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Chemical Composition and Quality of Labneh Contaning Palm Oil Made by Frequent Homogenizer.

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ABSTRACT

Labneh was made using buffalo's milk of 4% milk fat (control) treatment. Four treatments were made with frequent homogenizer technique for homogenization of palm oil with labneh mixture containing 23% total solids using skim milk powder. The chemical, microbiological and organoleptic properties were carried out. Control and treatment T_1 (4% milk fat and 4% palm oil) were of the lowest fermentation time during preparation of yoghurt used in making labneh. In the resultant fresh and stored labneh, the control sample were of the highest acidity, which gradually decreased in T_4 (water with 8% palm oil) Also, NPN, TVFA and acetaldehyde contents were of the maximum in the control, Treatments T_3 (liquid buffalo's skim milk with 8% palm oil) and T_4 (water with 8% palm oil) had the lowest values in this respect. The optimal samples microbiologically were noticed in control one, while the viable counts gradually decreased especially in fresh and stored T_3 and T_4 labneh in order. Organoleptically, control and T_1 were the superior as accepted of their flavour and body & texture. On the contrary T_4 had the minimum scoring points in this respect.

Keywords: Labneh, Frequent homogenizer.

INTRODUCTION

Labneh yoghurt. cheese or concentrated yoghurt is a traditional fermented milk product. It plays a significant role in the family diet A large quantites of labneh is still produced by the traditional method in which the set yoghurt is strained in cloth bags to the desired total solids level (22-26%), then packaged and stored in refrigerator for consumption.

Ultrafiltrated retentate could be used in desired level of total solids in labneh making before fermentation of the milk (Tamime & Robinson, 1978). (Rasic, 1987; El-Samrage and Zall, 1988). However, the traditional process and UF technique are the two main methods used for the manufacture of labneh in the most of dairy plants.

Recently it is necessary to apply homogenization of the vegetable oils in the manufacture of some dairy products in the modern dairy plants. Few work was published in this field on the production of filled labneh. Comparative study in the present work was done to study the effect of using frequent homogenizer and traditional method in labneh making. This was the main objective of the current study.

MATERIALS AND METHODS

Buffalo's milk was obtained from the herd of Animal Production Research Station, Mehalet Moussa. American skim milk powder, palm oil and commercial emulsifier were obtained from a private cheese factory in Kafr El-Sheikh Governorate. Yoghurt starter culture, consisted of A mixed strains of *Streptococcus thermophilus* and *lactobacillus delbrueckii sub sp. Bulgaricus* was obtained from chr. Hansen's Laboratories, Copenhagen, Denmark. Salt (Nacl) was obtained from salt & Minerals El- Nasr Company, Egypt.

For making Labneh. The milk was divided into 5 equal portions: The first one was standardized to 4% fat and served as a control. The other treatments were made using the frequent homogenizer as follows:

(T1) A mixture of standardized buffalo's milk 4% fat + 4% palm oil + skim milk powder (SMP) to reach 23% TS.

(T2) A mixture of standardized buffalo's milk 2% fat + 6% palm oil + SMP to reach 23% TS.

(T3) Buffalo's skim milk + 8% palm oil + SMP to reach 23% TS.

(T4) Water + 8% palm oil + SMP to reach 23% TS.

The emulsifier was added in palm oil treatments by 0.5% (w/w).

The control treatment was manufactured according to El-Samragy *et al., (1997)*. The other treatments were made by frequent homogenizer after well mixing and pasteurization to 65°C before homogenization for 20 min in frequent homogenizer made (in Germany) at pressure 70 par. The mixtures were inculated with yoghurt culture and incubated at 40°C until coagulation. The resultant labneh was stored in refrigerator at 5 ± 2°C for 15 days for chemical, bacteriological and organoleptical analysis,when fresh and after 5, 10 and 15 days, respectively. .

Milk and Mixtures were analyzed for acidity, total solids, fat, protein and ash contents according to AOAC, (2000). Lactose content was measured as given by Barnett and Abd El-Tawab, (1957). pH value was determined using pH mater model Jenway 3020, England.

Labneh was analyzed for acidity, pH , total solids, fat, protein, non protein nitrogen and ash (AOAC, 2000), salt content (Richardson, 1985), lactose content, total volatile fatty acids (Kowsikowski, 1978), and acetaldehyde (Lees and Jago, 1969). Total bacterial count, lactic acid bacterial count, califorms bacterial count and yeast & moulds counts were determined as described by APHA,(1992). Taste panel of 5 staff persons at dairy technology lab. (Mehalett Moussa Station) evaluated the organoleptic properties of labneh samples. The panelists scored labneh for flavour (0-60) pointes, Body & texture (0-30) pointes and appearance (0-10) pointes. (according to Ahmed&Ismail 1978).

Statistical analysis of variance and Duncan's test and average and standard error were carried out using computer program (SPSS, 1999).

RESULTS AND DISCUSSION

The results given in Table (1) show similarities in the composition of all milk treatments except the control. The similarity in chemical composition of these samples could be explained on the basis of uniformity of the main constituents to produce a mix containing TS and fat which be around 23% and 8% respectively.

Table 1. Acidity (%), pH and chemical composition (%) of milk used in Labneh manufacture.

Treatment	Acidity,	pH,	T.S,	Fat,	Protein,	Lactose,	Ash,
Control	0.16	6.60	13.88	4.03	3.85	4.78	0.74
T1	0.18	6.48	22.83	8.04	8.23	5.10	1.23
T2	0.18	6.35	22.70	8.10	8.27	5.60	1.27
T3	0.19	6.25	22.87	8.14	8.27	5.70	1.36
T4	0.20	6.17	22.98	8.10	8.16	5.94	1.43
S.E	0.01	0.06	0.08	0.06	0.11	0.05	0.04

Control:-Buffalo's milk standardized to4%fat(traditional method)
T1:- Buffalo's milk standardized to 4% fat + 4% palm oil + skim milk powder (Total solid = 23%).
T2:- Buffalo's milk standardized to 2% fat + 6% palm oil + skim milk powder (Total solid = 23).
T3:- Liquid buffalo's skim milk + 8% palm oil + skim milk powder (Total solid = 23%).
T4:-Water+ 8% palm oil + skim milk powder (Total solid = 23%).

pH values of yoghurt used in labneh making during the fermentation period are presented in Table (2).It was obvious from these results that the pH values decreased during incubation time. These results are coincided with that reported by El-Ghandour *et al.,* (2008) and El-Ghandour *et al.,* (2017). However, T3 and T4 had longer fermentation on time. This could be due to the variations in the prepared yoghurt mix.

See legend to Table (1) for details. Averages with different supers scripts differed significantly (P≤ 0.05).

Table (3) shows acidity, and chemical composition of the prepared labneh during storage up to 15 days .Titratable acidity (TA) in fresh labneh was 0.82% in the control and with presence of palm oil it ranged between 0.77 to 0.78%.The TA gradually increased in all samples during storage. Results in the same Table show that the total solids, fat, protein, ash and salt in dry matter slightly increased in all treatments during the storage period in contrast to lactose. The samples treated with vegetable oil contained the highest content of lactose due to of the initial content of their ingredients (SMP). These results are partially in agreement with Amer *et al.,* (1997), El-Samragy *et al.,* (1997), Mehaia (2005) and Shamsia and El-Ghannam (2012).

Table 2. pH values during the fermentation period of yoghurt used to produce labneh.

Treatment	Fermentation time (min.)						
	40	80	120	160	200	240	280
Control	6.53^{a}	6.34^{a}	6.03^{a}	5.50^{a}	4.63^{a}	--	--
T1	6.43^{a}	6.33^{a}	6.13^{a}	5.57^{a}	4.67^{a}	--	--
T2	6.22^{b}	6.13^{b}	5.77^{b}	5.40^{b}	4.60^{b}	--	--
T3	6.17^{b}	6.03^{b}	5.83^{b}	5.60^{c}	5.27^{c}	4.67^{a}	--
T4	5.97^{c}	5.83^{c}	5.67^{b}	5.53^{c}	5.37^{d}	5.03^{b}	4.67
S .E	0.05	0.10	0.09	0.19	0.14	0.08	0.10
F. test	**	**	**	*	**	**	**

Table 3. Acidity (%), pH and chemical composition (%) of Labneh as affected by using frequent homogenizer in the manufacture.

Storage	Treat	Acidity	pH	T.S	Fat/DM	T.P/DM	Ash/DM	Salt/DM	Lactose
	Control	0.82^{a}	4.63^{a}	$22.7o^{a}$	34.80	25.63^{a}	4.43	2.57^{a}	3.38^{a}
	T1	0.77^{a}	4.67^{a}	22.80^{a}	34.87	25.75^{a}	5.40	2.63^{a}	3.97^{b}
Fresh	T2	0.77^{a}	4.60^{a}	22.75^{a}	34.78	25.84^{a}	5.58	2.62^{a}	4.35^{c}
	T3	0.78^{a}	4.67^{a}	22.94^{b}	34.73	25.82^{a}	5.98	2.63^{a}	4.38^{c}
	T4	0.78^{a}	4.67^{a}	22.92^{b}	33.90	25.85^{a}	6.24	2.61^{a}	4.65^{d}
	Control	0.97^{a}	4.43^{a}	22.82^{a}	34.92	25.73^{a}	4.47	2.72^{a}	3.28^{a}
	T1	0.88^{b}	4.47^{a}	23.85^{a}	34.97	25.83^{a}	5.43	2.67^{a}	3.83^{b}
5 days	T2	0.85^{b}	4.37^{a}	22.90^{a}	34.90	25.95^{b}	5.70	2.72^{a}	4.25^{c}
	T3	0.92^{b}	4.57^{b}	23.13^{b}	34.83	25.95^{b}	6.03	2.73^{a}	4.27^{c}
	T4	0.88^{b}	4.47^{a}	23.18^{b}	34.00	25.97^{b}	6.30	2.73^{a}	4.52^{d}
	Control	1.03^{a}	4.28^{a}	23.00^{a}	34.95	25.78^{a}	4.58	2.78^{a}	3.20^{a}
	T1	1.00^{a}	4.32^{a}	23.15^{a}	35.05	25.92^{b}	5.57	2.72^{a}	3.73^{b}
10 days	T2	1.17^{b}	4.28^{a}	23.06^{a}	34.97	26.06^{b}	5.85	2.82^{a}	4.18^{c}
	T3	1.10^{b}	4.45^{b}	23.14^{a}	34.91	26.08^{b}	6.15	2.83^{a}	4.20^{c}
	T4	1.0^{a}	4.35^{a}	23.17^{a}	34.09	26.06^{b}	6.40	2.81^{a}	4.44^{d}
	Control	1.27^{a}	4.13^{a}	23.1	35.03	25.82^{a}	4.72	2.83^{a}	3.10^{a}
	T1	1.17^{b}	4.22^{a}	23.2	35.13	26.02^{b}	5.67	2.72^{a}	3.63^{b}
15 days	T2	1.27^{a}	4.18^{a}	23.0	35.03	26.17^{b}	6.07	2.87^{b}	4.13^{c}
	T3	1.23^{a}	4.32^{b}	23.1	34.97	26.19^{b}	6.32	2.85^{b}	4.08^{c}
	T4	1.17^{b}	4.22^{a}	23.2	34.20	26.18^{b}	6.53	2.87^{b}	4.35^{d}
S. E		0.04	0.05	0.07	0.08	0.05	0.16	0.05	0.06
F. test		**	*	*	N.S	*	N.S	*	*

See legend to Table (1) for details.

The results in Table (4) show gradual increase in non-protein nitrogen, TFVA and acetaldehyde during storage period. The total volatile free fatty acids contents were affected by substitution of milk fat with examined vegetable oil. Control labneh was of the highest content of TVFA levels. Production of flavour compounds such as acetaldehyde depends on the activity of starter and the circumstances of fermentation. These results are in accordance with Omar, (1995), Ragab, (2000) and Mehanna *et al.,* (2004). The same Table shows that the acetaldehyde content of labneh samples. It was alsoo affected by the substitution of

milk fat with palm oil. It decreased by using recombined milk in making Labneh. Similar results were obtained by El-Samragy, (1997). On the other hand, the TVFA values gradually increased up to 10 days of storage, and sharply decreased after that till the end of storage. This trend agrees with that obtained by El-Ghandour *et al.,* (2017).

Table 4. NPN/TN, TVFA and acetaldehyde contents of Labneh manufactured by frequent homogenizer.

Storage period	Treatment	NPN/TN,%	T.V.F.A*	Acetaldehyde**
	Control	6.58^{a}	9.53^{a}	355.00^{a}
	T1	6.38^{b}	8.72^{b}	265.00^{b}
Fresh	T2	6.56^{a}	8.50^{b}	255.00^{b}
	T3	6.32^{bc}	8.47^{b}	240.00^{c}
	T4	6.40^{c}	8.30^{b}	233.00^{c}
	Control	8.27^{a}	10.38^{a}	421.67^{a}
	T1	7.95^{b}	9.27^{b}	335.00^{b}
5 days	T2	8.05^{b}	9.48^{b}	316.75^{c}
	T3	8.02^{b}	9.52^{b}	318.33^{c}
	T4	8.05^{b}	9.42^{b}	305.00^{c}
	Control	9.22^{a}	11.62^{a}	445.00^{a}
	T1	8.93^{b}	10.72^{b}	361.67^{b}
10 days	T2	9.00^{b}	10.60^{b}	340.00^{c}
	T3	9.08^{b}	10.56^{b}	340.00^{c}
	T4	9.05^{b}	10.53^{b}	325.00^{d}
	Control	10.18^{a}	13.13^{a}	400.00^{a}
	T1	9.78^{b}	12.14^{b}	335.00^{b}
15 days	T2	1o.00^{c}	12.65^{c}	318.33^{c}
	T3	10.10^{c}	12.70^{c}	315.00^{c}
	T4	10.15^{c}	12.75^{c}	306.70^{c}
S. E		0.07	0.16	5.70
F test		**	**	**

See legend to Table (1) for details. * ml 0.1 N NaOH/100g Labneh. ** expressed as micro mol / 100g labneh.

Microbiological properties of control and all treatments of Labneh being made with vegetable oil are shown in Table (5). The total bacterial count decreased in Labneh made with vegetable oil. On the other hand, control Labneh contained the highest number of 8.50×10^{7}. Lactic acid bacteria behaved similary as that of total count.The increased during the first five days of cold storage, followed by decrease till the end of storage. These results are in agreement with Sharaf *et al.,* (1996), Salem *et al.,* (2007) and Ghandour, (2017). It is obvious from Table (5) that moulds and yeasts were not detected in all Labneh samples, when fresh or during storage, except when they detected and counted at the end of storage(15th day)in control and T1 with counts of 0.32×10^{2} and $0.20\times10^{2,}$ respectively. These results are similar to those reported by Hamad *et al.,* (2014), Basiouny *et al.,* (2015) and El-Ghandour, (2017). Coliforms could not be detected whether in fresh or in stored Labneh, which might be due to the heat treatment applied for the milk used.

Results given in Table (6) show the organoleptic properties of Labneh made using vegetable oil. For flavour ,control Labneh had the highest scoring points whether in fresh or after 5,10 and 15 days of the cold storage. A decrease in flavor scores was recorded after of 10 days of storage in all treatments. On the other hand, scoring points of all Labneh samples decreased in body and texture and appearance during the storage. These results are coincided with those obtained by Salem *et al.,* (2007), Hamad *et al.,* (2014) and El-Ghandour, (2017)

Table 5. Microbiological analysis (CFU/g) of Labneh manufactured using frequent homogenizer when fresh and during storage period for 15 days in refrigerator.

Storage period	Treatment	Total bacterial count	Lactic acid bacterial count	Yeast & Mould count
	Control	8.50×10^{7}	5.20×10^{5}	Nil
	T1	7.08×10^{5}	4.60×10^{5}	Nil
Fresh	T2	7.54×10^{5}	4.07×10^{3}	Nil
	T3	6.75×10^{4}	4.16×10^{3}	Nil
	T4	7.42×10^{4}	4.56×10^{3}	Nil
	Control	9.70×10^{8}	5.60×10^{6}	Nil
	T1	7.80×10^{6}	5.20×10^{5}	Nil
5 days	T2	7.87×10^{6}	5.75×10^{4}	Nil
	T3	7.24×10^{5}	4.89×10^{4}	Nil
	T4	8.31×10^{5}	5.24×10^{3}	Nil
	Control	8.30×10^{6}	4.30×10^{4}	Nil
	T1	7.60×10^{6}	4.00×10^{4}	Nil
10 days	T2	5.88×10^{5}	3.71×10^{6}	Nil
	T3	6.45×10^{5}	3.98×10^{4}	Nil
	T4	7.41×10^{5}	$5..07\times10^{5}$	Nil
	Control	6.60×10^{5}	3.80×10^{3}	0.32×10^{2}
	T1	6.20×10^{5}	3.20×10^{3}	0.20×10^{2}
15 days	T2	4.85×10^{5}	2.69×10^{3}	Nil
	T3	5.16×10^{4}	3.31×10^{4}	Nil
	T4	6.95×10^{4}	4.26×10^{3}	Nil

-See legend to Table (1) for details.- All samples were coliforms-free.

Table 6. Organoleptic properties 0f labneh made by using frequent homogenize at fresh and during storage period in refrigerator.

Storage period	Treatment	Flavour	Body & Texture	Appearance	Total score
	Control	56.67^{a}	25.67^{a}	8.33^{a}	90.67^{a}
	T1	54.33^{a}	27.33^{b}	8.83^{a}	90.33^{a}
Fresh	T2	51.33^{b}	25.33^{c}	8.33^{a}	85.17^{b}
	T3	50.67^{b}	24.33^{c}	8.17^{b}	83.17^{b}
	T4	48.33^{c}	23.33^{d}	7.68^{c}	79.43^{c}
	Control	56.33^{a}	25.33^{a}	8.17^{a}	89.83^{a}
	T1	54.67^{a}	26.67^{a}	8.66^{a}	90.00^{a}
5 days	T2	50.67^{b}	24.67^{b}	7.83^{b}	83.17^{b}
	T3	48.67^{b}	22.00^{c}	7.67^{c}	78.17^{c}
	T4	43.00^{c}	21.00^{c}	7.10^{c}	71.00^{d}
	Control	54.67^{a}	23.33^{a}	7.17^{a}	85.17^{a}
	T1	51.00^{b}	25.33^{b}	7.67^{a}	84.00^{a}
10 days	T2	48.33^{c}	21.33^{c}	7.17^{a}	76.83^{b}
	T3	45.33^{d}	19.00^{d}	7.17^{a}	71.50^{c}
	T4	41.00^{e}	17.33^{e}	6.67^{b}	65.00^{d}
	Control	51.00^{a}	20.67^{a}	6.83	78.50^{a}
	T1	49.00^{a}	23.33^{b}	7.00	79.33^{a}
15 days	T2	43.33^{b}	19.00^{c}	6.63	69.13^{b}
	T3	41.33^{b}	17.33^{d}	6.27	65.27^{c}
	T4	36.67^{c}	15.00^{e}	5.50	57.17^{d}
S. E		1.12	0.69	0.27	1.40
F test		**	**	*	**

See legend to Table (1) for detail

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التركيب الكيماوي والجودة للبنة المصنعة بالمجنس الترددي مع استخدام زيت النخيل

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قسم بحوث كيمياء الألبان

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فى هذا البحث تم تصنيع اللبنة من اللبن الجاموسى المعدل لـ ٤% دهن لبن وصنعت بالطريقة التقليدية (كنترول) كما صنعت باقى المعاملات بعد التجنيس باستخدام المجنس الترددى كما يلى: معاملة ١: لبن جاموسى ٤% دهن + ٤% زيوت نباتية ونستكمل الجوامد الكلية إلى ٢٣% باستخدام لبن فرز مجفف. معاملة ٢: لبن جاموسى ٢% دهن + ٦% زيوت نباتية ونستكمل الجوامد الكلية إلى ٢٣% باستخدام لبن فرز مجفف. معاملة ٣: لبن جاموسى فرز + ٨% زيوت نباتية ونستكمل الجوامد الكلية إلى ٢٣% باستخدام لبن فرز مجفف. معاملة ٤: ماء ويضاف إليه ٨% زيوت نباتية ونستكمل الجوامد الكلية إلى ٢٣% باستخدام لبن فرز مجفف. خزنت عينات اللبنة الناتجة فى الثلاجة لمدة ١٥ يوماً لتجرى عليها التحليلات الكيماوية والميكروبيولوجية والحسية، وأوضحت النتائج ما يلى: لوحظ تقدماً ملحوظاً فى إنتاج الحموضة فى معاملات الكنترول والمعاملة ١ ، ٢ اسرع حيث قل الوقت اللازم للتجين أثناء التحضين، وقد ظهر ذلك جلياً عند تخزين العينات فى الثلاجة حيث زادت الحموضة فى عينات الكنترول مقارنة بمثيلاتها فى باقى المعاملات، وظهرت المعاملة الأخيرة فكانت أقلهم فى الحموضة، وذلك فى العينات الطازجة والمخزنة، أيضاً انعكس هذا الإتجاه على التحلل البروتينى والدهنى حيث حظيت معاملة الكنترول أعلى القيم من حيث المحتوى من (NPN) وكذا من الأسيتالدهيد، تدرجت القيم حتى وصلت لأقل مستوياتها فى المعاملة الثالثة والرابعة، ومن حيث الاختبارات الميكروبيولوجية فقد سجلت معاملة الكنترول أعلى قيم فى الأعداد الميكروبية، وتدرجت فى باقى المعاملات إلى أن وصلت إلى أدناها فى المعاملة الثالثة والرابعة، وذلك فى العينات الطازجة والمخزنة، وفى التحكيم الحسى حظيت معاملة الكنترول والمعاملة الأولى على أعلى الدرجات حيث كان هناك فروقاً واضحة بينهما وباقى المعاملات على الترتيب، وظهرت المعاملة الأخيرة أقلهم خاصة فى درجات الطعم والقوام والتركيب.