**Friesodielsia sahyadrica** (Annonaceae), a peculiar new species from the Western Ghats, India

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**Introduction**

Annonaceae are one of the largest families of the magnoliid angiosperms, comprising trees, shrubs and lianas. Although they exhibit a pantropical distribution, relatively high levels of generic endemism are observed at the continental scale (Doyle and Le Thomas 1997). In India, they are represented by 24 genera and ca. 125 species (Kundu 2006).

During recent field studies in the northern Western Ghats of India, the authors collected some unusual specimens of Annonaceae. These specimens resembled species of the *Desmos* Loureiro (1790: 352) group, with respect to their scandent habit and glaucous abaxial leaf surface, whereas flower morphology resembled that of *Goniothalamus* (Blume 1830: 28) Hooker & Thomson (1855: 105), due to the presence of a coherent inner whorl of petals that conceal reproductive structures by forming a vault over stamens and carpels. However, a thorough investigation of literature on Indian Annonaceae revealed it to be a species of *Friesodielsia* Steenis (1948: 458), which is represented by two other species in India, namely *F. fornicata* (Roxburgh 1814: 94) Das (1963: 93), distributed from the northeastern part of India to Bangladesh and Myanmar, and *F. khoshooi* Vasudeva & Chakrabarty (1985: 435), endemic to the Andaman and Nicobar islands. This report is the first ever record of this genus for the Western Ghats.

*Friesodielsia* comprises about 51 species (Wang 2009, Chatrou et al. 2012), of which ten are recorded from tropical Africa whereas the rest are distributed across tropical Asia. Recent molecular phylogenetic studies (Richardson et al. 2004, Couvreur et al. 2011, Wang et al. 2012) have shown that *Friesodielsia* is polyphyletic with African and Asian species falling into different clades. The African species of *Friesodielsia* are related to the African genus *Monanthotaxis* Baillon (1890: 878), whereas the Asian species are related to the Asian genus *Dasymaschalon* Dalla Torre & Harms (1901: 174) (Couvreur et al. 2011, Wang et al. 2012). Palynological studies (Walker 1971) have also indicated that African and Asian *Friesodielsia* are distinct in their exine morphology (Table 1). Based on these results, the African species of *Friesodielsia* are likely to be transferred to *Monanthotaxis* or the African *Friesodielsia-Monanthotaxis* clade will be segregated into two or more genera (Wang et al. 2012) with the name *Friesodielsia* being retained by the Asian species, which is where the type of the genus occurs. It was therefore essential to assess the position of this new species from the Western Ghats with respect to the existing phylogenetic data.

Certain morphological features observed in the species from Western Ghats such as relative length of outer and inner petals as well as number of seeds per monocarp were consistent with those observed in many African species of *Friesodielsia*. Pollen exine morphology, on the other hand, was similar to that of the Asian group (Table 1, Fig. 2). Biogeographic evidence and molecular dating (Couvreur et al. 2011) suggested that clades such as the one consisting of *Friesodielsia* are younger than the time of the Gondwanan breakup and therefore more likely to have dispersed into India from Southeast Asia (Couvreur et al. 2011). Under this scenario, the species of *Friesodielsia* from the Western Ghats can be expected to cluster with the Asian group. Due to potentially conflicting evidence from morphology and biogeographic hypotheses, we used a molecular phylogenetic approach to ascertain the position of the new species from the Western Ghats; we wish to assign it to either the African or Asian group. Since *Desmos* shows similar patterns in diversity and distribution to that of Asian *Friesodielsia*, we included *Desmos lawii* Safford (1912: 506), an endemic species confined to the Western Ghats.
Notes:—Based on the molecular results, it is clear that *Friesodielsia sahyadrica* belongs to the Asian desmoid clade, which consists of *Dasymaschalon*, Asian *Friesodielsia* and *Desmos*. The Asian and the African *Friesodielsia* group are distinguished primarily based on three morphological characters: echinate pollen exine (Fig. 2), relative length of outer to inner petals and number of seeds per monocarp (Verdcourt 1971, Walker 1971). Features such as differences in petal lengths and number of seeds per monocarp (Table 1) are contrary to what has been documented so far in the Asian species, but instead are characteristic of the African group that is related to *Monanthotaxis*. In Asian *Friesodielsia*, however, the outer petals are much longer than the inner petals (Verdcourt 1971), which are not observed in *F. sahyadrica*. Wang *et al.* (2012) inferred multiple transitions from multi-seeded monocarps to maximally one to two-seeded monocarps within the desmoid clade. All species of Asian *Friesodielsia* known previously exhibit one or maximally two-seeded monocarps (Verdcourt 1971, Wang *et al.* 2012). *Friesodielsia sahyadrica* is unique among Asian species of *Friesodielsia* in having five-seeded monocarps. African *Friesodielsia*, however, often have monocarps with up to five seeds. Another peculiar feature of *F. sahyadrica* is its cylindrical sausage-shaped monocarps with no distinct constrictions between seeds (Fig. 3, 4). All species belonging to the Asian desmoid clade as well as African *Friesodielsia* exhibit distinctly moniliform monocarps when the number of seeds per monocarp is equal to or greater than two. Further and broader studies are required to determine the phylogenetic relationships of these and other taxa endemic to India.

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