

Cytotypes of *Acorus* (Acoraceae) are pseudocryptic species with contrasting biogeographic patterns, but shared pollination biology

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The helophyte and rheophyte genus *Acorus* is one of the most isolated genera in the angiosperm phylogeny. The *Acorus calamus* group is widely distributed in the Holarctic regions of Eurasia and America. These aromatic and medicinal plants are highly important in terms of ethnobotany. Earlier studies interpreted native diploids and invasive triploids occurring in North America as two species that differed in morphology and distribution ranges. In contrast, diploids, triploids, and tetraploids occurring in Eurasia are commonly interpreted as one species because they reportedly cannot be distinguished in collections. We resolve the controversy over taxonomic concepts between Eurasia and America and provide the first detailed multidisciplinary account of *Acorus* in temperate Asia. We used plastid and nuclear markers, leaf anatomy, seed micromorphology, pollen stainability, flow cytometry, and direct chromosome counts. Diploids and tetraploids show stable molecular and micromorphological differences. Triploids are their sterile hybrids, with the plastid genome inherited from the diploid parent. Diploids of America and Asia tend to differ in leaf characters. Coadaptive coexistence with pollinating beetles *Platamartus jakowlewi* and *Sibirhelus corpulentus* (Kateritidae) is conserved between diploids and tetraploids and over a distance of 4700 km between Japan and Western Siberia. Diploids are self-compatible and can set seeds in the absence of kateretid beetles. Tetraploids are self-incompatible and/or cannot set seeds in the absence of *Platamartus* and *Sibirhelus*. Diploids (*A. americanus*) and tetraploids (*A. verus*) are two biological species. *Acorus calamus* should be restricted to triploids; it apparently first evolved in temperate Asia. Diploids mostly occur in much cooler climates than triploids and tetraploids. Accessions of *A. verus* and *A. calamus* from tropical Asia are apparently derived from ancient introductions. Our data provide a new framework for the pharmacological use of *Acorus*.

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