

Extension of Kareish Cheese Shelf Life by Using Mentha Spicata Extracts

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ABSTRACT

The effect of using Mentha spicata extract (water and alcohol) in Kareish cheese making at concentration of (0.025, 0.05 and 0.1% w/w) and its effect on its chemical composition, microbiological properties, yield, rheological and sensory characteristics was investigated. The results revealed that, the addition of mentha extract either water or alcohol extract decreased the total solids content of resultant cheese compared with control. The same behavior was in Protein, salt and ash content. The lowering in Some Rheological characteristics were observed in treated cheeses. Kareish cheese made with 0.05% v/v in both types of extraction gained high sensory evaluation scores either it was fresh or after 30 days compared with control cheese. In addition, cheese made with Mentha spicata extract (alcohol or water) 0.1% had the lowest number of microbiological properties either fresh or 30 days compared with other treatments and control cheese. Furthermore, extension shelf life reached 30 days with the Mentha spicata extracts as compared with control cheese. No abnormal flavours were detected as well the bright white colour of cheese is not changed. recommended to added 0.05 water extract from sensory evaluation and economic point view.

Keywords: Kareish cheese, Mentha spicata, extract, shelf life, alcohol

INTRODUCTION

Kareish cheese is the main soft cheese processed by the farmer in the all villages of Egypt. It is processed from raw buffalo milk by kept it in earthen pots over night to coagulate with its normal micro flora, then, the cream found on the surface of coagulum leaving about third of the content of milk. the coagulum is filtrated through the mats, made from the stamps plants. Mats are hanged over night to get rid of the acidic were cut into small pieces (40-120 gms) and dry salt was sprinkled. The cheese is consumed freshly. wrongly it is known as skimmed milk cheese where it contains a poor of fat left into milk during coagulation. the modification method is to use the separator to have nearly all the cream and the skim milk is heated to destroy most of microorganisms. The yoghurt starter was added at 38 °c for more than 7 hours to have firm coagulant. It is highly accepted as a functional cheese. it has only 14 days keeping quality at refrigerator. Kareish cheese becomes very popular due to remarkable health quality for that kind of cheese as only known relatively fat free cheese consumed by the Egyptians. It is often recommended for persons suffering from obesity, cholesterol and heart diseases. The increasing demand for it by the Egyptian consumers is mainly attributed to its lower price (Abou-Donia *et al.*, 1975). It has high protein content and makes a balanced meal when mixed with some vegetable oil and fresh pieces of tomato. As Kareish cheese commonly contains high moisture content and is not pickled after processing, it must consume in a few days. Its maximum shelf-life does not exceed 12 days at 5 C (Abou-Dawood and Gomai, 1977). (Youssef *et al.* 1981) tried to increase its shelf-life and organoleptic quality by pickling it in salted whey or by adding salt to the curd in addition to pickling.

So, this work aims to extend the shelf life of Kareish cheese by Mentha spicata extracts as natural preservatives and to determine its effect on the characteristics of resultant cheese.

MATERIALS AND METHODS

Materials

Whole fresh buffalo milk was obtained from the experiential center of the Dairy Department, Faculty of Agriculture Mansoura University. Having 16.78 %Ts, 6.1% fat, 3.75 % protein, 4.7 % lactose and 0.9 % ash.

Alfa-laval separator 100 lb of milk capacity was used to separate the cream. Mentha spicata the herb was bought from local market. Yoghurt starter culture was obtained from Ch. Hansen's Laboratories, Denmark "*Streptococcus thermophilus* and *Lactobacillus elbrukiisubspbulgaricus*". Dry commercial food grade sodium chloride was taken from El-Nasr Salines Company, Egypt. Chemicals used for the detecting of the acidity, protein, etc, were obtained from El-Gomhoriacompany for chemicals and glasses.

Methods

Kareish cheese made by traditional method described by Abo donia, (1975). Mentha spicata extracts were prepared as the method described by (El-Shemyet *et al.*, 2012).

Mentha spicata extract preparation

Water and ethanol extracts were prepared and added to the curd before filling into mats at 0.025, 0.05 and 0.1 % the cheese kept at refrigerator for 30 days. Physicochemical, microbiological analysis were done at zero, 10, 20 and 30 days. Parallel sensory evolution by trained judges were followed. Results showed that extension shelf life reached 30 days with the Mentha spicata extracts as compared with control cheese. No abnormal flavors were detected as well the bright white colour of cheese is not changed. recommended to added 0.05 water extract from sensory evaluation and economic point view.

Total phenolics compounds (TPC) were determined by the method described by Farnad *et al.*, (2014). Fractionation of phenolic compounds were determined by HPLC according to the method of (Goupy, *et al.*, 1999). Total flavonoids content was determined according to the method described by Jia *et al.* (1999). The antioxidant activity of samples was determined by the 2, 2'-Diphenyl-1-picryl hydrazyl (DPPH) radical scavenging activity according to the colorimetric method described by (Brand-Williams *et al.* 1995). Fat content, titratable acidity as lactic acid percent, total protein and ash content were determined as the methods described by Ling, (1963).

Cheese total solids (T.S %) was determined as described by the Association of Official Analytical Chemists (A. O. A. C., 1990). pH of cheese samples was measured by using a digital pH-meter by direct immersing the glass electrode in cheese sample. Cheese yield was

confined according to the formulation which reported by Metzger *et al.*(2000).

Microbial analysis

American Public Health Association (1992) described methods in which samples of kareish cheese were analyzed for total viable bacterial count (T.C).

Coliform Bacterial Count (CFBC) :

It was estimated using MacConkey Agar Medium (Oxid, Basingstoke, Hampshire, England) according to (Difco 1977).

Fungi and Yeasts Count (FYC) :It was carried out on Potato Dextrose Agar (PDA) Medium according to Chalmers (1962).

Pre-cheese Coagulation time (CT).was determined as the method described by Davies and White, 1958. Curd tension: It was determined by using the method of (Chandrasekhara, *et al.*, 1975) the results were expressed as weight in grams required to get a knife out the curd. Curd Syneresis was determined as the described method by Lawrence, (1959).

Organoleptic properties were evaluated by the score system flavor (40 points), body and texture (30 points) and appearance (30 points) according to (Hassan 1996).

RESULTS AND DISCUSSION

Results in Table (1) illustrate the chemical composition of Mentha

Table 1. composition of Mentha spicata

phenolic compound	Mg
1-Naphtol	5.38
Rutin	12.36
Ascorbic acid	1.20
Chlorogenic acid	21.49
Ferulic acid	5.42
4-Hydroxy benzoic acid	6.21
Caffeic acid	9.88
Ellagic	8.41
P hydroxy benzoic	2.15
Coumarin	0.564
Pyrogallol	1.059
Protocatechuic	2.132

(DPPH %)=82.82 %

Total flavonoid (4.34 g Quercetin/100 g)
total phenolic compounds content methanol extract had
maximum phenol content (6.57 g Gallic acid/100 g

total phenolic compounds content in water extract(3.43 Gallic acid/100 g)

Data illustrated in Table (2) show the effect of Mentha spicata extract type on the inhibition of some microbial kind. This data reveal that there was a significant effect for the menthe extracts either in alcohol or water type on the inhibition of tested microbial kinds. Micrococci spp. gained the highest inhibition zone area among other tested microbial kinds followed by E. coli and these data are in agreement with (Adiguzel A 2009) who, decided that menthe had great inhibition effect on the growth and viability of some microbial types in food products.

Skim milk was obtained from dairy department, Faculty of agriculture, Mansoura University.

Data illustrated in Table (3) show the differences in some rheological properties of primary curd of Kariesh cheese treatments and these data revealed that as the concentration of both extracts the milk coagulation time increased being 110, 118 and 130 for alcohol extract ratios (0.025, 0.05 and 0.1%) respectively and was (105,117 and 126) for water extract respectively compared with 90 seconds for control. The addition of both extraction affected milk coagulation time and these data might be due to the effect of some compounds of Mentha spicata on delaying the activity of starter bacteria used on the fermentation process.

Curd tension: the addition of both extracts decreased the curd tension of the coagulum in a positive trend with the increasing of the concentration level. In general long time of coagulation and the differences in the acid content had obviously effect in the curd tension values.

Syneresis : As the extract level increase ,the Syneresis decreased in the other ward the curd had a higher content of water due to the increasing in the water holding capacity and that also might be a result from the low starter activity and the decreasing in the acid content with the increasing of menthe extract level in both types of extraction.

Table 2. Effect of addition mentha spicata extract on microorganisms as inhibition zone.

Treatments	Staph	E coli	Micrococcus
Alcoholic extract	1.2	1.7	2.2
Water extract	1.0	1.2	1.6

Table 3. some rheological properties of Kariesh cheese primary curd treated with Mentha spicata extracts

Treatments	Coagulation time (sec)	Curd tension	Curd syneresis (gm/30gm)		
			30m	60m	120m
Control	90	133.2	15.79	17.10	18.18
Alchol 0.025	110	111.68	17.85	18.38	19.66
Alchol 0.05%	118	108.12	16.98	17.17	18.08
Alchol 0.1%	131	103.43	14.63	14.89	15.94
Water 0.025	105	110.93	13.98	14.38	16.00
Water 0.05	117	88.48	13.68	14.40	15.90
Water 0.1	126	82.56	15.43	15.95	17.21

Data in the same Table indicate that there was different effect on the values of curd syneresis as affected by the type of extraction. So, alcohol treatments had strongest effect on the behavior of curd syneresis than water extract treatments, and that might be due to its effect on the strength of coagulation process. Moreover, the illustrated

data for the effect of alcohol extract levels on the curd syneresis show that the low levels of alcohol extract may have a encouraging effect for starter bacteria, which revealed on the curd strength and whey disposal.

Data presented in Table (4) reveal that the cheese yield was affected by the extract type and its concentration

ratio. Whereas, the low concentration treatments either in water or alcohol extract had the lowest yield among other treatments and control (22.25 and 20%) for the concentration 0.025% of water and alcohol extract respectively, that might be due to the encouraging effect of low concentration for starter bacteria used types. Unlike

that the high concentration of two types of menthe extracts treatments had the highest cheese yield and that might be as a result to the low whey disposing ability and the increasing in the water binding ability of the curd due to the decreasing in the acidity of resultant cheese.

Table 4. effect of extract addition on gross chemical composition of kareish cheese .

Storage period	Treatments	TS%	TP%	Fat	Ash%	Acidity%	pH	Yield
Fresh	Control	23.75	17.65	2.30	1.850	1.01	4.86	23.66
	Alchol 0.025	23.59	17.71	2.30	1.975	0.99	4.70	22.25
	Alchol 0.05%	22.96	17.07	1.95	1.920	0.75	4.65	24.00
	Alchol 0.1%	22.88	16.63	1.90	1.983	0.71	4.58	24.25
	Water 0.025	23.84	17.90	2.35	1.980	1.00	4.84	20.00
	Water 0.05	22.53	17.60	2.00	1.940	0.74	4.80	21.75
	Water 0.1	22.27	16.65	1.95	1.890	0.72	4.70	23.75
10	Control	23.80	17.88	2.35	1.890	1.33	4.82	
	Alchol 0.025	23.75	17.85	2.48	1.995	1.00	4.55	
	Alchol 0.05%	23.10	17.31	2.15	1.935	0.78	4.50	
	Alchol 0.1%	22.95	16.75	2.00	1.995	0.73	4.50	
	Water 0.025	23.95	18.15	2.60	1.990	1.03	4.80	
	Water 0.05	22.75	17.75	2.10	1.955	0.80	4.70	
	Water 0.1	22.40	16.80	2.07	1.915	0.80	4.65	
20	Control	23.93	17.95	2.38	1.915	1.15	4.75	
	Alchol 0.025	23.90	17.92	2.65	2.105	1.02	4.65	
	Alchol 0.05%	24.00	18.00	2.54	1.985	0.89	4.35	
	Alchol 0.1%	23.05	16.86	2.30	2.150	0.78	4.45	
	Water 0.025	24.10	18.20	2.82	1.995	1.05	4.60	
	Water 0.05	22.90	17.85	2.28	1.968	0.89	4.55	
	Water 0.1	22.62	16.98	2.15	1.925	0.89	4.60	
30	Control	23.59	17.71	2.30	1.975	0.84	4.70	
	Alchol 0.025	24.15	18.65	2.80	2.225	1.19	4.30	
	Alchol 0.05%	24.00	18.00	2.54	1.985	0.89	4.35	
	Alchol 0.1%	23.50	17.22	2.45	2.220	0.83	4.40	
	Water 0.025	24.75	18.30	2.90	2.150	0.98	4.35	
	Water 0.05	23.50	18.05	2.40	1.985	0.94	4.40	
	Water 0.1	22.90	17.05	2.25	1.955	0.92	4.55	

Data in the same Table reveal that all cheese determined items were affected by the type of *Mentha spicata* extract and its concentration. There isn't great differences between low concentration of two extract type and control either at the beginning or during all storage periods and that might be due to the low moisture content of resultant cheese in compare with other treatments. From that results there are great evidence that the low concentrations of menthe had an encouraging effect for starter bacteria used for fermentation but the high concentration especially on alcohol extract had delaying effect for it and other bacteria types in cheese microfloura. In addition, *Mentha spicata* water extract have low effect on the viability of starter bacteria type used either on low or high concentration and that was obvious on all determined items either on fresh or stored treatments. All determined items were increased during the progress in the cheese shelf life. For all treatments as storage period advance, the total solids gradually increased as compared control the addition of extracts increased the capability of holding the water .as for extract when the concentration increased up to 0.1% the total solids turned to decrease again. Fresh and 30 days alcohol treatments scored (22.88/23.50), (22.96/24.00)and (23.59/24.15) for 0.1, 0.05 and 0.025 % . Similar to alcohol extract water extract started to decrease at 0.1% concentration being (22.27/22.90), (22.53/23.50) and (23.84/24.75%)

respectively. Apparent increase in fat, protein and ash for all treatments was related to the increase in T.s. total protein and fat for fresh and 30 days old cheese were (17.65/18.52),(17.71/18.65),(17.07/18.00),(16.63/17.22), (17.90/18.30),(17.60/18.05) and (16.65/17.05%) for control 0.025,0.05 and 0.1% either alcohol or water extracts treatments respectively .

Illustrated data for pH and acidity in the same Table indicated that Control treatment scored the highest acidity value (1.01/1.19) for fresh and 30 days old cheese the addition of extracts gave lower values, as the extract concentration increased the acidity decreased especially at 0.1% level being (0.71/0.83)and (0.72/0.92) for fresh alcohol and water extracts respectively .it seems that mentha sepicta extract had some effect on yoghurt culture pH values behaved in contrast way as acidity .

Ash. similar to T.s as the storage period advanced as increased for all treatment the higher ash content is representing the kitchen salt and milk as fresh and 30 days old cheese were (1.850/1.975) ,(1.983/2.220) and (1.890/1.955) for control 0.1 alcohol and water extract respectively .

Illustrated data in Table (5) show that all treatments and control cheese were free from *E.coli* and *staphylococcus* spp. either on them were fresh or after 30 days of storage period. Furthermore, all treatments and control cheese were free from M& Y at the beginning of

storage period but it was appeared after 10 days of storage period.

Table (5) show the enumeration of colonies grown on four principal media Total count: the highest enumeration was 30 x10⁴ for fresh control treatment ,reached 100x10⁴ by the end of storage at refrigerator condition .the addition of *Mentha spicata* to cheese milk led to decrease in total solids of the cheese ,as the concentration increased the total count decreased ,especially with alcohol extract addition , (29/92). (27/ 66) and (25/57) respectively for fresh and 30 days sorage periods for 0.025,0.05 and 0.1 % alcohol extract . values for water extracts were (31/95),(30/72) and 26/67)

respectively for fresh and 30 days storage periods for 0.02,0.05,0.1 % water extract. These results are less than those found by Kaldes (1997) but higher than those obtained by Abou-Dawood *et al.* (2005). No colonies were detected on both mackoniky and staph 110 media . These counts were less than those found by Abou-Dawood *et al.* (2005) .while small number of colonies appeared on PDA media the lowest was for 0.1 % extract . fresh samples were of any colonies ,may be the appear colonies during ripening is due to recontamination of samples of cheese during storage. These result are in agreement with Diabiza (2006)) who found that the addition of ginger decreased the total bacterial counts and mould & yeast.

Table 5. effect of *Mentha spicata* extracts on bacteriological properties of kareish cheese.

Item	Control	Alcohol 0.025	Alcohol 0.05	Alcohol 0.1	Water 0.025	Water 0.05	Water 0.1
Fresh							
T.C	30	29	27	25	31	30	26
M& Y	N.D						
10 days							
T.C	48	64	40	27	68	35	39
M& Y	4	9	4	3	17	10	5
20 days							
T. C	66	80	55	40	78	48	43
M& Y	8	12	10	7	20	15	9
30 days							
T.C	100	92	66	57	95	72	67
M& Y	15	14	12	11	23	20	13

Summary of the opinions of the ten judgers are tabulated in table (6). colour and appearance of the cheese slightly decreased as the storage period advanced , no yeasts grown on the cheese. The addition of extract did not improve highly the appearance. Body and texture: for all treatments as the storage period advanced little decreases in body and texture since people or judgers consume the type of cheese freshly. The addition of extracts slightly improved the texture may be because the higher moisture

content. Flavor : marked increases in flavor for all treatments are detected after 20 days of storage .at day 30 , the scoring points slightly decreased ,the best was for extract addition treatments especially with 0.05% water extract . Total scoring points was the highest 0.05 % water extract at 20 days being 93.5 out of 100. Alcohol treatment scoring points were at day 20 (.84.5/100) less than control at the same storage condition.

Table 6. sensory evaluation of Kareish cheese as affected by the addition of extract *Mentha spicata* during storage

Treatments	Storage period	Flavour (40)	Body & Texture (30)	Appearance (30)	Total(100)
Control	fresh	37.0	27.0	28.0	92.0
	10	37.5	27.0	28.5	93.0
	20	37.0	26.5	28.0	91.5
	30	36.0	25.0	27.0	88.0
Alchol 0.025	fresh	36.5	26.5	26.0	89.0
	10	37.0	27.0	27.0	91.0
	20	36.5	26.0	26.5	89.0
	30	35.0	24.0	25.0	84.0
Alchol 0.05%	fresh	32.0	28.0	27.0	87.0
	10	32.5	28.0	27.5	88.0
	20	31.5	27.0	26.0	84.5
	30	30.5	25.5	24.0	80.0
Alchol 0.1%	fresh	34.5	28.0	28.0	90.5
	10	35.0	28.5	28.5	92.0
	20	34.5	28.5	28.0	91.0
	30	34.0	27.5	27.0	88.5
Water 0.025	fresh	37.0	27.0	26.0	90.0
	10	37.5	27.	27.	91.5
	20	37.0	26.0	27.0	90.0
	30	36.0	26.5	26.5	89.0
Water 0.05	fresh	36.5	27.5	28.0	92.0
	10	37.0	28.5	28.5	94.0
	20	37.5	28.0	28.0	93.5
	30	36.5	27.5	27.5	91.0
Water 0.1	fresh	33.0	25.5	26.5	84.0
	10	34.0	26.0	27.0	86.0
	20	33.5	26.0	26.0	83.5
	30	33.0	25.0	24.0	82.0

CONCLUSION

From pervious data we can recommended by using mentha specita extract at 0.5% concentration either water or alcohol in processing of kariesh cheese without any changes in its properties frather more enhancing its shelf life characteristics

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تأثير إضافة مستخلص النعناع البري علي جودة وزيادة مدة الصلاحية للجبن القريش محمود مصطفى محمد رفاعي ، متولي محمد أبو سريع و محمد الدسوقي عبد العزيز قسم الالبان – كلية الزراعة – جامعة المنصورة – مصر

في هذا البحث تم دراسة تأثير إضافة مستخلص النعناع البري سواء المستخلص الكحولي اوالمائي علي جودة ومدة صلاحية الجبن القريش. وكانت النتائج كالتالي زيادة مدة الحفظ والجودة للجبن القريش بزيادة نسبة الاضافة من مستخلص النعناع سواء الكحولي او المائي بنسب 0,025 و 0,05 و 0,1 و 0,1. أوضحت نتائج التحليل الكيماوي زيادة كلا من المواد الصلبة والدهن والبروتين وكذلك نسبة الرماد بزيادة النسبة من المستخلص ولكن بزيادة النسبة عن 0,1 تقل نسبة المواد الصلبة الكلية وكذلك نسبة البروتين الكلي والدهن وكانت كالتالي 23,50 و 17,20 و 2,45 % علي التوالي بالنسبة للمستخلص الكحولي وكذلك قلت نسبة المواد الصلبة الكلية والبروتين والدهن وكانت كالتالي 22.90 و 17.05 و 2.25 علي التوالي بالنسبة للمنتخلص المائي وذلك بعد 30 يوما من التخزين في الثلاجة . كذلك لوحظ انخفاض في محتوى العدد الكلي للبكتريا بزيادة نسبة الاضافة من المتخلص حيث وصل العدد الكلي بعد 30 يوما في العينة المضافة لها 0,1 % كانت كالتالي 57 و 67 و 10X⁴ سواء في حالة المستخلص الكحولي او المائي . اما بالنسبة للتقييم الحسي حصلت الجبن المضاف لها 0,05 % مستخلص مائي علي أعلي درجات للتقييم الحسي سواء في حالة الجبن الطازج او بعد 30 يوم عند التخزين في الثلاجة 100/ 92,0 و 100/91,0.