



ORIGINAL ARTICLE

Influence of oregano essential oil on traditional Argentinean cheese elaboration: Effect on lactic starter cultures



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KEYWORDS

Lactic acid bacteria;
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Abstract The aim of this work is to study the oregano essential oil (OEO) composition from Northwestern Argentinean regions and to evaluate its effect on the lactic starter cultures. The oregano used, *Origanum vulgare* var *hirtum*, was obtained from Andalgalá, Catamarca. The essential oil presented high amounts of α -terpinene (10%), γ -terpinene (15.1%), terpinen-4-ol (15.5%) and thymol (13.0%) as the main components. No negative effect on growth or metabolic activity of lactic acid bacteria *Streptococcus thermophilus* CRL 728 and CRL 813, *Lactobacillus delbrueckii* subsp. *bulgaricus* CRL 656 and CRL 468, and *Lactococcus lactis* subsp. *lactis* CRL 597 up to the maximum concentration (200 μ g/g) assayed was observed. No differences in the organoleptic characteristics of semi-hard cheeses flavored with oregano essential oil (200 μ g/g) and homemade cheeses flavored with oregano leaves were found. With respect to the microbiological quality of the products, neither enterobacteria nor mold and yeast were detected during ripening in essential-oil flavored cheese compared to control cheese (enterobacteria 2×10^3 UFC/g) and cheese flavored with oregano leaves (mold/yeast 4×10^4 CFU/g). Our results showed that the use of oregano essential oil and lactic starter culture considerably improved cheese quality.

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PALABRAS CLAVE

Bacterias lácticas;
Orégano;
Queso

Influencia del aceite esencial de orégano en la elaboración tradicional de quesos: efecto sobre el fermento láctico

Resumen El objetivo de este trabajo fue estudiar la composición del aceite esencial de orégano recolectado en el noroeste argentino y evaluar su efecto sobre algunos fermentos

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lácticos. El orégano recolectado correspondió a la especie *Origanum vulgare* var. *hirtum* proveniente de Andalgalá, Catamarca. En su aceite esencial (obtenido por arrastre con vapor de agua) se detectó principalmente α -terpineno (10%), γ -terpineno (15,1%), terpinen-4-ol (15,5%) y timol (13,0%). El aceite esencial no tuvo efecto inhibitorio (máxima concentración ensayada 200 $\mu\text{g/g}$) sobre el crecimiento ni sobre la actividad metabólica de *Streptococcus thermophilus* CRL 728 y CRL 813, de *Lactobacillus delbrueckii* subsp. *bulgaricus* CRL 656 y CRL 468, y de *Lactococcus lactis* subsp. *lactis* CRL 597. No se observaron diferencias en las características organolépticas de quesos semiduros aromatizados con el aceite esencial (200 $\mu\text{g/g}$) comparados con quesos artesanales aromatizados con hojas de orégano. Respecto de la calidad microbiológica de los productos, no se detectaron enterobacterias ni hongos o levaduras durante la maduración en los quesos aromatizados con el aceite esencial de orégano comparados con los quesos control, que presentaron desarrollo de enterobacterias (2×10^3 UFC/g), y con los quesos elaborados con hojas de orégano, en los que hubo desarrollo de hongos/levaduras (4×10^4 CFU/g). Los resultados obtenidos demostraron que el uso del aceite esencial de orégano y del fermento láctico incrementó la calidad general de los quesos artesanales.

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Introduction

Cheese is one of the most consumed dairy foods in the world. Artisanal cheeses, produced in much smaller quantities compared to commodity cheeses like cheddar and mozzarella, continue to grow because of the increasing sophistication and multiculturalism of consumers. An example of such homemade cheeses is the flavored cheese. Nowadays, various types of flavored cheeses are produced in the highland farms of the province of Tucumán in North-Western Argentina (NOA) by using traditional techniques and incorporating different species of native aromatic herbs, mainly leaves and fruits. Oregano (*Origanum* spp., Lamiaceae family) is one of the most important commercial spices; the crop covers more than 80% of the country cultivation area generating export markets of 1200 tons/year with values about \$2.5 million US dollars¹⁰. It is particularly used in culinary art due to its aroma, which is related to the essential oil. Cheeses flavored with oregano leaves are usually as semi-hard ones with short ripening periods of less than 3 months and have very good marketing potential¹. However, these products are nowadays commercialized through informal market which plays an important role in dairy farmers' economy. To reach the Protected Designation of Origin status, both the fermentation process and the microbiological quality need to be controlled. The main concern of this economic sector is the high microbial load in the surface of herbal leaves⁶, which reduces the microbiology quality and shelf life of the cheeses flavored with oregano leaves. Lactic starter culture and oregano essential oil could be useful to standardize the characteristics of flavored cheeses and to reduce the contaminating microflora present on the leaves. However, the antimicrobial properties of some essential herb oils is well known; for that reason, their possible effects on starter organisms need to be considered^{3,9}. Therefore, the aim of this work was to study the oregano essential oil obtained from North-Western Argentina and to evaluate its potential inhibitory effect on the lactic starter culture.

Materials and methods

Plant material

Aerial parts (leaves, stems and inflorescences) of an oregano plant were harvested from Andalgalá and Catamarca in Northwestern Argentina. The dry plant material was identified in the Laboratory for Plant Morphology at Miguel Lillo Institute by botanic experts.

Essential oil isolation and identification

Samples of leaves and flowers were hydrodistilled for 5 h in a Clevenger-type apparatus to obtain the oregano essential oil (OEO). The light green colored oil obtained (0.86% yield) was dried over anhydrous sodium sulfate and stored under a nitrogen atmosphere in sealed vials at -18°C until use. The chemical composition of OEO was analyzed by the GC-MS technique using a Hewlett-Packard gas chromatograph (Model 6890) coupled with a quadrupole mass spectrometer (Model HP 5973) and a Perkin Elmer Elite-5MS capillary column (5% phenylmethylsiloxane; length 30 m \times inner diameter 0.25 mm \times film thickness 0.25 μm). The injector, interphase, ion source and selective mass detector temperatures were maintained at 280°C , 230°C and 150°C , respectively. Helium (He) was used as carrier gas at a flow rate of 1.0 ml/min. The oven temperature was programmed as follows: 60°C for 1 min, then increased to 185°C (rate $1.5^\circ\text{C}/\text{min}$) and held for 1 min, and increased from 185 to 275°C (rate $9^\circ\text{C}/\text{min}$) and held for 2 min. The components were identified and compared on the basis of the retention index and mass spectra. The computer matching was done with the National Institute of Standards Technology (NIST 3.0) libraries provided with the computer controlling GC-MS systems. The retention indexes were calculated using a homologous series of *n*-alkanes C8-C18¹³.

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