Physicochemical and Sensory Properties of Labneh Fortified with *Salvia Officinalis*

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ABSTRACT

Labneh is one of the most popular dairy products in the Middle East and has gained immense popularity due to its higher nutritional value compared to traditional yogurt. Labneh is defined as a concentrated yogurt in which yogurt is concentrated by removing acidic whey from the solid parts. Sage "*Salvia officinalis*" and olive oil have many health benefits as good source of antioxidant compounds. In this study, sage powder and olive oil were in Labneh for increasing its health benefits. The incorporated results showed that the sage powder has no influence on pH, chemical composition and rheological properties, while olive oil significantly reduced the hardness and viscosity of Labneh. The treatments of Labneh with sage powder and olive oil were highly accepted in flavor by panelists. This study recommended that the adding of sage powder could be a good source of antioxidant compounds to increase the health benefits of labneh.

Key words: Labneh, sage, olive oil, rheological properties, sensorial properties

INTRODUCTION

Condensed/concentrated/cheese yogurt known as Labneh in the Middle East and Europe, is a semisolid fermented dairy product made by straining set yogurt until a level of 23–25 % total solids, of which 8–11 % fat is attained (Tamime and Robinson1999; Ozer and Robinson 1999; Hilali *et al.,* 2011; Sanlidere *et al.,*2013). Labneh is a popular food in various parts of the world especially in the Middle East, chiefly, Syria, lebanon, Turkey and Balkan regions .Labneh is consumed as a main dish at breakfast due to its significant nutritional and good storage characteristics (Nsabimana *et al.*, 2005 and Abd El-Salam *et al.,* 2011). The nutritional and storage characteristics of labneh led to its increasing economic importance (Benezech and Maingonnat, 1994; Nsabimana *et al.,* 2005). one type is prepared to be consumed within two weeks and usually stored in refrigerator and the other type is stored in vegetable oil at room temperature and can be consumed within two years (Keceli *et al.,* 1999). Olive oil preservation by coating the surface of labneh is known to affect the microbiological quality of labneh cheese (Rao *et al.,* 1987 and Keceli *et al*., 1999). Labneh is high nutritious food compared to yoghurt. It has 2.5-times higher protein content, 50% more minerals, and a considerably larger number of viable beneficial microorganisms than common yoghurt (Nsabimana *et al.,* 2005). The organoleptic quality of labneh can be enhanced by addition of herbs.

Sage is a well-known vegetal specie (Lu & Foo, 2002; Bauer *et al.*, 2012; Ben Taarit *et al.,* 2012; Generalic *et al.,* 2012). Many *Salvia* sub subspecies are used as herbal tea and for food flavoring (Hedge, 1992; Tisserand and Balacs, 1995). Sage preserves a variety of foods, including meats and cheeses (Hedge, 1992;Tisserand and Balacs,1995). Sage is largely used as a savory food flavouring either as dried leaves or essential oil (Perry *et al.,* 1999**;**Tsai & Yang, 2011).It is also used traditionally in food preparation. (Cuvelier *et al.,* 1994; Hohmann *et al.,* 1999; Lu and Foo, 2001; Wang *et al.,* 1998; Zupko *et al.,* 2001). Sage leaves was one of the favourite candidate species as a source of natural antioxidants in health care products. (Cuppett and Hall, 1998; Teissedre and Waterhouse, 2000). Rosmarinic acid is the major phenolic compound of sage, also found in many other plants used as seasoning (Petersen & Simmonds 2003). Earlier studies also demonstrated the presence of carnosol, ursolic acid, oleanolic acid and rosmarinic acid in the leaves of *S. officinalis* (Topçu,2006). Sage has one of the longest histories of use as a medicinal herb. It has a potential in treating cancer as it shows strong antitumor genic activities, as well as in the cosmetics, perfumery and pharmaceutical industries (Hedge, 1992 and Wang *et al.,* 2000). It presents many pharmacological properties, most of them associated with its polyphenol content (Hedge, 1992;Lu & Foo, 2002; Bauer *et al.,* 2012; Ben Taarit *et al.,* 2012; Generalic *et al.,* 2012).

Considering the previous aspects, the objective of this investigation is to enhance the nutritional value of labneh as functional food by the addition of the leaves of sage in labneh produced from cow milk retentate.

MATERIALS AND METHODS

Cow milk was concentrated by Ultra filtration (module type of Tubular UF unit, Model 2S 37 (with surface area 2 x 0.48m^2. The unit was operated under

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inlet pressure of 5-6 bar and outlet pressure of 2-3 bar at 50±2°C. The standardized Cow's milk and retentate were immediately pasteurized at 63°C for 30 min and cooled to 4°C and used in the preparation of labneh) at Nasser Secondary School of Agriculture, Damanhour, Beheira Governorate, Egypt. The obtained retentate has 6.4% fat – 24.39% total solids, *Salvia officinalis* (Sage) plant was obtained from local market, Shoubrikhit, Beheira Governorate, Egypt. *Lactic acid bacteria c*ommercial lactic culture (DVS Express 0.1, CHR. Hansen, Denmark).LACTA534 stabilizer (Modified starch (E1422) – Gelatin (E441) and mono and di-glycerides (E471) was obtained from Misr Food additives, Badr city, Egypt. Permeate concentrate (Fat 1.5%, max –moisture 4%, max –protein 3% max) (Holland) .Olive oil was obtained from local market Damanhour Beheira Governorate, Egypt. Plastics cups (100gm) were used in packaging the produced Labneh.

Preparation of *Salvia officinalis*(Sage):

The chemical analysis of sage is shown in table (2). Washing the plant and air dried and then the plant is fully grind and added directly to the labneh milk retentate.

Preparation of Labneh

Cow milk retentate (6.4% fat – 24.39% total solids) was heated to 50 °C and then 1% LACTA (534) stabilizer and 1% whey Permeate concentrate were added and dissolved then heated to 80°C and kept for 5 minutes. The heat treated mixture was cooled to 45°C , different levels (0.0 (control), 0.3, 0.5, and 0.7% herb sage (powder)) of sterilized sage herb (Autoclaved at 121°C for 15 minutes) were added (Table 1). The recommended dosage of Starter culture (DVS Express 1) was added, mixed well and then the mixture was incubated at 42°C until coagulation. Olive oil was added 1% of samples (Table 1), all samples were stored at 5 °C for 20 day.

Chemical analysis:

Moisture, ash, fat, protein content were determined by the methods of (Ling 1963). The pH was determined using a digital pH meter (Mettler Toledo 320, Switzerland) at room temperature (20 ± 1 ^{0}C) while the titratable acidity was determined according to AOAC, (2007).

Chemical composition of *Salvia officinalis*(Sage):

Moisture, protein, fat and ash content were determined in *Salvia officinalis* (Sage) by official methods of AOAC, (2007).

Microbiological tests of labneh

OGYA (Oxytetracycline-Glucose-Yeast (Extract) Agar) media was used for yeasts and molds count (Mislive*et al.,* 1992). Violet red bile agar (VRBA) media was used for Coliform bacterial count (Hitchins*et al.,* 1995).

Sensory Evaluation

Sensory test was carried out at Department of Food and Dairy Science and Technology, Faculty of Agriculture, Damanhour University. Ten of well-trained panelists were involved. Labneh that were stored overnight at 4?C were introduced to panelists in 100 ml yogurt plastic cups. Panelists were individually supplied with plain crackers and directed to have a bite between samples followed by a sip of water to rinse their palate between each sample. More samples were given upon request. Panelists scored their responses onto a print-out paper sheet with a scale of 10 points for texture ,10 points for color,20 points for flavor, and 40 points for overall acceptability (Pearce and Heap, 1974).

Table 1. Ingredients Incorporated in Labneh

Treatments	Olive oil	Sage herb	Permeate powder %	LACTA (534) stabilizer %
C1(control)	-	Zero	1	1
T1	-	0.3%	1	1
T2	-	0.5%	1	1
T3	-	0.7%	1	1
C2(control)	1%	Zero	1	1
T4	1%	0.3%	1	1
T5	1%	0.5%	1	1
T6	1%	0.7%	1	1

Table 2. Chemical analysis of *Salvia officinalis* (sage)

Properties	Sample (sage)
Moisture%	11.286%
Ash%	8.512%
Total protein%	0.087%
Total fat%	7.8%

Rheological properties:

Textural analysis:

Textural properties were measured with a texture analyzer (A. XT plus Texture Analyzer, Stable Micro Systems, UK). The software permits the automatic calculation of sample: Hardness, springiness, adhesiveness, cohesiveness, gumminess and chewiness. These texture profile parameters were obtained and calculated as describe by Bourne (1978).

Determination of viscosity:

Samples were analyzed in the form of labneh and kept at a temperature of 10 ^{0}C overnight and the Viscosity was measured using oscillatory viscometer (VR 3000M YR Viscometers, Spain).

Statistical analysis:

All obtained data were statistically analyzed using SAS software program (2000).

RERSULTS AND DISCUSSION

Physicochemical properties:

Table (3) shows the physicochemical properties of labneh prepared by addition of 0.0 (control), 0.3, 0.5, and 0.7% herb sage (powder). Moisture content of labneh samples were in range of 74.33 % - 76.680% for treatment (C2) and treatment (T3) respectively at 1st day of manufacturing and then the moisture decreased to 72.810 – 73.146% for treatment (C2) and treatment (T3) respectively at the end of storage period (20 days at 5^{0}C) . Statistical analysis showed that there were no significant differences ($p > 0.05$) in moisture content among all fresh treatments or during the storage period. The decreasing of moisture content at the end of storage period is related to natural evaporation (Salem *et al.* 1997, Al-Assar *et al.* 2005;Shamsia and El-Ghannam 2012 and Shamsia,2017).

Fat percent of labneh was ranged from 6.33% to 6.60% for treatment (C1) and treatment (T3) respectively at the 1st day of storage. Fat percent of labneh by adding olive oil was ranged from 9.90% to 10.50% for treatment (C1) and treatment (T6) respectively at the 1st day of storage. The obtained results showed that there were no significant differences among all treatments made without addition of olive oil in fat content ($p > 0.05$). While the fat content was increased when the olive oil was added and there were no significant differences in fat content ($p > 0.05$).among all treatments made with addition of olive oil.

Protein content of labneh samples was ranged from 8.84 to 9.10% for treatments (T3) and (C1) respectively at the 1st day of storage. Statistical analysis showed that there were no significant differences ($p > 0.05$) in protein content among all treatments of labneh made without addition of olive oil, while the protein content of labneh with adding olive oil decreased to be in range of 6.83 – 7.00% for treatment (T6) and treatment (C2) respectively at the 1st day of storage. There were no significant differences ($p > 0.05$) in protein content among all treatments of labneh made with addition of olive oil.

Acidity was ranged from 1.200 % to 1.260% for treatment (C1) and treatment (T3,T6) ,respectively at 1st day of storage and then decreased to 1.25 – 1.310% for treatment (C1,T3) and treatment (T6) respectively at the end of storage periods. There were no significant differences ($p > 0.05$) in acidity content among all fresh treatments or during storage periods. pH values were ranged between 4.80 and 4.90 for treatment (T3) and treatment (C2), respectively at 1st day of manufacturing, while at the end of storage period, the pH values were decreased in all samples, reached to 4.75 - 4.85 for treatment (T3) and treatment (C2,T4), respectively, but there were no significant differences ($p > 0.05$) among all samples. No effects were noticed in acidity and pH values after the addition of sage powder comparing with the control (Table3). The acidity of Labneh in this study was lower than that reported by El-Smaragy and Zall (1988), as they reported the acidity in Labneh was 1.63%. However, Tamime and Robinson (1988); Yamani and Abu-Jaber (1994) reported that the pH (4.0-5.0), titratable acidity (2.7%), chemical composition (74.57% moisture, 8.3% protein, 9.8%fat, 6.37%lactose and1.17% ash) of labneh.

Ash content of labneh samples was ranged between 0.7376 - 0.854% for treatment (C2) and treatment (T3), respectively at 1st day of manufacturing and then increased to 1.027 – 1.340% for treatment (C2) and treatment (T3), respectively at the end of storage periods. There were no significant differences ($p > 0.05$) in ash content among all fresh treatments or during the storage periods.

The results of current study were in agreement with that reported by Tamime *et al.*, (1989a, Tamime, 2007), they stated that the total solids (T.S.) were in range of 23 -29, while fat contents was 8.2% for labneh made from cow's milk using the traditional method. El-Smaragy and Zall (1988) found that the TS was 23.18% of labneh made from cow's milk using the ultrafiltration technique (UF).

This study confirmed that the addition of sage in Labneh has no effect on the physico-chemical properties of final product during storage.

Table 3.Physiochemical properties of labneh fortified with herb *Salvia officinalis* (powder)

Composition%	Storage period (day)	Treatments							
		C1	T1	T2	T3	C2	T4	T5	T6
Moisture%	0day	75.586^{ab}	75.440^{ab}	75.633^{ab}	76.680^{a}	74.336^{ab}	74.513^{ab}	74.850^{ab}	74.976^{ab}
	12day	74.476^{ab}	74.650^{ab}	74.690^{ab}	74.816^{ab}	73.253^{b}	73.370^{b}	73.559^{b}	73.586^{b}
	20 Day	72.956^{b}	72.896^{b}	73.063^{b}	73.146^{b}	72.810^{b}	72.906^{b}	72.996^{b}	73.010^{b}
Ash%	0day	0.7856^{fg}	0.8130^{efg}	0.8373 ^{defg}	0.854 ^{cdefg}	0.7376^{g}	0.7803^{fg}	0.808^{fg}	0.8380^{defg}
	12day	1.0633 ^{abcdefg}	1.1100^{abcdef}	1.1166^{abcdef}	1.1900^{abc}	0.9343 ^{bcdefg}	0.9736 ^{bcdefg}	1.0263 ^{abcdefg}	1.090^{abcdef}
	20 Day	1.173^{abcd}	1.2433^{ab}	1.2566^{ab}	1.3400^{a}	1.027 ^{abcdefg}	1.086^{abcdef}	1.1033^{abcdef}	1.1460^{abcde}
Fat%	0day	6.33^{j}	6.500^{hij}	6.50^{hij}	6.600 ^{ghij}	9.900^{f}	10.20^{cdef}	10.40^{bcd}	10.50^{abc}
	12day	6.400^{ij}	6.633^{ghij}	6.73^{ghi}	6.600 ^{ghij}	10.00^{ef}	10.30^{bcde}	10.50^{abc}	10.60^{ab}
	20 Day	6.500^{hij}	6.700^{ghij}	6.600 ^{ghij}	6.90^{g}	10.10^{def}	10.40^{bcd}	10.60^{ab}	10.80^{a}
Protein%	0day	9.10^{a}	8.94^{a}	8.90^{a}	8.84^{a}	7.00^{b}	6.94^{b}	6.89^{b}	6.83^{b}
	12day	9.13^{a}	8.96^{a}	8.93^{a}	8.86^{a}	7.02^{b}	6.97^{b}	6.92^{b}	6.86^{b}
	20 Day	9.15^{a}	8.99^{a}	8.96^{a}	8.89^{a}	7.11^{b}	7.00^{b}	6.97^{b}	6.93^{b}
Acidity	0day	1.200^{f}	1.230^{cdef}	1.240^{bcdef}	1.260^{abcdef}	1.210^{ef}	1.230^{cdef}	1.250^{bcdef}	1.260^{abcde}
	12day	1.220^{def}	1.260^{abcde}	1.270^{abcd}	1.280^{abc}	1.230^{cdef}	1.260^{abcde}	1.270^{abcd}	1.290^{ab}
	20 Day	1.250^{bcdef}	1.270^{abcd}	1.290^{ab}	1.250^{bcdef}	1.273^{abcd}	1.273^{abcd}	1.290^{ab}	1.310^{ab}
pH	0day	4.85^{abcd}	4.84^{abcd}	4.82^{abcde}	4.80^{bcde}	4.90^{ab}	4.88^{ab}	4.86^{abc}	4.85^{abcd}
	12day	4.83^{abcde}	4.79^{cde}	4.79^{cde}	4.78^{cde}	4.88^{ab}	4.86^{abc}	4.84^{abcd}	4.82^{abcde}
	20 Day	4.80^{bcde}	4.77^{de}	4.77^{de}	4.75^{de}	4.85^{abcd}	4.85^{abcd}	4.81^{bcde}	4.79^{cde}

C1: (control) ,T1: labneh mixture and 0.3% of herb sage (powder), T2: labneh mixture and 0.5% of herb sage (powder), T3: labneh mixture and 0.7% of herb sage (powder), C2: (control) with olive oil , T4 labneh mixture and 0.3% of herb sage (powder)and olive oil , T5: labneh mixture and 0.5% of herb sage (powder) and olive oil, T6: labneh mixture and 0.7% of herb sage (powder)and olive oil.

While the addition of olive oil in Labneh has increased the fat content, decreased the protein while it has no effect on the moisture, ash and the acidity and pH of final product

Microbiological analysis

The data in Table (4) show that all samples of labneh were free from coliform bacteria, Yeasts and Mold. The results recommended that the addition of herb sage powder could be safe and not a source of microbial contaminations. The microbiological quality meet the Egyptian Standard of fermented dairy products (ES 8042/2016) as it is recommended that the fermented dairy products must be free from coliform bacteria, Yeasts and Mold.

Sensory evaluation:

Table (5) shows the sensory properties of Labneh fortified with different levels of herb sage (powder). It is evident from the results of sensory evaluation that the addition of sage (*Saliva officinalis*) powder at different levels has no significant effect ($p > 0.05$) on all parameters "texture, color, flavor and overall acceptability" at 1st day of manufacturing. At the end of storage period, there was a significant decrease ($p<0.05$) in all parameters. It can be concluded that the addition of herb sage (up to 0.3% powder) improved the appearance, consistency and flavor of produced labneh. Hence fortified labneh can be made by blending UF-retentate with herb sage (powder) up to 0.3 % level with satisfactory sensory attributes. The sensory properties were lower in samples containing herb sage at level more than 0.3% when compared to the control. Samples containing sage at level ≥ 0.5% were received low values for flavor and color acceptability.

Table 4. Effect of treatments on Yeasts& Molds, total coliform bacterial Count (cfu/g) of labneh fortified with sage *salvia officinalis* powder

Microbial Test	Storage period (days)	Treatments							
		C1	T1	T2	T3	C2	T4	T5	T6
		Count (cfu/gm)							
Yeasts&Moulds	0	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
	12	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
	20	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
Coliform group	0	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
	12	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D
	20	N.D	N.D	N.D	N.D	N.D	N.D	N.D	N.D

N.D. not detected

C1: (control) ,T1: labneh mixture and 0.3% of herb sage (powder), T2: labneh mixture and 0.5% of herb sage (powder), T3: labneh mixture and 0.7% of herb sage (powder), C2: (control) with olive oil , T4: labneh mixture and 0.3% of herb sage (powder)and olive oil , T5: labneh mixture and 0.5% of herb sage (powder)and olive oil, T6: labneh mixture and 0.7% of herb sage (powder)and olive oil.

Table 5. Effect of addition of *Salvia officinalis* powder on the sensory evaluation of labneh

Properties	Storage period (day)	Treatments							
		C1	T1	T2	T3	C2	T4	T5	T6
Texture(10)	0day	8.500^{a}	8.333^{a}	7.916^{ab}	8.000^{ab}	8.666^{a}	8.000^{ab}	7.500^{abc}	7.500^{abc}
	20day	8.0833^{ab}	8.9166^{a}	6.7500^{bcd}	6.2500^{cd}	8.666^{a}	8.333^{a}	6.7500^{bcd}	6.000^{d}
Color(10)	0day	8.666^{b}	8.0833^{bc}	7.416^{bcd}	8.500^{b}	6.500^{f}	8.166^{bc}	7.2500^{bcd}	$7.333b^{cd}$
	20day	8.666^{b}	8.750^{b}	6.666^{cd}	6.666^{cd}	6.500^{f}	8.1666^{bc}	6.500^{cd}	6.000^{d}
(Flavor)(20)	0day	17.500^{b}	16.416^{bc}	16.333^{bc}	14.8333^{cd}	16.750^{a}	15.833^{bc}	14.666^{cd}	14.250^{cd}
	20day	15.916^{bc}	16.333^{bc}	14.083^{cd}	12.916^{de}	16.66^{a}	16.333^{bc}	12.916^{de}	10.833^{e}
overall acceptability (40)	0day	34.833^{a}	32.83^{ab}	31.66^{abc}	31.333^{abc}	33.66^{a}	32.000^{ab}	29.416^{bcd}	29.083^{bcd}
	20day	33.250^{ab}	34.00^{a}	27.500^{cd}	25.833^{de}	33.33^{a}	32.833^{ab}	26.166^{de}	22.833^{e}

C1: (control) ,T1: labneh mixture and 0.3% of herb sage (powder), T2: labneh mixture and 0.5% of herb sage (powder), T3: labneh mixture and 0.7% of herb sage (powder), C2: (control)with olive oil , T4: labneh mixture and 0.3% of herb sage (powder)and olive oil , T5: labneh mixture and 0.5% of herb sage (powder) and olive oil, T6: labneh mixture and 0.7% of herb sage (powder)and olive oil.

Rheological properties of labneh samples:

Rheological properties of fresh and stored Labneh samples are shown in Table (6).Hardness (the force required to compress a sample between the molars (Awad, 2011)). was widely varied among treatments while the control had intermediate value. Treatment 1 (T1) recorded the highest hardness at the first day of manufacturing, while reduction in hardness was measured in all treatments at the end of the storage period. Hardness was lower in all treatments that contain olive oil when compared with the treatments without addition of olive oil, and the hardness was decreased during storage in all treatments. The reduction of hardness during storage may be due to penetration of oil into the product (Ahmed *et al,* 2013) and increasing the protein hydration, which rapidly transforms into a smoother and soft product (Awad, 2011).

Adhesiveness (the tendency of labneh material to adhere with other material or surface (Shamsia and El-Ghannam,2012)). Data in Table (6) show that the (C2) had the highest adhesiveness value , (T1) had relatively low adhesiveness value at 1st day of manufacturing. While at the end of the storage period, (C1) had the highest adhesiveness value and (T1) had relatively lowest adhesiveness value.

Springiness (the rate at which a deformed material returns to its original shape on removal of the deforming force (Szczesniak *et al.,* 1963; Bourne, 1978)). Data in Table **(6)** show that the (T5) had the highest Springiness value, while (C1) had relatively lowest Springiness value at 1st day of manufacturing. At the end of the storage period, the highest Springiness value was found in T6, while (C2) had relatively low Springiness value. Cohesiveness (the strength of internal bonds making up the body of the product (Szczesniak *et al.,* 1963; Bourne, 1978)). Data in Table (6) show that the (T3) had the highest Cohesiveness value, while (T1) had relatively low Cohesiveness value at 1st day of manufacturing. While at the end of the storage period, it was found that (T1) had the highest Cohesiveness value, and (T6) had relatively low Cohesiveness value. The data represented in Table **(**6) show that the (C1) had the highest Gumminess value, while (C2) had relatively low Gumminess value at 1st day of manufacturing, but at the end of storage period, (T3) recorded the highest Gumminess value, and (T5) recorded the low Gumminess value. The data of Resilience in Table (6) show that the (T1,T2) had the highest Resilience value, and (T4) had relatively low Resilience value at 1st day of manufacturing, but at the end of the storage period (T6) had the highest Resilience value, and (T5) had relatively low Resilience value.

The texture parameters were varied among all Labneh treatments and there were no clear linkages between additions of the sage herb and the texture properties, but the addition of olive oil markedly reduced the hardness of Labneh. There was a decreasing in all hardness values during storage period.

Table 6. Effect of addition of herb *Salvia officinalis* and olive oil on Rheological properties of fresh and stored labneh

Textural properties	Storage period (day)	Treatments							
		C1	T1	T2	T3	C2	T4	T5	T6
Hardness(g)	0day	1136.27	1272.155	1121.529	1176.76	1085.10	869.285	1006.61	1111.61
	12 day	1050.45	841.111	840.705	1126.60	880.14	986.33	686.45	1059.41
Adhesivness	0day	-1030.9	-229.106	-646.890	-570.085	-1164.04	-534.99	-373.80	-392.97
(g.sec)	12 day	-1113.4	-297.513	-627.18	-582.24	-982.28	-465.4	-436.2	-357.74
Springness	0day	0.928	0.988	0.960	0.978	0.955	0.980	0.990	0.960
(mm)	12 day	0.933	0.978	0.933	0.968	0.931	0.976	0.978	0.983
Cohesivness	0day	0.533	0.394	0.522	0.489	0.554	0.506	0.508	0.488
	12 day	0.561	0.591	0.550	0.529	0.549	0.512	0.537	0.472
Gumminess	0day	606.143	501.176	584.907	575.45	601.280	439.442	511.44	542.39
(N)	12 day	588.919	497.25	462.74	595.60	483.63	495.28	368.51	500.55
Chewiness	0day	562.633	494.973	561.743	562.640	574.490	430.74	506.381	520.91
(j)	12 day	549.561	486.180	431.82	562.63	450.11	498.19	361.24	491.87
Resilience	0day	0.166	0.177	0.177	0.143	0.139	0.122	0.161	0.160
	12 day	0.161	0.213	0.173	0.146	0.139	0.14	0.122	1.142

C1: (control) ,T1: labneh mixture and 0.3% of herb sage (powder), T2: labneh mixture and 0.5% of herb sage (powder), T3: labneh mixture and 0.7% of herb sage (powder), C2: (control)with olive oil , T4: labneh mixture and 0.3% of herb sage (powder)and olive oil , T5: labneh mixture and 0.5% of herb sage (powder)and olive oil, T6: labneh mixture and 0.7% of herb sage (powder)and olive oil.

Table 7. Viscosity (mPa.s) of labneh produced by addition of herb *Salvia officinalis*

Treatments	Storage period (day)	
	0 day	12 day
C1	84285.25	76327.51
T1	81136.962	74750.66
T2	71471.33	65887.7
T3	76919.70	75159.2
C2	75493.74	62797.66
T4	68721	59153.05
T5	62142.92	51064.14
T6	73733.25	64402.11

C1: (control) ,T1: labneh mixture and 0.3% of herb sage (powder), T2: labneh mixture and 0.5% of herb sage (powder), T3: labneh mixture and 0.7% of herb sage (powder), C2: (control)with olive oil , T4: labneh mixture and 0.3% of herb sage (powder) and olive oil , T5: labneh mixture and 0.5% of herb sage (powder)and olive oil, T6: labneh mixture and 0.7% of herb sage (powder) and olive oil.

Viscosity of labneh:

Table (7) shows the viscosity values of labneh, the values were ranged between 68721 to 84285mPa.sat/ 10 °C at 1st day of manufacturing, and then the values decreased to the range of 51064.14 –76327.51mPa.sat / 10 °C at the end of storage periods.

comparing with hardness, the viscosity values also decreases at the end of storage period and the treatments with added olive oil also recorded low viscosity values when compared to treatment without olive oil.

The results of present study are in accordance with (Gassem and Frank, 1991;Aryana *et al*., 2006), they reported a decrease in viscosity of yogurt with increase of storage time.

CONCLUSIONS

Modern food science and nutrition have suggested the involvement of the ingredients that have antioxidant activities in order to increase the nutritional value of some food products. Since the sage "*Salvia officinalis*" is used for a long time as medicine, the results of this study concluded that the herb increased the antioxidant capacity of Labneh with no affecting on the chemical and physical properties of final products. As well as Labneh made with herb sage was accepted by panelists. There fore , our recommendation is that the herb sage can be used as a good source of antioxidant compounds to increase the health benefits of Labneh.

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الملخص العربي

الخصائص الفيزيوكيميائية والحسية للبنة المدعمة بعشب المريمية (*Salvia Officinalis*)

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تعتبر اللبنة واحدة من أكثر المنتجات الألبان شعبية في الشرق الأوسط لقيمها الغذائية العالية مقارنة بالزبادي التقليدي. تعرف اللبنة بأنها زبادي مركز عن طريق نزع جزء من الشرش الحامضى. لعشب المريمية Sage "*Salvia officinalis*" وزيت الزيتون العديد من الفوائد الصحية كمصدر جيد للمركبات المضادة للأكسدة. في هذه الدراسة، تم استخدام مسحوق عشب المريمية وزيت الزيتون في صناعة اللبنة لزيادة فوائدها الصحية. وأظهرت النتائج أن مسحوق عشب المريمية ليس له أي تأثير في درجة الحموضة، التركيب الكيميائي والخصائص الريولوجية، في حين أن زيت الزيتون يقلل بشكل كبير من صلابة و لزوجة اللبنة. . أظهرت نتائج التحكيم الحسى على المنتج أن استخدام مسحوق عشب المريمية وزيت الزيتون كانت مقبولة فى تلك المعاملات. توصى هذه الدراسة بإضافة عشب المريميةكمصدرا جيدا للمركبات المضادة للأكسدة إلى اللبنة مما يؤدى إلى زيادة فوائدها الصحية.