Foods 2025 Conference

The 6th International Electronic Conference on Foods

28–30 October 2025 | Online

MDPI

Chemical Composition, Antioxidant Capacity, and Volatile Profile of *Laser trilobum* (Kefe Cumin) Seeds Grown in Turkey

Belkis Tekguler[1], Ilkay Koca[1],Hojjat Pashazadeh[2] Ali Ali Radha[3], Bülent Karadeniz[4]

[1] Food Engineering Department, Engineering Faculty, Ondokuz Mayıs University, Samsun, 55139, Turkey
[2] Department of Gastronomy and Culinary Arts, Art and Design Faculty, Istanbul Nisantası University, Istanbul, 34398, Turkey
[3] Department of Public Health and Sport Sciences, Faculty of Health and Life Sciences, University of Exeter Medical School, University of Exeter, Exeter, EX1 2LU, UK
[3] Centre for Nutrition and Food Sciences, Queensland Alliance for Agriculture and Food Innovation (QAAFI), The University of Queensland, Brisbane, QLD 4072, Australia
[4] Food Institute, TUBITAK MAM, Gebze Campus, Kocaeli, 41470, Turkey

INTRODUCTION & AIM

Laser trilobum (L.) Borkh. (fam. Umbelliferae) is a perennial herbaceous plant grown in some parts of Turkey. Kefe cumin is originally from Southeast Asia, Caucasia, Iran and the Central Asia. It only grows in rocky steeps of eastern regions, heavily forested areas and at the edge of vineyards in Germany and Central Asia (Parlatan et al., 2009).

Its dried and ground fruits are used as a spice like cumin in some meat products, called '*Kefe kimyonu*' in Turkish. Its fruits are used as spice. The leaves are boiled in water and drunk as tea. A 2% solution of the plant is used in the treatment of pimples. Fruits of Kefe cumin have a flavour like cinnamon, with a resinous and peppery taste. Akgul (1992) determined the chemical composition of the fruit essential oil of Laser trilobum growing wild in Turkey by capillary GC and GC/MS. He found to be the major constituents as limonene (60.70%) and perillaldehyde (32.30%). İşcan *et al. (2002) determined Laser trilobum fruits* uçucu yağ *profilini perilaldehit % 61.7, limonen % 17.8, perilil alkol % 3.9, cis-1,2-limonen epoksit %1.4, trans-1,2-limonen epoksit %1.2 ve karvon % 1 olarak* belirlemişlerdir. *Vahdat et al. (2006) isolated oil by hydro distillation from aerial parts at complete flowering stage. They reported that found twenty-two compounds were identified accounting for over 92.14% of the composition of the oil of Laser trilobum plants. The oil of laser trilobum consisted of ten monoterpene hydrocarbons (52.3%), nine sesquiterpenes (35.4%) and three diterpenes (4.4%). Alpha-Pinene (34.6%),* β-*Caryophyllene (17.81) and Sabinene (7.99%) were the major components in this oil. Ebrahimzadeh et al. (2010) investigated the antioxidant and antihaemolytic properties of the leaves of Laser trilubum grown in Iran. They found that the leaves of L. trilubum showed high total phenol and flavonoid contents, and exhibited good but varying levels of antioxidant and antihaemolytic activities in nearly all the models studied.*

This study aimed to evaluate the chemical composition, antioxidant activity, and volatile compounds of ripe fruits (seeds) from L. trilobum plants grown in the Mersin/Adana region of the Taurus Mountains.

METHOD

Materials

Seven materials were used in this study: the seeds fruits were collected from the Toros Mountain region near Mersin, Turkey in August 2020.

Methods

Color of seeds was evaluated by measuring L (brightness, 100, white; 0, black), a* (+, red; –, green) and b* (+, yellow; –, blue) parameters by means of a tristimulus reflectance colorimeter (CR400 chromameter, Minolta, Osaka, Japan). Moisture, protein (Kjeldahl,N x6.25), crude fat (ether extraction) and ash of Kefe cumin seeds were determined according to the Association of* Official *Analytical Chemists (2000).*

Total phenolic analysis

According to Singleton and Rossi (1965), the total phenolics of the methanolic extracts of samples were determined.The calibration curve was drawn using gallic acid (Sigma) as a standard and the total phenolic content was expressed as mg GAE g^{-1}.

Ferric reducing antioxidant power (FRAP)

According to Gao et al. (2000), the FRAP assay was determined with some modifications. FRAP was calculated from a calibration curve using $FeSO_4$ *as the standard and expressed as* µmol $FeSO_4$ *equivalents per g* (µmol Fe^{2+} g^{-1}).

Radical scavenging effect test

DPPH (1,1-diphenyl-2-picrylhydrazyl) is a free radical with unpaired electrons. The radical scavenging effect of the sample was estimated by published methods. 50 µL *of different concentrations of cumin extracts were mixed with 1000* µL *of 100* µM *DPPH and incubated at room temperature for 120 min and absorbance was read spectrophotometrically at 515 nm. The inhibition of free radicals from DPPH as a percentage was calculated with the following equation:*

$$\text{DPPH radical scavenging activity (\%)} = [(A0-A1)/A0] \times 100.$$

Where; A0 is the absorbance of the control reaction, A1 is the absorbance of the extracts. The EC_{50} *value was defined as the concentration of 50% of DPPH radical scavenging activity (*Tekgüler *et al., 2024).*

Volatile compounds determination

The sample (1 g) and 22 mL of water were placed in the headspace vial (Perkin Elmer, USA). The sample was heated at 80°C for one hour and then put into headspace autosampler. The transfer line was a fused silica 1 m x 320 µm*. The vial pressure was fixed at 10 psi and column pressure was kept at 25 psi. The needle temperature was set at 90°C and transfer line temperatures at 100°C. The trap hold time was 6 min and the outlet split was on.*

Desorbed compounds were automatically injected into a GC column (Optima-Wax, 60 m length, 0.25 mm inner diameter, 0.25 µm *film thickness). The oven temperature was 70°C. The flow rate of the helium carrier gas was 1 mL min-1. The injection was performed in the splitless mode (200°C injection port temperature). The GC column temperature programme: 1. holding for 5 min at 35°C, 2. increasing from 35°C to 160°C at a rate of 3°C min-1, and 3. holding at 160°C for 15 min. The MS conditions: 200°C for ion source temperature; 70 eV for ionization energy; 33-300 amu for mass scan range; 350 V electron multiplier voltage; 0.25 s for scan time, 0.05 for standby time; and electron ionization (EI) as ion mode. The volatile compound was determined by comparing their retention index (RI) and mass spectra with a commercial spectra database (Wiley 6, NBS 75k) and the instrument's internal library. The unknown chromatograms were identified using Mass Spectral Libraries according to the retention index calculated thanks to the n-alkane series (C6-C20) (Tekgüler et al., 2021).*

RESULTS & DISCUSSION

The physical, chemical and antioxidant properties of cumin are shown in Table 1, and the volatile component composition is shown in Table 2.

Table 1. Physical, chemical and antioxidant properties of kefe cumin

	in literature (Parlatan et al., 2009)	in present study	
		Mean	Std dev
L		38.60	2.65
+a		13.65	3.47
+b		1.34	1.02
Moisture, g/100g	10.87-12.72	10.41	1.16
Ash, g/100g	6.46-9.37	10.00	0.83
Fat, g/100g	8.41-20.00	15.02	2.55
Protein, g/100g	3.63-4.06	18.77	1.32
Total phenolics, mg/g		7.914	1.70
FRAP mmol/g		38.89	20.97
DPPH (EC50), µg/mL		298.24	88.05

Table 2. Volatile compounds of kefe cumin

Compounds	In literature (a,b,c,d)	in present study	
		mean	std dev
Hexane		0.13	0.14
Heptane		2.88	1.17
Dimethyl sulfide		0.16	0.22
Carbonyl sulfide		0.08	0.07
2-methyl propanal		0.46	0.27
Acetic acid methyl ester		3.78	2.97
Acetic acid methyl ester		0.18	0.12
3-methyl butanal		2.14	1.32
Ethyl alcohol		2.31	3.10
α-pinene	0.84-1.80[a]	19.19	4.87
Hexanal		0.13	0.07
3-carene		2.99	1.67
γ-terpinene		1.25	1.09
β-pinene	0.40[a]	1.36	0.55
Limonene	38.83%[b]; 26.7-91.0%[c]; 51.6%[d]	47.99	15.46
2-pentyl furan		0.04	0.04
Hexanoic acid ethyl ester		1.51	2.20
2-cyclohexen-1-one, 2-methyl-5-(1-methylhethenyl)		0.17	0.41
1-cyclohexen-1-carboxaldehyde, 4-(1-methylhethenyl)	40.75%[b]; 4.4-62.0%[c]; 26.8%[d]	5.88	2.46
2,3-epoxycarene		0.17	0.19

a Parlatan et al. (2009); b Agar & Tosun (2025); c Baser et al. (1993); d Drobac et al. (2017)

CONCLUSION

This study represents one of the first comprehensive evaluations of L. trilobum seeds in terms of both chemical and aromatic composition. These findings suggest that L. trilobum seeds possess promising antioxidant properties and a rich volatile profile, supporting their potential use as a functional spice and as a natural ingredient in the cosmetic, fragrance, and pharmaceutical industries.

FUTURE WORK / REFERENCES

Agar, O. T., & Tosun, B. (2025). Chemical Composition of Essential Oils from Cultivated Laser trilobum (L.) Borkh. in Different Plant Parts. Turkish Journal of Agriculture - Food Science and Technology, 13(s1), 2308–2316.

Akgul, A., 1992. The Essential Oil Composition of Turkish Laser trilobum (L.) Borkh. Fruits.Journal of Essential Oil Research. 4,1:89-90.

AOAC, (2000). Official Methods of Analysis of the Association of Official Analysis Chemists (17th ed). AOAC International, Gaithersburg, MD

Baser, K. H. C., T., Ö., & Kirimer, N. (1993). The Essential Oil of Laser trilobum Fruit of Turkish Origin. Journal of Essential Oil Research, 5(4), 365-369.

Drobac, M., Petrović*, S.,* Milenković*, M., Couladis, M.,* Kukić-Marković*, J., &* Niketić*, M. (2017). Composition and antimicrobial properties of essential oils of laser trilobum rhizomes and fruits. Natural product communications, 12(3),*

Ebrahimzadeh, MA., , Nabavi SM., Nabavi S F., Eslami, B., Rahmani, Z., 2010. Antioxidant and Antihaemolytic Activities of the Leaves of Kefe cumin (Laser trilobum L) Umbelliferae Tropical Journal of Pharmaceutical Research, 9 (5): 441-449.

Gao, X., Björk*, L., Trajkovski, V., & Uggla, M. (2000). Evaluation of antioxidant activies of rosehip ethanol extracts in different test systems. Journal of the Science of Food and Agriculture, 80, 2021-2027*

Parlatan, A., Sariçoban*, C., &* Özcan*, M. M. (2009). Chemical composition and antimicrobial activity of the extracts of Kefe cumin (Laser trilobum L.) fruits from different regions. International Journal of Food Sciences and Nutrition, 60(7), 606-617.*

.Singleton, V.L., & Rossi, J.A. (1965). Colorimety of total phenolics with phosphomolybdic-phosphotungstic acid reagents. American Journal of Enology and Viticulture, 16, 144-158.

Tekgüler*, B., Koca,* İ*., Karadeniz, B., Zannou, O., & Pashazadeh, H. (2021). Antioxidant properties and monoterpene composition of 13 different pine resin samples from Turkey. Commagene Journal of Biology, 5*(2), 208-213.

Tekgüler*, B., Koca,* İ*., Zannou, O., & Karadeniz, B. (2024). Some chemical characteristics and volatile compound profiles of wild foxtail lily (Eremurus spectabilis). Harran Tarım ve Gıda Bilimleri Dergisi; 28*(1), 108-117.

Vahdat, M. Eslami B. Dabiri H.A. Khalilzadeh M.A. Tajbakhsh M. Larijani K. 2006. Essential oil composition of Laser trilobum (L.) Borkh. Umbelliferae herbs growing wild in Iran. JSIAU, 16, 60:20-23.

.