
Studies in Annonaceae. I

New species in *Anaxagorea* A. St. Hil. from the Neotropics

by P.J.M. Maas, A. Timmerman and L.Y.Th. Westra

Institute of Systematic Botany, Utrecht, the Netherlands

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SUMMARY

Five new species, all from tropical South America, are described. This is a precursor to a worldwide revision of *Anaxagorea* scheduled for publication in 1985.

INTRODUCTION

The present publication is the first of a forthcoming series of papers on *Annonaceae*. Studies on *Annonaceae* are carried out within the framework of the *Project Systematics of Annonaceae*. This project is a joint venture of several institutions. It has its center in the Institute of Systematic Botany, State University, Utrecht. Full information on this project may be found in a recent paper by P.J.M. Maas (1983).

The genus *Anaxagorea*, with representatives both in the Neotropics and in Asia, is characterized in particular by an apocarpous gynoeceium producing usually several dolabriform to clavate monocarps which dehisce in much the same way as pods of leguminous plants. Each monocarp contains two basal closely appressed shiny black seeds which, according to field observations by collectors (pers. comm.), are ejected over some distance upon dehiscence. The inflorescences are of the rhipidium-type, mostly of limited growth, and producing one flower at the time. There are, however, exceptions where inflorescences may continue to grow for some time and produce a number of flowers in succession. This is particularly the case in *A. floribunda* Timmerman which is newly described here. The pedicels are thickened towards the flower to a greater or lesser extent in all species, carrying an amplexicaul or almost amplexicaul upper

bract usually in the distal half. The flowers are usually fleshy, mostly not opening widely; the stamens and carpels remain enclosed at least in most species within a cavity formed by the hollow lower parts of the enveloping petals. *Anaxagorea* is probably most closely related to the large pantropical genus *Xylopia* L.

Work on the neotropical species of *Anaxagorea* was started by the second author in partial fulfillment of the requirements to obtain his MSc degree in Biology. His investigations revealed the existence of five undescribed species in tropical South America, which are published in the present paper. This paper will be followed by a worldwide revision of *Anaxagorea* scheduled for publication in early 1985.

DESCRIPTIONS

Anaxagorea angustifolia Timmerman, *sp. nov.*

Frutex vel arbor usque ad 7 m alta. Ramuli novelli 0.5–2.5 mm in diametro, sparsim puberuli mox glabrescentes. Petioli 3–6 mm longi, 1–1.5 mm in diametro, sparsim puberuli mox glabrescentes. Lamina anguste elliptica, 6–16 cm longa et 1.5–3.5 cm lata, basi acuta et in petiolum leviter decurrens, apice acuta vel acuminata, margine leviter revoluta, sparsim atrorubro-puberula, costa supra leviter impressa, venis secundariis rectis utrinque circ. 9–16 supra leviter elevatis e costa sub angulo ad 80° exeuntibus et arcibus plusminusve indistinctis 2–4 mm intra marginem sub angulo acuto vel recto coniunctis.

Inflorescentiae axillares, breviter pedunculatae vel fere sessiles, plerumque flore singulo coetaneo; pedunculus (sive rhachis sympodialis) usque ad 2 mm longus; pedicelli 3–4.5 mm longi, diametro basi circ. 1 mm et sub flore 1.5–2 mm; bractea supera calyci proxima vel ab eo ad 2 mm remota, diametro exteriori 2–3 mm, persistens. Alabastra ovoidea vel ellipsoidea. Flores flavi (in vivo).

Indumentum florale: pedicelli dense ad sparsim rubro- vel atrato-puberuli; sepala apice marginibusque pilis paucis, ceterum glabra; petala extus sparsim cremeo-puberula, intus glabra; monocarpia glabra.

Sepala libera, ovata, 8.5–9 mm longa et 5.5–6.5 mm lata, obtusa, membranacea, erecta. Petala exteriora anguste elliptica, 10–11 mm longa et 2.5–4 mm lata, obtusa, intus supra tertiam partem basalem carinata carina basi 1.5 mm lata, crassitudine carina inclusa circ. 2.5 mm. Petala interiora anguste ovata ad anguste elliptica, 8–10.5 mm longa et 1.5–3.1 mm lata, acuta, intus supra medium vel tertiam partem basalem leviter carinata vel tantummodo bifacialia, crassitudine carina inclusa circ. 2 mm. Stamina (staminum numerus ignotus) 1.8–2.2 mm longa et 0.7–0.8 mm lata, thecis 1.1–1.7 mm longis connectivo latioribus, appendice connectivi 0.2–0.3 mm longa et 0.8–0.9 mm lata, truncata. Staminodia (staminodiorum numerus ignotus) anguste obovata, circ. 2 mm longa et 0.8 mm lata, retusa apice utroque latere glandulosa. Monocarpia 22–23 mm longa, flava ad rubra (in vivo), stipite circ. 13 mm longo, rostro 1–1.5 mm longo. Semina matura non visa.

Type. *Fróes* 22217. Brazil. Amazonas: Rio Negro, Piraiuari, Içana, 24 Apr 1947, fr (holotype, U).

Other specimens examined. BRAZIL. Amazonas: Upper Rio Negro, Cucui, 30 Apr 1975, *Cavalcante 3060* fr (INPA, MG); Rio Vaupés, Trovão, 6 Nov 1947, *Pires 856* fl, fr (INPA, NY).

A. angustifolia is clearly distinct from other small-leaved species (*A. brevipedicellata* Timmerman, *A. pachypetala* (Diels) R.E. Fries, *A. panamensis* Standley, *A. prinoides* (Dunal) A. DC.) by its comparatively narrow leaves with usually more secondary veins, conspicuously keeled outer petals, and very short (less than 2.5 mm) stamens.

Anaxagorea brevipedicellata* Timmerman, *sp. nov.

Frutex vel arbor usque ad 3(-15) m alta. Ramuli novelli 0.5-3.5 mm in diametro, rufo-puberuli mox glabrescentes. Petioli 2-8 mm longi, 1-2 mm in diametro, indumento ut in ramulis novellis. Lamina (anguste) elliptica, (5-)8-15(-19) mm longa et 2-6 mm lata, basi acuta vel obtusa (rotundata), apice acuminata vel obtusa, sparsim rufo-puberula, costa supra impressa, venis secundariis rectis vel curvatis utrinque circ. 6-12 supra leviter impressis e costa sub angulo ad 70° exeuntibus et arcibus plusminusve indistinctis 2-6 mm intra marginem sub angulo obtuso coniunctis.

Inflorescentiae in ramulis vetustioribus (axillares) fasciculis similes, sessiles vel basi brevi incrassata insertae vel ad 13 mm longe pedunculatae (sive rhachide sympodiali suffultae); pedicelli 1.5-3.5 mm longi diametro basi 0.5-1 mm et sub flore 1-1.5 mm; bractea supera calyci proxima vel ab eo ad 1.5 mm remota, apiculata, diametro exteriore 1-2.5 mm, persistens. Alabastra ovoidea, acuminata, fusca (in vivo).

Indumentum florale: pedicelli dense rufo-puberuli mox glabrescentes: sepala extus sparsim rufo-puberula, intus pilis nonnullis prope apicem pilis stellatis adjectis; petala et monocarpia glabra.

Sepala basi connata, ovata vel anguste ovata, 2-6.5 mm longa et 1.5-3.3 mm lata, acuminata, apice mox reflexa, persistentia. Petala exteriora ovata (vel anguste ovata), 5-10 mm longa et 2-4 mm lata, apice longe acuminata et leviter recurvata, intus interdum supra medium carinata. Petala interiora obovata vel elliptica, 4.5-5.5 mm longa et 2.3-4 mm lata, acuminata vel obtusa, intus supra medium bifacialia vel carinata. Stamina circ. 10-11, 1.7-3.5 mm longa et 0.6-1.2 mm lata, thecis 0.9-2.7 mm longis connectivo latioribus, connectivi appendice 0.2-0.5 mm longa et 0.4-0.6 mm lata, acuta, obtusa vel rotundata. Staminodia desunt. Carpella circ. 10-20, 1.5-2 mm longa, rubella (in vivo). Monocarpia 20-25 mm longa, rubella (in vivo), stipite 13-16 mm longo, rostro 0.5-0.7 mm longo interdum caduco. Semina circ. 9 mm longa.

Type. *Campbell et al. P 22258*. Brazil. Pará: Rio Trombetas, km 54 on access road from Cachoeira Porteira to Perimetral do Norte, 24 May 1974, fl (holotype, INPA; isotypes, NY, U).

Other specimens examined. GUYANE FRANÇAISE. Chemin de Emerillon km 10.6, bank of Crique Tamouri, 26 Feb 1974, *Lescure 214* fr (CAY); left bank of Fleuve Grand Inini on Saut Emerillon, 25 Aug 1970, *Oldeman B 3553* fl (CAY); left bank of Crique Saï (affluent of Fleuve Grand Inini) a little

upstream from mouth, 26 Aug 1970, *de Granville* 632 fl (CAY); left bank of Fleuve Ouaiqui, 5 Jul 1973, *de Granville* 1705 fl (CAY), 9 Jul 1973, *de Granville* B 4919 fl (CAY).

BRAZIL. Pará: Rio Mapurea 1–2 km upstream from Rio Trombetas, 29 May 1974, *Campbell et al.* P 22403 fl (U); BR 165, Cuiabá-Santarém Highway km 1305, vicinity of Igarapé José Prêto, 23 Nov 1977, *Prance et al.* P 25691 fr (U).

The small number of stamens and the lack of staminodes are particularly noteworthy features of *A. brevipedicellata*. This species resembles *A. prinoides* (Dunal) A. DC. both in the vegetative parts and in the fruits. It is clearly distinguished from the latter by the shorter pedicels, acuminate sepals, acuminate outer petals, as well as by the lack of staminodes already mentioned.

Anaxagorea floribunda* Timmerman, *sp. nov.

Frutex circ. 1 m altus. Petioli 7 mm longi, 3.5–4 mm in diametro. Lamina anguste elliptica, 15–30 cm longa et (4.5–)5–9.5 cm lata, basim versus cuneata vel rotundata, basi ipsa manifeste inaequalis, apice acuminata, summo apice obtusa, sparsim ferrugineo-puberula, costa supra impressa, venis secundariis utrinque circ. (9–)11–14 supra leviter impressis e costa sub angulo ad 70° exeuntibus et arcibus distinctis 4–11 mm intra marginem sub angulo recto coniunctis.

Inflorescentiae ut videtur cauliflorae e basi trunci exeuntes prostratae flagelliformes, circ. 20 cm vel ultra longae, flores multos succedaneos in rhipidiis paniculatim dispositis efferentes; pedicelli 3.5–6.5 mm longi, diametro basi 0.5–1.5 mm et sub flore 1–2 mm; bractea supera calyci proxima vel ab eo ad 2.5 mm remota, diametro exteriore 2–2.5 mm. Alabastra ovoidea. Flores rubri (in vivo).

Indumentum florale: pedicelli sicut sepala petalaeque subglabri.

Sepala basi connata, ovata, 5–6.1 mm longa et 2.5–3 mm lata, acuminata, subchartacea, apice reflexa, persistentia. Petala exteriora ovata vel anguste ovata, 3–4.5 mm longa et 1.3–1.9 mm lata, acuminata. Petala interiora ovata, 2.5–4.2 mm longa et 1.3–2 mm lata, acuminata, intus supra medium carinata. Stamina circ. 10, 1.3–3 mm longa et 0.4–0.6 mm lata, thecis (0.6–)0.9–2 mm longis connectivo latioribus, connectivi appendice 0.3–0.5 mm longa et totidem lata, rotundata. Staminodia circ. 5, 1.4–2 mm longa. Monocarpia circ. 30 mm longa, apice obtuse conico (rostrum proprio caduco?).

Type. *Klug* 33. Peru. Loreto: Mishuyacu near Iquitos, Oct–Nov 1929, fl (holotype, NY).

Other specimen examined. PERU. Loreto: Maynas, Quebrada Sucusari, Llachapa camp of Explorama, N side of Río Napo below Mazan, 7 Nov 1979, *Gentry et al.* 27626 fr (MO).

The size of the inflorescence of this species is unusual in *Anaxagorea*. It is the only species in this genus as far as known showing flagelliflory. A similar mode of flowering is also found in some species of *Duguetia* A. St. Hil. (sect. *Geanthemum* R. E. Fries), which is quite interesting. *A. floribunda* is further characterized by the manifestly asymmetrical leaf base.

The measurements of the floral parts given in the above description are approximations, since it was hard to determine whether the largest (but still closed!) flowers on the type sheet were truly mature or not.

Anaxagorea manausensis Timmerman, *sp. nov.*

Frutex vel arbor usque ad 6 m alta. Ramuli hornotini 1–3 mm in diametro, fusco-puberuli. Petioli 4–9 mm longi et 1–2 mm lati indumento ut in ramulis. Lamina anguste elliptica, 8–17 cm longa et 2–5 cm lata, basi obtusa vel acuta, leviter decurrens in petiolum, apice longe acuminata, fusco puberula, costa supra impressa, venis secundariis rectis utrinque circ. 8–14 supra leviter impressis e costa sub angulo ad 75° exeuntibus et arcubus distinctis 3–5 mm intra marginem sub angulo recto coniunctis.

Inflorescentiae axillares ramulis vetustioribus gestae vel cauliflorae, breviter pedunculatae vel fere sessiles, plerumque flore singulo coaetaneo; pedunculus (sive rhachis sympodialis) usque ad 8 mm longus; pedicelli 10–19 mm longi, diametro basi 1–1.5 mm et sub flore 2.5–3 mm; bractea supera a calyce 3–9 mm remota, diametro exteriori 2 mm. Alabastra globosa. Flores castanei vel sepalis brunneis et petalis cremosis (in vivo).

Indumentum florale: pedicelli dense fusco-puberuli demum glabrescentes; sepala petalaeque extus dense fusco-puberula, intus glabra pilis nonnullis albidis solum in zona mediana faciei interioris petalorum exteriorum exceptis.

Sepala libera, late ad depresso ovata, 3.5–4 mm longa et 4 mm lata, rotundata, erecta, ante anthesim caduca. Petala exteriora elliptica, 8–9.5 mm longa et 5.5–7 mm lata, obtusa. Petala interiora obovata vel late obovata, 6.5–7.5 mm longa et 4.5–6 mm lata, intus supra medium carinata, crassitudine carina inclusa circ. 3 mm. Stamina circ. 25, 3.5–5 mm longa et 1.2–1.5 mm lata, thecis 2–3 mm longis connectivo non latioribus, connectivi appendice 0.4–0.7 mm longa et 0.9–1.3 mm lata, truncata. Staminodia circ. 10, anguste oblonga vel anguste obovata, 3–4 mm longa et 0.8–1.1 mm lata, truncata vel rotundata. Carpella circ. 20–30, circ. 3 mm longa. Fructus ignotus.

Type. *Prance et al. 14745*. Brazil. Amazonas: vicinity of Manaus, Reserva Florestal Ducke, 14 Sep 1971, fl (holotype, INPA; isotype, VEN).

Other specimen examined. BRAZIL. Amazonas: *ibidem*, 3 Oct 1957, *Ferreira 136/57* fl (INPA, MG, S).

A. manausensis should be placed within the alliance of *A. dolichocarpa* Sprague et Sandw. It is distinct from *A. dolichocarpa* and related species by the rather small leaves which are beset with minute dark brown stellate scales. The very small size of the upper bract, with an outer diameter not (or hardly) exceeding 2 mm, is also noteworthy.

Anaxagorea rufa Timmerman, *sp. nov.*

Frutex vel arbor usque ad 5(–10) m alta. Ramuli hornotini 2–12 mm in diametro, atropurpureo-puberuli deinde glabrescentes. Petioli 8–26 mm longi, 2.5–9.5 mm in diametro, indumento ut in ramulis. Lamina anguste elliptica vel (ob)ovata, (15–)20–48 cm longa et 5–15 cm lata, basi acuta vel rotundata inter-

dum leviter inaequalis, apice acuminata vel acuta, margine saepe leviter revoluta, atropurpureo-puberula raro glabrescens, costa supra plana vel leviter elevata, venis secundariis marginem saltem versus curvatis utrinque circ. 11–20 supra leviter elevatis e costa sub angulo ad 60° exeuntibus et arcubus plerumque indistinctis solum apicem versus plusminusve distinctis 2–8 mm intra marginem sub angulo acuto coniunctis.

Inflorescentiae axillares (plerumque) ramulis vetustioribus gestae, pedunculatae vel fere sessiles, plerumque flore singulo coetaneo; pedunculus (sive rhachis sympodialis) usque ad 5(–10) mm longus, pedicelli 3–8.5 mm longi diametro basi 2–3 mm et sub flore 3.5–5 mm; bractea supera calyci proxima vel ab eo ad 3.5 mm remota, diametro exteriori 7.5–10 mm, ante anthesim caduca. Alabastra globosa vel ovoidea, brunnea (in vivo). Flores extus brunnescentes, virescentes, virescenticremosi vel flavescentes, intus albi (in vivo).

Indumentum florale: pedicelli sicut facies exterior sepalorum petalorumque et etiam monocarpia dense rufo-puberuli; facies interior sepalorum petalorumque sparsim brunnescenti- vel croceo-puberula.

Sepala libera, ovata vel late ovata, 7.5–14.5 mm longa et 6–10.5 mm lata, obtusa vel lata rotundata, erecta, rigida. Petala exteriora ovata, 10–18.5 mm longa et (4.3–)6–7.5 mm lata, obtusa vel rotundata, marginibus involutis, intus supra medium carinata carina basi circ. 1 mm lata et usque ad 1.5–2 mm alta, crassitudine carina inclusa 2.3–5 mm. Petala interiora ovata, 9.5–16.5 mm longa et (3.5–)5–7 mm lata, rotundata, marginibus involutis, intus supra medium carinata, crassitudine carina inclusa 3.2–4.5 mm. Stamina circ. 125, 3.6–5 mm longa et 0.6–1.1 mm lata, thecis 1.5–3.5 mm longis connectivo latioribus, connectivi appendice 0.5–0.9 mm longa et 0.8–1.1 mm lata, rotundata vel truncata. Staminodia circ. 30, anguste obovata, 4.1–6 mm longa et 0.8–3 mm lata, rotundata apice glandulosa. Carpella circ. 10–20, 4–4.5 mm longa. Monocarpia 25–32 mm longa, albida, flava vel vinacea (in vivo), stipite 14–22 mm longo, rostro (0.6–)1.5–2.2 mm longo interdum caduco. Semina 14–15.5 mm longa et 7.5–8 mm lata.

Type. *Schultes & Cabrera 14464*. Colombia. Vaupés: Río Kananarí (affluent of Río Apaporis), Cerro Isibukurí, 28 Oct 1951, fl (holotype, U; isotypes, GH, S, US).

Other specimens examined. COLOMBIA. Vaupés: Yuruparí, 24 Sep 1939, *Cuatrecasas 6990* fl (US); Río Apaporis between Río Kananari and Río Pacoa, 1–15 Dec 1951, *García Barriga 13925* fl (US); Río Apaporis, Cach. Jirijirimo, 12 Aug 1951, *Schultes & Cabrera 13522* fl (US); Río Kananarí, Cerro Isibukurí, 4 Dec 1951, *Schultes & Cabrera 14745* fr (GH); Río Apaporis, Soratama (above mouth of Río Kananari), 6 Feb 1952, *Schultes & Cabrera 15171* fr (US); Río Kuduyarí (trib. of Río Vaupés), 16 Oct 1952, *Schultes & Cabrera 17870* fl (US).

VENEZUELA. Amazonas: Río Casiquiare, environment of Yavita, 6–19 Jul 1969, *Bunting et al. 3773* fr (NY); road from San Fernando de Atabapo to Santa Barbara 12–40 km from San Fernando, 24 Mar 1974, *Gentry & Tillett 10883* fl (MO); Río Orinoco below San Fernando de Atabapo, 26 Mar 1974, *Gentry et al. 10956* fl (MO); San Carlos de Río Negro, 21 Nov 1977, *Liesner 3723* fl,

fr juv (MO), 24 Nov 1977, *Liesner 3793* fl (MO), 4 Mar 1942, *Ll. Williams 14620* fr (F, G, S, US, VEN); Cerro Yapacana, 3 May 1970, *Steyermark & Bunting 103034* fr (US, VEN); forest of Yavita, 24 Jan 1942, *Ll. Williams 13957* fr (F, G, IJ, NY, US, VEN).

BRAZIL. Amazonas: Río Negro, Ilha das Flores, 18 Feb 1959, *Cavalcante 641* fr (MG), 17 Feb 1959, *W. Rodrigues 928* fr (INPA, S), Feb 1959, *W. Rodrigues 1000* fr (INPA); Río Curicuriary (affluent of Upper Río Negro), 28 Feb 1936, *Ducke RB 29012* fr (S); Salto de Huá, Río Maturacá, 21–26 Nov 1930, *Holt & Blake 469* st (US); Río Vaupés, Taraguá, 9 Nov 1949, *Pires 937* (S).

A distinctive species the relationship of which is within the alliance of *A. dolichocarpa* Sprague et Sandw. It may be recognized a.o. by the comparatively broad midrib which is often slightly raised on the upper side in the basal half of the lamina, and by the large size of the upper bract (which drops during flowering). The hairs on vegetative parts and outer side of sepals and petals have a very dark purplish-red colour not found in other species of *Anaxagorea*, where the hairs, if at all, are merely brown-coloured at most.

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