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Use of pattern recognition technique to develop an automated plant identification system for *Cryptocoryne walkeri*

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Automated systems have been developed among numerous other applications as a rapid and efficient method for species identification in the absence of expert taxonomists. So far, automation has been developed for insect identification, microbe identification and identification of a few plant species.

Genus *Cryptocoryne* is an aquatic flowering plant with 58 known species which belong to the family Araceae. Sri Lanka has 10 endemic species which have been highly exploited for the international aquarium trade. Identification of these species is based solely on the morphology of the inflorescence, but flowering is seasonal and depends on environmental conditions. However, as a result of over collection from natural habitats five species have been declared as critically endangered, three as endangered, and the remaining two as vulnerable, by the 2012 Red List of threatened fauna and flora of Sri Lanka. The Flora and Fauna Protection Ordinance, has declared *Cryptocoryne walkeri* as highly protected, prohibiting collection, transport and export. However, according to the Sri Lanka Customs this plant is still being smuggled out and prevention is difficult due to lack of quick identification procedures for *Cryptocoryne* spp. in the absence of the inflorescence.

This research was aimed at developing a partially automated system based on vegetative features such as leaf characters using artificial neural network systems (ANN). Methodology included identification of *Cryptocoryne* spp. using the National Herbarium at Peradeniya and the tissue culture center of the National Aquaculture Development Authority, appropriate character selection and qualitative and quantitative data collection from 72 individuals in 23 locations dispersed in 8 districts. Recorded data, 30 data entries for *C. walkeri* and 30 entries from other species including *C. bogneri*, *C. beckettii*, *C. thwaitesii* and *C. wendtii* were used in an ANN embedded pattern recognition system which was trained to identify *C. walkeri* specimens from other species belong to the genus. The developed identification system is equipped with a graphical user interface (GUI) to enhance the user friendliness. The system developed can be used to distinctly identify a *C. walkeri* specimen from other species belonging to the genus *Cryptocoryne* by loading a data file containing measurements of the selected characters of an unidentified *Cryptocoryne* specimen.

Keywords: *Cryptocoryne*, automated system, artificial neural network, vegetative features