

Eryngium campestre L.: Traditional uses, phytochemical content and biological activities

Eryngium campestre L.: Geleneksel kullanımları, fitokimyasal içeriği ve biyolojik aktiviteleri

Esen Sezen Karaoğlan 

Department of
Pharmaceutical Botany,
Faculty of Pharmacy,
Atatürk University, Erzurum,
Türkiye

ABSTRACT

Eryngium campestre L. is a species belonging to the Apiaceae family with traditional uses. This study involved a literature review of the species *E. campestre*. Ethnobotanical uses, phytochemical content, and biological activity studies were selected and compiled. It is documented that the leaves, flowers, stems, roots, or all parts of *E. campestre* have been traditionally used as food and medicine. It has been reported to contain phytochemical compounds such as essential oils, phenolic compounds, and triterpene saponins, and to possess various activities including antioxidant, cytotoxic, antimicrobial, anti-inflammatory, antipyretic, and wound-healing properties. Research on this plant is limited, and more studies are needed. Further phytochemical, pharmacological, clinical, and toxicological research would be beneficial.

Keywords: *Eryngium campestre* L., traditional use, phytochemistry, biological activity

ÖZET

Eryngium campestre L., geleneksel kullanımları olan Apiaceae familyasına ait bir türdür. Bu çalışmada, *E. campestre* türü ile ilgili literatür taraması yapılmıştır. Etnobotanik kullanım, fitokimyasal içerik ve biyolojik aktivite araştırmaları seçilerek derlenmiştir. *E. campestre*'nin yaprak, çiçek, gövde, kök veya tüm kısımlarının gıda ve ilaç şeklinde geleneksel olarak kullanıldığı kayıtlıdır. Uçucu yağlar, fenolik bileşikler ve triterpen saponinler gibi fitokimyasal bileşikler içerdiği ve antioksidan, sitotoksik, antimikrobiyal, antiinflamatuar, ateş düşürücü ve yara iyileştirici gibi çeşitli aktivitelere sahip olduğu belirtilmiştir. Bu bitkiyle ilgili araştırmaların sınırlı olduğu ve daha fazla çalışmaya ihtiyaç bulunduğu gözlenmiştir. Daha ileri fitokimyasal, farmakolojik, klinik ve toksikolojik araştırmaların yapılması faydalı olacaktır.

Anahtar kelimeler: *Eryngium campestre* L., geleneksel kullanım, fitokimya, biyolojik aktivite

*Correspondence:
esen.karaoglan@atauni.
edu.tr

ORCID iD:
0000-0002-9098-9021

Received:
22 January 2026
Accepted:
21 April 2026
Published:
28 April 2026

Recommended citation:

Karaoğlan, E. S. (2026). *Eryngium campestre* L.: Traditional uses, phytochemical content and biological activities. *Journal of Integrative and Anatolian Medicine*, 7(1), 26-33.
<https://doi.org/10.53445/batd.1869381>



Medicinal plants have been traditionally used worldwide for centuries. Some natural products serve as sources for modern medicines. Although many plants and their bioactive compounds have been studied, there are still numerous plants that remain unexplored and require further research (Marrelli, 2021).

Apiaceae is a family with rich diversity worldwide. It includes species that are commercially important, medicinally valuable, used as food and spices, and sometimes poisonous (Özek et al., 2023). The Apiaceae family primarily contains polysaccharides, alkaloids, phenylpropanoids, flavonoids, and terpenoids. Plants within the Apiaceae family have been reported to exhibit anti-inflammatory, antioxidant, antitumor, bacteriostatic, and analgesic activities (Li et al., 2023).

Eryngium L. is a large genus belonging to the Apiaceae family. This genus includes approximately 250 throughout the world North America and South America are centers of biodiversity (Cardenas-Valdovinos et al., 2023). There are 27 taxa in Türkiye (Sarı & Kandemir, 2021). *Eryngium* species are utilized for medicinal, food, and ornamental purposes. They are reported to contain compounds such as terpenes, flavonoids, saponins, coumarins, and steroids. They have been observed to exhibit effects such as cytotoxic, anti-inflammatory, antibacterial, antifungal, antimalarial, antioxidant, and antihyperglycemic activities (Wang et al., 2012). *Eryngium* species represent an important alternative source of bioactive compounds for the pharmaceutical, food, and other industries. However, further research is needed on their phytochemistry, biological activities, cultivation, and propagation (Cardenas-Valdovinos et al., 2023). *Eryngium campestre* is a species belonging to the genus *Eryngium*. It is a perennial plant, 30–60 cm in height, with a light green color and a spiny, thick stem. The basal leaves are 5–20 cm long, leathery, and generally green. The flowers have spherical or oval heads and are white. The fruits are scaly and oval-shaped (Medbouhi et al., 2019). This review aims to systematically summarize the ethnobotanical uses, phytochemical profile, and experimentally validated biological activities of *E. campestre*.

Methods

In this study, a literature search was conducted on the species *E. campestre* using the Google Scholar, Web of Science, and Scopus databases. The keywords used were

“*Eryngium campestre*”, “phytochemistry”, “biological activity”, and “ethnobotany”. Articles covering traditional uses, phytochemical content, and biological activities were selected and reviewed.

Traditional uses

Food uses

It is recorded that the aboveground parts (Akgul et al., 2018), stems (Altundağ Çakır, 2017; Celik & Yeşil, 2020; Kadioğlu et al., 2021; Mahklouf, 2019), leaves (Parada et al., 2011), and roots (Aslan et al., 2020; Bulut et al., 2019) of *E. campestre* are used as food. It has also been stated that its stems are eaten and its roots are used as rennet (Emre et al., 2024).

Medicinal uses

The several parts of *E. campestre* are used in traditional medicine. Plant parts and medicinal uses are shown in Table 1.

Table 1. Traditional medicinal uses of *E. campestre*

Parts	Medicinal Uses	Reference
Leaves	Diuretic	(İlbaş et al., 2024; Parada et al., 2011)
	Snake bites, gynecological diseases and body wounds	(Bağcı & Keskin, 2022)
Flowers	Snake bites, gynecological diseases and body wounds	(Bağcı & Keskin, 2022)
Stems	Diuretic	(İlbaş et al., 2024)
	Kidney disease	(Kültür et al., 2021)
	Stomachache	(Dogan, 2024)
Roots	Aphrodisiac	(Polat & Satıl, 2012)
	Snake bites	(Bağcı & Keskin, 2022)
	Cough, urinary problems, infections, kidney pain	(Hussain et al., 2024)
	Diuretic, emmenagogue	(Carrió & Vallès, 2012)
Aerial parts	Anti-inflammatory	(Karakaya et al., 2019)
	Aphrodisiac	(Polat & Satıl, 2012)
	Kidney stones	(Ecevit Genç & Özhatay, 2006)
	Disorders of the bladder and kidneys, urinary affections, cough and bronchitis	(Belkacem et al., 2021)
Unspecified	Treats affections of kidneys, increases secretion of urine, cholagogue and sudorific	(Bendif et al., 2021)

Phytochemical content

E. campestre essential oil contains mainly germacrene D (Cianfaglione et al., 2017). Apart from germacrene D, it contains germacrene B, campestrolide, myrcene, spathulenol, cadinol, and eudesma-4(15)-7-dien-1-ol (Medbouhi et al., 2019). In another study, the essential oil of the inflorescences mainly contained germacrene D, myrcene, β -curcumene, and (*E*)- β -farnesene, while germacrene D and myrcene were detected in the stems and leaves (Palá-Paúla et al., 2008). *E. campestre* methanol extract was investigated by HPLC method and it was observed that it contained polyphenolic compounds such as benzoic acid, quercetin, catechol, vanillic acid, naringenin, resveratrol, and quinol (Al-Askar et al., 2023). Saponin compounds commonly isolated from *E. campestre* root are listed in Table 2.

Table 2. Saponin compounds isolated from *E. campestre* root

Saponins	Reference
3- <i>O</i> - β - <i>D</i> -glucopyranosyl-(1 \rightarrow 2)-[α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 4)]- β - <i>D</i> -glucuronopyranosyl-22- <i>O</i> - β , β -dimethylacryloyl-A1-barrigenol	(Kartal et al., 2005)
3- <i>O</i> - β - <i>D</i> -glucopyranosyl-(1 \rightarrow 2)-[α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 4)]- β - <i>D</i> -glucuronopyranosyl-22- <i>O</i> -angeloyl-R1-barrigenol	
3- <i>O</i> - α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 2)- β - <i>D</i> -glucuronopyranosyl-22- <i>O</i> -angeloyl-R1-barrigenol	(Kartal et al., 2006)
3- <i>O</i> - α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 2)- β - <i>D</i> -glucuronopyranosyl-22- <i>O</i> - β , β -dimethylacryloyl-A1-barrigenol	
3- <i>O</i> - α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 2)- β - <i>D</i> -glucuronopyranosyl-21- <i>O</i> -acetyl-22- <i>O</i> -angeloyl-R1-barrigenol	
3- <i>O</i> - α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 2)- β - <i>D</i> -glucuronopyranosyl-22- <i>O</i> -angeloyl-28- <i>O</i> -acetyl-R1-barrigenol	
3- <i>O</i> - α - <i>L</i> -rhamnopyranosyl-(1 \rightarrow 2)- β - <i>D</i> -glucuronopyranosyl-21- <i>O</i> -acetyl-22- <i>O</i> - β , β -dimethylacryloyl-R1-barrigenol	

Biological activities

Antioxidant activity

The effects of methanol extracts of several parts of *E. campestre* on antioxidant enzymes such as catalase, glutathione peroxidase, and glutathione S-transferase were investigated. The strongest glutathione S-transferase inhibitory effect was observed in the flower extract (IC_{50} = 363 ng/mL). Additionally, it was observed that the total phenolic compound content in the methanol extract of *E. campestre* flowers (116.69 mg GAE/L) was higher than the leaves (109.62 mg GAE/L) (Güneş et al., 2014).

The ethanol extract of *E. campestre* roots showed higher 2,2-diphenyl-1-picrylhydrazyl radical scavenging (DPPH) activity (IC_{50} = 0.72 mg/mL) than the aerial parts extract (IC_{50} = 1.14 mg/mL) compared to standard butylated hydroxyanisole (BHA). In addition, ethanol extract of aerial parts showed stronger inhibitory capacity on hydroxyl radical production in deoxyribose system compared to root extract (50%, 45%, respectively, BHA; 52%) (Nebija et al., 2009).

The antioxidant activity of *E. campestre* extracts nanocapsulated in maltodextrin and chitosan, and incorporated into canola oil under time-lapse oxidation conditions were tested. The nanoencapsulated *E. campestre* extract with 8.5% maltodextrin and 1.5% chitosan had highest activity in canola oil (Azizkhani & Sodayan, 2021).

The antioxidant effect of ethanol extract of *E. campestre* var. *virens* roots was investigated using 2,2'-azino-bis(3-ethylbenzothiazoline-6-sulfonic acid) (ABTS), DPPH, ferric reducing antioxidant/power capacity (FRAP) and cupric reducing antioxidant capacity (CUPRAC) assays. It exhibited strong FRAP activity (0.36 ± 0.005 mM Fe^{2+} /mg extract) compared with the standard BHT (1.1 ± 0.12 mM) (Atay Balkan et al., 2020).

Antioxidant activities of different extracts of root and aboveground parts of *E. campestre* were evaluated by DPPH radical scavenging and β -carotene-linoleic acid methods. The n-butanol extract of aboveground parts showed a valuable antiradical effect with an IC_{50} value of 16.140 ± 0.256 μ g/mL, compared with the standard quercetin (IC_{50} = 1.1495 ± 0.0004 μ g/mL) (Bouzidi et al., 2017).

Antimicrobial activity

The antimicrobial activity of *E. campestre* aqueous extract was investigated using the disk diffusion method at 100 mg/mL concentration. It was effective against all Gram-positive bacteria, with the highest activity against *Bacillus subtilis*, *Staphylococcus aureus*, and *S. epidermidis*. The inhibition zone diameters of the aqueous extract against the tested bacteria were observed to be 18 mm, 12 mm, and 8 mm, respectively (compared to 46 mm, 46 mm, and 32 mm for the positive control imipenem). According to the results of the microdilution method, the aqueous extract showed bactericidal activity against *B. subtilis* (MIC = 0.2 mg/mL), *S. aureus* (MIC = 0.2 mg/mL), *S. epidermidis*

(MIC = 2 mg/mL) and *Pseudomonas aeruginosa* (MIC = 2 mg/mL), and fungicidal activity against *Candida albicans* (MIC = 0.02 mg/mL) (Jaradat et al., 2015).

Various extracts of shoots and roots of *E. campestre* were tested against *Klebsiella pneumoniae*, *P. aeruginosa*, *Escherichia coli*, *S. epidermidis*, *S. aureus*, *Enterobacter cloacae*, and *Acinetobacter baumannii*. In particular, the ethyl acetate extract of the shoots (Growth inhibition zone diameter; 11 ± 1 mm to 16 ± 2 mm) and the petroleum ether extract of the roots (Growth inhibition zone diameter; 13 ± 0 mm to 21 ± 1 mm) showed the highest activity, inhibiting the growth of all tested bacteria (Zaki et al., 2025).

The antifungal effects of essential oils of some *Eryngium* species (*E. pusillum*, *E. maritimum*, and *E. campestre*) against *Candida glabrata*, *C. albicans*, and *Trichophyton rubrum* were evaluated using microdilution technique. It was noted that *E. campestre* essential oil showed promising antidermatophyte properties (MIC₅₀ = 500 µg/mL) against *T. rubrum* (Majdoub et al., 2025).

Cytotoxic activity

The cytotoxic effects of *E. campestre* essential oil against A375 (human malignant melanoma), MDA-MB-231 cells (human breast adenocarcinoma), and HCT116 cells (human colon carcinoma) cell lines were determined using the MTT assay, and it was found to be effective against all cell lines (IC₅₀ values were 1.57, 2.99, and 1.64 µg/mL, respectively). Cisplatin was used as a control (IC₅₀ values were 0.41, 2.74, 2.34 µg/mL, respectively) (Cianfaglione et al., 2017).

Effects on lipid profile and glycemic index

The impact of high-intensity interval training with *E. campestre* on glycemic indices and lipid profiles in high fat diet induced obese rats was investigated. High-intensity interval training decreased cholesterol, triglyceride, insulin, and glucose levels ($p \leq 0.05$). *E. campestre* extract decreased cholesterol, triglyceride, insulin, glucose, and low-density lipoprotein levels ($p \leq 0.05$). High-intensity interval training and *E. campestre* alone improved glycemic indices and lipid profiles in obese rats, but high-intensity interval training combined with *E. campestre* was more effective in reducing low-density lipoprotein levels than high-intensity interval training ($p \leq 0.05$) (Ghadery et al., 2020).

Anti-inflammatory effect

The effects of aqueous extract of *E. campestre* on ethylene glycol-induced calcium oxalate kidney stones in rats were investigated. *E. campestre* decreased the levels of IL-1 β and IL-6 particularly at a dose of 400 mg/kg ($p < 0.001$) and showed a strong suppressive effect on pro-inflammatory cytokine production in rats. In addition, it reduced crystal deposition in the kidneys of hyperoxaluric rats (Safari et al., 2019).

The anti-inflammatory effect of the EtOH extract of *E. campestre* var. *virens* roots was investigated *in vitro*. Cytokine and nitric oxide inhibitory effects were tested using the Griess and ELISA methods. It showed 36.22% IL-6 and 44.24% IL-1 α inhibition at a dose of 100 µg/mL (Atay Balkan et al., 2020).

The anti-inflammatory effect of n-butanol extracts of the underground and aboveground parts of *E. campestre* was evaluated using the egg albumin induced edema method in female Wistar rats. The 500 mg/kg dose of aboveground parts showed the highest inhibitory activity (71.25%). The control diclofenac reduced edema by 70.04% at a dose of 30 mg/kg orally. It was observed to have a fairly strong anti-inflammatory effect comparable to diclofenac (Bouzidi et al., 2017).

The anti-inflammatory effects of *E. campestre* and *E. planum* extracts were investigated topically in a rat model with periodontitis. The results indicated that *E. planum* and *E. campestre* extracts exhibited anti-inflammatory effects by reducing leukocyte infiltration ($p < 0.01$) and nitro-oxidative stress ($p < 0.05$) (Conea et al., 2015).

Antipyretic effect

The antipyretic effect of n-butanol extracts (root and aboveground parts) of *E. campestre* was evaluated using the brewer's yeast-induced pyrexia method in female Wistar rats. Paracetamol (150 mg/kg) was used as a standard antipyretic. The extracts were administered at doses of 250 and 500 mg/kg. Both the root and the aboveground extracts showed time and concentration dependent antipyretic effects. The root extract at a dose of 500 mg/kg showed a significant antipyretic effect ($p < 0.001$) comparable to paracetamol from the second hour of the experiment (Bouzidi et al., 2017).

Wound healing activity

The wound healing effects of lipogel formulations containing *E. campestre* and *Satureja hortensis* extracts were investigated in Wistar rats. Wounds created in the dorsal neck area were evaluated in terms of size and histopathology on days 3, 5, 7, and 12. Formulations containing 95% paraffin and 5% polyethylene were reported to have good skin coverage, consistency, and homogeneity. Significant differences in fibroblast maturation were observed between rats treated with the lipogel formulations and normal saline ($p < 0.05$). In conclusion, lipogels containing *E. campestre* and *S. hortensis* extracts were found to be effective in wound healing (Royaniyan et al., 2021).

Insecticidal activity

The insecticidal efficacy of essential oils of some *Eryngium* species (*E. pusillum*, *E. maritimum*, and *E. campestre*) against the red flour beetle *Tribolium confusum* was investigated using a repellency test. After 120 minutes of exposure, *E. campestre* essential oil showed moderate repellency (52.5%). The main component of *E. campestre* essential oil was identified as spathulenol (27.4%) (Majdoub et al., 2025).

Conclusion

E. campestre belongs to the Apiaceae family. A literature review has shown that the aboveground parts and roots of the plant are used as food. The root is also used as rennet (Emre et al., 2024). It has been used in folk medicine to treat many diseases such as urinary and kidney problems, cough (Hussain et al., 2024), infections, gynecological diseases and wounds (Bađcı & Keskin, 2022). Its essential oil contains primarily germacrene D (Cianfaglione et al., 2017). Various polyphenolic compounds have been identified in the methanol extract of *E. campestre* (Al-Askar et al., 2023). Triterpenic saponosides were isolated from the root (Kartal et al., 2005; Kartal et al., 2006). It has been reported that *E. campestre* has antioxidant, antimicrobial, cytotoxic, anti-inflammatory, antipyretic, wound healing, insecticidal activities and improves the lipid profile and glycemic index. According to the results of the literature review, it is noteworthy that *E. campestre* essential oil has a cytotoxic effect against all three cell lines of human malignant melanoma, human breast adenocarcinoma, and human colon carcinoma (Cianfaglione et al., 2017). It is also interesting that 500 mg/kg of n-butanol extracts of the aerial parts of *E. campestre* (71.25%) showed an anti-

inflammatory effect similar to the control diclofenac at a dose of 30 mg/kg oral dose (70.04%) in the egg albumin-induced edema method in female Wistar rats (Bouzidi et al., 2017). Although various biological activities have been investigated, it has been observed that studies on *E. campestre* are limited. However, *E. campestre* has many uses in traditional medicine (Table 1). It has been reported that this species has been traditionally used in the treatment of urinary tract and gastrointestinal disorders, as well as for its purported aphrodisiac effects. However, such pharmacological activities have not yet been evaluated through *in vivo* or *in vitro* studies. Furthermore, clinical and toxicological investigations concerning this plant remain limited. Expanding clinical, toxicological, and pharmacological research on this plant, which is considered to have potential for drug development, would be beneficial.

Author contributions

The research concept, study design, data collection and analysis, and article writing were all done by the author.

Declaration of interests

The author declares no conflict of interest.

Funding statement

The author received no funding for this work.

References

- Akgul, A., Akgul, A., Senol, S. G., Yildirim, H., Secmen, O., & Dogan, Y. (2018). An ethnobotanical study in Midyat (Turkey), a city on the silk road where cultures meet. *Journal of Ethnobiology and Ethnomedicine*, 14, 12. <https://doi.org/10.1186/s13002-017-0201-8>
- Al-Askar, A. A., Bashir, S., Mohamed, A. E., Sharaf, O. A., Nabil, R., Su, Y., Abdelkhatek, A., & Behiry, S. (2023). Antimicrobial efficacy and HPLC analysis of polyphenolic compounds in a whole-plant extract of *Eryngium campestre*. *Separations*, 10(6), 362. <https://doi.org/10.3390/separations10060362>
- Altundađ akır, E. (2017). Traditional knowledge of wild edible plants of Iđdır Province (East Anatolia, Turkey). *Acta Societatis Botanicorum Poloniae*, 86(4), 3568.
- Aslan, S., Akan, H., & Pekmez, H. (2020). The ethnobotanical investigation of Yaslıca town and Arıkök neighborhood (Şanlıurfa/Turkey). *Biological Diversity and Conservation*, 13(1), 44–61. <https://doi.org/10.46309/biodicon.2020.730293>

- Atay Balkan, İ., Taşkin, T., Acar Şah, E., Akaydin, G., & Erdem, Y. (2020). Comparative study of the anti-inflammatory, antioxidant and urease inhibitory activities of *Eryngium kotschyi* Boiss. and *E. campestre* L. var. *virens* (link) weins extracts. *Journal of Research in Pharmacy*, 24(3), 399–409.
- Azizkhani, M., & Sordanlo, A. (2021). Antioxidant activity of *Eryngium campestre* L., *Froriepia subpinnata*, and *Mentha spicata* L. polyphenolic extracts nanocapsulated in chitosan and maltodextrin. *Journal of Food Processing and Preservation*, 45, e15120. <https://doi.org/10.1111/jfpp.15120>
- Bağcı, Y., & Keskin, L. (2022). An ethnobotanical field survey in the Kadınhanı district of Konya in Turkey. *Kahramanmaraş Sütçü İmam Üniversitesi Tarım ve Doğa Dergisi*, 25(2), 312–336. <https://doi.org/10.18016/ksutarimdoga.vi.865880>
- Belkacem, N., Okkacha, H., Benchohra, M., & Elhadj, T. (2021). Inventory, diversity and therapeutic uses of medicinal plants in the Tiaret Mountains (western Algeria). *Biodiversity Journal*, 12(1), 129–138.
- Bendif, H., Harir, M., Yahiaoui, M., Souilah, N., Hechaichi, F. Z., Miara, M. D., & Medila, I. (2021). Ethnobotanical survey of herbal remedies traditionally used in El Hammadia (Southern region of the province of Bordj Bou Arreridj, Algeria). *Algerian Journal of Biosciences*, 02(01), 006–015. <http://dx.doi.org/10.5281/zenodo.5045031>
- Bouzidi, S., Benkiki, N., Hachemi, M., & Haba, H. (2017). Investigation of *in vitro* antioxidant activity and *in vivo* antipyretic and anti-inflammatory activities of Algerian *Eryngium campestre* L. *Current Bioactive Compounds*, 13(4), 340–346. <https://doi.org/10.2174/1573407212666160815124204>
- Bulut, G., Dođan, A., Şenkardeş, İ., Avcı, R., & Tuzlacı, E. (2019). The medicinal and wild food plants of Batman city and Kozluk district (Batman-Turkey). *Agriculturae Conspectus Scientificus*, 84(1), 29–36.
- Cardenas-Valdovinos, J. G., García-Ruiz, I., Angoa-Pérez, M. V., & Mena-Violante, H.G. (2023). Ethnobotany, biological activities and phytochemical compounds of some species of the genus *Eryngium* (Apiaceae), from the Central-Western Region of Mexico. *Molecules*, 28, 4094. <https://doi.org/10.3390/molecules28104094>
- Carrió, E., & Vallès, J. (2012). Ethnobotany of medicinal plants used in eastern Mallorca (Balearic Islands, Mediterranean Sea). *Journal of Ethnopharmacology*, 141, 1021–1040. <https://doi.org/10.1016/j.jep.2012.03.049>
- Cianfaglione, K., Blomme, E. E., Quassinti, L., Bramucci, M., Lupidi, G., Dall'Acqua, S., & Maggi, F. (2017). Cytotoxic essential oils from *Eryngium campestre* and *Eryngium amethystinum* (Apiaceae) Growing in Central Italy. *Chemistry & Biodiversity*, 14, e1700096. <https://doi.org/10.1002/cbdv.201700096>
- Celik, B., & Yeşil, Y. (2020). An ethnobotanical study in Pöhrenk village (Çiçekdađı-Kırşehir province /Turkey). *İstanbul Journal of Pharmacy*, 50(2), 131–141. <https://doi.org/10.26650/IstanbulJPharm.2019.0072>
- Conea, S., Parvu, A. E., Taulescu, M. A., & Vlase, L. (2015). Effects of *Eryngium planum* and *Eryngium campestre* extracts on ligature-induced rat periodontitis. *Digest Journal of Nanomaterials and Biostructures*, 10(2), 693–704.
- Dogan, A. (2024). Cultural use and the knowledge of ethnomedicinal plants in the Pülümür (Dersim-Tunceli) Region. *Plants*, 13, 2104. <https://doi.org/10.3390/plants13152104>
- Ecevit Genç, G., & Özhatay, N. (2006). An ethnobotanical study in Çatalca (European Part of Istanbul) II. *Turkish Journal of Pharmaceutical Science*, 3(2), 73–89.
- Emre, G., Senkardes, I., Iscan, K., Evcimen, O., Yılmaz, I., & Tugay, O. (2024). An ethnobotanical study in Kırşehir (Türkiye). *Plants*, 13, 2895. <https://doi.org/10.3390/plants13202895>
- Ghadery, B., Ghazalian, F., Hosseini, S. A., Natanzy, H. A., & Shamsoddini, A. (2020). Effect of high-intensity interval training with *Eryngium campestre* on lipid profile and glycemic indices in high-fat diet-induced obese rats. *Hormozgan Medical Journal*, 24(2), e98982.
- Güneş, M. G., İşgör, B. S., İşgör, Y. G., Shomalı Moghaddam, N., Geven, F., & Yıldırım, Ö. (2014). The effects of *Eryngium campestre* extracts on glutathione-S-transferase, glutathione peroxidase and catalase enzyme activities. *Turkish Journal of Pharmaceutical Sciences*, 11(3), 339–346.
- Hussain, F. H. S., Majedi, S., Faraj, T. A., Ozdemir, M., Ahamad, J., Karim, T. H., Issa, K. D., & Mustafa, M. Q. (2024). Documentation of ethnomedicinal uses of wild plants growing in Kodo Mountain by Kurdish Tribe of Iraq. *Journal of The Chemical Society of Pakistan*, 46(6), 168–184.
- İlbaş, A. İ., Beyzi, E., Çimen, M., & Polat, A. (2024). Ethnobotanical characteristics and local use of some natural medicinal plants growing in Develi district and surroundings. *Journal of Erciyes Agriculture and Animal Science*, 7(1), 17–24. <https://doi.org/10.55257/ethabd.1388358>

- Jaradat, N. A., Al Khawaja, M. M., & Abu-hadid, M. M. (2015). Novel serial extraction method for antibacterial and antifungal evaluations of the entire *Eryngium campestre* L. plant from Jerusalem/Palestine. *Journal of Chemical and Pharmaceutical Research*, 7(3), 905–913.
- Kadiođlu, S., Kadiođlu, B., Dizikisa, T., & Karagöz Sezer, K. (2021). Ethnobotanical characteristics of wild plants growing naturally and used by the folk. *Journal of Muş Alparslan University Agricultural Production and Technologies*, 1(1), 39–50.
- Karakaya, S., Polat, A., Aksakal, O., Sümbüllü, Y. Z., & İncekara, U. (2019). Plants used in traditional medicine and other uses in South of Erzurum (Turkey): An ethnobotanical study. *Ethnobotany Research and Applications*, 18, 1–18. <http://dx.doi.org/10.32859/era.18.13.1-18>
- Kartal, M., Mitaine-Offer, A. C., Abu-Asaker, M., Miyamoto, T., Calis, I., Wagner, H., & Lacaille-Dubois, M. A. (2005). Two new triterpene saponins from *Eryngium campestre*. *Chemical and Pharmaceutical Bulletin*, 53(10), 1318–1320. <https://doi.org/10.1248/cpb.53.1318>
- Kartal, M., Mitaine-Offer, A. C., Paululat, T., Abu-Asaker, M., Wagner, H., Mirjolet, J. F., Guilbaud, N., & Lacaille-Dubois, M. A. (2006). Triterpene saponins from *Eryngium campestre*. *Journal of Natural Products*, 69, 1105–1108. <https://doi.org/10.1021/np060101w>
- Kültür, Ş., Gürdal, B., Sarı, A., & Melikođlu, G. (2021). Traditional herbal remedies used in kidney diseases in Turkey: an overview. *Turkish Journal of Botany*, 45(4), 269–287. <https://doi.org/10.3906/bot-2011-32>
- Li, M., Li, M., Wang, L., Li, M., & Wei, J. (2023). Apiaceae medicinal plants in China: A review of traditional uses, phytochemistry, bolting and flowering (BF), and BF control methods. *Molecules*, 28(11), 4384. <https://doi.org/10.3390/molecules28114384>
- Mahklouf, M. (2019). Ethnobotanical study of edible wild plants in Libya. *European Journal of Ecology*, 5(2), 30–40. <https://doi.org/10.2478/eje-2019-0011>
- Majdoub, S., El Mokni, R., Debbabi, H., Chaabane-Banaoues, R., Al-Hmadi, H. B., Chaieb, I., Piras, A., Babba, H., Porcedda, S., & Hammami, S. (2025). Phytochemical composition, antifungal and insecticidal properties of the essential oils of three species of the genus *Eryngium* Tourn. ex L. (Apiaceae, Saniculoideae) growing natively in Tunisia. *Chemistry & Biodiversity*, e01710. <https://doi.org/10.1002/cbdv.202501710>
- Marrelli, M. (2021). Medicinal plants. *Plants*, 10(7), 1355. <https://doi.org/10.3390/plants10071355>
- Medbouhi, A., Benbelaid, F., Djabou, N., Beaufay, C., Bendahou, M., Quetin-Leclercq, J., Tintaru, A., Costa, J., & Muselli, A. (2019). Essential oil of Algerian *Eryngium campestre*: chemical variability and evaluation of biological activities. *Molecules*, 24, 2575.
- Nebija, F., Stefkov, G., Karapandzova, M., Stafilov, T., Kadifkova Panovska, T., & Kulevanova, S. (2009). Chemical characterization and antioxidant activity of *Eryngium campestre* L., Apiaceae from Kosovo. *Macedonian Pharmaceutical Bulletin*, 55(1,2), 22–32. <https://doi.org/10.33320/maced.pharm.bull.2009.55.002>
- Özek, T., Özek, G., & Yur, S. (2023). Phytochemical and biological characteristics of Apiaceae species from Turkey. In Á. Máthé & K. Turgut (Eds.), *Medicinal and aromatic plants of Turkey* (Vol. 10). Springer. https://doi.org/10.1007/978-3-031-43312-2_4
- Palá-Paúla, J., Usano-Alemania, J., Soriab, A. C., Pérez-Alonso, M. J., & Brophyc, J. J. (2008). Essential oil composition of *Eryngium campestre* L. growing in different soil types. A preliminary study. *Natural Product Communications*, 3(7), 1121–1126. <https://doi.org/10.1177/1934578X0800300716>
- Parada, M., Carrió, E., & Vallès, J. (2011). Ethnobotany of food plants in the Alt Empordà region (Catalonia, Iberian Peninsula). *Journal of Applied Botany and Food Quality*, 84(1), 11–25. <https://doi.org/10.5073/JABFQ.2011.084.003>
- Polat, R., & Satıl, F. (2012). An ethnobotanical survey of medicinal plants in Edremit Gulf (Balıkesir -Turkey). *Journal of Ethnopharmacology*, 139, 626–641. <https://doi.org/10.1016/j.jep.2011.12.004>
- Royaniyan, F., Azadbakht, M., Amiri, F. T., Asgarirad, H., Davoodi, A., Akbari, F., Amir Khanloo, S., & Seraji, M. S. (2021). Effect of lipogel containing extracts of *Eryngium campestre* L. and *Satureja hortensis* L. on wound healing in male wistar rats. *Journal of Mazandaran University of Medical Sciences*, 31(203), 152–162.
- Safari, H., Esmaeili, S., Naghizadeh, M. S., Falahpour, M., Malekaneh, M., & Sarab, G. A. (2019). The Effects of aqueous extract of *Eryngium campestre* on ethylene glycol-induced calcium oxalate kidney stone in rats. *Endourology and Stone Diseases*, 16(6), 519–524.
- Sarı, İ., & Kandemir, A. (2021). Morphological and some ecological characteristics of *Eryngium ilex* P. H. Davis (Apiaceae). *Bağbahçe Bilim Dergisi*, 8(3), 82–96.
- Wang, P., Su, Z., Yuan, W., Deng, G., & Li, S. (2012). Phytochemical constituents and pharmacological activities of *Eryngium* L. (Apiaceae). *Pharmaceutical Crops*, 3, 99–120. <https://doi.org/10.2174/2210290601203010099>

Zaki, S. H., Selim, D. A., Aasy, N. K. A., & Helmi, S. (2025). Evaluation of the antibacterial potential in shoot and root extracts of *Eryngium campestre* with emphasis on Egyptian ecotype. *Scientific Reports*, 15, 25789. <https://doi.org/10.1038/s41598-025-05193-9>