

ФУРАЖИ И ХРАНЕНЕ

FATTY ACIDS COMPOSITION OF CORIANDER AND CUMIN
GROWN IN SERBIA

Acimovic Milica^{1*}, Popovic Sanja¹, Colovic Dusica¹, Djuragic Olivera¹,
Kostadinovic Ljiljana¹, Mariana Petkova², Levic Jovanka¹

¹Institute of Food Technology, University of Novi Sad – Serbia

²Institute of Animal Science Kostinbrod, Agricultural Academy – Bulgaria

*E-mail: corresponding author: milica.acimovic@fins.uns.ac.rs

МАСНОКИСЕЛИНЕН СЪСТАВ НА КОРИАНДЪР И КИМИОН,
ОТГЛЕЖДАНИ В СЪРБИЯ

А. Милица, С. Попович, Д. Солович, О. Джурагич, Л. Костадинович,
М. Петкова, Йованка Левич

¹Институт по хранителни технологии, Университет на Нови Сад – Сърбия

²Институт по животновъдни науки – Костинброд, България

*E-mail: corresponding author: milica.acimovic@fins.uns.ac.rs

РЕЗЮМЕ

Кориандър (*Coriandrum sativum* L.) и кимион (*Cuminum cyminum* L.) са растения от семейство Апиасеае, които произхождат от региона на Средиземно море. Техните семена са богати на етерични масла, които им придават характерен аромат. Освен на етерични масла, тези семена са богати на мастни киселини. Като се вземе предвид анализът на семената, получени от растения, отглеждани в опитното поле в Мошорин през 2014 г., кориандърът съдържа 7,60%, докато кимион – 8,39% мастни киселини. Дванадесет мастни киселини са установени при кориандъра, докато в кимион бяха определени 17-мастни киселини. Доминиращата мастна киселина в кориандъра е капринова киселина (C10:0) в количество 31,70%, следвана от мононенаситени мастни киселини с 18 С-атоми (C18:1N-9 и C18n:1N-12), които присъстват в концентрация 29,67%, и бехенова киселина (C22:0), с дял от 21,93%. Що се отнася до кимиона, доминиращите мастни киселини са мононенаситените и полиненаситените мастни киселини с 18 С-атома. Олеиновата киселина (C18: 1) присъства в количество от 59,33%, докато линоленовата киселина (C18: 2) присъства в концентрация от приблизително 26,59%.

Ключови думи: *Coriandrum sativum*, *Cuminum cyminum*, мастни киселини

INTRODUCTION

Coriander (*Coriandrum sativum* L.) and cumin (*Cuminum cyminum* L.) belonged to Apiaceae family that is native to the Mediterranean region. Nowadays, these two plants are successfully cultivated in most temperate re-

gions of the world, while the main producers of coriander are Ukraine, Russia, India, Morocco, Argentina, Mexico and Romania (Diederichsen, 1996). On the other hand, India is the biggest producer of cumin, followed by Iran, Turkey and Syria (Parthasarathy et al., 2008). Apart from this, Serbia has good agroecologi-

cal conditions for growth and development of these two species.

Coriander plant height varied between 66.4 and 76.3 cm, while leaf is significantly different depend on steam position (diversifolious). Flowers, which are grouped in umbels, also have different shape depend on position (actinomorphic and zigomorphic), whereas fruit is round to oval in shape (Acimovic, 2014). On the other side, cumin is significantly smaller plant, with height between 16.0 and 21.0 cm, with pinnate or bipinnate leaves and thread-like leaflets. The fruits are usually elongated or oval shaped (Acimovic et al., 2014).

The seeds of this plants are rich in essential oils which gives them their characteristic aroma. Linalool, which is the main constituent from coriander seed essential oil, has floral and pleasant odour (Ravi et al., 2007), while cumin had spicy and irritant flavor due to cuminaldehyde (Dattatreya et al., 2004). Apart from the essential oils, this seeds are rich in fatty oils. Coriander fatty oil has a dark, brownish green color and an odor similar to that of coriander seeds, while greenish brown color with strong aromatic flavor is characteristic for fatty oil extracted from cumin seeds. The seed oils from both species are used as a scent in perfumes, cosmetics and soaps (Kiralan et al., 2009; Beltaieb et al., 2010).

MATERIAL AND METHODS

Coriander and cumin were sown at the optimal time in Serbian agro-ecological conditions, in the first decade of April. Sowing was performed by hand at row spacing 35 cm, and around 70 seeds per meter were sown in a row (density of 200 plants per m²). The sizes of the experimental plots were 5 m². Weeds were controlled by hoeing and weeding when needed. Disease and insect control measures were not conducted. Harvest was carried out by hand in the phase of full maturity, in the end of July. After harvest seeds were kept in paper bags at room temperature until required for further analysis.

Experimental field was located in village Mošorin (45°18' N, 20°09' E), during 2014. Mošorin is located in the north part of Republic of Serbia. This area has moderate continental climate with some tendencies towards continental. The whole region is located in semi-arid area where variations in the amount of precipitation, air temperature and other important climatic elements are substantial over the years. The weather conditions during the growing period of coriander in analyzed year were characterized by average temperatures and more precipitation in comparison to long time average (LTA) for this region (Fig. 1).

The soil at experimental field had a neutral reaction to soil solution (pH 7.3 in KCl) and was moderately supplied with humus (2.7%). The soil is classified as highly calcareous loamy chernozem (with 8.4% CaCO₃). The content of readily available phosphorus and potassium was high (81.6 and 75.1 mg 100g⁻¹ of soil, respectively).

Fatty acid determination

Lipids were extracted from the mild samples of 1 gram by using cold extraction process, which involves mixing/homogenizing with chloroform: methanol mixture (2:1) according to the method by Folch et al. (1957).

Fatty acid methyl esters were prepared from the extracted lipids using method based on 14% boron trifluoride/methanol solution, as recommended method for this type of substrates (Verešbaranji, 1996). Nitrogen gas was used for drying and removing solvents from fatty acid methyl esters.

Obtained samples were analyzed by a GC Agilent 7890A system with FID, autoinjection module for liquid, equipped with fused silica capillary column (SP-2560, 100 m x 0.25mm, I.D., 0.20µm). Helium was used as a carrier gas (purity > 99.9997 vol %, flow rate = 1.26 ml/min).

The fatty acids peaks were identified by comparison of retention times with retention times of standards from Supelco 37 component fatty acid methyl esters mix and with data from internal data library, based on previous experiments.

Results were expressed as mass of fatty acid or fatty acid group (g) in 100 g of fatty acids.

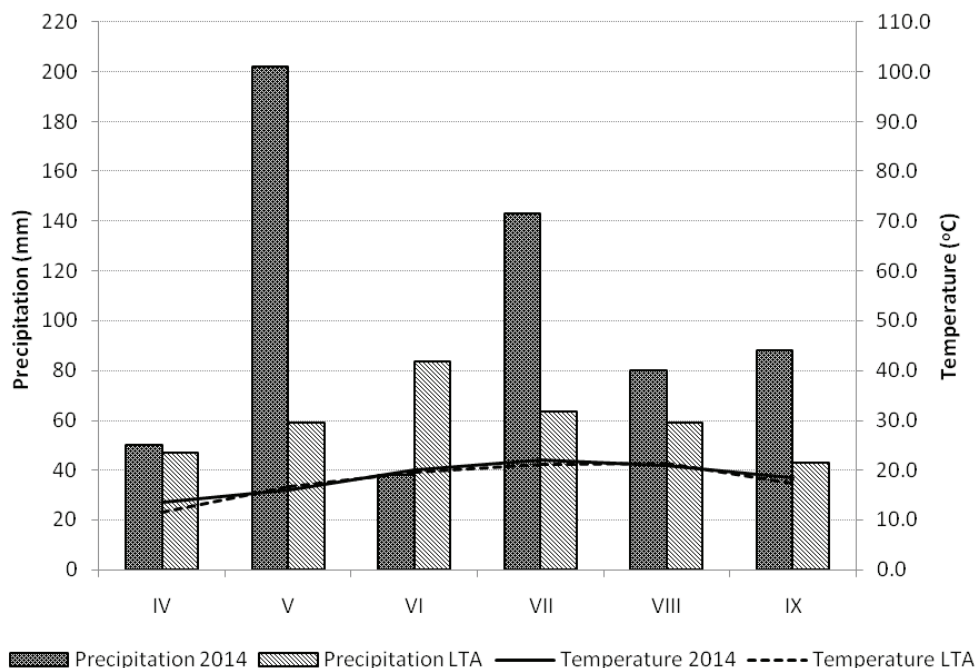


Fig. 1.

RESULTS AND DISCUSSION

According to the seed analysis obtained from experimental plants, coriander contains 7.60%, while cumin contains 8.39% of fatty oil (Table 1). According to literature data, coriander seeds contain between 19.0–21.0% of fatty oil (Kiralan et al., 2009) which is not in accordance with results reported in this study. Regarding the cumin, it was noticed that fatty oil content in fruits increases during maturation from 8.2% (green seed) to 16.9% (fully mature) (Rebey et al., 2013).

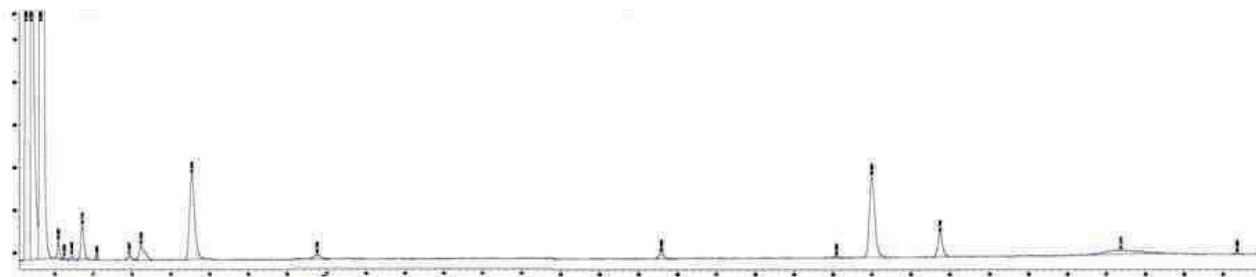
Twelve fatty acids were established in coriander fatty oil, whereas in cumin were determined 17 fatty acids. The dominant fatty acid in coriander was capric acid (C10:0) in the amount of 31.70%, followed by monounsaturated fatty acids with 18 C-atoms (C18:1n-9 and C18n:1n-12) which were present in concentration of 29.67% and behenic acid (C22:0) with a share of 21.93% (Fig. 2). Nine fatty acids were identified in Tunisian coriander, where petroselinic acid (C18:1n-

12) was accounted around 76.6% of all fatty acids, followed by stearic acid (C18:0) with 13.0% (Sriti et al., 2010). Changes in lipid contents and fatty acid profiles of coriander with respect to growing region and maturity are established (Msaada et al., 2009).

As far as cumin concerned, the dominant fatty acids were monounsaturated and polyunsaturated fatty acids with 18 C-atoms. The oleic acid (C18:1) was present in quantity of 59.33%, while linoleic acid (C18:2) was present in concentration of approximately 26.59% (Fig. 3). Rebey et al. (2013) reported total of 11 different fatty acids identified in cumin seed fatty oil. Monounsaturated fatty acids were also present (C16:1 and C18:1) in fully matured fruit in the amount of approximately 58.34%, whereas the content of polyunsaturated fatty acids (C18:2 and C18:3) were 12.61%. Results obtained in this study were slightly different from literature data, but should be taken into account that climatic conditions in Tunisia and in Serbia are significantly different.

Table 1. Fatty acid composition from coriander and cumin seeds

Fatty acid	RT	<i>Coriandrum sativum</i>	<i>Cuminum cyminum</i>
C4:0	10.102	2.14	0.60
C6:0	10.546	1.20	3.41
C8:0	11.772	1.42	0.00
C10:0	13.874	31.27	0.41
C11:0	15.326	0.00	0.26
C12:0	17.041	1.74	0.00
C13:0	18.974	0.00	1.51
C14:0	21.073	0.00	1.27
C14:1	22.751	0.00	0.21
C16:0	25.526	1.74	3.26
C16:1	26.846	0.00	0.16
C18:0	29.982	0.32	0.73
C18:1	30.985	29.67	59.33
C18:2	32.692	7.74	26.95
C20:1	34.711	0.00	0.18
C18:3	35.064	0.00	0.05
C22:0	37.748	21.93	0.52
C22:2	40.408	0.21	0.05
C24:0	40.730	0.00	1.09
C24:1	42.983	0.61	0.00
Saturated fatty acids		61.76	13.06
Monounsaturated fatty acids		30.28	59.88
Polyunsaturated fatty acids		7.95	27.05
<i>Fatty oil content</i>		<i>7.60</i>	<i>8.39</i>

**Fig. 2.** A typical HPLC chromatogram corresponding to coriander fatty oil

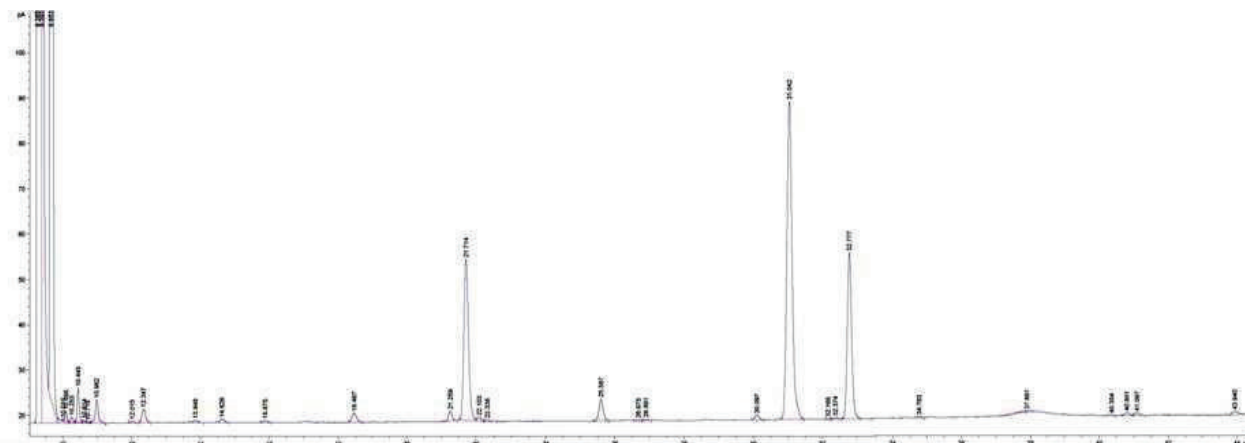


Fig. 3. A typical HPLC chromatogram corresponding to cumin fatty oil

CONCLUSIONS

In the coriander, the dominated classes of lipids are saturated fatty acids with the highest content of capric and behenic acids, while in cumin fatty oil dominate monounsaturated oleic acid.

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Acimovic Milica^{1*}, Popovic Sanja¹, Colovic Dusica¹, Djuragic Olivera¹, Kostadinovic Ljiljana¹, Mariana Petkova², Levic Jovanka¹

¹*Institute of Food Technology, University of Novi Sad – Serbia*

²*Institute of Animal Science Kostinbrod, Agricultural Academy – Bulgaria*

*E-mail: corresponding author: milica.acimovic@fins.uns.ac.rs

ABSTRACT

Coriander (*Coriandrum sativum* L.) and cumin (*Cuminum cyminum* L.) are plants from Apiaceae family originating from the Mediterranean region. Their seeds are rich in essential oils which gives them their characteristic aroma. Apart from the essential oils, this seeds are rich in fatty oil. According to the seed analysis obtained from plants grown at the experimental field in Mošorin during 2014, coriander contains 7.60%, while cumin contains 8.39% of fatty oil. Twelve fatty acids were established in coriander fatty oil, whereas in cumin were determined 17 fatty acids. The dominant fatty acid in coriander was capric acid (C10:0) in the amount of 31.70%, followed by monounsaturated fatty acids with 18 C-atoms (C18:1n-9 and C18n:1n-12) which were present in concentration of 29.67% and behenic acid (C22:0) with a share of 21.93%. As far as cumin concerned, the dominant fatty acids were monounsaturated and polyunsaturated fatty acids with 18 C-atoms. The oleic acid (C18:1) was present in quantity of 59.33%, while linoleic acid (C18:2) was present in concentration of approximately 26.59%.

Key words: *Coriandrum sativum*, *Cuminum cyminum*, fatty oil