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Effect of *Thymus vulgaris* Aqueous Extract on Chemical, Microbiological and Organoleptic Properties of Kariesh Cheese

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ABSTRACT

An aqueous extract of thyme was added to the Kareish cheese made of skimmed buffalo's milk at 0.5, 2.0 and 3.0 %. Cheese was chemically and microbiologically analyzed during storage. The obtained results indicated that the titratable acidity, ash and total solid and soluble nitrogen increased by increasing the added theme extract, and by the prolonging of the storage. Addition of different concentration of thyme, On the other hand, didn't affect significantly the total nitrogen, total protein and Protein/DM. The amino nitrogen content significantly increased by increasing the added thyme and with the increasing the storage period. Fat and Fat/DM and Salt and Salt/DM of cheese contents significantly increased by proceeding the storage period. Cheese made with supplementing of with 1% thyme gained the highest total scores (99.4), while the lowest of 81.83 was attained for the control. after 15 days. Concerning the microbiological quality, the results indicated thahe Increasing the concentration of added thyme extract resulted in significant decrease in the overall bacterial count. while the increase in cheese storage period resulted in lower increase in the microbiological load, but the increase was lower than the control.

Keywords: kareish cheese , thyme extract

INTRODUCTION

Kariesh cheese is a soft sour cheese made of skimmed cow's or buffalo's milks as well as buttermilk during sour cream production; apparently it is made only on farmsteads. It is considered to be one of the most important traditional Egyptian dairy products, commonly made in the Egyptian countryside, practically in small villages, as low-income people such as farmers use Kareish cheese in their daily food because its high protein content, low fat and cost. Therefore, Kareish cheese is a promising food in the avoidance of health problems associated with fat, particularly for old people developing countries, particularly in Egypt where low income people such as farmers and people in a small and isolated villages used Kariesh cheese in their diet. Kariesh cheese is one of the most popular kind of soft cheese in Egypt, which has low fat content and an good dietary source of protein, calcium, phosphorous, and water-soluble vitamins. However, it may be a tool to transmit food borne diseases and causing food poisoning outbreaks owing to contamination with different pathogen bacteria. Kareish cheese is soft cheese that is manufactured and consumed in Egypt. Due to the environmental parameters prevailing during its storage periods, combined with the composition of the cheese often create possibilities for overall development of mold and yeasts on cheese surface, which greatly reduces its quality (Aman, 1994; El Kholy *et al*., 1995, El Bagoury Mosaad, 2002, and Reps et al., 2002. al., 2002. Korish and AbdElhamid, 2012 and Todaro *et al*., 2013).

Blassy and Ismail (2003) and Hamad (2011) reported that acidity, total solids (TS), fat, fat/DM, salt and ash contents of Kariesh cheese gradually increased during storage period. On the other hand total bacterial count was decrease during storage while yeast and molds count were increased.

Coagulation time of buffalo's kariesh cheese was 3h, and acidity, T.S, fat and S.N% were increased during storage period. Kariesh cheese has the highest protein content (19.99±1.32 g/100g) among Egyptian cheeses. Kariesh cheese has the lowest fat content (3.87±0.97 g/100g), and it is also reported that kariesh cheese has the highest moisture content with the lowest ash content (68.97±1.86 and 1.81±0.47 g/100g, respectively). Recently, use of chemicals and synthetic additives in milk and its dairy products became a path of controversy by consumers and food producers due to their proven and/or potential negative effects on health. Therefore, interest to natural additives and their use in dairy products systems have been increased. thyme and their extracts considered strong antimicrobial substances and successfully have been involved in cheese making with high consumer acceptability (Ismail and El-Demerdash 2003, Burt, 2004, Soliman *et al*., 2004, Blassy and Ismail 2003 and Hamad 2011).

Thyme and their extracts considered strong antimicrobial substances and successfully have been involved in cheese making with high consumer acceptability (Hayaloglu and Fox, 2008; Leuschner and Ielsch, 2003; Gammariello et al., 2008). In this study, kareish cheese made from Fresh raw buffalo's milk containing thyme with different concentrations for 60 days and it was aimed to determine the effects of those plant extracts on chemical, microbiological and organoleptic properties of the cheese.

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MATERIALS AND METHODS

Fresh raw buffalo's milk was obtained from Misr El-Khair farm, Arab El-Awamer, Abnoub, Assuit city, while, cow's milk was obtained from El-Hammam farm Abnoub, Assiut city. Iodized salt produced by El-Max Saline's Co. Alex, Egypt. Skim milk powder was obtained from local market at Assiut city. Rennet obtained from Assuit university faculty of agriculture, dairy science department. Thyme seeds were obtained from local market at Assiut city.

Yoghurt starter culture *(Lactobacillus delbrueckii subsp bulgaricus & Streptococcus thermophillus*) were obtained from Assuit university, faculty of agriculture, dairy science department.

All chemicals and reagents used in this study were of analytical grade supplied by BDH and Sigma chemical companies.

Thyme aqueous extracts were perpetrated according to the method of El-Mesery

Kariesh cheese was made according to the method of Effat *et al.* (2001). Yoghurt's starter (1%) was divided into 5 portions, 2 kg each. First one was taken as 0.0 (control), thyme aqueous extract was added in level of 0.5, 1.0, 2.0 and 3.0%. Then the milk was incubated at 40°C. After complete coagulation, the curd was ladled in cloth cheese till complete draining. Each Kariesh cheese treatment was taken out and weighted, 3 % salt was added to the curd, and then the cheese was pickled in its whey (10% salt) at 5±2°C for 2 months.

Moisture, total solids content, titratable acidity, total nitrogen (TN %) , soluble nitrogen, total protein, amino nitrogen, protein in dry matter and ash were estimated according to A.O.A.C (2000) .The total protein was calculated as TN % x 6.38 (Plummer, 1988). Fat content and fat in dry matter, using Gerber method according to Ling (1963

Salt content was determined by using the "Mohr method" of A.P.H.A (2004).

For the bacteriological analyses, preparation and dilutions of the samples were. Total bacterial counts (T.B.C.) in the cheese samples were determined with the standard plate count technique according to A.P.H.A., (2004). The presence of coliform bacteria was detected by the multiple tube technique. The sample dilutions were inoculated into

Panel test of cheese samples was carried out according to El-Hofi *et al*., (1991) The panel test was carried out by 10 panelist from both agricultural research station Assiut and Dairy science Department , Assuit University.

The obtained data were subjected to statistical analysis. Data were performed in computer using the SPSS package (SPSS 1998). Means were compared using L.S.D. test and the significantly of variations in cheese treatments were compared using F-test.

RESULTS AND DISCUSSIONS

Results in Table (1) illustrate the effect of adding different concentration of the thyme aqueous extract on the acidity of kariesh cheese, and storage for different periods at 5±2° C. It could be found that by increasing of the extract concentration resulted in an increase of the cheese acidity(%), with the lowest effect on the acidity of control sample (0.36±0.009%), and with the highest effect on the treated with thyme samples. Highly significant differences (F-test, P<0.01) were observed among used concentrations of thyme at all storage period, except after 15 day which had significant differences (P<0.05, F-test). This might be to the presence of highly loads of bacteria that convert lactose to lactic acid.

Table 1.Changes in acidity, ash, TS and SN% of kariesh cheese supplemented with thyme extract during storage.

Concentrations	Acidity %								Ash %							
	Storage periods/ days															
	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01
Control	0.36± 0.009^{cC}	0.37± 0.025^{cC}	0.4± 0.009^{cBC}	0.43± 0.03^{bB}	0.546± 0.05^{bA}	**	0.05	0.07	1.94± 0.09^{cC}	2± 0.19^{bBC}	2.19± 0.16^{bBC}	2.25± 0.12^{dB}	2.5± 0.15^{bA}	**	0.27	0.39
0.5 %	0.4± 0.009^{bC}	0.4± 0.009^{cC}	0.42± 0.02^{bBC}	0.45± 0.01^{cB}	0.57± 0.02^{cA}	**	0.035	0.04	1.96± 0.15^{D}	2± 0.1^{CD}	2.23± 0.19^{BC}	2.3± 0.09^{B}	2.7± 0.09^{cdA}	**	0.24	0.35
1 %	0.41± 0.01^{bBC}	0.4± 0.01^{cC}	0.44± 0.04^{bBC}	0.46± 0.01^{cB}	0.65± 0.05^{bA}	**	0.058	0.08	2± 0.19^{D}	2.08± 0.09^{CD}	2.3± 0.1^{BC}	2.35± 0.09^{B}	2.8± 0.1^{bcA}	**	0.22	0.32
2 %	0.45± 0.02^{aD}	0.46± 0.01^{bCD}	0.5± 0.02^{aBC}	0.52± 0.02^{bB}	0.71± 0.03^{abA}	**	0.04	0.06	2.04± 0.2^{C}	2.1± 0.09^{C}	2.39± 0.08^{B}	2.39± 0.09^{B}	2.9± 0.09^{abA}	**	0.22	0.31
3 %	0.48± 0.02^{aC}	0.49± 0.01^{aC}	0.5± 0.02^{aC}	0.57± 0.02^{aB}	0.72± 0.02^{aA}	**	0.04	0.05	2.07± 0.2^{C}	2.11± 0.09^{C}	2.4± 0.09^{B}	2.45± 0.05^{B}	3.01± 0.1^{aA}	**	0.21	0.31
F-test	**	**	*	**	**	-	-	-	NS	NS	NS	NS	**	-	-	-
LSD 0.05	0.03	0.03	0.04	0.04	0.07	-	-	-	-	-	-	-	0.2	-	-	-
LSD 0.01	0.04	0.04	0.06	0.06	0.1	-	-	-	-	-	-	-	0.28	-	-	-
Concentrations	TS %								S. N. %							
	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01
Control	25.54± 1.27	25.49± 1.3	26.13± 0.51	26.8± 0.95	27.13± 0.7	NS	-	-	0.185± 0.005^{aE}	0.22± 0.019^{aD}	0.28± 0.01^{aC}	0.42± 0.02^{B}	0.59± 0.001^{aA}	**	0.03	0.04
0.5 %	24.7± 1.37	25.5± 0.98	25.9± 0.89	25.99± 1.04	26.53± 0.65	NS	-	-	0.168± 0.007^{bC}	0.2± 0.01^{abD}	0.27± 0.01^{abC}	0.4± 0.09^{B}	0.56± 0.009^{bA}	**	0.011	0.016
1 %	24.65± 1.42	24.89± 0.85	25.16± 1.13	25.86± 0.91	26.16± 0.85	NS	-	-	0.168± 0.007^{bD}	0.18± 0.004^{bcD}	0.265± 0.004^{abC}	0.4± 0.02^{B}	0.53± 0.001^{cA}	**	0.02	0.03
2 %	24.55± 1.48	24.88± 1.15	24.96± 1	25.7± 0.75	25.93± 0.8	NS	-	-	0.17± 0.001^{bD}	0.18± 0.004^{bcD}	0.252± 0.002^{bcC}	0.35± 0.05^{B}	0.49± 0.01^{dA}	**	0.04	0.05
3 %	24.66± 2.01	24.7± 0.99	24.56± 0.77	25.73± 0.8	25.66± 0.55	NS	-	-	0.166± 0.007^{bD}	0.172± 0.002^{cD}	0.238± 0.007^{cC}	0.33± 0.01^{B}	0.49± 0.009^{eA}	**	0.01	0.02
F-test	NS	NS	NS	NS	NS	-	-	-	*	**	**	NS	**	-	-	-
LSD 0.05	-	-	-	-	-	-	-	-	0.011	0.02	0.01	-	0.02	-	-	-
LSD 0.01	-	-	-	-	-	-	-	-	0.016	0.03	0.02	-	0.03	-	-	-

abcdef letters indicate significant differences between concentrations. ABC letters indicate significant differences between storage periods.
NS: non-significant *: Significant **: Highly Significant.

From data presented in Table (1) it could be observed that, non-significant differences (F-test) were found among concentrations at storage periods except 60 days, which had high significant differences (F-test, P<0.01). Ash content increased during storage periods as a result of increasing salt in cheese during storage with high significant differences (F-test, P<0.01).

Data illustrated in Table (1) show that TS% increased during storage periods, and reached to 27.13±0.7, 26.53±0.65, 26.16±0.85, 25.93±0.8 after 60 days and 25.66±0.55% for control, and cheeses with added 0.5, 1.0, 2.0 and 3.0% of added thyme aqueous extract respectively, which came in agreement whith Saad and abdel-Salam (2015)

As with the soluble nitrogen (SN) content of the examined cheeses,

results in Table (1) show that the highest of SN content (0.185±0.005%) was found in control sample, while the treated cheese with 0.5, 1.0, 2.0 and 3.0% thyme extract contained 0.168±0.007, 0.168±0.007, 0.17±0.001 and 0.166±0.007 %, respectively. Data also clearly show that, SN content increased during storage periods, which might be to the protein hydrolysis, thus, data after 60 days were 0.59±0.001, 0.56±0.009, 0.53±0.001, 0.49±0.01 and 0.49±0.009% for control, 0.5, 1.0, 2.0 and 3.0%, respectively. High significant differences (F-test, P<0.01) were found among concentrations at 15, 30 and 60 days, while significant differences (P<0.05, F-test) were recorded at fresh cheese and non-significant differences (F-test) were recorded at 45 days of storage.

Data shown in Table (2) illustrate that non-significant differences (F-test) appeared among different concentrations during all storage periods. TN contents were 2.9± 0.28, 2.95±0.25, 2.97±0.33, 3.07±0.3 and 2.99±0.09% for control, 0.5, 1.0, 2.0 and 3.0%, respectively. It could also be shown that TN% decreased during storage to 2.54±0.05, 2.6±0.09, 2.67±0.97, 2.7±0.01 and 2.7±0.04 for control, 0.5, 1.0, 2.0 and 3.0%, after 60 days of storage, respectively without significant differences (F-test).

Table 2. Changes in T.N., AN, TP and TP/DM % of kariesh cheese supplemented with thyme extract during storage.

Concentrations	T. N. %								T.P.%							
	Storage periods/ days															
	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01
Control	2.9± 0.28	2.9± 0.02	2.81± 0.13	2.63± 0.21	2.54± 0.05	NS	-	-	18.5± 1.8	18.5± 0.16	17.94± 0.88	16.79± 1.36	16.38± 0.34	NS	-	-
0.5 %	2.95± 0.25	2.91± 0.1	2.9± 0.1	2.7± 0.09	2.6± 0.09	NS	-	-	18.83± 1.5^{A}	18.58± 0.69^{A}	18.51± 0.66^{A}	17.22± 0.63^{AB}	16.55± 0.63^{B}	*	1.67	2.38
1 %	2.97± 0.33	2.94± 0.09	2.9± 0.02	2.76± 0.06	2.67± 0.07	NS	-	-	18.94± 2.1	18.79± 0.57	18.64± 0.32	17.64± 0.39	17.07± 0.45	NS	-	-
2 %	3.07± 0.3	3± 0.1	2.94± 0.04	2.8± 0.09	2.7± 0.01	NS	-	-	19.62± 1.9	19.15± 0.63	18.75± 0.29	17.9± 0.57	17.22± 0.13	NS	-	-
3 %	2.99± 0.09	2.9± 0.49	2.85± 0.03	2.81± 0.07	2.7± 0.04	NS	-	-	19.42± 0.57^{A}	19.09± 0.59^{A}	18.73± 0.22^{AB}	17.92± 0.51^{BC}	17.22± 0.31^{C}	**	0.84	1.2
F-test	NS	NS	NS	NS	NS	-	-	-	NS	NS	NS	NS	NS	-	-	-
LSD 0.05	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LSD 0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Concentrations	TP/DM							
	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01
Control	70.52± 7.08	69.73± 0.62^{c}	68.67± 3.38^{c}	62.68± 5	60.± 1.2^{bc}	NS	-	-
0.5 %	76.28± 6.45^{A}	72.88± 2.6^{bcAB}	71.42± 2.46^{bcAB}	66.25± 2.45^{BC}	62.51± 2.4^{cC}	**	6.63	9.44
1 %	76.82± 8.69^{A}	75.47± 2.3^{abcAB}	74.1± 1.29^{abAB}	68.11± 1.49^{BC}	65.25± 1.72^{abcC}	*	7.62	10.84
2 %	79.81± 7.86^{A}	76.88± 2.5^{abA}	75.12± 1.13^{abAB}	69.66± 2.24^{BC}	66.43± 0.48^{abC}	*	7.04	10.01
3 %	80.4± 2.33^{A}	77.77± 2.5^{aA}	76.26± 0.91^{aA}	70.11± 1.99^{C}	67.1± 4.24^{aB}	**	3.49	4.97
F-test	NS	*	**	NS	*	-	-	-
LSD 0.05	-	4.13	3.76	-	2.83	-	-	-
LSD 0.01	-	5.87	5.35	-	4.03	-	-	-

abcdef letters indicate significant differences between concentrations. ABC letters indicate significant differences between storage periods.
NS: non-significant *: Significant **: Highly Significant

Regarding the total protein (TP) % contents of the examined cheeses, the obtained results in Table (2) show that control cheese and cheeses with added , 0.5, 1.0, 2.0 and 3.0% thymine contained 18.51±1.8, 18.83±1.5, 18.94±2.1, 19.62±1.9 and 19.42±0.57%, when fresh, respectively. TP% decreased during storage period as a result of protein analysis and it reach after 60 days to 16.38±0.34, 16.55±0.63, 17.07±0.45, 17.22±0.13 and 17.22±0.31% for control, 0.5, 1.0, 2.0 and 3.0%, respectively. Non-significant differences (F-test) were found among storage periods in case of control, 1.0 and 2.0% while, significant differences (P<0.05, F-test) were found in case of 0.5% and high significant differences (F-test, P<0.01) were found in 3.0%.

Treated cheese contents of total protein in dry matter (TP/DM) were shown in Table (2). TP/DM% in fresh cheese were 70.52±7.08, 76.28±6.45, 76.82±8.69, 79.81±7.86 and 80.4±2.33% for control, 0.5, 1.0, 2.0 and 3.0%, respectively. Non-significant differences (F-test) were found among concentrations in fresh and after 45 days of storage, while significant differences (P<0.05, F-test) were found after 15 and 60 days, and highly significant differences (F-test, P<0.01) were found after 30 days.

From the same results it could be revealed that, TP/DM% decreased with increasing storage period. and reached to after 60 days 60.00±1.2, 62.51±2.4, 65.25±1.72, 66.43±0.48 and 67.1±4.24%, after 60 days for control, 0.5, 1.0, 2.0 and 3.0%, respectively. Non-significant differences (F-test) were found among storage periods at control sample while significant differences (P<0.05, F-test) were found in 1.0 and 2.0% and high significant differences (F-test, P<0.01) were found in 0.5 and 3.0%.

Fat content of the examined cheese is illustrated in in Table (3). Non-significant differences (F-test) were found in all concentrations, except after 60 days of storage which was highly significant (F-test, P<0.01). Increasing the storage period resulted in an increase in the fat content of cheeses. Kariesh cheese stored for 60 days which had high significant differences (F-test, P<0.01) among its concentrations, Non-significant differences (F-test) were found in the rest values in different storage periods.

Fat in dry matter (Fat/DM), on the other hand indicated in Table (3) show that fat/DM values for 0.5, 1.0, 2.0 and 3.0 % were 3.63±0.4, 3.7±0.62, 3.73±0.64 and 3.82±0.38%, respectively, compared with control sample 3.13±0.38%. The Fat/DM became 3.56±0.15, 3.91±0.17, 4.01±0.17, 4.23±0.38 and 4.74±0.3 after 60 days for control, 0.5, 1.0, 2.0 and 3.0%, respectively. Non-significant differences (F-test) were found among concentrations in fresh cheese and after 30 days while significant differences (P<0.05, F-test) were found after 15 and 45 days, high significant differences (F-test, P<0.01) were found after 60 days.

Table 3. Changes in fat, fat/DM, salt and salt/water% of kariesh cheese supplemented with thyme extract during storage.

Concent-rations	Fat %								Fat/DM %							
	Storage periods/ days															
	0	**15**	**30**	**45**	**60**	**F-test**	**LSD 0.05**	**LSD 0.01**	**0**	**15**	**30**	**45**	**60**	**F-test**	**LSD 0.05**	**LSD 0.01**
Control	0.8± 0.09	0.82± 0.02	0.84± 0.09	0.91± 0.03	0.96± 0.04^{c}	NS	-	-	3.13± 0.38	3.23± 0.1^{b}	3.31± 0.36	3.4± 0.13^{c}	3.56± 0.15^{c}	NS	-	-
0.5 %	0.9± 0.09	0.92± 0.07	0.95± 0.05	0.97± 0.02	1.04± 0.04^{bc}	NS	-	-	3.63± 0.4	3.63± 0.29^{ab}	3.66± 0.19	3.79± 0.09^{bc}	3.91± 0.17^{bc}	NS	-	-
1 %	0.93± 0.15	0.95± 0.07	0.96± 0.04	0.99± 0.05	1.05± 0.04^{bc}	NS	-	-	3.7± 0.62	3.78± 0.3^{a}	3.81± 0.15	3.84± 0.19^{ab}	4.01± 0.17^{bc}	NS	-	-
2 %	0.92± 0.11	0.95± 0.05	1.0± 0.09	1.03± 0.06	1.1± 0.1^{ab}	NS	-	-	3.73± 0.46	3.82± 0.2^{a}	4.0± 0.39	4.03± 0.23^{ab}	4.23± 0.38^{b}	NS	-	-
3 %	0.94± 0.09^{B}	0.99± 0.04^{B}	1.0± 0.09^{B}	1.05± 0.07^{B}	1.21± 0.07^{aA}	*	0.14	0.2	3.82± 0.38	4.0± 0.18^{a}	4.06± 0.4	4.12± 0.29^{a}	4.74± 0.3^{a}	NS	-	-
F-test	NS	NS	NS	NS	**	-	-	-	NS	*	NS	*	**	-	-	-
LSD 0.05	-	-	-	-	0.12	-	-	-	-	0.42	-	0.37	0.46	-	-	-
LSD 0.01	-	-	-	-	0.17	-	-	-		0.59	-	0.52	0.65	-	-	-
Concent-rations	Salt %								Salt/water%							
	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01	0	15	30	45	60	F-test	LSD 0.05	LSD 0.01
Control	1.68± 0.16^{bB}	1.79± 0.25^{bB}	1.8± 0.26^{bB}	1.9± 0.15^{cAB}	2.27± 0.15^{bA}	*	0.37	0.53	2.25± 0.21^{bB}	2.39± 0.34^{bB}	2.43± 0.35^{bB}	2.68± 0.2^{bAB}	3.12± 0.21^{bA}	*	0.5	0.72
0.5 %	1.76± 0.06^{C}	2.03± 0.15^{B}	2.3± 0.1^{B}	2.4± 0.05^{bcB}	2.5± 0.1^{bA}	**	0.18	0.25	2.33± 0.08^{C}	2.72± 0.2^{B}	2.79± 0.13^{B}	2.86± 0.06^{bcB}	3.38± 0.12^{bcA}	**	0.24	0.34
1 %	1.76± 0.06^{C}	2.05± 0.05^{B}	2.09± 0.15^{B}	2.3± 0.03^{bcB}	2.6± 0.1^{dA}	**	0.16	0.23	2.33± 0.08^{C}	2.72± 0.06^{B}	2.78± 0.2^{B}	2.81± 0.05^{bcB}	3.52± 0.13^{bA}	**	0.21	0.3
2 %	1.77± 0.06^{C}	2.11± 0.08^{B}	2.35± 0.15^{B}	2.55± 0.06^{bB}	2.7± 0.09^{bA}	**	0.17	0.24	2.36± 0.08^{C}	2.81± 0.11^{B}	2.94± 0.2^{BC}	3.26± 0.09^{abB}	3.64± 0.12^{bA}	**	0.43	0.61
3 %	1.79± 0.06^{D}	2.11± 0.1^{C}	2.17± 0.14^{BC}	2.31± 0.07^{aB}	3.0± 0.09^{aA}	**	0.17	0.25	2.37± 0.08^{C}	2.79± 0.13^{B}	2.99± 0.37^{B}	3.11± 0.1^{aB}	4.04± 0.12^{aA}	**	0.35	0.5
F-test	NS	NS	NS	**	**	-	-	-	NS	NS	NS	*	**	-	-	-
LSD 0.05	-	-	-	0.15	0.2	-	-	-	-	-	-	0.21	0.26	-	-	-
LSD 0.01	-	-	-	0.22	0.28	-	-	-	-	-	-	0.3	0.38	-	-	-

abcdef letters indicate significant differences between concentrations. ABC letters indicate significant differences between storage periods.
NS: non-significant *: Significant **: Highly Significant

Concerning the salt content of the testes cheeses indicated in Table (3) show that the detected salt% in the examined cheese when fresh for control, 0.5, 1.0, 2.0 and 3.0% were 1.68±0.16, 1.76±0.06, 1.76±0.06, 1.77±0.06 and 1.79±0.06%, respectively. Non-significant differences (F-test) were found among concentrations fresh cheese and after 15 and 30 days, while, high significant differences (F-test, P<0.01) were found after 45 and 60 days. Salt % increased to reach 2.27±0.15, 2.5±0.1, 2.6±0.1, 2.7±0.09 and 3±0.09 for control, 0.5, 1.0, 2.0 and 3.0%, respectively after 60 days of storage.

Except control sample which had significant differences (P<0.05, F-test) among storage periods, while other concentrations have high significant differences (F-test, P<0.01) among storage periods.

Data of salt in serum in Table (3) show Non-significant differences (F-test) were found among concentrations fresh cheese, 15 and 30 days while significant differences (P<0.05, F-test) were found after 45 days storage and high significant differences (F-test, P<0.01) were found after 60 days of storage. On the other hand storage periods had high significant differences (F-test,

P<0.01) at all concentrations except control which had significant differences (P<0.05, F-test

Results of organoleptic properties in Table (4) indicate that Non-significant differences (F-test) were found among concentrations during storage periods in all properties. The best score recorded for fresh cheese and after 15, 30, 45 and 60 days was at concentrations 0.5, 1.0, 1.0, 0.5 and 0.5%, respectively. Some molds were appeared in control sample after 30 days of storage accordingly, organoleptic properties didn't done during this period. These results were in accordance with El-Bialy (2016) who reported that total score decrease during storage comparable with fresh sample.

Table 4. Organoleptic properties of kariesh cheese supplemented with thyme extract during storage period at 5±2° C

Concentrations	Body & Texture (40)					Flavour (50)				
	Storage periods/ days									
	0	**15**	**30**	**45**	**60**	**0**	**15**	**30**	**45**	**60**
Control	37.2±3.5	35.33±6.94	36.6±3.8	-	-	46.7±4.57	42.33±4.45	46.2±2.77	-	-
0.5 %	36.9±6.17	33.83±4.4	38.4±2.3	39±1.58	37.71±1.6	45.9±6.7	43.33±5.64	47.4±4.33	48.66±1.5	47±1.73
1 %	37.4±4.62	36.5±3.27	39.6±0.86	39±1.22	35.85±5.08	47±4.59	46.33±2.94	49.8±0.44	48.11±1.53	45.14±6.71
2 %	37.6±2.79	35±3.03	37±4.24	37.55±2.29	37.42±2.38	47±3.88	43.83±3.65	46.4±3.04	47.22±1.71	46.42±2.99
3 %	36.6±4.22	33.5±3.88	37.8±1.92	38.66±1.93	36.42±3.69	46.1±3.81	44.16±3.71	46.2±1.3	46.33±1.93	42.85±10.18
F-test	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
LSD 0.05	-	-	-	-	-	-	-	-	-	-
LSD 0.01	-	-	-	-	-	-	-	-	-	-
Concentrations	General appearance (10)					All over scores (100)				
	Storage periods/ days									
	0	15	30	45	60	0	15	30	45	60
Control	9±1.05	7.66±1.96	9.2±1.3	-	-	92.9±7.5	81.83±10.10	92±6.21	-	-
0.5 %	9.1±1.59	7.83±1.47	9.8±0.44	9.55±0.72	9.14±0.69	91.9±14.24	85±11.13	95.6±6.98	97.11±3.29	93.14±3.89
1 %	9.1±0.99	8.33±1.36	10±0.0	9.33±0.86	8.57±0.97	93.5±10.05	91.16±7.41	99.4±1.34	96.44±2.65	89±12.3
2 %	9±0.81	7.5±1.5	9.4±0.89	9±1.41	8.14±1.77	92.3±8.08	86.33±7.86	92.8±9.47	94.11±4.98	91.85±4.37
3 %	8.9±1.19	7.16±1.72	8±1.87	9.22±1.39	8.14±1.83	91.5±7.54	84.83±8.84	91.2±3.27	94.88±4.53	87.28±14.57
F-test	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
LSD 0.05	-	-	-	-	-	-	-	-	-	-
LSD 0.01	-	-	-	-	-	-	-	-	-	-

NS: non-significant.

Microbiological properties:

Table (5) showed microbiological properties of kariesh cheese supplemented with different concentrations of thyme aqueous extracts (0.0, 0.5, 1.0, 2.0 and 3.0%) during storage period (0, 15, 30, 45 and 60 days). As seen from data in the Table, control sample had the highest bacterial counts (6.83±0.01) log cfu/g, while other concentrations were 6.53±0.03, 6.44±0.03, 6.34±0.05 and 6.08±0.08 log cfu/g for 0.5, 1.0, 2.0 and 3.0% respectively.

Table 5.Microbiological properties of kariesh cheese supplemented with thyme aqueous extracts during storage period

Concentrations	Storage periods/ days							
	0	**15**	**30**	**45**	**60**	**F-test**	**LSD 0.05**	**LSD 0.01**
	Log (cfu/gm)							
Control	6.83 ± 0.01^{aE}	6.88 ± 0.01^{aD}	6.93 ± 0.01^{aC}	6.97 ± 0.01^{aB}	7.00 ± 0.01^{aA}	**	0.03	0.04
0.5 %	6.53 ± 0.03^{bD}	6.58 ± 0.01^{bC}	6.62 ± 0.02^{bC}	6.67 ± 0.01^{bB}	6.73 ± 0.02^{bA}	**	0.04	0.06
1 %	6.44 ± 0.03^{cC}	6.56 ± 0.03^{bcB}	6.6 ± 0.02^{bB}	6.67 ± 0.01^{bA}	6.72 ± 0.03^{bA}	**	0.05	0.08
2 %	6.34 ± 0.05^{dD}	6.49 ± 0.03^{cC}	6.6 ± 0.03^{bB}	6.65 ± 0.02^{bcAB}	6.7 ± 0.04^{bA}	**	0.07	0.1
3 %	6.08 ± 0.08^{eD}	6.26 ± 0.08^{dC}	6.47 ± 0.04^{cB}	6.62 ± 0.02^{cA}	6.68 ± 0.03^{bA}	**	0.11	0.15
F-test	**	**	**	**	**	-	-	-
LSD 0.05	0.09	0.08	0.05	0.04	0.05	-	-	-
LSD 0.01	0.13	0.12	0.07	0.06	0.08	-	-	-

abcdef letters indicate significant differences between concentrations. ABC letters indicate significant differences between storage periods
****: Highly Significant.**

It can be concluded from the same Table that, the extracts have inhibitory effects on the bacteria in general, with increasing the added thyme aqueous extracts concentration the bacterial total counts decreased. High significant differences (F-test, P<0.01) were found among different concentrations at all storage periods in both extracts.

Results also showed that, bacterial load were increased during storage periods and it reach 7±0.01 log cfu/ml in control sample after 60th days, while at 3.0% cumin and thyme it reach 6.57±0.03 and 6.68±0.03 after 60th days with high significant differences (F-test, P<0.01) between storage periods at different concentrations in both extracts, respectively. These results not in accordance with Blassy and Ismail (2003) and Hamad (2011) who revealed that total bacterial count in kariesh cheese was decrease during storage, while it was in accordance with those reported by Wahba etal., (2010) who found that the addition of plant materials to Kariesh cheese reduced the total bacterial and coliform populations and with Saad and abdel-Salam (2015) who illustrate that the total colony count of plain cheese significantly increased (P<0.05) through the storage period.

Regarding to coliform bacteria detection, it could be observed that, coliform bacteria had not been detected at all investigated samples. This may be attributed to a good quality of raw material and a good heat treatment which applied.

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تأثير إضافة مستخلص الزعتر المائي علي الصفات الكيماوية والميكروبيولوجية والحسية للجبن القريش

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في هذة الدراسة تم تجهيز مستخلص مائي من بذور نبات الزعتر وتم إضافتة للجبن القريش المصنع من لبن جاموسي فرز بنسبب 0.5و2.0 و3.0 % وتم تحليل عينات الجبن المصنعة عند أوقات تخزين مختلفة شملت بداية الصناعة وبعد 15 و 30 و 45 و 60 يوم من التخزين تحت درجة حرارة 5 درجة مئوية لكل من الصفات الكيماوية حيث تم تقدير النسب المئوية لكل من الحموضة- المادة الجافة الكلية –الرماد- النيتروجين الذائب –النيتروجين الكلي – النيتروجين الاميني- البروتين الكلي – البروتين في المادة الجافة – الدهن – الدهن بالمادة الجافة – الملح – الملح في السيرم . أيضا تم تقييم العدد الكلي للبكتريا وكذا الكشف عن وجود بكتيريا القولون في جميع المعاملات خلال مدد التخزين المشار إليها سلفاً . ودلت النتائج المتحصل عليها أن نسبة الحموضة إزدات بزيادة نسب الزعت المضافة وكذلك بزيادة فترة التخزين وكذلك الحال بالنسبة لكل من الرماد والجوامد الصلبة الكلية وكذلك النيتروجين الذائب زادت قيمة زيادة معنوية بزيادة مدة التخزين نتيجة لتحليل البروتين , علي الجانب الاخر لم يكن تأثير الاضافة والتخزين تأثيرا معنويا علي كل من النيتروجين الكلي و البروين بالتالي وكذلك البروتين بالمادة الجافة وعلي العكس النيتروجين الاميني زادت قيمتة بزيادة الزعتر المضاف وكذلك بزيادة مدة التخزين وكانت الزيادات معنوية. نسبة الدهن في الجبن إزدات بزيادة التخزين ولكن الزيادات لم تكن معنوية وكذلك الحال بالنسبة للدهن بالمادة الجافة , وفيما يتعلق بالملح في الجبن بزيادة مدة التخزين إزدادت نسبة الملح في الجبن وكانت الزيادة معنوية ولكن تأثير نسبة المستخلص غير معنوي حتي مدة تخزين 45 و 60 يوم التي اضحت الزيادات معنوية و بالمثل كانت نسبة الملح بالسيرم . وفيما يتعلق بالخواص الحسية حصلت الجبن المضاف إليها مستخلص زعتر بنسبة 1% بعد30 يوم من التخزين علي أعلي النقاط ( ) وكانت أقل النقاط للجبن الكنترول بعد15 يوم من التخزين . وفيما يتعلق الجودة الميكربيولوجية فقد دلت النتائج علي أن زيادة المستخلص المائي للجبن أدي الي إنخفاض الاعدا الكلية للبكتيريا إنخفاضا ملحوظا بينما أدت زيادة مدة تخزين الجبن إلي زيادة الحمولة الميكروبيولوجية ولكن الزيادات لم تكن أكثر من عينات الجبن الكنترول الغير مضاف إليها مستخلص الزعتر .