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Mini Review

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Pharmacological activities of *Ballota acetabulosa* (L.) Benth: A mini review

Abstract

The *Ballota* L. genera belonging to the Lamiaceae family found mainly in the Mediterranean area, Middle East, and North Africa. From the ancient times this genus has been largely explored for their biological properties. Phytochemical investigations of *Ballota* species have revealed that diterpenoids are the main constituents of the genera. A large number of flavonoids and other metabolites were also identified. This mini review covers the traditional and pharmacological properties of *Ballota acetabulosa* (L.) Benth species.

Volume 8 Issue 3 - 2020

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Received: May 15, 2020 | **Published:** June 22, 2020

Introduction

All over the world various plants have been used as medicine. More recently, plant extracts have been developed and proposed for various biological process. In developing countries herbal medicine has been improved as a substitute solution to health problems and costs of pharmaceutical products. The development of drug resistance pathogens against antibiotics has required a search for new antimicrobial substances from other sources, including plants. Plants contain a wide range of substances that are used to treat chronic as well as infectious diseases.[1]

The genus *Ballota* L. (Lamiaceae) consists of about 33 species growing mainly in the Mediterranean region. In Turkey, the genus *Ballota* is represented by 11 species, 6 subspecies, 10 of which are endemic.[2] *B. acetabulosa* was first described by Carl von Linnaeus as *Marrubium acetabulosum* in 1753[3] and later on taxonomically described in its current nomenclature by George Bentham in 1834.[4] This species is used as a remedy for wounds and burns. Aerial plant part may serve as Natural food preservative.[5]

Habitat and distribution

Plant found in rocks and rough ground in dry hills, well-drained sand, chalk, loamy soil.[6,7] It usually grows at an elevation up to 900 m.[6,8] This plant is native to East Aegean Islands, Greece, Kriti, Turkey and Turkey-in-Europe.[7]

Botanical description

Shrubs up to 60 m., stem erect up to 80 cm long, woolly haired, port dense, rounded compact. Leaves evergreen, thick, fluffy, drawing greyish to green on white, opposite, ovate serrated, wavy margin, aromatic, small whorls, 2-lipped flowered; petiole small, toothed and rounded, diameter up to 5 cm. Flowers small hermaphrodite, grouped in small whorled ears and foliate; calyx green, elongate, 1.5 cm long, funnel shaped, widens with a diameter of 2 cm after flowering; corolla, purple and white, just above the calyx. Fruit small, trigons, pink mottled, scratched violet-purple.[7,9,10]

Pharmacological activity

Dugler and Dugler investigated the antimicrobial activities of methanolic leaf extracts of *B. acetabulosa* by disc diffusion and microdilution method against *Enterococcus faecalis, Escherichia coli, Klebsiella pneumoniae, Pseudomonas aeruginosa, Proteus mirabilis* and *Candida albicans* pathogens causing complicated urine tract infections. They observed strong antimicrobial activity against *E. coli* (ZOI-18.6 mm), with MIC (MBC) of 32(64) mg/mL.[11] Dulger and Kilcik studied the antifungal activities of ethanol extracts prepared from the leaves, rootstock and the combined formulation of *B. acetabulosa* against medical yeast *Candida species* (*C. albicans* ATCC 10231, *C. tropicalis* ATCC 13803 and *C. guilliermondii* ATCC 6260) and *Cryptococcus species* (C. neoformans ATCC 90112 and *C. laurentii* ATCC 34142) by the visual broth macrodilution method. They observed a strong antifungal effect against *Candida* species compared to *Cryptococcus* species (MIC-3.12 to 25 mg/mL).[8]

Phytochemical contents

The phytochemical research of *B. acetabulosa* led the isolation and identification of several groups of phytochemical constituents. We have briefly summarized various phytochemicals of *B. acetabulosa* in Table 1.

Therapeutic properties

Whole plant has anti-microbial, anti-diabetic, depressant, diuretic, stimulant, spasmolytic, sudorific and expectorant properties.[10] Aerial part posses anti-inflammatory activity, anti-tussive activity,[8,18] anti-oxidant activity[19] and anti-microbial activity.[8,18,20]

Medicinal uses

B. acetabulosa is mainly used to treat cough and cold,[8] gastrointestinal disorder,[5] haemorrhoids,[21] wounds and burns,[8,22] nephrolithiasis, gout, diabetes, as well as depression, anxiety and hysteria.[10] In homeopathy it is used in the form of anti-cough tincture, insomnia and nervous system disorders.[10]

Table 1 Different phytochemical contents of *B. acetabulosa*

Phytochemicals	Name
Labdane diterpenes	Ballonigrin, dehydrohispanolone (hispanone)[11,12]
	18-hydroxyballonigrin[13]
Flavones	Apigenin[14,15]
	Ladanein[12]
	Scutellarein 7,4′-dimethyl ether[14,15]
	Luteolin[16]
Flavone glycosides	Apigenin-7-O-β-D-glucopyranoside[17]
	Acacetin-7-O-β-D-glucopyranoside[14,15]
	Chrysoeriol-7-O-β-D-glucopyranoside[14,15]
Flavonol glycosides	Rutin[16]
Acyl flavonoid glycosides	Apigenin-7-O-β-D-(4”-E-p-coumaroyl)glucopyranoside (echinaticin); chrysoeriol-7-O-β-D-(3″-E-p-coumaroyl)-glucopyranoside; chrysoeriol-7-O-β-D-(3″-Z-p-coumaroyl)glucopyranoside5[17]
Flavanones, flavanone glycosides	Naringenin[16]
	Naringin[16]
Carboxylic acids	Caffeic acid, chlorogenic acid, E-coumaric acid, gallic acid, rosmarinic acid[16]
Other metabolites	Oleuropein[16]

Conclusion

In this mini review we have briefly summarized the traditional uses, ethnobotanical description, ethnopharmacological properties and phytochemical constituents that have been isolated from *B. acetabulosa*. This mini review highlights the significance of the ethnopharmacological properties of *B. acetabulosa*, and research on *B. acetabulosa* should be encouraged. Further research should be conducted to explore new potential therapeutic agents and their ethnopharmacological properties for the treatment of life-threatening diseases.

Acknowledgments

None.

Conflicts of interest

The authors declare that they have no conflict of interest.

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Citation: Kumar S, Kumari R. Pharmacological activities of *Ballota acetabulosa* (L.) Benth:A mini review. *Pharm Pharmacol Int J.* 2020;8(3):180–182.
DOI: 10.15406/ppij.2020.08.00294

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Citation: Kumar S, Kumari R. Pharmacological activities of *Ballota acetabulosa* (L.) Benth: A mini review. *Pharm Pharmacol Int J.* 2020;8(3):180–182.
DOI: 10.15406/ppij.2020.08.00294