Genetic variation of *Kaempferia* (Zingiberaceae) in Thailand based on chloroplast DNA (*psbA-trnH* and *petA-psbJ*) sequences

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ABSTRACT. Genetic variation and species authentication of 71 *Kaempferia* accessions (representing 15 recognized, six new, and four unidentified species) found indigenously in Thailand were examined by determining chloroplast *psbA-trnH* and partial *petA-psbJ* spacer sequences. Ten closely related species (*Boesenbergia rotunda*, *Gagnepainia godefroyi*, *G. thoreliana*, *Globba substrigosa*, *Smithatris myanmarensis*, *Scaphochlamys biloba*, *S. minutiflora*, *S. rubescens*, and *Stahlianthus* sp) were also included. After sequence alignments, 1010 and 865 bp in length were obtained for the respective chloroplast DNA sequences. Intraspecific sequence variation was not observed in *Kaempferia candida*, *K. angustifolia*, *K. laotica*, *K. galanga*, *K. pardi* sp nov., *K. bambusetorum* sp nov., *K. albomaculata* sp nov., *K. minuta* sp nov., *Kaempferia* sp nov. 1, and *G. thoreliana*, for which more than one specimen was available. In contrast, intraspecific sequence polymorphisms were observed in various populations of *K. fallax*, *K. filifolia*, *K. elegans*, *K. pulchra*, *K. rotunda*, *K. marginata*, *K. parviflora*, *K. larsenii*, *K. roscoeana*, *K. siamensis*, and *G. godefroyi*. 
A strict consensus tree based on combined \textit{psbA-trnH} and partial \textit{petA-psbJ} sequences revealed four major groups of \textit{Kaempferia} species. We suggest that the genus \textit{Kaempferia} is a polyphyletic group, as \textit{K. candida} was distantly related and did not group with other \textit{Kaempferia} species. Polymorphic sites and indels of \textit{psbA-trnH} and \textit{petA-psbJ} can be used as DNA barcodes for species diagnosis of most \textit{Kaempferia} and outgroup species. Nuclear DNA polymorphism should be examined to determine if there has been interspecific hybridization and chloroplast DNA introgression in these taxa.

\textbf{Key words:} \textit{Kaempferia}; Chloroplast DNA; \textit{psbA-trnH}; \textit{petA-psbJ}; DNA barcode