GENETIC DIVERSITY IN EGGPLANT *SOLANUM* L. AND RELATED SPECIES FROM SOUTHERN NIGERIA

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CERTIFICATION

THIS IS TO CERTIFY THAT THE THESIS:

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SUBMITTED TO THE SCHOOL OF POSTGRADUATE STUDIES, UNIVERSITY OF LAGOS FOR THE AWARD OF THE DEGREE OF

DOCTOR OF PHILOSOPHY (Ph.D.)
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CELL BIOLOGY AND GENETICS.

IS A RECORD OF ORIGINAL RESEARCH CARRIED OUT BY

SIFAU, MUTIU OYEKUNLE

IN THE DEPARTMENT OF CELL BIOLOGY AND GENETICS.

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DEDICATION

This work is dedicated to

- **Almighty Allah** (SWT), the Lord of the Universe and the Fountain of Knowledge.
- My late father, Pa **Majeobaje Akanmu Sifau** for leaving a legacy of steadfastness, obedience and service to Allah and Humanity for the children.
- **All teachers** who render services that can neither be quantified nor paid for: monetarily or materially to humanity.

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ABSTRACT

Solanum L., with an estimated number of over 2000 species, and the largest genus in the Solanaceae, includes economically important species such as the tomato, potato, and eggplant. The common name "Eggplant" is given to vegetable *Solanum* which has been used as nomenclature to refer to several *Solanum* species important for human diet and health. Many vegetable *Solanum* species that occur in Nigeria are sources of food and of medicine. Despite the importance of this genus, its taxonomy and phylogenetic relationships among these taxa are currently unclear. The advent of molecular biology has revolutionized the field of plant systematics and is being applied for elucidating the phylogenetic relationships at all taxonomic levels of *Solanum* species. The objective of this study was to assess and measure the genetic diversity in eggplant and related *Solanum* species' genetic resources in Southern Nigeria using both morphological and molecular methods. This is in order to establish the phylogenetic relationship among the taxa studied and identify agronomic marker traits useful for classification with a view to promoting their conservation, effective management and sustainable use. A total of forty nine (49) eggplant *Solanum* samples and related species were collected during exploration. These represent 12 different species of which two additional *Solanum* species were discovered for Nigeria. Taxonomic key was generated for all the species collected for ease of identification after they have been morphologically described in detail. The dendrogram constructed using morphological data from collected samples of different species of vegetable *Solanum* (eggplants) and related species through UPGMA clustering method showed the phenetic relationship among samples studied. Principal Component Analysis (PCA) revealed that fruit characters were important agronomic marker traits with a coefficient of variation (>50%) that most effectively discriminated among eggplant accessions and hence useful in establishing a simple but effective eggplant classification

system in Nigeria. DNA sequence data from one nuclear region (ITS) and two chloroplast regions (trnl C- trnl D and trnl E – trnl F) resulted in a well resolved phylogenetic hypothesis, with results strongly suggesting that most of the *Solanum* accessions in this study are monophyletic. Of the three gene regions, trnL-trnF spacer was especially useful for phylogenetic inference, with both a high percentage of parsimony-informative sites as well as a low level of homoplasy. The highest bootstrap value of 100 was observed between *S. macrocarpon* L. and *S. torvum* Sw., and between *S. macranthum* A.Rich. and *S. indicum* L. This was closely followed by a value of 99 between *S. aethiopicum* L. and *S. dasyphyllum* Schum. & Thonn. All these indicate a close relationship between these species and a possibility of a common ancestor is strongly proposed. There were situations whereby results from molecular study contradicted those of morphological analysis. There were also cases whereby observations noticed in morphological analysis were equally noticed in molecular analysis. Therefore, molecular analysis was able to reveal more about relationships among the accessions studied by either confirming or negating the result of morphological analysis. The combination of molecular markers and morphological evaluations as used in this study has greatly helped in cultivar identification and clarification of the phylogenetic affinities of the large and complex genus *Solanum.*