Cymbopogon nardus (L.) Rendle
ናርዶስ ሳር

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Local and common names: ናርዶስ ሳር Nardos sar (Amh); Citronella, Winter's citronella, Ceylon citronella (Eng)

Voucher number and identification: GA052/AHRI/2025

Synonyms: *C. nardus* is known by 27 synonyms, among which *C. nardus* var. *luridus*, *C. virgatus* and *C. nardus* var. *confertiflorus* are *the later published names.*

Varieties recorded in Ethiopia: Only one variety is registered in Ethiopia, namely *C. nardus* var. *Wondo*.

Family*:* Poaceae

Botanical and habitat distribution

C. nardus has not been listed, nor has its botanical description been provided in the published Flora of Ethiopia and Eritrea. The following description is therefore based on other literature sources. It is a tall, aromatic, perennial grass that grows in dense clumps, reaching up to 2.5 m in height. Its long, narrow leaves, about 20-60 cm long and 3-15 mm wide, bend downwards and have a characteristic lemon like scent, often turning reddish as they mature. The plant produces a dense, spike like inflorescence (flowering stem) up to 60 cm long and reproduces naturally by seed as well as division of clumps. To the author's knowledge, flowering has not been observed in Ethiopia, and propagation is mainly achieved vegetatively by dividing and replanting the clumps. The species is valued for its essential oil, which is widely used in the formulation of insect repellents and in traditional medicine. Detailed studies on altitudinal range requirement of *C. nardus* in Ethiopia are lacking. Based on general tropical records, the species occurs or can be cultivated in lowland areas around 500 m up to 1500-2000 masl. It prefers well drained soils with moderate rainfall.

Conservation status

R. abyssinicus 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

C. nardus is a tropical, clump forming perennial grass cultivated mainly for its EO. While specific Ethiopian data are limited, cultivation practices can be cautiously inferred from related species like *C. citratus*. The plant thrives in warm, humid climates (20-30^{0}C, 1300-2000 mm rainfall) on well drained loamy soils and is propagated vegetatively by root divisions or slips. Initial spacing trials of 50-75 cm between plants and 75-100 cm between rows, combined with full sunlight, moderate fertilization, and regular weeding are recommended. Harvesting likely begins 4-6 months after planting and continues every 2-3 months, with leaves cut near the base and distilled soon after, though local trials are needed to confirm optimal yields and oil content.

Cultivation in botanic garden

The plant was cultivated in the AHRI-ALERT botanic garden in October 2024, using a whole plant collected from the former mini medicinal plant garden at the Ethiopian Public Health Institute (Accession number 0040).

Ethnomedicinal uses

UNIDO and recent reports indicate that *C. nardus* is cultivated in various countries, particularly in South and Southeast Asia, mainly for its citronella oil, valued for its insect repellent properties as well as for use in soap perfumery, pest control, and aromatherapy. In Ethiopia, the species is grown for its traditional medicinal and culinary purposes. Locally, it is primarily used as mosquito repellent through burning its leaves to produce insect repelling smoke, a practice common in rural communities. Beyond its practical uses, the smoke is associated with household protection, cleanliness, and traditional health preservation. Information on its application against human ailments is limited.

Major phytoconstituents

It is reported that fresh leaves of *C. nardus* contain about 1.96-3.38% of essential oil (EO). Citronellal, a monoterpenoid responsible for the characteristic aroma, is the predominant constituent (27.87-35.2%) of the EO. Other major constituents include geraniol (21.24-28.4%), and citronellol (8.2-13.02%), elemol (5.25-11.8%), and nerol, reaching up to 11.21%.

Pharmacological and safety evidences

Preclinical evidences

***Antimicrobial effect*:** The major essential oil component of *C. nardus*, citronella, exhibits a strong antimicrobial effect. It has shown notable antibacterial efficacy against *Propionibacterium acnes*; the bacterium associated with acne. The oil also demonstrates antifungal and antibiofilm activity against *Candida albicans* and *Aspergillus niger*. Additionally, a study evaluated the antiviral activities of *C. nardus* fractions against measles virus in Vero cells showed a reduction of virus-induced cell death.

Insect repellent and insecticide effects: *C. nardus* showed strong repellence against mosquitoes such as *Anopheles stephensi*, *Culex quinquefasciatus, and Aedes aegypti* a major vector of malaria, filariasis, dengue, yellow fever and chikungunya. As a botanical pesticide, the oil contains bioactive compounds that act as fumigants, contact insecticides, repellents, and antifeedants. The essential oil also showed larvicidal potency.

***Wound healing effect*:** Investigations showed that essential oil of *C. nardus* reduced levels of the inflammatory cytokines and accelerated wound healing in mice with chronic diabetic wound.

***Other pharmacological effects*:** Antioxidant, anti-proliferative, analgesic, diuretic, organo-protective, and anti-diabetic effects were reported form this plant.

Clinical evidences

There are no clinical trial reports. Hovwer, the oils of *C. nardus* has proven efficacy as mosquito repellent.

Safety

The skin and eye irritation studies on rabbit show that the essential oils of the plant had a very weak irritant power on the skin and the eye. The essential oil also showed low toxicity, with no mortality or major adverse effects in acute and sub-acute oral toxicity studies in Wistar rats. The LD_{50} value was estimated to 5000 mg/kg. The Maximum Acceptable Concentrations (MACs) of citronellal in finished products range from 0.49% to 2.3%.

Product registration

No citronella-based products have been developed or registered for public use in Ethiopia. In the USA, topical preparations for use as insect repellent are not considered drugs and do not require FDA approval. Instead, the U.S. Environmental Protection Agency (EPA) evaluates these products, determining whether they require full registration or qualify for exemption.

Research gaps and recommendations

C. nardus has significant but underexplored medicinal and industrial potential. EO yield and composition vary widely, and cultivation, harvesting, and chemotype selection for high EO content remain suboptimal. Chemical profiling and genetic studies are needed to identify superior, locally adapted varieties, and standardizing EO yield and composition would support high quality herbal product production. Adoption of good agricultural practices could enhance herbage and EO yield. Strengthening local distillation, value addition, storage, market systems, and coordinated research could establish *C. nardus* as a valuable medicinal and industrial crop in Ethiopia. The phytochemicals are limited to GC—MS analysis. Therefore, the isolation of bioactive constituents is recommended.

References

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