



Taxonomy of the tribe Apieae (Apiaceae) revisited as revealed by molecular phylogenies and morphological characters

PEDRO JIMÉNEZ-MEJÍAS^{1,2} & PABLO VARGAS¹

¹ Real Jardín Botánico de Madrid, Plaza de Murillo s.n., 28014 Madrid, Spain

² Author for correspondence: pjimmej@gmail.com

Abstract

The family Apiaceae is in the process of major systematic rearrangements at different taxonomic levels. In particular, molecular phylogenies of the tribe Apieae are generating heterogeneous assemblages of morphologically diverse taxa. We analysed a nearly complete taxonomic sample to evaluate the phylogenetic relationships within this tribe, and to review the most informative taxonomic characters of the fruit. Nuclear (ITS) and plastid (*rps16*) sequences allowed inferring phylogenetic relationships of species and genera of Apieae. Fruit morphology was studied with stereomicroscope, including overall observations and anatomical cross-sections. Both phylogenetic reconstructions were incongruent. Based on the ITS phylogeny, Apieae is arranged in two main clades, one containing most species of *Stoibrax* and the other clade formed by the rest of species of the tribe grouped into three well-supported subclades. The *rps16* phylogeny shows the *Anethum* alliance to be basal, recovered in a weakly supported clade sister to the rest of the tribe, and a clade subdivided in six well-supported subclades. Nevertheless, three genera are revealed to be non-monophyletic in both phylogenetic reconstructions: *Anethum*, *Seseli* and *Stoibrax*. In the interest of the recognition of natural groups within Apieae, we proposed to create three new genera to accommodate the species that split from the three polyphyletic genera: *Canaria* for *Seseli webbii*, *Modescidium* for *Stoibrax involucratum*, and *Schoenoselinum* for *Anethum foeniculoides*.

Key words: Carpology, polyphyly, taxonomy, Umbelliferae

Introduction

The family Apiaceae (446 genera, 3540 spp; Mabberley 1997) is undergoing one of the major taxonomic re-arrangements within the angiosperms. The current systematic knowledge of Apiaceae has changed in the light of recent molecular phylogenies. Whereas some authors considered two major subfamilies, Saniculoideae (ca. 250 spp.; Mathias 1965) and Apioideae (2827–2935 spp; Downie *et al.* 2010) plus the much smaller Azorelloideae and Mackinlayoideae (Nicolas & Plunkett 2009), other authors circumscribed Saniculoideae as a tribe (Saniculeae) within Apioideae (Magee *et al.* 2010a). Conciliation of taxonomy and molecular phylogenetics provides a more natural classification of the family, although it implies changes that are taxonomically unexpected from a morphological point of view. Previous studies showed the former subfamily Hydrocotyloideae to be polyphyletic (Nicolas & Plunkett 2009). The type genus (*Hydrocotyle* L.) and allied genera were transferred to the family Araliaceae, whereas the remaining members (36 genera) were kept in Apiaceae in a polyphyletic fashion. At least 18 genera of the subfamily Apioideae have been identified as “highly polyphyletic” (Downie *et al.* 2010), some of them being artificial assemblages distributed worldwide, such as *Angelica* L., *Ligusticum* L., *Pimpinella* L., *Seseli* L. or the so-called “*Peucedanum* problem” (Winter *et al.* 2008). The tribal re-arrangement of the Apiaceae based on molecular phylogenies resulted in the circumscription of morphologically heterogeneous genera (Downie *et al.* 2010), in some cases still without nomenclatural recognition. Subsequently, previously evaluated morphological and anatomical data need to be re-appraised in the light of solid phylogenetic relationships.

In particular, morphological polymorphisms within genera, together with extreme reduction of key taxonomic characters and convergence of characters between distantly related groups, appear to account for misleading classification of some Apiaceae groups. Within Apioideae, the comprehensive analysis performed by Downie *et al.* (2010), which comprises more than half of the genera presently included in the subfamily (292 of 404), provided a systematic scheme at the tribe and genus levels. These authors reported that tribe Apieae is composed of 12 genera, most of them monotypic, plus *Seseli webbii* (see Table 1 for authors of the studied species). Although small, Apieae is a