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

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**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-5,7- endoperoxide and phytocyclones. 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.

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**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 plans. *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 humanity 1, 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 cervices up to 1500m above mean sea level 4, 7.
Taxonomic hierarchy and vernacular names:

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

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

| Phytoecdysteroid                | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 |
|---------------------------------|----|----|----|----|----|----|----|----|
| Cyasterone                      | OH | OH | H  | H  | OH | O  | CH3| CH3|
| 3-Epicyasterone                 | OH | OH | H  | H  | OH | H  | CH3| CH3|
| 3-Epi-22-acetylcyasterone       | OH | OH | H  | H  | OH | OAc| H  | CH3| CH3|

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 hepatitis. *Ajuga bracteosa* is also mentioned in Ayurveda for the treatment of rheumatism, gout, palsy and amenorrhoea. It is also used as a remedy for malaria. In Asian countries it is used as a folk medicine against gout, hepatitis, pneumonia, rheumatism, and various neuro inflammatory disorders. 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 etc. Traditional method of application is shown in following table.

| Conditions                  | Methods of applications                                      |
|-----------------------------|-------------------------------------------------------------|
| 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 to cure bites of insects               |
| Eye trouble                 | Plant extract is used to cure eye trouble                    |
| Bladder disease             | Plant extract 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 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      | Ethanolic leaf extract    | In vivo | 23         |
| Anti-inflammatory activity    | Ethanolic extract         | In vivo | 24         |
| Analgesic activity           | Methanolic extract        | In vivo | 25         |
| Antidepressant activity      | Choloroform extract       | In vivo | 26         |
| Anticoagulant activity       | Methanolic extract        | In vivo | 27         |
| Anti-cancer                  | Petroleum, methanolic, water | In vitro | 28 |
| Immunoregulatory             | Ethanolic extract         | In vivo | 29         |
| Insecticidal activity        | Methanolic extracts       | In vivo | 30         |
| Anti-arthritic activity      | Ethanolic extract         | In vivo | 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.

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