University of Fdribourg / Faculty of Science and Medicine / Department of Biology

Past, present and future of relict trees: diversity, phylogeny, and biogeography of Juglandaceae

Yi-Gang Song

The integration of past, present and future spatial-temporal patterns is crucial in all research areas of biogeography and conservation biology. Comparatively little is known about the biogeography and conservation biology of many relict woody plants, which possessing multiple refugia. The walnut family (Juglandaceae) is one of the best model taxon to fill this gap.

To understand the current, history, and future of the distribution patterns of Juglandaceae family, the species richness, phylogenetic diversity, reconstructions of ancestral geographical ranges, phylogenetic analysis and species distribution model have been used.

This study found that the Juglandaceae originated in North America and Europe in the Early Eocene epoch with widespread dispersal mainly between 13 and 26 Mya. The intercontinental migration of the diversity centre occurred from North America and Europe towards Southwest China and Northern Vietnam, which are identified as priority conservation areas. High-latitude cooling during the Oligocene period followed by a long-term stable, warmer climate in the Early and Middle Miocene periods steered the southward translocation of the family.

Secondly, our results clearly confirm the division of the genus *Pterocarya* into two monophyletic sections: the *Platyptera* section and the *Pterocarya* section. The divergence between the two sections took place during the Early Miocene era (20.5 Mya).

Thirdly, the Last Glacial Maximum (LGM) played a vital role in the current disjunct distribution of *Pterocarya fraxinifolia*. Future climate change will beneficial to the European expansion of this species. The high invasive potential of *P. fraxinifolia* in Europe indicates that researchers and conservationists should focus on its potential switch from relict to invasive tree species.

Jury:

Prof. tit. Gregor Kozlowski (thesis supervisor)

Prof. Peter Linder (external co-examiner)

Dr. Giuseppe Garfì (external co-examiner)

Prof. Louis-Félix Bersier (internal co-examiner)

Prof. Jörn Dengjel (president of the jury)