Short Communication

Developmental Patterns of Pedate Leaves in Tribe Areae (Araceae-Aroideae) and Their Systematic Implication

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Based on observations of the development of pedate leaves in Araceae, including new observations on Pinellia pedatisecta and Typhonium larsenii, two patterns were recognized. One pattern was found to be restricted to Arisaema (Arisaematinae) and Pinellia (Atherurinae), which may suggest monophyly between these two genera (subtribes).

Key words: Arisaema — Aroid systematics — Leaf development — Pinellia — Typhonium

In Engler (1920), Aroideae tribe Areae is divided into six subtribes, Arinae, Arisarinae, Arisaematinae, Pinelliinae (= Atherurinae (Nicolson, 1984)), Ambrosininae and Cryptocoryninae. Although his system was adopted in many systematic works, the interrelationships between the subtribes have not been established. For the purpose of phylogenetic systematics of this group, characteristics that show synapomorphy of some taxa should be incorporated. In tribe Areae, pedate leaves are distributed among three subtribes: Arinae (in Typhonium larsenii and allied species, and the three species of Sauromatum), Arisaematinae (in about 60 species out of 150) and Atherurinae (in Pinellia pedatisecta). In this study, the significance of the pedate leaves in the systematics of this group is reconsidered.

Plants of Pinellia pedatisecta Schott and Typhonium larsenii Hu, cultivated in the Botanical Gardens, Faculty of Science, The University of Tokyo, together with Arisaema serratum (Thunb.) Schott, A. thunbergii Blume, A. consanguineum Schott, Dracunculus vulgaris Schott, Helicodiceros muscivorus (L.) Engler, Sauromatum venosum (Ait.) Kunth, and Syngonium vellozianum Schott were examined. Patterns of development of the foliage leaves of those species were observed and compared with previous information on the developmental patterns. In this paper, the leaflets are numbered from inside to outside as 1 (terminal leaflet), 2, 3, ... and so on (Fig. 1).

Development of the compound leaves of Arisaema has been observed by Troll (1932b) and Murata (1984). In the early stages of development, the leaf blade appears as a flat triangular region at the top of the leaf primordium. In trifoliolate leaves, each of the three angles develops into the terminal and lateral leaflets. In both pedate
leaves (in *A. serratum* and *A. urashima*, for example) and radiate leaves (in *A. consanguineum*, for example), of the three angles of the triangular primordium, the two basal angles, after becoming lobed many times along the lower margin, develop into lateral leaflets. The remaining upper lobe then develops into the terminal leaflet. Consequently, all of the lateral leaflets are folded downwards along the petiole. Leaves showing this pattern of development are here called the *Arisaema* type. In *Pinellia pedatisecta*, the same pattern of development was observed (Fig. 2A).

Another developmental pattern of pedate leaves has been referred to by Goebel (1898–1901) and observed more precisely by Troll (1932a, 1938–1939) in *Dracunculus, Sauromatum, Helicodiceros* and *Eminium* (as *Helicophyllum*) (Aroidae) and *Syngonium* (Colocasioidae). In this study, this pattern was observed not only in *Dracunculus vulgaris, Sauromatum venosum* (Fig. 2B), *Syngonium podophyllum* and *Helicodiceros muscivorus* (Fig. 2C), but also in *Typhonium larsenii* (Fig. 2D, E). At first, a flat triangular region appears at the top of the leaf primordium. The top angle (1 in Fig. 2B) and the basal two angles (2) later develop into the terminal leaflet and the adjacent lateral leaflets, respectively. New lobes (3) then appear at the base of the two basal lobes (2), which are oriented to the terminal lobe (1) as shown in Fig. 2B. In this way, each new lobe successively appears at the base of the previous lobe and is oriented to the penultimate lobes. Consequently, as shown in Fig. 2E, leaflet 5 is encircled by leaflet 3 and 3 is encircled by 1, while 6 is encircled by 4 and 4 is encircled by 2. Leaves showing this pattern of development are here called the *Sauromatum* type. In Schott’s drawings preserved in the Naturhistorisches Museum, Wien, are precise sketches of unfolded young leaves of *Xanthosoma platylobum* (Engler) Schott (as *Acontias platylobum*, included in subfamily Philodendroideae in Grayum’s (1984) system), and *Zomicarpa riedelianum* Schott (Aroidae), which also have *Sauromatum* type leaves. Judging from a photograph of *Arophyton tripartitum* in Bogner (1972), *Sauromatum* type leaf also occurs in *Arophyton* (Aroidae Arophytoneae). Accordingly, the *Sauromatum* type leaves occur in three subfamilies, Colocasioidae, Philodendroideae and Aroidae.

Although the pedate leaves of the *Arisaema* and *Sauromatum* types are very