Nutrition & Food Science
International Journal
ISSN 2474-767X

Research article
Volume 2 Issue 2 – January 2017
DOI: 10.19080/NFSIJ.2016.02.555581

Nutri Food Sci Int J

Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh

Gehan A Ghoneem[1], Magdy M. Ismail[2]*, Naeem AEL Boraey[1], Mohamed M Tabekha[1] and Hoda F Elashrey[2]

[1]*Food Industries Department, Mansoura University, Egypt*

[2]*Dairy Technology Department, Animal Production Research Institute, Egypt*

Submission: December 09 2016; **Published:** January 27, 2017

***Corresponding author:** Magdy M Ismail, Dairy Technology Department, Animal Production Research Institute, Agricultural Research Center, Dokki, Giza, Egypt, Email: abo-omar98@hotmail.com

Abstract

Labneh (concentrated yoghurt) is a semisolid dairy product made from yoghurt by draining away part of its water. The effect of utilization soy milk and ABT culture in Labneh preparation on chemical composition, microbial properties and sensory evaluationproperties was studied. Six treatments of Labneh were manufactured from soy and cow milk and their mixtures using classic and ABT-5 starters. Values of yield, acidity, redox potential (E_h), total solids (TS), fat, ash, TN, TVFA, saturated fatty acids (SFA), monounsaturated fatty acids (MUSFA), and total amino acids were lower while unsaturated fatty acids (USFA), polyunsaturated fatty acids (PUSFA) and linoleic acid and α-linolenic acid contents were higher in Labneh made from soy milk than that made from cow milk. Also, *Str.thermophillus, L. acidophilus* and bifido bacteria numbers were high in soy milk Labneh. Mixing of cow milk with soy milk improved the sensory evaluation scores of Labneh. Labneh made using classic starter had higher values of yield, acidity, WSN, TVFA, SFA and lower values of pH than that made using of ABT Labneh. ABT culture Labneh possessed high levels of USFA and total free amino acids contents.

Keywords: Soy milk; Cow milk; ABT; Fatty acids; Labneh

Introduction

Concentrated yoghurt or Labneh is a fermented dairy product produced by the process of elimination of whey from yogurt. This product, which originated in the Middle East, has found wide distribution all over the world due to its high nutritional benefits [1].The total solids (TS) content is typically 23–25% and the product has a cream/white colour, a soft and smooth body, a good spread ability with little syneresis and a flavour that is clean and slightly acidic. This perception of low acidity stems from the masking effect of the high fat content of Labneh-typically around 10%, for the titratable acidity may be in the range of 1.8–2.0%as lactic acid [2]. Recently, researchers are interested in the physiologically beneficial phyto chemicals from soybeans and soya products [3]. Isoflavones, an important component of soybeans and soya products, has been reported to protect against cardiovascular diseases, breast cancer, prostate cancer, testicular cancer, uterine cancer and other hormone-dependent cancers, and osteoporosis [4].

Soya milk is the biggest traditional drink soya-based product consumed in the world especially in South East Asia. It is made from soaked soybeans by grinding, heating, and filtering. On the other side, probiotics are live bacteria added to food products that provide health benefits [5]. In order to impart these desired benefits, these bacteria have to survive severe conditions of pH and bile in the gastrointestinal track [6]. Functional foods including probiotic bacteria are gaining popularity due to the health benefits related with probiotic consumption and the concept of preventive disease treatment [7]. This present study focuses on using soy milk as a prebiotic in manufacturing of bio-Labneh. Furthermore, the chemical composition, microbiological properties and sensory attributes of Labneh were evaluated.

Materials and Methods

Materials

Fresh cow's milk was obtained from El-Serw Animal Production Research Station, Animal Production Research Institute, Agriculture Research Center. Yellow soybeans (*Glycine max* (L.) were purchased from a local grocery in Damiette Governorate. A commercial classic yoghurt starter containing *Streptococcus thermophillus and Lactobacillus delbrueckii* subsp. *bulgaricus* (1:1) and ABT-5 culture which consists of *S. thermophiles, Lactobacillus acidophilus* + *B. bifidum* (Chr.

Hansen's Lab A/S Copenhagen, Denmark) were used. Starter cultures were in freeze-dried direct-to-vat set form and stored at –18°C until used.

Methods

Preparation of soymilk: Beans of good quality were carefully selected and soaked overnight 12-18h, at room temperature in ultrapure water contained 0.5% NaHCO3. Once soaked, water was discarded and the grains were re-soaked in boiling water for 15min then, hulls were removed under running water by manual rubbing. The peeled soybeans were next rinsed and drained with cold water several times. Of the water to be added to the soaked beans (1:6 beans: water ratios), about half was added at room temperature (23ºC) and blended with the beans at high speed for 10 min. The remaining water was heated to 80ºC and added to the slurry to enhance protein extraction. This mixture was blended for an additional 3 min. at high speed. The resultant slurry was filtered through 3 layers of cheese-cloth to remove coarse material (okara, which is mainly composed of insoluble fiber material). Thereafter, the isolated soymilk was boiled on a low heat for 5 min. to destroy trypsin inhibitor for improving flavor and cooled down to 25°C.

Labneh preparation: Six treatments of Labneh were made from soy or cow milk mixtures as follows:

A: Labneh made from soy milk and classic starter

B: Labneh made from cow milk and classic starter

C: Labneh made from 75% cow milk + 25% soymilk and classic starter

D: Labneh made from soy milk and ABT culture

E: Labneh made from cow milk and ABT culture

F: Labneh made from 75% cow milk + 25% soymilk and ABT culture

Labneh was made using the procedure normally used in homes. Fresh milk was heated to 85°C for 15 min., cooled to 40°C, inoculated with cultures (0.1g/L of yoghurt mix) and incubated at 40°C for fully coagulation. The produced yoghurt was left at 4°C overnight, mixed and put into cloth bags which were hung for 24 h in a refrigerator to allow for whey drainage. The resulting Labneh was mixed with 1.5% salt and transferred to 250g plastic cups, covered with polyethylene film and stored at 5°C for 28 days. Labneh samples were analyzed in fresh and after 7, 14, and 21 days of refrigerated storage.

Methods of analysis

Chemical analysis: Total solids, fat, total nitrogen and ash contents of samples were determined according to AOAC [8]. Titratable acidity in terms of % lactic acid was measured by titrating 10g of sample mixed with 10ml of boiling distilled water against 0.1N NaOH using a 0.5% phenolphthalein indicator to an end point of faint pink color. pH of the sample was measured at 17 to 20°C using a pH meter (Corning pH/ion analyzer 350, Corning, NY) after calibration with standard buffers (pH 4.0 and 7.0). Redox potential was measured with a platinum electrode [model P14805-SC-DPAS-K8S/325; Ingold (now Mettler Toledo), Urdorf, Switzerland] connected to a pH meter (model H 18418; Hanna Instruments, Padova, Italy). Water soluble nitrogen (WSN) of Labneh was estimated according to Ling [9]. Total volatile fatty acids (TVFA) were determined according to Kosikowiski [10].

Determination of fatty acids composition: The extraction of milk fat was done using the method of Rose-Gottlieb using diethyl ether and petroleum ether (Methodenbuch, Bd. VI VDLUFA-Verlag, Darmstadt, 1985). After that the solvents were evaporated on a vacuumrotary evaporator. For obtaining methyl esters of the fatty acids, sodium methylate (CH3ONa) was used [11]. The fatty acid composition of Labneh was determined by gas chromatography "Pay-Unicam 304" with flame ionization detector and column ECTM- WAX, 30m, ID 0.25 mm, Film:0,25 µm.

Determination of amino acids composition: Amino acid profile of fresh Labneh was performed following the protocol of Walsh & Brown [12].

Microbial analysis: Labneh samples were analyzed for *Lactobacillus delbrueckiissp. bulgaricus, Streptococcus thermophiles* and *Lactobacillus acidophilus* counts according to the methods described by Tharmaraj & Shah [13]. The count of bifido bacteria was determined according to Dinakar & Mistry [14].

Sensory properties judging: The sensory properties of the Labneh samples were determined by a panel of judges who were familiar with the product using the hedonic scale where 1-9 represents dislike extremely to like extremely [15].

Statistical analysis: The obtained results were statistically analyzed using a software package [16] based on analysis of variance. When F-test was significant, least significant difference (LSD) was calculated according to Duncan [17] for the comparison between means. The data presented, in the tables, are the mean (± standard deviation) of 3 experiments.

Results and Discussion

Yield and physicochemical composition of Labneh

No significant ($p<0.05$) differences were observer between yield values of Labneh made from soymilk or cow milk (Table 1). Also, utilization of ABT culture in Labneh manufacturing had no significant ($p<0.05$) effect on yield. It is quite apparent from the results reported in Table 1 that the acidity levels were lower in soy milk Labneh as compared with than made from cow milk. Thus, mixing 25% soy milk with cow milk lowered the titra table acidity values of Labneh produced. Increasing of acidity in cow milk Labneh may be attributed to lactose fermentation by starter bacteria which produced high levels of lactic acid. On contrary, lactose absent in soy milk caused low acidity concentrations in

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

resulted Labneh. The E_h values took the same trend of acidity where as the pH values had the opposite trend.

On the other side, Labneh treatments prepared using classic starter had slightly higher acidity and E_h and lower pH values than those of ABT Labneh. Moreover, the rise in titra table acidity and E_h or drop in pH in classic starter Labneh was more than that observed in the ABT Labneh. These results were in agreement with those of Hussein [18] for yoghurt. In all Labneh treatments, acidity and E_h levels increased and pH values decreased with progress of storage period. Similar results were cleared by Ayyad et al. [19]. As it is cleared from Table 1, total solids contents of various Labneh samples were close to each other. Using different types of milk or starter didn't affect the total solids of fresh Labneh and during storage period. Significant($p<0.05$) increasing in fat, ash and TN values were observed in Labneh made from cow milk as compared with that made from soy milk (Table 2).

Table 1: Yield and physicochemical composition of Labneh during storage period.

Properties	Treatments	Storage period (days)				Means
		Fresh	7	14	21	
	A	25.01	-	-	-	25.01^{a}
	B	24.54	-	-	-	24.54^{a}
Yield	C	24.04	-	-	-	24.04^{a}
%	D	24.33	-	-	-	24.33^{a}
	E	23.7	-	-	-	23.70^{a}
	F	22.95	-	-	-	22.95^{a}
	A	0.91	0.98	1.09	1.25	1.05^{c}
	B	1.32	1.4	1.5	1.72	1.48^{a}
Acidity	C	1.17	1.23	1.33	1.56	1.32^{b}
%	D	0.8	0.85	0.95	1.08	0.92^{c}
	E	1.21	1.27	1.35	1.56	1.35^{ab}
	F	1.14	1.2	1.27	1.46	1.27^{b}
	Means	1.09^{C}	1.15^{BC}	1.25^{B}	1.44^{A}	
pH	A	4.98	4.87	4.75	4.58	4.79^{a}
values	B	4.52	4.4	4.24	3.97	4.28^{a}
	C	4.66	4.58	4.44	4.2	4.47^{a}
	D	5.11	5.05	4.94	4.8	4.97^{a}
	E	4.64	4.57	4.45	4.2	4.46^{a}
	F	4.71	4.65	4.55	4.36	4.57^{a}
	Means	4.77^{A}	4.69^{A}	4.56^{A}	4.35^{A}	
	A	83.6	92.7	99.5	110.9	96.7^{d}
	B	121.4	136.7	158.2	180.3	149.1^{a}
Eh	C	103.5	110.7	125.4	166.2	126.4^{b}
mV*	D	74.1	81.9	91.6	99.41	86.7^{e}
	E	106.4	114.5	132.4	157.8	127.8^{b}
	F	102.5	109.2	119.3	145.9	119.6^{c}
	Means	98.8^{D}	107.6^{C}	121.1^{B}	143.4^{A}	
	A	27.8	27.93	28.23	28.4	28.09^{a}
	B	29.03	29.33	29.5	29.73	29.40^{a}
	C	28.06	28.26	28.33	28.53	28.29^{a}
TS	D	27.67	28	28.26	28.36	28.07^{a}
%	E	29.15	29.3	29.5	29.7	29.41^{a}
	F	28.3	28.3	28.66	28.8	28.50^{a}
	Means	28.32^{A}	28.52^{A}	28.75^{A}	29.92^{A}	

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

[abcde] Letters indicate significant differences between Rayeb milk treatments

[ABCD] Letters indicate significant differences between storage times

*mV: millivolts

A: Labneh made from soy milk and classic starter; B: Labneh made from cow milk and classic starter; C: Labneh made from 75% cow milk + 25% soymilk and classic starter; D: Labneh made from soy milk and ABT culture; E: Labneh made from cow milk and ABT culture; F: Labneh made from 75% cow milk + 25% soymilk and ABT culture.

Table 2: Chemical composition of Labneh during storage period.

Properties	Treatments	Storage period (days)				Means
		Fresh	7	14	21	
	A	7.4	7.4	7.4	7.5	7.4^{d}
	B	9.2	9.2	9.3	9.4	9.3^{a}
Fat	C	8.2	8.2	8.3	8.3	8.2^{cd}
%	D	7.5	7.6	7.6	7.7	7.6^{d}
	E	9.3	9.3	9.4	9.5	9.4^{a}
	F	8.4	8.4	8.5	8.6	8.5^{bc}
	Means	8.3^{A}	8.3^{A}	8.4^{A}	8.5^{A}	
	A	1.48	1.53	1.6	1.63	1.56^{b}
	B	1.6	1.66	1.7	1.83	1.70^{ab}
Ash	C	1.53	1.58	1.66	1.75	1.63^{b}
%	D	1.5	1.59	1.65	1.69	1.61^{b}
	E	1.7	1.75	1.81	1.88	1.78^{a}
	F	1.57	1.64	1.7	1.76	1.67^{ab}
	Means	1.56^{C}	1.62^{BC}	1.69^{AB}	1.76^{A}	
TN	A	1.36	1.38	1.39	1.41	1.38^{b}
%	B	1.54	1.57	1.58	1.6	1.57^{a}
	C	1.46	1.47	1.48	1.5	1.48^{ab}
	D	1.35	1.37	1.39	1.4	1.38^{b}
	E	1.52	1.54	1.55	1.58	1.55^{a}
	F	1.45	1.47	1.5	1.52	1.48^{ab}
	Means	1.45^{A}	1.47^{A}	1.48^{A}	1.50^{A}	
	A	0.335	0.357	0.385	0.43	0.377^{a}
	B	0.327	0.348	0.372	0.415	0.365^{a}
WSN	C	0.33	0.353	0.38	0.422	0.371^{a}
%	D	0.315	0.333	0.356	0.395	0.350^{a}
	E	0.315	0.332	0.351	0.39	0.347^{a}
	F	0.317	0.335	0.36	0.398	0.352^{a}
	Means	0.323^{A}	0.343^{A}	0.367^{A}	0.408^{A}	
	A	9.6	10.2	12.6	14.8	11.8^{cd}
	B	12.2	13.2	15.8	18	14.6^{a}
	C	11	12	14.2	16	13.3^{ab}
TVFA*	D	9	9.4	11.4	13.6	10.8^{d}
	E	11.6	12.4	14.6	16.8	13.8^{a}
	F	10.2	11	13	14.6	12.2^{bc}
	Means	10.44^{C}	11.37^{C}	13.60^{B}	15.63^{A}	

abcde Letters indicate significant differences between Rayeb milk treatments

ABCD Letters indicate significant differences between storage times

*expressed as ml 0.1 NaOH 100 g^{-1} Labneh.

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

Therefore, mixing soy milk with cow milk decreased the mentioned contents. Using classic or ABT cultures in Labneh manufacturing had no clear effect on fat, ash and TN contents. Also, through storage period, no significant (p<0.05) changes in fat and TN values were observed. The contents of WSN of Labneh made from soy, cow milk or mixture of soy and cow milk using classic or ABT starters were similar. In various Labneh treatments, WSN slightly increased during storage. On the contrary, TVFA concentrations of cow milk Labneh were significantly (p<0.05) higher than that of soy milk one. Addition of 25% soy milk to cow milk decreased TVFA values. Also using ABT culture in manufacturing of Labneh lowered TVFA content. As a result of starter activity and lipolysis, TVFA contents gradually increased within storage period.

Free fatty acids content (FFA) of Labneh

The FFA profile in fresh Labneh was presented in Tables 3 and 4.

Table 3: Effect of using soymilk on free fatty acids content of fresh Labneh.

Fatty acids	C	Treatments					
		A	B	C	D	E	F
		Saturated fatty acids (SFA) %					
Caprylic	8:00	0.5	0.58	0.56	0.4	0.45	0.37
Capric	10:00	1.1	1.8	1.57	1.09	1.15	1.17
Undecanoic	11:00	-	0.2	0.2	-	0.22	0.25
Lauric	12:00	1.59	2.59	2.05	1.39	1.99	1.75
Tridecanoic	13:00	0.34	0.75	0.55	0.38	0.25	0.3
Myristic	14:00	2.93	10.16	8.65	3.1	10.15	9.31
Pentadecanoic	15:00	0.84	3.61	3.24	1.26	2.95	2.58
Palmitic	16:00	15.51	26.97	24.1	14.9	26.92	24.05
Heptadecanoic	17:00	0.47	2.19	1.85	0.24	2.49	2.14
Stearic	18:00	5.99	12.37	11.45	5.4	12.51	11.47
Arachidic	20:00	0.32	0.26	0.21	0.31	0.22	0.21
Behenic acid	22:00	0.31	0.18	0.17	0.34	0.12	0.15
Total		29.9	61.66	54.6	28.81	59.42	53.75
Unsaturated fatty acids (USFA) %							
	12:1 ω5	0.5	0.67	0.59	0.53	0.55	0.6
5-Tetradecenoic (phytosteri)	14:1 ω5	-	0.45	0.43	-	0.56	0.52
	14:1 ω7	0.25	0.4	0.74	0.3	0.33	0.66
Myristioleic acid	14:1 ω9	0.4	0.48	0.76	0.44	0.35	0.8
	16:1 ω5	-	0.2	-	-	0.3	0.25
Palmitioleic	16:1 ω7	0.27	2.13	1.96	0.32	2.11	2.03
	16:2 ω4	-	0.42	0.33	-	0.43	0.45
Hexagonic	16:3 ω4	-	0.36	0.35	-	0.49	0.4
	18:1 ω4	-	0.29	0.23	-	0.25	0.3
Octadecosaenoic	18:1 ω5	-	0.44	0.57	-	0.72	0.61
Vaccienic	18:1 ω7	1.42	1.71	2.01	1.49	1.77	1.51
Oleic	18:1 ω9	21	23.9	22.84	20.74	23.95	23.14
	18:2 ω4	0.97	0.79	0.6	-	0.85	0.75
	18:2 ω5	-	0.25	0.22	-	0.52	0.3
Linoleic	18:2 ω6	38.2	1.96	9.14	39.79	2.76	9.95
	18:2 ω7	-	0.35	0.26	-	0.47	0.4
α-Linolenic	18:3 ω3	4.77	0.72	1.95	5.58	0.94	1.94
	18:3 ω4	-	0.21	0.15	-	0.19	0.18
Gamma linolenic	18:3 ω6	0.15	0.29	0.14	-	0.18	0.15

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

Octadecatetraenoic	18:4 ω3	0.21	0.32	0.2	-	0.55	0.2
Gadoleic acid	20:1 ω9	0.15	0.25	-	0.16	-	-
Eicosaenoic	20:1 ω11	-	0.3	0.35	-	0.45	0.3
Eicosatrienoic	20:3 ω6	-	-	-	-	0.2	-
Total		68.29	36.89	43.82	69.35	38.92	44.94
Non identified fatty acid		1.81	1.69	1.58	1.84	1.48	1.31

Table 4: Effect of using soymilk on free fatty acid indices ratios of fresh Labneh.

LCFA	MCFA	SCFA	PUSFA	MUSFA	USFA	SFA	Treatments
75.77	20.54	3.69	44.3	23.99	68.29	29.9	A
48.23	45.93	5.84	5.67	31.22	36.89	61.66	B
53.92	41.11	4.97	13.34	30.48	43.82	54.6	C
75.89	20.7	3.41	45.37	23.98	69.35	28.81	D
50.8	44.84	4.36	7.58	31.34	38.92	59.42	E
54.51	41.35	4.14	14.72	30.72	44.94	53.75	F

SFA: saturated fatty acids; USFA: unsaturated fatty acids; MUFA: monounsaturated fatty acids (C:1); PUSFA: polyunsaturated fatty acids (C:2+ C:3); SCFA: short chain fatty acids (C8 to C12); MCFA: medium chain fatty acids (C13 to C16); LCFA: long chain fatty acids (> C16).

Saturated and unsaturated fatty acids

The saturated fatty acids (SFA) values of Labneh in various samples were inversely proportional with the amount of unsaturated fatty acids (USFA). The values of SFA were higher than USFA in different Labneh treatments except samples A and D (soy milk Labneh). Replacement of 25% cow milk with soy milk markedly lowered the level of SFA and inversely increased the amounts of USFA of Labneh. Using of ABT culture reduced SFA and increased USFA contents of fresh Labneh. According to these findings, combination of soy milk and ABT culture in one fermented dairy product like Labneh greatly lowered SFA content whereas highly increased USFA values.

Reducing of SFA and rising USFA values in soymilk bio-Labneh obtained in our study increase the healthy benefit of this product because it is well known that unsaturated fatty acids are more important in human nutrition. In general, the most predominant SFA found in different Labneh samples was palmitic acid (C_{16}) followed by stearic and myristic acids (C_{14}). The highest acid ratio of USFA differed between treatments. In samples A and D (soy milk Labneh), the major acid of USFA was linoleic (18:2 ω6) followed by oleic acid (18:1 ω9)whereas oleic acid was the corresponding one for samples B and E. For samples C and F, the first acid of USFA was oleic while the next was lionleic acid.

Monounsaturated (MUSFA) and polyunsaturated fatty acids (PUSFA) fatty acids

Cow milk Labneh had higher contents of MUSFA than that made from soy milk. Blending 25% soy milk with cow milk lowered the levels of MUSFA of Labneh. Conversely, soy milk Labneh had the highest concentrations of PUSFA as compared with cow milk one. Addition of soy milk to cow milk highly increased levels of PUSFA.

Utilization of ABT culture in Labneh manufacturing didn't cause clear differences in the contents of MUSFA and PUSFA. In all Labneh samples except A and D, MUSFA values were higher than those of PUSFA. Soy milk Labneh (samples A and D) had the opposite trend. Oleic acid was found to have the greatest concentration of MUSFA in different Labneh samples. The dominant fatty acid of PUSSFA was linoleic acid followed by α-linolenic acid.

As it is well known, omega fatty acids are a group of essential fatty acids very important for human health. Soy milk Labneh (treatments A and D) characterized by very high levels of linoleic acid (omega-6) and α-linolenic acid (omega-3) as compared with Labneh manufactured from cow milk (samples B and E). Because of the ultra-high contents of linoleic and α-linolenic acids in soy milk, substitution of 25% cow milk with soy milk highly increased the Labneh content from the two mentioned acids. On the other side, mixing of soy milk with cow milk slightly lowered the concentration of this acid in Labneh. The slight decline in oleic acid content does not lower the importance of the vast increase in linoleic and α-linolenic acids contents of Labneh when soymilk was used in manufacturing.

The follow-up studies for many authors reported the healthy importance of linoleic and α-linolenic acids. Simopoulos [20] cleared that the beneficial health effects of omega-3 fatty acids, eicosa pentaenoic acid (EPA) and docosa hexaenoic acid (DHA) were described first in the Greenland Eskimos who consumed a high seafood diet and had low rates of coronary heart disease, asthma, type 1 diabetes mellitus, and multiple sclerosis. Since that observation, the beneficial health effects of omega-3 fatty acids have been extended to include benefits related to cancer, inflammatory bowel disease, rheumatoid arthritis, and psoriasis.

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

Short chain fatty acids (C8 – C12)

Using soy milk in Labneh preparation decreased the levels of short-chain fatty acids (SCFA). Also, ABT-Labneh had lower SCFA contents than that made by classic culture. In various Labneh samples, the fatty acid lauric (C:12) was the predominant SCFA followed by capric acid (C10:0) and caprylic acid (C8:0). Besh kovaet al. [21] found that the formation of volatile free fatty acids (C2-C10) was more active in the mixed yoghurt cultures than in the pure ones owing to the stimulating effect of protocol-operation between the two thermophillic species on the metabolic activities, which are responsible for the formation of free fatty acids. Infact, volatile acids is not only produced from lipolysis by lipases but also from several biochemical pathways including the fermentation of lactose or citrate and the degradation (oxidative deamination or decarboxylation) of amino acids (alanine and serine) which are the most important precursor of most volatile fatty acids [21, 22].

Medium chain fatty acids (C14 – C16)

Medium chain fatty acids (MCFA) of Labneh had the same trend of SCFA. Utilization soy milk in manufacturing caused decreasing of the content from these fatty acids. Values of MCFA of Labneh didn't affect by culture type. In various Labneh samples, the value of palmitic acid (C_{16}) was the highest of MCFA and was followed by the value of myristic (C_{14}).

Long chain fatty acids (> C16)

The concentrations of long chain fatty acids (LCFA) were very high in soy milk Labneh comparing with that made form cow milk. Addition 25% soy milk to cow milk also increased the content of Labneh from these acids. Using ABT culture raised LCFA levels in Labneh samples. Among all the long chain fatty acids determined, the value of oleic and stearic acids were the highest in various Labneh samples except A and D where the predominant acid of long chain fatty acids was linoleic acid followed by oleic acid. On a general note, the values of LCFA were higher than SCFA and MCFA in all Labneh samples.

Free amino acids content (FAA) of Labneh

Outcomes of (Tables 5 and 6) show the effect of using soy milk and ABT culture on the content of FAA of fresh Labneh.

Table 5: Effect of using soymilk on free amino acids content (g/100mL) of fresh Labneh.

Amino acids	Treatments					
	A	B	C	D	E	F
Aspartic (ASP)	1.54	1.08	1.02	1.55	1.1	1.07
Threonine (THR)	0.47	0.52	0.49	0.56	0.56	0.55
Serine (SER)	0.66	0.74	0.64	0.7	0.76	0.66
Glutamic acid (GLU)	2.55	2.34	2.42	2.57	2.37	2.45
Proline (PRO)	0.82	1.55	1.17	0.82	1.58	1.2
Glycine (GLY)	0.61	0.31	0.36	0.58	0.28	0.33
Alanine (ALA)	0.72	0.51	0.55	0.74	0.53	0.56
Valine (VAL)	0.83	1	0.88	0.83	0.97	0.85
Methionine	0.22	0.44	0.33	0.25	0.47	0.34
Isoleucine (ILE)	0.69	0.73	0.65	0.68	0.76	0.68
Leucine (LEU)	1.13	1.32	1.28	1.17	1.21	1.25
Tyrosine (TYR)	0.59	0.66	0.62	0.59	0.63	0.6
Phenylalanine (PHE)	0.69	0.76	0.7	0.73	0.76	0.73
Histidine (HIS)	0.41	0.45	0.39	0.42	0.48	0.44
Lysine (LYS)	0.95	1.12	1.02	0.93	1.15	1.06
Arginine (ARG)	1.04	0.54	0.65	1.07	0.55	0.75
Cystine (CYS)	0.22	0.23	0.24	0.21	0.24	0.25

Table 6: Effect of using soymilk on free amino acid indices ratios of fresh Labneh.

Total BCAA/ Total (%)	E/T (%)	Total BCAA (g/ 100mL)	Total Non-EAA (g/ 100mL)	Total EAA (g/ 100mL)	Total amino acids (g/ 100mL)	Treat-ments
18.74	38.12	2.65	8.75	5.39	14.14	A
21.33	44.33	3.05	7.96	6.34	14.3	B
20.95	42.8	2.81	7.67	5.74	13.41	C
18.61	38.68	2.68	8.83	5.57	14.4	D
20.42	44.17	2.94	8.04	6.36	14.4	E
20.19	42.85	2.78	7.87	5.9	13.77	F

Total EAA: total essential amino acids; Total Non-EAA: total nonessential amino acids; Total BCAA: total branched-chain amino acids; E/T: Ratio of essential amino acids to total amino acids.

Total free amino acids

Labneh made from soy or cow milk or from mixture of them nearly possessed the same levels of total free amino acids. On the other side, utilization of ABT culture in Labneh making had no clear effect on total free amino acids content. In various Labneh treatments, the highest level of total free amino acids was that of glutamic acid, which is responsible for protection from cardiovascular diseases, followed by aspartic acid. On the contrary, methionine and cystine acids had the lowest content of total amino acids.

Essential amino acids (EAA)

The levels of EAA were slightly higher in cow milk Labneh than those detected in Labneh made from soy milk. Labneh made from mixtures 75% cow milk + 25% soy milk contained slightly lower EAA levels than those of cow milk Labneh. Also, Labneh made from the above mentioned mixture had low values of essential amino acids to total amino acids (E/T) as compared with cow milk Labneh. Because of low content of soy milk from sulfur amino acids (methionine and cysteine), Labneh made from it contained lower levels of these acids than that made

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

from cow milk. Tabe & Higgins [23] reported that legumes (e.g., soybean, pea, bean, chickpea, alfalfa, lentil, clover) are mainly limited in the contents of sulfur amino acids, methionine and cysteine. Bio-Labneh made using ABT had a little increasing of EAA than that made using classic starter. In different Labneh samples, the major essential amino acid was leucine followed by lysine. Methionine content was the lowest.

Nonessential amino acids (Non-EAA)

In contrary to EAA, soy milk Labneh had the highest values of nonessential amino acid comparing with cow milk Labneh. Using ABT culture in Labneh manufacturing also increased the levels of non-EAA. Generally, glutamic and aspartic acids were predominant in different Labneh treatments.

Branched-chain amino acids (BCAA)

Leucine, isoleucine, and valine possess a similar structure with a branched-chain residue and therefore are referred to as BCAAs [24]. Free BCAAs, especially leucine, play a very important role in protein metabolism; leucine promotes protein synthesis and inhibits protein degradation via mechanisms involving the mammalian target of rapamycin [25]. These findings suggest that leucine is not only a building block of proteins but also a modulator of protein metabolism. Cow milk Labneh had slightly higher amounts of total BCAA than that made from soy milk. Thus, mixing cow milk with soy milk increased the Labneh content of total BCAA as compared with that made from only soy milk. On the other hand, no clear differences were noticed in values of total BCAA between Labneh made using classic or ABT culture. Leucine was the abundant acid of total BCAA for various Labneh samples.

Microbial analysis of Labneh

In different Labneh samples, the numbers of *Streptococcusthermophillus,Lactobacillusbulgaricus*, *Lactobacillusacidophilus* and *Bifidobacteriumbifidum* increased up to the seventh day then reduced till to the end of storage period (Table 7). This reduction may be attributed to the high acidity produced by microbial fermentation [26]. Similar results were obtained by other authors but with some variations. Ayyad et al. [19] showed that the numbers of total viable count, *B. bifidum, L. acidophilus* and lactic acid bacteria of low fat Labneh increased up to the fourteenth day then decreased. Soy milk Labneh recorded the highest count of *Str.thermophillus* dislike cow milk Labneh which had the lowest count. Thus, mixing 25% soy milk with cow milk increased the count of Str.thermophillus in Labneh samples. Also loss of viability of these bacteria during storage period was lower in Labneh made from soy milk or mixtures of soy milk with cow milk than that made from cow milk. Loss of viability values of *Str.thermophillus* in samples A, B and C were 18.33, 31.37 and 20.37% respectively.

Table 7: Effect of using soymilk and ABT-5 culture on starter bacteria counts of Labneh.

Properties	Treatments	Storage period (day)				Means
		Fresh	7	14	21	
	A	60	84	70	49	65.7^{c}
	B	51	73	59	35	54.5^{e}
Strepto coccus thermophillus	C	54	79	63	43	59.7^{d}
(cfu×x10^{5}/g)	D	72	98	86	68	81.0^{a}
	E	60	84	69	48	62.2^{c}
	F	67	92	78	58	73.7^{b}
	Means	60.7^{C}	85.0^{A}	70.8^{B}	50.2^{D}	
	A	51	60	41	17	42.2^{c}
	B	59	82	66	48	63.7^{a}
Lacto bacillus bulgaricus	C	56	81	66	45	62.0^{b}
(cfu×x10^{5}/g)	D	-	-	-	-	-
	E	-	-	-	-	-
	F	-	-	-	-	-
	Means	55.3^{C}	74.33^{A}	57.67^{B}	36.67^{D}	
	A	-	-	-	-	-
	B	-	-	-	-	-
Lactobacillus acidophilus	C	-	-	-	-	-
(cfu×x10^{5}/g)	D	31	36	33	25	31.2^{a}
	E	24	28	24	14	22.5^{c}
	F	27	31	27	19	26.0^{b}
	Means	27.3^{B}	31.7^{A}	28.0^{B}	19.3^{C}	

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

	A	-	-	-	-	-
	B	-	-	-	-	-
Bifido bacterium bifidum	C	-	-	-	-	-
(cfu×x10^5/g)	D	40	47	42	33	39.4^a
	E	34	40	34	26	33.5^c
	F	37	43	38	30	37.0^b
	Means	37.0^B	43.3^A	38.0^B	29.7^C	

abcde Letters indicate significant differences between Rayeb milk treatments

ABCD Letters indicate significant differences between storage times.

ABT Labneh samples possessed the greatest counts of *Str. thermophillus*, meaning that the presence of *L. acidophilus* and *B. bifidum* clearly encouraged *Str.thermophillus* growth. This effect may be due to the low activity of acidity production of *L. acidophilus* and *B. bifidum* as compared with *L.bulgaricus* found in classic starter. Therefore, loss of survival values of *Str. thermophillus* were lower in ABT Labneh than those of classic starter one. Samples D, E and F had 5.55, 20.00 and 13.43% loss of survival of Str.thermophillus respectively.

The counts of *L.bulgaricus* decreased in soy milk Labneh. Thus the loss of viability during storage increased with using soy milk in Labneh production. The obtained results agreed with Sumarna [27]. Slight increases were found in the viable counts of *L. acidophilus* in soy milk Labneh. These results refer to using of soy milk in manufacturing of Labneh enhances the activity of *L. acidophilus*. The loss of survival levels during Labneh storage were 19.35, 41.67 and 29.63% for samples D, E and F respectively. Similar results were found by Hassanzadeh-Rostami et al. [28].

It is clear from the results of Table 7 that bifido bacteria counts were higher in soy milk Labneh than those detected in Labneh made from cow milk which may be due to the activation effect of soy milk components on bifido bacteria. Also, the losses of viability rates of bifido bacteria throughout cold storage of Labneh were lower in soy milk samples than other treatments. Loss of viability levels of samples D, E and F were 17.5, 23.53 and 18.92% respectively. Kamaly [29] stated that *B.longum* and *B. bifidum* exhibited proteolytic activity and were more pronounced in soy milk than inreconstituted skimmed milk. However the drop in the probiotic bacteria counts during storage time but they remained above 10^6 cfu.g^{-1} indifferent Labneh treatments. This main that the viability of strains after the storage period was sufficient to yield numbers of beneficial organisms that were higher than the accepted threshold (10^6 cfu.g^{-1}) for a probiotic effect [30].

Changes in sensory evaluation of Labneh

Table 8: Effect of using soymilk and ABT-5 culture on sensory evaluation of Labneh.

Properties	Treatments	Storage period (day)				Means
		Fresh	7	14	21	
	A	8.5	8.5	8.25	8	8.31^a
	B	9	9	8.75	8.25	8.75^a
Color	C	9	9	8.75	8.25	8.75^a
	D	8.5	8.5	8.25	8	8.31^a
	E	9	9	8.75	8.5	8.81^a
	F	9	9	8.75	8.5	8.81^a
	Means	8.83^A	8.83^A	8.58^A	8.25^A	
	A	8.5	8.5	8.25	8.05	8.32^a
	B	9.1	9.1	8.75	8.25	8.80^a
Appearance	C	9	9	8.75	8.25	8.75^a
	D	8.5	8.5	8.25	8	8.31^a
	E	9	9	8.75	8.3	8.76^a
	F	9.05	9.05	8.75	8.25	8.77^a
	Means	8.86^A	8.86^A	8.58^A	8.18^A	
	A	8.15	8.15	7.9	7.5	7.92^b
	B	9.75	9.75	9.4	9.1	9.50^a
	C	9.35	9.35	9.05	8.7	9.11^ab

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

Smell	D	8.6	8.6	8.4	8.1	8.42[ab]
	E	9.75	9.75	9.5	9.25	9.56[a]
	F	9.4	9.4	9.25	9	9.26[ab]
	Means	9.17[A]	9.17[A]	8.91[A]	8.61[A]	
	A	8	8	7.75	7.25	7.75[b]
	B	9.25	9.25	9	8.6	9.02[ab]
	C	8.7	8.7	8.5	8.15	8.51[ab]
Taste	D	8.5	8.5	8.3	7.75	8.26[ab]
	E	9.4	9.4	9.2	8.9	9.22[a]
	F	8.85	8.85	8.7	8.4	8.70[ab]
	Means	8.78[A]	8.78[A]	8.57[A]	8.17[A]	
	A	8.5	8.5	8.3	8	8.32[a]
	B	9.25	9.25	9	8.5	9.00[a]
Mouth feel	C	8.9	8.9	8.65	8.2	8.66[a]
	D	8.6	8.6	8.45	8.2	8.46[a]
	E	9.4	9.4	9.2	8.75	9.19[a]
	F	9	9	8.8	8.55	8.84[a]
	Means	8.94[A]	8.94[A]	8.73[A]	8.37[A]	
	A	9.75	9.75	9.65	9.5	9.66[a]
	B	9.5	9.5	9.4	9.25	9.41[a]
Texture & Body	C	9.75	9.75	9.6	9.5	9.65[a]
	D	9.5	9.5	9.4	9.3	9.42[a]
	E	9	9	8.9	8.9	8.92[a]
	F	9.3	9.3	9.25	9.15	9.25[a]
	Means	9.47[A]	9.47[A]	9.37[A]	9.25[A]	
	A	8	8	7.8	7.5	7.82[a]
	B	9.2	9.2	8.8	8.3	8.87[a]
Overall Acceptability	C	9	9	8.7	8.3	8.75[a]
	D	8.5	8.5	8.35	8.1	8.36[a]
	E	9.35	9.35	9.05	8.65	9.10[a]
	F	9.1	9.1	8.5	8.5	8.90[a]
	Means	8.86[A]	8.86[A]	8.60[A]	8.22[A]	

No significant ($p<0.05$) differences in scoring points of color and appearance were observed between Labneh made from soy or cow milk (Table 8). Labneh made from mixture 25% soy milk with 75% cow milk had similar color and appearance values for those made from cow milk. The color and appearance scores of Labneh made using classic or ABT cultures were close to each other. These results are in agreement with those obtained by Ammar et al. [31]. Cow milk Labneh gained the highest scores of smell, taste and mouth feel. On contrary, soy milk Labneh recorded the lowest levels because of a be any flavor. Blending cow milk with soymilk markedly improved the smell; taste and mouth feel evaluation grades of Labneh. Because ABT culture produces mild acidity as compared with classic culture [32], ABT Labneh slightly had higher scores of smell; taste and mouth feel properties than those of classic starter Labneh. Similar results were observed by Abd El-Salam et al. [33].

Unlike other characterizes of sensory evaluation, texture and body properties of soy milk Labneh were better than those of Labneh made from cow milk. On the other hand, the texture and body scores of ABT Labneh slightly lowered than classic starter Labneh. Scores of overall acceptability of Labneh made from cow milk were slightly higher than soy milk one. Mixing cow milk with soy milk improved overall acceptability attribute of the produced Labneh.

Conclusion

Supplementation of cow milk with 25% soymilk and using of ABT culture produced bio-Labneh with highly nutritional value. The produced Labneh had low saturated fatty acids and high unsaturated fatty acids levels which improved the health effects. Also, this bio-Labneh characterized by acceptable in properties of color, appearance, smell, taste, mouth feel texture and body.

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

References

1. Atamian S, Olabi A, Baghdadi OK, Toufeili I (2014) The characterization of the physicochemical and sensory properties of full-fat, reduced-fat and low-fat bovine, caprine, and ovine Greek yogurt (Labneh). Food Sci Nutr 2(2): 164-173.
2. Rasic JL (1987) Yoghurt and yoghurt cheese manufacture. Cultured Dairy Products Journal 22: 6-8.
3. Jooyandeh H (2011) Soy products as healthy and functional foods. Middle East J Sci Res 7(1): 71-80.
4. Patisaul HB, Jefferson W (2010) The pros and cons of phytoestrogens. Front Neuroendocrinol 31(4): 400-419.
5. FAO (2001) Health and nutritional properties of probiotics in food including powder milk with live lactic acid bacteria. World Health Organization.
6. Gerez CL, Font de Valdez G, Gigante ML, Grosso CR (2012) Whey protein coating bead improves the survival of the probiotic Lactobacillus rhamnosus CRL 1505 to low pH. Lett Appl Microbiol 54(6): 552-556.
7. Pedretti S (2013) Probiotic market: up or down? Nutra foods 12: N18-N19.
8. AOAC (2000) Association of Official Analytical Chemists. Official Methods of Analysis. (17th edn), Washington, DC, USA.
9. Ling ER (1963) A Text - Book of Dairy Chemistry. Vol. 2, Practical, (3rd edn), Champan and Hall, London, England, UK.
10. Kosikowski FV (1978) Cheese and Fermented Milk Foods. (2nd edn), Cornell Univ. Ithaca, New York, USA.
11. Jahreis GJ, Fritsche MSC, Steinhart H (1997) Conjugated linoleic acid in milk fat: High variation depending on production system. Nutrition Research 17(9): 1479- 1484.
12. Walsh MK, Brown RJ (2000) Use of amino acid analysis for estimating the individual concentrations of proteins in mixtures. J Chromatogr A 891(2): 355- 360.
13. Tharmaraj N, Shah NP (2003) Selective Enumeration of Lactobacillus delbrueckiissp. bulgaricus, Streptococcus thermophilus, Lactobacillus acidophilus, Bifidobacteria, Lactobacillus casei, Lactobacillus rhamnosus, and Propionibacteria. J Dairy Sci 86(7): 2288-2296.
14. Dinakar P, Mistry VV (1994) Growth and viability of Bifidobacterium bifidum in Cheddar cheese. J Dairy Sci 77(10): 2854-2864.
15. Tunde-Akintunde TY, Souley A (2009) Effect of processing methods on quality of soymilk. Pakistan J Nutrition 8(8): 1156-1158.
16. SAS 1991 SAS User's guide: statistics. SAS Inst, Inc, Cary, NC.
17. Duncan DB (1955) Multiple Range and Multiple F-test. Biometrics 11(1): 1-42.
18. Hussein GAM (2010) Preparation of yoghurt and probiotic yoghurt-like fermented products for bottle-fed infants. Egyptian J Dairy Sci 38(2): 171-182.
19. Ayyad KM, Abdul Ghaffar I, Aida S Salem, Ismail MM (2015) Production of probiotic low fat Labneh by using exopolysaccharide-producing strains. Egyptian J Dairy Sci 43(1): 41-51.
20. Simopoulos AP (2002) Omega-3 fatty acids in inflammation an autoimmune diseases. J Am Coll Nutr 21(6): 495-505.
21. Beshkova D, Simova E, Frengova G, Simov Z (1998) Production of flavour compounds by yogurt starter cultures. J Ind Micro Biotechn 20(3): 180-186.
22. Kneifel W, Ulbert F, Erhard F,Jaros D (1992) Aroma profiles and sensory properties of yoghurt and yoghurt related products. I Screening of commercially available starter cultures. Milchwissenchaft 47: 362-365.
23. Tabe LM, Higgins TJ (1998) Engineering plant protein composition for improved nutrition. Trends in Plant Science 3(7): 282-286.
24. Layman DK, and Baum JI (2004) Dietary protein impact on glycemic control during weight loss. J Nutr 134(4): S968-S973.
25. Shimomura Y, Murakami T, Nakai N, Nagasaki M, Harris RA (2004) Exercise promotes BCAA catabolism: effects of BCAA supplementation on skeletal muscle during exercise. J Nutr 134 (Suppl): S1583-S1587.
26. Dave RI, Shah NP (1997) Viability of probiotic bacteria in yoghurts made from commercial starter culture. Int Dairy J 7(1): 31-38.
27. Sumarna (2008) Changes of raffinose and stachyose in soy milk fermentation by lactic acid bacteria from local fermented foods of Indonesian. Malaysian J Microbiology 4(2): 26-34.
28. Hassanzadeh-Rostami Zahra, Mazloomi SM, Rahmdel S, Kazemi Asma (2015) Mixtures of soy- and cow's milk as potential probiotic food carriers. J Biology and Today's World 4(1): 29-33.
29. Kamaly KM (1997) Bifido bacteria fermentation of soybean milk. Food Research International 30(9): 675-682.
30. Gomes A, Malcata FX (1998) Development of probiotic cheese manufacture from goat milk: Response surface analysis via technological manipulation. J Dairy Sci 81(6): 1492-1507.
31. Ammar El-Tahra MA, Ismail MM, Khalil AE, Eid MZ (2015) Impact of fortification with honey on some properties of bio-yoghurt. J Microbiology Biotechnology and Food Science 4(6): 503-508.
32. Kurmann JA, Rasic JL, Kroger M (1992) Encyclopedia of Fermented Fresh Milk Products: An International Inventory of Fermented Milk, Cream, Buttermilk, Whey and Related Products. (1st edn), E van Nostrand Reinhold, New York, USA.
33. Abd El-Salam MH, Hippen AR, El-Shafie K, Assem FM, Abbas H, et al. (2011) Preparation and properties of probiotic concentrated yoghurt (labneh) fortified with conjugated linoleic acid. International Journal of Food Science & Technology 46(10): 2103-2110.

How to cite this article: Gehan A G, Magdy M I, Naeem A B, Mohamed M T, Hoda F E. Effect of Blending Soy Milk with Cow Milk on some Properties of Bio-Labneh. Nutri Food Sci Int J. 2017; 2(2): 555581. DOI: 10.19080/NFSIJ.2017.02.555581

DOI: 10.19080/NFSIJ.2017.02.555581