Journal of Food Science and Technology (Iran)

Homepage:www.fsct.modares.ir

Scientific Research

Investigating the effect of the extract of *Artemisia sieberi* Besser. from different habitats of Qom region on the quality and shelf life of Iranian white cheese

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ARTICLE INFO

Article History:

Received:2023/8/29
Accepted: 2023/10/19

Keywords:

Artemisia sieberi Besser.,
Coliform,
Fat content,
Habitats
Total phenol.

DOI: 10.22034/FSCT.21.146.168

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ABSTRACT

In order to evaluate the effect of *Artemisia sieberi* extract from different habitats on the shelf life of Iranian white cheese, this research was conducted in 2022 in the research laboratory of Qom University, Iran. A factorial experiment was conducted based the completely randomized design, and cheese in terms of chemical and microbial characteristics in the conditions of no extract (control) and the use of extract containing 1% of the weight of the fresh material of *A. sieberi* from three habitats of Venan, Tajkhatun and Abbas Abad was checked on the 1st, 15th and 30th. The results showed that the population of cheese microorganisms increased with the increase of the storage period, and the extract of Venan better controlled the population of microorganisms than other extracts. The amount of pH and protein in the dry matter decreased with the increase of the storage period, and the amount of moisture, salt, fat, dry matter, phenol and antioxidant activity increased. Venan extract increased the quality and shelf life of cheese more than other extracts, which may be due to the higher amount of total phenol in Venan extract compared to other extracts. In general, the extract of *Artemisia sieberi* significantly increased the shelf life and quality of cheese, and with further studies, the extract of this valuable plant can be used to increase the shelf life and quality of food products, especially dairy products.

[DOI: 10.22034/FSCT.21.146.169]

1. Introduction

Cheese is one of the most widely consumed dairy products, and depending on its type, it possesses a distinctive aroma and flavor, containing varying amounts of key milk components such as protein, fat, water, minerals, and vitamins. It is commonly used, especially in breakfast meals on a daily basis [1]. Due to its low pH of cheese, it is susceptible to contamination by undesirable microorganisms, particularly mold and yeast [2]. Nowadays, various compounds such as polysaccharides, proteins, fats, and bioactive substances of medicinal plants are used to preserve agricultural products and food [3]. Bioactive substances derived from plants, due to their appropriate antimicrobial activity against bacteria responsible for spoilage and pathogenic agents, can serve as an alternative to conventional chemical preservatives in increasing the performance of food coatings [4].

In a research, edible coatings containing oregano essential oil were used in cheese [5]. The antimicrobial effects of different levels of *Kelussia Odoratissima* powder on preventing the growth of coliform, mold and yeast, overall acceptability, pH and acidity of local cheese samples from Borujerd, Iran during cold storage were investigated. The findings showed that by increasing the percentage of *K. Odoratissima* powder in the cheese samples, the number of coliforms, molds and yeasts, titratable acidity and overall acceptability decreased significantly ($p<0.05$), and its pH increased. Finally, in terms of organoleptic properties, the sample containing 0.1% celery powder was more favorable than other concentrations used [6]. In a research study aimed at investigating the antibacterial effects of alcoholic and aqueous extracts of *Thymus persicus* and *Mentha longifolia* on bacteria isolated from local cheeses in the city of Maragheh, the antimicrobial effects of these extracts on *Escherichia coli* and *Staphylococcus aureus* isolates were examined. According to the results, the alcoholic (ethanolic) extracts of *T. persicus* and *M. longifolia* indicated a greater antibacterial effect on *S. aureus* compared to *E. coli* ($p<0.05$). The ethanolic extract of *T. persicus* exhibited a higher antibacterial effect compared to the ethanolic extract of *M. longifolia* [7].

Anyway, *A. sieberi* belongs to the Asteraceae family and is one of the 300 known aromatic plant species in Iran, which has numerous secondary compounds with different biological activities [8]. The phytochemical compounds in the essential oils of this plant have diverse uses in perfumery, cosmetics, soap industry, flavor enhancers, etc. [9]. This plant contains compounds such as phenols, flavonoids, and essential oils [10, 11], as well as coumarin, santonin, proteins, fats, and bitter substances [12]. One of the goals of using herbal ingredients in cheese production is to improve their aroma and taste. For example, 25 different herbs are used in Van Herb Turkish cheese [13]. However, it should be noted that the excessive use of aromatic plant compounds can cause significant changes in the flavor of cheese, and the strong smell produced, even in small amounts, may limit their use [14]. Therefore, not only the antimicrobial effect of herbal compounds should be added, but also their acceptance by consumers should be considered [15]. The use of marjoram [16], black cumin [17], green pepper [18], thyme, rosemary and lemongrass [19] showed good acceptance by consumers.

To reduce the odor resulting from the use of plants and achieve the goal of preventing the growth of microbial contaminants in cheese, a combination of several plants has been recommended. In some cases, a combination of ingredients has proven to be more effective than individual applications. For example, the combined use of marjoram and thyme was found to be more effective in controlling *Cillus cereus*, *Listeria monocytogenes*, and *Pseudomonas aeruginosa* than their individual applications [20]. The application of fennel and *Hyssopus officinalis* essential oils at a concentration of 0.2 microliters per milliliter was observed to reduce 50% of the growth and proliferation of *Penicillium verrucosum* [21].

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An enhancing effect between saffron and cheese whey in preventing the activity of the *Penicillium verrucosum* fungus was observed. It was also reported that milk contains compounds that contribute to the enhancing effect of saffron [22]. In the application of mustard and cinnamon essential oils, an interesting point was noted: the ability to control microbial factors using these two substances in low-fat milks was greater than in high-fat milks [23].

On one hand, considering that fermented dairy products have long held a significant place in the community's dietary basket due to their desirable nutritional properties, high shelf life, unique aroma and taste, as well as therapeutic benefits [24]. On the other hand, due to people's attention to the use of natural compounds and the reluctance to use chemical compounds due to their negative effects on health [14], in recent years due to the favorable and therapeutic effects of these compounds, the use of various plant-derived ingredients in food formulations has gained attention [25]. Since no study has been conducted on the effect of *A. sieberi* extract on the nutritional properties of cheese, in this study the effect of this plant extract on the shelf life and quality of Iranian white cheese has been investigated.

2- Material and Methods:

This research was carried out in a laboratory in the central laboratory of Qom University, Iran in 1401. To prepare white cheese, fresh and complete cow's milk, after determining its ingredients and standardization, it was pasteurized at a temperature of 63-65 ℃ for 30 minutes. Subsequently, to carry out various stages of cheese making, the milk temperature was adjusted to 35 ℃, and 5 liters of milk were poured into each of the specific sterile containers. Afterward, a starter was added in the amount of 0.5% (v/v), and after half an hour, 0.2% (w/v) of calcium chloride was added.

After the pH of the milk reached 6.5, microbial rennet (Mito, Japan) at a concentration of 0.1% (w/v) was added to the milk after dissolving it in sterile distilled water. To enhance the rennet efficiency, the milk temperature was maintained at approximately 35 ℃ during the curd formation period. After one hour, the formed curd was cut into 1-2 cubic centimeter pieces. Then, the extract of *A. sieberi* from three different regions (Venan, Taj Khatun, and Abbas abad) in the amount of 1% by weight of the curd, and no extract (as a control), were added to the cheese. The curd pieces were placed under sterile weight pressure for six hours for whey drainage. Subsequently, the whey-drained curd pieces were immersed in 20% saline solution (w/v) for 8 hours under sterile conditions. Afterward, the cheese samples were transferred to 8% sterile saline solution and stored at 15-12 ℃ for 15 days. After the initial ripening period, the samples were kept in the refrigerator at 4 degrees Celsius for two months for final ripening. Chemical and microbial properties of the cheese were then measured on days 1, 15, and 30.

2-1- Microbiological Experiments on Cheese: Under sterile conditions, 20 grams of thoroughly homogenized cheese sample was prepared, and successive dilutions were made depending on the microbial culture being tested. All cultures were performed in triplicate.

2-2- Total Coliform Count: VRB agar medium incubated at 37℃ for 24 hours was used and assessed as pour plates [26].

2-3- Total Bacterial Count: Using PCA culture medium, incubated at 30℃ for 48 hours, the assessment was performed as pour plates [26].

2-4- Mold and Yeast Count: Surface culture method employing YGC culture medium at 25℃ for 72 hours was utilized [26].

2-5- Cheese Chemical Experiments: After completion of the microbial activities, the samples were subjected to chemical tests in triplicate.

2-6- pH Measurement: According to the Iranian National Standard No. 2852 [27], the direct insertion of the pH meter electrode into the homogenized cheese tissue was performed. This process was carried out in triplicate, and the averages of the results were reported.

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2-7- Salt Content Measurement: The Mohr's method was employed for measuring the salt content in cheese samples [28].
2-8- Cheese Fat Content: The cheese fat content was determined using the Gerber method [29].
2-9- Dry Matter Measurement: The content of dry matter was measured based on the method presented in the catalog of the moisture balance (Sartorius Ltd., Epsom, UK).
2-10- Moisture Percentage: The content of moisture was calculated using the formula: Moisture Percentage = 100 - Dry Matter Percentage.
2-11- Content of Fat: The content of fat in dry matter calculated using the formula: (Fat × 100) / Dry Matter.
2-12- Total Phenolic Compounds: After extraction, the obtained extracts were concentrated by evaporation with a rotating evaporator at 40°C, dried using a freeze-dryer, and the amount of phenolic compounds in the extract was measured through the Folin-Ciocalteu colorimetric method [30].
2-13- Statistical Analysis:
The study was conducted in a factorial experiment based on a completely randomized Design (CRD). Analyses were performed using SAS statistical software V9.4. Means were compared by Duncan's Multiple Range Test (DMRT) using SAS statistical software.

3- Results and Discussion

Based on the results, the effect of the origin of the extract preparation (habitats) and the storage time, as well as their interaction effects on the percentage of coliform, total bacteria, and mold and yeast in Iranian white cheese were significant at the probability level of 1% (Table 1).

Table 1. Results of variance analysis of the effect of habitat and storage time on the population of cheese microorganisms

Source of variation	d.f.	Counting mold and yeast	Total count of bacteria	Percentage of Coliform
Habitat	3	1.09**	4.22**	3.79**
Storage time	2	21.70**	0.19**	31.78**
Habitat × storage time	6	0.30**	0.05**	0.10**
Error	24	0.01	0.002	0.08
Coefficient of variation (%)	-	5.21	0.86	7.02

** significant at 1% probability level.

values decreased with the increase of storage time. Mold and yeast were more in the samples that were kept for 30 days without the extract of *A. sieberi* than other samples (Table 2).

The results showed that the highest percentage of coliforms and total bacteria was related to the treatment of not using the extract of *A. sieberi* on the first day of storage, and their

Table 2. Comparison results of the average interaction effect of Habitat × Storage time on the population of cheese microorganisms

Treatments		Coliform (%)		Total bacteria		Counting mold and yeast	
Habitat	Storage time (days)						
Control	1	6.06±0.01	a	6.37±0.02	a	1.00±0.00	h
Abbas abad		6.00±0.01	a	6.09±0.03	c	1.00±0.00	h
Taj khatoun		5.49±0.11	b	5.51±0.01	f	1.00±0.00	h
Venan		4.93±0.15	c	4.72±0.01	i	1.00±0.00	h
Control	15	4.82±0.08	c	6.34±0.01	a	2.34±0.08	e
Abbas abad		4.15±0.15	d	5.97±0.01	d	1.79±0.08	f
Taj khatoun		3.75±0.22	e	5.46±0.01	fg	1.24±0.05	g
Venan		2.92±0.15	f	5.02±0.05	h	1.05±0.01	h
Control	30	2.90±0.00	f	6.12±0.01	b	4.06±0.04	a
Abbas abad		2.88±0.24	f	5.84±0.01	e	3.84±0.05	b
Taj khatoun		2.14±0.06	g	5.40±0.01	g	3.38±0.06	c

[DOI: 10.22034/FSCT.21.146.169]

Venan	1.55±0.10 [h]	4.44±0.04 [j]	3.01±0.08 [d]

a Means in each column followed by the same letter are not significantly different (P <0.05).

treatment containing 0.5% pennyroyal essential oil. In another study examining the impact of Khuzestani savory (*Satureja khuzestanica*) essential oil on *E. coli* in Iranian white cheese, the results showed that Khuzestani savory extract possesses antibacterial properties in Iranian white cheese. In another study aimed at investigating the anti-Listerial effect of *Zataria multiflora* essential oil on the behavior of *Listeria monocytogenes* under the conditions of Iranian white cheese production, various methods were employed. These methods included preparing the plant, extracting the essential oil, preparing bacterial inoculum, producing cheeses containing Listeria bacteria, and using different concentrations of *Zataria multiflora* essential oil (0, 50, 150, and 300 ppm). Microbiological and chemical analyses were conducted on the cheese samples. The results showed that the number of bacteria decreased logarithmically with the increase in the concentration of the mentioned essential oil in the cheese samples. The reduction in bacterial growth was significant in samples with concentrations of 150 and 300 ppm of the essential oil compared to samples without thyme. The findings of this research suggest the potential positive effects of *Zataria multiflora* in cheese as an anti-Listerial substance. It was recommended the use of a concentration of 150 ppm *Zataria multiflora* in Iranian white cheese, as it could contribute to the health of this product while maintaining its beneficial organoleptic effects and reducing Listeria growth in cheese.

The evaluation of microbiological characteristics indicated a significant reduction in Lactobacillus and Bifidobacterium. The probiotic bacterial count in cheeses containing walnut powder was lower than the control sample, attributed to the reduced moisture content and increased salt concentration. In this study, an increase in the microbial population of cheese was observed with an increase in storage time. Although the origin of the *A. sieberi* extract had a significant effect on controlling the populations of bacteria, total coliforms, mold, and yeast, and leading to a reduction in the populations of these microorganisms. In a related research project, the impact of *Zataria multiflora* essential oil on the microbiological properties of Abadeh cheese during the ripening stage was investigated. Three types of cheese containing *Zataria multiflora* essential oil at concentrations of 0, 110, and 1100 ppm in three replicates, totaling 54 samples of 110 grams each, were prepared. The samples were stored at approximately 5 °C and tested at ripening periods of 0, 15, 30, 60, and 90 days. The research results demonstrated that the concentration of 110 ppm of *Zataria multiflora* essential oil had a significantly inhibitory effect on the total bacterial count during days 30 and 60 and on the counts of coliforms and Staphylococci during the 10-day period ($p < 0.05$) [33]. Another study examined the inhibitory effect of garlic extract over a 9-day post-ripening period at room temperature on *Listeria monocytogenes*. The contamination reached its maximum on the 15th day and then remained constant. At all stages, the activity of this contamination in Cheddar cheese with garlic was reported to be lower than the control sample [34].

The antimicrobial effect of pennyroyal (*Mentha pulegium*) essential oil on *Escherichia coli* as the causative agent of spoilage in Iranian white cheese was investigated. The results of the study on the inhibitory effect of this essential oil on Escherichia coli in white cheese indicated that all treatments led to a significant reduction in the bacterial count over the 30-day storage period compared to the control sample. Furthermore, the lowest counts of *Escherichia coli* in white cheese were observed in the

The acidic nature of the *Inula helenium* (Elecampane) extract and the presence of a high concentration of phenolic compounds in this plant, along with the antimicrobial properties of the extract attributed to tannins and flavonoids, have

[DOI: 10.22034/FSCT.21.146.169]

been introduced as effective factors in reducing the population of initiators [38,39].
The results indicated that the effect of origin of the extract and storage time, as well as the interaction effect of these two factors, were statistically significant on the pH level, moisture content, salt percentage, fat content, protein content, and dry matter of the cheese (Table 3).

Table 3. Analysis of variance results of the effect of Habitat and Storage time on cheese properties

Sources of Variation	d.f.	pH	Moisture percentage	The percentage of salt	Total Fat	Total protein	Dry matter
Habitat	3	0.02**	0.04**	0.01**	0.12**	0.25**	0.04**
Storage time	2	0.34**	1.36**	0.02**	10.65**	5.02**	1.36**
Habitat × storage time	6	0.001**	0.0013**	**0.0001	0.01**	0.01**	0.0013**
Error	24	0.002	0.007	0.001	0.001	0.004	0.007
Coefficient of variation (%)	-	0.97	0.13	1.11	0.15	0.52	0.24

** significant at 1% probability level.

The comparison of means revealed that the pH of the cheese whey at the beginning of storage without the use of *A. siebei* extract was higher, followed by the application of Abbas abad extract, exceeding the other treatments. With an increase in the storage period, the pH of the cheese decreased. The highest moisture content of the cheese (64.82%) was related to the treatment with Venan extract on the first day of storage, and the highest salt content (2.35%) was measured in the treatment without the use of *A. siebei* extract after 30 days of storage. As the storage time increased, the fat content of the cheese significantly increased. In the samples of cheese with a 30-day storage period and Venan extract treatment, the highest fat content (32.5%) was observed. The protein content of the cheese on the 15th day of storage and in the treatment with Venan extract was higher than other times (12.55%). The dry matter of the cheese in the treatment with Venan extract and on the 30th day of storage surpassed other treatments (Table 4).

The pH level and moisture content on the first day of storage were higher than in other storage periods. With an increase in the shelf life of the cheese, the percentage of salt, fat content, and dry matter of the cheese increased. Regarding similar additives during cheese production, it was observed that in the cheese samples prepared with walnut powder, the pH and dry matter values were lower. Cheese samples containing walnut powder had a higher percentage of lipolysis compared to the control sample. In a study, it was reported that in blended cheeses with Hazelnut oil, the moisture and pH levels were higher compared to the control cheese, especially on the last day of ripening. This response can be attributed to the nature of the chemical compounds present in related plants.

[DOI: 10.22034/FSCT.21.146.169]

Table 4. Comparison results of the average interaction effect of Habitat × Storage time on cheese characteristics

Treatments		pH	Humidity (%)	Salt (%)	Total Fat (%)	Total Protein (%)	dry matter (g)
Habitat	Storage time (days)						
Control	1	5.14±0.02 a	58.01±0.03 b	2.27±0.01 bcd	15.98±0.02 l	11.90±0.04 f	35.33±0.06 e
Abbas abad		5.09±0.02 a	59.80±0.27 ab	2.23±0.01 def	16.03±0.01 k	11.99±0.05 e	35.31±0.08 ef
Taj khatoun		5.05±0.03 ab	61.54±0.04 ab	2.20±0.01 fg	16.09±0.00 j	12.09±0.02 d	35.25±0.07 ef
Venan		5.00±0.02 bc	63.93±0.04 a	2.18±0.01 g	16.15±0.01 i	12.22±0.02 c	35.18±0.05 f
Control	15	4.93±0.01 cd	58.12±0.04 de	2.28±0.00 bcd	16.23±0.01 h	12.07±0.02 de	35.84±0.04 bc
Abbas abad		4.88±0.04 de	64.32±0.14 cd	2.26±0.00 cde	16.40±0.01 g	12.15±0.02 cd	35.74±0.01 cd
Taj khatoun		4.85±0.03 def	65.05±0.04 c	2.22±0.02 efg	16.55±0.02 f	12.35±0.03 b	35.69±0.01 d
Venan		4.81±0.02 efg	67.35±0.14 c	2.19±0.02 fg	16.60±0.02 e	12.55±0.03 a	35.65±0.02 d
Control	30	4.77±0.01 fgh	62.93±0.06 f	2.35±0.01 a	17.72±0.01 d	10.91±0.01 i	35.99±0.01 a
Abbas abad		4.75±0.00 gh	63.46±0.02 ef	2.32±0.00 ab	17.80±0.01 c	10.96±0.04 i	35.94±0.01 ab
Taj khatoun		4.72±0.01 h	64.77±0.04 ef	2.29±0.01 bc	17.93±0.01 b	11.13±0.02 h	35.90±0.00 ab
Venan		4.70±0.02 h	65.14±0.05 def	2.26±0.02 cde	17.96±0.01 a	11.25±0.01 g	35.86±0.00 abc

a Means in each column followed by the same letter are not significantly different (P <0.05).

The results of the analysis of variance indicated that the effect of the origin of the extract (habitat) and storage time, as well as their interactive effect, on the fat content in dry matter, protein in dry matter, total phenol content, and antioxidant activity of the cheese were statistically significant at (Table 5).

Table 5. Analysis of variance results of the effect of Habitat and Storage time on the biochemical properties of cheese.

Sources of Variation	Storage time (days)	Fat in dry matter	Protein in dry matter	Total phenol content	The amount of antioxidant activity
Habitat	3	1.51**	1.54**	43.78*	97.25**
Storage time	2	61.91**	50.33**	138.77**	329.45**
Extract origin × storage time	6	0.07**	0.04**	0.58**	8.77**
Error	24	0.02	0.005	0.85	0.37
Coeff of variation (%)	-	0.27	0.22	3.64	1.38

** significant at 1% probability level.

The results of the mean comparisons indicated that in the treatment with the application of Venan extract after 30 days of storage, the fat content in the dry matter in cheese was higher than in other treatments. The highest protein content in the dry matter of cheese was related to the Venan extract treatment after 15 days. In the Venan extract treatment after 30 days, the cheese exhibited the highest total phenol content (32.21 mg gallic acid per gram of dry weight of cheese) and antioxidant activity (56.33%) (Table 6).

Phenolic compounds have the ability to react with proteins, and this depends on their concentration, pH, and molecular weight. Phenolic compounds with low molecular weight are not capable of forming strong cross-links, but their higher molecular weight and polymerized forms exhibit more active cross-linking and precipitate more rapidly with proteins [41]. Therefore, as expected, the use of Venan extract, which itself has a higher concentration of phenolic compounds, led to an increase in phenolic compounds in the cheese. The highest phenol content was measured in the sample treated with Venan extract after 30 days. The antioxidant activity of *A. sieberi* is mostly due to the presence of ascorbic acid and phenolic compounds [8]. Another study demonstrated that the antioxidant properties of yogurt increased with

[DOI: 10.22034/FSCT.21.146.169]

the addition of pomegranate extract [42]. Phenolic compounds interact with casein proteins and the water in the cheese, influencing their functional properties. Various reports confirm that proteins exhibit antioxidant properties due to their interaction with phenolic compounds [41].

Table 6. The results of the comparison of the average interaction effect of Habitat × Storage time on the biochemical properties of cheese

Treatments		Fat in dry matter (%)	Protein in dry matter (%)	The amount of antioxidant activity (%)	Amount of total phenol (mg gallic acid/dw)
Habitat	Storage time (days)				
Control	1	45.24±0.07 h	33.95±0.02 f	36.06±0.04 h	19.80±0.14 h
Abbas abad		45.39±0.11 h	34.17±0.04 e	38.23±0.15 g	20.84±0.40 h
Taj khatoun		45.65±0.09 g	34.42±0.04 d	40.99±0.12 f	23.37±0.40 fg
Venan		45.89±0.08 f	34.71±0.01 b	42.17±0.39 e	24.89±0.45 ef
Control	15	45.28±0.05 h	33.83±0.04 g	40.97±0.29 f	22.81±0.63 g
Abbas abad		45.88±0.02 f	34.03±0.03 f	41.87±0.35 ef	24.21±0.74 fg
Taj khatoun		46.36±0.06 e	34.54±0.02 c	43.96±0.29 d	25.92±0.20 de
Venan		46.55±0.07 d	35.00±0.05 a	45.79±0.32 c	27.19±0.04 cd
Control	30	49.24±0.03 c	30.42±0.02 k	45.73±0.31 c	26.49±0.55 cde
Abbas abad		49.52±0.02 b	30.52±0.04 j	45.67±0.17 c	28.01±0.23 bc
Taj khatoun		49.93±0.02 a	30.95±0.05 i	51.13±0.18 b	29.27±0.05 b
Venan		50.08±0.01 a	31.25±0.02 h	56.33±0.50 a	32.21±0.64 a

a Means in each column followed by the same letter are not significantly different (P <0.05).

[DOI: 10.22034/FSCT.21.146.169]

4- Conclusion

In general, the population of cheese microorganisms, including coliforms and bacteria, decreased with an increase in storage duration, while the levels of mold and yeast increased. In this experiment, Venan extract controlled the population of microorganisms better than extracts from other regions and control conditions (no use of herb extract), which could be due to the type and amount of phytochemical compounds of the plant in different habitats. With the increase of storage time, while the pH and protein content of the cheese dry matter decreased, the amount of moisture, salt, fat, dry matter and fat, and the amount of phenol in the dry matter of the cheese and antioxidant activity increased. In all studied traits, Venan extract further improved the composition of cheese and increased the quality and shelf life of cheese compared to extracts from other studied regions, which can be due to the higher metabolic quality of Venan extract, including higher phenol content. In general, the extract of *A. sieberi* increased the quality and quantity of cheese, and with further studies, it can be recommended to use the extract of this valuable plant in the food industry, especially dairy products, in order to optimize the quality of these products.

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مقاله علمی_پژوهشی

بررسی تأثیر عصاره درمنه دشتی (*Artemisia sieberi* Besser.) رویشگاه‌های مختلف منطقه قم بر کیفیت و ماندگاری پنیر سفید ایرانی

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اطلاعات مقاله

تاریخ های مقاله :

تاریخ دریافت: ۱٤۰۲/٦/۷

تاریخ پذیرش: ۱٤۰۲/۷/۲۷

کلمات کلیدی:

درمنه دشتی،

فنول کل،

کلی‌فرم،

میزان چربی،

رویشگاه‌ها.

DOI: 10.22034/FSCT.21.146.169

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چکیده

به منظور ارزیابی اثر عصاره درمنه دشتی رویشگاه‌های مختلف بر عمر ماندگاری پنیر سفید ایرانی، تحقیقی در سال ۱٤۰۱ در آزمایشگاه مرکزی دانشگاه قم انجام شد. این تحقیق در قالب طرح کاملا تصادفی به صورت فاکتوریل انجام و پنیر از نظر شیمیایی و میکروبی در شرایط عدم کاربرد عصاره (شاهد) و کاربرد عصاره حاوی ۱ درصد وزن ماده تر درمنه دشتی از سه رویشگاه ونان، تاج‌خاتون و عباس‌آباد در روزهای ۱، ۱۵ و ۳۰ ام بررسی شد. نتایج نشان داد جمعیت میکروارگانیزم‌های پنیر با افزایش دوره نگهداری افزایش یافت و عصاره ونان بهتر از عصاره‌ها، جمعیت میکروارگانیزم‌ها را کنترل کرد. با افزایش مدت نگهداری، میزان pH و پروتئین در ماده خشک کاهش و میزان رطوبت، نمک، چربی، ماده خشک، فنول و فعالیت آنتی‌اکسیدانی افزایش پیدا کرد. عصاره ونان بیشتر از سایر عصاره ها سبب افزایش کیفیت و عمر نگهداری پنیر شد که ممکن است ناشی از بیشتر بودن میزان فنول کل عصاره ونان در مقایسه با سایر عصاره‌ها باشد. بطور کلی عصاره درمنه دشتی بطور معنی‌داری موجب افزایش عمر ماندگاری و کیفیت پنیر گردید که با مطالعات بیشتر می توان از عصاره این گیاه ارزشمند برای افزایش ماندگاری و کیفیت محصولات غذایی خصوصا محصولات لبنی استفاده نمود.

[DOI: 10.22034/FSCT.21.146.169]