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Radiation and Speciation

Origin and taxonomic status of *Lycopersicon*: Evidence from the evolution of the rDNA 5' external transcribed spacer

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The taxonomic status of tomatoes (*Lycopersicon* spp.) and their relationship to the members of section *Petota* of *Solanum* is studied using the external transcribed spacer (5' ETS) of nuclear rDNA in 33 *Solanum-Lycopersicon* species. The 5' ETS can be subdivided into a variable region (VR) characterized by duplications/amplifications of structural elements and a conservative region (CR) evolving stepwisely by base substitutions. Phylogenetic reconstruction based on CR revealed three major groups within *Solanum* section *Petota*. A paraphyletic ancestral group 1 includes non-tuber-bearing species series *Etuberosa* as well as tuber-bearing Central American diploids. One of the derived clades (group 2) contains non-tuber-bearing species of series *Juglandifolia* and series *Neolycopersicon* (tomatoes), which are imbedded in section *Petota*; the other (group 3) embraces all tuber-bearing South American species and Central American polyploids. Each group exhibits a specific 5' ETS structural VR variant. Variant D of group 3 is characterized by a cluster of down-stream subrepeats and evolved directly from the most ancestral variant A found in group 1. Variants B/C specific for group 3 represent a parallel lineage of molecular evolution. Our analysis indicates that tomatoes are derived members of section *Petota*, closely related to series *Juglandifolia*, and originated from a heterogeneous pool including tuber and non-bearing *Solanum* species. From a phylogenetic systematic viewpoint, treating tomatoes as a distinct genus is not justified.