

Studies in Annonaceae. V**Additional notes on *Anaxagorea* A. St. Hil.**

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SUMMARY

After completion of the monograph of *Anaxagorea*, a number of new collections were studied and annotated. Among this material there appeared to be a new species from Venezuela, at the same time the first true rheophyte in Annonaceae. The rare and hitherto incompletely known *A. silvatica* has now turned up from the state of Espirito Santo, Brazil. The flower of this species is described for the first time. New records are mentioned insofar as they add to previously existing information.

ADDITIONS

***Anaxagorea crassipetala* Hemsley, Diagn. plant. nov. mexic. 1: 2. 1878; Maas and Westra, Bot. Jahrb. Syst. 105: 131. 1984.**

Material examined. ECUADOR. Esmeraldas: 2–4 km SE of San Lorenzo, alt. 10 m, 7–17 Aug. 1983, *Boom 2604* fl (NY, U).

BOLIVIA. Pando: Nicolas Suarez, ca. 30 km SW of Cobija, near the villa Marieta (11°11'S, 68°10'W), alt. 250 m, 14 Aug 1982, *Sperling and King 6614* fr (NY, U).

Distribution. Add: Ecuador and Bolivia.

***Anaxagorea rheophytica* Maas and Westra, *sp. nov.* – Type. *W.W. Thomas 3217*. Venezuela. Amazonas: dep. Río Negro, along Río Mawarinuma, at**

* Maas and Westra are responsible for the taxonomy, Koek-Noorman contributed on anatomy.

“Puerto Chimo” camp, ca. 6 km E of Cerro de la Neblina Expedition base camp (0°50' N, 66°07' W), alt. 170 m, 23 Apr 1984, fl, fr (holotype, U; isotype, NY). Figs. 1, 2.

Frutex ad 2 m alta. Folia angustissime elliptica vel angustissime elliptica-ovata, ad 8 cm longa et 0.9 cm lata, costa supra plana vel leviter impressa, venis

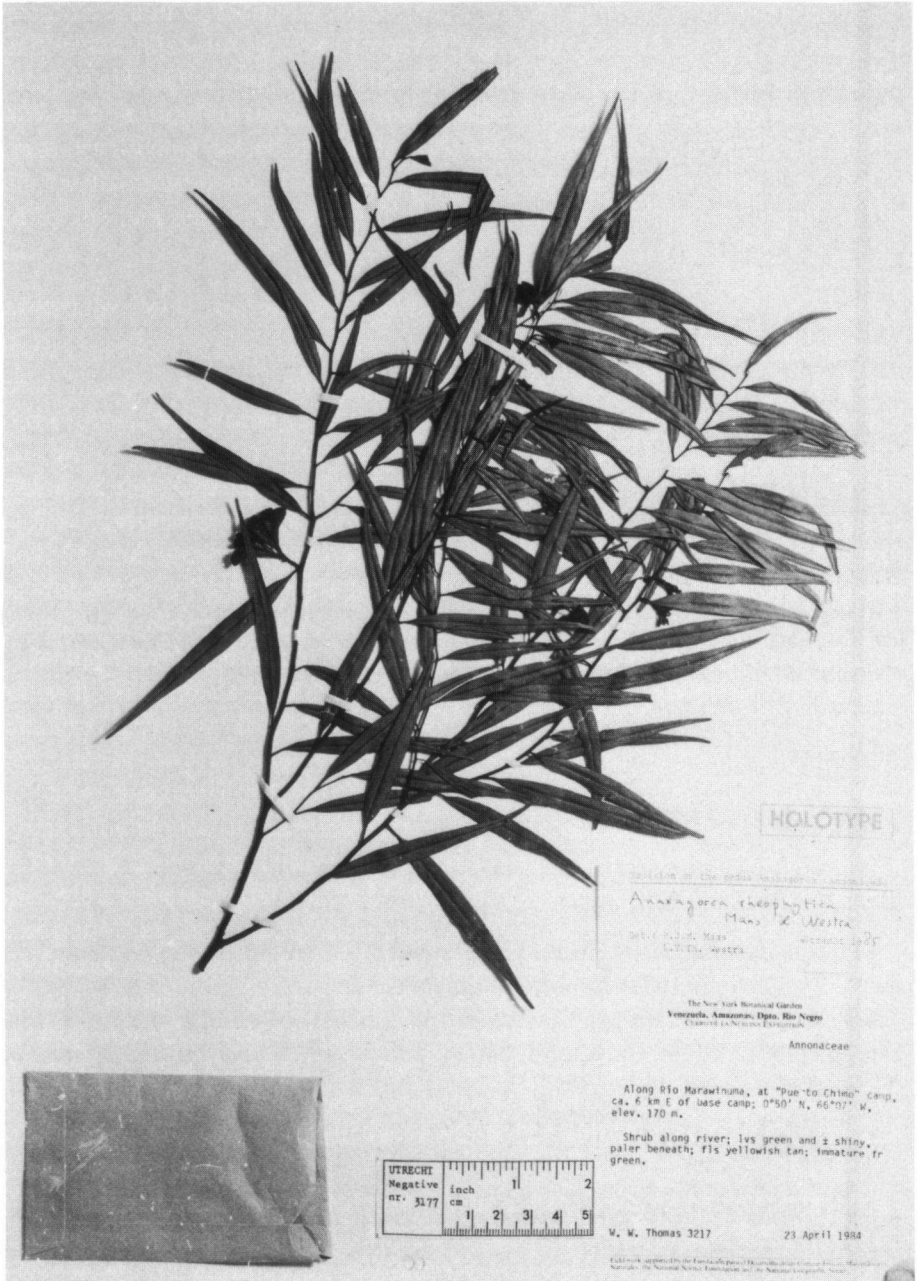


Fig. 1. *Anaxagorea rheophytica*, holotype specimen (W. W. Thomas 3217, U).

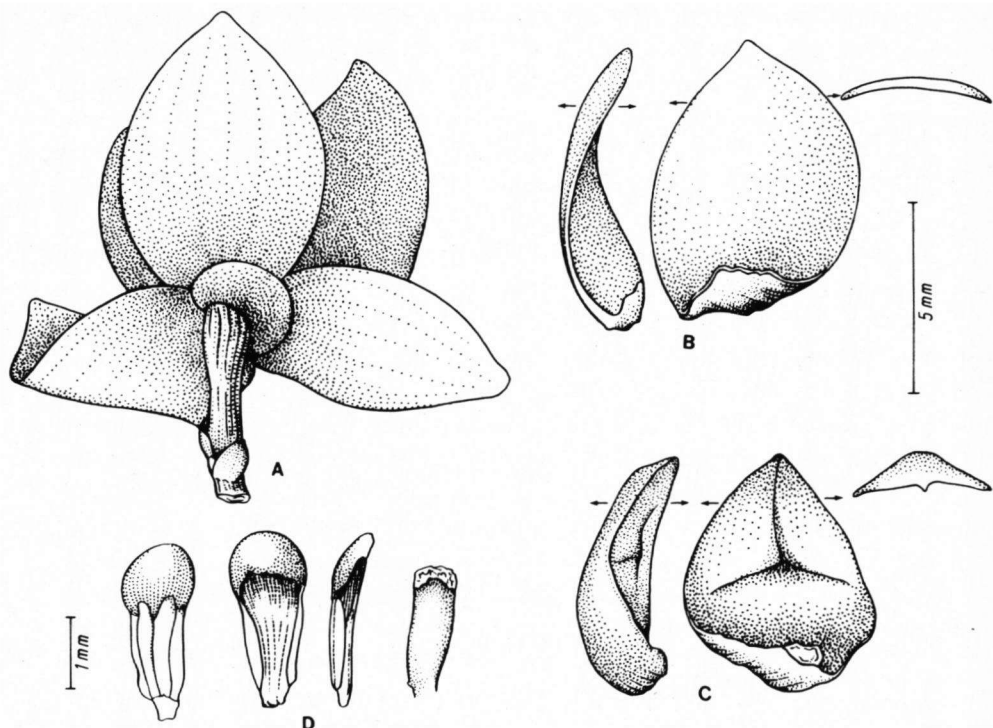


Fig. 2. *Anaxagorea rheophytica* (Liesner 15879, U): A, flower seen from outside; B, (left:) outer petal – lateral view, (middle:) same – adaxial view, (right:) cross section through same as indicated by arrows; C, (left:) inner petal – lateral view, (middle:) same – adaxial view, (right:) cross section through same as indicated by arrows; D, (left:) stamen – abaxial view, (second from left:) same – adaxial view, (second from right:) same – lateral view, (right:) staminode, abaxial view.

secundariis utroque latere c. 7–12 arcubus plerumque distinctis coniunctis.

Inflorescentiae axillares plerumque breviter pedunculatae, uniflorae, pedicellis ad 5 mm longis, bractea supra calice proxima, persistenti.

Sepala libera, elliptica-ovata, 8–10 mm longa et 5–7 mm lata. Petala exteriora elliptica-ovata, 8–10 mm longa et 5–7 mm lata, intus plana. Petala interiora elliptica-ovata, petalis exterioribus paullo minora, intus in parte superiore carinata. Stamina c. 40–50, c. 2.5 mm longa et 1.0 mm lata, thecis connectivo latioribus, appendice connectivi ad 1.0 mm longa, late rotundata. Staminodia c. 15–20, c. 2.0 mm longa et 0.7 mm lata, late rotundata vel truncata, apice glandulosa. Carpella 6–12.

Monocarpia ad 18 mm longa, stipite ad 13 mm longa, rostro brevissimo, seminibus 2 modo generis, ad 7 mm longis et 3 mm latis.

Shrub to 2 m tall. Leafy twigs 0.5–1.5(–2) mm in diam., glabrous. Petioles 2–5 mm long, 0.5–1.0 mm in diam., glabrous. Lamina very narrowly elliptic to very narrowly elliptic-ovate, 5–8 cm long, 0.5–0.9 cm wide, glabrous (to

the naked eye) on both sides, cuneate at the base, decurrent along the petiole, gradually narrowing toward the apex, the apex itself rounded, margin slightly revolute, primary vein flat to slightly impressed on the upper side, secondary veins straight (mostly), to curved or recurved, ca. 7–12 on each side of primary vein, slightly raised on upper side, angles with primary vein ($30^\circ - 40^\circ - 70^\circ - 100^\circ$), loop-forming at obtuse (to right) angles, loops mostly distinct, smallest distance between loops and margin 1 mm.

Indument of vegetative parts consisting of sparse, microscopical simple trichomes.

Inflorescences axillary, mostly short-pedunculate, 1-flowered; peduncle to 1(–2) mm long; pedicels 3–5 mm long, ca. 0.5–0.7 mm thick at the base and 0.7–1.0 mm thick below the flowers; upper bract close to the calyx, with an outer diameter of 2–2.5 mm, persistent. Flower buds ovoid to ellipsoid.

Inflorescence parts sparsely to moderately puberulous with simple trichomes.

Flowers greenish to (yellowish-)tan (*in vivo*). Sepals free, elliptic-ovate, 8–10 mm long, 5–7 mm wide, acute to obtuse, membranaceous, erect. Outer petals elliptic-ovate, 8–10 mm long, 5–7 mm wide, acute to obtuse, inner side flat. Inner petals elliptic-ovate, only slightly smaller than outer petals, acute to obtuse, inner side keeled above the middle. Stamens ca. 40–50, ca. 2.5 mm long, 1.0 mm wide, thecae ca. 1.5 mm long, broader than the connective, apical prolongation of connective 0.7–1.0 mm long, broadly rounded. Staminodes ca. 15–20, ca. 2.0 mm long, 0.7 mm wide, broadly rounded to truncate, with glandular tissue at the apex. Carpels ca. 6–12, 2–2.5 mm long.

Monocarps 15–18 mm long, green (*in vivo*), sparsely puberulous, stipitate part 10–13 mm long, beak ≤ 0.5 mm long. Seeds 7×3 mm.

Specimens examined. VENEZUELA. Amazonas: dep. Río Negro, base of Cerro de la Neblina, along Río Mawarinuma, near “Puerto Chimo” camp ($0^\circ 50' N$, $66^\circ 05' - 08' W$), alt. 190 m, 24 Apr 1984, *Gentry and Stein 46909* fl (MO), alt. 150–180 m, 26 Apr 1984, *Gentry and Stein 46990* fl (MO, U), alt. 150 m, 13 Feb 1984, *Liesner 15879* fl, fl (MO, U).

Distribution. Base of Cerro de la Neblina, Amazonas, Venezuela. Growing as a rheophyte along river.

Discussion. *A. rheophytica* comes closest to *A. angustifolia* Timmerman which occurs slightly more to the south, and it might at first sight be taken for a narrow-leaved form of that species. It differs from it by the much smaller leaves with a midvein which distinctly tends to be flat on the upper side, rather than slightly impressed as in *A. angustifolia*. Also, the venation in *A. rheophytica* has a more “irregular” look than that in *A. angustifolia* due to the tertiary veins being nearly as thick as the secondary veins. Florally, *A. rheophytica* is distinct from *A. angustifolia* by the outer petals which are flat on the inner side, not with a thick keel (it must be remembered, in this context, that the number of stamens and staminodes in *A. angustifolia* has to be established yet).

According to notes on two (out of the four seen) labels (collections by Gentry), this species is rheophytic, which is nicely shown in such features as (a.o.) the very long, narrow leaves, dense branching, near-lack of indument (save for tiny scattered trichomes), axillary flowers more or less hidden among the foliage (Van Steenis 1981). According to Van Steenis, there are no rheophytes proper known in the family. He mentions *Artabotrys harmandii* Finet and Gagnep., *Neostenanthera gabonensis* (Engl. and Diels) Exell (both from Africa), and *Xylopia parviflora* (A. Rich.) Benth. (Asia), but as riparian species rather than rheophytes. The present species, then, should be the first true rheophyte in Annonaceae. This conclusion was confirmed by Van Steenis upon examination of the material (Van Steenis, pers. comm.). For this reason we chose the epithet which, in our opinion, is the most fitting for this new species!

Notes on leaf anatomy of *A. rheophytica*:

The leaf anatomy of *A. rheophytica* fits in with that of the genus as a whole (Koek-Noorman in Maas and Westra 1984; Koek-Noorman and Berendsen 1985). There are no contradictory features. Noteworthy, again, are the peculiar tiny trichomes with their large top-cell. In *A. rheophytica*, only simple trichomes are found (fig. 3).

Looking within the limits of *Anaxagorea*, the leaf anatomy of *A. rheophytica* much resembles that of *A. silvatica* and the Asiatic species, to a lesser extent

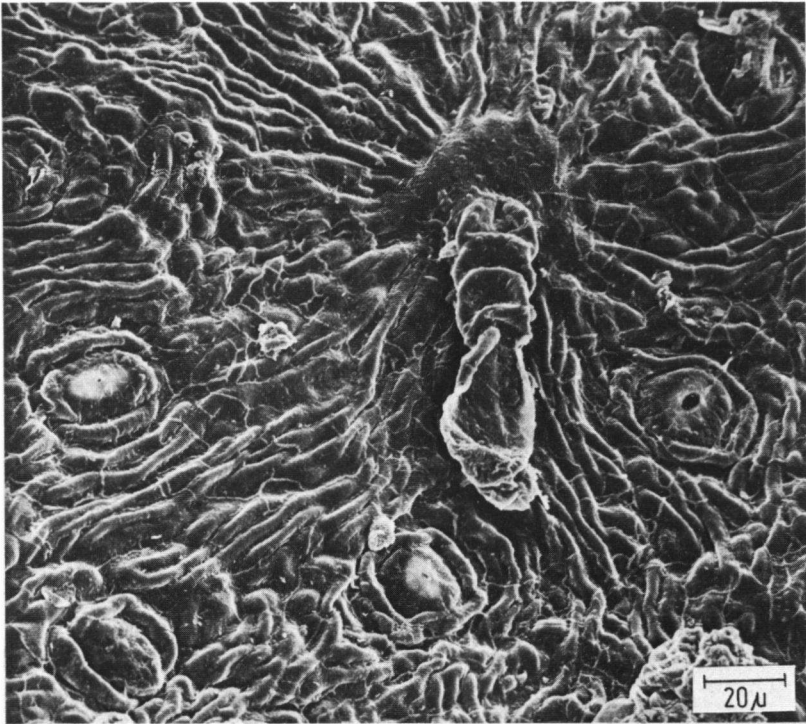


Fig. 3. *Anaxagorea rheophytica* (W.W. Thomas 3217, U): trichome on leaf. SEM photograph by W. Berendsen.

that of *A. prinoides*. This is particularly because of the structure of the primary vein, the lack of (astro)sclereids and druses, and the presence of oil cells in the sponge parenchyma only. Note that in all these character states *A. rheophytica* is distinctly different from *A. angustifolia*!

The cuticle of *A. rheophytica* shows some remarkable features, setting the new species very clearly apart from all other species:

- cuticle 4–8 μm thick, with periclinal ledges almost equalling the height of the epidermal cells;
- presence of trichomes both abaxially and adaxially;
- striations obvious on the abaxial side, weak on the adaxial side;
- stomata with polar T-pieces.

As noted above, only simple trichomes are met with in *A. rheophytica*. This is also the case in *A. angustifolia* and *A. brachycarpa*, and in the Asiatic species.

Anaxagorea rufa Timmerman in Maas, Timmerman and Westra, Proc. Kon. Ned. Akad. Wetensch., C, 87 (3): 301. 1984; Maas and Westra, Bot. Jahrb. Syst. 105: 172. 1985.

We received a fruiting specimen, with monocarps up to 4 cm long (reddish-green *in vivo*), which may well belong to *A. rufa*, but comes from a locality well outside the known area of this species. Without flowers, however, an absolutely certain identification cannot be guaranteed.

Specimen examined. BRAZIL. Pará: km 210 on road from Itaituba to Humaitá (5°10'S, 57°00'W), forest on terra firme, alt. 150 m, 12 Feb 1976, *Bamps 5349* fr (BR).

Anaxagorea silvatica R.E. Fries, Acta Horti Berg. 12 (1): 10. 1934; Maas and Westra, Bot. Jahrb. Syst. 105: 175. 1985. Fig. 4.

Recently, a collection of this rare species with both flowers and fruits was received from the Jardim Botânico, Rio de Janeiro. Two flowers were examined, one (presumably) mature flower (unfortunately damaged by insect eating, most of the inner parts gone), and one still in bud. The following should now be added to the description:

Flowers dimerous, whitish (*in vivo*), with strongly imbricate outer petals. Floral parts puberulous with brownish hairs; margins of sepals and petals ciliolate.

Sepals orbicular to transversely elliptic, 3.5–4.0 mm long, 4.5–5.5 mm wide, thinly coriaceous, laxly appressed to the petals. Outer and inner petals broadly elliptic to orbicular, 8–10 mm long and wide, carnosae, somewhat bowl-shaped, inner side without keel or any other protrusion. Stamens ca. 30–35, 2.5–3.0 mm long, 1 mm wide, filamental part 0.6–0.8 mm long, thecae 1.5–2.0 mm long, not broader than the connective, apical prolongation of connective 0.1–0.3 mm long, broadly rounded to truncate. Staminodes 11

(in the one flower where these could be examined), 2.0–2.5 mm long, 0.6–0.7 mm wide, broadly rounded to truncate, with glandular tissue at the apex. Carpels (ca.) 10 (in the one flower where these could be examined), ca. 2 mm long.

Monocarps in this collection up to 6 in number, otherwise as described.

Specimens examined. BRAZIL. Espírito Santo: Estrada da Colonia, 61 km from Collatina, 16 May 1934, *J.G. Kuhlmann* 317 fl, fr (RB, U).

Distribution. Add: the state of Espírito Santo, Brazil.

Discussion. The flower of *A. silvatica* as now known is remarkable in several features. Most striking is the fact that the perianth is entirely made up of whorls of two, instead of three. Dimerous whorls are also found in the palaeotropical *A. javanica* var. *dipetala*: this strengthens the impression that, somehow, there is a link between *A. silvatica* and *A. javanica* (see also Maas and Westra, *l.c.*), notwithstanding the wide geographical gap between the two species. In *A. javanica* var. *dipetala* there is only one whorl of petals, not two as in *A. silvatica*.

Next, also noteworthy are the outer petals with strikingly imbricating

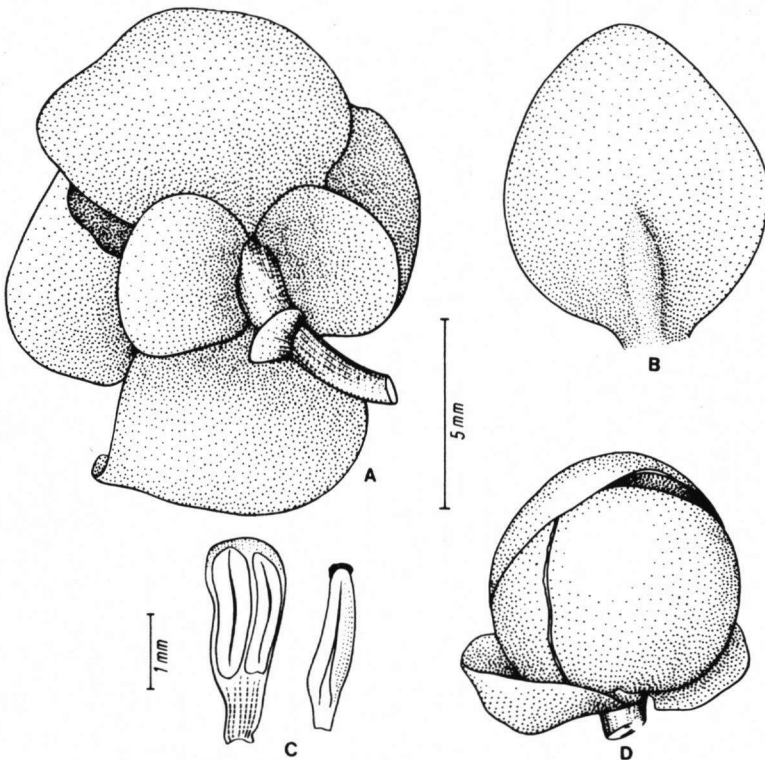


Fig. 4. *Anaxagorea silvatica* (*J.G. Kuhlmann* 317, U): A, flower seen from below; B, outer petal – adaxial view; C, (left:) stamen – abaxial view, (right:) staminode, abaxial view; D, floral bud.

anterior margins. Up till now, petals in *Anaxagorea* were only known to have a valvate aestivation.

The occurrence of staminodes with a glandular top in combination with a fairly low number of stamens also deserves attention. Until now, the presence of such staminodes was found to coincide with a large number of stamens (Maas and Westra 1984), that is to say, 40 and up.

With only this one flowering collection, it is, of course, not possible to say whether dimerous whorls are exceptional in this species (as they are, in fact, in *A. javanica*) or regular. The imbricate aestivation may or may not have a connection with the number of elements per whorl: this also needs confirmation by more collections.

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