

Fossil fruits of Engelhardioideae: Exploring the Patagonian-Northern Hemisphere connection in the fossil record

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Engelhardioideae (Juglandaceae that usually have fruits with a trilobed wing) have a relatively well-documented Cenozoic macrofossil record, primarily based on fruits and leaves. Fossil Engelhardioideae are significant for understanding character evolution in the group both in light of the fact that at least some fossil engelhardioids have combinations of features not known in extant taxa, and because most fossils are known from geographic areas where extant engelhardioids do not occur today. In this presentation, we will explore the utility of fossils for understanding the biogeography of Engelhardioideae and Cenozoic biogeographic connections between South America and the Northern Hemisphere. The extant engelhardioids display a trans-Pacific geographic disjunction, with New World representatives in Mexico to northwesternmost South America and Old World representatives in Eastern to Southeast Asia. The fossil record of Engelhardioideae matches a widespread Northern Hemisphere pattern recognized in extant taxa sometimes dubbed “Tertiary relicts.” Fossil engelhardioids are most diverse in North America and most abundant in Europe; the East Asian record is limited, but reports are on the increase. Previously, a direct reading of the fossil record could have been interpreted as suggesting a North American origin and early diversification of the clade, with dispersal to Europe and East Asia over the North Atlantic and Bering Land Bridges, respectively. However, newly discovered winged fruits that have characters consistent with Engelhardioideae from the early Eocene (ca. 52 Ma) Laguna del Hunco flora of southern Argentina complicate this scenario, not only because the Engelhardioideae were previously not thought to have any significant presence in South America, but because this is among the oldest known occurrences of the clade in the fossil record. We will discuss how phylogeny may help us to better understand the development of the biogeographic range exhibited by this clade. The surprising occurrence of fossil Engelhardioideae in southern South America mirrors reports of other taxa that were previously cryptic in the Cretaceous to Paleogene of Argentina, such as Potamogetonaceae (*Baibiancarpus chubutensis*), *Nelumbo* (*Nelumbo puertae*), and the ferns *Regnellidium* (Marsileaceae). These taxa were previously known as macrofossils only from the Northern Hemisphere, suggesting that continuing work on Southern Hemisphere floras may yield interesting biogeographic results.

Keywords: Cenozoic, character evolution, Juglandaceae, biogeography, Tertiary.