*Hagenia abyssinica (*Bruce) J.F. Gmel.
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Local and common names: ኮሶ Koso (Amh); Heexoo (Oro); ሐበ. Habbi (Tig); Kousso, Hagenia, Cusso, Brayera, African redwood (Eng)

Voucher number and identification: GA072/AHRI/2025

Synonyms: *H. abyssinica* is known by eight synonyms, among which *H. abyssinica* var. *viridifolia*, *H. anthelmintica* and *Brayera anthelmintica* are *the later published names.*

Varieties recorded in Ethiopia: There are no recognized infraspecific classifications or registered varieties of *H. abyssinica* in Ethiopia.

Family: Rosaceae

Botanical and habitat distribution

It is a tree growing up to 25 m tall with brownish bark peeling in strips, sometimes very thick on old stems. Young branches are pubescent covered with 3-4 mm long stiff hairs. Leaves are up to 40 cm in length bearing 5–8 narrowly oblong leaflets on each side. The petiole is 5–13 cm long and winged with adnate stipules. The inflorescence is a conspicuous, drooping (hanging downwards) panicle up to 60 cm long and 30 cm wide. Colour of male flowers range from orange to white, while the female flowers are reddish. The fruits are small and asymmetric. The Afromontane forests of East Africa are well-suited habitats for *H. abyssinica*. The plant prefers an altitudinal range of 1850-3700 masl with annual rainfall of 1000–1500 mm.

Conservation status

According to IUCN Red List, *H. abyssinica* is classified globally as a species of Least Concern. However, in Ethiopia, its population has declined drastically, warranting conservation attention.

Propagation method

Propagation is mainly achieved through seedlings and naturally grown wildlings. Its seedling requires shaded, moist, and cool environmental conditions, especially during its early stages. Once germinated in soil, the numerous secondary roots enable the seedlings to absorb nutrients quickly and establish themselves effectively. This competence involves the production of healthy leaves for photosynthesis and well-developed root systems. In contrast, seedlings germinated on petri

dishes often deplete their food reserves early and struggle to adapt when transferred to soil. Under favorable conditions, potted seedlings grow rapidly and reach transplanting size within six to eight months. Additionally, an *in vitro* propagation protocol has also been developed for this plant.

Cultivation in botanic garden

H. abyssinica was planted in AHRI-ALERT botanic garden in June 2024 from seedlings donated from Gullele Botanic Garden (Accession number 0054).

Ethnomedicinal uses

H. abyssinica is widely known in Ethiopia for its medicinal significance. Different parts of the plant are traditionally used to treat diverse ailments. The bark is applied to treat fever, cough, typhoid, and livestock diseases. The flowers or the whole panicles are widely used as an effective remedy against intestinal worms, especially tapeworms. The roots are employed to relieve stomachache, severe abdominal pain, and diarrhea, while the leaves serve in the treatment of malaria, hepatitis, and throat diseases. The stem and its reddish sap are used for stomach disorders and wound healing. Additionally, different parts of the plant are used to treat skin problems, sexually transmitted infections, epilepsy, and livestock diseases. In some cases, the leaves are used as part of polyherbal preparations to treat cancer and livestock ailments.

Major phytoconstituents

The major bioactive constituents in *H. abyssinica* include one-, two-, and tricyclic phloroglucinol derivatives, including kosins: kosotoxin, protokosin, kosidin, α-kosin and β-kosin.

Pharmacological and safety evidences

Preclinical evidences

***Antimicrobial effect*:** Solvent extracts from the flowers and leaves of *H. abyssinica* exhibited notable antibacterial activity against *Escherichia coli*, *Shigella flexneri*, and *Staphylococcus aureus*. Additionally, stem bark extracts demonstrated antibacterial effects against *S. aureus*, methicillin-resistant *S. aureus* (MRSA), and *Pseudomonas aeruginosa*, and significantly reduced parasitemia in animal malaria models. Nevertheless, the plant appears to possess limited antifungal activity. Consistent with traditional claims, leaf extracts were effective in reducing tapeworm eggs in animal studies, while both flower and bark extracts displayed strong activity against *Schistosoma mansoni*. However, the plant is reported to have limited antifungal effect.

***Antidiabetic effect*:** Crude extracts from the flowers and leaves of *H. abyssinica* have been shown to significantly reduce blood glucose levels in diabetic, normoglycemic, and oral glucose-loaded mice. Additionally, the plant exhibits in vitro α-amylase inhibitory activity.

***Anti-hyperlipidemic effect*:** Aqueous and ethyl acetate fractions, as well as methanolic leaf extracts of *H. abyssinica*, significantly lowered serum total cholesterol, triglycerides, and low-density lipoprotein (LDL) cholesterol levels in streptozotocin-induced diabetic mice compared to negative controls.

***Wound healing effect*:** In wound healing pharmacological evaluation of *H. abyssinica*, ointments containing 5% (w/w) and 10% (w/w) crude flower extract of the plant showed a significant wound contraction and increment of tensile strength in excision and incision models, respectively.

***Other pharmacologic effects*:** Anti-trpyanosomal, antioxidant, antidiarrheal, anti-inflammatory, cytotoxic

Clinical evidence

No well-controlled human trials have been conducted. However, in one study, a single oral dose of powdered *H. abyssinica* flowers mixed with honey was administered on an empty stomach to six volunteers, confirming the plant's potential taenicidal activity.

Safety

Acute oral toxicity studies demonstrated that methanolic leaf and flower extracts of *Hagenia abyssinica* have an LD_{50} greater than 2 000 mg/kg in mice, with no observable adverse effects over a 14-day period. Similarly, acute dermal toxicity testing of a 10% (w/w) methanolic flower extract revealed no signs of toxicity, erythema, edema, or mortality during the 14-day observation. The active compound kosotoxin exhibited no observable oral toxicity up to 200 mg/kg; however, it was toxic when administered intraperitoneally at doses above 50 mg/kg, with a single 100 mg/kg (i.p.) dose proving lethal to all tested animals.

Research gaps and recommendations

Standardizing the phytoconstituents of the plant is recommended.

References

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