J. Food and Dairy Sci., Mansoura Univ., Vol. 9 (2): 73 - 76, 2018

Effect of Vegetable Protein and Functional Proteins Fortification on the Properties of Kareish Cheeses

Gomaa, M. SH. ; M. E. Abdel-Aziz and A. A. Mohamed
Dairy Department, Faculty of Agriculture, Mansoura University, Mansoura, Egypt.

ABSTRACT

Kareish cheeses made with whey protein concentrate and soy flour was (2%, 3% and 4%), or 1:1% mixing ratio. All The treatments were kept at 4 ° C for 15 days; Cumin was added to fortify cheese, being made with whey protein concentrate and soy flour (0.1%, 0.3% and 0.5%). The increase in the concentration if added whey protein concentrate and soy flour to cheese milk resulted in an increase in the resulting cheese yield, compared with the control. The increase was found to be 3%higher than that of whey protein concentrate (T3) and (T6). Addition of soy flour resulted in increase in softness of the cheese resulting compared with the addition of whey protein concentrate. Addition of the whey protein concentrate and soy flour improved the test and textures to a certain degree, when using 2% and 1:1% of the whey protein concentration and soy flour in treatments (T1& T2 &T7) with reduced test and textures treatments (T3 & T4) which, improved test, textures and utilization of high whey protein concentrate and soy flour at the highest of cheese yield. Some of the sensory defects which may appear as result of the high rate of consolidation of the whey protein concentrate and soy flour through the addition of *cuminum cyminum* to Kareish cheese. The results indicated that the different levels of substitution were of considerable effect on all of studied parameters. NPN, SN, TN levels. On the other hand, all cheese samples were free from coliform bacteria, *Staph. Spp* and, Lipolytic bacteria.
Keywords: Kareish cheese - whey protein concentrate-Soy flour- *cuminum cyminum*.

INTRODUCTION

Kareish cheese is one of the most popular types of soft cheese consumed in Egypt. It contains most of the skim milk constituents including 16.70% protein, 3.98% sugar, 72.50% water and 0.1% fat. Kareish cheese is made from skimmed buffalo's or cow's milk or a mixture of both. Several polysaccharides (EPS) are defined as long chain sugars produced by microbial cells (Marshall, 2001). Kareish cheese is an acid coagulated white soft cheese made from skim milk with soft composition, white curd and slightly salty. It is one of the most popular cheeses consumed in Egypt and Arabian countries. This cheese is an excellent source of protein, amino acids, calcium, phosphorus, vitamins and many micronutrients. Environmental conditions prevailing during storage, combined with the composition of the cheese often create possibilities for extensive development of cheese surface, which reduces considerably its quality. Therefore, Kareish cheese will be the most promising food to avoid the health problems associated with fat. The farm-house manufacture of this cheese depends on the removal of whey from natural acid coagulated skim milk using a cheese mat and dry salting. The production of Kareish cheese by this method needs at least 4-5 days, which markedly decreases its microbiological quality. Many modifications have been tried to improve cheese quality (Reps *et al*., 2002) and (Francois *et al*., 2004).

The aim of this research was to evaluation the effect of added whey protein concentrate and soy flour on the sensory, chemical and texture profile characteristics of Kareish cheese.

MATERIALS AND METHODS

Caw's milk was obtained from the dairy processing unit at the faculty of Agriculture Mansoura University. Caw's milk used in the preparation of Kareish cheese contained of Moisture 87.88%, Total protein 2.65%, pH 6.2, Lactose 3.76%, and fat 3.42%)

Salt: Dried trade category food of sodium chloride obtained from El-Nasr Saline's Company, Egypt

Soy flour: was obtained from the soy products plant, for food additives company Alexandria, Egypt. Soy Flour used in the preparation of Kareish chasse contained of ((ash. 6%±0.1 %) , (Total protein 48.9%±0.1%) , (fat 1%±0.1%).

Starter culture: was obtained from Ch. Hansen's Laboratories, Denmark. It consists of *"Streptococcus thermophillus and Lactobacillus delbrukii subsp bulgaricus*"

Chemicals: were obtained from El-Gomhorea chemicals company.

Kareish cheese: was made according to Abou-Donia (2008).

Treatments: were compiled in periods of (fresh, 7 and 15 days), to Kareish cheese for chemical analysis, bacteriological properties and organoleptic properties.

Total solids were estimated according to AOAC (2005).

PH values were evaluated using a pH meter with a glass electrode type CG710, West Germany.

Total nitrogen, soluble nitrogen and Non-protein-nitrogen contents of both Kareish were determined as described by Ling (1963).

Total viable bacterial count described by Marshall (1993).

Lipolytic bacterial and Proteolytic bacterial count was carried out as described by Chalmers (1962)

Coliform bacteria and *Staph. Spp* were determined according to the method described by the American public Health Association (A.P.H.A., 1960).

Organoleptic samples were scored using scorecard (50, 40, 10 points) for Flavour, body, texture, appearance and color respectively. The scores were averaged by six panelists according to Nelson and Trout (1965).

Cheese yield was division the weight of cheese by the weight of milk, twofold by 100, according to the formulation by Metzger *et al*. (2000).

Textural properties of cheese (hardness, cohesiveness, springiness, chewiness, gumminess were evaluated using a texture analyzer (TA1000, Lab Pro, FTC TMS-Pro, USA) as described by Szczesniak *et al*. (1963) and Bourne (1978).

RESULTS AND DISCUSSION

Results presented in Table (1) show the average yield of different treatments of Kareish cheese .These data cleared that the use of whey protein concentrate resulted increase on the yield of the resultant cheese, compared with control. The results indicated that the different levels of substitution were of considerable effect on all of studied

parameters. NPN, SN, TN levels, and pH value were safely higher in control, compared with the different treatments.

In addition, these differences in the cheese yield were related to the type of the added component and its ratio.Moreover, treating with 3% whey protein concentrate (T3) resulted in the highest overall yield (24%) at zero time, and treatment (T4) soy flour 4%, was (23.5%) , compared with the control, of the lowest yield (20%). These results might be due to the interaction and formation of a complex between the casein micelles and any hydrocolloid, which effect on the water holding capacities which, of a direct effect on yield cheese. These results agree with Tuinier *et al*., (2002), who reported that the use of hydrocolloids increased the yield of cheese and its moisture.Data in the same Table showed that control throughout the storage. Moreover, pH value of all treatments and control had an opposite trend Moreover; there was a gradual increase in the SN and NPN during storage periods.

This increase might be due to the activity of proteinases and peptidases released from the micro-organisms of higher proteolytic activity in cheese. This will improve the sensory properties of the resultant cheeses, this finding are in harmony with the results obtained by El-Zeiny,and Metwally, (2003) and Salama (2004). Total nitrogen content was increased gradually with the progress of storage period up to 15 days. This is attributed to the changes in moisture content during Kareish cheese storage.

Table 1. chemical composition of Kareish cheese fortified with whey proteins concentrate and Soy flour.

Treatment	Storage period (day)	TN %	SN %	NPN %	T.S %	pH	Chasse yield%
Control	Fresh	1.59	0.385	0.341	16.83	4.28	
	7	1.69	0.407	0.382	16.79	4	20
	15	1.84	0.508	0.448	16.71	3.82	
	Fresh	1.92	0.159	0.192	18.10	3.74	
T1	7	2.47	0.230	0.304	18.08	3.68	21
	15	2.97	0.353	0.450	18.02	3.70	
	Fresh	1.94	0.189	0.208	18.18	3.67	
T2	7	2.26	0.220	0.267	18.14	3.6	21.5
	15	2.76	0.280	0,375	18.12	3.42	
	Fresh	2.49	0.250	0.270	18.70	3.83	
T3	7	2.64	0.328	0.322	18.63	3.78	24
	15	2.75	0.390	0.383	18.58	3.74	
	Fresh	1.95	0.214	0.175	20.20	3.86	
T4	7	2.11	0.261	0.218	20.17	3.81	23.5
	15	2.17	0.300	0.315	20.15	3.83	
	Fresh	1.64	0.170	0.167	21.5	3.83	
T5	7	1.96	0.225	0.183	21.2	3.83	22
	15	2.01	0.238	0.253	21	3.8	
	Fresh	1.92	0.229	0.195	23.70	3.9	
T6	7	2.03	0.258	0.248	23.67	3.8	22.5
	15	2.21	0.285	0.330	23.60	3.7	
	Fresh	1.88	0.228	0.188	23.87	3.9	
T7	7	2.03	0.257	0.247	23.73	3.86	23
	15	2.33	0.305	0.346	23.64	3.85	

T1: 2% whey proteins concentrate T2: 2% Soy flour
T3: 3% whey proteins concentrate T4: 3% Soy flour
T5: 4% whey proteins concentrate T6: 4% Soy flour
T7: whey protein concentrate and Soy flour by 1:1

Several parameters of texture profile analysis were determined in Kareish cheese with various percentages of whey protein concentrate and Soy flour Table (2). Kareish cheese textural properties were considerable affected by using partial substitution. Hardness; gumminess and chewiness were considerable lower in Kareish cheese made with the partial substitution of whey protein concentrate than control. However the cohesiveness, adhesiveness and springiness were safely higher in cheese Soy flour.

The results indicated that the hardness, gumminess and chewiness are inversely proportional to substitution percentage of whey protein concentrate and soy flour the partial substitution of whey protein concentrate with soy flour was of higher effect on the textural properties of cheese than using soy flour as partial salt replacer Table (2). The lower values of hardness, adhesiveness, gumminess and chewiness in cheese with added whey protein concentrate and Soy flour mixtures could be related to its higher total solid content and non-compact structure, as the high total solid control decreases the protein network strength, resulting smooth cheese that coats the mouth during mastication Maifreni *et al*., (2002). These results are in general agreement with those observed by Hassan *et al*. (2004)& Beal and Mittal,(2000).

On the other hand, total viable bacterial count (TVBC) increased in all treatments, compared to control during different storage periods. All (TVBC) in all treatments were in normal range. Treatment with 3% whey protein concentrate reduced the count of proteolytic bacteria; compared with other treatments Table (3) all cheese samples were free from coliform bacteria, *Staph. Spp*. and Lipolytic bacteria.

Table 2. Textural properties of Kareish cheese fortified with whey proteins concentrate and Soy flour.

Treatment	Storage Period(day)	Hardness (N)	Adhesiveness (J)	Cohesiveness	Springiness (mm)	Gumminess (N)	Chewiness (J)
Control	Fresh	3.13	25.60	0.30	0.40	1.25	0.50
	15	3.10	26.00	0.30	0.40	1.26	0.50
T1	Fresh	3.11	27.63	0.33	0.42	1.04	0.44
	15	3.08	28.00	0.34	0.43	1.06	0.45
T2	Fresh	3.25	31.34	0.42	0.47	0.95	0.44
	15	3.19	31.73	0.43	0.47	0.95	0.44
T3	Fresh	3.14	33.38	0.50	0.53	0.78	0.41
	15	3.12	34.60	0.50	0.54	0.76	0.41
T4	Fresh	3.30	38.11	0.38	0.44	0.97	0.43
	15	3.25	39.28	0.37	0.44	0.92	0.40
T5	Fresh	3.18	44.82	0.43	0.48	0.85	0.41
	15	3.14	58.47	0.44	0.48	0.84	0.40
T6	Fresh	3.96	66.99	0.52	0.53	0.62	0.33
	15	3.88	69.47	0.53	0.53	0.62	0.33
T7	Fresh	3.20	28.46	0.38	0.44	.99	0.43
	15	3.16	30.13	0.39	0.44	0..99	0.43

T1: 2% whey proteins concentrate T2: 2% Soy flour
T3: 3% whey proteins concentrate T4: 3% Soy flour
T5: 4% whey proteins concentrate T6:4% Soy flour
T7: whey protein concentrate and Soy flour by 1:1

Table 3. Bacteriological properties of Kareish cheese fortified with whey proteins concentrate and soy flour.

Treatment	Storage period (day)	T.C bacteria$\times10^6$ c.f.u/gm	Proteolytic bacteria $\times10^3$ c.f.u/gm
Control	Fresh	2	3
	7	11	10
	15	24	28
T1	Fresh	5	7
	7	18	18
	15	35	29
T2	Fresh	2	-
	7	16	9
	15	38	21
T3	Fresh	15	-
	7	33	5
	15	45	16
T4	Fresh	5	4
	7	30	5
	15	47	15
T5	Fresh	4	-
	7	6	5
	15	15	10
T6	Fresh	2	0
	7	5	7
	15	10	13
T7	Fresh	8	4
	7	18	11
	15	30	19

T1: 2% whey proteins concentrate T2: 2% Soy flour
T3: 3% whey proteins concentrate T4: 3% Soy flour
T5: 4% whey proteins concentrate T6: 4% Soy flour
T7: whey protein concentrate and Soy flour by 1:1

Data presented in Table (4) show the best substitution in all sensory properties was 2% whey protein concentrate and 2% Soy flour. The less one was with 4% soy flour. From the previous data, it could be concluded that the replacement of whey protein concentrate and Soy flour enhanced the organoleptic and texture properties of the cheese, compared with the control.

Table 4. organoleptic properties of Kareish cheese fortified with whey proteins concentrate and soy flour.

Treatments	Storage period (day)	Flavour (50)	Body and texture(40)	Appearance (10)	Total (100)
Control	Fresh	47	38	7	92
	7	46	35	6	88
	15	45	35	5	85
T1	Fresh	48	37	7	91
	7	47	36	5	88
	15	45	35	5	85
T2	Fresh	42	34	7	87
	7	37	32	5	74
	15	35	30	5	70
T3	Fresh	45	35	6	86
	7	45	35	5	85
	15	40	33	5	78
T4	Fresh	35	36	7	82
	7	34	35	6	75
	15	30	35	6	71
T5	Fresh	43	38	6	83
	7	42	36	5	83
	15	40	36	5	81
T6	Fresh	40	33	7	80
	7	39	32	7	78
	15	39	30	6	75
T7	Fresh	43	35	6	84
	7	43	35	5	83
	15	39	33	5	77

T1: 2% whey proteins concentrate T2: 2% Soy flour
T3: 3% whey proteins concentrate T4: 3% Soy flour
T5: 4% whey proteins concentrate T6: 4% Soy flour
T7: whey protein concentrate and Soy flour by 1:1

Results in Table (5) revealed that the addition of (*cuminum cyminum*) of Kareish cheese treated with whey proteins concentrate and soy flour was better in sensory arbitration in terms of taste and texture in all levels compared with control.

Table 5. organoleptic properties of Kareish cheese added (*cuminum cyminum*), which is fortified with whey proteins concentrate and soy flour .

Treatments		Storage period(day)	Flavor (50)	Body (40)	Appearance (10)	Total (100)
		Fresh	41	30	8	79
	Control	7	41	30	7	78
		15	37	30	5	74
		Fresh	40	37	5	82
	A	7	39	36	4	79
		15	37	34	4	75
		Fresh	44	31	7	82
T1	B	7	44	31	6	81
		15	40	31	4	75
		Fresh	49	28	7	84
	C	7	49	28	7	84
		15	46	26	6	78
		Fresh	43	31	7	81
	A	7	40	28	5	73
		15	38	27	5	70
		Fresh	43	39	8	90
T2	B	7	40	37	7	84
		15	40	35	6	81
		Fresh	42	32	6	80
	C	7	40	31	6	77
		15	33	30	6	69
		Fresh	40	37	8	85
T3	C	7	40	37	5	82
		15	39	28	5	73
		Fresh	44	33	6	83
T4	C	7	43	32	6	81
		15	35	30	6	71

T1: 3%whey proteins concentrate **T2: 3%soy flour**
T3: 4%whey proteins concentrate **T4: 4%soy flour**
A: 0.1% *cuminum cyminum* **B: 0.3% *cuminum cyminum***
C: 0.5% *cuminum cyminum*

CONCLUSION

The addition of vegetable proteins like soy flour, Functional proteins like whey proteins concentrate and *cuminum cyminum* on the properties of Kareish cheeses was the most appropriate in making of functional Kareish cheeses. This treatment improves the Textural properties and organoleptic properties of resultant Kareish cheeses.

REFERENCES

A.P.H.A. 1960. Standard methods for the examination of dairy products microbiological and chemical. American Public Health Association.

Abou-Donia, S. 2008. Origin, history and manufacturing process of Egyptian dairy products: an overview. Alexandria Journal of Food Science and Technology, 5 (1): 51-62.

AOAC(1984) Official methods of analysis 14th ed , S.Williams (ed).Association of official analytical chemists inc ., Arlington , VA, USA .284 .

Beal, P. and G. Mittal. 2000. Vibration and compression responses of Cheddar cheese at different fat content and age. Milchwissenschaft, 55 (3): 139-142.

Bourne, M. C. 1978. Texture profile analysis [Food acceptability]. Food technology.

Chalmers, C. H. 1962. Bacteria in relation to milk supply. Edward Arnold (publishers) LTD. London.

El-Zeiny , H.M. and A.M Mewally, (2003), production of Domiati cheese with typical characteristics from pasteurized milk using lactobacillus helveticus and lactobacillus casei cultures. J.Agri.Sci . Mansoura univ 27: (7) : 5391 – 5398.

Francois, Z.N.,N. Ahmed , M.T. Félicité, and M. El-Soda. 2004. Effect of ropy and capsular exopo - lysaccharides producing strain of Lactobacillus plantarum 162 RM on characteristics and functionality of fermented milk and soft Kareish type cheese. African J. Biotechnol. 3 :512–518.

Hassan, A. N., M. Corredig, J. F. Frank, and M. Elsoda. 2004. Microstructure and rheology of an acid-coagulated cheese (Kareish) made with an exopolysaccharide - producing *Streptococcus - thermophillus* strain and its exopolysaccharide non - producing genetic variant. Journal of Dairy Research, 71 (1): 116-120.

Ling, E. R. 1963. textbook of dairy chemistry.

Ling, E. R. 1963. textbook of dairy chemistry.

Maifreni, M., M. Marino, P. Pittia, and G. Rondinini. 2002. Textural and sensorial characterization of Montasio cheese produced using proteolytic starters. Milchwissenschaft 57(1):23-26.

Marshall, R. T. 1993. Standard methods for the examination of dairy products. American Public Health Association.

Marshall, R. T. 1993. Standard methods for the examination of dairy products. American Public Health Association.

Marshall, R. T. edMarth; E. H. and J. L. A. A. Steele, (2001). Frozen Desserts. Applied dairy microbiology,(2):93-125.

Metzger, L., D. Barbano, M. Rudan, and P. Kindstedt. 2000. Effect of milk preacidification on low fat Mozzarella cheese. I. Composition and yield. Journal of Dairy Science, 83 (4): 648-658.

Nelson, J. A. and G. M. Trout. 1965. Judging dairy products. (4th edition).

Reps, A., L.J. Drychowski, J. Tomasik, and K.W. Niewska.2002. Natamycin in ripening cheeses. Pakistan Journal of Nutrition.1 (5):243- 247.

Salama, F. M. M. (2004). Improving the quality of Domiati cheese .9th Egypt .J. Dairy Sci. &Tech.,Cairo, Egypt.

Szczesniak, A. S., M. A. Brandt and H. H. Friedman. 1963. Development of standard rating scales for mechanical parameters of texture and correlation between the objective and the sensory methods of texture evaluation. Journal of Food Science, 28 (4): 397- 403.

Tuinier R. Rolinc and Kwuif C.G., (2002), Electrosorption of pectin onto casein micelles. Bio macro molecules , 3: 632 – 638

تاثير التدعيم بالبروتين النباتى و البروتين الوظيفى على خواص الجبن القريش

محمد شلبي جمعه ، محمد الدسوقي عبد العزيز محمد و أحمد عبد السلام محمد

قسم الالبان – كلية الزراعة – جامعة المنصورة – جمهورية مصر العربية

الجبن القريش المصنوعة مع التدعيم مركز بروتين شرش اللبن ودقيق الصويا بنسب (٢٪، ٣٪ و ٤٪)، أو ١: ١٪ نسبة الخلط. جميع المعاملات تم الاحتفاظ بها على ٤ درجات مئوية لمدة ١٥ يوما. تم إضافة الكمون إلى الجبن المدعم، مع مركز بروتين شرش اللبن ودقيق الصويا (١٪، ٠.٣٪ و ٠.٥٪). وقد أدت التدعيم بمركز بروتين شرش اللبن ودقيق الصويا إلى لبن الجبن إلى زيادة في محصول الجبن الناتج مقارنة مع الكنترول. وقد وجد أن الزيادة كانت أعلى فى المعاملات المدعمة بنسبة ٣٪ من مركز بروتين شرش اللبن مثل (T3) و (T6). كما أدى إضافة دقيق الصويا إلى زيادة في ليونة الجبن الناتجة مقارنة بالعينات المضاف اليها مركزبروتين شرش اللبن. وأظهرت النتائج أن مستويات الاستبدال المختلفة لها تأثير كبير على جميع انتائج NPN, SN, TN . ومن ناحية أخرى، كانت جميع عينات الجبن خالية من بكتيريا القولون و الاستاف والبكتيريا المحللة للبروتين.