

P13: Phylogenetic analysis of the chloroplast genome sequences with reference to the earliest land plants.

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Relationship among vascular plants and three groups of bryophytes, mosses, liverworts, and hornworts, have been a big problem in land plant phylogeny. The answer to this question would have insights in what the earliest land plant looked like, and how the vascular plants evolved. Liverworts basal hypothesis was proposed based on cladistical analysis of morphological data and supported by intron presence in land plants other than liverworts. Hornworts basal hypothesis was proposed by cladistic analysis including sperm morphology and molecular phylogeny of multiple genes. Bryophyte monophyly was implicated with sperm morphology only data and not statistically rejected in molecular phylogeny. Thus, no consensus with wide acceptance has been achieved. We recently determined the chloroplast genome sequence of *Physcomitrella patens* (mosses), *Anthoceros formosae* (hornworts), and 2 pteridophytes (*Psilotum nudum* and *Adiantum capillus-veneris*). We report phylogenetic analysis of the newly determined sequences along with previously reported sequences of *Marchantia polymorpha* (liverworts), 8 seed plants, and 10 outgroup taxa. This data set is capable of inferring the phylogenetic relationship among the three groups of bryophytes and vascular plants. The ancestral character states within land plants will be discussed with the phylogenetic results.