

P803

The Current Understanding of Streptophyta and Land Plant Phylogeny

Jung Ho Lee

BK21 Program, School of Biological Sciences, Seoul National University, Seoul 151-747

During the last half of 20th century, the recognized primitive green plant was an unicellular green alga, *Chlamydomonas*, which had been one of major plant materials for the researches on molecular biology, but is now generally regarded as an extremely derived green alga. Similarly, magnoliids were considered as primitive angiosperms, on the basis of floral morphology, but is now generally accepted as euangiosperms. With these two examples, we can feel that there have been many changes in our understanding on the green plant systematics, to which botanists have not done pay much attention.. Contrast to 'chlorophytes (green algae)', a botanist encounters the term 'streptophytes', which is the green plant lineage leading to land plants. The lineage can be defined by having two ultra-cellular structures, MLS and/or phragmoplast. *Chlorokybus* and *Mesostigma*, unicellular algae having MLS but lacking phragmoplast, are considered as the basal streptophytes. As chloroplast genomic markers, *psbB* operon and four group II introns support the Streptophyta lineage. Phragmoplast are found in embryophytes (land plants) and in some algae including Charales, Coleochaete and Spirogyroids, which have been considered as possible close algal relatives of embryophytes. *Coleochaete orbicularis* is the model organism of Antithetic Hypothesis (Bower 1896), Charales has the most similar phragmoplast to embryophytes. Spirogyroids can survive on land for a few months unlike the other two. Though some molecular systemic studies suggested the Charales, Zygnematales is also suggested to be the possible candidates. Chloroplast *clpP*, *rps12* and *rpl23* operons have given us better understanding on the issue. In terms of basal most lineage of bryophytes, liverworts and hornworts are the candidates. Morphological study and rRNA phylogeny support the hornworts as basal most, but the distribution of three mitochondrial group II introns supports the liverworts. In recent molecular phylogenetic studies, hornworts were frequently placed as the sister to vascular plants. For the basal most lineage of vascular plants, Lycopodiaceae is strongly supported by both molecular phylogeny and morphological studies, but Psilotaceae, once regarded as primitive vascular plants, is now considered as derived ferns by reduction. In seed plant evolution, Anthophyte Hypothesis on the basis of fossil studies had suggested Gnetales, double fertilized gymnosperms with vessel elements, as basal most lineage of angiosperms or the closest gymnosperms to angiosperms. By some, Magnoliids had been used in explaining flower evolution as primitive angiosperms. However, ANITA, which has been refuted by some as analytical artifacts since 1999, is now generally accepted as the basal most lineages of angiosperms. The Anthophyte hypothesis is no longer accepted, but Gnetales is treated as the derived lineage of Gymnosperms. However, phylogenetic relationships among euangiosperm lineages (Chlorantaceae, Monocots, eumagnoliids and Ceratophyllum/eudicots) are remained to be resolved. Future systematics of land plants require more consideration of three aspects: phenotypic character evolution, molecular evolution, and genomic character evolution. This study is supported in part by KRF2003-003-C00135 to JL.