Adding Essences or Vegetable Pickles to Goats milk to improve the Quality of Soft Cheese made it

Ismail, M.M.[1] and Hamad, M. N. F.[2]

[1]Dairy Technology Department, Animal Production Research Institution, Agriculture Research Center.

[2]Food science and Dairy Department, Faculty of Agriculture "Qena", South Valley University.

ABSTRACT

The effect of adding some additives to goat's milk on the quality of white cheese was studied. Six treatments were done by adding of Milky, Estmobli (Ripened white cheese for 1-2 months in high salt brine with green pepper *Capsicum annum*), Parameli (Ripened white cheese for 6 months in its salted whey with green pepper *Capsicum annum* and stored in casks or plastic jars) and ripened white cheese (Ripened white cheese for 6 months in its salted whey and stored in cans) essences to goat's milk at 0.04%. Pickled pepper (*Capsicum annum*) and mixture of pickled carrot (*Daucus carota*), cucumber (*Cucumus sativus*) and green and black olive (*Olea europeae*) (1.5% (w/w)) were mixed to goat's milk curd. The obtained results showed that adding the mentioned additives to goat's milk had no clear effect on the yield, acidity, pH, fat, salt and TN contents of fresh white cheese, and during the ripening period. Adding Estmboli and Parameli essences slightly increased WSN, NPN and TVFA contents of cheese. Organoleptic properties of white cheese were improved by blinding green pepper & Estmboli and Prameli essences with goat's milk, and pickled vegetables with goat's milk curd.

Key words: Goat's milk- Estmboli- Prameli cheese.

INTRODUCTION

In most countries, consumption of cheese has been raised over the past decades **(Hoebermann 1997 and Anonymous, 2002)**. The increased availability and appreciation of specialty of cheeses by those individuals willing to expand their culinary horizons has increased consumption of these types of products along with the more common domestic cheeses. Differentiation of one cheese type from another has thus assumed more importance. From the consumer perspective and the marketing/manufacturing perspective, as each manufacturer seeks to distinguish his product from others in reliable ways, as well as to increase the quality and uniformity of the product. Numerous varieties of goat's milk cheese are produced worldwide, depending on the geographical localization, milk composition and the technology used in the cheesemaking process.

On the other hand, milk and goat's milk products are important form the view point of human nutrition, especially for people with food allergies or those living in dry areas, where cow's milk is not easy to produce. Dairy goat farming is of relevant economic importance in the Mediterranean area, where developed countries such as France, Italy, Spain, and Greece have an important dairy goat industry, with an increasing demand for Gourmet cheeses, yogurt, and milk from sheep and goats **(Haenlein, 2001)**. In addition, there is an interest in value-added products such as artisanal farmhouse dairy products and those enriched with polyunsaturated fatty acids (PUFA), or conjugated linoleic acid (CLA), which could offer potential benefits in terms of human health. It is well-known that goat's milk have better digestibility in comparison with cow's milk because of smaller size of the fat globules, more easily

hydrolysed triacylglycerols containing short-chain fatty acids, and more essential amino-acids **(Hellin *et al.*, 1998)**, higher proportion of soluble minerals and smaller size of casein micelles **(Jandal 1996)**. Also, goat's milk is used for therapeutic purposes, especially, because of its antiallergenic effect **(Park 1994)**.

Because of the majority of Egyptians do not prefer the goaty flavour, and goat's milk in Egypt has been less appreciated than buffalo's or cow's milk for cheese production. Therefore, the present study was carried out to elucidate the following points: 1) improvement the goat's milk cheese flavour and 2) produce new soft white cheese type with distinctive aroma.

MATERIALS AND METHODS

Fresh goat's milk (12.51% TS, 6.65 pH, 0.16% titratable acidity, 3.9% fat and 3.38% total protein) was obtained from El-Serw Animal Production Research Station, Animal Production Research Institute, Agriculture Research Center. Egypt. Various flavouring essences were purchased from Delta aromatic International Company, Giza, Egypt, while different pickled vegetables were obtained from private plant in Damietta Governorate. Liquid calf rennet (single strength) was obtained from local market (Damietta city), and was added to milk in sufficient concentration required to coagulate milk within 40 min. Dry coarse commercial food grad salt was obtained from El-Nasr Salines Company, Egypt. Analytical grade calcium chloride obtained from El-Gomhouria Company, Egypt.

White cheese was made as described by **Abd El–Kader (2003)**. Goat's milk was divided into seven equal portions. Control cheese was made of goat's milk without added essences (A). Flavouring essences 0.04% or pickles (1.5% (w/w) during ladling), however, were added to goat's milk as indicated: milky essence (B), mixture of green pepper and Estmboli essence (C), Parameli essence (D), ripened white cheese essence (E), pickled pepper (*Capsicum annum*) (F) and mixture of pickled carrot (*Daucus carota*), cucumber (*Cucumus sativus*) and green and black olive (*Olea europeae*) (G).

Goat's milk of different above treatments was heated to 40°C then the flavouring essences of treatments B, C, D and E were added to milk at 0.04% (is usually ratio used in cheese factories). The admixture of milk and essences was blinded at 2000 rpm/5min. Salt was added to all treatments at 12%, and finally milk was renneted. After complete coagulation, the resultant curds were ladled in wooden frames, lined with muslin cloth. The curd of treatments F and G was mixed with sliced pickled vegetables at 1.5% (w/w) during ladling. After 24 hours, the resultant cheese of all treatments were weighed and pickled into their own whey, and 0.04% flavourings were added also to the whey of treatments B, C, D and E. The cheese samples were stored in plastic jars at 25°C for 3 months. Samples of cheese were analyzed when fresh and after 15, 30, 60 and 90 days of ripening period. Three replicates of each treatment were conducted.

Milk samples were analyzed for titratable acidity (TA), total solids (TS), fat and total protein contents according to **Ling (1963).** The pH values were estimated using a pH meter type CG 710. Actual cheese yield was determined by dividing the weight of cheese by the weight of milk used to make cheese, multiplied by 100. Adjusted cheese yield was calculated using the formula presented by **Metzger *et al.* (2000)**:

Adjusted yield = (actual yield × (100 − actual moisture + actual salt)) / (100 − (55 + 1.5)).

Each batch of white cheese was analyzed for dry matter, pH, titrable acidity, fat, total nitrogen (TN), water soluble nitrogen (WSN) and non-protein-nitrogen (NPN). Salt and total volatile fatty acids (TVFA) contents were also detected. Dry matter content was determined by drying at 102±2ºC to a constant weight according to ISO 5534:2004. pH was measured at 20±2ºC. Titratable acidity was expressed as % lactic acid and was determined by titration of water solution of 10 g cheese with 0.1 N NaOH using phenolphthalein as indicator. Fat content was determined by the Gerber butyrometric method and total nitrogen (TN), water soluble nitrogen (WSN) and non-protein-nitorgen (NPN) by the Kjeldahl method according to the **AOAC (1995)**. Salt content was determined according the method described by **Reddy & Marth (1993)**. Salt-in-moisture content was calculated as the percentage of salt in the cheese based on combined moisture plus salt content. Total volatile fatty acids (TVFA) were determined as described by **Kosikowski (1978)** and expressed as ml of 0.1 N NaOH / 100 g^{-1} cheese. Chemical analyses were conducted in triplicate.

A panel of 10 staff of Faculty of members the Agriculture (Qina), South Valley University described the sensory characteristics of the cheeses. The score points were 50 for taste & flavour, 35 for body and texture, 15 for colour and appearance, which give a total score of 100 points.

RESULTS AND DISCUSSION

Data in **Table 1** clear that the values of both actual and adjusted yields of fresh cheese were similar between different treatments. Actual yield percentages of treatments A, B and C were 24.90, 24.88 and 24.91%, respectively. On the other hand, the actual yield was higher than those of adjusted one in all of cheese samples. The actual and adjusted yield ratios of sample F were 24.94 and 17.05%, respectively.

The yield found in our study were lower than those obtained by **Ismail & Osman (2004)**, who mentioned that the yield of Domiati cheese made from goat's milk was 26.11%.

The results obtained from the chemical analysis showed similarities in the composition of control and experimental batches of fresh cheese and during ripening period **(Table 1)**. The acidity, pH, total solids (TS), fat, F/DM, salt and salt in moisture contents of control and treated with flavouring substances white cheese samples did not differ clearly. According to **Schar & Bosset (2002)** the main factors influencing the changes in cheese during storage are product composition, processing, packaging and storage conditions (time and temperature). The similarity in chemical composition of all studied samples found in the present study could be explained with the uniformity of the factors mentioned above. The values of TS at the end of the ripening period were 43.08 and 43.55% for A and D treatments cheese, respectively.

During ripening period, there was a pronounced increase in the TS and titratable acidity %, and a decrease in pH values in all treatments. The increase in TS contents of cheese might be attributed to curd contraction and expulsion of whey, as the result of acid production. These results were in accordance to those reported by **El-Shafei (1994)**. Also, as ripening period progressed, fat, F/DM, salt and salt in moisture contents of cheese in all treatments increased gradually. The gradual increase in the above contents of the cheese is due to the progressive loss in the moisture occurring during storage. These results were in accordance to those reported by **El-Shafei (1994) and Abou Zeid *et al*., (2007).**

Table 1. Effect of adding some flavouring essences and pickled vegetables to goat's milk on yield and chemical composition of white cheese.

Treatments	Storage period (days)	Actual Yield %	Adjusted Yield* %	Acidity %	pH values	TS %	Fat %	Fat/DM %	Salt %	Salt in Moisture %
A	0	24.90	16.77	0.42	6.43	35.78	13.8	38.57	6.48	9.16
	15	-	-	1.28	5.69	38.86	15.9	40.92	6.86	10.01
	30	-	-	2.38	3.84	40.70	18.2	44.72	7.21	10.84
	60	-	-	2.79	3.79	42.11	19.7	46.78	7.52	11.50
	90	-	-	2.99	3.71	43.08	20.2	46.88	7.91	12.20
B	0	24.88	16.84	0.41	6.41	35.90	13.9	38.72	6.45	9.14
	15	-	-	1.31	5.65	38.52	16.0	41.54	6.82	10.00
	30	-	-	2.36	3.81	41.09	18.1	44.05	7.20	10.89
	60	-	-	2.80	3.76	42.91	19.9	46.36	7.54	11.67
	90	-	-	2.97	3.70	44.01	20.3	46.12	7.93	12.41
C	0	24.91	16.50	0.43	6.40	35.32	14.0	39.64	6.50	9.13
	15	-	-	1.27	5.70	37.90	16.1	42.48	6.84	9.92
	30	-	-	2.43	3.80	39.98	18.3	45.77	7.23	10.57
	60	-	-	2.81	3.73	42.98	19.9	46.30	7.50	11.62
	90	-	-	3.01	3.68	44.05	20.4	46.31	7.90	12.37
D	0	24.86	16.93	0.41	6.42	36.12	14.0	38.76	6.49	9.22
	15	-	-	1.26	5.72	38.92	15.9	40.85	6.80	10.02
	30	-	-	2.42	3.80	40.22	18.3	45.50	7.20	10.86
	60	-	-	2.84	3.72	42.30	19.8	46.81	7.52	11.53
	90	-	-	3.05	3.67	43.55	20.4	46.84	7.92	12.30
E	0	24.91	16.87	0.41	6.43	35.98	13.8	38.35	6.51	9.23
	15	-	-	1.24	5.70	38.90	15.8	40.62	6.83	10.05
	30	-	-	2.42	3.78	40.80	18.2	44.61	7.23	10.09
	60	-	-	2.85	3.71	41.95	19.7	46.96	7.53	11.48
	90	-	-	3.04	3.65	44.02	20.3	46.12	7.91	12.38
F	0	24.94	17.05	0.44	6.39	36.24	13.7	37.80	6.50	9.25
	15	-	-	1.33	5.65	38.32	15.9	41.49	6.87	10.02
	30	-	-	2.44	3.75	40.46	18.4	45.48	7.25	10.85
	60	-	-	2.87	3.66	42.75	19.8	46.31	7.56	11.66
	90	-	-	3.11	3.60	44.04	20.3	46.10	7.96	12.45
G	0	24.96	16.75	0.45	6.38	35.72	13.7	38.35	6.52	9.21
	15	-	-	1.32	5.63	37.64	16.0	42.51	6.84	9.88
	30	-	-	2.43	3.75	40.52	18.1	44.67	7.27	10.89
	60	-	-	2.86	3.64	43.01	19.6	45.57	7.57	11.72
	90	-	-	3.09	3.61	44.31	20.2	45.58	7.98	12.53

* moisture and salt adjusted cheese yield.

The results given in **Table 2** described the influence of adding some of flavouring essences and pickled vegetables to goat's milk on TN, TN/DM, WSN, WSN/TN, NPN, NPN/TN and TVFA of white cheese. There were no pronounced differences among treatments and control for TN and TN/DM contents in fresh cheese and during ripening period. Values of TN of samples A, B, F and G were 2.88, 2.86, 2.86 and 2.85%, respectively, after 60 days of ripening period.

Adding estmboli and parameli essences (treatments C and D) to goat's milk slightly increased WSN, NPN and TVFA contents of white cheese. NPN of samples A, B, C, D and E were 0.217, 0.219, 0.224, 0.231 and 0.220%, respectively, at the end of ripening stage. Also, data in **Table 2** reflect that during storage, the WSN, WSN/TN, NPN and NPN/TN contents raised due to the protein breakdown in the cheese by milk and rennet enzymes and other microbial activities **(El-Zeini *et al*., 2007)**. Similar trend was observed for TVFA of cheese.

Table 2. Effect adding some flavouring essences and pickled vegetables to goat's milk on TN and some ripening indices of white cheese.

Treatments	Storage period (days)	TN %	TN/DM %	WSN %	WSN/TN %	NPN %	NPN/TN %	TVFA*
A	0	2.35	6.57	0.271	11.53	0.106	4.51	7.4
	15	2.42	6.23	0.332	13.72	0.139	5.74	12.4
	30	2.64	6.49	0.426	16.14	0.177	6.70	15.3
	60	2.88	6.84	0.534	18.54	0.195	6.77	20.0
	90	2.95	6.85	0.678	22.98	0.217	7.35	27.2
B	0	2.37	6.60	0.274	11.56	0.108	4.56	7.2
	15	2.45	6.36	0.330	13.47	0.137	5.59	12.6
	30	2.61	6.36	0.421	16.13	0.174	6.67	15.6
	60	2.86	6.66	0.544	19.02	0.196	6.85	20.2
	90	2.96	6.72	0.674	22.77	0.219	7.40	27.3
C	0	2.34	6.62	0.280	11.96	0.114	4.87	7.6
	15	2.40	6.33	0.337	14.04	0.145	6.04	12.6
	30	2.65	6.63	0.435	16.41	0.181	6.38	15.4
	60	2.89	6.74	0.550	19.03	0.201	6.95	20.4
	90	2.96	6.72	0.684	23.11	0.224	7.57	27.5
D	0	2.36	6.53	0.286	12.12	0.117	4.96	8.0
	15	2.43	6.24	0.342	14.07	0.148	6.09	12.7
	30	2.67	6.63	0.441	16.52	0.187	7.00	15.8
	60	2.88	6.80	0.554	19.24	0.208	7.22	20.6
	90	2.93	6.73	0.693	23.65	0.231	7.88	27.9
E	0	2.37	6.59	0.270	11.39	0.107	4.51	7.2
	15	2.48	6.37	0.334	13.47	0.138	5.56	12.1
	30	2.67	6.54	0.430	16.10	0.179	6.70	15.3
	60	2.90	6.91	0.537	18.52	0.195	6.72	20.1
	90	2.97	6.75	0.675	22.27	0.220	7.41	27.1
F	0	2.38	6.57	0.273	11.47	0.108	4.53	7.3
	15	2.43	6.34	0.331	13.62	0.135	5.55	12.5
	30	2.69	6.65	0.427	15.87	0.178	6.61	15.4
	60	2.86	6.22	0.536	20.15	0.198	7.44	20.2
	90	2.96	6.72	0.671	22.67	0.222	7.50	27.3
G	0	2.36	6.61	0.275	11.65	0.110	4.66	7.3
	15	2.44	6.48	0.337	13.81	0.139	5.70	12.2
	30	2.65	6.54	0.436	16.45	0.180	6.79	15.1
	60	2.85	6.63	0.540	18.94	0.198	6.95	20.0
	90	2.94	6.64	0.678	23.06	0.221	7.52	27.1

* expressed as ml 0.1 NaOH 100 g^{-1} cheese

Sensory analysis is becoming increasingly widespread, and its use may often be considered scientifically rigorous; it is a key element in defining cheese quality and is, therefore, seen as an essential tool in the food industry, particularly, in the dairy sector.

The organoleptic properties of white cheese of all samples improved during ripening period **(Table 3).** Similar results were found by **Ismail *et al*., (2010).** Scores of color & appearance and body & texture of both control and examined samples were similar in the fresh cheese and throughout the ripening period. Treatments A, D and G gained 33, 33 and 33 for scores of body and texture after 90 days of ripening period. The main difference between control and examined samples was found in sensory evaluated flavour. The flavour scores of samples treated with flavouring essences and pickled vegetables were higher than those of control. Cheese treatments made from goat's milk mixed with green pepper and astmboli essence (Treatment C), prameli essence (Treatment D) or mixture of pickled carrot (*Daucus carota*), cucumber (*Cucumus sativus*) and green and black olive (*Olea europeae*) (Treatment G) gained

the highest scores of flavour. This means that the goaty milk flavour which is not preferred to most Egyptians was overcome by adding some flavouring essences and pickled vegetables.

Table 3. Effect adding some flavouring essences and pickled vegetables to goat's milk on organoleptic properties of white cheese.

Treatments	Storage period (days)	Color& Appearance (15)	Body& Texture (35)	Taste & Flavor (50)	Total (100)
A	0	11	30	30	71
	15	13	32	32	77
	30	13	32	34	79
	60	13	33	35	81
	90	13	33	36	82
B	0	12	29	31	72
	15	13	32	34	79
	30	13	32	36	81
	60	13	33	36	82
	90	13	33	37	83
C	0	13	30	32	75
	15	13	31	35	79
	30	13	32	37	82
	60	13	33	40	86
	90	14	33	44	91
D	0	12	29	34	75
	15	13	32	36	81
	30	13	33	39	85
	60	13	33	42	88
	90	13	33	46	92
E	0	12	29	33	74
	15	13	33	35	80
	30	13	34	38	84
	60	13	33	39	84
	90	14	33	43	89
F	0	12	31	33	76
	15	12	33	36	81
	30	13	33	38	84
	60	13	33	40	86
	90	13	33	44	90
G	0	11	30	35	76
	15	13	30	38	81
	30	13	32	40	85
	60	13	33	42	88
	90	13	33	46	92

CONCIUSION

It could be concluded that adding green pepper & Estmboli, Prameli essences and pickled vegetables to goat's milk improved white cheese quality, especially, flavour.

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تحسين خواص الجبن الأبيض المصنع من لبن الماعز.

مجدي محمد إسماعيل*، محمد نور الدين حماد**
* قسم تكنولوجيا الألبان- معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية.
** قسم علوم الأغذية والألبان – كلية الزراعة (قنا) – جامعة جنوب الوادي.

استهدفت هذه الدراسة تحسين طعم ونكهة الجبن الأبيض المصنع من لبن الماعز ليناسب الذوق المصري.

تم إضافة بعض الطعوم المستخدمة على نطاق تجاري وهي طعم اللبن الحليب وطعم الأسطمبولي، وطعم البرميلي وطعم الجبن الأبيض المسوى للبن الماعز بنسبة ٠.٠٤% كما تم تصنيع معاملات أخرى بإضافة الفلفل الأخضر المخلل (الشطة) وإضافة خليط من الجزر المخلل والخيار المخلل والزيتون الأخضر والأسمر المخلل إلي خثرة اللبن.

تشير النتائج إلي أن إضافة المواد السابقة للبن الماعز لم يكن لها تأثير واضح على قيم التصافي والحموضة والرقم الهيدروجيني والمواد الصلبة والدهن والملح والنتروجين الكلي بالجبن الناتج، في حين أدى إضافة طعم الأسطمبولي والبرميلي إلي زيادة طفيفة في قيم النتروجين الذائب في الماء والنتروجين الغير بروتيني والأحماض الدهنية الكلية الطيارة، وقد ظهر تحسن واضح بالخواص الحسية للجبن الأبيض المصنع من لبن الماعز نتيجة لإضافة طعوم الأسطمبولي والبرميلي والخضروات المخللة للبن.