

## Abstract

Plants of the genus *Physalis* are of economic interest because of their fleshy edible fruits with high nutritional value. Some species have high medicinal value with a long history of ethnomedicinal use to treat diverse diseases. There is therefore a need to correctly discriminate the different species of *Physalis* for proper utilization. Although most *Physalis* species have unique morphologies, their vegetative stages are identical, making it difficult to accurately identify them based on morphological characteristics. DNA barcoding has the potential to discriminate species accurately. In this study, ribulose biphosphate carboxylase large (*rbcL*) and internal transcribed spacer 2 (ITS2) regions were used to discriminate *Physalis* species and to reveal their phylogenetic relationships and genetic diversity. *Physalis* plant samples were collected from seven counties in Kenya based on the availability of the germplasm. The voucher specimens were identified using the botanical taxonomy method and were deposited in the University of Nairobi herbarium. Genomic DNA was isolated from leaf samples of 64 *Physalis* accessions and used for PCR amplification and the sequencing of *rbcL* and ITS2 barcode regions. The discriminatory ability of the barcodes was based on BLASTn comparison, phylogenetic reconstruction and cluster analysis, and the determination of inter- and intra-specific distances. The nucleotide polymorphism, genetic diversity and distance of the identified *Physalis* species were determined using DnaSP and MEGA 11.0 software. Species discrimination was more robust using ITS2 sequences. The species identified and discriminated by ITS2 sequences were *Physalis purpurea*, *Physalis peruviana* and *Physalis cordata*. The *rbcL* sequences were only able to identify *Physalis* to the genus level. There was high interspecific and low intraspecific divergence within the identified *Physalis* species based on ITS2 sequences. The ITS2 barcode is an ideal DNA barcode for use in the discrimination of species, as well as in genetic diversity studies of *Physalis* accessions in Kenya.