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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.