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REVIEWER'S REPORT

Manuscript No.: IJAR-55078

Title: Phytochemical study and larvicidal activity evaluation of essential oils from Cymbopogon citratus (D.C.) Stapf. and Cymbopogon giganteus Chiov. on Anopheles gambiae s.l.

Recommendation:

Accept as it is ……Yes……

Accept after minor revision……

Accept after major revision ……

Do not accept (*Reasons below*) ……

Rating	Excel.	Good	Fair	Poor
Originality		√		
Techn. Quality		√		
Clarity			√	
Significance		√		

Reviewer Name: Professor Dr Dillip Kumar Mohapatra

Detailed Reviewer's Report

1. Strengths

a. Strong scientific relevance

The study targets *Anopheles gambiae*, the major malaria vector, addressing a **high-priority public health problem**.

Work aligns with the global need for **eco-friendly alternatives to synthetic insecticides**.

b. Well-structured methodology

Essential oil extraction using a standard **Clevenger apparatus** maintains reproducibility.

Larvicidal bioassay strictly follows **WHO protocol (1985)**, adding credibility and comparability.

LD50 computation and ANOVA with Tukey's test show **appropriate statistical analysis**.

c. Clear results & comparative insight

Extraction yields of both species clearly reported.

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Identification of C. citratus components (citral-rich profile) is well presented.

Effective comparison between **natural essential oils vs. deltamethrin** strengthens scientific value.

d. Importance for local biodiversity

Uses aromatic plants found in Niger—contributes to **valorisation of local resources**.

Supports sustainable control strategies using **native Cymbopogon species**.

2. Weaknesses

a. Incomplete phytochemical characterization

Essential oil of *C. giganteus* is **not analysed in this study**; reliance on literature limits originality.

Lack of detailed chromatograms or identification of compounds reduces the completeness of phytochemical analysis.

b. Limited scope of biological testing

Only **2nd and 3rd instar larvae** tested; absence of pupal or adulticidal evaluation.

No evaluation of **synergistic effects**, repellency, or residual toxicity.

Only one synthetic insecticide (deltamethrin) used for comparison.

c. Data presentation issues

Figures lack statistical annotations (error bars, p-values).

Table 4 has minor formatting inconsistencies and unclear letter-coded comparisons.

d. Interpretation gaps

Mechanism of action of citrals/limonene is not deeply discussed.

Environmental and non-target toxicity assessment is missing.

Stability and shelf-life of essential oils not addressed.

e. Limited generalizability

Essential oils vary widely due to climate, soil, season; single-location sampling limits extrapolation.

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3. Significance of the Study

a. Scientific Significance

Adds evidence that **citral-rich** essential oils from *C. citratus* and limonene-rich oils from *C. giganteus* possess strong larvicidal activity.

Provides updated LD50 values for wild *Anopheles gambiae* populations.

b. Environmental Significance

Results support the use of **biodegradable, plant-based insecticides** that reduce ecological burden compared to pyrethroids.

Highlights opportunity for **community-based integrated vector management**.

c. Public Health Significance

Offers an alternative approach for malaria-endemic countries facing rising pyrethroid resistance.

Could guide development of **affordable mosquito-control products** using local agricultural resources.

4. Key Points (Summary for Publication)

Extraction yields:

C. citratus (1.91%) > *C. giganteus* (0.46%).

Chemical composition:

C. citratus EO dominated by **α-citral (44.8%)** and **β-citral (32.7%)**.

C. giganteus composition not analysed in this study but literature indicates **limonene chemotype**.

Larvicidal activity:

C. giganteus EO most active (LD50 = **70.13 ppm**).

C. citratus EO moderately active (LD50 = **114.36 ppm**).

Deltamethrin highly potent (LD50 = **2.3 ppm**).

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Dose-dependent mortality observed for all treatments.

Essential oils are **less potent than synthetic insecticides**, but more **environmentally friendly**.

Study supports the **traditional use of Cymbopogon plants as mosquito repellents**.