



Journal of Drug Delivery and Therapeutics

Open Access to Pharmaceutical and Medical Research

© 2011-18, publisher and licensee JDDT, This is an Open Access article which permits unrestricted non-commercial use, provided the original work is properly cited



Open  Access

Review Article

A review on phytochemical and ethnopharmacological studies of *Ajuga Bracteosa* Wall. Ex Benth.

Tabasum Ali*, Zahida shah¹, Rabiah bashir¹

Department of Pharmaceutical Sciences, University of Kashmir, Hazratbal Srinagar-190006, Jammu and Kashmir, India

ABSTRACT

Herbal medicines as the major remedy in traditional system of medicine have been used in medical practices since antiquity. The plants of genus *Ajuga* are evergreen, clump-forming rhizomatous perennial or annual herbaceous flowering species, with *Ajuga* being one of the 266 genera of the family Lamiaceae. There are at least 301 species of the genus *Ajuga* with many variations. *Ajugabracteosa* Wall. ex Benth (*A. bracteosa*) is an important medicinal plant of Himalaya regions. Medicinal potential is due to presence of various pharmacologically active compounds such as neo-clerodane diterpenoids, flavonol glycosides, iridoid glycosides, ergosterol-5,8- endoperoxide and phytoecdysones. The aim of this review article was to gather information about *A. bracteosa* which is currently scattered in form of various publications. This review article tried to attract the attention from people for therapeutic potential of *A. bracteosa*. The present review comprises upto date information of, traditional uses, botanical aspects, active ingredients and pharmacological activities such as antitumor, antimicrobial, antimalarial, anti-inflammatory, cardiotoxic activity, antiarthritic activity, antioxidant activity. A large variety of compounds have so far been isolated from *Ajuga bracteosa*.

Keywords: *Ajuga bracteosa*, Herbal medicines, pharmacological activities.

Article Info: Received 24 Jan 2019; Review Completed 25 Feb 2019; Accepted 28 Feb 2019; Available online 15 March 2019



Cite this article as:

Ali T, Zahida Shah, Basher R, Department of Pharmaceutical Sciences, University of Kashmir, Hazratbal Srinagar-190006, Jammu and Kashmir, India, Journal of Drug Delivery and Therapeutics. 2019; 9(2):489-492
<http://dx.doi.org/10.22270/jddt.v9i2.2388>

*Address for Correspondence:

Tabasum Ali, Department of Pharmaceutical Sciences, University of Kashmir, Jammu and Kashmir, India

INTRODUCTION

For curing ailments people are relying on medicinal plants from the ancient times. History of medicinal plants is as old as human history. Herbal drugs are used worldwide for treatment of different kinds of diseases; hence medicinal plants play a crucial role in world health. It is approximated that indirectly or directly almost 25% of entire modern medicines are derived from plants. Medicinal plants show distribution worldwide but they are more abundant in tropics. According to World Health Organization, 60%–80% population of developing countries depends on herbal plants for their primary health care. From the last decades the use of medicinal plants become so popular that many important plants are at risk of extinction due to over exploitation. Genus *Ajuga* of family Lamiaceae has numerous pharmacologically active plants. These species are found in the territory of Western Himalaya and upper Gangetic plains. *Ajuga bracteosa* (*A. bracteosa*) is an important medicinal plant of Himalaya region. Because of the presence of active ingredients it has tremendous medicinal potential. On the basis of its conservation status *A. bracteosa* is indexed into

critically endangered category. There is possibility of extinction of this highly medicinal plant. So there is need of multidimensional approach to conserve this plant species through better management practices like *ex-situ* conservation as well as multiplication both through biotechnological as well as conventional methods that could provide the possible solution to the existing problem. To spend a prosperous healthy life and treat various ailments medicinal plants are the nature's gift for the humanity¹⁻³.

GEOGRAPHICAL DESCRIPTION

The plants of genus *Ajuga* are native to Europe, Asia, and Africa, also grow in Australia, India and North America. There are at least 301 species of the genus *Ajuga* with many variations. *Ajuga* is one of the 266 genera of the family Lamiaceae. *Ajuga bracteosa* is distributed in subtropical and temperate regions from Kashmir to Bhutan, Pakistan, Afghanistan, China, Malaysia, western Himalayas, plains of Punjab and upper gangetic plains of India at an altitude of 1300m. In India, it is abundant in western Himalaya at an altitude 1300m. It is found along roadsides, open slopes, and rock crevices up to 1500m above mean sea level⁴⁻⁷.



Figure 1: *Ajuga bracteosa* Wall. ex Benth. Herb

Taxonomic hierarchy and vernacular names:

Vernacular names ⁸	Taxonomical profile (http://www.zipcodezoo.com/plants/a/ajuga bracteosa)
Sanskrit : Nilkanthi. English : Bungle, Copal tree. Punjabi : Khurbanti. Kashmir : Jan-i-adam. Others: Lilkounthe, Ratpacho, Khwaga Bootei. Hindi: <i>Kori booti</i> .	Kingdom : Plantae Phylum : Tracheophyta Family : Lamiaceae Subfamily: Ajugoideae Tribe : Ajugeae Genus : <i>Ajuga</i> Botanical name: <i>Ajuga bracteosa</i> Wall. ex Benth

Chemical constituents:

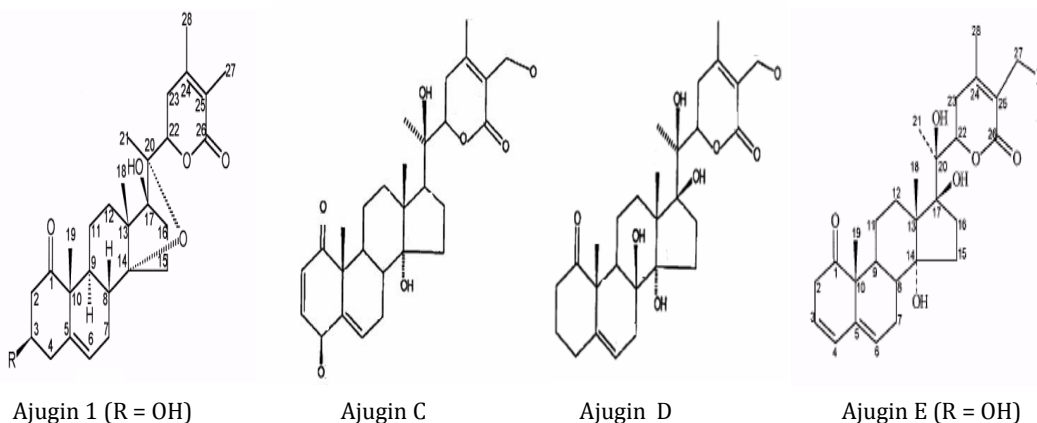
Research so far has revealed the presence of following types of constituents present in *Ajuga bracteosa* ⁹⁻¹¹

- General: Glycosides, Tannins, Ceryl alcohol, α -sitosterol, β - Sitosterol, Cerotic and palmitic acid.
- Alcoholic Extract: Glucose, Arabinose, Phenolic bitter components, Acidic bitter components, Neutral bitter components

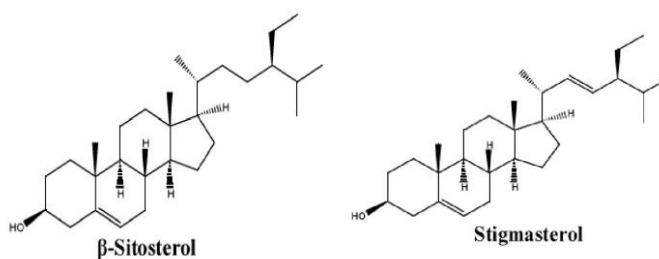
- Non-saponifiable Fraction: Ceryl alcohol, α -sitosterol, β - sitosterol.

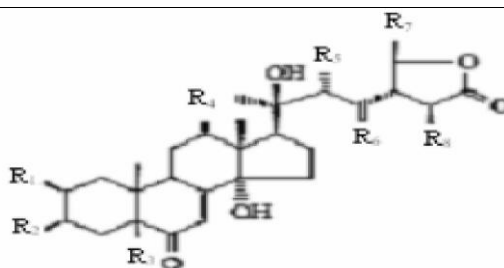
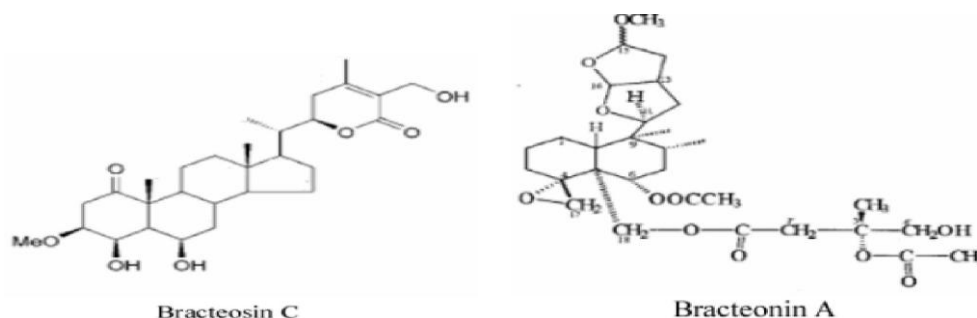
- Saponifiable Fraction: Cerotic acid, Palmitic acid, Oleic acid, Linoleic acid.

Structure of important compounds isolated from *Ajuga bracteosa*: Phytochemical studies carried out on *Ajuga bracteosa* resulted in the isolation and structure elucidation of following compounds ^{7,12}



Phytosterols from *Ajuga bracteosa* Wall. ex Benth. Herb



Withanolides from *Ajuga bracteosa* Wall. ex Benth. HerbPhytoecdysteroids from *Ajuga bracteosa* Wall. ex Benth. HerbWhere R₁, R₂, R₃, R₄, R₅, R₆, R₇ and R₈ is

Phytoecdysteroid	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	R ₇	R ₈
Cyasterone	OH	OH	H	H	OH	O	CH ₃	CH ₃
3-Epicyasterone	OH	OH	H	H	OH	H	CH ₃	CH ₃
3-Epi-22-acetylcysterone	OH	OH	H	H	OAc	H	CH ₃	CH ₃

PHARMACOLOGICAL PROPERTIES OF AJUGA BRACTEOSA

Some of the biological properties known traditionally have been proved by modern scientific procedures. Some of these are listed below:

Traditional Uses

Ajuga bracteosa is used to cure many ailments. The plant is aromatic, astringent and tonic. It is useful in the treatment of agues. The juice of the root is used in the treatment of diarrhoea and dysentery. The leaves are used in the treatment of fevers as a substitute for quinine. Crushed leaves are used as astringent to stop bleeding. Leaf decoction

with honey and ginger juice is used for high fever and respiratory congestion. In Taiwan, the entire plant of *Ajuga bracteosa* has been used to treat various inflammatory disorders, including hepatitis¹³ *Ajuga bracteosa* is also mentioned in Ayurveda for the treatment of rheumatism, gout, palsy and amenorrhea¹⁴. It is also used as a remedy for malaria¹⁵. In Asian countries it is used as a folk medicine against gout, hepatitis, pneumonia, rheumatism, and various neuro-inflammatory disorders¹⁶. The decoction of the leaves, flowers, and barks is used in India for the treatment of cancer and other diseases like diabetes, malaria, and inflammation etc¹⁷. Traditional method of application is shown in following table.

Conditions	Methods of applications ¹⁸⁻²²
Pimples Barks	juice is used to treat pimples
Jaundice	Leaves extracts are used to treat jaundice
Hypertension	Whole plant is used to treat hypertension
Bites of insects	Plant extract is used is used to cure bites of insects
Eye trouble	Plant extract is used is used to cure eye trouble
Bladder disease	Plant extract is used is used to treat bladder disease
Sore throat	Whole plant is used to sore throat
Cold	Decoction of root is taken
Headache	Paste of the leaves is applied to cure headache
Abdominal pain	Powder of the whole plant is given to treat abdominal
Internal colic	Whole plant is used to treat internal colic
Leprosy	Root powder is ingested
Blood purification	Leaves extract is used for blood purification
Diabetes	Decoction of leaves is used to treat the diabetes
Indigestion	Powder of whole plant is also used to treat indigestion
Astringent	Whole plant is used as astringent
Tonic	Whole plant is also used as tonic
Fever	Decoction of leaves is used to treat the fever
Swollen wounds	Plant extract is used is used to cure swollen wounds

PHARMACOLOGICAL ACTIONS

The following are the pharmacological actions of *Ajuga bracteosa* reported till date.

Activity	Type of extract used	model	References
Antiplasmodial activity	Ethanollic leaf extract	<i>In vivo</i>	23
Anti-inflammatory activity	Ethanollic extract	<i>In vivo</i>	24
Analgesic activity	Methanollic extract	<i>In vivo</i>	25
Antidepressant activity	Choloroform extract	<i>In vivo</i>	26
Anticoagulant activity	Methanollic extract		27
Anti-cancer	Petroleum, methanollic, water	<i>In vitro</i>	28
Immunoregulatory	Ethanollic extract	<i>In vivo</i>	29
Insecticidal activity	Methanollic extracts	<i>In vivo</i>	30
Anti-arthritic activity	Ethanollic extract	<i>In vivo</i>	31

CONCLUSION

It is quite evident that *Ajuga bracteosa* contains several important bioactive compounds and some have already shown their therapeutic potential. Because of its efficacy towards various diseases this plant has immense potential. To validate and understand its traditional uses and clinical practices some progress has been made, but still consistent efforts are required to explore the individual compounds isolated for number of ailments. *Ajuga bracteosa* is used both in allopathic and traditional system of medicine as a remedial measure. Hence to find out the mechanisms of action as well as bioactivity of other compounds in different crude extracts and to find therapeutic potential to combat diseases extensive research is required.

REFERENCES

- Singh N, Mahmood U, Kaul VK, Jirovetz L. A new phthalic acid ester from *Ajuga bracteosa*. *Nat Prod Res* 2006; 20(6):593-7.
- Israili ZH, Lyoussi B. Ethanopharmacology of plants of genus *Ajuga*. *Pak J Pharm Sci* 2009; 22:425-62.
- Ahmad KS, Kayani WK, Hameed M, Ahmad F, Nawaz T. Floristic diversity and ethnobotany of senhsa, district Kotli, Azad Jammu & Kashmir (Pakistan). *Pak J Bot* 2012; 44:195-201.
- Khare, C.P., Indian Medicinal Plants - An Illustrated Dictionary. 1st Indian Reprint Springer(India) Pvt. Ltd., New Delhi, India: 2007; 28.
- Chandel, S., Bagai, U. Antiplasmodial activity of *Ajuga bracteosa* against Plasmodium berghei infected BALB/c mice Indian journal of medicinal research 2010; 131:440-444.
- Chauhan, N.S., Medicinal and aromatic plants of himachal Pradesh Indus publishing company New Delhi. 1999.
- Upadhyay, S.U., Patel, V.B., Patel, A. A., Upadhyay, U.L., Patel, N.M. *Ajuga bracteosa*- A promising herb Pharma science monitor - An international journal of pharmaceutical sciences 2011; 2080-88.
- Chopra RN, Nayar SL, Chopra IC. Glossary of Indian Medicinal Plants. 6th Reprint, NISCAIR, CSIR, New Delhi: 2002; 10
- Chauhan NS. Medicinal and Aromatic Plants of Himachal Pradesh. 2nd edition Chaman Enterprise, New Delhi: 2006; 83-85.
- Chopra RN, Chopra IC, Verma BS. Supplement to glossary of Indian Medicinal Plants. Reprinted 2nd March. NISC, CSIR, New Delhi: 1998; 4.
- Rastogi RP, Mehrotra BN. Compendium of Indian Medicinal Plants. CDRL, Lucknow And NISC, New Delhi, 1993.Vol-I.
- Riaz N, Malik A, Aziz-ur-Rehman, Nawaz SA, Muhammad P and Choudhary MI. Cholinesterase-inhibiting withanolides from *Ajuga bracteosa*. *Chem. Biodivers.*, 2003; 1:1289-1295.
- Hsieh WT, Liu YT, Lin WC: Anti-inflammatory properties of *Ajuga bracteosa* in vivo and in vitro study and their effects on mouse model of liver fibrosis. *J Ethnopharmacol* 2011; 135(1):116-125.
- Kaithwas G, Gautam R, Jachak SM, Saklani A: Antiarthritic effects of *Ajuga bracteosa* Wall ex Benth. in acute and chronic models of arthritis in albino rats. *Asian Pac J Trop Biomed* 2012; 2(3):185-188.
- Chandel S, Bagai U: Screening of antiplasmodial efficacy of *Ajuga bracteosa* Wall ex. Benth. *Parasitol Res* 2011; 108(4):801-805.
- Nisar A, Akhtar N, Hassan A, Banday T, Wani B, Zargar MA: Effect of *Ajuga bracteosa* on systemic T-cell immunity in Balb/C mice: dual Th1/Th2 immunostimulatory effects. *Am J Chin Med* 2014; 42(2):375-392.
- Pal A, Toppo FA, Chaurasiya PK, Singour PK, Pawar RS: In-vitro cytotoxicity study of methanollic fraction from *Ajuga bracteosa* wall ex. benth on MCF-7 breast adenocarcinoma and hep-2 larynx carcinoma cell lines. *Pharmacognosy Res* 2014; 6(1):87-91.
- Ahmad KS, Habib S. Indigenous knowledge of some medicinal plants of Himalaya Region, Dawarian Village, Neelum Valley, Azad Jammu and Kashmir, Pakistan. *Univ J Plant Sci* 2014; 2(2):40-7.
- Hamayun M, Khan SA, Sohn EY, Lee IJ. Folk medicinal knowledge and conservation status of some economically valued medicinal plants of District Swat, Pakistan. *Lyonia* 2006; 11(2):101-13.
- Sher H, Khan ZD. Resource utilization for economic development and folk medicine among the tribal people. Observation from the northern part of the Pakistan. *Pak J Plant Sci* 2006; 12(2):149-62.
- Ahmad I, Ahmad MSA, Hussain M, Hameed M, Ashraf MY, Koukab S. Spatio-temporal effects on species classification of medicinal plants in Soone valley of Pakistan. *Int J Agric Biol* 2009; 11(1):64-8.
- Sher H, Al-yemeni M. Economically and ecologically important plant communities in high altitude coniferous forest of Malam Jabba, Swat, Pakistan. *Saudi J Biol Sci* 2011; 18(1):53-61.
- Chandel S, Bagai, U.. Screening of antiplasmodial efficacy of *Ajuga bracteosa* Wall ex. Benth. *Parasitology Research* 2011; 108(4):801-805
- Gautam R, Jachak SM, Saklani A. Anti-inflammatory effect of *Ajuga bracteosa* Wall Ex Benth. mediated through cyclooxygenase (COX) inhibition. *J Ethnopharmacol.* 2011; 133(2):928-30.
- Zulfiker A. *In vivo* analgesic activity of ethanolic extracts of two medicinal plants-*Scoparia dulcis* L. and *Ficus racemosa* Linn. *Biol Med.* 2010; 2(2): 42-8.
- Kirby LG, Lucki I. Interaction between the forced swimming test and fluoxetine treatment on extracellular 5-hydroxytryptamine and 5-hydroxyindoleacetic acid in the rat. *J Pharmacol Exp Ther.* 1997; 282(2):967-76.
- Scarano A, Murrura G, Di Cerbo A, Palmieri B, Pinchi V, Mavriqi L, Varvara G. Anti-hemorrhagic agents in oral and dental practice: an update. *Int J Immunopathol Pharmacol.* 2013; 26:847-54.
- Pal A, Toppo FA, Chaurasiya PK, Singour PK, Pawar RS: In-vitro cytotoxicity study of methanollic fraction from *Ajuga bracteosa* wall ex. benth on MCF-7 breast adenocarcinoma and hep-2 larynx carcinoma cell lines. *Pharmacognosy Res* 2014; 6(1):87-91.
- Nisar A, Akhtar N, Hassan A, Banday T, Wani B, Zargar MA: Effect of *Ajuga bracteosa* on systemic T-cell immunity in Balb/C mice: dual Th1/Th2 immunostimulatory effects. *Am J Chin Med* 2014; 42(2):375-392.
- Fekete G, Polgar I L, Bathori M, Col J, Darvas B: Efficacy of *Ajuga* extracts against sucking insects. *Pest Manag Sci* 2004; 60(11):1099-1104.
- Kaithwas G, Gautam R, Jachak SM, Saklani A: Antiarthritic effects of *Ajuga bracteosa* Wall ex Benth. in acute and chronic models of arthritis in albino rats. *Asian Pac J Trop Biomed* 2012; 2(3):185-188.