

## **EFFECT OF SOME MEDICINAL HERBS ON THE QUALITY AND SHELF LIFE OF KAREISH CHEESE**

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### **Abstract**

This present study supplemented the kareish cheese by some medicinal plants such as mint, rosemary, cumin and marjoram. These medicinal plants have distinctive tastes that are preferred by many persons. Kareish cheese is one of the most popular cheeses in Egypt. The chemical composition, microbiological contamination of these plants and sensory evaluation were studied. The results show that, slight differences were noticed among kareish cheeses in titratable acidity, pH values and total protein content. Generally, the addition of medicinal plants increased some minerals such as Fe, Zn and Ca when compared with control. The herbs decreased the total bacterial count, mould and yeasts during the storage period till 30 days. It improved the flavours when compared with control after 30 days of storage period. Also, the addition of different medicinal plants (0.5%) gave the highest scores for overall acceptability.

### **INTRODUCTION**

Kareish cheese is among soft cheeses which are most popular in Egypt and Arabian countries owing to its high protein, low fat and reasonable price. It is an acid coagulated fresh cheese, made from skim milk with soft composition, white curd and slightly salty. Kareish cheese is considered one of the most food products rich in calcium and phosphorus. These elements are essential for bones and teeth formation. It is also rich in sodium and potassium, which play an important role in the formation of body liquids and muscles (Francois et al., 2004).

The exploration of naturally-occurring antimicrobials for food preservation receives increasing attention due to consumer awareness of natural food products and a growing concern of microbial resistance toward conventional preservation Gachkar et al., (2007).

Many plants and plant-derived antimicrobial components are used in folklore therapeutics for the treatment of periodontal disorders and for the purpose of oral hygiene (Tsai et al., 2007). Researchers have been interested in biologically active compounds isolated from plant species for the elimination of pathogenic microorganism because of the resistance that microorganism have built against antibiotics Gachkar et al., (2007). To prolong the shelf-life of fruits and vegetables, the growth of microbial populations must be controlled several post-harvest processes,

such as washing and removal of damaged tissues are employed to reduce initial high counts Gachkar et al., (2007). The same authors reported antimicrobial activity of essential oils from oregano, thyme, sage, rosemary, clove, coriander, garlic onion and cumin against both bacteria and fungi.

*Origanum majorana* L. (marjoram) is a herbaceous and perennial plant native to southern Europe and the Mediterranean. For food uses, marjoram is employed to flavor sausages, meat, salads and soups (Novak et.al, 2000). Traditionally, it is used as a folk remedy against asthma, indigestion, headache and rheumatism. However, little is known about the biologically active compounds of marjoram as a medicinal plant, except for its essential oil (Ghaly et al., 2008).

Rosemary (*rosmarinus officinalis* L., Lamiaceae) is an aromatic, evergreen, shrubby herb indigenous to most European countries bordering on the Mediterranean Sea, which is widely used in pharmaceutical products and folk medicine Arslan & Özcan (2008). Several extracts, essential oils and chemical constituents isolated from these species demonstrated a number of interesting biological activities such as mainly antioxidant activity Arslan & Özcan (2008) and exhibits different protective effects such as hepatoprotective , anti-hyper-glycemic and anti-ulcero-genic actions Tsai et al., (2007).

Essential oil extracted by hydrodistillation from cumin (*Cuminum cyminum*) was characterized by means of GC and GC-MS. Cumin contained  $\alpha$ -pinene (29.1%), 1,8-cineole (17.9%) and linalool (10.4%), respectively. (*Cuminum cyminum*) oil exhibited stronger antimicrobial activity against *E.coli*, *S.aureus* and *L. monocytogenes* (Gachkar et al., (2007).

The general term for cultivated mint in Turkey is 'Nane', it is consumed both fresh and dried, in particular mixed as aroma source with salads. Mint is also used in medicine and food industry in Turkey (Kaymak et al., 2008).

The aim of present study was to improve the flavour and prolong shelf-life of kariesh cheese manufacture by adding some medicinal plants.

## **MATERIALS AND METHODS**

### **MATERIALS**

Buffalo's skim milk was obtained from the Faculty of Agriculture, Cairo University. Herbs and spices (mint, cumin, rosemary and marjoram) were obtained from the Horticultural Research Institute, Agricultural Research Centre, Giza, Egypt.

Pure culture of str. *Salivarius* sub sp. *Bulgaricus* were obtained from Hansen Laboratories (Denmark).The used material (Zigiber powder) and sodium chloride were obtained from local market.

## **Methods**

### **Manufacture of kareish cheese**

Buffalo's skim milk was heated to 85°C for 15 sec. and cooled to 32°C. Active starter (2% w/w) and 5% sodium chloride (salt) were added and mixed well. Rennet solution was added at rate of (3g/100kg) milk. Then, the cheese was divided into 4 equal portions as follows: The first portion was kept untreated and served as control. The second, third and fourth were mixed with some medicinal plants (cumin, mint and rosemary) at 0.5%, 1% and 1.5%. Also, the marjoram was added at 0.5% and 1%, only. The Kareish cheese was manufactured as described by Effat *et. al.*, (2001)

The cheeses were packed in plastic bags and stored at 4°C for 30 days and analyzed at zero time, 14<sup>th</sup> day and 30<sup>th</sup> day.

### **Chemical analysis**

Fresh kariesh samples were analyzed for titratable acidity (T.A.) and total solids (T.S.) as described by Ling (1963). The pH value was measured using pH meter type HANNA (8417). Moisture, fat, protein and ash were determined as described in (A.O.A.C., 2000). The mineral contents were determined by using the Atomic Absorption Spectrophotometer as described in (A.O.A.C., 2000). Folin-Ciocalteu reagent was used to determine total phenol in medicinal plants extracted samples (Singleton and Rossi, 1965). The scavenging activity of plants extracts was estimated by using 1,1-diphenyl-2-picrylhydrazyl (DPPH) as a free radical model according to the method of Magalhaes *et al.*, (2006).

### **Microbiological analysis**

All samples were examined for total bacterial counts (TBC) and moulds and yeasts according to the American Public Health Association (APHA, 1992).

### **Sensory evaluation**

The sensory evaluation of kareish cheeses was carried out according to El-Shafei *et al.*, (2008). The samples were presented to the panelists in a random order. The cheeses were evaluated organoleptically after zero time and after 30 days of ripening in the dairy science department, food technology research Institute, agriculture research centre. Panelists evaluated cheese for appearance (20 points), body and texture (45 points), flavor (35 points) and overall acceptability (100 points). Scores were obtained for all sensory attributes.

### **Statistical analysis**

Statistical analyses were carried out by SPSS10 (SPSS, Chicago, III) program for windows. Data were expressed as means  $\pm$  SEM. Statistical analysis was performed using one-way analysis of variance followed by Tukey post hoc test. Least significant differences (LSD) and Duncan's tests were done to compare a pair of group means.

The level of statistical significance was set at  $p < 0.05$  as reported by (Eidi *et al.*, 2007).

## RESULTS AND DISCUSSION

### Total phenol for medicinal plants

Total phenol in medicinal plants was determined as indicated in fig (1). The marjoram had a high level of total phenol, followed by rosemary. The cumin had the lowest level of total phenol.

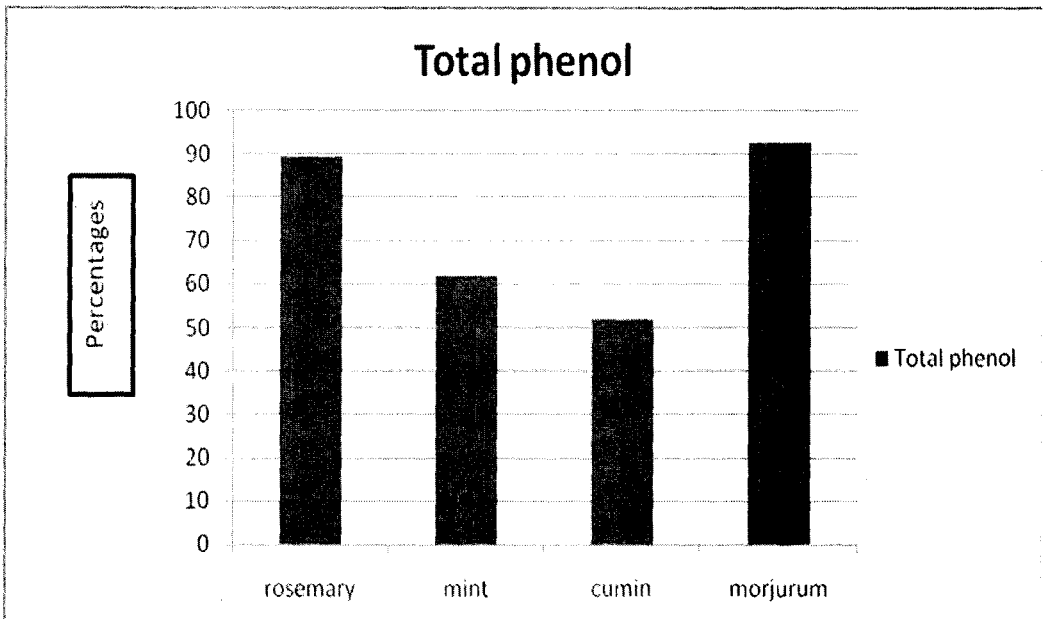


Fig 1. Total phenol (mg/g GAE) contents in medicinal plants

### Free radical-Scavenging activity for medicinal plants

Results in table (1) showed that scavenging capacity was increased by increasing sample volume. The rosemary and marjoram plants had the highest level of scavenging capacity. The cumin had the lowest level of scavenging capacity. The results indicated that there is a relationship between total phenol content and free radical-scavenging activity for rosemary, cumin, majoram plants. The high level of total phenol content caused increasing for free radical-scavenging activity.

Table 1. scavenging activity of medicinal plants

Items	25 $\mu$ L	50 $\mu$ L	100 $\mu$ L
Rosemary	31.79	49.83	50.70
Mint	14.97	27.32	31.79
Cumin	4.64	5.87	19.79
Majoram	13.49	25.22	33.63

### Chemical composition for kareish cheese

Table (2) records the chemical composition of kareish cheese during storage of all treatments. The moisture content of kareish cheese manufactured with different additions gradually decreased till the end of the storage period. Higher moisture content was found in control cheese and those manufactured with the all medicinal plants at the percentage of 0.5%. This might be due to the activity of mixed strains for producing acidity (Effat *et al.*, 2001). Slight differences were noticed among kareish cheese in titratable acidity, pH values and total protein content throughout aging (table 2), indicating that, addition of medicinal plants to cheese milk did not affect the composition of the resulted cheese. These results are in agreement with those reported about different varieties of low fat cheese by other investigators (El-Shafei, *et al.*, 2008 and Francois *et al.*, 2004).

### Minerals contents

Table (3) show the minerals content for kareish cheeses under study. Generally, the addition of medicinal plants as flavourings increased the minerals level. Addition of mint to kareish cheese increased calcium and zinc levels more than the other medicinal plants. Also, the rosemary and marjoram increased in phosphorus and iron. Using of rosemary also increased manganese level.

Table 2. Compositional parameter of kareish cheese manufactured with some herbs\* during storage at 4 °C.

Items	control	Cumin			Rosemary			Mint			Marjoram		
		0.5%	1%	1.5 %	0.5%	1%	1.5%	0.5%	1%	1.5 %	0.5%	1%	
Zero time													
1-Moisture	77.99	78.96	74.15	77.10	79.50	75.77	76.75	77.89	75.26	74.82	76.03	77.25	
2- Fats	0.6	0.67	0.95	1.5	0.7	1.1	1.5	0.65	1.50	1.70	0.70	1.90	
3- Total protein	16.50	16.73	16.95	17.18	16.83	17.00	17.40	16.96	17.43	17.89	16.98	17.44	
4-Ash	3.10	3.68	3.94	4.10	3.70	4.10	4.20	3.68	4.20	4.40	3.70	4.10	
5- Titratable acidity	0.96	0.95	0.94	0.94	0.90	0.90	0.90	0.95	0.94	0.96	0.95	0.94	
6- PH	5.35	5.17	5.33	5.33	5.25	5.25	5.44	5.45	5.17	5.35	5.17	5.17	
14 days													
1- Moisture	75.98	77.60	72.80	75.20	78.01	75.70	76.65	77.70	75.25	74.62	75.37	77.20	
2- Fats	0.6	0.66	0.95	1.6	0.7	1.1	1.4	0.65	1.40	1.60	0.65	1.80	
3- Total protein	15.51	16.10	16.05	16.19	16.30	16.30	16.80	16.16	16.59	17.20	16.20	16.92	
4-Ash	3.20	3.75	4.00	4.25	3.80	4.20	4.30	3.78	4.30	4.54	3.79	4.25	
5- Titratable acidity	1.20	1.30	1.30	1.4	1.00	1.10	1.30	1.20	1.22	1.22	1.02	1.28	
6- PH	5.09	5.00	4.86	4.66	5.13	5.00	4.88	5.09	4.88	5.00	5.30	4.88	
30 days													
1- Moisture	74.99	76.55	72.10	73.80	77.90	75.10	76.50	77.60	75.00	74.50	75.00	76.90	
2- Fats	0.50	0.67	0.90	1.6	0.6	1.00	1.4	0.60	1.30	1.50	0.60	1.70	
3- Total protein	15.62	16.20	16.50	16.20	16.30	16.20	16.70	16.20	16.60	17.28	16.19	16.80	
4-Ash	3.50	3.95	4.15	4.40	3.90	4.35	4.45	3.94	4.46	4.68	3.95	4.39	
5- Titratable acidity	1.30	1.4	1.4	1.30	1.25	1.25	1.42	1.30	1.30	1.33	1.06	1.35	
6- PH	5.00	4.60	4.60	5.18	4.88	4.88	4.60	5.00	5.00	5.18	5.18	5.18	

\*different percentages( 0.5%, 1% and 1.5%).

Table 3. Minerals content of kareish cheeses supplemented by some medicinal plants

Minerals	Ca(mg/100)	P(mg/100g)	Zn(mg/100)	Mn(mg/100)	Fe(mg/100)
control	352.761	169.184	0.666	0.186	0.188
Cumin					
0.5%	353.676	147.63	1.168	0.077	0.572
1 %	363.975	173.15	1.730	0.153	0.881
1.5%	377.605	184.65	2.383	0.160	1.705
Rosemary					
0.5%	366.696	169.15	1.273	0.252	1.606
1%	367.811	171.51	1.341	0.269	2.349
1.5%	368.051	189.06	1.427	0.279	3.234
Mint					
0.5%	401.308	138.03	1.773	0.080	1.713
1%	406.680	143.69	2.104	0.143	1.441
1.5%	408.519	176.77	2.990	0.310	2.555
marjoram					
0.5%	369.784	185.16	1.531	0.190	1.306
1%	385.961	204.33	2.154	0.250	2.612

### Microbiological analysis

Table (4) reveals average of T.B. counts of each kind of kareish cheeses (supplemented by some medicinal plants). The results show that the T.B. counts was higher in the control than in all other treatments. During storage period, these counts decreased gradually and reached its minimum at the end period of cold storage. Generally, the control kareish cheese had the highest T.B. counts compared with others kareish cheeses. The counts of mould and yeasts were lower than allowed according to the Egyptian Standards (2000) being not more than 100 cfu/g. The results show that the mould and yeasts counts were lower in the control than in all treatments. During storage period, these counts increased gradually and reached its maximum by the end period of cold storage for control. Generally, the control kareish cheese had the highest mould and yeasts counts after 14 and 30 days of storage compared with others kareish cheeses. The microbiological quality of kareish cheese shows that sanitation procedure was sufficient during the manufacture of this type of cheese. These result in agreement with (Salama *et al.*, 2009) who found that the adding of ginger decreased the total bacterial counts and mould and yeast.

Table 4. Microbial analysis for kareish cheeses supplemented by some medicinal plants

Items	Storage period (days)					
	Zero time		14 days		30 days	
	T.C $10^5$	Mould & Yeast $10^2$	T.C $10^5$	Mould & Yeast $10^2$	T.C $10^5$	Mould & Yeast $10^2$
control	450	10	56	20	45	31
Cumin 0.5%	300	9	35	9	20	8
1 %	400	17	12	12	12	9
1.5%	380	10	30	10	16	9
Rosemary 0.5%	400	17	26	17	15	15
1%	380	15	26	15	14	10
1.5%	390	15	25	10	12	N.D.
Mint 0.5%	400	9	25	9	12	8
1%	380	9	26	9	12	1
1.5%	390	10	24	8	10	9
marjoram 0.5%	400	10	16	10	5	6
1%	380	9	6	8	2	N.D.

### Sensory evaluation

A pre-testing study was conducted by adding 2.5% and 5% of the chosen medicinal plants. The results showed that those percentages were refused by the panelists. So, the lower percentages accepted by panelists were used. The cheeses were evaluated for flavour, body and texture, appearance and overall acceptability. Data pertaining to the overall evaluation and preference of cheese during storage at (4 ° C) are depicted in figures 2, 3, 4 and 5. According to the panelists, cheese manufactured with a medicinal plant (cumin, mint, rosemary and marjoram) received higher score points. As shown in figures, the use of these medicinal plants enhanced the flavour and improved the body and texture of the treated kareish cheese compared with control. Generally, at the zero time, the control had the highest scores for overall evaluation. After 30 days, the cheese containing the medicinal plants exhibited the highest score for flavour compared with control. It was also noticed that, the addition of 0.5% had the highest scores for overall evaluation compared with the other percentages of all herbs used. There are a high significant differences for overall evaluation between samples at zero time and after 30 days.



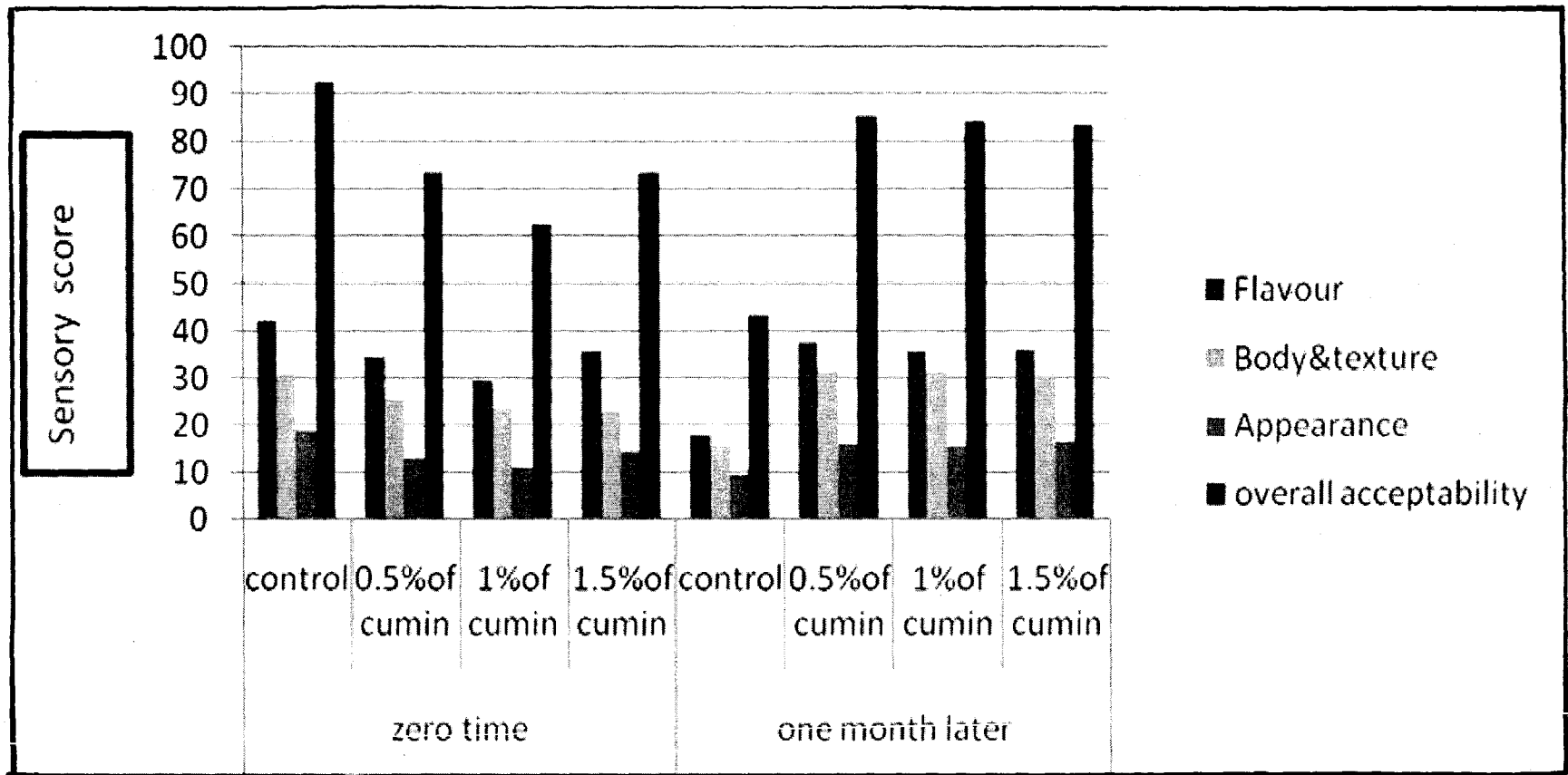


Fig 2. Sensory evaluation of kareish cheese containing different percentages of cumin at zero time and one month later.

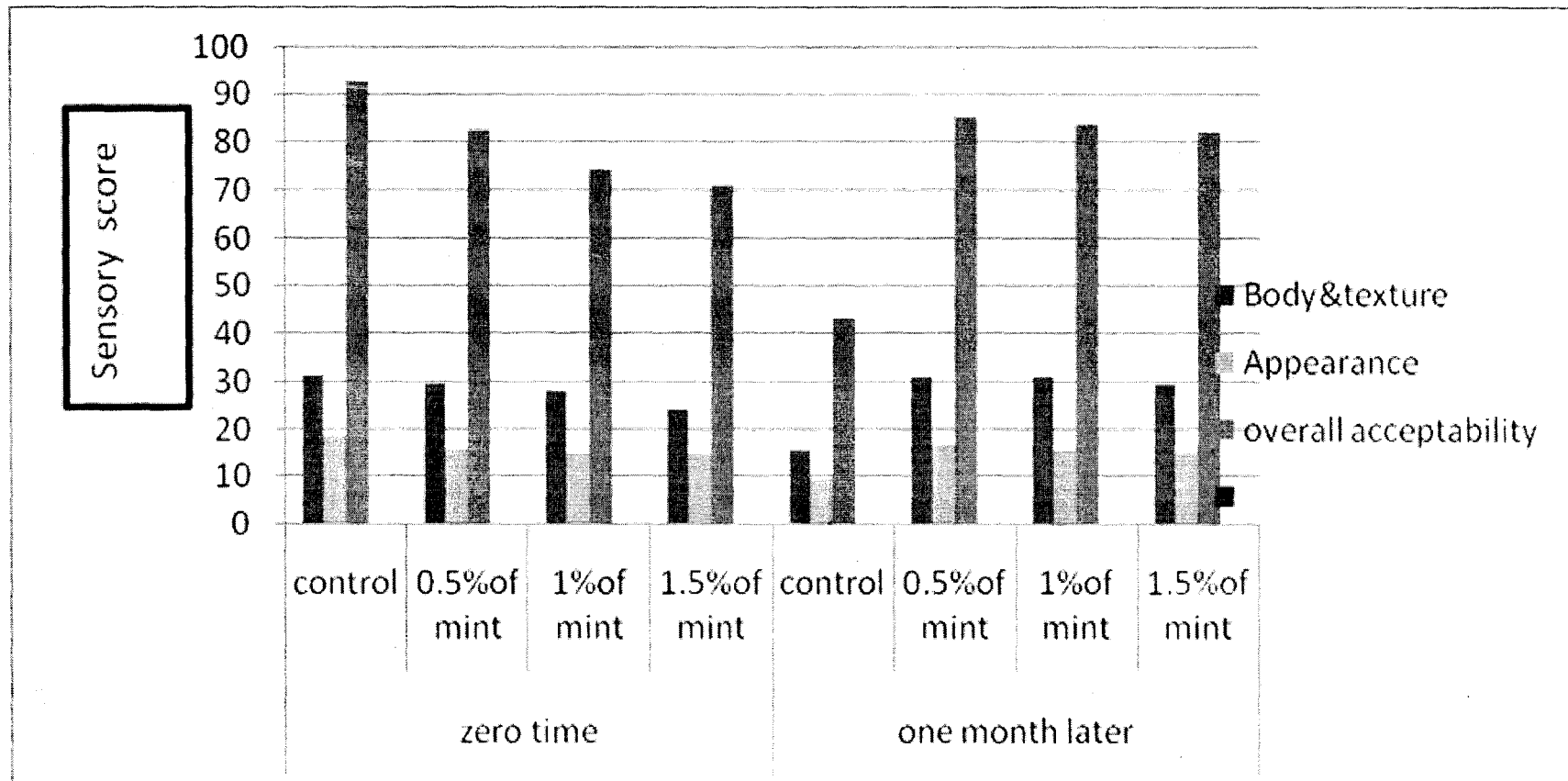


Fig 3. Sensory evaluation of kareish cheese containing different percentages of mint at zero time and one month later.

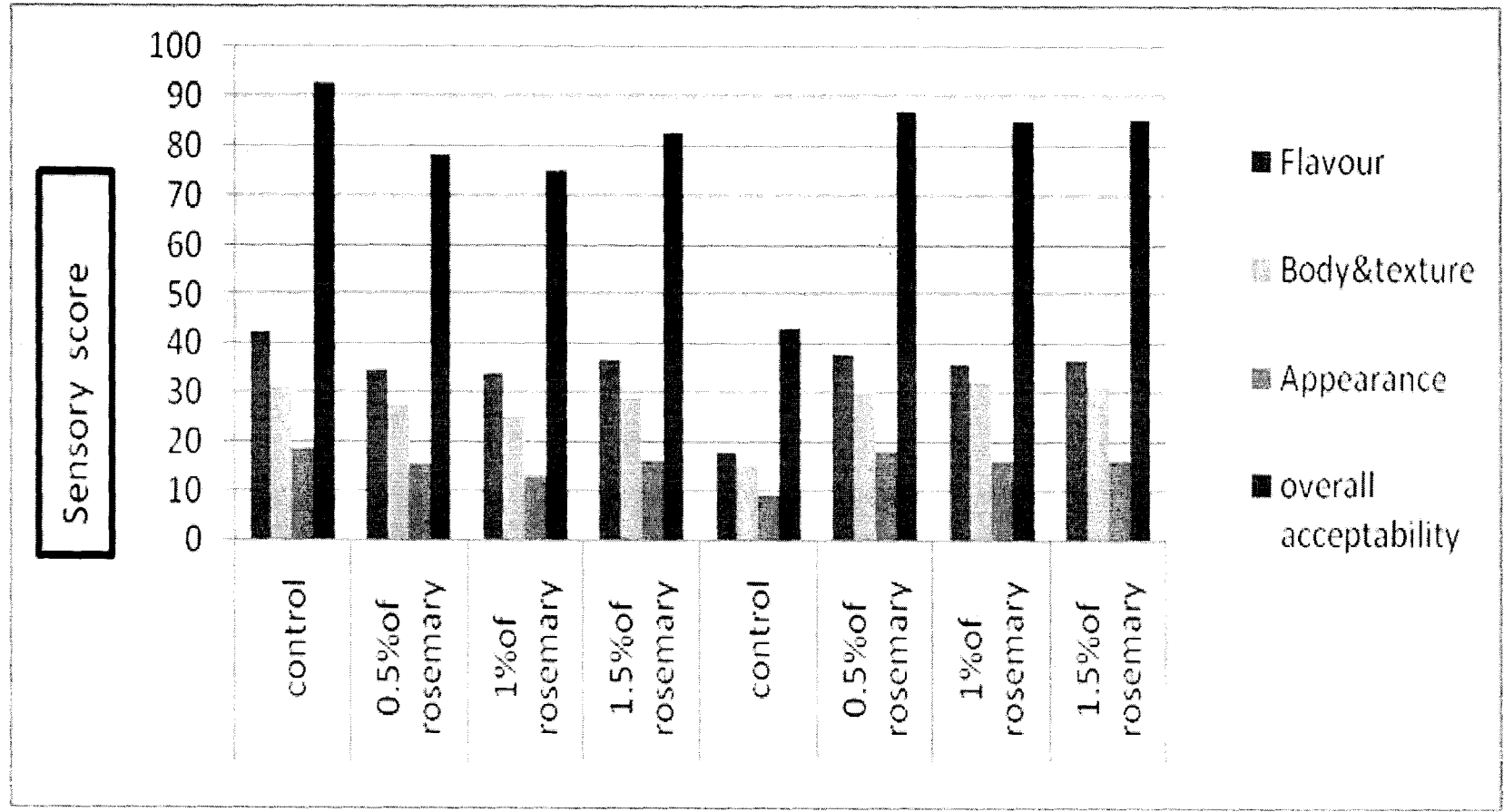


Fig 4. Sensory evaluation of kareish cheese containing different percentages of rosemary at zero time and one month later.

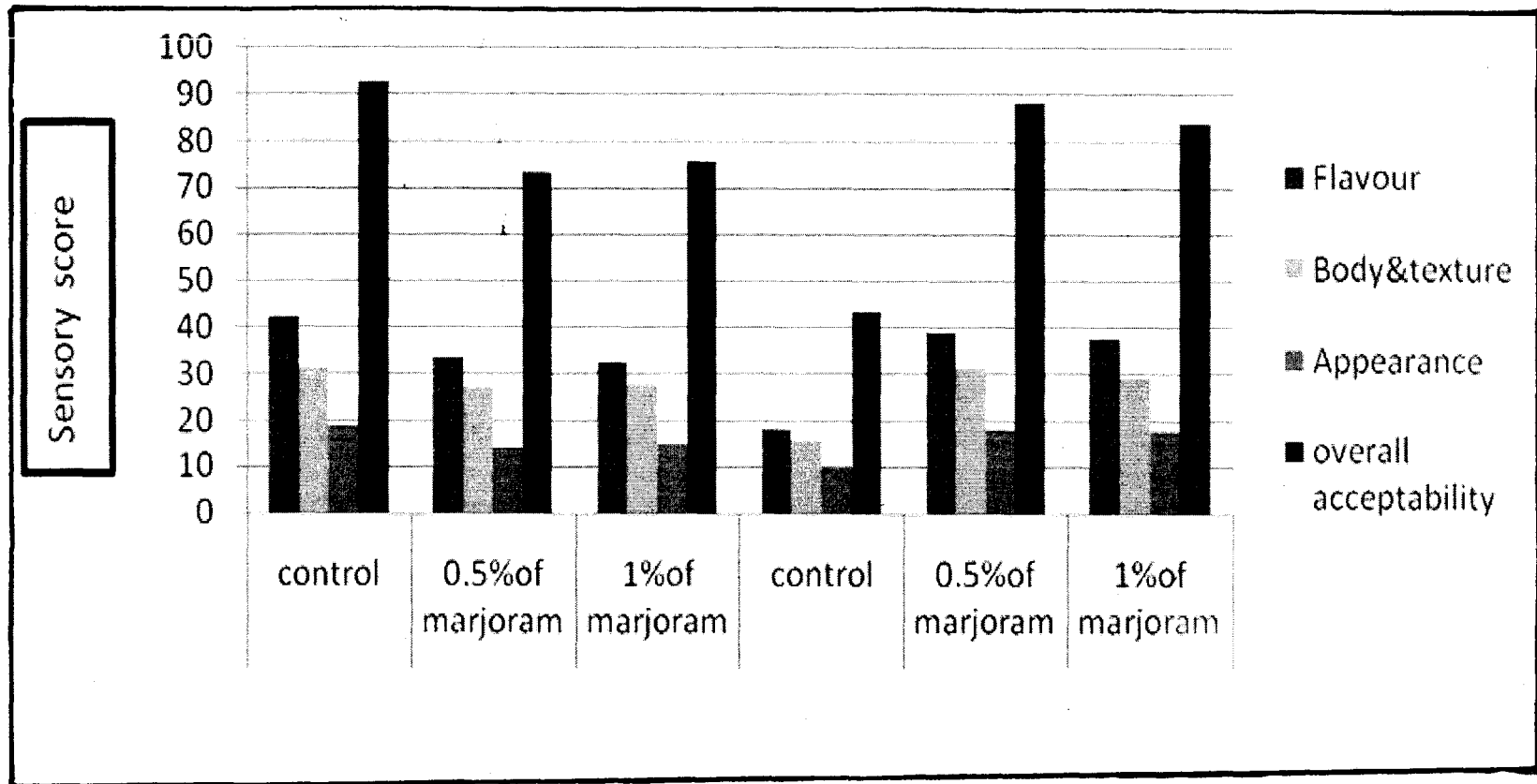


Fig 5. Sensory evaluation of kareish cheese containing different percentages of marjoram at zero time and one month later.

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## تأثير إضافة بعض النباتات الطبية على جودة و فترة الحفظ للجبن القريش

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قامت هذه الدراسة بتدعيم الجبن القريش ببعض النباتات الطبية مثل النعناع و حصالبان و الكمون و البردقوش. وهذه النباتات لها نكهة محببة لدى بعض الأشخاص كما أن الجبن القريش من أحب أنواع الجبن فى مصر. لقد تم عمل التحليل الكيمائى و الميكروبيولوجى وكذلك الأختبارات الحسية. و أوضحت النتائج وجود بعض الأختلافات الطفيفة فى التركيب الكيمائى مثل الحموضة و البروتين الكلى. كما أن إضافة بعض النباتات الطبية زادت من كمية بعض العناصر المعدنية بالجبن القريش مثل الحديد و الزنك و الكالسيوم. كما أن استخدام هذه النباتات أدى إلى إنخفاض فى العد الكلى للبكتيريا و الفطر و الخمائر مع فترة التخزين ( ٣٠ يوم). إضافة هذه النباتات حسن من نكهة الجبن مع التخزين لمدة ٣٠ يوم. و كانت أفضل نسبة هى إضافة (٥,٠%) من هذه النباتات الطبية المستخدمة فى جميع الصفات