

**Bioprospecting Potential of *Ajuga integrifolia*
for Access and Benefit Sharing**



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1. Introduction

Ethiopia is lucky to be gifted with rich biodiversity and traditional knowledge that could pioneer successful bioprospecting. However, like any other developing countries, Ethiopia lacks technical expertise and monetary resources to explore them significantly. The only option for Ethiopia is to collaborate with the developed nations or domestic investors and interested one in pharmaceutical, cosmetics and other companies alike and jointly explore them strategically and wisely. In doing so, the model of cooperation should be such that it builds the science infrastructure within, preserve and protect the local traditional medicinal and other knowledge reducing the brain drain, and equally share the outcome of the joint projects

The Ethiopian Biodiversity Institute (EBI) is the nationwide capable authority through ABS directorate playing the practical role of the Nagoya protocol on Access and Benefit sharing of genetic resources and associated traditional knowledge. Ethiopia has the officially permitted outline for the implementation of the ABS. The laws concerning the National Access and Benefit Sharing framework is proclamation on Access to genetic Resources and Community Knowledge and Community Rights (Proclamation No 482/2006) and Regulation 169/2009). Based on these frameworks, the country has been implementing the access and benefit sharing objective of the CBD. The Proclamation includes a range of issues such as ownership, user rights, and conditions for access, benefit sharing, types of benefits, powers and responsibilities among the others.

Therefore, the objective of this information is to encourage any bioprospecting company or an individual interested to work on the genetic resource, *Ajuga integrifolia*, for medicinal uses such as hypoglycemic, antihypertensive, anti-inflammatory, anticancer, antibacterial, immunomodulatory and antispasmodic activities.

2. Description of the Plant

Ajuga integrifolia Buch.-Ham. (Syn: *Ajuga remota*; *Ajuga bracteosa*) is known by common names: 'Armagussa', 'Etse Libawit', 'Medhanit' (in Amharic). It is one of the species in the genus *Ajuga* and family *Lamiaceae*. The plants in the genus *Ajuga* are evergreen, clump-forming rhizomatous annual or perennial herbaceous flowering species in the mint family, *Lamiaceae*. 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 integrifolia, mostly known under the name *Ajuga bracteosa*, is a herb often lying on the ground and rooting at the nodes, covered with soft hairs, stems growing up to 40 cm high. Its leaves are oblanceolate and coarsely toothed. Its flowers are small, pale blue, white or pale violet found in small clusters in the leaf axils. It flowers from late August to October while honeybees are frequently visiting the flowers for pollen and nectar (Fichtl and Admasu Adi, 1994; Ermias Dagne, 2009).

3. Distribution of *Ajuga integrifolia*

It occurs in many parts of Ethiopia, Eritrea, Sudan, Somalia, Djibouti, Kenya, Uganda, Rwanda, Burundi, Tanzania, Yemen, Saudi Arabia, Afghanistan and Eastern Asia. It is a common herb of humid or wetter areas, in disturbed or shaded grassland, along roadsides and in ditches. It is found at an altitude of 1500 to 3200 m a.s.l. (Inga Hedberg *et al.*, 2006; Fichtl and Admasu Adi, 1994; Ermias Dagne, 2009). In Ethiopia it grows in different regions including Bale, Gojam, Gondar, Harerge, Kefa, Shoa, Sidamo, Tigray and Wollo (Hedberg *et al.*, 2006; Coll and Tandrón, 2005 cited in Tadesse Bekele, 2008). Engedasew Andarge *et al.*, (2015) also reported that *Ajuga integrifolia* has found abundantly (plenty) in Dawuro Zone, SNNPR, Ethiopia. Getachew Alebie *et al.*, (2017) on Systematic review on traditional medicinal plants used for the treatment of malaria in Ethiopia also reported that *Ajuga integrifolia* was more frequently cited species which indicates its occurrences in many parts of Ethiopia and potentially higher bioactive antimalarial content.

4. Ethno-medicinal uses

Ajuga integrifolia is widely used in traditional medicine for treating diarrhea, stomach disorders, evil eye, retained placenta, ascariasis, malaria, swollen legs, hypertension, jaundice and wounds. It can also be used for veterinary purposes (Asres *et al.*, 2001; Vohra and Kaur, 2011). A decoction of the leaves of the herb is used in the traditional medicine for a number of diseases including diabetes, hypertension, fever, malaria and stomach pain (Mirutse Giday *et al.*, 2009).

5. Chemical composition and pharmacological activities

Some compounds isolated from these plants have medicinal value and are of ecological and economic importance (Israili and Lyoussi, 2009; Vohra and Kaur, 2011). A large number of compounds have been isolated from various species of the *Ajuga* herb. Some of the bioactive

compounds (steroids) isolated from genus *Ajuga integrifolia* are:-Ecdysone, 20-hydroxyecdysterone, Polypodine, Cyasterone, 29-Norcyasterone, 29-Norsengosterone, Ajugalactone, Ponosterone, Ajugasterone C, etc. Different parts of the *Ajuga* plant possess different bioactive compounds (Vohra and Kaur, 2011).

Several compounds such as glycoside, tannin, ceryl alcohol, cerotic acid, have been isolated from *Ajuga integrifolia* leaves. The aqueous extract of leaves shows diuretic, stimulant action, aperients and febrifugal due to the presence of alkaloids, flavonoids, steroids, triterpenoids, saponins and tannins like phenolic compounds (Pala *et al.*, 2011).

Clerodane diterpenoid is found to be among the important bioactive compounds isolated from the bark of *Ajuga integrifolia*. The bark after decoction is useful for curing jaundice and sore throat in experimental animal model.

The bioactive compounds isolated from the root of *Ajuga integrifolia* are steroids, palmitic acid and heptacos-3-en-25-one. The roots of *Ajuga integrifolia* contains comparatively larger amounts of chromium which may be interrelated to its use as remedy for diabetes.

The considerably larger amounts of potassium (159 mg per 100 g in roots in comparison to 139 mg per 100 g in leaves) than sodium (29 mg per 100 g in roots in comparison to 21 mg per 100 g in leaves) may have some correlation with the use of the herb in hypertension (Pala *et al.*, 2011).

Generally, crude extracts from multiple parts of the *Ajuga integrifolia* plant are used to treat various disorders in different traditional systems. The presence of different bioactive compounds in *Ajuga integrifolia* might be responsible for the variety of medicinal purposes such as hypoglycemic, antihypertensive, anti-inflammatory, anticancer, antibacterial, immunomodulatory and antispasmodic activities of the plant (Pala *et al.*, 2011).

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