Gymnostachys, unlike Acorus, should be retained within Araceae: pollen ultrastructure supports molecular results

M. Hesse

Department of Palynology and Structural Botany, Institute of Botany, University of Vienna, Rennweg 14, A1030 Wien, Austria. E-mail: michael.hesse@univie.ac.at

Most of the aroid subfamilies clearly come out in the molecular trees (Barabé et al. 2004, Cabrera et al. 2003, Tam et al. 2004). Gymnostachydoideae and Orontioideae (clade 1 of Tam et al. 2004, the clade consisting of the monogenic subfamily Gymnostachydoideae sister with subfamily Orontioideae, and occupying the basal position in the Araceae) constitute the major group «proto-Araceae» sensu Mayo et al. 1997). They face all the other aroid subfamilies, the «True Araceae» sensu Mayo et al. (1997).

Ultrastructural pollen wall characters confirm unequivocally the tribal arrangement in the morphological classification by Mayo et al. (1997) and support greatly the arrangement of tribes and genera in the molecular trees. In several cases, pollen features are distinctive in clades corresponding to well circumscribed subfamilies or in closely related tribes within parts of subfamilies. This is valid especially for the Lasiioideae, the Monsteroideae, the Zamioculcadoideae and the (genuine) Aroideae with their unique combination of pollen characters (Hesse 2002, Bogner & Hesse 2005). In some earlier classifications Gymnostachys together with Acorus formed a clade or a subfamily within Araceae, but at present Acorus is treated as an order (Acorales) of its own.

There is still a debate (Buzgo 2001) about Gymnostachys: either to be included (retained) within Araceae (as the most basal subfamily with its single genus containing the most primitive characters, see Grayum 1990, Bogner & Nicolson 1991, Mayo et al. 1997, all basing on anatomical-morphological characters, or French et al. 1995, Cabrera et al. 2003, Tam et al. 2004, both basing on molecular data), or to be excluded from Araceae (Hay & Mabberley 1991, from anatomical-morphological reasons), a hypothesis also by Josef Bogner (pers. comm.).

We wondered if Gymnostachys pollen features would support a segregation from all the other Araceae, especially from the other basal subfamily of proto-Araceae, the Orontioideae. In fact there is not a single pollen feature which would support such a hypothesis. In contrast, all pollen characters of Gymnostachys (Gymnostachydoideae) are in very good agreement and practically identical with those of Orontium, Lysichiton and Symlocarpus (Orontioideae): a thick tectum, rather high columnellae, a thin, often lamellate endexine, and a stereotypically formed sulcus. Moreover, the Orontioideae differ palynologically clearly from the next subfamily, the Pothoideae, not to speak of the other aroid subfamilies: distinctive features are the typically rather thin and open tectum, the presence of low columnellae, and an often spongy endexine (the respective foot layers do not show significant differences).
Hence, the proto-Araceae (Gymnostachydoideae and Orontioideae) are palynologically clearly separated from the True Araceae (sensu Mayo et al. 1997), but likewise clearly different from the formerly in Araceae included genus Acorus, which shows a prominent, widely closed tectum and a clearly different, unique aperture construction: a continuous endexine across the sulcus region and a secretory tapetum, while in all Araceae a plasmodial tapetum seems to be present.

In conclusion, the placement of Gymnostachys by its pollen characters is in accordance with molecular results, and this is another fine example for the utility of pollen characters as a compass needle for systematics.

References: