

The use of *Sambucus ebulus* L. in folk medicine and chemical composition

Cenk PAŞA *

Department of Plant and Animal Production, Balıkesir University, Altınoluk Vocational School, Medicinal and Aromatical Plant Programme, Altınoluk, Edremit, Balıkesir, Turkey.

GSC Advanced Research and Reviews, 2023, 17(03), 081–085

Publication history: Received on 31 October 2023; revised on 10 December 2023; accepted on 13 December 2023

Article DOI: <https://doi.org/10.30574/gscarr.2023.17.3.0463>

Abstract

Sambucus species are distributed in regions with temperate and subtropical climates on earth. The high economic value of *Sambucus* species to humans has increased their economic cultivation in recent years, which has encouraged their rapid spread.

Sambucus ebulus L. species is widely distributed especially in Southern and Central Europe, Northwest Africa and Southwest Asia (especially Northern Iran). *S. ebulus* plant is an important medicinal plant used in folk medicine by the peoples of the Balkan Peninsula, Western Europe and the Middle East. The plant has no special soil requirements. It can be grown in almost any soil type. It has high resistance to prevailing winds. Various parts of the plant have been traditionally used to treat bites, burns, infectious wounds, edema, eczema, urticaria, arthritis and sore throat.

Keywords: *Sambucus ebulus*; Folk Medicine; Caprifoliaceae; Medicinal and Aromatic Plants; Essential oil

1. Introduction

Plants have served as one of the oldest sources of useful medicines for living things for many years. Despite the abundance of synthetic chemicals today, the contribution and importance of plants in the treatment and prevention of diseases cannot be ignored.

Sambucus ebulus L. species is widely distributed especially in Southern and Central Europe, Northwest Africa and Southwest Asia (especially Northern Iran). *Sambucus ebulus* L. is a rhizomatous perennial plant with a branched erect stem that can grow between 0.5-1.5 m [1,2].

There are 18 species of the *Sambucus* genus, which is a member of the Caprifoliaceae family [3]. The subtropical regions of America, Eurasia, and Africa are home to six species: *S. caerulea*, *S. canadensis*, *S. ebulus*, *S. nigra*, *S. pubens* and *S. racemosa* [4,5].

The genus *Sambucus* (Adoxaceae) is represented by 2 species in the flora of Turkey [6]. Among these, *Sambucus ebulus* L. is a perennial herb known locally as elderberry, sultanotu, and sahmehlemi [6,7].

S. ebulus can be found in areas close to cities, highways, and railroads as well as in bushes, close to forests, near rivers, and as an uncultivated, high-altitude plant. It is widespread in Turkey's damp grasslands and woodland borders and is also frequent in Iran [8]. *S. ebulus* L. is capable of growing in a broad range of soil types, including light (sandy) and medium (loamy), as well as in partial shade or direct sunlight. It can also flourish in neutral, non-acidic, and non-alkaline environments. The building can endure severe winds and environmental contamination, although it is vulnerable to marine exposure [9].

* Corresponding author: Cenk PAŞA

The aim of this study is to compile all available information from the literature on the phytochemistry, traditional medicinal values, scientifically supported uses, morphology and habitat of the *Sambucus ebulus* plant.

Morphology: *Sambucus ebulus* L. species is a perennial herbaceous plant with an unpleasant odor that can grow between 0.5-1.5 m. Its body is straight, ribbed, simple or slightly branched, glabrous or covered with sparse hairs. Its leaves are lanceolate or oval. The leaves are large, 5-20 cm long, 3-5 cm wide and consist of 9-11 leaflets, the latter lanceolate or oblong-lanceolate, with long pointed tips with an oblique base [10]. The flowers of the plant are hermaphrodite. During flowering, the plant can be easily distinguished by the thick glitters on which the flowers are usually carried. Flowers normally appear at the tips of branches in colors ranging from white-yellowish or sometimes pinkish-purple [11]. The flowering of the plant generally occurs from the end of April to the end of July, and the fruits ripen from August to the first month of October and fall at the end of autumn [12]. The fruits are small, in large clusters and approximately 3-5 mm in diameter [10]. The fruits are round drupes and have a slight odor when ripe, and their color can be brown-black, blue, red, orange, reddish-purple or yellow [13].

Chemical Compounds: Flavonoids, steroids, tannins, glycosides, cardiac glycosides, caffeic acid derivatives, ebulitins, ebulin 1, and volatile compounds are some of the phytochemicals from *S. ebulus* that are well-known [14-20].

S. ebulus flowers contain 0.03 to 0.3% of an essential oil (around 0.01% of the berries are essential oil), which is made up of a lot of alkanes and free fatty acids, mainly palmitic acid. They also have flavonoids, at least 0.8% of them. Additionally, it has been determined that caffeic acid and its derivatives, such as chlorogenic acid and p-coumaric acid, exist. Numerous plants contain chlorogenic acid, which is known as an antioxidant and is an ester of caffeic acid and quinic acid [21-24]. Sixty essential oil components or 97.33 % of the total oil, were found in another investigation. Geranyl acetate (5.6 %), -bisabolene (11.4 %), germacrene D (6.4 %), and -cubene (5.2 %) make up the majority of the components [25].

As a result of the researches carried out to determine the phytochemical components of *S. ebulus*; It has been determined that the fruits of the plant have an important nutritional value because they are rich in sugar, fiber, vitamins and minerals anthocyanins, phytosterols, flavonoids, phenols, triterpenes, tannins, cardiac glycosides, iridoid glycosides, volatile caffeic acid derivatives, chlorogenic acid, ursolic acid, and lectins were also found in *Sambucus* plants. Essential polyunsaturated fatty acids (PUFAs) such -linolenic, linoleic, oleic, and palmitic acid were discovered in *S. ebulus* seeds [2].

Antioxidants can defend the body against damage caused by free radicals, aging, malignant cells, and atherosclerosis [26]. Numerous studies have demonstrated the potent antioxidant properties of numerous natural compounds and their imitations, which are utilized to treat cancer cells, slow the aging process, and scavenge free radicals. Due to their antioxidative properties, methanol extracts from the fruit of the *S. ebulus* species are effective against diphenyl picrylhydrazyl (DPPH) free radicals; additionally, the antioxidative capacity of the extracts increases with extract concentration [27-29].

Traditional Uses: Plants have benefited humans for medicinal purposes and as a source of food since ancient times [30]. Bioactive components obtained from plants are used in making traditional medicines [31].

Traditional Chinese medicine has long used a variety of plant species as treatments for ailments connected to the bones and joints, rubella, and acute nephritis [32-34]. Sinusitis, herpes, epilepsy, rash, sore throat, neuralgia, swelling, syphilis, toothache, headache, bruises, chills, abrasions, asthma, bronchitis, and high fever are other conditions that can occur in Africa, Europe, the United States, and the West Indies [35-42].

Sambucus species have antibacterial, anti-ulcerogenic, antidiabetic, chronic stress, antioxidant, and anti-inflammatory properties. *Sambucus* species play an important role in the folk medicine of Iran as well as other countries from Western Europe to the Middle East. The leaves of *S. ebulus* species are used externally against rheumatic pains, abscesses, wounds, sunstroke, snake bites, edema, colds, eczema, high fever and foot ulcers. In addition, its leaves are used internally as a laxative, diuretic and diaphoretic, and are also used by the local people against hemorrhoids and stomach pain.

According to Shokrzadeh and Saravi (2010), *S. ebulus* species have been used for a very long time to treat infections, fevers, edema, rheumatism, and inflammations [43]. The rhizomes and roots of the plant were used in traditional eastern medicine to treat bee stings, arthritis, and sore throats [8, 44-51]. There are various uses for this plant. For instance, the fruit can be used to make blue dye and ink. Additionally, the leaves are supposed to deter rats and moles, and the root juice is used to colour hair [52-55].

In folk medicine in Bulgaria, the fruits, rhizomes and flowers of the plant are used as a diuretic, antiseptic, tonic and laxative. It is also known in Romanian folk medicine as a rheumatic pain, cold, bacteriostatic and diuretic agent [2]. In Anatolian folk medicine, *S. ebulus* is used especially against inflammatory problems such as rheumatic pain, edema, eczema, urticaria, burns, infected wounds, hemorrhoids and peptic ulcers [56]. Anti-inflammatory, antinociceptive, wound healing, cytotoxic, anti-ulcer and anti-*Helicobacter pylori* effects of *S. ebulus* have been determined as a result of research [57].

In Italy and France, the plant's fruits have been utilized as food or medicinal for 5000 years. Historically, different portions of *S. ebulus* have been used to cure a variety of conditions, including rheumatoid arthritis, fever, bites, and sore throat. It is prescribed as an analgesic for a variety of painful illnesses, including joint problems, fractures, dislocations, and numerous bone and joint disorders. In traditional Iranian medicine, it is known as Khaman and Palem. Additionally, *S. ebulus* is advised for the treatment of bites, blisters, fistulas, gout, burns, and uterine illnesses. It is also advised for use as a laxative and diuretic [58].

The flowers of *S. ebulus* L. species are used for cough, bronchitis, whooping cough, asthma, hemorrhoids, expectorant and cold in Turkey [59, 60]. The leaf-stem part is used as an antipyretic, against rheumatic pain, wounds and snake bites [61]. In addition, the fresh leaves of the plant are collected before the fruits ripen and boiled in milk for approximately 20 minutes. Then, the poultice is used externally for rapid healing of wounds [2].

2. Conclusion

As a result of this research, it has been seen that *Sambucus ebulus* is used in the treatment and prevention of many diseases. It has been observed that it is used in the treatment of treat bites, burns, infectious wounds, edema, eczema, urticaria, arthritis and sore throat in alternative medicine.

References

- [1] Westwood J. Albion: A Guide to Legendary Britain. London, England: Grafton; 1985.
- [2] Jabbari M, Daneshfard B, Emtiazy M, Khiveh A, Hashempur MH. Biological Effects and Clinical Applications of Dwarf Elder (*Sambucus ebulus* L): A Review. Journal of Evidence-Based Complementary & Alternative Medicine 2017, Vol. 22(4) 996-1001.
- [3] Barbarich AI, Bradis EM, Visyulina OD, Volodchenko VS. Manual of Plants of Ukraine. 2nd ed. Kiev: Urozhay. (In Ukrainian), 1965, pp: 638.
- [4] Mabberley DJ. The Plant-Book, a Portable Dictionary of the Vascular Plants, 2 Edition, Printed in the United Kingdom at the University Press, Cambridge, 1997, pp: 635.
- [5] Ebadi AG, Hisoriev H. Review on Distribution of *Sambucus ebulus* L. in the North of Iran. American-Eurasian J. Agric. & Environ. Sci., 2011,10 (3): 351-353.
- [6] Chamberline D, Phill D, Victoria A. In The Flora of Turkey and the East Aegean Islands Vol. 4 ; Davis, P. H., Ed. Edinburgh Univ. Press: Edinburgh, UK, 1965–1988, pp. 541–543.
- [7] Yesilada E, Gurbuz I, Shibata H. Screening of Turkish antiulcerogenic folk remedies for anti-*Helicobacter pylori* activity. J. Ethnopharmacol, 1999, 66: 289-293.
- [8] Shokrzadeh M, Saravi SS, Mirzayi M. Pharmacogn. Mag, 2009, 5, 316.
- [9] Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM, Webb DA. The Flora Europaea Organization (Cambridge University Press), 1976.
- [10] Hummer KE, Pomper KW, Postman J, Graham CJ, Stover E, Mercure EW, Aradhya M, Crisosto CH, Ferguson L, Thompson MM. Emerging fruit crops. In: Fruit Breeding. Handbook of Plant Breeding, 8. Springer, Boston, MA, 2012.
- [11] Fu F, Xu M, Li W. Antiviral phytomedicine elderberry (*Sambucus*) inhibition of 2019-nCoV, 2020.
- [12] Kozuharov S. Field Guide to Vascular Plants in Bulgaria (Nauka i izkustvo, Sofia, Bulgaria, 1992).
- [13] Lee J, Finn CE. Anthocyanins and other polyphenolics in American elderberry (*Sambucus canadensis*) and European elderberry (*S. nigra*) cultivars. J. Sci., 2007, 2665–2675.

- [14] Saeedi Saravi SS, Shokrzadeh M. Histopathological and Biochemical Disorders Following Administration of *Sambucus ebulus* Extract on Mice & Rats and Preventive Effects of Vitamins C and E on Renal & Hepatic Disorders. *Phcog. Mag.* 5 (19): 131-135., 2009.
- [15] Ebrahimzadeh MA, Mahmoudi M, Karami M, Saeedi Saravi SS, Ahmadi AH, Salimi E. Separation of Active and Toxic Poisons in *Sambucus ebulus*. *Pakistan. J. Biol. Sci.* 10(22): 4171-3, 2007.
- [16] Ahmadiani A, Fereidoni M, Semnani S, Kamalinejad M, Saremi S. Antinociceptive and anti-inflammatory effects of *Sambucus ebulus* rhizome Extract in rats. *J. Ethnopharmacol.* 61: 229-235, 1998.
- [17] Ghannadi AR, Ghassemi-Dehkordi N. Pharmacognostical Investigations on *Sambucus ebulus* L. and *Sambucus nigra* L. *Daru.* 7(1): 55, 1997.
- [18] De Benito FM, Citores L, Iglesias R, Ferreras JM, Soriano F. Ebulitins: A new family of type 1 ribosome-inactivating proteins (rRNA N-glycosidases) from leaves of *Sambucus ebulus* L. that coexist with the type 2 ribosome-inactivating protein ebulin 1. *FEBS Lett.* 360(3): 299-302, 1995.
- [19] Yesilada E. Evaluation of the anti-inflammatory activity of the Turkish medicinal plant *Sambucus ebulus*. *Chem. Nat. Comp.* 33(5): 539-540, 1995.
- [20] Pribela A, Durcanska J, Piry J, Karovicova J. Volatile substances of dwarf elder *Sambucus ebulus* L. fruits. *Biologia. (Bratislava)* 47(3): 225-230, 1992.
- [21] Rhee MH, Park HJ, Cho JY. Salicornia herbacea: Botanical, chemical and pharmacological review of halophyte marsh plant. *J. Med. Plants Res.* 3(8): 548-555, 2009.
- [22] Bonita JS, Mandarano M, Shuta D, Vinson J. Coffee and cardiovascular disease: in vitro, cellular, animal, and human studies. *Pharmacol. Res.* 55: 187-198, 2007.
- [23] Bouayed J, Rammal H, Dicko A, Younos C, Soulimani R. Chlorogenic acid, a polyphenol from *Prunus domestica* (Mirabelle), with coupled, 2007.
- [24] Medina I, Gallardo JM, Gonzalez MJ, Lois S, Hedges N. Effect of molecular structure of phenolic families as hydroxycinnamic acids. *J. Agric. Food Chem.* 55: 3889-3895, 2007.
- [25] Endo Y, Tsurugi K. RNA N-glycosidase activity of ricin A-chain. Mechanism of action of the toxic lectin ricin on eukaryotic ribosomes. *J. Biol. Chem.* 262(17): 8128-8130, 1987.
- [26] Feizbakhsh A, Pazoki H. *Sambucus ebulus*. *Pharmacol Online* 1, 16–22, 2010.
- [27] Ebrahimzadeh M, Nabavi S, Nabavi S. *Pak. J. Biol. Sci.* 12, 447, 2009.
- [28] Ranković B, Kosanić M, Stanojković T, *Farmacia* 62, 306–317, 2014.
- [29] Shahrbandy K, Hosseinzadeh R. *Pak. J. Biol. Sci.* 10, 637–640, 2007.
- [30] Hardy K, Hardy K. Paleomedicine and the evolutionary context of medicinal plant use. 1–15. *Rev. Bras. Farmacogn.* 31, 1–15, 2021.
- [31] Yuan, L, Zhong ZC, Liu Y. Structural characterisation and immunomodulatory activity of a neutral polysaccharide from *Sambucus adnata* Wall. *Int. J. Biol. Macromol.* 154, 1400–1407, 2020.
- [32] Liao Q, Yang W, Jia Y, Chen X, Gao Q, Bi K. LC-MS determination and pharmacokinetic studies of ursolic acid in rat plasma after administration of the traditional Chinese medicinal preparation Lu-Ying extract. *Yakugaku Zasshi* 125 (6), 509–515, 2005.
- [33] Xiao HH, Zhang Y, Cooper R, Yao XS, Wong MS. Phytochemicals and potential health effects of *Sambucus williamsii* Hance (Jiegumu). *Chin. Med.* 11 (1), 1–16, 2016.
- [34] Yang B, Lin X, Tan J, She X, Liu Y, Kuang H. Root bark of *Sambucus williamsii* Hance promotes rat femoral fracture healing by the BMP-2/Runx2 signaling pathway. *J. Ethnopharmacol.* 191, 107–114, 2016.
- [35] Amini E, Nasrollahi F, Sattarian A, Isazadeh-Araei M, Habibi M. Systematic and molecular biological study of *Sambucus* L. (Caprifoliaceae) in Iran. *Thaiszia J. Bot.* 29 (2), 133–150, 2019.
- [36] Charlebois D, Byers PL, Finn CE, Thomas AL. 4 elderberry: botany, horticulture, potential. *Hortic. Rev.* 37 (4), 214–280, 2010.
- [37] Kaileh M, Berghe W, Vanden Boone E, Essawi T, Haegeman G. Screening of indigenous Palestinian medicinal plants for potential anti-inflammatory and cytotoxic activity. *J. Ethnopharmacol.* 113 (3), 510–516, 2007.

- [38] Abdramanov A, Massanyi P, Sarsembayeva N, Usenbayev A, Alimov J, Tvrda ´ E. The in vitro effect of elderberry (*Sambucus nigra*) extract on the activity and oxidative profile of bovine spermatozoa. *J. Microbiol. Biotechnol. Food Sci.* 1319–1322, 2021.
- [39] Chen F, Liu DL, Wang W, Lv XM, Li W, Shao LD, Wang WJ. Bioactive triterpenoids from *Sambucus javanica* Blume. *Nat. Prod. Res.* 34 (19), 2816–2821, 2020.
- [40] Cvetanović A. *Sambucus ebulus* L. antioxidants and potential in disease. *Pathology* 321–333, 2020.
- [41] Ghaffari H, Ataei-Pirkooh A, Mirghazanfari SM, Barati M. Inhibition of herpes simplex virus type 1 infection by *Sambucus ebulus* extract in vitro. *Med. J. Islam. Repub. Iran* 35, 9, 2021.
- [42] Neekhra S, Awasthi H, Singh DP. Beneficial effects of *Sambucus nigra* in chronic stress-induced neurobehavioral and biochemical perturbation in rodents. *Phcog. J.* 13 (1), 2021.
- [43] Shokrzadeh M, Saeedi Saravi SS. The chemistry, pharmacology and clinical properties of *Sambucus ebulus*: A review, *Journal of Medicinal Plants Research* Vol. 4(2), pp. 095-103, 2010.
- [44] Ebrahimzadeh MA, Mahmoudi M, Karami M, Saeedi Saravi SS, Ahmadi AH, Salimi E. Separation of Active and Toxic Poisons in *Sambucus ebulus*. *Pakistan. J. Biol. Sci.* 10(22): 4171-3, 2007.
- [45] Tuzlacı E, Tolon E. Turkish folk medicinal plants, part III: Sile (Istanbul). *Fitoterapia* 71: 673-685, 2000.
- [46] Guarrera PM. Traditional antihelminthic, antiparasitic and repellent uses of plants in Central Italy. *J. Ethnopharmacol.* 68(1-3): 183-192, 1999.
- [47] Yesilada E, Gurbuz I, Shibata H. Screening of Turkish antiulcerogenic folk remedies for anti-*Helicobacter pylori* activity. *J. Ethnopharmacol.* 66: 289-293, 1999.
- [48] Petkov V. A source of ideas for phytopharmacological investigations. *J. Ethnopharmacol.* 15: 121-132, 1986.
- [49] Mirhaydar H. *Plant Information: Plant Usage in Disease Treatment*. Islamic Farhang Press, Tehran pp. 303-304, 1994.
- [50] Zargari A. *Medicinal plants*. Tehran University Press, Iran, pp. 5- 10, 1981.
- [51] Samsamshariat H, Moattar F, Afsharypour S. *Treatment with Plants*. Marshal Press, Tehran, pp. 61-253, 1981.
- [52] Duke JA, Vinson J, Lord JM. *CRC Handbook of medicinal herbs*. (CRC MedHerbs ed2), 2002.
- [53] Davis PH. *Flora of Turkey an the east aegean islands*. Edinburg Univ., 3: 465-482, 1982.
- [54] Rechinger KH. *Flora iranica I*, Graz. Akad. Drucl. Verlagsanstalt, 1963.
- [55] Tutin TG, Heywood VH, Burges NA, Moore DM, Valentine DH, Walters SM, Webb DA. *Flora Europaea* Vol. 1-5. Cambridge Univ. Press, Cambridge, 1980.
- [56] Sezik, E, Zor M, Yesilada E. Traditional medicine in Turkey II: folk medicine in Kastamonu. *Int. J. Pharmacogn.* 1992, 30, 233–239.
- [57] Atay I, Kırmızıbekmez H, Gören AC, Yeşilada E. Secondary metabolites from *Sambucus ebulus*. *Turk J Chem* (2015) 39: 34 – 41, 2015.
- [58] Ognyanov I, Popov A, Ivanova B, Dinkov D, Petkov V. *Sambucus ebulus* L. phytochemical and pharmacological screening. *Rivista Italiana Essenze, Profumi, Piante Officinali, Aromi, Saponi, Cosmetici Aerosol.* 61: 114-118, 1979.
- [59] Ebadi AG, Hisoriev H. Review on distribution of *Sambucus ebulus* L. In the North of Iran. *Euras. J. Agric. Environ. Sci.*, pp. 351–353, 2011.
- [60] Koca U, Yesilada E. Wound healing potential of *Sambucus ebulus* L. leaves and isolation of an active component, quercetin 3- O -glucoside *Ipek Pes*, 129, 106–114, 2010.
- [61] Waswa EN, Li J, Mkala EM, Wang VO, Mutinda ES, Nanjala C, Odago WO, Katumo DM, Gichua MK, Gituru RW, Hu G, Wang Q. Ethnobotany, phytochemistry, pharmacology, and toxicology of the genus *Sambucus* L. (*Viburnaceae*). *Journal of Ethnopharmacology* 292 (2022) 115102, 2022.