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Effect of Adding *Alpinia officinarum* Powder on The Properties and Shelf Life of White Soft Cheese Made from Goat's Milk

Eid, M. Z.[1]; M. S. Mostafa[2]; Ola M. A. K. Shalabi[2]; M. M. Ismail[1] and R. I. El-Metwally[1]*

[1]Dairy Technology Department, Animal Production Research Institute, Agricultural Research Center, Dokki, Giza, Egypt.
[2]Dairy Department, Faculty of Agriculture, Mansoura University.

ABSTRACT

The purpose of this study was to investigate the effect of adding *Alpinia officinarum* powder (AOP) on the quality, properties and shelf life of white soft cheese made from goat's milk. White soft cheese was made by adding 0.0, 0.25, 0.50, 0.75 and 1.0 % (AOP) to goats milk and the resultant cheese were stored at 5°C for 60 days. A direct relationship was found between the rate of AOP added and the values of curd tension and syneresis of cheese. Addition of AOP, moreover, lowered titratable acidity , water soluble nitrogen levels and total volatile fatty acids whereas increased values of pH, total solids, fat, salt, total protein, total phenol compounds, dietary fibers, antioxidant activity , compared with control cheese. Goat cheese contained AOP had lower counts of total viable bacteria, psychrophilic, proteolytic, lipolytic and mold and yeasts. Goat cheese fortified with 0.25 and 0.50% AOP was shown to be the favorable ones, during the storage period based on the sensory evolution scores. Generally, addition of AOP, rich in phenolic compounds and antioxidant activity etc., increased the keeping quality of cheese and render it to be as a functional food.

Keywords: *Alpinia officinarum* powder, goat's milk, White soft cheese, phenolic compounds, antioxidant activity.

INTRODUCTION

The particular interest in goat's milk has been sparked by its undeniable dietary properties. The chemical composition of this milk is hassling when compared with cow's milk, and its ingredients is different. The former is higher in dry matter, total protein, casein, milk fat and minerals and have higher nutritional value (Haenlein, 2001).

Goat milk fat contains more vitamin A than cow's milk. The fatty acid composition also differs, as it is rich in volatile fatty acids (caproic, caprylic and capric acids), which are responsible for the taste and smell of the associated milk products, while the higher content of medium-chain fatty acids are responsible for the more prolonged bacteriostatic stage. Goat milk is mainly used to make cheese (Boyazoglu and Morand-Fehr, 2001). Milk fat and proteins, especially casein, are major contributors to cheese yield and also affect the curdling properties of milk (Cecchinato and Bittante, 2016). Goat milk deviates from bovine and human milk in alkalinity, buffering capacity, and digestibility. It also has certain beneficial properties that make it possibility useful in human medicine and nutrition (Slačanac *et al.*, 2010). Despite these preferences, many consumers refuse goat's milk and some of its derived products because of its objectionable "goat" odor and taste. Additionally, goat milk products can become sour during fermentation (Vieitez *et al.*, 2016), which passively affects their sensory properties. Moreover, goat milk has lower total casein content than bovine milk, and contains little to no $\alpha s1$-casein and exhibits a greater extent of casein micelle dispersion, which influences the rheological traits of the resultant products (Hodgkinson, *et al.*, 2018).

Alpinia officinarum (Galangal) is a rhizome belonging to the family, zingeberaeceae, grown in South East of Asia. This rhizome is characterized by dark reddish brown color and has a strong aromatic smell. In Asia the rhizomes are ground to powder for use in curries, drinks, and jellies (Yang and Eilerman 1999). Ethnomedical, used this rhizome in the treatment of rheumatism, bronchial catarrh, halitosis, ulcers and pertussis in children (Kirtikar, 2001). It is used, moreover, in the treatment of stomach pain, back pain, rheumatism, asthma, diabetes, heart disease, liver disease, kidney disease and to increase appetite (Rajpal and Kohli, 2009).This rhizome is advantageously used in various purposes such as antibacterial, antifungal, anti-inflammatory, anti-hepatotoxic, antioxidant, immune-modulatory, antiulcer, antitumor and anti-allergic activities (Khare, 2007). Galangal rhizome can also be used as a substitute for antibiotics, disinfectants, and food flavorings. It is frequently consumed in foods and might be safe when given orally in higher doses as medicine (Tang *et al.*, 2018). Galangal contains diuretic, antiplatelet, antifungal, and anti-tumor properties and can be used as a stomach therapy and to treat cardio-tonic lesions (Ding *et al.*, 2019).

Therefore, the aim of this study was extending the shelf life, improving the organoleptic properties and the nutritional value of the resultant goat milk cheese by adding AOP.

MATERIALS AND METHODS

Materials:

Fresh goat's milk with the following specifications was obtained from El-Serw Station, Animal Production

* **Corresponding author.**
E-mail address: raidmetwally@gmail.com
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Research Institute, Agricultural Research Center, Egypt: acidity 0.16%, pH 6.64, fat 4.15, total solids 13.05, and total protein 3.49. Liquid calf rennet (single strength) and the *Alpinia officinarum* powder (AOP) were bought from the local market of Damietta city. Dry coarse commercial food grade salt was perchaused from the Egyptian El-Nasr company. Calcium chloride of analytical grade was gained from El-Gomhouria Company, Egypt. Chemical composition of the tested AOP is shown in Table (1).

Table 1. Chemical composition of *Alpinia officinarum* powder (AOP).

Chemical composition g/100g	
Fat	2.31
Protein	5.22
Ash	3.18
Carbohydrates	75.8
Fiber	16.6
Phenolic content*	96.5
Antioxidant activity**	2.97

***Data expressed as mg gallic acid equivalent (GAE)/ 100 g dry weight.**
****Data expressed as µmol Trolox equivalent (TE)/g dry weight.**

Methods:

White soft cheese making:

Goat's milk was employed to make white soft cheese using the method described by Abd El–kader (2003).

Goat milk was divided into five batches and AOP was added as follow:

Treatment A: goat's milk free from AOP (control).
Treatment B: goat's milk fortified with 0.25 % AOP.
Treatment C: goat's milk fortified with 0.50 % AOP.
Treatment D: goat's milk fortified with 0.75 % AOP.
Treatment E: goat's milk fortified with 1.0 % AOP.

Goat milk of all treatments was heated to 63 °C for 30 minutes, cooled to 40 °C, 0.02% calcium chloride and 6 % salt were added to all milks and coagulation was done using1.5 mL liquid rennet / kg. After complete coagulation, the resultant curds were ladled in wooden frames, lined with muslin cloth and the resultant cheese from each treatment was weighted and pickled into its own whey after 24-hour period. Cheese samples were kept in plastic jars at 5°C. Fresh cheese samples and cheese aged for 15, 30, 45, and 60 days were under-went to analysis chemically , microbiologically and organolepticaly. Three replicates of each treatment were conducted.

Chemical analyses

Total solids, fat, and total nitrogen contents were determined according to (AOAC, 2012). Titratable acidity (Richardson, 1986). The pH values were measured using a digital laboratory pH meter with a glass electrode model SA 720 (Orion, U.S.A). Water-soluble nitrogen (WSN) Ling (1963). Total volatile fatty acids (Kosikowiski, 1978). Salt contents (Richardson, 1985) using the Volhard method. The total phenol compounds (Zheng and Wang, 2001) using Folin Ciaoalteu Reagent (FCR) and gallic acid as a standard solution. The antioxidant activity (AA %) (Lee et *al.,* 1995).

Microbiological analysis:

Counts of the total viable bacterial, Psychrophilic, Proteolyptic, Lipolyptic and mold and yeasts were estimated according to the American Public Health Association (2004).

Sensory evaluation:

Staff members of El-Serw Station evaluated the white soft cheese treatments for their organoleptic qualities. A total of 100 points were awarded, 50 points awarded for flavor, 35 points for body and texture, and 15 points awarded for color and appearance.

Statestical analysis:

Using software based on analysis of variance, the results were statistically examined (SAS, 1991). When F-test was a significant, the least significant difference (LSD) was calculated according to Duncan (1955) to compare between means. The data presented in the Tables are the mean (± standard deviation) of 3 experiments.

RESULTS AND DISCUSSION

Table (2) illustrated the effect of adding AOP on the rennet coagulation time (RCT), curd tension and curd synersis of goat's milk. It is obvious that adding AOP had a significant (P<0.05) effect on rennet coagulation time. The main reason for that was presumably due to the presence of some ingredients having slight inhibitory effect on the activity of the rennet. Milk treatments containing AOP possessed lower rennet coagulation time values as compared with control. The curd tension levels raised significantly, while the syneresis values reduced as the concentration of added AOP increased. These results are in line with those of (El-Metwally *et al.,* 2021).

Table 2. Effect of adding AOP on rennet coagulation time, curd tension and curd synersis of goat's milk.

Treatments	RCT (Sec)	Curd tension (g)	Curd syneresis (gm/15 gm of curd)*			
			Time (min)			
			10	30	60	120
0.0 % AOP	173^{a}	36.37^{e}	4.443^{a}	6.612^{a}	7.956^{a}	8.997^{a}
0.25% AOP	170^{b}	36.54^{d}	4.428^{b}	6.587^{b}	7.925^{b}	8.978^{b}
0.50% AOP	166^{c}	36.71^{c}	4.411^{c}	6.561^{c}	7.908^{c}	8.959^{c}
0.75% AOP	161^{d}	36.85^{b}	4.394^{d}	6.546^{d}	7.889^{d}	8.931^{d}
1.0 % AOP	157^{e}	37.11^{a}	4.381^{e}	6.531^{e}	7.872^{e}	8.911^{e}
LSD	2.485	0.023***	0.002***	0.002***	0.002***	0.001***

Significant different at p < (*0.05, **0.01, ***0.001). For each effect the different letters in the means the multiple comparisons are different from each. Letters a is the highest means followed by b, c …..etc
***Whey excluded (grams) from 15 gm of curd kept at room temperature after 10, 30, 60 and 120min.**
AOP= *Alpinia officinarum* powder

Table (3) referred to the effect of adding AOP on yield and some chemical properties of white soft goat cheese. With 1% AOP added (treatment E), the best yield (24.51%) was obtained. It was evident that adding different AOP concentrations boosted the yield values of the cheese owing to the high percentage of its total solids (carbohydrate 75.8%, protein 5.22%, fat 2.31 %). Abd-El Salam and Benkerroum (2006) emphasized that pH is more important than Nacl, protein, fat, or moisture for determining the yield and textural qualities of cheese. From the present Table, It was clear, also, that control cheese, without AOP, had slightly greater acidity values than cheese made with it. The findings demonstrated that when the level of AOP increased, the acidity decreased. Extending the storage times in all treatments caused the acidity percent and pH values to grow and decrease significantly (P<0.05), respectively (Table, 8).

These results are in agreement with those reported by Ismail *et al.,* (2010) and Khalifa and Wahdan (2015). The continues fermentation of lactose to lactic acid may be the cause of the increase in acidity and decreased in pH (Salem *et al.,* 2013 and Moneeb and El-Derwy 2021). Table (3), moreover, cleared that with an increase in AOP content, total solids (TS) increased significantly (P<0.05) during the course of the storage time in all treatments, which may be caused by moisture loss. These results are in approval with those found by Al. Otaibi and El. Demerdash (2008) and Sayed-Ahmad *et al.,* (2018). The findings of Fat, Fat/DM, Salt, and Salt in moisture showed that these variable values rose significantly (P<0.05) across the storage periods and by increasing AOP. These results are in approval with those reported by Abd El-Aziz *et al.* (2007) and Zommara *et al.,* (2007).

Table 3. Effect of adding AOP on the yield and some chemical properties of white soft goat cheese, during storage period.

Treatments	Storage period (days)	Yield %	Acidity %	pH values	TS %	Fat %	Fat/ DM%	Salt %	Salt in moisture
A	0	24.03	0.22	6.45	39.12	15.85	40.52	4.11	6.32
	15		1.11	4.52	45.92	18.68	40.71	4.49	7.66
	30		1.83	4.24	46.57	19.30	41.45	5.11	8.72
	60		2.27	3.98	46.83	19.58	41.82	5.20	8.90
B	0	24.11	0.21	6.51	39.23	15.91	40.58	4.19	6.45
	15		1.09	4.56	45.99	18.75	40.79	4.56	7.78
	30		1.80	4.33	46.66	19.37	41.52	5.19	8.86
	60		2.24	4.12	46.93	19.65	41.88	5.29	9.06
C	0	24.25	0.21	6.53	39.37	16.00	40.66	4.25	6.55
	15		1.07	4.66	46.12	18.84	40.87	4.66	7.96
	30		1.78	4.42	46.77	19.45	41.59	5.27	9.00
	60		2.21	4.20	47.09	19.75	41.95	5.35	9.18
D	0	24.36	0.20	6.53	39.48	16.07	40.71	4.33	6.67
	15		1.06	4.70	46.23	18.91	40.92	4.71	8.05
	30		1.76	4.49	46.90	19.53	41.66	5.33	9.12
	60		2.20	4.23	47.19	19.83	42.03	5.42	9.30
E	0	24.51	0.20	6.54	39.63	16.16	40.79	4.41	6.81
	15		1.05	4.75	46.45	19.05	41.01	4.79	8.21
	30		1.73	4.58	47.11	19.66	41.73	5.40	9.26
	60		2.17	4.40	47.38	19.94	42.09	5.48	9.43

Treatment A: goat's milk free from AOP (control). Treatment B: goat's milk fortified with 0.25 % AOP.
Treatment C: goat's milk fortified with 0.50 % AOP. Treatment D: goat's milk fortified with 0.75 % AOP.
Treatment E: goat's milk fortified with 1.0 % AOP.

Table (4) shows that the TN and TN/DM values of goat's cheese contained AOP were slightly higher than the control and the current findings were in approval with that of El-Tantawy *et al.,* (2006). AOP has a modest quantity of crude protein, fat and ash and is high in crude fiber and carbohydrates (Yun Lin *et al*, 2015 and Tang *et al.,* 2018).

Table 4. Effect of adding AOP on cheese ripening indicences and TVFA contents of white soft goat cheese , during storage period

Storage period (days)	A control	B	C	D	E
			TN %		
0	2.34	2.36	2.38	2.41	2.42
15	2.41	2.42	2.44	2.46	2.48
30	2.52	2.57	2.59	2.61	2.62
60	2.74	2.76	2.78	2.80	2.82
			TN/DM %		
0	5.98	6.01	6.04	6.10	6.11
15	5.24	5.26	5.29	5.32	5.34
30	5.41	5.51	5.53	5.57	5.56
60	5.85	5.88	5.81	5.93	5.95
			WSN %		
0	0.253	0.251	0.251	0.250	0.249
15	0.319	0.317	0.315	0.313	0.311
30	0.424	0.421	0.419	0.416	0.415
60	0.544	0.542	0.540	0.538	0.536
			WSN/TN %		
0	10.81	10.63	10.54	10.37	10.28
15	13.23	13.09	12.91	12.72	12.54
30	16.82	16.38	16.18	15.94	15.83
60	19.85	19.63	19.42	19.21	19.01
			TVFA %		
0	13.19	13.16	13.12	13.05	12.97
15	20.26	20.25	20.21	20.13	20.02
30	25.62	25.59	25.50	25.42	25.33
60	36.11	36.07	36.00	35.87	35.75

***expressed as ml 0.1 NaOH 100 g-1 cheese**

In the contrast, by increasing the ratios of AOP, WSN, WSN/TN, and TVFA values significantly (P<0.05) decreased (Tables, 4, 8). Treatment (E) had the lowest values compared with control.This can be referred to the decreasing growth and activity of cheese microflora (Abdel-Kader *et al.,* 2001 and Salama, 2004).

Khalifa and Wahdan (2015) and Batool *et al.,* (2018) reported that the increase in the content of TVFA could be referred to lipolytic activity in addition to free fatty acids produced and to the higher titratable acidity percent in cheese during ripening. Generally, TN, WSN, WSN/TN and TVFA values of all goat's cheese treatments progressively significantly (P<0.05) increased throughout the storage period.

Table (5) demonstrated that, over the storage period, counts of the total viable bacteria, of all treatments were increased till the 15 day of storage then decreased gradually thereafter. The main reason for that may be due to the gradual increase in acidity during storage. Furthermore, Gazal *et al.,* (2014) and Basri *et al.,* (2017) reported that AOP has, antibacterial and antifungal effects.

On the other hand, counts of psychrophilic , proteolytic, lipolytic, mold and yeasts were significantly (P<0.05) rose in all cheese treatments till the end of the storage period and cheese containing AOP had lower counts than the control cheese .

Data in Table (6) revealed that, among all the cheese treatments, control cheese had the lowest value of phenolic content. Antioxidant activity has been linked to similar results, when compared to the control. It was seen that adding AOP significantly (P<0.05) boosted total antioxidant activity (Tables, 6, 8). The phenolic content and antioxidant activity in AOP may be responsible for the increased antioxidant activity of supplemented cheese. These results were in agreement with Housman *et al.,* (2014) and Alasmary *et al.,* (2019). Table 6, showed, also, that adding AOP to cheese was accompanied by high amounts of dietary fibers, because AOP has a higher dietary fiber content, 16.6 % (Gazal *et al.,* 2014 and Tang *et al.,* 2018).

The score points of organoleptic properties of cheese during storage are presented in Table (7).

Table 5. Effect of adding AOP on some microbial groups (log cfu/ml) of white soft goat cheese , during storage period.

Storage period (days)	Total viable bacterial (cfu x 10^5)				
	A	B	C	D	E
0	24.4	23.1	22.5	21.6	21.0
15	64.1	62.2	61.4	60.2	59.2
30	8.6	7.4	7.1	6.3	5.5
60	3.7	2.9	2.3	2.0	1.7
	Psychrophilic (cfu x 10^3)				
0	2.62	2.55	2.51	2.39	2.22
15	11.48	11.39	11.32	11.18	10.95
30	59.66	54.52	49.40	45.22	38.30
60	83.17	70.21	61.52	52.58	37.41
	Proteolyptic (cfu x 10^3)				
0	1.1	0.89	0.80	0.74	0.70
15	2.22	2.02	1.85	1.73	1.69
30	3.85	3.71	3.57	3.44	3.39
60	6.87	6.69	6.52	6.40	6.35
	Lipolyptic (cfu x 10^3)				
0	0.64	0.60	0.58	0.55	0.51
15	1.65	1.59	1.52	1.47	1.42
30	3.27	3.20	3.11	3.01	2.97
60	5.44	5.36	5.21	5.15	5.08
	Molds & Yeasts (cfu x 10^2)				
0	1	0.8	0.75	0.72	0.70
15	3.95	3.82	3.79	3.75	3.71
30	5.88	5.73	5.68	5.64	5.60
60	18.22	18.01	17.92	17.85	17.81

Table 6. Effect of adding AOP on contents of phenolic compounds, dietary fibers and total antioxidant activity of fresh soft goat cheese.

Treatments	Phenolic content*	Total antioxidant activity**	Dietary fibers%
A control	0.77	0.12	--
B	1.18	0.29	0.59
C	1.41	0.37	0.71
D	1.66	0.49	0.84
E	1.89	0.58	0.99

***Data expressed as mg gallic acid equivalent (GAE)/g dry weight.**
****Data expressed as µmol Trolox equivalent (TE)/g dry weight.**

Table 7. Effect of adding AOP on organoleptic properties of white soft goat cheese, during storage period

Treatments	Storage Period (days)	Color & Appearance (15)	Body & Texture (35)	Flavour (50)	Total (100)
A Control	0	14	30	44	88
	15	14	31	45	90
	30	13	32	46	91
	60	12	33	46	91
B	0	13	31	46	90
	15	12	31	46	89
	30	12	32	47	91
	60	11	32	47	90
C	0	12	30	47	89
	15	12	31	47	90
	30	11	32	48	91
	60	11	32	48	91
D	0	11	29	42	82
	15	11	30	42	83
	30	10	31	41	82
	60	10	31	41	82
E	0	10	29	40	79
	15	10	29	40	79
	30	9	30	39	78
	60	9	30	39	78

The addition of AOP to cheese led to slightly decrease in color and appearance but it improved significantly ($P < 0.05$) the body and texture and flavor as well as the keeping quality of the cheese. The interplay of milk components, rennet enzymes, lipases, and secondary flora during the maturing process led to biochemical events that gave cheese its body and texture and flavour (Urbach, 1997 and Smit *et al.,* (2005). Shetty and Monisha (2015) and Chouni and Paul (2018) reported that AOP is reportedly commonly used as a spice for culinary flavoring because of its distinctive scent and pungency. The sensory evaluation gave the greatest ratings to treatments B and C, while treatment E received the lowest rate for fresh cheese and throughout the storage period.

Table 8. Statistical analysis of white soft cheese treatments.

Analysis	Effect of cheese treatments					
	A	B	C	D	E	LSD
yield	24.03^{e}	24.11^{d}	24.25^{c}	24.34^{b}	24.51^{a}	0.0463***
Acidity	1.35^{a}	1.33^{a}	1.23^{a}	1.22^{a}	1.28^{a}	0.158***
pH	4.797^{e}	4.88^{d}	4.953^{c}	4.987^{b}	5.067^{a}	0.033***
TS	44.61^{e}	44.70^{d}	44.83^{c}	44.95^{b}	45.14^{a}	0.0118***
Fat	18.35^{b}	18.32^{b}	18.51^{ab}	18.58^{a}	18.70^{a}	0.1991***
Salt	4.73^{e}	4.80^{d}	4.88^{c}	4.94^{b}	5.02^{a}	0.023***
Salt in moisture	7.90^{e}	8.03^{d}	8.17^{c}	8.28^{b}	8.42^{a}	0.096***
TN	2.50^{c}	2.52^{b}	2.54^{b}	2.57^{a}	2.58^{a}	0.021***
WSN	0.396^{a}	0.383^{ab}	0.381^{bc}	0.379^{cd}	0.377d	0.002***
TVFA	23.79^{a}	23.76^{a}	23.71^{ab}	23.61^{b}	23.51^{c}	0.094***
TVBC	252^{a}	239^{b}	233.7^{c}	225.3^{d}	218.5^{e}	1.075***
psych	106.72^{a}	103.41^{b}	101.25^{c}	98.77^{d}	95.38^{e}	0.055***
prot.	3.51^{a}	3.32^{b}	3.18^{c}	3.07^{d}	3.03^{e}	0.042***
lipo	2.27^{a}	2.69^{b}	2.64^{c}	2.61^{d}	2.54^{e}	0.027***
Moulds & Yeast	7.26^{a}	7.09^{b}	7.03^{c}	6.99^{d}	6.95^{d}	0.037***
Color	13.25^{a}	12.00^{b}	11.5^{b}	10.5^{c}	9.5^{d}	0.825
Body	31.5^{a}	31.5^{a}	31.25^{a}	30.25^{b}	29.5^{b}	0.825
Flavor	45.25^{c}	46.5^{b}	47.5^{a}	41.5^{d}	39.5^{e}	0.825
Phenolic content	0.77^{e}	1.18^{d}	1.41^{c}	1.66^{b}	1.89^{a}	0.022***
Total antioxidant	0.12^{e}	0.19^{d}	0.27^{c}	0.39^{b}	0.48^{a}	0.024***
Dietary fibers%	---	0.59^{d}	0.71^{c}	0.84^{b}	0.99^{a}	0.029***

	Effect of storage period (days)				
	0	15	30	60	LSD
Acidity	0.21^{d}	0.94^{c}	1.78^{b}	2.21^{a}	0.140***
pH	6.51^{a}	4.64^{b}	4.41^{c}	4.18^{d}	0.030***
TS	39.36^{d}	46.14^{c}	46.80^{b}	47.08^{a}	0.011***
Fat	15.99^{d}	18.84^{c}	19.46^{b}	19.67^{a}	0.178***
Salt	4.26^{d}	4.64^{c}	5.26^{b}	5.34^{a}	0.021***
Salt in moisture	6.56^{d}	7.93^{c}	8.99^{b}	9.17^{a}	0.086***
TN	2.38^{d}	2.44^{c}	2.58^{b}	2.78^{b}	0.018***
WSN	0.25^{d}	0.31^{d}	0.42^{b}	0.54^{a}	0.002***
TVFA	13.09^{d}	20.17^{c}	25.49^{b}	35.96^{a}	0.084***
TVBC	25.6^{d}	69.8^{c}	225.2^{b}	614.2^{a}	0.0962***
psych	2.45^{d}	11.26^{c}	79.38^{b}	311.3^{a}	0.05***
prot.	0.85^{d}	1.89^{c}	3.59^{b}	6.56^{a}	0.037***
lipo	0.57^{d}	1.53^{c}	3.16^{b}	5.32^{a}	0.024***
Molds & Yeast	0.79^{d}	3.80^{c}	5.71^{b}	17.96^{a}	0.033***
Color	12^{a}	11.8^{c}	11^{b}	10.6^{b}	0.738
Body	29.8^{b}	30.4^{b}	31.4^{a}	31.6^{a}	0.738
Flavor	43.8^{a}	44^{a}	44.2^{a}	44.2^{a}	0.738

CONCLUSION

From the previous findings, it can be concluded that the use of AOP enhanced the goat cheese's quality and its shelf life, particularly at concentrations of 0.25 and 0.50%, and minimized its goaty flavor, which is disliked by the majority of Egyptian consumers.

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تأثير إضافة مسحوق الخولنجان الصغير على صفات ومدة حفظ الجبن الأبيض الطري المصنع من لبن الماعز

محمد زكى عيد[1]، محمد صبرى مصطفى[2] ،علا محمد شلبى[2] مجدى محمد اسماعيل[1] و رائد إبراهيم المتولى[1]

[1] قسم بحوث تكنولوجيا الألبان- معهد بحوث الإنتاج الحيواني- مركز البحوث الزراعية
[2] قسم الألبان – كلية الزراعة – جامعة المنصورة

الملخص

تم دراسة تأثير إضافة مسحوق الخولنجان على خصائص ومدة حفظ الجبن الأبيض الطري المصنع من لبن الماعز. تمت إضافة مسحوق الخولنجان (AOP) بنسب (0.0 ، 0.25 ، 0.50 ، 0.75 و 1.0٪) إلى اللبن. تم تخزين الجبن الأبيض الطري الناتج لمدة 60 يومًا على 5 درجات مئوية وأخذت العينات لتحليلها على فترات كل 15 يومًا. و أوضحت النتائج أن اضافة مسحوق الخولنجان (AOP) للبن الماعز كان له تأثيرا على زمن التجبن و قوة شد الخثرة و معدل التشرش و أدت هذه الاضافة الى اللبن إلى زيادة ، المواد الصلبة ، الدهون ، الملح ، البروتين الكلي ، الفينول الكلى ، الألياف الغذائية ، نشاط مضادات الأكسدة وقيم الpH مقارنة بجبن المقارنة. على العكس من ذلك ، انخفضت درجة الحموضة ، والنيتروجين الذائب ، و قيم الأحماض الدهنية الطيارة والعدد البكتيري الكلي ، والبكتريا المحللة للبروتين و البكتريا المحللة للدهون ، و الفطريات والخمائر. أظهرت نتائج التحكيم الحسي أن جبن الماعز الأبيض الطرى المدعم بمسحوق الخولنجان (AOP) بنسب 0.25 و 0.50٪ كان افضل من باقى المعاملات خلال فترة التخزين كما زادت مدة حفظ الجبن المحتوى على مسحوق الخولجان مقارنة بجبن المقارنة ... ونظرا لاحتواء مسحوق الخولنجان على مركبات فينولية ومواد مضادة للاكسدة و ألياف و غيرها من المواد المفيدة للصحة العامة ....فيمكن اعتبار جبن لبن الماعز المحتوى على هذا المسحوق جبن وظيفى .