

# Flowering Plants of Africa

Volume 63

June 2013



# Flowering Plants of Africa

Since its inception in 1921, this serial, modelled on the former *Curtis's Botanical Magazine*, has published well over 2 000 colour plates of African plants prepared by some 80 artists.

The object of the serial is to convey to the reader the beauty and variety of form of the African flora, to stimulate an interest in the study, conservation and cultivation of African plants and to advance the science of botany as well as botanical art.

The illustrations are mostly prepared by artists on the staff of the South African National Biodiversity Institute, but we welcome other contributions of suitable artistic and scientific merit. Please see *Guide for authors and artists* on page 145.

A list of available back issues is given in the current *Publications Catalogue* of the Institute and on the website [www.sanbi.org](http://www.sanbi.org). Copies of this serial and of the *Catalogue* are obtainable from the SANBI Bookshop, South African National Biodiversity Institute, Private Bag X101, Pretoria, 0001 South Africa.

## History of this series

(note Afrikaans translation and changes in title)

### **Volume 1 (1921) to Volume 24 (1944):**

*The Flowering Plants of South Africa*

### **Volume 25 (1945–1946) to Volume 26 (1947):**

*The Flowering Plants of Africa*

### **Volume 27 (1948–1949) to Volume 52 (1992–1993):**

*The Flowering Plants of Africa*

*Die Blomplante van Afrika*

### **Volume 53 (1994) to Volume 63 (2013):**

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**Cover illustration:** *Erica verticillata* (Plate 2296)

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# Flowering Plants of Africa

A magazine containing colour plates with descriptions of  
flowering plants of Africa and neighbouring islands

Edited by

A. Grobler

with assistance of

G.S. Condy

Volume 63



Pretoria  
2013

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# Contents

## Volume 63

2281.	<i>Eulophia ensata</i> . G.D. Duncan and Gillian Condry . . . . .	2
2282.	<i>Aloe mitrifloris</i> subsp. <i>comptonii</i> . E.J. van Jaarsveld and Gillian Condry . . . . .	10
2283.	<i>Aloe pavelkae</i> . E.J. van Jaarsveld and Gillian Condry . . . . .	16
2284.	<i>Gasteria croucheri</i> subsp. <i>pondoensis</i> . N.R. Crouch, G.F. Smith, D.G.A. Styles and Gillian Condry . . . . .	22
2285.	<i>Lachenalia pearsonii</i> . G.D. Duncan and Gillian Condry . . . . .	32
2286.	<i>Crassula smithii</i> . G.F. Smith, N.R. Crouch and Gillian Condry . . . . .	38
2287.	<i>Crotalaria agatiflora</i> subsp. <i>agatiflora</i> . T. Jaca, T. Nkonki and Gillian Condry . . . . .	44
2288.	<i>Abrus precatorius</i> subsp. <i>africanus</i> . T. Nkonki, T. Jaca and Gillian Condry . . . . .	50
2289.	<i>Cucumis metuliferus</i> . S.P. Bester and Gillian Condry . . . . .	56
2290.	<i>Begonia sonderiana</i> . N.R. Crouch and Tracey McLellan . . . . .	66
2291.	<i>Turnera oculata</i> var. <i>oculata</i> . E.J. van Jaarsveld and Gillian Condry . . . . .	72
2292.	<i>Plumbago pearsonii</i> . E.J. van Jaarsveld, A.E. van Wyk and Marieta Visagie . . . . .	78
2293.	<i>Plumbago wissii</i> . E.J. van Jaarsveld, A.E. van Wyk and Marieta Visagie . . . . .	84
2294.	<i>Delosperma scabripes</i> . N.R. Crouch, P.M. Burgoyne and Wilna Eloff. . . . .	90
2295.	<i>Commicarpus pentandrus</i> . M. Struwig and Gillian Condry . . . . .	98
2296.	<i>Erica verticillata</i> . A.N. Hitchcock, E.G.H. Oliver and Vicki Thomas . . . . .	104
2297.	<i>Pavetta edentula</i> . P.P.J. Herman and Gillian Condry . . . . .	120
2298.	<i>Cephalanthus natalensis</i> . M. Jordaan and Gillian Condry . . . . .	126
2299.	<i>Chlorocyathus lobulata</i> . G. Coombs, A.P. Dold, C.I. Peter and Susan Abraham. . . . .	132
2300.	<i>Miraglossum davyi</i> . S.P. Bester and Gillian Condry . . . . .	138
	Guide for authors and artists . . . . .	145
	Index to Volume 63 . . . . .	148

*Crotalaria agatiflora* subsp. *agatiflora*

Leguminosae

*East and northeast Africa*

*Crotalaria agatiflora* Schweinf. subsp. *agatiflora*, Schweinfurth: 13 (1892); Taubert: 206 (1895); Baker: 315 (1914); Brenan: 414 (1949); Polhill: 205 (1968). Polhill: 72-74 (1982).

*Crotalaria* L. is a large genus in the Leguminosae family with approximately 690 species (Lewis *et al.* 2005; Le Roux & Van Wyk 2012). The genus is distributed in the tropical and subtropical areas of the world with the majority of species found in Africa and Madagascar (Polhill 1968; Polhill 1982; Lewis *et al.* 2005). Polhill (1968) studied the genus extensively after Milne-Redhead (1961) and recognised 432 species for the African continent. About 54 indigenous species are found in southern Africa (Nkonki & Swelankomo 2003) of which four are exotic species and declared invasive alien species or weeds (Germishuizen *et al.* 2006). Other species in the genus are also known to occur in India, America and China (Lewis *et al.* 2005; Le Roux *et al.* 2011). The genus shows a remarkable diversity in its morphology, which greatly facilitates the differentiation of individual species, but variation between the species is of a markedly reticulate nature precluding any simple division of the genus into sections (Polhill 1968). *Crotalaria agatiflora* has five subspecies and subsp. *agatiflora* differs from the other four by its bracteoles which are less than 2.0(–3.5) mm long and its ovate-elliptic leaflets that are less than twice as long as broad, usually glabrous beneath. There are various common names for *C. agatiflora* subsp. *agatiflora* including bird flower, canary bird bush, rattlebox, Queensland bird flower and *voëltjebos*. The common name, rattlebox, is derived from the fact that the seeds become loose in the pod as they mature and rattle when the pod is shaken.

The plant illustrated here is indigenous to tropical East Africa and northeast Africa (Tanzania and Kenya). In southern Africa it occurs in Namibia, South Africa (Gauteng, North West, Limpopo, Mpumalanga, KwaZulu-Natal and the Western and Eastern Cape) and has become naturalised in Australia (Queensland), New Zealand and South America. Distribution of *Crotalaria agatiflora* subsp. *agatiflora* in Africa, based on the PRE Computerised Information System (PRECIS), Southern African Plant Invaders Atlas (SAPIA 2011) and Global Biodiversity Information Facility (GBIF 2013) databases, is presented in Figure 1. Canary bird bush was first introduced into South Africa as an ornamental plant. The earliest known record in the Pretoria National Herbarium is from the Johannesburg Railway Horticulture Garden dated 1921 in the Johannesburg area. According to SAPIA, the earliest record of its establishment in the wild is from the Rustenburg and Brits area in North West. It has escaped from cultivation into natural areas and has been recorded in conservation areas and reserves in Pretoria such as the Colbyn conservancy area, and Faerie Glen, Groenkloof and Wonderboom Nature Reserves (Henderson & Musil 1987; SAPIA 2011).

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PLATE 2287.—1, flowering stem × 1. Voucher specimen: *Condy 251* in National Herbarium, Pretoria.  
2, fruiting branch × 1. Voucher specimen: *Condy 253* in National Herbarium, Pretoria. Artist: Gillian Condy.



PLATE 2287 *Crotalaria agatiflora* subsp. *agatiflora*

*Crotalaria* species are widely used in Chinese traditional medicine to treat several types of internal cancers. In the United States of America some species, such as *C. pumila*, are used to treat yellow fever and skin rashes. In the Siaya area, Kenya, the roots are used as a remedy for gastrointestinal discomfort (Kokwaro & Johns 1998). *Crotalaria agatiflora* subsp. *agatiflora* is used as a medicinal plant in several African countries for the treatment of bacterial infections and cancer (Le Roux *et al.* 2011). In Ecuador *C. agatiflora* subsp. *agatiflora* is also traditionally used as a decoction to treat cancer. The above ground parts of *C. agatiflora* subsp. *agatiflora* are used in its native range to treat otitis media, a bacterial infection of ears, as well as for treatment of sexually transmitted diseases (Le Roux *et al.* 2011). In India other species of *Crotalaria* has similar uses, where it is used to treat eczema and the leaves are placed on cuts or wounds to aid the healing process. Sharma *et al.* (1967) found that *C. agatiflora* subsp. *agatiflora* relieves spasms in dogs, found to be a good relaxant, and lowered blood pressure during treatment.

A few *Crotalaria* species are consumed by humans in some parts of the world, however, many species are known to be toxic to humans and livestock. Examples include (but are not limited to) *C. oridicola*, *C. barkae*, *C. berteroana* and *C. retusa*. Toxicity has been proven in the genus *Crotalaria* to be due to the presence of pyrrolizidine alkaloids in plants and seeds (Pilbeam & Bell 1979). All plant parts of *C. agatiflora* subsp. *agatiflora* have been reported not to be toxic or poisonous.

In South Africa *Crotalaria agatiflora* subsp. *agatiflora*, is a declared category 1a species according to the National Environmental Management: Biodiversity Act (2004) and listed as a proposed invader in the Conservation of Agricultural Resources Act (1983). This species was previously misidentified as *C. agatiflora* subsp. *imperialis* (Macdonald *et al.* 2003). It grows in watercourses in Grassland and Savanna biomes; potentially invasive in forest margins and also occupies cleared grassy areas in South Africa. In some parts of the world where it has been introduced, it is regarded as an agricultural, environmental and garden weed. For example in Australia it is regarded as a minor environmental weed that has escaped cultivation and invading grasslands and areas with sandy soils (Cooperative Research Center for Australian Weed Management 2013). This is also the case in South Africa where the species has escaped cultivation and has established itself in the wild. According to herbarium material in the National Herbarium, Pretoria, *C. agatiflora* subsp. *agatiflora* is frequently collected along roads and railways, near rivers, gardens and natural habitats. Ecological data was compiled from herbarium specimens (collected from

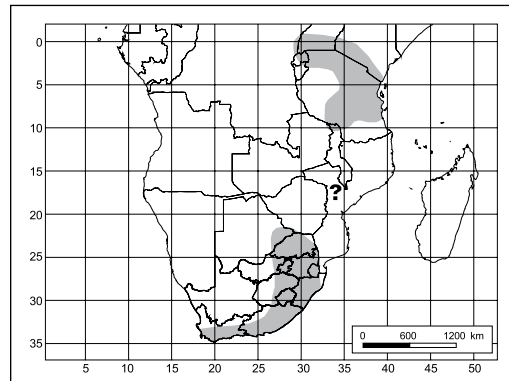


FIGURE 1.—Distribution range of *Crotalaria agatiflora* subsp. *agatiflora* based on herbarium records in the National Herbarium, Pretoria, and SAPIA and GBIF databases. The question mark (?) indicates regions of possible occurrence where records were not found.



1921–2011) and SAPIA records. Sixty-five percent were recorded near road sides, five percent along rivers, 10 percent in natural areas (including nature reserves) and 18 percent in urban areas including gardens.

*Crotalaria agatiflora* subsp. *agatiflora* reproduces and spreads exclusively by seeds. The average number of pods produced per plant is 50 and number of seeds per pod is 28. Seeds germinate in early summer.

Although no studies have focused on its effects on natural ecosystems, canary bird bush may affect the ecology of invaded areas in several ways for example through the enhancement of nitrogen levels in the soil. The species threatens watercourses in Grassland and Savanna biomes where it has been introduced. Furthermore, it has the potential to invade forest margins and often occupies cleared grassy areas and disturbed sites.

**Description**—Perennial woody herb, 0.3–2 m high, usually much branched, glabrous. *Leaves* 3-foliolate; leaflets ovate-elliptic, 25–90 × 10–35 mm, glabrous to densely hairy; petioles 30–120 mm long, mostly longer than leaflets. *Stipules* linear and caducous or absent, 4–12 mm long. *Racemes* stoutly pedunculate, many-flowered; flowers 40–50 mm long; bracts linear to attenuate-lanceolate, up to 16–20(–24) × 1–6(–9) mm; bracteoles filiform, 0.5–3.5 mm long. *Calyx* 18–30 mm long, with upper and lateral lobes joined almost to tips on either side, ± twice as long as tube; pedicels about 15 mm long, glabrous-glaucous or villose. *Standard* ovate, lemon-yellow to greenish yellow, sometimes medially pubescent outside; wings half to two-thirds as long as keel; keel broadly rounded, with a relatively short, projecting, often greenish or purplish beak, 11–55 mm long. *Pod* oblong-clavate, narrowed to a 15–25 mm long stipe, ± 75–100 mm long, glabrous. *Seeds* tumid, 6–7(–9) mm long, ± smooth. *Flowering time*: January–December in South Africa. Plate 2287.

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*Cucumis metuliferus*

## Cucurbitaceae

*Sub-Saharan Africa and Yemen*

*Cucumis metuliferus* E.Mey. ex Naudin in Annales des Sciences Naturelles, Botanique ser. 4, 11: 10 (1859); Meyer: 406 (1838); Sonder: 495 (1862); Hooker: 543 (1871); Cogniaux: 499 (1881); Hiern: 397 (1898); Stuhlmann: 137 (1909); Bews: 202 (1921); Landsell: 144 (1923); Cogniaux & Harms: 146, t. 15 (1924); Burtt Davy: 228 (1926); Broun & Massey: 102 (1929); Exell et al.: 195 (1929); Exell: 186 (1944); Andrews: 172 (1950); Hutchinson & Dalziel: 213 (1954); Meeuse: 68 (1962); Berhaut: 262 (1967); Jeffrey: 98 (1967); Keraudren: 142 (1967); Launert & Roessler: 12, 14 (1968); Renew: 6, t. 5 (1968); Fernandes & Fernandes: 259 (1970); Ross: 341 (1972); Jeffrey & Mann: 463, 464 (1978); Onderstall: 190 (1984); Halliday et al.: 71, t. 7 (1986); Kirkbride: 70 (1993); Germishuizen & Fabian: 414 (1997); Lebrun & Stork: 132 (1997); Retief & Herman: 395 (1997); Welman: 415 (2003); Braun et al.: 83 (2004); Da Silva et al.: 51 (2004); Mapaura & Timberlake: 38 (2004); Phiri: 45 (2005); Pooley: 80 (2005); Setshogo: 53 (2005); Klopper et al.: 253 (2006); Welman: 371 (2006); Figueiredo & Smith: 65 (2008); Welman: 1 (2009). *Cucumis tinneanus* Kotschy & Peyritsch: 17, t. 8 (1867).

*Cucumis* is the Latin name for the cucumbers, which had already been in cultivation in ancient Egypt, and consists of 55 species (Telford *et al.* 2010). Molecular studies showed the affinities of the genera *Cucumella*, *Dicoelospermum*, *Mukia*, *Myrmecosicyos* and *Oreosyce* which are, based on this data, now included in *Cucumis* (Ghebretinsae *et al.* 2007a, 2007b; Schaefer 2007). The genus is largely indigenous to Africa, but also found in Asia, Australia and some of the islands in the Pacific. The genus includes two major commercial vegetable crops namely cucumbers (*C. sativus*, mainly from Asia) and melons (*C. melo*, from Africa and Australasia) and two minor crops namely the West Indian gherkin (*C. anguria*) and the kiwano (*C. metuliferus*) (Kirkbride 1993). Despite Africa being the proposed centre of origin for the genus, the type species (*C. sativus*) comes from southern Asia (Garcia-Mas *et al.* 2004).

This species is found naturally throughout sub-Saharan Africa: from northern tropical Africa from Nigeria eastwards to Sudan and Ethiopia, south to the Congo, Okavango and Namibia and south from Kenya to the Eastern Cape in South Africa. It has also been reported from Yemen (Wood 1997). The natural distribution is given in Figure 1. Surprisingly, this is the first member of this genus to feature in this series. The other six members of the Cucurbitaceae family from previous volumes of *Flowering Plants of Africa* are *Citrullus ecirrhosus* (Chadwick & De Winter 1990), *Coccinia palmata* (Welman & Condy 2007a), *Gerrardanthus tomentosus* (Crouch *et al.* 2003), *Momordica clematidea* (Meeuse 1959) [= *M. cardiospermoides*], *M. foetida* (Welman & Condy 2007b) and *Trochomeria macrocarpa* (Meeuse 1954).

This plant usually grows in shallow or deep, well-drained sand or loam soils, mostly in alluvial soil on riverbanks, in river beds or on flood plains. It is also recorded from clay soil and rocky slopes. It climbs on trees, shrubs and even grasses

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PLATE 2289.—1, flowering stem, × 1; 2, leaf, × 1; 3, fruiting branch, × 1. Voucher specimens: Bester 11104 (1, 2); Bester & Condy 10672 (3) in National Herbarium, Pretoria (PRE). Artist: Gillian Condy.



PLATE 2289 *Cucumis metuliferus*

through attaching itself by means of tendrils. The variety of habitats further includes forest edges, deciduous woodland, savanna or grassland in natural or disturbed areas and abandoned lands and dry thickets. Herbarium specimens of this species have been collected from a wide altitudinal range, from 210–1 800 m above sea level. Plants flower from January to May and fruit from February to July (based on records from the National Herbarium in Pretoria [PRE]).

The fruiting specimen depicted here was collected in the Pretoria National Botanical Garden towards the end of May 2011, where it was twining amongst trees and surrounding vegetation on the northern (and warmer) side of the Silverton Ridge. The flowering stem was collected from a plant further east on the same ridge towards the end of March 2012. After pollination, the fruits develop slowly over a couple of months.

Despite numerous literature references and labels on herbarium sheets that indicate that the species is rare, it possibly only indicates local rarity as the African horned cucumber is very widespread in its natural distribution. By the time that the fruit ripens, most of the rest of the plant has already died away, which may explain why so many labels indicate that it is rare. The threat status of this species was assessed and Red Listed as least concern (LC) in the most recent assessment for South Africa (Foden & Potter 2005).

The African horned cucumber is edible and Meeuse (1962) states that two types of 'jelly-melon' can be distinguished: a bitter (and unpalatable) and non-bitter form. He further reports this plant to be an excellent vegetable, like cucumber. Fruits can be stored for up to six months without cold storage. The bitterness of plants does not seem to be geographically correlated and it is not possible to tell whether a fruit is bitter or not without tasting it first. Elatrased activity in the plant is mainly responsible for its bitterness (Watt & Breyer-Brandwijk 1962). One of us (GC) has personally eaten the fruit sliced up in salad, but it had an uninteresting and bland taste. Parsley (1981) suggests that the flesh be scooped out and added to other salad ingredients to make a refreshing fruit salad, as it has a slight pineapple-banana flavour. Morton (1987) is of the opinion that the desirability of these fruits are over-emphasised by previous authors who reported on the use of this plant as a vegetable. Nevertheless, it is not only cultivated for its edible fruits but also because the fruits are so decorative.

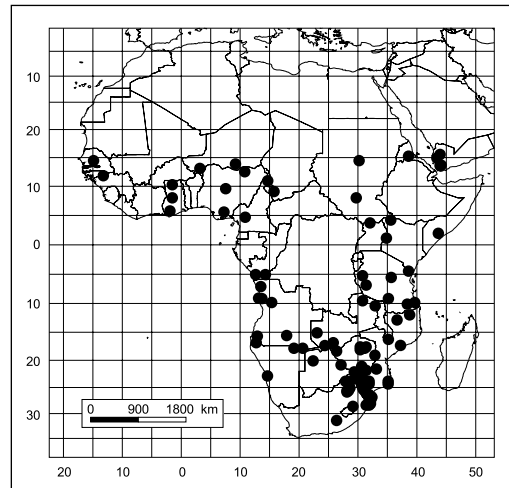


FIGURE 1.—Known distribution of *Cucumis metuliferus* based on specimens in the National Herbarium, Pretoria; Lebrun & Stork (2003); and Wood (1997).

The leaves (like those of most Cucurbitaceae) may be cooked and eaten as spinach (Onderstall 1984; Roodt 1998; Pooley 2005). The foliage, however, contains saponin, an oily glycoside, which is a strong foaming extract when mixed with water. This compound can be toxic, but also has many medicinal uses. According to Roodt (1998), the bitter compounds in the leaves can be neutralised when it is cooked. The root is used for birth pains. It is also cooked and applied externally to the genitalia for treatment of gonorrhoea. The Bushmen roast the fruit and then strain the flesh before eating it (Renew 1968; Roodt 1998)—the strained liquid is retained as a water source.

Fruits are eaten by a variety of birds when they ripen on the stems; birds are therefore largely responsible for the dispersal of seeds. They eat the juicy ripe fruit easily due to the absence of a tough or hard outer skin. Fruit that fall to the ground may further be consumed by rodents, primates and small antelope. It has proportionally much more moisture than commercial cucumbers and is thus a useful source of water for humans and animals in arid areas (Van Wyk & Gericke 2000). The flesh may further be used for making a jelly (Welman 2009). Some indigenous tribes pound the roots, mix it with fat and smear it on their bodies in order to ward off evil spirits (Watt & Breyer-Brandwijk 1962).

Plants produce many seeds per fruit and these seeds germinate and grow quite easily. As this species is a fast-grower, it can quickly cover a frame, trellis or unsightly compost heap in the garden. It is, however, prone to mildew and white fly, which also cause the plant to die back quickly.

In the early 1970s, *Cucumis metuliferus* was used in hopeful trials to incorporate its nematode and disease-resistance into muskmelons and the common cucumber (Fassuliotis 1970, 1977; Provvidenti & Robinson 1974). Success in producing fertile  $F_1$ -generations to incorporate the disease resistant genes of *C. metuliferus* into other economically important Cucurbitaceae has still to be realised. Norton (1969) was able to incorporate into *C. melo* the resistance to the root-knot nematode found in *C. metuliferus* (Fassuliotis 1967) by successfully crossing the latter with the feral type of the former. However, this claimed cross between *C. metuliferus* and *C. melo* is highly unlikely due to the long phylogenetic distance between the two taxa (one is in section *Metuliferi*, the other in section *Cucumis*, which split several million years ago) (pers. comm., H. Schaefer).

The African horned cucumber has been grown in Queensland (Australia) and has become naturalised (Morton 1987) and even been listed on the Australian weed list (Randall 2007). It was first grown commercially in New Zealand in the 1980s and registered under the name 'Kiwano'. More recently, it has also been grown in Kenya (Van Wyk & Gericke 2000). This species is also listed as a noxious weed in the US (Holm *et al.* 1979; Thomas 2007). Only a few natural species of *Cucumis* are cultivated, and then usually as garden novelties (Whitaker & Davies 1962).

The description that follows is partly adapted from Kirkbride (1993) and from specimens housed at PRE.

**Description.**—Annual mostly climbing herb, sometimes a creeper with trailing stems. Vegetative parts covered with spreading stiff white or brown hairs resulting in a rough feel (Figure 2a). *Stems* to 5 m long, radiating from a woody rootstock, hispid with spreading hairs (Figure 2a). *Tendrils* slender, simple, in axils of leaves. *Leaves* ovate-cordate in outline with a large basal sinus, sometimes heart-shaped, to 32–125 × 35–135 mm, sometimes unlobed but usually palmately 3–5-lobed,



FIGURE 2.—*Cucumis metuliferus*: a, multi-cellular hairs on stem; b, hairs on petiole; c, hairs on main veins of leaves (abaxial side); d, toothed leaf-margin with sinus; e, toothed projection on epicarp with bristle of immature fruit; f, toothed projection on epicarp with bristle of mature fruit. Voucher specimens: Bester 8459 (a, b); Retief 1252 (c, d); Bester 11104 (e); Bester & Condry 10672 (f); all in National Herbarium, Pretoria. Scale: a–f, 1 mm. Photographs: S.P. Bester.

lobes triangular to rounded, rarely ovate, obtuse to rounded and apiculate, veins below roughly hairy (Figure 2c), margins minutely toothed (Figure 2d); petioles to 20–110 mm long, hirsute (Figure 2b). *Flowers* monoecious, funnel-shaped, axillary. *Male flowers* in clusters of 1–4, sessile or shortly pedicellate, peduncle to 10 mm long, corolla green to pale yellow, 5–13 × 2–8 mm, united in lower third, pedicels 2–20 mm long. *Female flowers* solitary on 20–60 mm long pedicels, corolla yellow, 8–15 × 4–12 mm. *Ovary* to 20 mm long, green with numerous dark green fleshy spines ending in stiff bristles. *Fruit* ellipsoid-cylindrical, obscurely trigonous, 60–130 × 28–94 mm when ripe, the scattered spines rather stout, broad-based, fleshy, ±6–14 × 2–5 mm and white to brown bristle-tipped; deep green, ripening yellow to orange-red with longitudinal bands of pale markings, rather soft and fleshy; carried on a 20–70 mm long peduncle (Figure 2e & f). *Seeds* ellipsoid, flattened, hundreds per fruit 6.0–9.0 × 2.0–4.0 × 1.0–1.5 mm embedded in a light green, emerald-green or translucent, jelly-like flesh. Plate 2289.

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