Cymbopogon citratus (DC.) Stapf
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Local and common names: ሎሚ ሳር Lomisar (Amh); Xajiisaar, Xajisaara (Oro); Lemongrass (Eng)

Voucher number and identification: GA051/AHRI/2025

Synonyms: *C. citratus* is known by six synonyms, among which *Andropogon nardus* subsp. *cerifer*, *A. cerifer* and *C. nardus* subvar. c*itratus* are the latest published names.

Varieties recorded in Ethiopia: Currently, three lemongrass varieties, namely *C. citratus* var. *WG-Lomisar-Java*, *C. citratus* var *WG-Lomisar-UA* and *C. citratus* var. *WG-Lomisar-I* are nationally registered in Ethiopia.

Family: Poaceae

Botanical and habitat distribution

C. citratus is stemless perennial grass with numerous stiff tillers arising from short rhizomatous rootstock, making large tussocks. Leaves are long, glaucous, green, linear tapering upwards and along the margins; ligule very short; sheaths are serrated (toothed), those of the barren shoots are widened and tightly clasping at the base, others are narrow and separating. The evergreen leaves release citrus/lemon like aroma when crushed. It seldom flowers under cultivation. It is best grown at altitudes of 1200-2000 masl, where the average annual rainfall ranges from 2500-3000 mm; higher altitudes increase susceptibility to rust infestation.

Conservation status

C. citratus is not currently included in the IUCN Red List, although POWO reports that the species is not threatened, which broadly corresponds to the IUCN category of least concern.

Propagation method

In Ethiopia, *C. citratus* is propagated through vegetative propagation by splitting clumps into slips with one to three tillers. Healthy, pest-free tillers are planted at the start of the rainy season, with tops cut back to 20-25 cm and dried sheaths removed to expose young roots. Slips are planted at a suitable depth, the soil is firmed to remove air pockets, and plants are spaced 60 cm apart between plants and rows for proper establishment.

Cultivation in botanic garden

The species was planted 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 0038).

Ethnomedicinal uses

C. citratus is widely used in the Ethiopian ethnomedicinal practice. The leaves are the main plant parts used and are prepared in various ways: leaf smoke is inhaled to alleviate cough, while leaf infusions or juices are taken orally to treat respiratory and gastrointestinal ailments, including pneumonia and stomachache, and leaves are used in traditional preparations for gallstone related symptoms. The roots are traditionally used to manage diarrhoea, and dried leaf powder mixed with water is employed in anthrax treatment. The whole plant is also crushed to relieve cough. *C. citratus* also serves as a natural insect repellent and is also used in cooking.

Major phytoconstituents

The leaf of *C. citratus* is rich in essential oils (EO), including citral, and **neral,** which together constitute about 28-71% of the total EO. Other volatile compounds include **γ-myrcene, nerol, geraniol, citronellal, terpinolene, geranyl acetate,** and **terpinol methylheptenone were also identified.**

Pharmacological and safety evidences

Preclinical evidences

Antimicrobial effect: *In vitro* the essential oil of *C. citratus* is active against a broad range of microbes, including bacteria (*Staphylococcus spp.*, *E. coli*, *Klebsiella pneumonia), and fungi (Candida sp.*, *Aspergillus sp.*). *The methanol extract and* essential oil of *C. citratus* also showed antiviral activity against the DENV-1 virus that causes dengue and HSV-1 virus, respectively.

Insect repellent and insecticide properties**:** *C. citratus* exhibits both insect repellent and insecticidal activities, primarily due to its essential and major constituents such as citral. The EO showed strong insecticidal effects, causing high mortality against the velvet caterpillar (*Anticarsia gemmatalis*) and showing synergistic activity with clove oil against adult *Anopheles* mosquitoes. The methanol leaf extract also displayed potent larvicidal activity against *Anopheles arabiensis*.

***Anti-inflammatory*:** *C. citratus* showed anti-inflammatory effects via nitric oxide scavenging activity and inhibits inducible nitric oxide synthase expression. The anti-inflammatory effect was also noted in carrageenan induced inflammatory models.

Other pharmacologic effects: Cytotoxic, antioxidant, hyperlipidemic and anti-obesity effects were reported from *C. citratus extracts* and essential oil.

Clinical evidences

In healthy children, a mouthwash containing *C. citratus* oil was effective in reducing plaque index (PI) and GI (Gingival index) while in healthy adults, the use of a *C. citratus* oil mouth rinse decreased malodor. In another clinical study conducted on 47 patients with *Pityriasis versicolor* (fungal skin infection) revealed that using essential oil of *C. citratus* inhibited *Tinea versicolor*. Different clinical studies also reported that topical application of *C. citratus* treats fungal infections, reduce dandruff, and improved skin hydration, texture, and antioxidant protection. Moreover, a study conducted on 110 participants showed that, infusions prepared from *C. citratus* leaf powder significantly increased packed cell volume, hemoglobin.

Safety

The EO of *C. citratus* and its major component were found safe when given orally and applied topically. No mortality was observed at doses up to 5000 mg/kg when given orally. Citral is a mild skin irritant and sensitizer but is not irritating to the eyes. Subacute and chronic studies indicate the oil is generally safe at moderate doses, although repeated dose studies in rats have reported mild hepatotoxicity at 250 mg/kg, highlighting the need for dose control during prolonged use. Citral is non-genotoxic, and its No-Observed-Adverse-Effect Level for developmental toxicity in rats is 200 mg/kg/day; at higher doses, it primarily reduces pup weight rather than causing structural malformations. In human studies, topical applications in dermatology and oral health were well tolerated, with occasional mild, localized irritation that resolved spontaneously. Cytotoxicity and regulatory data indicate low toxicity at clinical doses. The US FDA has listed *C. citratus* oil as substance added to foods or used as spice, which indicates its recognition for safe use in food products.

Research gaps and recommendations

Despite promising evidence on the safety and efficacy of *C. citratus* EO, several gaps remain. Current clinical trials are mostly small and short-term; larger, well-designed studies and post-marketing surveillance are advised to further confirm efficacy and safety. Standardization of doses and formulations, through phytochemical profiling, stability testing, and rigorous quality control are also advised. The phytoconstituents identification of this plant is limited to GC-MS, and therefore the identification of non-volatile compounds is recommended.

References

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