**Part XXIX**

# A taxonomic revision of the genus Tabernanthe and a study of wood anatomy of T. iboga

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## Summary

The taxonomy of the genus *Tabernanthe* (Apocynaceae) has been revised. Two species are recognised, *T. elliptica*and *T. iboga*. Both occur in Africa.

The secondary xylem of *Tabernanthe iboga* is described. A comparison has been made with a representative of the closely related genus *Tabernaemontana*. On wood anatomical grounds the relationship seems justified.

## Introduction

The present publication is a revision of the genus *Tabernanthe* based on herbarium material and living plants grown in the greenhouse at Wageningen. The paragraph on wood anatomy (secondary xylem) is based on fresh material and specimens fixed in FAA and preserved in alcohol.

The second author contributed the text on *T. elliptica* and supervised the other taxonomical parts of the study.

The genus is exclusively African and counts two species. It is closely allied to *Tabernaemontana* from which it is distinguished mainly by presence of the disk and the in bud not inflexed corolla lobes.

## History of the genus

*Tabernanthe* was described by H. Baillon in 1889 with a single species: *Tabernanthe iboga*. He undoubtedly named it after *Tabernaemontana* because of the relationship and similarity to that genus. The epithet *iboga* is a vernacular name in Gabon, near Cap Lopez, where M. Griffon du Bellay found the type specimen. Since 1889, six more taxa were described, all directly as species of *Tabernanthe*.

J. Braun & K. Schumann described another genus in the same year, i.e. *Iboga*, again named after the same vernacular name. Its only species, *Iboga vateriana*, was named after the Director of the Berlin Bot. Garden, W. Vater. In Engler & Prantl, Natürl. Pflanzenfam. 4(2) 1895, K. Schumann himself stated that Baillon and he indeed described the genus at the same time, but that his work was delayed and priority was for Baillon's publication.

## Genus diagnosis

**Tabernanthe** Baill., Bull. Soc. Linn. Paris, 1: 782. 1889; Stapf in Fl. Trop. Afr. 4(1): 122. 1902; Leeuwenberg, Agric. Univ. Wageningen Papers 87-5: 1,13. 1988.

Type species: *Tabernanthe iboga* Baill.

Heterotypic synonyms: *Iboga* J. Br. & K. Schum., in Danckelmann, Mitth. Deutsch. Schutzgeb. 2: 172. 1889. Type species: *I. vateriana* J. Br. & K. Schum. (= *T. iboga* Baill.).

*Daturicarpa* Stapf, Kew Bull. 1921: 170, fig.2. 1921. Type species: *D. elliptica* Stapf (= *T. elliptica* (Stapf) Leeuwenberg).

Small tree or shrub with white latex; bark shallowly longitudinally fissured. Branches with concolourous lenticels, with conspicuous leaf scars, dichotomously branched and just above branching with two inflorescences; branchlets terete, often sulcate and angular when dried. *Leaves* opposite, petiolate or subsessile, those of a pair equal to unequal; petiole caniculate above, those of a pair connate into a short ocrea (not widened into intrapetiolar stipules); blade herbaceous when fresh, membranaceous when dried, entire. *Inflorescences* two together just above each ramification, pedunculate, irregularly corymbose; pedicels slender; bracts sepal-like. *Sepals* pale green, erect, imbricate in bud, entire. *Corolla* white, creamy or pale yellow, thin; tube not twisted; lobes in bud overlapping to the left, not inflexed, entire, spreading. *Stamens* included; anthers narrowly triangular, acuminate at the sterile apex, sagittate and fertile at the base, introrse, dehiscent throughout with longitudinal slits. *Pistil* glabrous; ovary abruptly narrowed into the style, composed of two carpels and surrounded by a disk; style cylindrical; pistil head composed of a basal ring, probably the receptive belt or stigma, a subglobose or obcampanulate central part with 5 lateral grooves, and two slender apical lobes; style and stigma persistent when the corolla is shed. *Fruit* pendulous, composed of two united or free carpels. Aril pulpy, white, enveloping the seed. *Seed* dark brown, obliquelly ellipsoid, with a deep groove to halfway at the hilar side, brain-like deeply indented all over, papillose, smooth; endosperm copious, starchy, ruminate, yellowish, enveloping the embryo; embryo almost straight, spathulate; cotyledons rounded at the apex.

## Key to the species

Carpels fused; fruit smooth or bumpy; corolla tube usually with purple or violet dots in 5 groups in the throat; 7-20 pairs of secondary leaf veins, some sepals slightly spreading in dried flowers . . . . . 2. **Tabernanthe iboga**

Carpels almost free, only connected by the disk and the style; fruit of 2 separate mericarps bearing blunt soft prickles; 4-7 pairs of secondary leaf veins; sepals closely clasping the corolla base in dried flowers . . . 1. **Tabernanthe elliptica**

1. **Tabernanthe elliptica** (Stapf) Leeuwenberg, Agric. Univ. Wageningen Papers 87-5: 1,13. 1988. **Fig. 1; Map 1**

Basionym: *Daturicarpa elliptica* Stapf, Kew Bull. 1921: 170, fig. 2. 1921; Hürlimann, Ber. Schw. Bot. Ges. 67: 487-505. 1957.

Type: Zaïre: Orientale: between Lubutu and Kirundu, Bequaert 6843 (BR lecto-, designated here).

Heterotypic synonyms: *D. lanceolata* Stapf, l.c. and fig. 1. Type: Zaïre: Orientale: Kisangani, Tshopo R. bank, Bequaert 7058 (BR holo-).

*D. firmula* Stapf, l.c.. Type: Zaïre: Equateur: Moma, Jespersen Oct. 1910 (BR holo-).

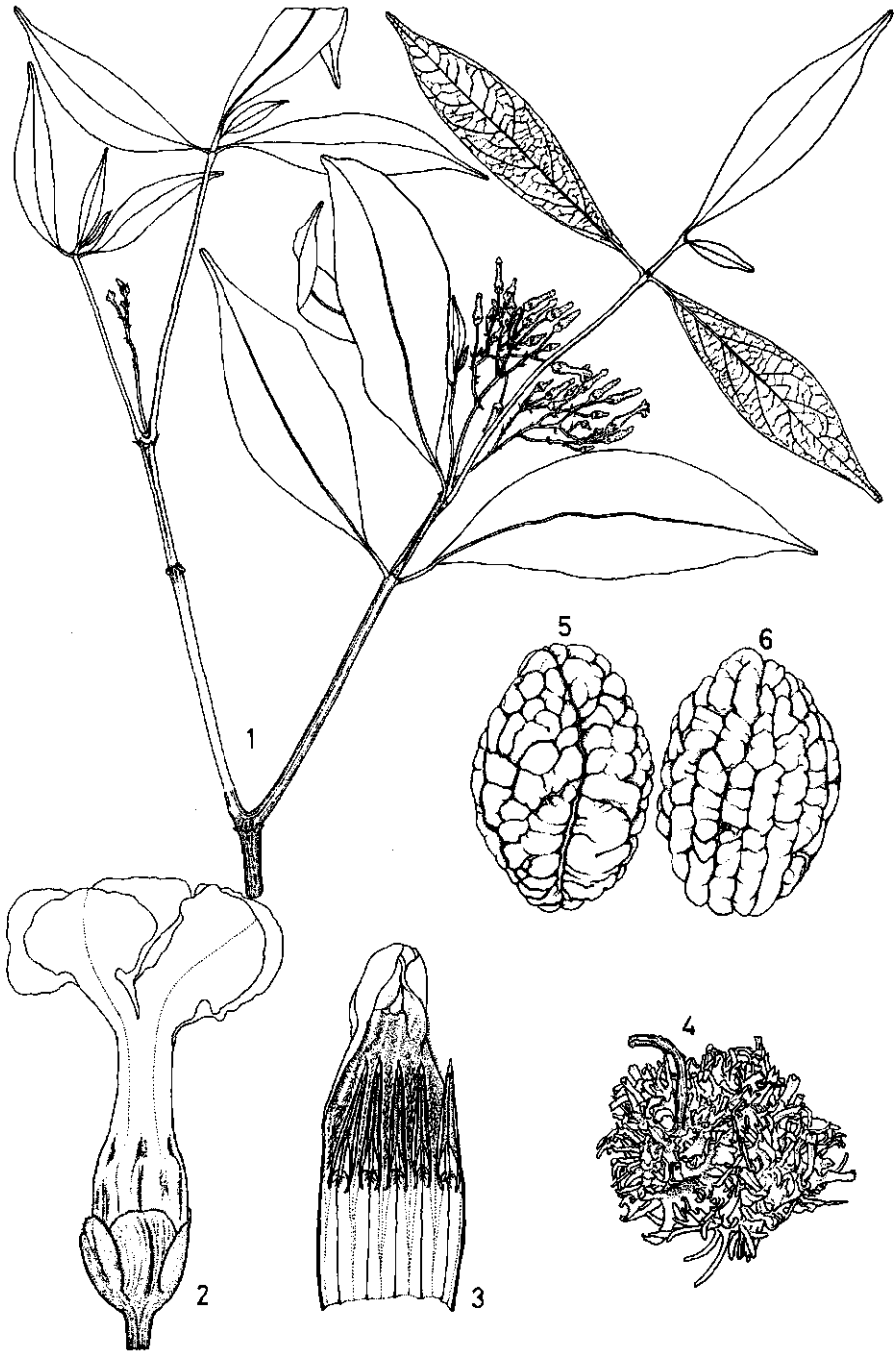
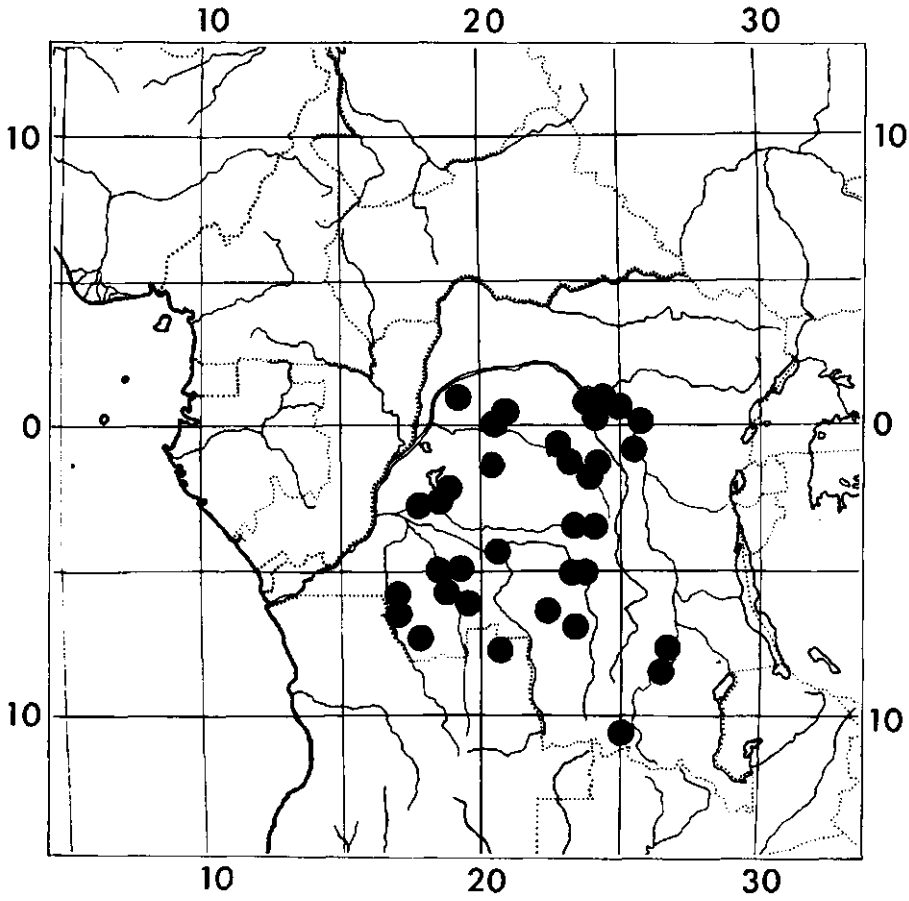



Figure 1. *Tabernanthe elliptica* 1, flowering branch (× 2/3); 2, flower (× 6); 3, opened corolla (× 6); 4, fruit (× 2/3); 5, seed, hilar side (× 4); 6, seed, back side (× 4). 1-3 from Lebrun 6254; 4 from Bamps 8199; 5-6 from Anonym. (1-3 herb. mat.; 4-6 alc. mat.).

Shrub 0.5-2 m high, with little latex. Trunk 1-3 cm in diameter; bark pale brown, lenticellate. Branches pale brown; branchlets glabrous. *Leaves* petiolate; petiole glabrous, 2-12 mm long, with 1-2 rows of colleters in the axils; blade elliptic or narrowly elliptic, 2-4 × as long as wide, 6-20 × 1.5-10 cm, acuminate or caudate at the apex, cuneate at the base or decurrent into the petiole, glabrous on both sides, sometimes with scattered small black dots beneath, with 4-7 pairs of upcurved distant secondary veins; tertiary venation rather inconspicuous, slightly reticulate. *Inflorescence* 1.5-5 × 1.5-3 cm, few-flowered, rather lax. Peduncle slender, glabrous, 5-15 mm long; pedicels glabrous, 2-12 mm long. Bracts deciduous. *Sepals* connate at the base for 0.3-0.5 mm, ovate or broadly ovate, 1-2 × as long as wide, (0.8)2-3(4) × 1-2 mm, acute to rounded or sometimes acuminate at the apex, glabrous or sometimes papillose on both sides, minutely ciliate, especially at the apex or not, inside with 2-6 colleters, usually in the middle, but sometimes only near the edges or in an interrupted row. *Corolla*: (tube orange, limb creamy, throat with 5 pink stripes at the base, teste Louis 14081), thin, in the mature bud forming a comparatively small ovoid head being about 1/3 of the whole length, head slightly wider than the tube apex, but narrower than the tube base (obtuse at apex), glabrous or minutely papillose on base of lobes outside, inside with densely pubescent 2 mm long stripes of hairs pointing downwards among the anthers; tube 2-5 × as long as the calyx, 1.2-2.5(3) × as long as the lobes, (3)5-8 mm long, almost ovoid, at the base 2-3 mm and below the mouth 1-1.5 mm wide; lobes obliquely obovate or nearly so, 0.5-0.8 × as long as the tube, 1.3-1.4 × as long as wide, 2.5-4 × 1.5-3 mm, not undulate. *Stamens* 0-1 mm included, inserted 0.2-0.5 of the length from the base of the corolla tube, (at 1-3 mm); anthers sessile, 2.5-3.2 × as long as wide, 3-3.2 × 1-1.2 mm, with apex for 0.1-0.2 mm sterile, glabrous. *Pistil* 3.5-5 mm long, with apex about halfway the anthers; ovary subglobose or broadly ovoid, 1-1.5 × 1-1.5 × 1-1.5 mm, composed of 2 separate carpels; disk entire, united with the distal sides of the ovary, up to half its length; style 1.5-2.5 mm long, not very thin, about 0.2 mm thick, cleft at the base or not; pistil head 0.7-1 × 0.6-0.7 mm, composed of a subglobose or obcampanulate head, often with 5 lateral grooves, 0.5-0.6 × 0.4-0.5 mm, with a stigmoid bilobed apex, 0.1 × 0.1 mm and a basal ring 0.6-0.7 × 0.1-0.3 mm. About 20-50 ovules in each carpel. *Fruit* of 2 separate mericarps; mericarps orange or yellow, soft, fleshy, ellipsoid, 20-50 × 20-45 × 15-40 mm, with soft blunt prickles 1-12 × 0.5-2 × 0.3-1 mm drying flat, among prickles smooth and not dotted, rounded at the apex and at the base, not recurved, not ridged, about 5-20-seeded; wall thick, 5-10 mm thick, of a thin orange outer and a thick more or less spongy white inner layer. *Seed* 9-11.5 × 4.5-7 × 4-6 mm; embryo 5-5.5 mm long; cotyledons elliptic, 1.3 × as long as wide, 2-2.8 × 1.5-2.1 mm, subcordate or rounded at the base; rootlet 2.8-3.2 × 0.5-0.7 mm.

Geographical distribution: Congo, Zaïre, Angola (Lunda).

Geographical selection of the about 80 specimens examined:




MAP 1. *Tabernanthe elliptica.*

CONGO: KOUILOU: Ngongo Region (fl. Mar.), Attims 181 (P); ibid., km 8 Ndindi Road (fl., imm. fr. May), Sita 3730 (P).

ZAÏRE: BANDUNDU: Kingunda (fl.), Hürlimann s.n. 22 July 1955 (MO); Ipamu (fl., fr. Sept.), Vanderyst 12055 (BR); Imbela (fl. Sept.), Callens 4228 (BR, NY); Kikwit (fl. Jan.), Vanderyst 3044 (BR, paratype); Makamba (fl., fr.) Breyne 4054 (BR); Panzi (fl. Apr.), Callens 2693 (K, NY), Vanderyst 16915 (BR); Bokore (fl., fr. Oct.), Jans 599 (BR); Illongonga, Sapin s.n. Dec. 1907 (BR); Nioki (Oct.), Flamigni 6021 (BR); Bankaie (fl., imm. fr. June), Gilbert 14287 (BR). EQUATEUR: Wafania (bud, imm. fr.), Hulstaert 895 (BR); Bolongo (fr. June), Collart 97 (BR); Bomandja (fr. Oct.), Evrard 4981 (BR); Ikelemba River source (fr. June), Evrard 4211 (BR); Mondombe (fl., fr.), Jespersen s.n. Nov. 1907 (BR); Ikela, L. Dubois 838 (BR); Moma (bud, fr.), Jespersen s.n. Oct. 1910 (BR, type of *Daturicarpa firmula*). HAUT-ZAÏRE: Lifera, Opala (fr. Nov.), Lisowski 43473 (BR, K, POZG); Between Lubutu and Kirundu (bud, fr. Feb.), Bequaert 6843 (BR, lectotype); km 45 of road from Kisangani to Wanié-Rukula, Amunyala Falls (fr. Mar.), Lejoly 4831 (BR); km 23 Kisangani-Bengamisa Road (bud, fr. May), Bokdam 4154 (WAG); Yabahondo, Isangi (fr. Oct.), Germain 8134 (BR, M, P); Tshopo River bank (fl., fr. Mar.), Bequaert 7058 (BR, K, type of *Daturicarpa lanceolata*); Yalibwa (fr. Apr.), Germain 324 (BR); Weko, Isangi (fl. Mar.), Louis 14081 (BR, K, WAG). KASAI OCCIDENTAL: Sankuru River (fr.), E. Laurent s.n. Dec. 1895 (BR); ibid. (fl.),

Sapin s.n. Sept. 1906 (BR); Musoko, near Mutombo (fl. Aug.), Liben 3519 (BR). KASAI ORIENTAL: Lodja (fl. Sept.), Lebrun 6254 (BR); between Katakokombe and Lodja (fl. Sept.), Lebrun 6197 (BR); Kondue (fr. Nov.), E. & M. Laurent 17 (BR, paratype); Batempa (fr. Mar.), Lescrouwaet 353 (BR, paratype); Mwene-ditu (fl. July), Germain 7952 (P). KIVU: Kalima (bud Feb.), Kitembo 50 (BR); Pangi (fr. June), Michelson 45 (BR). SHABA: km 13 Kyamasumba-Kolwezi Road (fr. Jan.), Bamps & Malaisse 8199 (BR); km 6 Nasondoye-Kamina Road (fr. Apr.), Malaisse 12262 (BR); km 12 Nasondoye-Dilolo Road (fr. Jan.), Schmitz 6404 (BR).

ANGOLA: LUNDA NORTE: Dundo, Luachimo River (fl., fr. Nov.), Gossweiler 13930 (B, BM, K).

CULT.: ZAÏRE: Kisantu Bot. Garden (fl. Nov.), Tilquin 49 (BR).

2. **Tabernanthe iboga** Baill., Bull. Soc. Linn. Paris, 1: 782. 1889; D. Oliver in Hook. Icon. Pl. 24: pl. 2337. 1894; Stapf, Kew Bull. 1895: 37. 1895; K. Schumann in Engler & Prantl, Natürl. Pflanzenfam. 4(2): 146. 1895; Stapf in Fl. Trop. Afr. 4(1): 124. 1902.

Type: Gabon, Cap Lopez, Griffon du Bellay 327, (P holo-). **Fig. 2; Map 2**

Heterotypic synonyms: *T. albiflora* Stapf, Kew Bull. 1898: 305. 1898; De Wildeman, Ann. Mus. Congo-Bot. 2(I-1): 38. 1899; Ann. Mus. Congo-Bot. 1(I-4): 81, pl. 41. 1899. Type: Zaïre: VI: Mbandaka (syn. Coquilhatville), A. Dewèvre 684 (BR holo-).

*T. tenuiflora* Stapf, Kew Bull. 1898: 305. 1898; De Wildeman, Ann. Mus. Congo-Bot. 2(I-1): 38. 1899; Stapf in Fl. Trop. Afr. 4(1): 124. 1902. Type: Zaïre: A. Dewèvre 361 (BR holo-).

*T. bocca* Stapf, in Fl. Trop. Afr. 4(1): 122. 1902. Type: Congo: Müller s.n. (K holo-).

*T. subsessilis* Stapf in op. cit. 123. Type: Angola: Pungo Andongo, F. Welwitsch 5950 (BM lecto-, designated here, BM, COI, G, K, P isolecto-).

*T. mannii* Stapf, l.c.. Type: Gabon: Gabon River, G. Mann 943 (K holo-, P iso-).

*T. pubescens* Pichon, Bull. Mus. Nat. Hist. Nat. 25(2): 637. 1953, **syn. nov.** Type: Angola: Nordeste, J. Gossweiler 13672 (B holo-, BM, K, P iso-).

*Iboga vateriana* J. Br. & K. Schum. in Danckelmann, Mitt. Deutsch. Schutzgeb. 2: 172. 1889; Stapf in op. cit. 125. Type: Cameroun: Batanga, J. Braun 1054 (M lecto-, designated here, HBG isolecto-).

Small tree or shrub, 0.5-4 m high. Trunk terete, 3-10 cm in diameter; bark pale to dark grey, smooth. Branches with a pale to dark brown bark, with pale grey-brown lenticels; branchlets glabrous or pubescent. *Leaves* subsessile to distinctly petiolate; petiole glabrous or pubescent, 1-13 mm long, with three or more rows of colleters in the axils; blade bright to dark green above, paler beneath, elliptic, narrowly elliptic or narrowly obovate, sometimes ovate, 2-4.2 × as long as wide, (2.5)3.2-22 × (0.9)1.5-10 cm, acuminate at the apex and often also mucronate, subcordate or cuneate at the base or decurrent into the petiole (sometimes unequal-sided and then usually one side subcordate and the other cuneate), glabrous or pubescent on both sides (if hairy usually more so on the veins), secondary veins 7-20 on each side, curved, forming an angle of 50°-90° with the costa, anastomosing at the apex; tertiary venation reticulate. *Inflorescences* 3-7 × 2-4 cm, 2-5 × branched, few to many flowered, lax. Pedun-

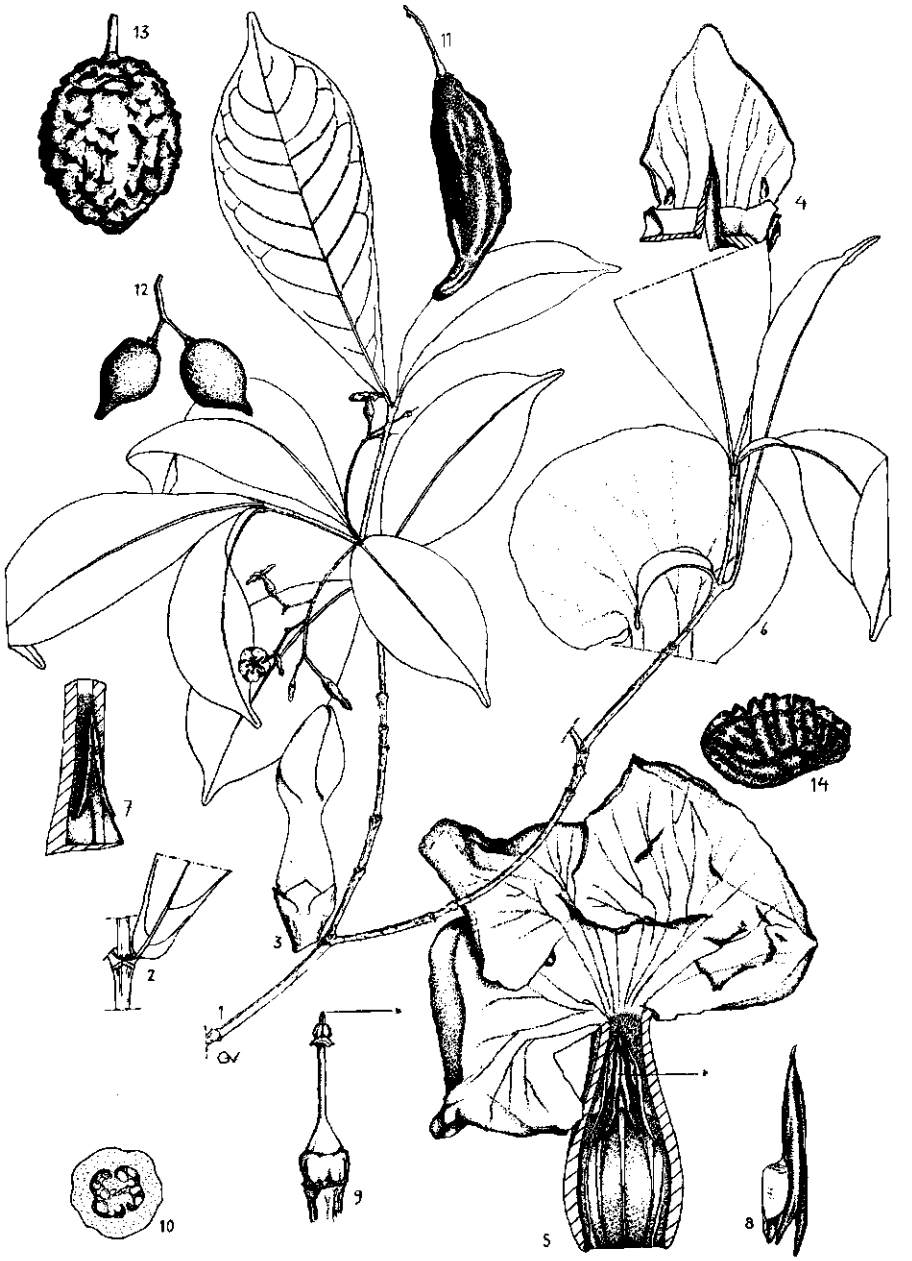
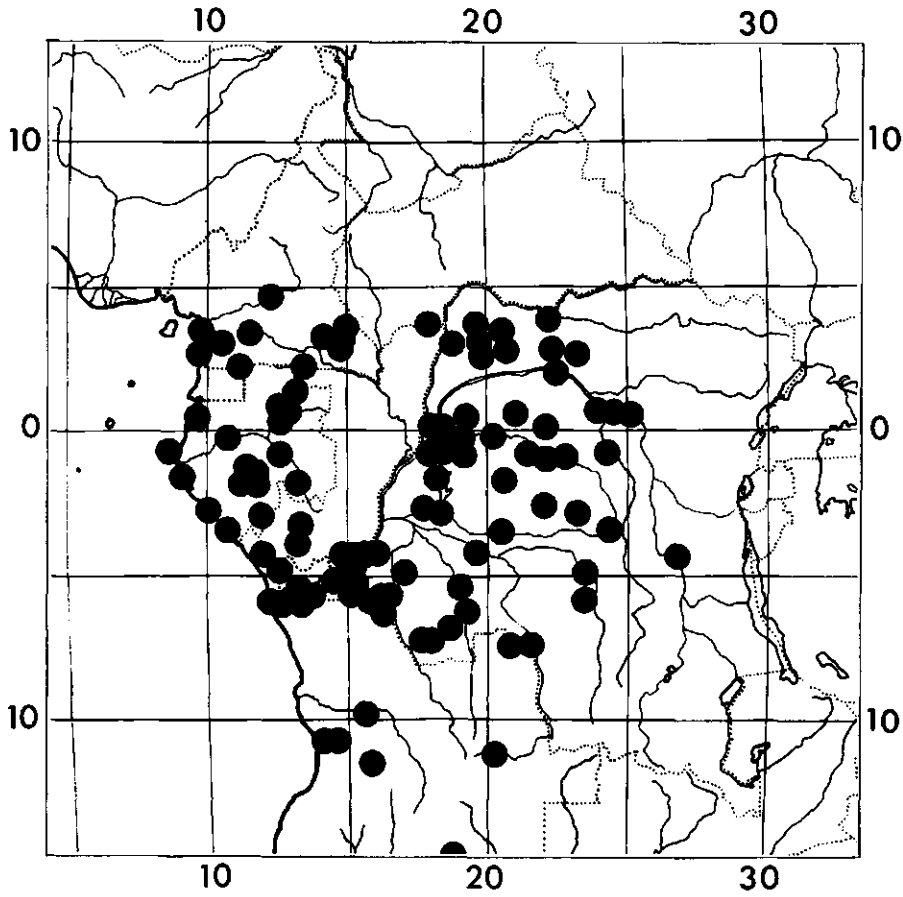



Figure 2. *Tabernanthe iboga* 1, flowering branch (× 1/2); 2, base of subsessile leaf (× 1); 3, mature bud (× 2 1/2); 4, partly torn calyx segment inside (× 10); 5, part of corolla inside (× 5); 6, spread corolla lobe inside (× 5); 7, stamen (× 5); 8, stamen (× 10); 9, pistil (× 5); 10, transverse section of ovary, just above disk (× 10); 11-13, fruit (× 1/2); 14, seed (× 2 1/2). 1 from Leeuwenberg 12544; 2 from Gillardin 617; 3-10 from Leeuwenberg 12400; 11 from Breteler & de Wilde 692/78; 12 and 14 from Bernardi 8222; 13 from Leeuwenberg 12542. (1, 2, 12, 14 herb. mat.; 3-11, 13 alc. mat.).




MAP 2. *Tabernanthe iboga*.

cle glabrous or pubescent, 0.5-4.5 cm long, fairly slender; pedicels glabrous or pubescent, 2-17 mm long, thickened at apex just below the calyx by which sepals seemingly connate at base. Bracts persistent, sparsely pubescent at the apex, about as long as the sepals, without colleters. *Flowers* fragrant. *Sepals* almost free, ovate, triangular or broadly so, 0.8-1.3(2) × as long as wide, 1.1-3 × 1-2.2 mm, glabrous or pubescent on both sides (less indumentum inside), minutely ciliate at least at apex, acute, obtuse or acuminate; colleters in 5 alternisepalous groups of 1-8 (in a single flower 7-28 colleters); calyx persistent, even under the fruit. *Corolla* usually with red to purple or violet dots or stripes in 5 groups in the throat, in the mature bud 6-12 mm long (the lobes are 42-69% of the length of the bud and 2-4.7 × 1.2-2.8 mm, in a conical or ovoid head), glabrous or above the calyx pubescent outside, inside pubescent from the insertion of the stamens to the mouth (density of indumentum decreasing towards mouth);

tube 2.8-7 × as long as the calyx, 1.2-3.2 × as long as the lobes, 5.5-8.7 mm long, almost cylindrical to urceolate, 1.5-3.5 mm wide, contracted at the base, 0.9-2 mm, fairly abruptly widened at the throat; lobes suborbicular or obliquely ovate, 0.3-0.9 × as long as the tube, 0.7-1.2 × as long as wide, 2.3-6 × 2.5-6.1 mm, obtuse or rounded at the apex, auriculate at the right side of the base, undulate and sometimes obscurely sinuate, spreading and recurved later. *Stamens* included for 1-2.5 mm, inserted 2.5-4 mm above the corolla base; anthers subsessile, 2.7-3.2 × 0.4-0.7 mm, at the apex for 0.1-0.3 mm sterile, glabrous or slightly pubescent inside, glabrous outside. *Pistil* 4.1-5.3 mm long; ovary subglobose, 1.2-1.8 × 0.8-1.8 × 0.8-1.8 mm, syncarpous, only basally 2-celled, placentas 2 parietal, much projecting, united at the base and less so at the apex; disk completely united with the ovary, entire or 5-lobed; style 1.7-2.5 × 0.1-0.3 mm (not thickened at apex); basal ring of pistil head 0.2-0.4 × 0.5-0.9 mm, central part 0.3-0.5 × 0.4-0.6 mm, apical lobes 0.2-0.6 mm long; apex of pistil about 0.9-1.6 mm below apices of anthers. On each placenta about 15-30 ovules (in 4-8 rows). *Fruit* glabrous (sometimes pubescent when immature), yellow to red, sometimes with lighter coloured, white or greyish-yellow spots, variable in shape (subglobose, ellipsoid or ovoid, not laterally compressed), rounded, obtuse, acute or acuminate at the apex, obtuse or rounded at the base, smooth or less often bumpy, 29-64 × 13-40 × 13-39 mm, many-seeded; wall 1.5-8 mm thick, white inside and on section. *Seed* dull, 7-10 × 4-6 × 3.5-5.5 mm; testa reticulate at the hilar side; embryo 4 mm long; cotyledons suborbicular, 1.7 × 1.7 mm, cordate at the base; rootlet 2.3 × 0.5 mm.

Geographical distribution: Tropical Africa, from Cameroun to Angola.

Ecology: Forest understorey or gallery forests, sometimes riverine or swamp forests or relatively wet savanas. Alt. 0-1500 m. Flowering and fruiting throughout the year.

Geographical selection of the about 650 specimens examined:

CAMEROUN: Bissaga, Letouzey 1456 (P); between Bange-mouth and Yokadouma, Mildbraed 4592 (HBG); 16 km EES of Mouangko, Asongani 682 (WAG); Yokadouma, Hedin 523 (P); 5 km S of M'Balmayo, W. de Wilde 1806 (P, WAG); between Mang and Asip, Letouzey 5558 (BR, HBG, K, P, WAG); km 18 Yokadouma-Lomie, Letouzey 5370 (P); near Zokadiba, Letouzey 12156 (K, P, WAG); Grand Batanga, Dinklage 931 (HBG); Mékoassi, Raynal 9964 (P); near Alati, Biholong 269 (P).

CENTRAL AFRICAN REPUBLIC: Boukoko, Tisserant 2141 (BM, BR, P).

GABON: Libreville, Klaine 428 (K, P); Cap Lopez, Griffon du Bellay 327 (P, holotype); Mondorobé, Pobequin 53 (P); Gamba, Breteler & van Raalte 5629 (WAG); near Ndjolé, N. Hallé 1750 (BR, P); Bélinga, Breteler & de Wilde 555/78 (WAG); ibid., N. Hallé 3766 (P); Simintang, Leeuwenberg 11567 (WAG); km 15 Mékombo-Makokou, Hladik 2602 (P); near Lastoursville, Breteler & de Wilde 797/78 (WAG); km 23 Mouanda-Franceville, Breteler 6257 (WAG); Divindé, le Testu 5905 (P); Etéké, Aubreville 184 bis (P); 20 km E of Mimongo, A.M. Louis et al. 988 (WAG); km 10 Mimongo-Mbigou, J. de Wilde et al. 374/83 (WAG); km 40 Mouila-Yeno, Breteler et al. 8131 (WAG); 20 km S of Mayumba, J. de Wilde et al. 671/83 (WAG).

CONGO: Kouilou, Farron 5042 (P); Ngokamina II, Bouquet & Sita 2221 (P); near Oyabi, Bou-

quet & Sita 2263 (P); 25 km W of Sibiti, C. Farron 4232 (P); Tchisséka, Bouquet 1965 (P); near Brazzaville, Sita 1962 (P); near Kinkala, Koechlin 5255 (P).

ZAÏRE: BAS-ZAÏRE: between Malemba and Matambama Kanzi, Wagemans 2218 (WAG); Moanda (= Muanda), Nsimundele 112 (BR); Luki, Toussaint 2213 (B, BR, FHO, K, P); Sandanda, Donis 142 (BR); Bingila, Dupuis s.n. (BR); Matomba (= Matombe), Wagemans 1363 (BR, MO, UC); Sanga, Compère 1743 (BR); Kisantu, Callens s.n. (F); Kingana (= Kinganga), Pauwels 728 (BR); Kingemba Kinga, Pauwels 1889 (BR); Kimvula, Callens 4783 (BR, WAG). KINSHASA: Sabuka, E. et M. Laurent s.n. (BR); Kimuenza, Robyns 4304 (BR, K, MO); Kinshasa, Bequaert 845 (BR); Lemba, Cabra 29 (BR); between Kinshasa and Ndjili, Dubois 1547 (BR, K, M); Ndjili, Pauwels 5262 (BR, WAG); Kinkole, Breyne 4146 (BR); Kimpoko, Okitolembo 12 (BR, WAG); Menkao, Breyne 2973 (BR); Bombo River, Breyne 33 (BR). BANDUNDU: Kole, Lebrun 6337 (BR, WAG); Mongandjale (= Mogandjale), Flamigny 10289 (BR); Bokoro, Jans 627 (BR); Kenge, Devred 2645 (BR, K, L); Ipamu, Vanderyst 9386 (BR); between Dekese and Bumbuli, Lebrun 6492 (BR, WAG); Popokabaka, L. Dubois 1577 (BR); Kiyaka, Devred 2776 (BR, K, P, WAG); Kidima, Callens 3493 (BR, NY); Kisangi (= Kisandji), Renier 81 (BR); Panzi, Callens 2713 (BR). EQUATEUR: Bas-Uele, Dewulf 790 (BR); Bombura, Evrard 908 (BR); Bobutu, Evrard 474 (BR); Boketa, Evrard 625 (BR); Ekuta, Sapin s.n. (BR); Guluma, Brimeyer 34 (BR); near Likimi, Malchair 290 (BR); Dundusana, Mortehan 509 (BR); Upoto, E. Laurent s.n. (BR); Coquilhatville (= Mbandaka), Dewèvre 684 (BR, type of *T. albiflora*); Eala, Leemans 103 (BR, K, MO, P, WAG); Mongo, Louis

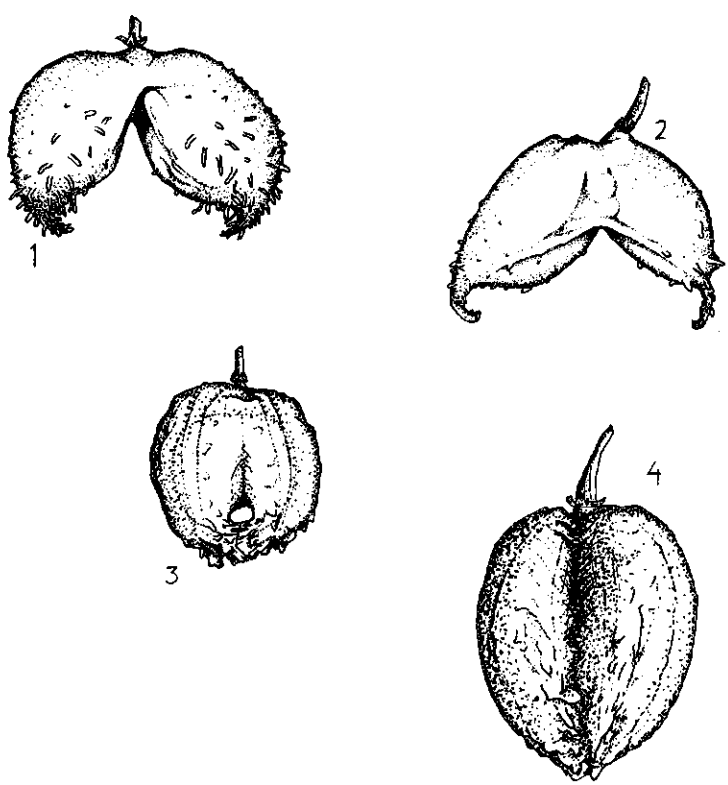



Figure 3. *Tabernanthe elliptica* × *T. iboga* 1-4, fruit (× 1). 1 from Breyne 4421; 2 from Szafranski 1260; 3 from Breyne 3237; 4 from Anonym. 1 ('Mebange', P). (1-4 herb. mat.).

151 (BR, C, K, LISC, MO, P, WAG); Mondjo, Ikelemba River, J. Léonard 542 (BR, F); Tolongote, Evrard 4172 (BR, K); between Mompono and Befori, Evrard 5717 (BR); Wendji, Lebrun 1157 (BR, C, LISC, MO, UPS, WAG); Lake Tumba, J. Léonard 643 (BR, COI, M); Bobanda, Evrard 3847 (BR, K); between Flandria (= Boteka) and Makako, Evrard 6050 (BR); Flandria (= Boteka), Hulstaert 112 (BR); Bolengambi, Evrard 6110 (BR, K); Bokote, Hulstaert 996 (BR); Bokondji (= Bokonji), De Wanckel 128 (BR); Lolia Buma, L. Dubois 680 (BR); Mondombe, Jespersen 40 (BR); Monkoto, L. Dubois 102 (BR, WAG). HAUT-ZAÏRE: Mobwasa, Reygaert 1118 (BR); Yandjali, Germain 8091 (BR, P); Yangambi, J. Louis 9226 (BR, C, K, LISC, MO, P, UPS, WAG, Z); Kisangani, Lubini 3218 (WAG); near Osuke, Lisowski 43259 (BR). KASAI OCCIDENTAL: Badibanga, Liben 1753 (BR, COI, LISC). KASAI ORIENTAL: near Booke, Robin 107 (BR); Mukumari, Gillardin 583 (BR); Katako Kombe, Lebrun 6129 (BR, K, WAG); Sangaie, Gillardin 617 (BR). KIVU: Mutambo, A. Léonard 5669 (BR).

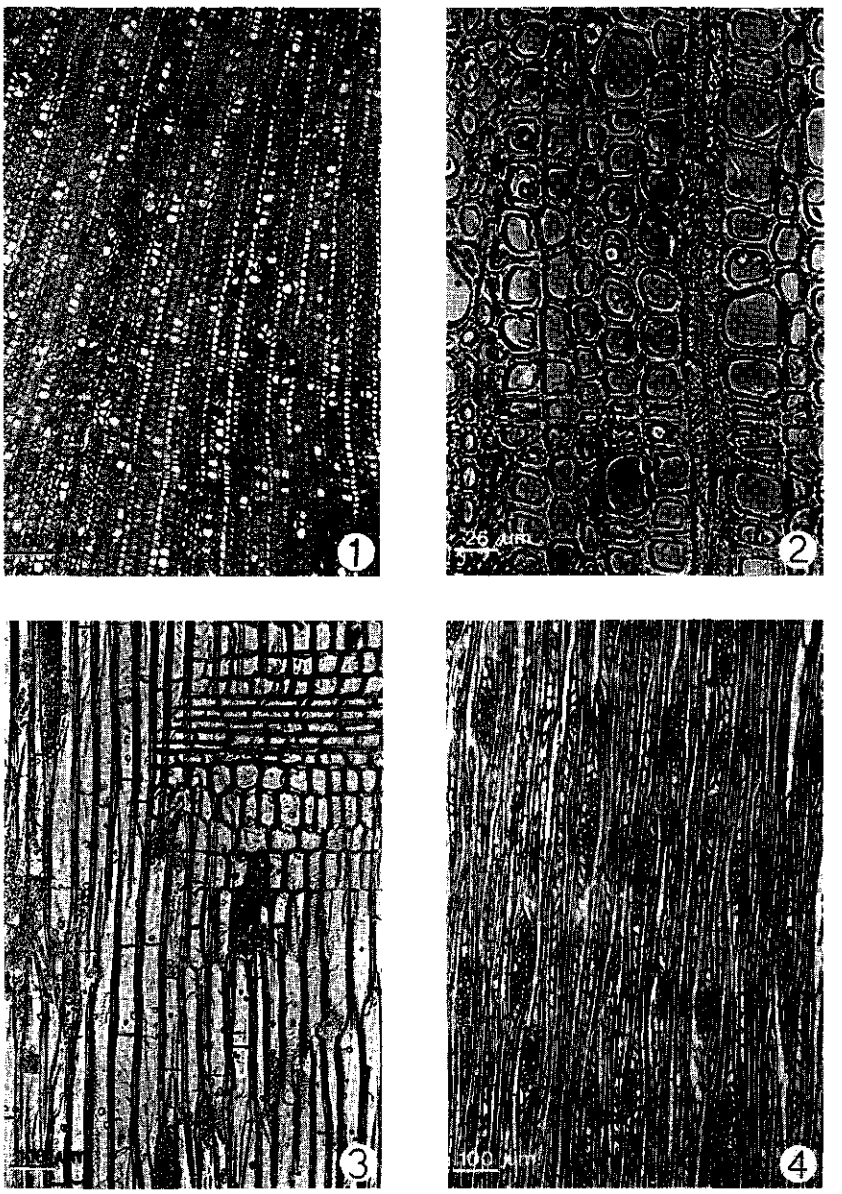
ANGOLA: MAIOMBE: Buco Zau, Gossweiler 6949 (BM). UIGE: Entre, Raimundo et C. Matos e Maia 883 (LISC). LUNDA: near Dundo, Martins 65 (P); Nordeste, Gossweiler 13672 (B, BM, K, P, type of *T. pubescens*); Dala, Exell & Mendonça 1109 (BM). CUANZA SUL: Amboim, Gossweiler 9974 (COI); Gabela, Teixeira et al. 11202 (LISC). BIÉ-CUANDO-CUBANGO: between Chitembo and Chingueia, Teixeira et al. 10716 (LISC); near Longa, Mendes 3170 (LISC). MULANYE: Pungo Andongo, Welwitsch 5950 (BM, COI, G, K, P, type of *T. subsessilis*).

CULT.: IVORY COAST: km 17 Abidjan-Dabou, Leeuwenberg 12024 (WAG). GABON: Akoga, Leeuwenberg 12542 (WAG); ibid., Leeuwenberg 12543 (WAG); ibid., Leeuwenberg 12544 (WAG).

NOTE: After a detailed study of all the herbarium material, we found that hybridisation occurs between the two species *T. iboga* and *T. elliptica*, and that more than one transition-form exist. H. Breyne, for example, made a few artificial hybrids in the botanical garden of Kisantu, Zaïre, and also some hybrids were found in the wild.

*T. iboga* has a fruit consisting of two fully united, smooth carpels; the fruit of *T. elliptica* consists of two free carpels with blunt soft prickles. When hybridisation occurs, forms can arise which resemble *T. elliptica* the most, e.g. the two carpels connate only at the base and there smooth, but free in the upper part and with prickles (see fig. 3-1; H. Breyne 4421); other forms are intermediate between the two species, resembling both species to the same extent, e.g. the two carpels connate and smooth in the lower half and free and prickly in the upper half (see fig. 3-2; Szafranski 1260); also forms resembling *T. iboga* more may occur, e.g. the two carpels (almost) fully connate, smooth, sometimes with only some small prickles at the apex. (see fig. 3-3, 3-4; H. Breyne 3237, Anonym. 1 ('Mebange', P)).

Consequently, only fruiting plants can be safely recognised as hybrids.




Phot. 1-4. Secondary xylem of *T. iboga* -1: Transverse section showing vessels, regularly distributed, within a ground tissue of radially arranged libriform fibres. Note the wood-rays and the growth-ring boundaries. -2: Transverse section, enlargement of a part of fig. 1, showing a 2-seriate wood-ray crossing a growth-ring boundary. -3: Radial section showing a wood-ray composed of procumbent, square and upright cells. Note vessels with simple perforation plates (lower right-hand side corner), and septated libriform fibres with regularly distributed small bordered pits. -4: Tangential section showing uniseriate and multiseriate wood-rays mainly with tails of more than 4 marginal rows. Note the septated libriform fibres without pits in the tangential walls.

# Wood anatomy of Tabernanthe iboga Baill.

## Materials and methods

The collected *T. iboga* is a shrub of 1.20 m high, with a stem diameter of 2 cm. The sample, from which sections were made, was taken from a cultivated shrub, grown at ORSTOM, 17 km west of Abidjan on the road to Dabou, (5.19 N; 4.08 W), Ivory Coast, West Africa, planted by A. Bouquet (ca 1948). Altitude 30 m above sea level. Fresh stem samples were fixed in FAA; they are preserved at the Department of Plant Taxonomy, Wageningen, the Netherlands with the accompanying herbarium voucher (Lg 12024). Other wood-sections of the same species were made from fresh material (shrubs of 0.80 m tall with a stem diameter of 1-1.5 cm), which was collected as seed in Gabon (1982) and raised in the greenhouses of the Agricultural University, Wageningen (Lg 12542; Lg 12543; Lg 12544).

Transverse, radial and tangential sections of the wood samples were made with a sledge microtome, varying in thickness from 15-20 µm. All sections were embedded in Kaiser's gelatin-glycerin (Johansen, 1940). Means and ranges of the number of wood rays per mm in tangential direction, ray height and width, radial vessel diameter and vessel-member length are based on at least fifty measurements. The vessel-member length was measured including the tails. Vessel frequency was determined by counting vessels in radial sections, because in cross-sections vessels were not always distinguishable from libriform fibres. The countings were converted to number of vessels per square mm in cross sections. For all quantitative data, mean values are given, preceded and followed by extreme values between brackets. The author has used the definition of libriform fibres given by Reinders (1935) and Janssonius (1940). Wood ray types are classified according to a modified system of Kribs (1959).

## Results

The secondary xylem of the investigated *T. iboga*-samples shows the following characters (see also Table 1):

Growth rings fairly distinct, marked by gradually decreasing radial diameters of the cells followed by an abrupt increase. *Vessels* solitary, in radial multiples of 3(-6), sometimes in clusters, regularly distributed; round to slightly oval or flattened where in contact with each other; average number (112-)135(-162) per square mm; radial diameter (15-)30(-50) µm, thin-walled (3-5 µm). Vessel-member length (110-)770(-1210) µm. Perforations simple in very oblique end walls. Inter-vessel pits alternate, bordered, with a horizontal diameter of 3-5

μm, sometimes with coalescent apertures. Vessel-ray pits half-bordered, with a horizontal diameter of 3-5 μm. Vessels in contact with libriform-fibres and/or wood rays. *Fibres* libriform, thin-walled, (2.5-)5(-9) μm, septate, with mainly small bordered pits with slit-like inner apertures, confined to the radial walls (regularly distributed); length (425-)1010(-1575) μm. *Parenchyma* absent. *Rays* (1-)2 to 3(-4)-seriate; uniseriate rays composed of upright cells, but sometimes also square cells are present; multiseriate rays composed of upright cells in the tails and mainly procumbent-, together with square cells in the centre; tails of multiseriate rays sometimes short, usually with more than 4 marginal rows (with an average number of 6, up to 20); height (125-)695(-3500) μm; (10-)13(-17) per tangential mm. *Crystals* regularly present, not abundant, only in ray cells and then almost always in square and/or upright cells, mainly rhomboidal, sometimes together with sand, seldom together with a druse.

Table 1. Secondary xylem characters of the investigated *Tabernanthe iboga*.

| | Lg 12024 | Lg 12542 | Lg 12543 | Lg 12544 |
|---|---|---|---|---|
| presence of growth rings | + | + | + | + |
| *vessels* | | | | |
| mean radial diameter (μm) | 30 | 30 | 30 | 30 |
| (min-max) | (20-45) | (15-50) | (20-50) | (15-40) |
| average number per mm | 160 | 132 | 134 | 112 |
| perforation | simple | do. | do. | do. |
| inter-vessel pits (μm) | 3-5 | 3-5 | 3-5 | 3-5 |
| average member length (μm) | 720 | 890 | 625 | 835 |
| *fibres* | | | | |
| type | libriform septate | do. | do. | do. |
| *rays* | | | | |
| average height (μm) | 785 | 640 | 660 | 690 |
| (max) | (3500) | (2475) | (2650) | (2700) |
| average width (cells) | 2 | 2-3 | 2 | 2 |
| type | HoIII/ HeI(II) | do. | do. | do. |
| predominant cell type | p;u | p;u | p;u | p;u |
| number per tangential mm | 12 | 12 | 15 | 13 |

Symbols and abbreviations used:
I: uniseriate rays and multiseriate rays with long uniseriate tails; II: uniseriate rays and multiseriate rays with short uniseriate tails; III: only uniseriate rays present; He: heterogeneous wood ray; Ho: homogeneous wood ray; p: procumbent wood ray cell; u: upright wood ray cell.

## Discussion

Although this anatomical study was not intended to make a full comparison between genera of the *Tabernaemontaneae*, one species of *Tabernaemontana* can be compared with *Tabernanthe iboga* described earlier.

Only few and incomplete wood characteristics of *Tabernaemontana* species are known from literature, *T. sphaerocarpa* Bl. being the only complete one (Janssonius 1920).

The wood of *T. sphaerocarpa* shows as many similarities with the wood of *T. iboga*. In *T. sphaerocarpa* the vessels are small (radial diameter 30-100 μm), regularly distributed, solitary and in clusters; round to oval, flattened where in contact with each other; about 30 per square mm; member length 150-1000 μm; perforations simple in almost straight to very oblique end walls; inter-vessel pits bordered, diameter 3-4 μm; vessel-ray pits half-bordered. Fibres libriform, thin-walled, 3-5 μm, septate, with small bordered pits, mainly confined to the radial walls; length 900-1350 μm. Parenchyma very rare, paratracheal. Rays 1 to 3(-6)-seriate; uniseriate rays composed of upright cells; multiseriate rays composed of upright cells in the tails and procumbent cells in the centre. Crystals regularly present, only in ray cells and then in upright cells, less in procumbent cells, one or more per cell.

In conclusion, the wood anatomy of *Tabernanthe iboga* justifies a close relationship to at least one species of *Tabernaemontana*.

## Acknowledgements

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B, BM, BOL, BR, C, COI, F, FHO, HBG, K, L, LISC, LISJC, M, MO, NY, P, UC, UPS, WAG, Z.

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# Index of Scientific names

Synonyms are in *italics*. Page number of principal entries are in **bold face**, those of figures in *italics*.