Utilization of Bifidobacteria in production of concentrated yoghurt (Labneh)

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SUMMARY

Viability of Bifidobacteria in Labneh was followed using six groups of starters in processing Labneh from fresh buffaloes' milk.

Heat treated yoghurt milk was divided into 6 equal portions, then inoculated with groups of starter namely, Control (3% yoghurt starter), Treatment I (2% yoghurt starter + 1% *Bifidobacterium bifidum*), Treatment II (1% yoghurt starter + 2% *Bifidobacterium bifidum*), Treatment III (2% yoghurt starter + 1% *Bifidobacterium longum*), Treatment IV (1% yoghurt starter + 2% *Bifidobacterium longum*), and Treatment V (1% yoghurt starter + 1% *Bifidobacterium bifidum* + 1% *Bifidobacterium longum*).

Labneh samples were kept in refrigerator at 5 ± 2°C for 14 days and chemically, microbiologically, and organoleptically analysed.

The attained results revealed significant differences between treatments in their chemical and microbiological properties either when fresh or in stored samples, while organoleptically, some variations between samples were recorded.

The present study recommended using *Bifidobacterium bifidum* and *Bifidobacterium longum* in making good quality Labneh.

INTRODUCTION

During last century many reports were published on the use of probiotics in dairy foods and on their benefits on the public health

of the consumer (Ouwehand, et al., 2003). For example, it improves intestinal health, reduces risk of cancer and heart diseases, improves the immune system, and lactose intolerance cases (Aumara and Farahat, 2007)

Various suggestions were given to use numbers of probiotic bacteria to produce beneficial effects in dairy products. Recently the Codex Alimentarius Commission of FAO & WHO (2002) approved an international standard for a major development in functional foods pertains to foods containing probiotics and prebiotics which enhance health by promotion microbial flora in the intestine (Mattila - Sandholm et al. 2002). So some genus of important probiotic bacteria were bifidobacteria genus which isolated from human origin and grown poorly in cow's milk, they are forced to multiply in an artificial environment (Kehagias, et al., 1977, Reuter, 1989, Klavert, et al., 1993).

On the other hand, number of substances are known to improve the growth of bifidobacteria. However, since supplementation of milk for production of dairy products is regulated by legislation in many countries. In recent years, emphasis has been put on the commercial production of probiotic strains in highly concentrated form with good stability and viability (Saxelin, et al., 1999, Mattila-Sandholm et al., 2002, Kehagias, et al., 2004).

Labneh is a concentrated fermented milk well known in most countries of Middle East. It is consumed fresh or preserved in olive oil up to one year. It may be defined as the product obtained from yoghurt after removal of its whey. Labneh can be characterized by a white colour, a soft and smooth body, a good spreadability an aslightly acidic flavour. Fresh Labneh made with the addition of yoghurt starter with *Bifidobacterium bifidum* had the highest organoleptic scores (Nsabimana et al., 2005)

Labneh contains less moisture and more protein than yoghurt and the number of viable culture bacteria is considerably higher than that in yoghut.

Labneh of uniform quality could become a popular nutritious product possessing a healthy image equal to or greater than that of yoghurt.

The characteristics of Labneh are affected by type of milk (El-Samragy et al., 1988 and Mahfouz et al., 1992) the nature of fermentation (Abu Donia et al., 1992 and Osman et al., 1992) and manufacturing method (Tamime et al., 1989,1991 and Abu Donia et al., 1992).

The aim of the present investigation was to study the effect of cold storage (5 ± 2°C) and low salt content (2%) of Labneh, on the viability and bio chemical activity of commonly used bifidobacteria and consequently on the quality and composition of the resultant product.

MATERIALS & METHODS

Bacterial Strains:

Thermophilic yoghurt culture (CH_1) consisting of *Streptococcus thermophilus* and *Lactobacillus delbrueckii subsp. bulgaricus*, also *bifidobacterium bifidum* (BB_{12}) were obtained from Chr. Hansen's laboratories (Horsholm, Denmark), while *bifidobacterium longum* (BL_{411}, DPL) was provided by Rhone poulenc (USA). All cultures were in freeze-dried form.

Labneh was manufactured from fresh buffalo's milk (17.01% TS and 6.4% fat). The milk was heated to 90°C for 15 min. and rapidly cooled to 40°C.

The milk was divided into 6 equal portions, 3% yoghurt culture (control), 2% yoghurt starter + 1% *B. bifidum*, 1% yoghurt starter + 2% *B. bifidum* , 2% yoghurt starter + 1% *B. longum*, 1% yoghurt starter + 2% *B. longum*, and 1% yoghurt starter + 1% *B. bifidum* + 1% *B. longum* were added to portion 1,2,3,4,5 and 6, respectively and then incubated at 42°C until complete coagulation within three hours. After coagulation, all samples were kept in refrigerator at 5±2°C for 2 hours, then yoghurt was mixed thoroughly with 2% sodium chloride , and transferred individually into cheese cloth bags and hung at room temperature for 12 hours to allow whey drainage. The fresh Labneh was filled into 250g. plastic containers and kept in refrigerator (5±2°C) for 14 days for analysis.

Methods of analysis:

Labneh samples were chemically examined for titratable acidity (TA%), total solids (TS%) and fat contents according to Ling, (1963) and acetaldehyde content (μ mol/100g.) according to Lees and Jago (1969)., total volatile fatty acids (TVFA expressed as ml. 0.1 N NaOH / 100g) according to Kosikowski (1982). The pH values were measured using a Radiometer PHM-80, (Copenhagen, Denmark). Total nitrogen (TN) and Non-protein nitrogen (NPN) contents were determined by semi-micro Kejeldahl method as described by Ling (1963) and NPN was used to calculate total protein as follows:

Total protein = (TN – NPN) × 6.38.

Curd tension of yoghurt was estimated according to the method described by Chandrasekharra et al., (1957) and curd syneresis of yoghurt was measured as given by Mehanna and Mehanna (1989).

Microbiological analysis:

Bifidobacterium was enumerated according to Dave and Shah (1996) using modified MRS agar medium supplemented with 0.05% L. cystein-HCL and 0.05% NPNL antibiotic mixture, while *S. thermophilus, L. delbrueckii subsp. bulgarcus* and total bacterial counts in a mixed culture were counted individually by using differential media.

Sensory evaluation of all Labneh samples was assessed when fresh and during storage for 14 days using the following scheme: flavour (60), body & texture (30) and appearance (10) as suggested by Ahmed and Ismail (1978).

Statistical analysis:

The obtained data from three replicates were statistically analyzed using general linear models procedure adapted by SPSS for windows (2004) for user's guide. Duncan test within program SPSS was done to determine the degree of significance between means.

RESULTS & DISCUSSION

Effect of type of starter cultures on the curd tension and syneresis of fresh yoghurt

Data belonging the curd tension and syneresis of yoghurt were tabulated in (Table 1). Addition of bifidobacteria to the yoghurt milk decreased the curd tension especially, when bifidobacterium longum was added. There is significant differences between treatments for curd tension. The lowest curd tension value was obtained when both types of bifidobacterium were added to the milk (Treatment V).

Regarding the curd syneresis after 30 min., treatment (V) had a higher amount of whey exuded (7.87 ml), whereas the lowest amount was recorded in the control (6.38 ml) , the others were 6.95, 7.12, 6.83, 7.33ml for treatments I, II, III, IV, respectively. Statistical analysis showed significant differences between treatments after 30, 60 and 120 min. Increasing amount of whey exuded in treatment V may be due to weak body and texture as a result of water holding capacity of both Bifidobacterium than control, especially, in fresh case. The obtained results are in agreement with Mann, (1984), and Hefnawy et al., (1992).

Effect of type of starter on the yield, fat and protein recoveries of fresh Labneh:

Table (2) shows the yield of fresh Labneh and the fat, protein contents. Mixing Bifidobacterium with yoghurt starter led to some increase in the yield of fresh Labneh. As the presentage of yoghurt culture increased in the starter, the yield of Labneh decreased, this is owing to the moisture content of the Labneh, as mentioned before. It seems that Bifidobacterium had higher water holding capacity as compared with yoghurt culture. Statistical analysis showed significant differences between control and the other five treatments for the yield, while no significant differences between the five treatments.

The highest fat and protein recoveries were recorded in control, and the lowest values were noticed for treatment IV, when compared with the others. This might be due to increase the moisture content in resultant Labneh.

Table (1) : Effect of using different cultures on curd tension (g) and curd syneresis (g/15g curd) of yoghurt (Average and SE of three replicates)

Property	Treatments*					
	Control	I	II	III	IV	V
Curd Tension	$52.76^{a}\pm$ 0.533	$50.33^{ab}\pm$ 1.613	$45.43^{cd}\pm$ 0.721	$49.32^{b}\pm$ 0.377	$46.13^{c}\pm$ 0.524	$40.72^{d}\pm$ 0.280**
Curd Syneresis after						
(30 min.)	$6.38^{bc}\pm$ 0.104	$6.95^{b}\pm$ 0.311	$7.12^{ab}\pm$ 0.073	$6.83^{b}\pm$ 0.205	$7.33^{ab}\pm$ 0.338	$7.87^{a}\pm$ 0.197
(60 min.)	$7.50^{bc}\pm$ 0.169	$7.63^{b}\pm$ 0.186	$8.23^{ab}\pm$ 0.088	$7.40^{bc}\pm$ 0.306	$8.52^{ab}\pm$ 0.252	$8.97^{a}\pm$ 0.246
(120 min.)	$8.20^{c}\pm$ 0.76	$8.97^{b}\pm$ 0.318	$9.62^{a}\pm$ 0.145	$8.73^{bc}\pm$ 0.136	$9.15^{ab}\pm$ 0.087	$9.85^{a}\pm$ 0.161

* Control : 3% yoghurt starter.
Tmment I : 2% yoghurt starter + 1% Bifidobacterium bifidum.
Treatment II : 1% yoghurt starter + 2% Bifidobacterium bifidum.
Treatment III : 2% yoghurt starter + 1% Bifidobacterium longum.
Treatment IV : 1% yoghurt starter + 2% Bifidobacterium longum.
Treatment V: 1% yoghurt starter + 1% Bifidobacterium bifidum + 1% Bifidobacterium longum

** Averages with different superscripts (a,b.... etc.) are significantly different ($P<0.05$).

These findings are in agreement with the results obtained by Amer, et al., (1997) and Ibrahim, et al., (1994). Statistical analysis in fat and protein recovery showed significant differences between treatments.

Effect of type of starter on the pH and acidity development of Labneh:

Values of pH and acidity of Labneh during storage are shown in Table (3), The addition of bifidobacterium to the yoghurt milk did not increase the acidity of the resultant Labneh. Treatments having bifidobacterium had less acidity values as a compared with the control, the lowest value was in treatment IV and the highest was in the control. This may be due to the fact that

Table (2): Yield and recovery percentages of fat (F.R) and protein (P.R) of Labneh made using different starter cultures (Average and SE of three replicates)

Property	Treatments*					
	Control	I	II	III	IV	V
Yield	$31.67^{b}\pm$ 0.521	$32.25^{ab}\pm$ 0.523	$33.10^{a}\pm$ 0.577	$32.85^{a}\pm$ 0.621	$33.60^{a}\pm$ 0.493	$32.50^{ab}\pm$ 0.452
F.R	$94.01^{a}\pm$ 1.600	$90.28^{ab}\pm$ 4.190	$87.33^{bc}\pm$ 3.473	$88.71^{b}\pm$ 3.572	$86.18^{bc}\pm$ 0.581	$89.67^{ab}\pm$ 0.886
P.R	$82.73^{a}\pm$ 0.767	$80.44^{a}\pm$ 1.443	$78.35^{b}\pm$ 1.257	$79.05^{ab}\pm$ 0.910	$76.73^{bc}\pm$ 2.109	$80.99^{a}\pm$ 0.664

* See legend to Table (1) for details.

Table (3) : pH, acidity, total solids (TS) and fat contents of Labneh made using different starter cultures when fresh and during storage in refrigerator (Average and SE of three replicates)

Property	Storage period/days	Treatments*					
		Control	I	II	III	IV	V
pH	fresh	4.35^{ab}±0.033	4.40^{a}±0.041	4.46^{a}±0.055	4.45^{a}±0.049	4.44^{a}±0.046	4.40^{a}±0.046
	7	3.85^{b}± 0.225	3.95^{ab}± 0.225	4.02^{a}± 0.209	4.10^{a}± 0.132	4.05^{a}± 0.126	3.98^{ab}± 0.192
	14	3.50^{b}±0.058	3.75^{ab}±0.058	3.82^{a}±0.073	3.80^{a}±0.132	3.85^{a}±0.132	3.77^{ab}±0.088
Acidity,%	fresh	0.98^{a}±0.038	0.96^{a}±0.035	0.90^{ab}±0.025	0.87^{b}±0.048	0.85^{b}±0.036	0.95^{a}±0.048
	7	1.27^{a}± 0.035	1.11^{ab}± 0.046	1.06^{ab}± 0.049	1.01^{b}± 0.046	1.00^{b}± 0.050	1.17^{a}± 0.060
	14	1.57^{a}±0.060	1.45^{ab}±0.058	1.40^{b}±0.076	1.35^{bc}±0.076	1.37^{b}±0.044	1.40^{b}±0.058
TS, %	fresh	23.50^{a}±0.379	23.20^{a}±0.451	22.77^{b}±0.219	22.97^{ab}±0.219	22.20^{bc}±0.458	22.83^{ab}±0.145
	7	24.05^{a}± 0.087	23.67^{ab}± 0.101	23.18^{b}± 0.109	23.18^{b}± 0.109	22.88^{bc}± 0.136	22.93^{bc}± 0.145
	14	24.13^{a}±0.073	23.85^{ab}±0.076	23.25^{ab}±0.144	23.25^{ab}±0.144	22.92^{b}±0.130	22.80^{b}±0.312
Fat, %	fresh	10.83^{a}±0.186	10.70^{a}±0.176	10.17^{b}±0.240	10.40^{ab}±0.208	10.13^{b}±0.176	$10.50a^{b}$±0.145
	7	11.03^{a}± 0.285	10.95^{a}± 0.087	10.90^{ab}± 0.104	10.80^{b}± 0.115	10.70^{b}± 0.132	10.85^{ab}± 0.087
	14	11.10^{a}±0.153	10.95^{ab}± 0.087	10.90^{ab}± 0.104	10.85^{b}± 0.087	10.75^{b}± 0.076	10.90^{ab}± 0.087

* See legend to Table (1) for details.

bifidobacterium genus is heterofermentative, which means that it was low acid producer in the resultant product, that agrees with the results given by El-Ghandour, (1998). Statistical analysis showed no differences between pH values for the fresh six treatments.

After 7 and 14 days of storage some differences were detected between the control and the other treatments Similar results were obtained by Hamad and El-Sheikh (1989).

Effect of type of starter on the TS and fat content of the Labneh:

Although Labneh samples were packed into plastic containers, the TS slightly increased as the storage time progressed due to evaporation of moisture.

Probiotic Labneh contained lower TS content than their control. The addition of 2% B. longum led to a significant decrease in T.S. of Labneh. Also treatment II had less T.S when compared with the other treatments.

The same table shows that, fat content values ranged from 10.13 to 10.83% and from 10.75 to 11.10% in fresh and stored Labneh samples respectively, the fat content for all treatments slightly decreased with increasing ratios of bifidobacterium, that agrees with that above recorded data in T.S content. These results are also in agreement with Salji et al., (1983).

Statistical analysis showed that slightly differences between the control and the other five treatments for T.S and fat content when fresh and after storage period.

Effect of type of starter on TP and NPN:

From Table (4) it is clear that the fresh Labneh made without probiotic bacteria (control) had higher TP (8.11%) as compared with probiotic-Labneh, the lowest TP was recorded for treatment IV. Also the same trend was observed between treatments after 7 and 14 days of storage whereas protein content slightly increased by progressing the storage period as a result of eliminating some moisture from the stored Labneh. Statistical analysis showed no significant differences between the control and the other fresh

Table (4): Total protein, non protein nitrogen (NPN), total volatile fatty acids (TVFA) and acetaldehyd contents of Labneh made using different starter cultures (Average and SE of three replicates)

Property	Storage period/days	Treatments*					
		Control	I	II	III	IV	V
TP, %	fresh	$8.11^{a}\pm0.296$	$8.03^{a}\pm0.291$	$7.96^{ab}\pm0.153$	$8.00^{ab}\pm0.104$	$7.9^{0b}\pm0.153$	$7.97^{ab}\pm0.219$
	7	$8.40^{a}\pm 0.176$	$8.15^{ab}\pm 0.087$	$7.98^{bc}\pm 0.093$	$8.12^{b}\pm 0.044$	$8.03^{bc}\pm 0.169$	$8.12^{b}\pm 0.073$
	14	$8.43^{a}\pm0.088$	$8.20^{ab}\pm0.029$	$8.03^{bc}\pm0.093$	$8.20^{ab}\pm0.058$	$8.10^{bc}\pm0.0581$	$8.15^{b}\pm0.029$
NPN, %	fresh	$0.050^{ab}\pm0.002$	$0.049^{ab}\pm0.003$	$0.046^{b}\pm0.003$	$0.051^{ab}\pm0.007$	$0.049^{b}\pm0.006$	$0.055^{a}\pm0.006$
	7	$0.070^{c}\pm 0.003$	$0.082^{b}\pm 0.004$	$0.085^{ab}\pm 0.002$	$0.089^{a}\pm 0.002$	$0.078^{bc}\pm 0.004$	$0.085^{ab}\pm 0.005$
	14	$0.085^{b}\pm0.006$	$0.093^{a}\pm0.003$	$0.095^{a}\pm0.003$	$0.090^{ab}\pm0.002$	$0.087^{b}\pm0.004$	$0.095^{a}\pm0.002$
TVFA**	fresh	$8.95^{c}\pm0.306$	$9.43^{b}\pm0.120$	$9.40^{bc}\pm0.115$	$9.70^{ab}\pm0.088$	$9.73^{ab}\pm0.056$	$9.93^{a}\pm0.145$
	7	$9.87^{c}\pm 0.044$	$10.51^{b}\pm 0.334$	$10.63^{ab}\pm 0.088$	$10.73^{a}\pm 0.088$	$10.67^{ab}\pm 0.060$	$10.85^{a}\pm 0.058$
	14	$10.77^{c}\pm0.044$	$11.35^{b}\pm0.153$	$11.70^{a}\pm0.076$	$11.57^{b}\pm0.044$	$11.67^{ab}\pm0.073$	$11.80^{a}\pm0.153$
Acetaldehyde***	fresh	$320.0^{b}\pm7.637$	$333.3^{ab}\pm6.009$	$330.0^{b}\pm7.637$	$348.3^{ab}\pm8.819$	$353.3^{a}\pm8.819$	$361.67^{a}\pm6.138$
	7	$326.0^{bc}\pm 6.110$	$335.3^{b}\pm 3.711$	$331.67^{b}\pm 4.910$	$356.7^{ab}\pm 0.819$	$360.0^{a}\pm 0.408$	$370.0^{a}\pm 5.774$
	14	$335.0^{b}\pm2.886$	$338.3^{b}\pm4.409$	$346.66^{ab}\pm6.009$	$361.7^{a}\pm1.929$	$368.3^{a}\pm4.469$	$380.0^{a}\pm5.773$

* See legend to Table (1) for details.

** expressed as mls 0.1 N-NaOH/100g Labneh.

*** expressed as µ mol /100g Labneh.

treatments, but slightly significant differences were recorded during storage.

The same Table shows that, the highest values of NPN of fresh samples were recorded in treatment V (0.055%) that may be due to presence of a symbiotic reaction between three starter cultures which stimulates of protein hydrolysis. After storage periods for 7 and 14 days the same trend was observed in between treated samples with a remarkable increase in this values during storage. These results are in accordance with Rasic and Kurmann (1978) and El-Shibiny et al (1979).

Statistical analysis showed significant differences between the control and probiotic Labneh in fresh and stored samples.

Effect of using probiotic bacteria on the TVFA of the Labneh:

Table (4) shows the values of TVFA, the fresh control treatment had a lower value (8.95) while treatment V owned the highest value (9.93) meanly mixing three starter cultures had a stimulation reaction in this respect. Statistical analysis showed significant differences between all treatment samples especially in the control. The same trend was observed between the samples after 7 and 14 days, the values increased with progressing storage periods. This indicates a partial activation of starter cultures at refrigerator temperature.

Progressing of storage period for 7 and 14 days caused significant variations between treatments in this respect.

Effect of using probiotic bacteria on the acetaldehyde content of Labneh:

Table (4) deals with the acetaldehyde contents of different Labneh samples when fresh and during 14 days of storage. The addition of probiotic bacteria to Labneh milk led to an increase of acetaldehyde of the resultant Labneh. Treatment III and IV produced more acetaldehyde as compared with treatment I and II when fresh, the highest value of acetaldehyde was recorded in treatment V (361.07 µ mol /100g).

On the other hand acetaldehyde content gradually increased until the end of storage period. These results are in agreement with those obtained by El-Shibiny et al. (1979) and Mehanna and Hefnawy (1990) in yoghurt. Abou-Donia et al (1992) mentioned that, acetaldehyde content increased with advanced of cold storage period in Labneh.

Statistical analysis showed some differences in between treatments at fresh and during storage period.

Effect of inoculating probiotic bacteria on the bacterial count of the Labneh

Table (5) includes the enumeration of colonies, grown on TC, LAB, B. bifidum and B. longum during 14 days of storage. It is clear that for all treatments and for all groups of bacteria as the storage time progressed the number of bacteria gradually decreased. This is may be due to the salt content of the Labneh as well as the low temperature (5±2°C) of the storage period.

Colonies grown on TC was higher for control as compared with the other five treatments, then treatment V (made by mixed cultures). These results are in agreement with El-Samargy et al (1990). Regarding LAB count, the numbers of bacterial colonies were almost similar in the control and probiotic Labneh. As above mentioned the numbers of bacterial count gradually decreased with progressing the storage period. According to Bifidobacterium bifidum (B.b.) and Bifidobacterium longum (B.l.) count which were enumerated at MRS media , also gradually decreased with increasing the storage period.

Effect of using probiotic bacteria on the organoleptic properties of the Labneh

Table (6) shows the sensory evaluation of Labneh samples. In fresh state, treatment I and V had preferable samples, (93) points as a total scores, the other treatments had 91, 92 and 90 points for control and treatments II, III and IV respectively. The variations between treatments were due to flavour score which varied between 55 to 58 points.

Progressing storage period for 7 days led to a remarkable decrease in sensory scores for all samples especially in flavour

Table (5): Microbiological characteristics of fresh and stored Labneh made using different starter cultures (Average and SE of three replicates)

Property	Period/ days	Treatments*					
		Control	I	II	III	IV	V
T.C	fresh	$2.17x10^6$±0.348	$1.77x10^6$±2.03	$1.70x10^6$±0.115	$1.83x10^6$±0.219	$1.90x10^6$±0.265	$2.00x10^6$±0.306
	7	$2.80 x10^5$± 0.252	$2.50 x10^5$± 0.153	$1.90 x10^5$± 0.208	$2.13 x10^5$± 0.210	$2.70 x10^5$± 0.173	$3.30 x10^5$± 0.404
	14	$2.60 x10^3$±0.321	$1.40 x10^3$±0.152	$1.70 x10^3$±0.208	$1.90 x10^3$±0.152	$1.50 x10^3$±0.152	$2.10 x10^3$±0.058
L.A.B	fresh	$1.50x10^5$±0.208	$1.60x10^5$±0.266	$1.50x10^5$±0.173	$1.60x10^5$±0.231	$1.50x10^5$±0.208	$1.60x10^5$±0.306
	7	$1.60 x10^4$± 0.306	$1.50 x10^4$± 0.153	$1.30 x10^4$± 0.173	$1.70 x10^4$± 0.153	$1.20 x10^4$± 0.115	$1.30 x10^4$± 0.153
	14	$2.20 x10^2$±0.378	$2.80 x10^2$±0.208	$1.80 x10^2$±0.115	$1.70 x10^2$±0.152	$1.50 x10^2$±0.305	$1.90 x10^2$±0.231
B.b	fresh	Nil	$2.0x10^6$±0.153	$2.60x10^6$±0.173	Nil	Nil	$2.50x10^6$±0.115
	7	Nil	$4.20 x10^4$± 0.306	$3.80 x10^4$± 0.115	Nil	Nil	$3.20 x10^4$± 0.306
	14	Nil	$2.50 x10^3$±0.152	$3.50 x10^3$±0.153	Nil	Nil	$2.30 x10^3$±0.153
B.l	fresh	Nil	Nil	Nil	$1.93x10^8$±0.373	$2.10x10^8$±0.208	$2.10x10^8$±0.208
	7	Nil	Nil	Nil	$1.70 x10^8$± 0.265	$1.93 x10^8$± 0.240	$1.53 x10^8$± 0.285
	14	Nil	Nil	Nil	$4.40 x10^6$±0.346	$3.20 x10^6$±0.306	$1.90 x10^6$±0.173

* See legend to Table (1) for details.
T.C = Total bacterial count.
L.A.B = lactic acid bacterial count.
B.b = Bifido bacterium bifidum count.
B.l = Bifidobacterium longum count

which ranged from 49 to 51 points, body & texture and appearance were not affected by progressing storage period. Still, treatment I and V were of acceptable flavour and the other properties. Regarding to storing for 14 days, values score marks greatly decreased as in flavour points which effective in total scores and consuming the Labneh. As before mentioned in 7 days, treatment I and V had a preferable score for in classified point score in order as well as a gradually decrease for all property of resultant Labneh, that is may be due to acetic and acidic flavour in all treatment samples. These results are in agreement with those given by El-Ghandour (1998).

Table (6) : Organoleptic properties of fresh and stored Labneh made using different starter cultures. (Average of 10 panelists)

Treatments*	Storage period/days	Flavour (60)	Body & texture (30)	Appearance (10)	Total (100)
Control	Fresh	55	28	8	91
I		57	28	8	93
II		56	27	8	91
III		57	27	8	92
IV		56	26	8	90
V		58	27	8	93
Control	7	50	27	8	85
I		50	28	8	86
II		49	26	7	82
III		50	26	7	83
IV		49	25	7	81
V		51	28	7	86
Control	14	40	25	7	72
I		42	25	7	74
II		39	24	7	70
III		40	24	7	71
IV		38	24	7	69
V		44	25	6	75

* See legend to Table (1) for details.

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الملخص العربى

استخدام بكتريا بيفيدو باكتريم فى صناعة اليوغورت المركز (اللبنة)

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فى هذا البحث تم تصنيع اللبنة بالطريقة التقليدية وذلك بإضافة خلطات مختلفة من البادئ (٣%) على النحو التالى :
كنترول (٣% بكتيريا بادئ اليوجورت) – المعاملة الأولى (٢% بادئ اليوجورت + ١% بيفيدو باكتريم بيفيدم) .
المعاملة الثانية (١% بادئ اليوجورت + ٢% بيفيدو باكتريم بيفيدم) – المعاملة الثالثة (٢% بادئ اليوجورت + ١% بيفيدو باكتريم لونجيم) – المعاملة الرابعة (١% بادئ اليوجورت + ٢% بيفيدو باكتريم لونجيم) – المعاملة الخامسة (١% بادئ اليوجورت + ١% بيفيدو باكتريم بيفيدم+ ١% بيفيدو باكتريم لونجيم) وتم تخزين عينات اللبنة الناتجة فى الثلاجة لمدة ١٤ يوم وأجريت عليها التحليلات الكيماوية والميكروبيولوجية والحسية ، وأوضحت النتائج ما يلى :
لوحظ زيادة التصافى فى المعاملات الخمس مقارنة بالكنترول وانخفض فيها نسبة الاسترجاع لكل من الدهن والبروتين على السواء . – زادت الحموضة فى عينات الكنترول مقارنة بمثيلاتها فى باقى المعاملات سواء فى حالتها الطازجة أو المخزنة . – أيضا لوحظ انخفاض فى الجوامد الكلية بمكوناتها المقدرة (الدهن – البروتين الكلى) فى العينات التى صنعت باستخدام البيفيدو باكتريم تبعا لزيادة نسبة الرطوبة بها عن الكنترول . – كما زاد معدل

التحلل لكل من البروتين والدهن فى المعاملة الخامسة ، وكان أقلها فى معاملة الكنترول .- وفى الاختبارات الميكروبيولوجية حظيت عينات الكنترول بأكبر عدد من البكتريا للعدد الكلى يليها المعاملة الخامسة وزاد العدد فى المعاملة الخامسة مقارنة بباقى العينات فى عدد بكتريا حمض اللاكتيك وبكتريا البيفيدو باكتريم مما يدل على وجود ثمة علاقة تكافلية بين الثلاثة أنواع من بكتريا البادئ المستخدمة فى الصناعة. - وفى التحكيم الحسى ظهرت المعاملة الأولى والخامسة كأفضل المعاملات تبعا للاختلافات الجوهرية فى النكهة إذا ما قورنت بالكنترول كما حظيتا هاتين المعاملتين بأعلى درجات التحكيم فى العينات المخزنة عن باقى العينات الأخرى .