

QUALITY OF YOGHURT AS AFFECTED BY REPLACEMENT OF MILK FAT WITH PALM OILS .

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ABSTRACT

The best out of six blends previously made from buffalo milk made the addition of 1% retentate powder , as well as one out of six blends of yoghurt made from retentate supplemented with 3% retentate powder were chosen . The effect of the replacement milk fat with different levels of palm oil on the quality of yoghurt was examined . the best replacement level was 1:1 for buffalo milk , and 3:1 (palm oil : milk fat) for yoghurt .

INTRODUCTION

There has been a phenomenal increase in the production of fermented milk in the developed countries. Yoghurt is a very popular flavorful and healthful dairy product in Egypt. Its production and consumption is growing continuously due to its therapeutic properties beside its high nutritive value (Karagul *et al.*, 2004). The health promoting properties of live lactic acid bacteria in yoghurt include protection against gastrointestinal upsets, enhancement of digestion of lactose by maldigesters, decrease of risk of cancer, lowering of the blood cholesterol, improving of immune response and help the body to assimilate protein, calcium and iron (Perdigeon *et al.*, 1998; Marona and Pedrigo, 2004). Yoghurt treatments being made from buffalo milk +1% retentate or from retentate +3% retentate powder . were selected since they previously gave the highest total score recorded for the organoleptic characters.

MATERIALS AND METHODS

Fresh buffalo's milk and cream were obtained from the Dairy Department, Faculty of Agriculture, Mansoura University. Skim milk powder "Moisture: 4% Fat: 1.25% used in this work was made in Poland by "VARIMEX". Retentate powder: {protein: 69.8% lactose:17.2 % ash: 7.2% moisture: 4.4% fat: 1.4%} used in this work was made in Poland by "VARIMEX".. yoghurt starter (*S. salivarius* subsp. *thermophilus* and *L. delbrueckii* subsp. *bulgaricus*) was obtained from the Dairy Dept., Fac. of Agric., Mansoura. Univ. .All mixes were inoculated with 3.0% yoghurt starter and incubated at 40° c for 4-6 h. . Fat and total solids (T. S) were estimated by the method described by British Standard Institution's (B. S. I) Method (1955). pH measured by a digital pH-meter(Janway 3010 – England). Total volatile fatty acids (T. V. F. A) were estimated according to Kosikowski (1982). Total nitrogen (T. N), soluble nitrogen (S. N), non-protein nitrogen (N. P. N) and titratable acidity (T. A) were estimated as described by Ling

(1963).The curd tension is determined by using the method of Chandrasekhare *et al.* (1957).Yoghurt stored at 4 -5 °C, and examined for total bacterial count (T. C), moulds and yeasts (M & Y), coliform bacteria and stapHylococci as mentioned in the Standard Methods for Examination of Dairy Products (1985).Libolytic and Proteolytic bacterial count were carried out as described in Chalmers (1962).

RESULTS AND DISCUSSION

I: Effect of substitution of milk fat by different levels of palm oil on chemicals compositions of yoghurt made from buffalo milk + 1%retentate powder :

Table (1) shows the chemical composition of Buffalo milk and buffalo milk + 1% retentate. Buffalo milk contained 16.77% total solids, 6.5% fat and 3.48% total protein. The PH and acidity of buffalo milk were 6.71 and 0.17 %, respectively . Buffalo milk + 1% retentate had 17.75% total solid, 6.1% fat and 4.18% total protein. The PH -value of buffalo milk was 6.63, and the acidity was 0.19 % . On the other hand , Retentate + 3%retentate powder contained 19.81% total solid, 5.6% fat and 5.60% total protein. The PH -value of buffalo milk was 6.01, and the acidity was 0.20 % .

It could also be seen from Table (2)that the titratable acidity increased and the PH decreased with the increase of palm oil added to yoghurt during storage in all treatments. These results are in disagreement with Elgazzar and Marth (1991) .

Table (1): Chemical composition of buffalo milk , buffalo milk + 1% retentate powder and Retentate + 3%retentate powder.

Treatment	Test					
	T.S%	F%	T.P%	T.N%	pH	acidity%
Buffalo milk	16.77	6.5	3.48	0.547	6.71	0.17
Buffalo milk + 1% retentate powder	17.75	6.1	4.18	0.656	6.63	0.19
Retentate + 3%retentate powder	19.81	5.6	5.60	0.879	6.01	0.20

Table (2) also showed that the T.V.F.F.A. in all treatments as affected with the substitution of different levels of palm oil was increased when palm oil increased, and the T.V.F.F.A increased during storage in all treatments . The T.V.F.F.A increased when fat content increased. It is obvious from Table (2) that T.N , S.N and N.P.N contents of all treatments have increased during stored, however the T.N, S.N and N.P.N contents decreased with increase of added palm oil . These results disagree with the those obtained by EL-Shibiny *et al.* (1979) .

Data in Table (3) showed that the curd tension increase with the was increase in with total solids . These results are in harmony with those obtained by Abrahamsen and Holmen (1980). The curd tension decreased with the increase of added palm oil to yoghurt .

Table (2) Effect of substitution of milk fat by different levels of palm oil on chemicals compositions of yoghurt made from buffalo milk + 1%retentate during storage ..

	Storage period (days)																							
	yoghurt made from buffalo milk+1% retentate powder																							
	T.S %			Fat %			T.N %			N.P.N %			S.N %			T.V.F.F.A Mg/ 100g			PH			Acidity %		
	Fr.	7 days	14 days	Fr.	7 days	14 days	Fr.	7 days	14 days	Fr.	7 days	14 days	Fr.	7 days	14 days	Fr.	7 days	14 days	Fr.	7 days	14 days	Fr.	7 days	14 days
CN	17.80	18.30	18.82	6.4	6.6	7.4	0.773	0.913	0.963	0.028	0.031	0.033	0.130	0.133	0.138	4.62	4.80	4.82	4.91	4.06	3.93	0.76	1.02	1.06
T1	17.78	18.31	18.80	6.5	6.8	7.1	0.700	0.820	0.840	0.026	0.028	0.029	0.121	0.126	0.127	4.91	5.00	5.11	4.50	4.05	3.62	1.10	1.40	1.45
T2	17.77	18.29	18.77	6.7	7	7.3	0.691	0.791	0.821	0.022	0.025	0.028	0.101	0.105	0.111	5.20	5.40	5.53	4.11	4.07	3.40	1.13	1.46	1.49
T3	17.77	18.29	18.70	6.9	7.2	7.6	0.661	0.733	0.753	0.019	0.021	0.023	0.097	0.103	0.109	5.33	5.60	5.69	4.06	4.01	3.00	1.22	1.60	1.63

CN: Buffalo milk + 1% retentate powder T1 : fortified fat by percent 1:1 cream: palm oil respectively. T2: fortified fat by percent 1:2 cream: palm oil respectively. T3: fortified fat by percent 1:3 cream: palm oil respectively.

Table (3): Effect of substitution of milk fat by different levels of palm oil on Curd tension of yoghurt made from buffalo milk + 1%retentate during storage.

Stored period (days)												
yoghurt manufactured from buffalo milk+1% retentate powder												
Treatments	CN			T1			T2			T3		
	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days
Curd tension	5.6	5.8	6.1	5.3	5.5	5.9	5.0	5.2	5.6	4.6	4.9	5.1

Data presented in Table (4) show that the total count , protolytic and lipolytic bacteria increased during storage . However , coliform , molds , yeasts and *staphylococcus spp.* were not detected, whether in fresh or stored yoghurt made from buffalo milk+1% retentate in all treatments.

It is obvious from Table (5) that the yoghurt made from Buffalo milk + 1% retentate supplemented with fat (1:1 cream: palm oil respectively) gave the highest total score. Moreover, it is clear that the more added palm oil, the lower the total score was gained.

Table (4): Effect of storage period on Microbiological properties of yoghurt made from Buffalo milk + 1% retentate with different levels of palm oil .

period (days)															
yoghurt manufactured from buffalo milk+1% retentate powder															
	T.C. 106*			Lipolytic 103*			Protolytic 103*			M&Y 103*			E.colif & Staph. 103*		
	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days
CN	111	152	163	8	15	23	8	19	24	-	-	-	-	-	-
T1	95	132	145	12	16	20	9	23	28	-	-	-	-	-	-
T2	122	152	180	22	29	32	16	25	30	-	-	-	-	-	-
T3	130	163	191	35	38	54	19	30	32	-	-	-	-	-	-

CN : Buffalo milk + 1% retentate powder

T1 : fortified fat by percent 1:1 cream: palm pit oil respectively.

T2: fortified fat by percent 1:2 cream: palm oil respectively.

T3: fortified fat by percent 1:3 cream: palm oil respectively.

Table (5): Organoleptic –scoring points of yoghurt made from buffalo milk + 1% retentate powder.

Treatment	Appearance 10	Body & Texture 40	Flavor 50	Total points 100
Zero time				
CN	6	35	40	81
T1	6	40	45	91
T2	5	30	41	76
T3	9	22	39	70
7 days				
CN	3	37	46	86
T1	8	40	45	93
T2	9	34	34	77
T3	8	25	39	72
14 days				
CN	6	37	46	89
T1	8	40	46	94
T2	5	36	40	81
T3	6	29	40	75

- On the other hand, the cold storage increased the total score for all treatments. however, the substitution of milk with 1:1 cream: palm pit oil gained the highest total score, followed by treatments control, T2 and T3, respectively.

II : Effect of substitution of milk fat by different levels of palm oil on chemical compositions of yoghurt made from retentate + 3%retentate powder :

Table (6): Effect of substitution milk of fat by different levels of palm oil on Curd tension of yoghurt made from Retentate + 3% retentate powder during storage.

Stored period (days)												
yoghurt making from Retentate + 3%retentate powder.												
Treatments	CR			T1			T2			T3		
	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days
Curd tension	6.8	6.9	7.2	6.9	7.1	7.3	7.5	7.6	7.9	7.7	7.9	8.1

Data in Table (6) showed that the curd tension increased was the increase of the total solids content . These results are in agreement with Abrahamsen and Holmen (1980). On the other hand, The curd tension increased with the increase of added palm oil to yoghurt .

It could be seen from Table (7) that the titratable acidity decreases and pH values increase with the increase of palm oil added to yoghurt during storage in all treatments. These results are in agreement with Eigazzar and Marth (1991) .

Table (7) showed the T.V.FF.A. in all treatments decreased when palm oil increased and the T.V.FF.A increased during storage in all treatments . The T.V.FF.A increased with the increase in fat content.

It is obvious from Table (7) that T.N, S.N and N.P.N contents of yoghurt in all treatments increased during storage . , however the T.N, S.N and N.P.N decreased with the increase of added palm oil . These results are in disagreement with EL-Shibiny *et al.* (1979) .

Data presented in Table (8) show that total count , protolytic and lipolytic bacteria increased during storage, but libolytic bacteria decreased by the increase in the palm oil content . However , coliforms, molds ,yeasts and *staphylococcus spp.* were not detected whether in fresh or stored yoghurt made from Retentate + 3%retentate powder.

It is obvious from Table (9) that the yoghurt made from Retentate + 3%retentate powder (1:3 cream: palm pit oil, respectively) gave the highest total score. Moreover, it is clear that the more added palm oil, the higher the total score points. On the other hand, the cold storage increased the total score for all treatments. Mean while, the treatment (T3") obtained the highest total score, followed by treatments T2", T1" and control, respectively.

Table (7) Effect of substitution of milk fat by different levels of palm oil on chemicals compositions of yoghurt made from Retentate + 3%retentate powder.

	Storage period (days)																							
	yoghurt made from Retentate + 3%retentate powder.																							
	T.S %			Fat %			T.N %			N.P.N %			S.N %			T.V.F.F.A Mg/ 100g			PH			Acidity %		
	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days
CR	19.85	19.94	19.99	5.9	6.1	6.3	0.989	1.122	1.129	0.022	0.029	0.030	0.153	0.161	0.164	3.15	3.24	3.29	4.53	4.33	4.21	0.81	1.10	1.23
T1"	19.83	19.90	19.93	6.0	6.3	6.4	0.985	1.119	1.125	0.018	0.022	0.025	0.146	0.149	0.152	3.08	3.12	3.25	4.63	4.39	4.31	0.79	0.90	0.95
T2"	19.82	19.86	19.90	6.1	6.2	6.3	0.980	1.102	1.108	0.014	0.019	0.022	0.140	0.145	0.148	3.01	3.09	3.15	4.71	4.42	4.35	0.75	0.85	0.89
T3"	19.82	19.84	19.88	6.1	6.2	6.2	0.975	1.019	1.104	0.011	0.016	0.020	0.036	0.143	0.145	2.11	2.25	2.38	4.75	4.46	4.40	0.73	0.78	0.83

CR: Retentate + 3%retentate powder

T1" : fortified fat by percent 1:1 cream: palm pit oil respectively.

T2" : fortified fat by percent 1:2 cream: palm pit oil respectively.

T3" : fortified fat by percent 1:3 cream: palm pit oil respectively.

Table (8): Effect of storage period on microbiological properties of yoghurt making from Retentate + 3%retentate powder with different levels of palm oil .

	Stored period (days)														
	yoghurt manufactured from buffalo milk+1% retentate														
	T.C 106x			Libolytic 103x			Protohytic 103x			M&Y 103x			E.coli & Staph. 103x		
	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days	fresh	7 days	14 days
CR	98	120	132	15	19	21	20	26	30	-	-	-	-	-	-
T1*	88	95	101	10	13	16	29	36	41	-	-	-	-	-	-
T2*	55	68	89	5	9	12	35	40	44	-	-	-	-	-	-
T3*	46	58	78	3	6	10	49	55	60	-	-	-	-	-	-

CR: Retentate + 3%retentate powder

T1* : fortified fat by percent 1:1 cream: palm pit oil respectively.

T2* : fortified fat by percent 1:2 cream: palm pit oil respectively.

T3* : fortified fat by percent 1:3 cream: palm pit oil respectively.

Table (9): Organoleptic –scoring points of yoghurt made from Retentate + 3%retentate powder during storage .

Treatment	Appearance 10	Body & Texture 40	Flavor 50	Total points 100
Zero time				
CR	5	30	40	75
T1	6	35	40	81
T2	8	36	45	89
T3	10	39	46	95
7 days				
CR	6	33	38	77
T1	6	36	45	87
T2	8	38	45	91
T3	9	39	48	96
14 days				
CR	7	35	36	78
T1	7	38	44	89
T2	9	39	45	93
T3	10	40	48	98

REFERENCES

- Abrahamsen, R.K and Holmen T.B (1980) Yoghurt from hyper filtrated , Ultrafiltrated , evaporated milk and from milk with added milk powder. *Milchwissenschaft*;35(7)399-402.
- British Standard Institution, B. S. I. (1955): Gerber method for the determination of fat in milk and milk products. B. S. I. Publication No. 696, Parts 1 and 2.
- Chalmers, C. H. (1962): *Bacteria in relation to the milk supply*. 4th Ed. Edward Arnold, London.
- Chandrasekhare, M.R., Bhagawan; M. Swaminathan and .Subrahman (1957). The use of mammalian milk and processed milk foods in the feeding of infants . *Indian J. Child. Health*, D70L

- El- Gazzar, F,E and Marth, E. H.(1991) Ultrafiltration and reverse Osmosis in dairy technology: A review . J.Food Protection 54(10)801-809
- El-shibing , S., :El- Dien , H. F. and Hofi, A.,A.(1979) Effect of storage on the chemical composition of Zabadi.Egypt. J .Dairy Sci. 7(1):1-8.
- Ling (1963): A text book of Dairy chemistry practical. 4th Ed. Vol. 2. Champman Hull Ltd. London.
- Karagul,Y.,C.Wilson and H.Whil,(2004). Formulation and processing of yoghurt .J.Dairy Sci.,87:543-550.
- Kosikowski, F. V. (1982): Cheese and fermented milk food. 2nd Ed. 3rd printing with previous, E. V. Kosikowski and Accociates, P. O. Box 139, Brooktandatz, New York.
- Marona , D. and G.Pedrigon, (2004) Yoghurt feeding inhibits promotion and progression of cancer . med. Sci. Monit., 10:96-104.
- Perdigeon,G.J.Valdez and M.Rachid,(1998).Antitumour activitiy of yoghurt . Study of possible immune nresponse. J.Dairy Re.,65:129-138.
- Standard methods for the examination of dairy products (1985):
Published by the American public health association APHA.IN.C.15th E d.
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اثر استبدال دهن اللبن بنسب مختلفة من زيت النخيل على جودة اللبن المختمر أثناء التخزين

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كانت أفضل الخلطات من ٦ خلطات عند تصنيع الزبادي كانت المصنعة من اللبن الطبيعي مع إضافة ١% مركز لبن مجفف و كذلك عندما تم تصنيع الزبادي من مركز اللبن المدعم بـ ٣% مركز لبن مجفف و عند تصنيع اللبن الزبادي من لبن طبيعي مع إضافة ١% مركز لبن مجفف كان استبدال الدهن النباتي (زيت النخيل) إلى دهن اللبن بنسبة ١:١ أفضل نسب الاستبدال و عند تصنيع الزبادي من مركز اللبن المدعم ٣% مركز لبن مجفف أعطت نسبة ٣:١ دهن لبن إلى زيت النخيل أفضل نسب الاستبدال .

قام بتحكيم البحث

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