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Diplopanax vietnamensis, a New Species of Nyssaceae from Vietnam—One More Living Representative of the Tertiary Flora of Eurasia

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ABSTRACT. A new species of *Diplopanax*, *D. vietnamensis* (Nyssaceae, Cornaceae s.l.), was discovered in the mountains of southern Vietnam. It differs from the single known species, *Diplopanax stachyanthus*, by short, simple, densely pubescent inflorescences and large yellow-white flowers with five prominent bosses on the flower disc. This genus (with two species, *D. stachyanthus* and *D. vietnamensis*) is now regarded as congeneric with *Mastixicarpum*, representatives of which were an integral component of the *Mastixia*-like paratropical broad-leaved evergreen vegetation that covered much of the Northern Hemisphere from the uppermost Cretaceous to the late Miocene, about 65 to 7 million years ago.

Key words: *Diplopanax*, Nyssaceae, Tertiary flora of Eurasia, Vietnam.

The montane flora within the eastern part of the Indochinese Peninsula is still relatively unknown. Without a doubt it is diverse and conceals a great number of exciting discoveries. Floristically, the highland forests of this area represent relictual remnants of a primitive, tropical flora that occupied wide tropical and subtropical areas of Europe, Asia, and North America during the early Tertiary, approximately 40–70 million years ago (Axelrod et al., 1998; Kubitzki & Krutzsch, 1998; Zhang & Lu, 1998). Due to subsequent climate cooling and increased aridity, the European and North Asian rep-

resentatives of this highland tropical flora and its corresponding climatic zone have disappeared almost completely. Small relictual and depauperate elements of it can still be found in Portugal, the Colchis, and in a few other orographically favored continental regions. The largest remaining humid warm Tertiary flora was shifted to Southeast Asia.

One of the richest assemblages of ancient, tropical Tertiary taxa may now be observed in highland tropical areas of Southeast Asia. Primary mountain forests of this region include a surprisingly large proportion of archaic genera well represented in the fossil record of the Upper Cretaceous and Lower Tertiary recorded from Europe, East Asia, and North America (Kubitzki & Krutzsch, 1998; Martinetto, 1998). Among them are numerous Actinidiaceae, Annonaceae, Berberidaceae, Chloranthaceae, Daphniphyllaceae, Fagaceae, Hamamelidaceae, Juglandaceae, Lardizabalaceae, Lauraceae, Magnoliaceae, Menispermaceae, Nyssaceae, Pentaphylacaceae, Platanaceae, Ranunculaceae, Rhoipteleaceae, Sabiaceae, Saururaceae, Theaceae, as well as a number of gymnosperm genera such as *Amentotaxus* Pilger (Cephalotaxaceae), *Cephalotaxus* Siebold & Zuccarini ex Endlicher (Cephalotaxaceae), *Glyptostrobus* Endlicher (Taxodiaceae), *Keteleeria* Carrière (Pinaceae), *Pseudolarix* Gordon (Pinaceae), and a great number of others (Axelrod et al., 1998; Martinetto, 1998; Nguyen, 1998; Nguyen & Nguyen, 1998; Wu

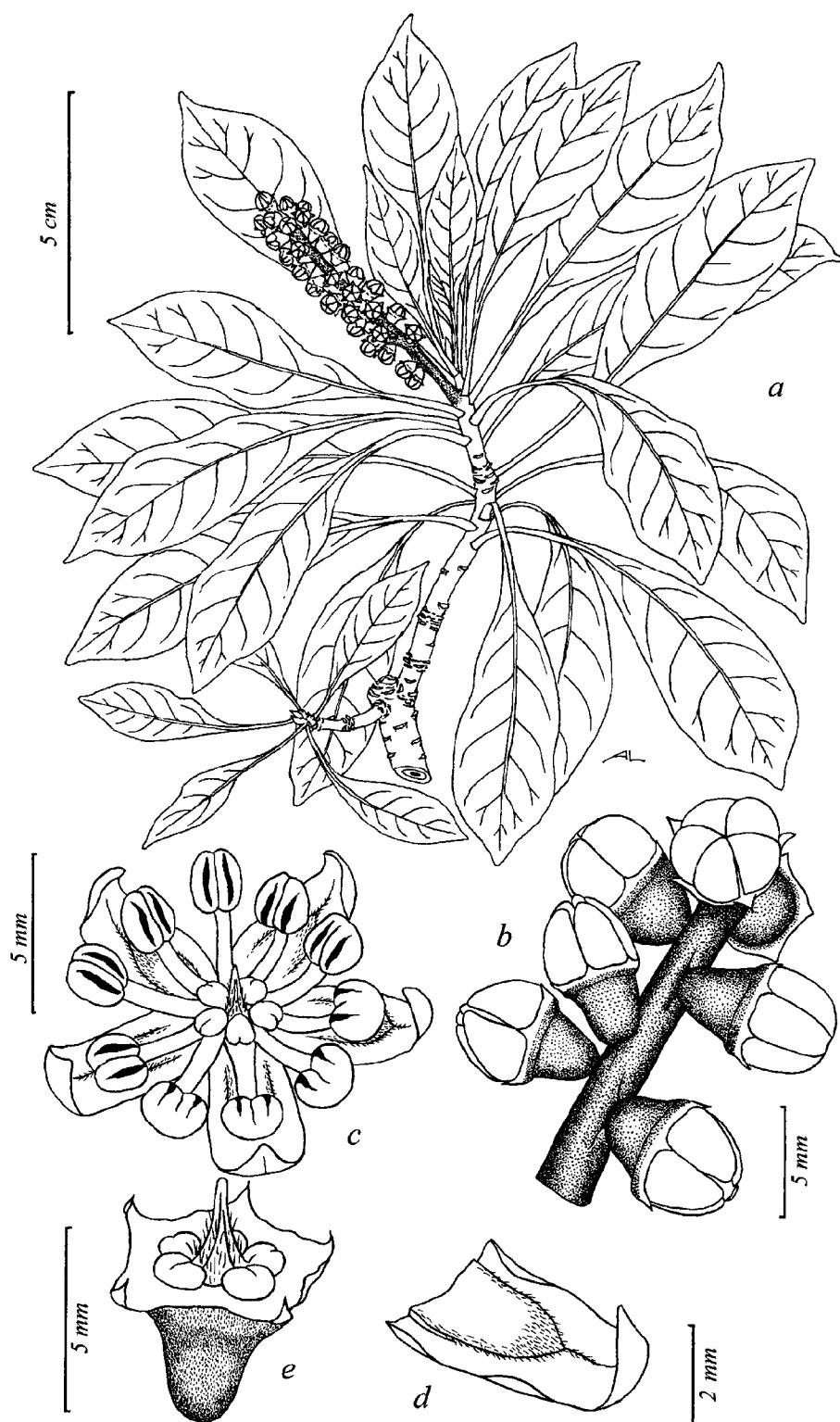


Figure 1. *Diplopanax vietnamensis* Averyanov & T. H. Nguyen. —a. Flowering leafy branchlet. —b. Portion of inflorescence with mature flower buds just before opening. —c. Open flower. —d. Adaxial surface of petal. —e. Calyx, style, and bosses on the disc. (All drawn from an isotype, L. Averyanov & T. H. Nguyen VH 596, LE.)

& Wu, 1998). These plants were widely distributed in the Northern Hemisphere during the Eocene and Miocene. Most of these plants from these areas existed during the past 5–10 million years including such famous “living fossils” as *Cathaya* Chun & Kuang (Pinaceae), *Metasequoia* Miki ex Hu & W. C. Cheng (Taxodiaceae), and *Pseudolarix* Gordon (Pinaceae) (Axelrod et al., 1998). Species of the genus *Diplopanax* Handel-Mazzetti are typical representatives of this flora.

Diplopanax (with a single species, *D. stachyanthus* Handel-Mazzetti) was described in 1933 from southern China and was initially placed in the Araliaceae (Handel-Mazzetti, 1933). Later, based on the study of fruit structure, it was suggested that the genus has affinities with *Mastixia* (Nyssaceae) and especially with some fossil Mastixiaceae (Hoo & Tseng, 1978; Tseng, 1983). Comparison of extant *Diplopanax* fruit pyrenes and fossil fruit remnants of Miocene species of *Mastixicarpum* M. E. J. Chandler gave evidence that the two genera may be congeneric (Eyde & Xiang, 1990). It is remarkable that species of *Mastixicarpum* were widespread and integral components of Tertiary European floras especially during the Miocene. Fruits of these plants are the most common fossils in lignite beds of Europe from the uppermost Cretaceous to the late Miocene, roughly 65 to 7 million years ago (Eyde & Xiang, 1990).

Woody fruits of *Diplopanax* and *Mastixicarpum* have a certain similarity and obviously represent the same woody-fruited evolutionary line in the family Nyssaceae (Cornaceae s.l.). It was long supposed that this line of woody-fruited relatives had died out in the later Miocene about 5–10 million years ago (Eyde & Xiang, 1990). With the description of the new species, at least two modern species still exist in Southeast Asia. The second extant species, *Diplopanax vietnamensis*, was recently discovered in southern Vietnam (Kon Tum Province). It was observed as an occasional co-dominant of the first forest stratum in primary, wet, evergreen, broad-leaved tropical mountain forests. Other common trees in these forests are also relictual genera of Tertiary age from such families as Betulaceae, Fagaceae, Hamamelidaceae, Lauraceae, Magnoliaceae, and Sabiaceae. This unique region represents a model for the study of the flora, vegetation, and climate reconstructions from now-extinct Northern Hemisphere forest floras of Tertiary age (Martinetto, 1998). This area in Southeast Asia may be the birthplace and cradle of the Holarctic and even Paleotropic flora (Wu & Wu, 1998).

According to available data, *Diplopanax* includes two extant and four extinct species. Distribution of

extant species comprises southern China and Vietnam. *Diplopanax stachyanthus* is the type species of the genus. The following dichotomous key is provided for the identification of *Diplopanax* species.

KEY TO THE MODERN SPECIES OF *DIPLOPANAX*

- 1a. Tree, about 8–12(15) m tall; inflorescence a raceme or panicle branched at the base, 15–30 cm long; rachis of inflorescence glabrous or sparsely pubescent in basal portion; mature flower buds before opening about 3 mm wide; flowers egg-yellow, about 8 mm diam.; disc of the flower without prominent bosses and ± smooth; style glabrous 1. *D. stachyanthus*
- 1b. Tree, 15–25 m tall; inflorescence not a branched spike, 5–8 cm long; rachis of inflorescence densely pubescent in basal portion; mature flower buds before opening 4–5 mm wide; flowers yellow-white, about 10–12 mm diam.; disc of the flower with 5 prominent bilobed bosses surrounding the base of the style; style sparsely pubescent 2. *D. vietnamensis*

1. *Diplopanax stachyanthus* Handel-Mazzetti,
Sinensis 3(8): 197–198. 1933. TYPE: China.
Guangxi: Kwangsi, N. Luchen, Miu-shan, Bin-long, 1200 m, 14 June 1928, R. C. Ching 5969
(holotype, LU; isotype, NY).

This species is distributed in southern China (Provinces Hunan, Guangdong, Yunnan, and Guangxi Zhuang Autonomous Region) and northern Vietnam (Provinces Cao Bang and Vinh Phuc). *Diplopanax stachyanthus* grows in wet evergreen broad-leaved montane primary and open secondary forests and shrubs, wood sides, at elevations of 900–1600 m on soils developed predominantly on silicate sands, clay, granite, and rhyolites. It flowers in April–June.

Specimens examined. CHINA. KWANGSI: Shap Man Taai Shan, near Iu Shan village, SE Shang-sze, Kwangtung Border (Shang-sze District), 23 May 1933, W. T. Tsang 22361 (LE). VIETNAM. CAO BANG PROV.: Le A pass at elevation 1600 m a.s.l., 24 Nov. 1976, Khoi, Nhan & Ve 71 (LE). VINH PHUC PROV.: Tam Dao 2, 29 May 1977, T. B. Nguyen 121 (LE).

2. *Diplopanax vietnamensis* Averyanov & T. H. Nguyen, sp. nov. TYPE: Vietnam. Prov. Kontum: cloud evergreen primary forest on N slope of Ngoc Linh mountain system, 2380 m, 9 Mar. 1995, L. Averyanov, N. T. Hiep VH 596¹ (holotype, HN; isotypes, AUU, LE, MO, P). Figure 1.

¹ Index VH (abbreviation of words **Vietnamese Highlands**) is used in the numbering of herbarium collections that were made during fieldwork associated with the U.S. National Geographic Society exploration program “Flora of Highlands of South Viet Nam.”

Inflorescentia brevis, simplex (eramosa), spiciformis, 5–8 cm; inflorescentiae rhachis crassa, basi dense pilosa; flores albido-flavides, magni, 10–12 mm in diametro, discus florum cum 5 crassis excrescentiis; stylus disperse pilosus—species nova a *D. stachyantho* (sola antea cognita species generis) dignoscatur.

Tree 15–25 m tall. *Branchlets* glabrous, apically with numerous spirally arranged leaves appearing verticillate within shortened internodes of the branch. *Leaves* simple, entire, petioled, coriaceous, bright glossy green and shiny, glabrous. *Petioles* 1.5–3 cm long and 2–3 mm thick. *Leaf blade* narrowly obovate, elliptic or oblong-lanceolate, 8–18 cm long, 3–6 cm wide, base narrowly cuneate, apex shortly attenuate and rounded. *Inflorescences* axillary (usually appearing as subterminal or terminal), spike 5–8 cm long, rachis 3–5 mm thick, densely finely pubescent throughout its length with short appressed white hairs. *Flowers* articulated, sessile, actinomorphic, 5-merous, with 5 free petals, 5 calyx teeth, and 10 stamens, 10–12 mm diam., yellow-white, fragrant. *Calyx* broad, with 5-dentate limb about 6 mm diam.; calyx lobes tooth-like, short, with broad base and acute tip. *Petals* rigid to coriaceous, with inflexed tips in bud and in open flowers, ovate with broad base, narrowed toward the acute apex, about 5 mm long, 2.5–3 mm wide, with prominent broad ovate hairy callus at basal half on adaxial surface. *Stamens* shorter than petals, with thick filaments; anthers with 2 longitudinally dehiscent cells. *Ovary* inferior, 1-celled, broadly obovate, about 4 mm long, densely pubescent outside with fine appressed white hairs. *Style* 1, undivided, conical, with broad pubescent base, narrowing toward punctiform stigma, surrounded at the base with 5 thick bilobed glabrous bosses. *Fruits* drupe-like, about 3–4 cm long, 1.6–2 cm wide, with very hard, durable, woody endocarp of pyrene.

The new species differs from *D. stachyanthus* by its short, simple, spike-like inflorescence 5–8 cm long, a densely pubescent basal portion of the inflorescence rachis, large yellow-white flowers about 10–12 mm in diameter, the presence of 5 prominent bosses on the flower disc, and a sparsely pubescent style. *Diplopanax vietnamensis* is known from the mountainous regions of Kon Tum Province in southern Vietnam, where it grows in wet evergreen broad-leaved montane closed primary forests along ridges and on mountain summits at elevations of 1000–2500 m on soils developed predominantly on silicate sandstones, granite, and gneiss. Sometimes this species was observed as a significant

component of the secondary forest stratum. This tree flowers in March–May.

Paratypes. VIETNAM. Prov. Kontum: cloud evergreen primary forest on N slope of Ngoc Linh mountain system at 2400–2450 m, 6 Mar. 1995, L. Averyanov & N. T. Hiep VH 561 (AUU, HN, LE, MO, P); Kon Plong Distr., Hieu Municipality, Mang La forest enterprise (14°39'N, 108°25'E), 15 Apr. 2000, L. Averyanov, P. K. Loc, P. H. Hoang, D. X. Du & N. T. Vinh VH 5111 (AUU, HN, LE, MO).

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