Public Abstract

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Graduation Term:FS 2011

Department:Biological Sciences

Degree:PhD

Title:PHYLOGENETIC AND PHYLOGENOMIC STUDIES OF WILD ONIONS (ALLIUM, AMARYLLIDACEAE) AT THREE TAXONOMIC SCALES

I used standard molecular phylogenetic and emerging phylogenomic methods to address questions about the evolutionary relationships among populations, species and subgeneric clades of the genus Allium. To test the hypothesis that morphological alliances reflect shared evolutionary history among species, I examined the phylogenetic relationships among 74/81 Amerallium species in North America. Morphological alliances are largely congruent with the clades recovered in the molecular phylogenetic analysis, although strict monophyly was observed in only three of eight alliances. To test the hypothesis that pseudovivipary, a rare form of asexual reproduction, has evolved multiple times in the species A. canadense, I reconstructed the phylogeny of 119 populations of A. canadense including multiple representatives from all five sexual varieties and the asexual variety A. c. canadense. Pseudovivipary has evolved at least six times in this species and is associated with polyploidy. Finally, I conducted a chloroplast phylogenomic study across the genus Allium (18 species representing eleven subgenera) using genome survey sequencing (GSS) methods to test the efficacy of these new methods in plant genera with large nuclear genomes and to generate genomic resources for future studies. GSS methods recovered sufficient plastid sequences to assemble complete plastid genomes in all samples. Relationships among subgenera are largely congruent with previously published studies, with a couple of exceptions that may be the result of differences in taxon sampling density. The data generated during this study can be used in future phylogenetic and molecular evolution studies within the genus Allium.