**Title:** An analysis of phylogenetic and phytochemical diversity in *Scutellaria* to identify species with medicinal potential

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*Scutellaria baicalensis* is a medicinal plant whose root extracts have been widely used in Asian medicine for more than 2,000 years. Flavonoids in these extracts possess anti-cancer, antioxidant, antiviral, and neuro-psychologic properties. Because of interest in the medicinal properties of these flavonoids, the reference genome of *S. baicalensis* has been recently completed. Although *S. baicalensis* has been well-studied, the *Scutellaria* genus contains more than 470 other species, the majority of which not analyzed. This study aims to extend the current knowledge of *Scutellaria* by analyzing flavonoid profiles for a large set of species representing the diversity in the genus.Targeted metabolite analysis of fresh and dried samples was completed with High Performance Liquid Chromatography (HPLC) to quantify 15 flavones. A phylogenetic tree of these species was constructed from chloroplast genomic data andusedto identify “medicinal hotspots” – clades of species accumulating high concentrations of medicinally relevant flavones. Based on these results, a subset of species were selected for organ-specific metabolite profiling and genome size analysis. A comparison of phytochemical profiles for these species indicates significant diversity in site and identity of flavone accumulation when compared to *S. baicalensis*. Inconsistences in site of accumulation between the proposed flavonoid biosynthesis pathway for *S. baicalensis* and chemical analysis results indicate shared and unique flavonoid biosynthetic routes among species. Flow cytometry results revealed 7 of the 8 species analyzed have similarly sized genomes as *S. baicalensis*. This similarity in genome size can facilitate the use of the reference genome of *S. baicalensis* as a tool to study genetic data collected from other species. Whole genome sequencing was also performed on 4 species as *S. baicalensis* to evaluate interspecies variation in genome structure. Results of our comparative metabolite and phylogenetic study provide insight regarding the varying medicinal value of species within the *Scutellaria* genus. This information may be valuable to researchers studying the genus when deciding which species to target for further development.

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