-	-	-	-	120	200	250	230	310	320	323	360
		5	-	-	-	-	490	520	525	550	480	490	491	493
		10	18	18	20	20	940	900	900	850	520	510	530	512
		15	20	25	25	25	640	680	620	610	413	410	409	308

These results are in line with those of *Barbour et al., (1984),* who stated that camel milk inhibit pathogenic bacteria. In a comparative study, *Konuspayeva et al., (2005)* found that lactoferrin concentration in camel milk has 30-100 times higher than in bovinn milk, and after heat treatment at 85^0C, camel milk still contains 37% of lactoferrin.The same samples appeared slightly increase in yeasts and fungi then considerable increase after the tenth day of cold storage up to the final storage periods.

On the other hand blended samples with buffalo's milk recorded higher increase in lactic acid up to the tenth day, and then decreased at considerable numbers up to the end of storage periods. This increase in microbial numbers was mainly as results of substituting camel milk partially by buffalo's milk that removed the inhibition related to the inhibitory factors in camel milk. Table (5) demonstrates sensory evaluation of yoghurt samples fortified with

sodium alginate and or blended with buffalo's milk by 3: 1 or 1: 1. these results showed that the control samples did not coagulate up to the tenth day of cold storage, while adding sodium alginate at ratios of 0.5, 0.75 and 1.0% caused excessive increase in the consistency imparting an atypical jellylike structure in the non coagulated samples of 100% camel milk . On the other hand, the sodium alginate improved the very weak body and texture of all samples up to the concentration of 1.0% and reducing whey separation whether at room temp or at refrigerator. The very soft curd obtained after ten days cold storage of 100% camel milk yoghurt may in accordance with the low content of protein (CP) (*Mehaia, 1993*$_a$) and the higher content of antimicrobial growth factors and higher protein proteolysis (*Barbour et al., 1984*) and *(Abu–Tarboush,1996)* and *Lucey and Singh (1998).*

Camel yoghurt sample with 1.00% stabilizer achieved the highest total score for the appearance, body & texture and flavor for fresh, and stored samples up to final storage periods (77.00, 87.00, 83.00 and 72.54 %) respectively.

Blending camel milk with buffalo's whole milk improved the organolyptic properties at remarkable degree by increasing the blending ratios up to 1: 1. Moreover, adding sodium alginate improved both flavor and body & texture at magnitude levels as shown in table (5). The best results achieved by the ratio 1.0 % stabilizer when camel milk blended with buffalo's at the level 3 : 1, meanwhile these results showed by the ration of 0.75% stabilizer at the level(1:1) replacement of buffalo's milk. It is observed from illustrated degrees that there was acceptable flavor in stored camel yoghurt 100% up to the tenth day of cold storage and palatable flavor in both blended milks (3:1 and 1:1) this may be related to the development of acidity increasing of the diacetyl and acetyl methyl carbinol that increase with higher replacement of camel milk by buffalo's milk and the curd firmness was also increased with higher replacement which increase casein and T.S. content.

Table (5) Sensory Evaluation of Yoghurt Manufactured from Camel milk Fortified with Sodium Alginate and/ or Blended with Buffalo's Milk.

Items	Stor-age in days	Treatments											
		Control	T_{1a}	T_{1b}	T_{1c}	T_{2a}	T_{2b}	T_{2c}	T_{2D}	T_{3a}	T_{3b}	T_{3c}	T_{3D}
Appearan-ce 20 degree	Fresh	9.00	13.33	17.67	17.67	17.33	17.67	17.63	17.63	18.16	18.33	18.67	18.33
	5	12.33	15.33	18.00	18.33	17.00	18.00	18.33	17.33	17.23	18.33	18.67	17.33
	10	12.33	15.33	18.00	18.33	17.00	18.00	18.33	17.33	17.23	18.33	18.67	17.33
	15	14.00	15.00	15.33	15.66	13.33	14.00	14.33	14.67	13.67	14.67	15.00	15.00
Flavour 50 degree	Fresh	24.00	33.67	34.33	35.00	43.33	43.67	44.67	45.00	46.33	46.67	47.33	46.00
	5	30.00	33.39	38.67	39.67	44.67	45.00	46.33	46.70	47.00	47.33	48.00	46.33
	10	35.33	40.33	42.00	43.00	42.00	46.33	46.67	46.00	46.67	47.67	47.67	44.00
	15	36.00	81.00	30.00	37.33	35.33	34.33	35.00	36.00	35.67	36.00	36.33	35.00
Body & texture 30degree	Fresh	14.00	21.33	22.67	24.33	23.33	24.00	25.33	26.70	27.67	27.33	27.67	25.33
	5	16.00	23.43	23.33	25.33	24.67	24.67	25.67	27.00	27.00	28.67	28.38	24.67
	10	20.33	23.67	24.00	25.67	25.67	25.00	26.00	25.33	26.33	25.67	27.33	23.33
	15	23.00	20.00	22.00	22.60	21.00	21.70	22.00	21.33	22.33	23.00	23.33	22.00
Total 100 degree	Fresh	47.00	68.33	74.67	77.00	83.99	85.31	87.93	89.33	92.16	92.33	94.67	89.33
	5	58.33	72.03	79.93	83.00	87.01	87.60	90.13	91.70	92.18	94.67	95.29	89.33
	10	67.99	79.33	84.00	87.00	84.67	89.33	91.00	88.6	90.23	91.67	89.67	84.66
	15	73.00	66.00	67.33	72.54	69.66	70.03	71.33	72.00	71.67	73.67	73.66	72.00

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تحسين جودة الزبادى المصنع من لبن الابل

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نظراً لما أثبتته الدراسات السابقة من كون لبن الجمال ذات قيمة غذائية وعلاجية كبيرة لما يحتويه من عوامل مضادة لنمو العديد من البكتيريا والفيروسات لذا كان هذا العمل لدراسة أثراضافة ألجينات الصوديوم كمادة مغلظة للقوام تناسب طبيعة اللبن الحامضية , وذلك بمستويات استخدام ٠,٥ ,٧٥ و١,٠٠%. وكذلك خلط لبن الابل مع اللبن الجاموسى بنسب استبدال ٣ :١ و١ :١ مع استخدام أوعدم استخدام المثبت وذلك على صفات الزبادى المصنع من لبن الابل ٠

تم دراسة بعض الخواص الكيماوية والفيزوكيميائية والميكروبيولوجية والحسية كدرجة تركيز (الأس الأيدروجينىpH)، تطور الحموضة فى المنتج الطازج وكذلك خلال فترات التخزين على درجة حرارة الثلاجة لمدة ٥ ،١٠ ،١٥ يوم ٠وكذلك خواص رشح الخثرة للشرش.

أوضحت نتائج دراسة الخواص الكيماوية انخفاض واضح فى قيم الاس الأيدروجينى فى مقابل زيادة ملحوظة فى حموضة المعايرة خلال فترات التخزين وكانت هذه التغيرات طفيفة فى عينة الكنترول أثناء التحضين وخلال فترات التخزين الأولى من ٥-١٠ يوم ثم زادت الحموضة زيادة واضحة بزيادة فترة التخزين حتى نهايته بالنسبة لعينة الكنترول والعينات المضاف لها مثبت فقط٠ ترتب على استبدال جزء من لبن الجمال باللبن الجاموسى زيادة كبيرة فى هذه التقديرات على مستوى جميع المعاملات بزيادة نسبة الاستبدال واتى أوضحت أيضا انخفاض كبير فى وقت التحضين وزيادة فى تركيز مادة النكهة من الداى آسيتايل والأسيتايل ميثايل كربينول حتى اليوم العشر من التخزين ثم انخفاض آخر حتى نهاية مدة التخزين٠

وعلى الجانب الآخر فقد أوضحت النتائج أيضاً أن اضافة ألجينات الصوديوم قد حسن كثيراً من قوام وصلابة خثرة الزبادى الناتج وقلل انفصال الشرش الذى ازداد زيادة واضحة وكبيرة بزيادة نسبة الاستبدال فى المعاملات التى لم يضاف لها مثبت ٠

أوضحت نتائج الفحص الميكربيولوجى أن الأعداد الكلية وأعداد ميكروبات البادئء انخفضت بدرجة واضحة خلال الفترة الأولى من التخزين ثم بدأت فى الزيادة بعد اليوم الخامس من التخزين وذلك على مستوى عينة الكنترول والمعاملات الأخرى التى لم يضاف اليها اللبن الجاموسى ٠ كما كان هناك تثبيط واضح فى نمو الفطريات والخمائر وانعد م وجود البكتريا المكونة للجراثيم فى عينات الكنترول ومعاملات المثبت٠كما أوضحت النتائج أن الاستبدال الجزئى باللبن الجاموسى قد قلل من هذا التأثير المثبط للنشاط الميكروبى فى المنتج أثناء التحضين والتخزين على مستوى جميع المعاملات .

أوضحت أيضاً نتائج التحكيم الحسى تحسن واضح فى الطعم وخواص التركيب والقوام باضافة المثبت وبزيادة نسبة الاستبدال باللبن الجاموسى حتى النسبة ١:١.