

**ETHNOBOTANICAL SURVEY AND INSECTICIDAL
POTENTIALS OF SELECTED PLANTS AGAINST *Anopheles
gambiae* (DIPTERA: CULICIDAE) IN NORTH-CENTRAL,
NIGERIA**

BY

**ADELAJA, Olukayode James
[04/55EK006]**

APRIL, 2021

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NIGERIA**

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(04/55EK006)

B.Sc., M.Sc. Zoology (Ilorin)

**A Thesis Submitted to the Department of Zoology, Faculty of Life Sciences for the
Award of the Degree of Doctor of Philosophy in Zoology of the University of Ilorin,
Ilorin, Nigeria.**

APRIL, 2021

CERTIFICATION

This is to certify that Mr ADELAJA, Olukayode James of the Department of Zoology has successfully carried out this research under my supervision in partial fulfilment of the requirements for the award of the degree of Doctor of Philosophy (Zoology), University of Ilorin, Nigeria.

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DEDICATION

This research work is dedicated to Almighty God the creator of the universe, my Baba and best friend who saw me through the duration of this programme. To Him be all the Glory.

DECLARATION

I, ADELAJA, Olukayode James hereby declare that this Thesis entitled: “Ethnobotanical Survey and Insecticidal Potentials of Selected Plants against *Anopheles gambiae* (Diptera: Culicidae) in North-Central, Nigeria” is a record of my research work. It has neither been presented nor accepted in any previous application for a higher degree. All sources of information have been specifically acknowledged. In addition, the research work has been ethically approved by the University Ethical Review Committee (UERC/LSC/119).

.....

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.....

Date

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ABSTRACT

Widescale report of insecticide resistance in *Anopheles* mosquitoes is a major challenge confronting the usefulness of available interventions involving limited insecticides. Some plants have indigenously been used as insecticides without scientific validation. Therefore, this study was conducted to survey and evaluate the bio-efficacy of selected insecticidal-plants in North-central, Nigeria and to broaden the scope of available insecticides for management of *Anophelesgambiae*. The objectives were to determine the: species types and frequency; repellent activity; contact toxicity; vapour toxicity; and major potent chemical components of selected insecticidal-plants against *A. gambiae*.

Insecticidal-plant species types and frequency were determined from nine ethnic groups in North-Central, Nigeria using questionnaires. The common plants acclaimed to have insecticidal potency were collected, identified in the herbarium and thereafter screened for insecticidal activities against *A. gambiae*. Oils from selected plants were extracted using a Clevenger apparatus. The repellency, contact and vapour-toxicities of these oils were evaluated against the larva and adult stages of *An. gambiae* using modified World Health Organisation bioassay test-procedures. Standard insecticide (Deltamethrin) and repellent (N,N-Diethyl-metoluamide(DEET)) were used as controls. The major potent chemical components were determined using Gas-Chromatography-Mass-Spectrometry. Questionnaires, knock-down time (KdT₅₀), mortality and repellency data were analysed using descriptive statistics, Chi-square, Analysis of Variance, Tukey post-hoc test, Preference Index and probit analysis ($p < 0.05$).

The findings of this study were that: *Hyptis suaveolens*, *Ocimum gratissimum*, *Citrus sinensis*, *Ageratum conyzoides*, *Cymbopogon citratus*, *Thymus vulgaris*, *Nicotiana tabacum*, *Capsicum annum*, *Cassia mimosoides*, *Annona senegalensis*, *Eucalyptus globulus*, *Parkia biglobosa*,

Hibiscus rosa sinensis, *Allium cepa*, *Erythraea suaveolens*, *Latania camara* and *Moringa oleifera* were identified belonging to twelve families. The most represented families were: Lamiaceae (*H. suaveolens*, *O. gratissimum* and *T. vulgaris*) and Fabaceae (*C. mimosoides* and *P. biglobosa*); and species were: *Hyptis suaveolens* (19.6%), *Ocimum gratissimum* (18.7%), *Citrus sinensis* (10.8%), *Ageratum conyzoides* (6.2%), *Thymus vulgaris* (6.2%) and *Nicotiana tabacum* (5.6%). *H. suaveolens* and *A. conyzoides* leaves had the same preference index (-0.87) as DEET against *A. gambiae*. All plant-oils tested displayed better ($p < 0.05$) repellent activities against *A. gambiae* at 3.0 and 5.0 mg/ml compared to DEET in the presence of human-odour; *H. suaveolens* (3.0 mg/ml), *C. sinensis* (4.0 mg/ml), *N. tabacum* and *A. conyzoides* (5.0 mg/ml) recorded 100% mean larval mortality against *An. gambiae* 24-hours post-exposure. Similarly, adult *A. gambiae* exposure to 5.0 mg/ml *N. tabacum* resulted in 100% mortality which compared favourably ($p > 0.05$) with Deltamethrin; knock-down activity of 5.0 mg/ml *C. sinensis* (80%) against adult *A. gambiae* was significantly higher ($p < 0.05$) compared to DEET (70%) after 20 minutes of exposure. KdT_{50} was lowest in 5.0 mg/ml *O. gratissimum* (31.32 minutes) and *H. suaveolens* (25.18 minutes) which was lower than DEET (36.10 minutes); and D-Limonene, was the most potent chemical component in *C. sinensis*, *A. conyzoides* and *O. gratissimum*.

This study concluded that *H. suaveolens*, *A. conyzoides*, *C. sinensis*, *N. tabacum* and *O. gratissimum* demonstrated excellent repellent, contact and vapour-toxic properties comparable to standard commercial insecticides against *An. gambiae*. These plants are therefore recommended as potential source of novel bio-insecticide for management of *An. gambiae*.