Molecular and Morphological characterisation of the Leptostemonum clade and the distribution in Uganda.

Date

2024-12-21

Authors

Kawuma, Carol

Publisher

Makerere university.

Abstract

Leptostemonum clade is the most species-rich (550 species) within genus Solanum, with 39 % of the indigenious vegetables grown in Uganda. Wild crop relatives from the subgenus have the potential to improve crop resistance against diseases, drought and pests. But, the genus presents numerous taxonomic challenges. This study streamlined the taxonomy of the Leptostemonum clade. Specifically to; assess diversity and distribution, establish the evolutionary relationships and analyse the morphological variations within Solanum campylacanthum and its relationship with S. cerasiferum. Field surveys to collect presence data and specimens from the different regions of Uganda were purposively done. Presence data was geocoded using a hand-held GPS. From each plant collected, a young leaf was put to dry in silica jel in a labelled ziplock bag for later use in DNA extraction. Voucher specimens were pressed, dried and identified at MHU. Additional specimen data was retrieved from GBIF and MHU. 186 species were sampled from field works. Distribution maps were generated using ArcMap software and modelling was performed using MaxEnt software version 3.3.3. DNA extraction was done using EZNA sp. Plant mini Kit (Omega Bio-Tex, Inc), DNA amplification was done for two gene regions, trnL- trnF and Waxy. Sequence editing was done using Geneious Prime Version 2022.1. Bayesian and Maximum likelihood were performed using Mrbayes and IQ tree. Morphologocal studies using phenetic methods was done for S. campylacanthum and S. cerasiferum. Dendrograms and box plots were generated using PAST. 18 species of the leptostemonums were recorded. South western Uganda and Karamoja region were the most species. Solanum chrysotrichum was a new record and S. forskali confirmed to occur in Uganda. Temperature and rainfall are the key variables that determine the distribution of the solanums. The phylogenies of trnL-trnF and Waxy showed A strong support for the monophyly of the Leptostemonum clade (PP=1) for both Bayesian and maximum likehood analyses. The Ugandan species align within the known clades with five representive clade (Aculeastrum, Eggplant, Coagulans, giganteum and new world). Morphologically, three clusters have been described within the group of S. campylacanthum. 1. unarmed S. campylacanthum, 2. Sparsely armed S. campylacanthum, 3. moderately to densely armed S. campylacanthum and one group of S. cerasiferum. Prickle density and leaf tip angles are for the first time reported as useful morphological characters in the intraspecific delimitation of S. campylacanthum.

Description

A Thesis Submitted to the Directorate of Research and Graduate Training for the fulfillment of the requirement for the award of the Degree of Doctor of Philosophy of Makerere University.

Keywords

Leptostemonum., Diversity., Solanum., Molecular., Maxent.

Citation

Kawuma, C. (2024). Molecular and Morphological characterisation of the Leptostemonum clade and the distribution in Uganda. (PhD Botany). (Unpublished thesis). Makerere University, Kampala, Uganda..

URI

http://hdl.handle.net/10570/14290

Collections

School of Biosciences (Biosciences) Collections