

**Session: Pollen and Spore Morphology**

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

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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 *Orontoideae* (clade 1 of Tam *et al.* 2004, the clade consisting of the monogeneric subfamily *Gymnostachydoideae* sister with subfamily *Orontoideae*, 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 *Lasioideae*, 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 & Mabblerley 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 *Orontoideae*. 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 *Symplocarpus* (*Orontoideae*): a thick tectum, rather high columellae, a thin, often lamellate endexine, and a stereotypically formed sulcus. Moreover, the *Orontoideae* 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 columellae, 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.

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