

EFFECT OF FEEDING ON SOME MEDICINAL HERBS ON FLAVOUR AND OTHER PROPERTIES OF LABNEH MADE FROM GOATS MILK

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ABSTRACT

Some medicinal herbs plants were used for feeding goats to improve the quality of labneh made from its milk and hinder goaty off-flavour. Five goats groups were fed on five different rations treatments, R1 was a control ration free from medicinal herbs, while R2 was supplemented with chamomile flowers R3 with thyme leaves, R4 with fennel fruits and R5 with reppermint leaves. Labneh was made from the produced milk of each treatment and stored for 4 weeks at 5±1°C. It was analyzed at 0, 1, 2, 3 and 4 weeks for moisture, fat contents, titratable acidity, pH, soluble nitrogen, non protein nitrogen, total nitrogen and total bacterial counts, lactic acid bacteria and coliform groups. The sensory properties were also evaluated. The results revealed that labneh yield of group R2 showed slight increase in its yield were present, compared with other groups. S light increase in moisture content of fresh labneh of group R2 and R5, whereas their values decreased slightly with storage period. Acidity of labneh was increased gradually during the storage period. Also, the acidity was inversely proportional with pH values. Fat content and salt content based on dry matter as well as total nitrogen content were nearly the same in all treatments. Gradual increase in soluble nitrogenous compounds as percent of total nitrogen was observed with storage period. Values of NPN/TN% of labneh of groups R2 and R5 were higher than R1, R3, R4. T.V.F.A. were lower in groups R1 and R4 in comparison to those values in R5, R3, and R2 in order. All samples contained the same free fatty acids in different quantities. Goaty flavour compounds were higher in fresh labneh cheese, while, it was decreased in other groups. Storage of labneh samples resulted in increased values of total carbonyl content after the first week and decreased after the second and fourth weeks. Total bacterial count and the count of LAB was decreased during storage period. The mould and yeast were not detected at the level of 10² and started to grow after two weeks. Organoleptic properties of labneh of R2 (fed on chamomile) recorded best flavour score point as well as body and texture and total score. Finally, labneh made goats milk treated medicinal herbs in general were better than those of the control one.

Keywords: Labneh, goats milk, properties, flavour, medicinal herbs, lactic acid bacteria.

INTRODUCTION

Labneh is one of the most important dairy products in the Middle East mostly in Egypt, Iraq, Lebanon, Syria, Jordan, Gulf countries and Saudi Arabia. It is gaining popularity as a new type in between cheese and yoghurt. It provides energy, protein and significant amounts of calcium, phosphorus

and vitamins. It is like fermented cultured milk or concentrated fermented milk or yoghurt milk (Tamime & Robinson, 1988, Ragab, 2000 and Ayyad, 2003).

Flavour is a major attribute that influences the selection and consumption of cheeses fermented dairy products. With the increased consumption and popularity of cheese and labneh made from goat milk, investigators and resolutions of some of these problems have become economically more important (Attale & Richter, 1996 and Ayyad, 2003). The intensity of the non acceptable goaty flavour was highly correlated to the free fatty acids content, particularly, branched-chain fatty acids having 8-10 carbon atoms, which they were considered as an important contributors to the flavour of goat cheeses. Also, the flavour seems to be greatly dependent upon various factors, e.g., season, lactation period, feeding, milk yield, milk fat content and composition. So, cheese made from goats milk are generally characterized by a strong typical flavour (Hassan, 1992 and Mehana *et al.*, 2003).

Spices have been used not only for flavouring food, but also for their properties as antimicrobial and/or antioxidant agents. The selective plants used here (chamomile, thyme, fennel and peppermint) are considered to have particular health benefits as carminatives, antispasmodics, antifatulent in dyspepsia and anorexia, antiseptics for respiratory and gastrointestinal tracts infections and flavour improving in foods. The use of medicinal herbs plants in animals nutrition as stimulants for milk and meat production is a very recent approach, which improved body weight of litters and lambs and increased milk production of ewes, buffalo and cows than those fed the same rations without herbs. On the same time, goats' milk products are very rarely accepted by Egyptian consumers due to their non acceptable flavour. Thus, many studies were done using natural herbs and their essential oils to improve goaty flavour, but little work had been carried out to establish the effect of animal feeding on herbs and to study the changes that occurred on the quality of goats' milk products (Abou-Dawood, 1996; El-Saadany *et al.*, 1999; Blumenthal *et al.*, 2000; Abdel-Kader *et al.*, 2001 and Ayyad, 2003).

Therefore, the present work was aimed to study the effect of using goat's milk as affected by certain feeding rations (medicinal herbs) on quality and properties of labneh manufactured in order to improve it or mask its goaty off-flavour.

MATERIALS AND METHODS

Starter cultures:

Lactobacillus delbruekii subsp. *bulgaricus*, *Streptococcus salivarius* subsp. *thermophilus* were obtained from Chr-Hansen's Laboratories, Copenhagen, Denmark. These cultures were activated on MRS medium before being used.

Herbs:

Air-dried chamomile flowers, fennel fruits, leaves and aerial parts of thyme and leaves and flowering tops of Peppermint were purchased from Royal Co., Cairo, Egypt. These herbs were 100% natural and cultivated

according to international laws of organic agriculture without chemicals or pesticides to protect human health and environment.

Experimental animals:

Fifty Zaraibe goats were chosen randomly. Goats were divided into five similar groups, ten goats/group. They were kept under similar housing conditions, in five semi-open sheds.

Goats in the five groups were fed on:

Group 1 (R1) = ration composed of 25% concentrate feed mixture (CFM) + 35% yellow corn (YC) + 17% rice straw (RS) + 23 % berseem hay (BH), on DM basis. This group served as control ration (CR), which was free from feed additives.

Group 2 (R2) = fed on CR + 5 gm chamomile flowers.

Group 3 (R3) = fed on CR + 5 gm thyme leaves and aerial parts.

Group 4 (R4) = fed on CR + 5 gm fennel fruits.

Group 5 (R5) = fed on CR + 5 gm Peppermint leaves and flowering tops.

The fresh whole goats' milk (Zaraybe) was collected from each group and standardized to contain 4 + 0.1% fat and used for labneh manufactured.

Labneh manufacture:

Labneh was made by the traditional method as following: Fresh whole goat's milk was heated to 90°C for 20 min, cooled at 45°C and then inoculated with 2% yoghurt starter and the mixture was well agitated. Dispensed in plastic containers and incubated at 43±1°C for 3 hours until complete coagulation. Yoghurt was cooled overnight, mixed thoroughly with 1% of sodium chloride and then, put into cheese cloth bags, which was hanged in the refrigerator room at 4 to 6°C for 12 hrs to allow whey drainage. The fresh labneh was well mixed and filled into 100 gm plastic containers and kept for analysis.

Chemical analysis:

Moisture content, fat content, titratable acidity, total nitrogen, soluble nitrogen, non protein nitrogen were estimated according to the methods describing by Ling (1963).

pH values were measured directly using a digital pH meter model 201 Drion Res. Japan.

Salt content of labneh was determined according to Davies (1932).

The amino acid nitrogen (AAN) of the samples was determined using 33.3% phosphotungstic acid solution by semi-micro Kjeldahl method as described by Stadhouders (1959).

Free fatty acids were isolated from labneh lipid of each treatment and determined according to the method described by Metcalfe and Schmitz (1961).

The total volatile fatty acids of the samples were determined as given by Kosikowski (1978).

Total carbonyl compounds were determined according to the method described by Basset and Harper (1958).

Labneh scoring

The labneh samples were scored for organoleptic properties according to Nelson and Trout (1965). 50 points were giving for flavour, 35 points for body and texture and 15 points for appearance.

Microbiological analysis:

Total bacterial count was determined as given by Marth (1978). The proteolytic bacterial count was determined as described by Chalmer (1962). The lipolytic bacterial count was determined as given by Sharf (1970). The coliform bacterial count was enumerated using the method described in the standard method for the examination of milk and dairy products (Oxoid Manual, 1982). Lactic acid bacterial count was determined according to Lees *et al.* (1974). Moulds and yeasts counts were enumerated as recommended by the APHA (1992).

Statistical analysis:

Statistical evaluation for the results by a split-pilot ANOVA was performed according to the method described by Buimer (1967).

RESULTS AND DISCUSSION

Yield of Labneh:

Results in Table (1) show that, slight decrease was observed on the yield of labneh made from goat's milk after one week of storage. Also, negligible decrease of labneh yield was observed during the storage period up to 4 weeks. The changes in the labneh yield during the storage period were found to be of nearly similar values in all feeding treatments. Similar observations were reported by Omar (1995) and Ragab (2000).

Table (1): Effect of different medicinal herbs ratios treatments on the yield percentage of labneh during storage at 5 ± 1°C.

Herbs Treatments	Storage period (weeks)				
	0	1	2	3	4
R ₁	28.06 ^{ab}	27.72 ^a	27.36 ^{ab}	27.14 ^{ab}	27.10 ^{ab}
R ₂	28.75 ^a	28.33 ^a	28.16 ^a	27.96 ^a	27.90 ^a
R ₃	27.86 ^b	27.06 ^a	26.86 ^b	26.72 ^b	26.66 ^{ab}
R ₄	28.13 ^{ab}	27.95 ^a	27.56 ^{ab}	27.34 ^{ab}	27.25 ^{ab}
R ₅	27.56 ^{ab}	27.16 ^a	26.84 ^{ab}	26.66 ^{ab}	26.51 ^b

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

a,b means in the same column with different superscript, significantly different (p < 0.05).

Moisture content:

Data presented in Table (2) show that no considerable differences in the moisture content of labneh in all feeding treatments during storage period. Slight decrease was observed on the labneh manufactured from goats milk in all treatments. The moisture content of the fresh labneh were 71.083, 72.228, 71.537, 70.827 and 72.988% in treatments R₁, R₂, R₃, R₄ and R₅, respectively. At the end of storage period (4 weeks), the moisture content reached 69.539, 70.930, 69.030, 69.502 and 71.404%, respectively. Similar

results were reported by Omar (1995); Abd El-Moaty (1996) and Ragab (2000).

Acidity and pH values:

Results in Table (2) show that acidity was increased gradually with the progress of storage period, which, reached 2.165, 2.340, 2.211, 2.155 and 2.21 (as lactic acid) in labneh samples after four weeks for R1, R2, R3, R4 and R5, respectively. The corresponding pH values for these treatments after 4 weeks recorded 3.45, 3.42, 3.45, 3.38 and 3.40 for these treatments, respectively. These means that highest hydrolysis of milk lactose was happened and produced highest amount of acidity through the storage period of labneh. The obtained results are similar to those reported by Hefnawy *et al.* (1992); Omar (1995); Abd El-Moaty (1996) and Ragab (2000).

Table (2): Effect of different medicinal herbs ration treatments on the chemical composition of labneh during storage at 5 ± 1°C.

Chemical composition		Storage period (weeks)				
		0	1	2	3	4
Moisture %	R ₁	71.083 ^a	70.435 ^a	69.871 ^b	69.663 ^b	69.539 ^c
	R ₂	72.228 ^{ab}	71.838 ^a	71.327 ^a	71.129 ^a	70.930 ^{ab}
	R ₃	71.537 ^{ab}	69.824 ^a	69.427 ^b	69.208 ^b	69.030 ^c
	R ₄	70.827 ^b	70.039 ^a	69.886 ^b	69.691 ^b	69.502 ^{bc}
	R ₅	72.988 ^a	72.134 ^b	71.884 ^a	71.634 ^a	71.404 ^a
Acidity %	R ₁	1.625 ^b	1.855 ^b	1.934 ^b	2.075 ^b	2.165 ^b
	R ₂	1.850 ^a	2.085 ^a	2.165 ^a	2.285 ^a	2.340 ^a
	R ₃	1.865 ^a	1.995 ^{ab}	2.015 ^b	2.105 ^b	2.211 ^b
	R ₄	1.654 ^b	1.825 ^b	1.959 ^b	2.046 ^b	2.155 ^b
	R ₅	1.854 ^a	1.905 ^b	2.043 ^b	2.150 ^b	2.210 ^b
pH	R ₁	3.69 ^c	3.58 ^a	3.54 ^{ab}	3.51 ^a	3.45 ^a
	R ₂	3.60 ^c	3.52 ^c	3.50 ^c	3.45 ^c	3.42 ^b
	R ₃	3.60 ^c	3.55 ^b	3.55 ^a	3.48 ^b	3.45 ^a
	R ₄	3.62 ^c	3.56 ^b	3.52 ^b	3.42 ^d	3.38 ^d
	R ₅	3.64 ^b	3.55 ^b	3.53 ^{ab}	3.48 ^b	3.40 ^c
Fat/D.M %	R ₁	44.496 ^c	44.224 ^b	43.92 ^b	43.623 ^b	43.146 ^{bc}
	R ₂	45.601 ^a	44.860 ^a	43.889 ^b	43.588 ^b	43.281 ^b
	R ₃	44.580 ^{bc}	43.814 ^c	43.501 ^b	43.029 ^b	42.961 ^c
	R ₄	44.834 ^{bc}	44.412 ^b	43.667 ^b	43.564 ^b	42.905 ^a
	R ₅	45.119 ^b	44.600 ^{ab}	44.260 ^a	44.000 ^a	43.916 ^a
Salt/D.M %	R ₁	2.123 ^a	2.281 ^a	2.364 ^a	2.384 ^a	2.400 ^a
	R ₂	2.118 ^a	2.215 ^a	2.325 ^a	2.327 ^a	2.358 ^a
	R ₃	2.066 ^a	2.122 ^a	2.259 ^a	2.312 ^a	2.315 ^a
	R ₄	2.169 ^a	2.229 ^a	2.300 ^a	2.360 ^a	2.366 ^a
	R ₅	2.123 ^a	2.281 ^a	2.364 ^a	2.384 ^a	2.400 ^a

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

a,b means in the same column with different superscript, significantly different (p < 0.05).

Fat content:

Concerning to the fat content based on dry matter of labneh made from goat's milk as affected by certain feeding rations during the storage period at $5\pm 1^\circ\text{C}$ for four weeks. The results revealed that fat content on dry matter basis don't show considerable changes between different herbs treatments. These observations are similar to those reported by Hefnawy *et al.* (1992); Omar (1995); Abd El-Moaty (1996) and Ragab (2000).

Salt content:

From results presented in Table (2), it could be noticed that, salt content of labneh on its dry matter basis nearly the same and don't show considerable changes between treatment.

Nitrogen fractions of labneh:

Total nitrogen (TN):

The results in Table (3) show that, the nitrogen content nearly the same in all treatments. However, total nitrogen content was increased gradually with the prolongation of storage period up to 4 weeks. This is attributed to the changes in moisture content during labneh storage. Similar results were reported by Omar (1995); Abd El-Moaty (1996) and Ragab (2000).

Table (3): Effect of different medicinal herbs ration treatments on nitrogen fraction of labneh during storage at $5 \pm 1^\circ\text{C}$.

Chemical composition		Storage period (weeks)				
		0	1	2	3	4
T.N. %	R ₁	1.747 ^a	1.859 ^b	1.997 ^a	2.053 ^a	2.182 ^b
	R ₂	1.778 ^a	1.8987 ^{ab}	1.986 ^a	2.093 ^a	2.194 ^b
	R ₃	1.738 ^a	1.840 ^b	1.964 ^a	2.147 ^a	2.282 ^a
	R ₄	1.732 ^a	1.975 ^a	1.671 ^b	2.136 ^a	2.211 ^b
	R ₅	1.882 ^a	1.904 ^{ab}	2.065 ^a	2.114 ^a	2.173 ^b
SN/TN %	R ₁	10.088 ^a	10.750 ^a	11.065 ^b	11.742 ^a	12.068 ^d
	R ₂	10.185 ^a	10.985 ^a	11.275 ^a	11.958 ^a	12.985 ^a
	R ₃	10.102 ^a	10.795 ^a	11.150 ^{ab}	11.650 ^a	12.653 ^b
	R ₄	10.095 ^a	10.650 ^a	11.185 ^{ab}	11.440 ^b	12.540 ^c
	R ₅	10.075 ^a	10.875 ^a	11.160 ^{ab}	11.650 ^a	12.650 ^b
NPN/TN	R ₁	5.490 ^b	6.380 ^c	7.046 ^c	8.176 ^c	8.910 ^c
	R ₂	5.640 ^a	6.940 ^a	7.540 ^a	8.648 ^a	9.850 ^a
	R ₃	5.438 ^b	6.580 ^b	7.158 ^{bc}	8.144 ^c	8.948 ^d
	R ₄	5.435 ^b	6.520 ^b	7.090 ^c	8.040 ^d	9.146 ^c
	R ₅	5.638 ^a	6.840 ^c	7.336 ^b	8.534 ^b	9.436 ^b

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

a,b,c,d means in the same column with different superscript, significantly different ($p < 0.05$).

Soluble nitrogenous compounds (SN):

Results in Table (3) show the changes in the soluble nitrogenous compounds as percent of total nitrogen in labneh. The results showed

gradual increase in the soluble nitrogenous compounds. Also, the results showed that SN/TN were 12.068, 12.985, 12.653, 12.540 and 12.650 for treatment R1, R2, R3, R4 and R5, respectively after storage for four weeks. The increasing of SN/TN may be due to the hydrolysis of protein as a result of the acidity of lactic acid bacteria. Mahfouz *et al.* (1992); Omar (1995); Abd El-Moaty (1996) and Ragab (2000) reported similar results.

Non protein nitrogen content

From the obtained results, there was a slight increase in the NPN/TN%. The NPN/TN% content of labneh had the same trend in each treatment being slightly increased during storage up to four weeks. The results also revealed that NPN/TN% of labneh (treatments R2 and R5) were higher than those of other treatments. These results are in agreement with those reported by Mahfouz *et al.* (1992); Omar (1995); Abd-El-Moaty (1996) and Ragab (2000).

Total volatile fatty acids (TVFA):

Table (4) show an increase of the T.V.F.A of labneh manufactured from goat's milk group treatments R2, R3 and R5). At the end of storage period (4 weeks). The corresponding values of labneh reached 10.8, 12.8, 12.4, 11.2 and 12.0 (ml NaOH 0.1 N/100 g) for R1, R2, R3, R4 and R5, respectively.

Table (4): Effect of different medicinal herbs ration treatments on the T.V.F.A. (ml NaOH 0.1 N/100g) of labneh during storage at 5 ± 1°C.

Herbs Treatments	Storage period (weeks)				
	0	1	2	3	4
R ₁	7.4 ^c	8.2 ^b	9.1 ^c	9.8 ^d	10.8 ^c
R ₂	8.8 ^a	9.6 ^a	10.8 ^a	11.8 ^a	12.8 ^a
R ₃	8.6 ^a	9.4 ^a	9.8 ^b	10.5 ^c	12.4 ^{ab}
R ₄	7.0 ^c	8.0 ^b	9.2 ^c	10.0 ^d	11.2 ^c
R ₅	8.1 ^b	8.3 ^b	10.1 ^b	11.2 ^b	12.0 ^b

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

a,b,c,d means in the same column with different superscript, significantly different (p < 0.05).

Free fatty acids (FFA):

FFA were estimated in labneh samples made from goat's milk as affected by different feeding treatments are shown in Tables (5, 6, 7, 8 and 9). The results show that free fatty acids such as caprylic (C8), capric (C10), lauric (C12), myristic (C14), palmitic (C16), stearic (C18), oleic (C18 9=16); linoleic (C18 9=10, 12=13) and linolenic (C18 9=10, 12=13, 15=16) were found in all samples with different quantities. Also, the results revealed that goat's labneh had the highest level of volatile fatty acids (C2-C12), where they were 22.698% in R1 and lower level 20.998, 20.745, 21.239 and 17.909 as percent of TFA for treatments R2, R3, R4 and R5, respectively. Also, it is clear that fresh labneh treatment R1 had increased level of volatile fatty

acids. The corresponding values of TVFA in labneh stored for four weeks mad from goat's milk were 21.642% (R1), 18.807% (R2); 25.067% (R3); 14.170% (R4) and 26.451% (R5) of TFA. But, the saturated fatty acids values were 49.657, 53.960, 51.234, 54.251 and 53.209, as percent of TFA content

Table (5): Effect of different medicinal herbs ration treatments on free fatty acids (%) of fresh labneh.

Fatty acids		Ration treatments				
Group	Conc.	R ₁	R ₂	R ₃	R ₄	R ₅
T.V.F.A.	4	1.293	1.157	1.620	1.966	1.016
	6	2.388	1.794	2.063	2.734	1.648
	8	3.034	2.474	2.447	3.314	2.152
	10	11.565	11.094	10.497	10.056	9.549
	12	4.418	4.479	4.118	3.169	3.544
	Total	22.698	20.998	20.745	21.239	17.909
Unsaturated fatty acid	14:1	0.449	0.463	0.446	0.444	0.732
	16:1	0.849	0.724	0.493	0.654	1.148
	18:1	26.347	23.762	26.946	23.412	26.328
	18:2	--	0.093	0.136	--	0.674
	18:3	--	--	--	--	--
	Total	27.645	25.042	28.021	24.510	28.882
Saturated fatty acid	14	10.149	11.710	10.739	10.779	10.488
	Iso 14	0.183	0.156	0.141	2.683	--
	15	0.642	0.590	0.522	0.745	0.524
	Iso 16	0.775	0.544	0.657	0.519	0.458
	16	27.102	30.910	28.930	28.599	30.801
	17	0.397	0.309	0.228	0.286	1.056
	18	10.409	9.741	10.017	10.640	9.882
	Total	49.657	53.960	51.234	54.251	53.209

Table (6): Effect of different medicinal herbs ration treatments on free fatty acids (%) of labneh for one week at 5 ± 1°C.

Fatty acids		Ration treatments				
Group	Conc.	R ₁	R ₂	R ₃	R ₄	R ₅
T.V.F.A.	4	--	1.207	3.275	--	--
	6	3.121	1.863	3.248	3.813	1.908
	8	3.614	2.586	3.461	1.332	2.282
	10	12.414	10.553	11.767	16.251	12.416
	12	4.176	4.064	4.077	5.136	4.140
	Total	23.325	20.273	25.828	26.532	20.746
Unsaturated fatty acid	14:1	0.510	0.744	0.373	0.326	0.340
	16:1	0.847	2.450	1.285	--	1.742
	18:1	25.722	24.336	25.142	21.721	25.012
	18:2	--	0.286	--	0.671	0.365
	18:3	--	--	--	--	--
	Total	27.079	27.816	26.800	22.718	27.459
Saturated fatty acid	14	8.456	10.810	9.246	10.318	9.967
	Iso 14	--	--	--	--	--
	15	1.243	0.876	0.633	0.121	0.568
	Iso 16	0.835	0.942	0.680	--	1.109
	16	25.564	27.525	24.583	31.380	29.917
	17	2.236	2.436	2.410	0.800	1.285
	18	11.262	9.322	9.820	8.131	8.954
	Total	49.596	51.911	47.372	50.750	51.800

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

Table (7): Effect of different medicinal herbs ration treatments on free fatty acids (%) of labneh for two week at 5 ± 1°C.

Fatty acids		Ration treatments				
Group	Conc.	R ₁	R ₂	R ₃	R ₄	R ₅
T.V.F.A.	4	--	--	--	--	--
	6	--	--	1.131	--	1.497
	8	2.475	--	1.453	--	1.849
	10	11.642	10.549	7.398	6.998	9.520
	12	2.731	0.51	2.934	1.115	2.693
	Total	16.848	11.059	12.916	8.113	15.559
Unsaturated fatty acid	14:1	0.393	--	--	1.261	--
	16:1	--	8.438	4.031	1.582	--
	18:1	38.131	327.816	40.200	54.329	26.071
	18:2	0.1	3.489	2.201	0.54	--
	18:3	--	--	--	--	--
	Total	38.624	39.743	46.432	53.712	26.071
Saturated fatty acid	14	8.165	9.04	6.998	5.349	7.554
	Iso 14	--	--	--	--	--
	15	--	0.708	0.215	0.788	--
	Iso 16	--	--	--	--	--
	16	33.45	33.152	33.43	30.805	46.652
	17	0.167	--	--	0.723	3.601
	18	2.746	6.298	--	0.510	0.263
Total	44.528	49.198	40.652	38.175	58.370	

Table (8): Effect of different medicinal herbs ration treatments on free fatty acids (%) of labneh for three week at 5 ± 1°C.

Fatty acids		Ration treatments				
Group	Conc.	R ₁	R ₂	R ₃	R ₄	R ₅
T.V.F.A.	4	--	0.253	--	--	3.543
	6	1.042	0.034	--	5.101	4.353
	8	3.600	3.405	3.063	3.715	17.413
	10	20.698	19.880	14.675	17.613	6.238
	12	3.337	10.152	2.456	2.880	31.547
	Total	28.677	33.724	20.194	29.309	0.363
Unsaturated fatty acid	14:1	--	--	0.162	--	0.363
	16:1	0.842	0.612	1.083	1.435	1.157
	18:1	30.437	27.478	35.958	30.218	29.992
	18:2	--	--	--	--	--
	18:3	--	--	--	--	--
	Total	31.279	28.09	37.203	31.653	31.512
Saturated fatty acid	14	8.373	9.427	6.605	5.450	8.596
	Iso 14	--	--	--	--	--
	15	--	--	--	0.226	1.014
	Iso 16	--	--	--	--	--
	16	30.123	28.076	34.485	31.320	27.033
	17	0.461	0.291	0.948	0.652	0.298
	18	1.087	0.392	0.565	1.390	--
Total	40.044	38.186	42.603	39.038	36.941	

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

for fresh labneh treatments, respectively. As well as these values reached 40.911, 53.446, 40.480, 48.123 and 44.087% at the end of storage period (4 weeks), respectively. The unsaturated fatty acids were 37.490, 27.747, 34.457, 37.707 and 29.461% in labneh after 4 weeks, respectively. The results, in general revealed that saturated fatty acids were decreased through the storage period, but unsaturated ones were increased. These means that, the health value of this dairy product was increased.

Table (9): Effect of different medicinal herbs ration treatments on free fatty acids (%) of labneh for four week at 5 ± 1°C.

Fatty acids		Ration treatments				
Group	Conc.	R ₁	R ₂	R ₃	R ₄	R ₅
T.V.F.A.	4	--	--	--	--	--
	6	1.921	--	--	1.410	--
	8	2.471	2.732	3.53	1.804	4.278
	10	13.565	13.251	17.547	8.268	17.956
	12	3.642	2.824	3.990	2.688	4.217
	Total	21.642	18.807	25.067	14.170	26.451
Unsaturated fatty acid	14:1	--	--	0.754	--	--
	16:1	0.399	0.401	1.141	0.972	1.382
	18:1	37.091	27.346	32.558	35.703	27.375
	18:2	--	--	--	0.201	--
	18:3	--	--	--	0.831	--
	Total	37.490	27.747	34.453	37.707	29.461
Saturated fatty acid	14	8.179	7.798	9.035	7.812	10.141
	Iso 14	--	--	--	--	--
	15	0.275	0.499	0.598	--	0.226
	Iso 16	--	--	--	--	--
	16	31.901	44.404	29.704	34.502	32.988
	17	0.185	0.414	0.687	3.978	0.614
18	0.371	0.331	0.456	1.831	0.118	
Total	40.911	53.446	40.48	48.123	44.087	

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

Goaty flavour compounds:

Table (10) show the level of carbonyl compounds goaty flavour compounds (as % of TFA) of labneh made from goat's milk as affected by different ration treatment. It could be noticed that the percentages of 4-methyloctanoic and 4-ethyloctanoic acids were higher in fresh labneh of group R1 (control) while, their percentages were decreased in other groups (R2, R5, R3 and lastly R4). These results indicate that medicinal herbs used here were greatly affecting on goaty flavour, which removed some of these volatile fatty acids especially when milk was heated at 90C, which this degree is higher than the boiling point of the volatile fatty acids (C2-C8). Also, some of these branched chain fatty acids may inter in specific metabolic pathways of labneh microflora, thus reducing its concentration during storage at temperature 5-7°C. Similar observations were reported by Quere *et al.* (1996).

Table (10): Carbonyl compounds (as % of T.V.F.A.) in labneh made from goats milk as affected by different medicinal herbs ration treatments when fresh and after 4 weeks of storage.

Carbonyl compounds	Ration treatments									
	R ₁		R ₂		R ₃		R ₄		R ₅	
	Fresh	28	Fresh	28	Fresh	28	Fresh	28	Fresh	28
Exanoic acid	10.531	8.879	9.543	6.125	9.956	6.237	12.934	9.951	9.302	8.692
N-methyl octanoic acid	2.176	1.206	1.351	0.774	1.653	0.899	1.812	0.932	1.516	0.817
N-methyl octanoic acid	1.983	0.965	1.278	0.616	1.540	0.719	1.786	0.778	1.462	0.684
Onanoic acid	0.125	0.037	0.167	0.017	0.299	0.029	0.193	0.026	0.161	0.013
Onanoic acid	51.123	62.841	52.834	63.213	50.613	68.131	48.351	58.649	53.41	68.847

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

Total carbonyl compounds content (T.C.C.):

Results in Table (11) show that total carbonyl compounds content of goat's milk labneh was affected by different feeding reactions. It was 0.207, 0.831, 0.735, 0.587 and 0.817 mg/100 g in the fresh labneh for treatment R₁, R₂, R₃, R₄ and R₅, respectively. Also, the results showed that carbonyl content was increased through the first week of storage period. Then, these values were decreased after 3 and 4 weeks of storage. Similar observations were reported by Magdoub *et al.* (1992) and Eltibe (2000).

Table (11): Effect of different medicinal herbs ration treatments on the total carbonyl content of goats milk labneh during storage at 5 ± 1°C.

Herbs Treatments	Storage period (weeks)				
	0	1	2	3	4
R ₁	0.207 ^c	0.978 ^c	0.853 ^c	0.542 ^c	0.397 ^d
R ₂	0.831 ^a	1.781 ^b	2.128 ^{ab}	1.836 ^b	0.893 ^b
R ₃	0.735 ^{ab}	1.660 ^b	2.036 ^b	1.800 ^b	0.642 ^c
R ₄	0.587 ^b	2.012 ^a	2.312 ^a	2.034 ^a	0.903 ^a
R ₅	0.817 ^a	2.176 ^a	2.425 ^a	1.989 ^{ab}	0.942 ^a

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.

a,b,c,d means in the same column with different superscript, significantly different (p < 0.05).

Microbiological properties:

Data presented in Table (12) show that the fresh labneh produced by goat's milk in different feeding groups had a comparatively higher total bacterial count (TC) being 45, 46, 43, 44 and 42 x 10⁶ in treatment R₁, R₂, R₃, R₄ and R₅, respectively. The results also show that TC was decreased during the storage period to 20, 21, 18, 16 and 20 x 10⁶ for the same treatments, respectively. Also, the results show that lactic acid bacteria behaved in a similar way of TC, being lowest in R₃ treatment and nearly the same with other treatments. LAB were decreased until the end of storage period (4 weeks).

The moulds and yeast counts were not detected at the level of 10² count of fresh labneh. However, they started to grow after two weeks of

storage, and increased gradually up to the end of storage. El-Samragy (1997) and Ragab (2000) reported similar results.

Table (12): Effect of different medicinal herbs ration treatments on the total bacterial count, lactic acid bacteria and mould & yeast content of goats milk labneh during storage at 5 ± 1°C.

Herbs Treatments	Total bacterial count x10 ⁶					Lactic acid bacteria x10 ⁶					Mould & Yeast x10 ⁶				
	Storage period (weeks)														
	0	1	2	3	4	0	1	2	3	4	0	1	2	3	4
R ₁	45 ^a	40 ^a	36 ^a	29 ^a	20 ^a	36 ^a	30 ^a	26 ^a	21 ^a	18 ^a	- ^a	1 ^a	- ^a	12 ^a	18 ^a
R ₂	46 ^a	40 ^a	34 ^a	25 ^b	21 ^a	36 ^{ab}	31 ^a	25 ^a	22 ^a	17 ^a	- ^a	- ^a	- ^b	2 ^c	5 ^b
R ₃	43 ^a	40 ^a	38 ^a	23 ^b	18 ^a	30 ^{ab}	26 ^a	20 ^a	16 ^a	18 ^a	- ^a	1 ^a	2 ^{ab}	8 ^b	12 ^{ab}
R ₄	44 ^a	42 ^a	36 ^a	22 ^b	16 ^a	32 ^{ab}	29 ^a	22 ^a	18 ^a	15 ^a	- ^a	- ^a	2 ^{ab}	3 ^c	11 ^{ab}
R ₅	42 ^a	39 ^a	33 ^a	25 ^b	20 ^a	34 ^b	29 ^a	21 ^a	19 ^a	15 ^a	- ^a	- ^a	- ^a	2 ^c	9 ^b

R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.
 a,b,c,d means in the same column with different superscript, significantly different (p < 0.05).

Organoleptic properties:

The organoleptic properties of labneh made from goat's milk as affected by medicinal herbs are presented in Table (13). The results reveal that labneh made from goat's milk group R₂ (Chamomile) gained higher score points for flavour, as well as for body and texture and total score points at different stage of storage of labneh. The best treatments which had associated with the highest evaluation were treatment R₂ followed by R₅ then R₃ and R₄ in comparison with the scores of group R₁. These results are in agreement with those reported by Abd-El-Moaty (1996); El-Samragy (1997) and Ragab (2000).

Table (13): Effect of different medicinal herbs ration treatments on the total bacterial count, lactic acid bacteria and mould & yeast content of goats milk labneh during storage at 5 ± 1°C.

Ration Treatments	Fresh				1 week storage				2 week storage				3 week storage				4 week storage			
	A	BT	F	T	A	BT	F	T	A	BT	F	T	A	BT	F	T	A	BT	F	T
Perfect point	15	35	50	100	15	35	50	100	15	35	50	100	15	35	50	100	15	35	50	100
R ₁	14	31	43	88 ^a	14	30	43	87 ^a	13	30	42	85 ^a	12	29	40	81 ^a	11	26	36	73 ^a
R ₂	14	34	47	95 ^a	14	34	48	94 ^a	14	34	48	94 ^a	13	33	45	91 ^a	13	32	45	90 ^a
R ₃	14	32	45	91 ^a	14	31	44	89 ^a	14	30	42	88 ^a	12	30	40	82 ^a	11	28	39	78 ^a
R ₄	14	32	44	90 ^a	14	30	43	87 ^a	14	30	43	87 ^a	12	29	41	82 ^a	11	28	38	77 ^a
R ₅	14	33	45	92 ^a	14	32	44	90 ^a	14	31	43	88 ^a	13	31	42	88 ^a	12	29	39	80 ^a

A= Appearance & Color, BT= Body & Texture, F= Flavor, T= Total score point.
 R₁= Control, R₂= Chamomile, R₃= Thyme, R₄= Fennel and R₅= Pepper mint.
 a,b,c means in the same column with different superscript, significantly different (p < 0.05).

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تأثير التغذية ببعض الأعشاب الطبية على نكهة والخواص الأخرى للبننة المصنعة من لبن الماعز

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في الأونة الأخيرة إهتم الباحثون بإنتاج وتصنيع منتجات لبنية من ألبان الماعز لاقت شهرة عالمية إلا أنها لم تلق نفس الرواج في مصر لما لهذه المنتجات من طعم لا يتناسب مع الذوق المصري لوجود النكهة المميزة للبن الماعز ولذلك فقد هدفت هذه الدراسة لتغذية الماعز على بعض الأعشاب الطبية مثل أزهار الكاموميل والزعتر والشمر والنعناع الفلفلي وذلك من أجل التغلب على نكهة لبن الماعز الغير مرغوبة حيث تم إختيار عدد ٥٠ من الماعز الزريبي عمرها من ٣-٥ سنوات ومتوسط الوزن ٥٠ كجم وقسمت إلى ٥ مجموعات غذيت على العلائق الآتية :

- أ- المجموعة الأولى (المقارنة) غذيت على عليقة قياسية تحتوي على المركبات الغذائية والبرسيم وقش الأرز كمادة مالئة ،
- ب- المجموعة الثانية وقد غذيت على عليقة المقارنة بالإضافة إلى أزهار الكاموميل .
- ج- المجموعة الثالثة وغذيت على عليقة المقارنة بالإضافة إلى أوراق الزعتر وأجزائه الطبية .
- د- المجموعة الرابعة وغذيت على العليقة المقارنة بالإضافة إلى ثمار الشمر .
- هـ - المجموعة الخامسة وغذيت على عليقة المقارنة بالإضافة إلى أوراق النعناع الفلفلي والقسم الزهرية للنعناع .

وبعد ذلك تم تجميع اللبن الناتج وتم تصنيعه إلى لبنة ثم درس أثر هذه التغذية على التركيب الكيماوي وصفات وخواص اللبنة المصنعة من اللبن الناتج الطازج والمخزنة لمدة ١ ، ٢ ، ٣ ، ٤ أسابيع وقد أوضحت الدراسة النتائج التالية :

- ١- لوحظ زيادة بسيطة في تصافي الجبن الناتج من المعاملة رقم ٢ بالمقارنة بالمجاميع الأخرى .
 - ٢- وجدت زيادة بسيطة في نسبة الرطوبة في اللبنة الطازجة للمجموعة الثالثة والخامسة بينما تناقصت هذه القيم بدرجة بسيطة خلال فترة التخزين .
 - ٣- كانت هناك زيادة ملحوظة في حموضة اللبنة خلال فترة التسوية في حين أخذت درجات الـ pH إتجاه معاكس للحموضة .
 - ٤- محتوى اللبنة من الدهن والملح والنيوتروجين الكلي مقسوماً على المادة الجافة كان متقارباً في كل المعاملات .
 - ٥- وجدت زيادة متدرجة في النيوتروجين الذائب للبنة خلال فترة التسوية .
 - ٦- قيم NPN على TN للبنة للمجاميع الثانية والخامسة كانت أعلى من المجاميع الأخرى .
 - ٧- الأحماض الدهنية الطيارة كانت منخفضة في المجموعة الثانية والخامسة في حين كانت عالية في المجاميع الأخرى .
 - ٨- كل المجاميع المختبرة إحتوت على نفس المحتوى من الأحماض الدهنية الحرة .
 - ٩- كانت هناك زيادة في مركبات النكهة للبنة الطازجة في حين أنها تناقصت خلال فترة تخزين اللبنة .
 - ١٠- أدى تخزين اللبنة إلى زيادة مركبات الكاربونيل خلال الأسبوع الأول في حين تناقصت هذه القيمة خلال أسابيع التخزين الأخرى .
 - ١١- تناقصت أعداد البكتيريا وبكتيريا حمض اللاكتيك خلال تخزين اللبنة في حين تزايدت أعداد الفطريات والخمائر التي لم تختبر خلال الأسبوعين الأول والثاني للتخزين .
 - ١٢- سجلت الخصائص الحسية للبنة قيم عالية للرائحة والخصائص الأخرى مما يعني صفات حسية جيدة للبنة .
- وفي النهاية توضح الدراسة أن إضافة الأعشاب الطبية إلى علائق الماعز يحسن من صفات اللبن الناتج مما يعني منتجات لبنية جيدة .