

***Gymnanthemum amygdalinum* (Delile) Sch.Bip.**

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Local and common names: ግራዋ (Amh); Eebiiicha (Oro); Vernonia tree (Eng)

Voucher number and identification: GA061/AHRI/2025

Synonyms: *G. amygdalinum* has 17 known synonyms. Among these, *V. condensata*, *V. bahiensis* and *V. giorgii* the are later published names globally, whereas *V. amygdalina* is the most commonly cited name in Ethiopia.

Varieties recorded in Ethiopia: There are no recognized infraspecific taxa or registered varieties of *G. amygdalinum* in Ethiopia.

Family: Asteraceae

Botanical and habitat distribution

G. amygdalinum is a perennial shrub or small tree often much branched from near the base. The bark is rough and flaky, gray to brown in colour. The leaves are alternate, green, and characteristically bitter in taste. The flowers are arranged in clusters (inflorescences) composed of small creamy-white, thistle-like flower heads (capitula). These clusters occur both in the leaf joints (axillary) and at the tips of branches (terminal), forming broad, flat-topped groups, and are often pleasantly aromatic. In its natural habitat, the species main occurs at forest edges, in woodland, and along rivers and streams (riverine vegetation). It is typically found in moist environments at elevations between about 600-2700 masl, and 750–2000 mm of annual rainfall.

Conservation status

G. amygdalinum is not currently included in the IUCN Red List. However, POWO reports that the species is not threatened, which broadly corresponds to the IUCN category of Least Concern.

Propagation method

G. amygdalinum can be propagated by stem cuttings, which is the simplest and quickest method. The cuttings are planted either vertically or at a 45° angle to encourage the development of side shoots. The plant can also grow from seeds collected from matured, dried flowers. The seeds are sprinkled on nursery beds of humus-rich soil, kept shaded from intense sunlight heat, and watered

regularly until they germinate. Seedlings are then transplanted to their final location about four to six weeks later. Moreover, the plant can be propagated using micropropagation techniques.

Cultivation in botanic garden

The plant was established in the botanic garden in October 2024, using a whole plant collected from the AHRI-ALERT Health Village Compound (Accession number 0116).

Ethnomedicinal uses

G. amygdalinum has been traditionally used for the treatment of various diseases. Aqueous leaf extracts are commonly employed to treat malaria, fever, abdominal pain, nematode infection, and ascariasis. Leaf extract mixed with honey is used to alleviate menstrual pain and to treat infections caused by amoeba and giardia. Chopped leaves combined with coffee grounds and blended with butter are traditionally used to treat diarrhea. In addition to its medicinal applications, this plant has numerous other uses. In Ethiopia, it is used to make "Tej," a traditional honey wine, and as a bittering agent (hops) in "tella," a traditional beer. The leafy component of *G. amygdalinum* is rich in nutrients and contributes to human nutrition and food security.

Major phytoconstituents

G. amygdalinum contains a wide range of phytochemicals including flavonoids (luteolin, myricetin, luteolin-7-*O*- β -glucoside), sesquiterpene lactone (vernodalin, vernodalol, vernolide, vernonioside A1, vernonioside A2, vernonioside B1, vernonioside B2, vernolepin, vernomygdin, vernodalinol, and vernoamyoside), phenolic acids (caffeoylgunic). Luteolin, isorhamnetin, vernodalol, vernodalinol, and vernoniosides are among the major bioactive compounds isolated from this plant.

Pharmacological and safety evidences

Preclinical evidences

Antimicrobial effects: The hexane, chloroform and acetone extract as well as the isolated constituents of *G. amygdalinum* showed antibacterial effect against *Escherichia coli*, *Klebsiella pneumoniae* and *Proteus mirabilis*.

Antimalarial effects: The leaves and root extracts of *G. amygdalinum* showed suppression of a parasitemia in *Plasmodium berghei* infected mice while the aqueous leaf extract reduced the *P.*

berghei macrogametocyte density in mice. Furthermore, the ethanolic extract almost completely inhibited the early sporogonic stages.

Anti-inflammatory and analgesic effects: Extracts from the leaves exhibit strong anti-inflammatory and pain-relieving properties by inhibiting pro-inflammatory enzymes and the production of cytokines.

Antidiabetic effects: Extracts from the leaves and roots of *G amygdalinum* have shown a significant ability to lower blood glucose levels in animal models.

Other pharmacological effect: anticancer, hepatoprotective, nephroprotective and antioxidant.

Clinical evidences

In a clinical study using an infusion of fresh *G. amygdalinum* leaves to treat uncomplicated malaria in patients aged 12 years and above, over 67% of participants reported an adequate clinical response. However, the infusion showed limited effectiveness in clearing the malaria parasite. Only 32% of the patients who experienced clinical improvement showed complete parasite clearance

Safety

An acute toxicity study on female Sprague Dawley rats at a dose of 5000 mg/kg has shown no signs of toxicity or mortality. Also, the body and organ weights remained normal. Liver function tests showed slight increases in AST and globulin. Genotoxic evaluation showed that exposure of HepG2 cells to chloroform root extract of *G. amygdalinum* doesn't cause genotoxic effect. In the study using the infusion of fresh *G. amygdalinum* leaves, no severe adverse events were recorded throughout the study period

Research gaps and recommendations

Clinical trials are needed to validate the efficacy of the plant in humans for various diseases, including malaria. Moreover, chronic toxicity studies should be conducted to assess potential long-term adverse effects and to establish safe dosage levels for human use. Moreover, the phytochemicals have not yet been standardized. Standardizing the plant's phytoconstituents was therefore advised.

References

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