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基于4个核基因系统发育树分析华中枳和富民枳的分类地位

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摘 要:【目的】富民枳和华中枳具有较强的抗寒能力,是潜在的优良柑橘砧木资源。研究这两个物种的分类地位,以期为它们的保护和利用提供理论依据。**【方法】**考虑到杂交以及不完全谱系分选的影响,挑选了4个没有明显连锁关系的核基因片段(CTV.4,HYB,LGT,P12),对富民枳、华中枳和宜昌橙进行直接或克隆测序,重建广义柑橘属的系统发育树,进一步探究富民枳和华中枳的分类地位。**【结果】**4个单基因树的拓扑结构存在不一致性,富民枳和华中枳在CTV.4基因树中表现出杂交起源的特性,揭示了这2种植物可能是枳(♀)与柚(♂)的自然杂交种。**【结论】**研究为枳属与狭义柑橘属之间在自然状态下存在基因交流提供了新证据,为富民枳和华中枳的物种起源提供了新见解。这2个物种是狭义柑橘属与枳属之间的桥梁,对研究广义柑橘属的系统发育关系和柑橘育种具有重要价值。因此,它们应受到更多的关注和保护,建议将华中枳列为地方保护物种或与富民枳同等级的保护物种。

关键词:柑橘属;分类学;自然杂交;保护物种

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Taxonomic status of *Citrus* × *pubinervia* and *Citrus* × *polytrifolia* based on the phylogenetic trees reconstructed by four nuclear genes

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Abstact:【Objective】Evergreen trifoliate orange is a special member of *Citrus* s.l., with its trifoliolate similar to those of *C. trifoliata*, yet its evergreen features resembles that of species within *Citrus* s.s. Currently, two types of evergreen trifoliate orange have been established as independent species, including *C.* × *pubinervia* and *C.* × *polytrifolia*. Evergreen trifoliate oranges possess strong cold resistance and are excellent citrus rootstock resources. However, their taxonomic status has long been disputed since their discovery, hindering research on their conservation and utilization. 【Methods】 Considering the impacts of hybridization and incomplete lineage sorting, four nDNA segments (CTV.4, HYB, LGT and P12) that show no significant linkage relationship were selected for direct or cloning sequencing in *C.* × *polytrifolia*, *C.* × pubinervia, and *C. cavaleriei* to reconstruct the phylogenetic tree of the *Citrus* s. l. and, further exploring the taxonomic status of these two evergreen trifoliate oranges. 【Results】 The phylogenetic tree based on HYB gene sequences revealed that *C. trifoliata*, *C.* × *polytrifolia*, and *C.* × pubinervia formed the first strongly supported independent clade (LP=100%, PP=1.00) within *Citrus* s. l., known as the "*Poncirus*" clade. "*Poncirus*" clade further diverged into the "deciduous trifoliate or-

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