

Flowering Plants of Africa

Volume 65

June 2017



L. Ward
1980

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 journal 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 (SANBI), but we welcome other contributions of suitable artistic and scientific merit. Please see *Guide for authors and artists* on page 159.

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Cover illustration: *Protea namaquana* (Plate 2327)

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Flowering Plants of Africa

A peer-reviewed journal containing colour plates with descriptions of flowering plants of Africa and neighbouring islands

Edited by

Alicia Grobler

with assistance of

Gillian Condy

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Pretoria
2017

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Ruellia kaokoensis Van Jaarsv. sp. nov., p. 154

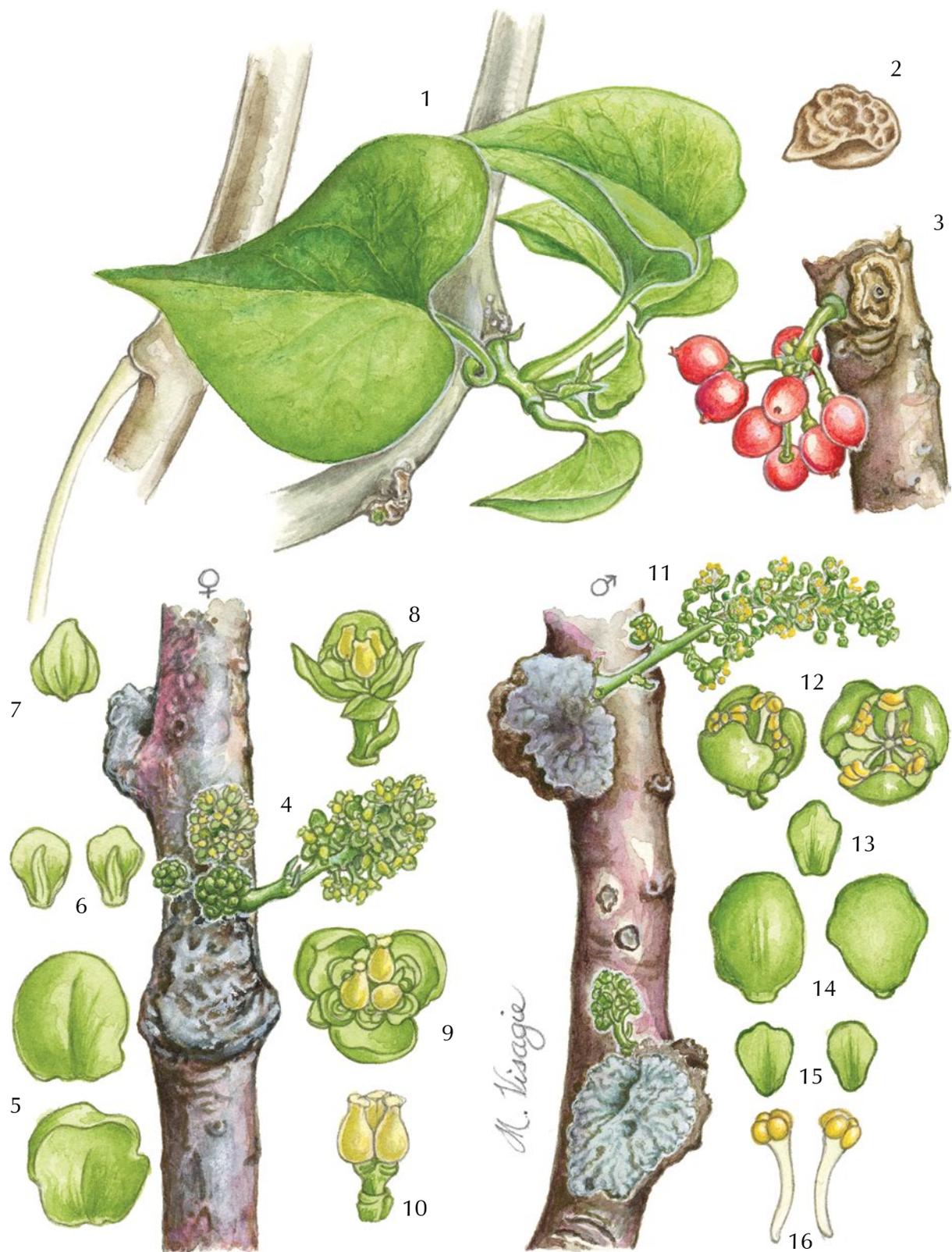


PLATE 2324 *Tinospora fragosa* subsp. *fragosa*

Tinospora fragosa* subsp. *fragosa

Menispermaceae

Angola, Botswana, Namibia, South Africa, Zimbabwe

Tinospora fragosa (I. Verd.) I. Verd & Troupin subsp. ***fragosa***, in *Memoires de l'academie Royale des Sciences d'Outre-Mer, Classe des sciences naturelles et medicales* 13: 1–312 (1962); Van Jaarsveld: 28 (2016). *Desmonema fragosum* I. Verd.: 209 (1941).

Tinospora fragosa subsp. *fragosa* is a remarkable, summer-deciduous, succulent-stemmed twiner restricted to the Limpopo and Mpumalanga provinces of South Africa, as well as Zimbabwe, Botswana, northern Namibia and southern Angola (Figure 1). When its growth is disturbed in one point, it can regenerate roots from distances of up to 10 m away, which ensures its survival in a grazing-dominated bushveld environment (Van Jaarsveld 1981; De Wet et al. 2016).

Tinospora fragosa subsp. *fragosa* belongs to the Menispermaceae, a small family of mainly lianas with a few shrubby exceptions, such as the *dawidjieswortel* (*Cissampelos capensis*) in the Western Cape (South Africa). It has a distribution which includes most of the world's tropics and with more or less 350 species in 65 genera. The genus *Cocculus* is the largest genus in the family. The family also has some useful members such as curare (*Curarea toxicofera* and *T. tecunarium*) a muscle relaxant, a substitute for sarsaparilla and which is used in hunting fish (picrotoxin) (Heywood 1978). Diagnostic features of this family are their alternate leaves without stipules and very small, inconspicuous unisexual flowers borne on different plants (dioecious). The flowers consist of two to three fleshy petals and two rows of three sepals per row. Stamens are free or united. The family has been divided into eight tribes based on seed structure. Our species belongs to the tribe Tinosporae with a straight sculptured endocarp. *Tinospora* was named by Miers in the *Annals and Magazine of Natural History* in 1851. It consists of about 35 species, of which most are African, but with members also from Madagascar, some Pacific Islands, and with two species in Asia and Australia. The origin of the genus name is somewhat unclear, with *teino* Greek for 'to stretch' and *spora* meaning 'seed' (Jackson 1990).

There are three species of *Tinospora* indigenous to South Africa, *Tinospora caffra* (Miers) Troupin, *T. tenera* Miers and *T. fragosa* subsp. *fragosa*. The genus was recently revised acknowledging three species in South Africa (De Wet et al. 2016). *Tinospora fragosa* subsp. *kaokoensis* van Jaarsv. was recently named from plants on the Namib margin in Kaokoveld, Namibia. This subspecies differs from the typical one by its ability to flower on younger stems, its swollen roots, and its distinctly striated stems that taper at intervals with the thinner portions desiccating spontaneously and acting as a vegetative propagation back-up (Van Jaarsveld 2016).

PLATE 2324.—1, young branches with leaves, × 1; 2, seed, × 1.5; 3, female fruiting branch, × 1; 4, branch with shortened, often rounded female inflorescence, × 1; 5 inner sepals, × 4; 6, outer sepals, × 4; 7, petals, × 4; 8, opened flower from side, × 4; 9, opened flower from top, × 4; 10, flower with sepals and petals removed, × 4; 11, branch with elongated male inflorescence, × 1; 12, opened flowers, × 4; 13, outer sepals, × 4; 14, inner sepals, × 4; 15, petals, × 4; 16, stamens, × 4. Voucher: Van Jaarsveld 25946 in Compton Herbarium, Cape Town. Artist: Marieta Visagie.

Frederik van der Merwe (1894–1968), a medical inspector of schools, had a passion for indigenous plants especially *Aloe* and *Ledebouria* (Gunn & Codd 1981). He had a keen eye for the unusual and, a true plant connoisseur, rapidly spotted the unknown species of succulent-stemmed *Tinospora* growing in trees and shrubs on well-drained, warm sites and which the local bushveld farmers called *Aäron-se-staf* (Aaron's rod). His scientific background ensured that he documented the preserved specimen of *Tinospora* that he collected (male and female specimens) on the northern slopes of the Zoutpansberg at Waterpoort (Limpopo Province), where he found them commonly growing (Verdoorn 1941).

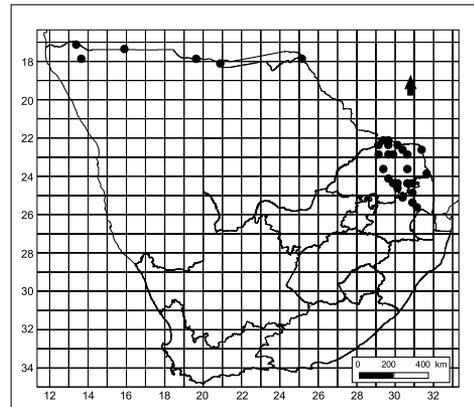


FIGURE 1.—The distribution of *Tinospora fragosa* subsp. *fragosa* in southern Africa (from De Wet et al. 2016).

Van der Merwe further noticed the species' peculiar mode of regeneration from aerial roots where the plant had been severed, losing contact with the ground. When the local farmers observed this, they were prompted to name the sprouting *Tinospora fragosa* subsp. *fragosa* Aaron's rod, in reference to the biblical account: Aaron was chosen leader of the 12 tribes of Israel, but this was disputed by the other tribes. He then asked the tribal leaders to each bring their walking sticks to be placed in the tent of gathering. The next morning it was only Aaron's rod that had sprouted with his authority firmly established.

The plant also came under the attention of the botanist Inez Verdoorn at the Botanical Research Institute in Pretoria, who was in charge of the National Herbarium from 1944–1951 (Gunn & Codd 1981). Realising it was a new species, she named it *Desmonema fragosum* I.Verd. in 1941. However, in 1962 Troupin, in his treatment of *Tinospora*, rightfully transferred it to this genus.

The savannas of Africa are known for their herbivores, as well as fires, and succulent plants need specific strategies to survive in this type of environment with its particular disturbance regime. Plants have to either stand their ground where they germinate (defence mode) or move away somehow. In an attempt to avoid predation, succulents have a vast number of strategies, consisting mostly of mechanical, chemical and camouflage defensive modes. Aloes, for example, have a combination of chemical and mechanical defence (bitter sap and thorns) and, in spite of this, are still grazed during severe droughts. *Tinospora fragosa* subsp. *fragosa* grows in dry river valleys, rocky sites and on flats. The species has the special ability to rapidly twine, enabling it to mobilise and displace itself to a new position. It thus follows a path of passive resistance by growing away from danger (i.e. out of reach of grazing animals). The stems of *T. fragosa* subsp. *fragosa* are succulent and juicy, but with bitter sap. If it is grazed and subsequently loses contact with the soil, it has sufficient reserves in its succulent stems to grow a survival root – a true life line – re-rooting the plant to ensure its long-term survival, unlike most other creepers that would die upon loss of soil contact (Van Jaarsveld 2015). The root will only appear during the growing sea-

son (November to April), to give it its best chance of survival.

The plant produces large heart-shaped leaves to maximise photosynthesis and fasten the lengthening of its twining stems. During autumn the greyish-brown stems become exposed as the leaves start to drop. The bitterness of the stem sap provides some form of protection and may deter primates such as vervet monkeys and baboons. *Tinospora fragosa* subsp. *fragosa* plants have been observed by one of us (EJv) from various sites in the Limpopo Province (South Africa), Angola, northern Namibia and eastern Zimbabwe. In the Gonarezhou National Park, in the south-eastern corner of Zimbabwe and just north of the Kruger National Park, *T. fragosa* subsp. *fragosa* plants are grazed by larger herbivores such as elephant, sometimes leaving the fibrous stems behind (Van Jaarsveld 2015).

The pollinator of the inconspicuous unisexual flowers is unknown, but it is probably attracted by the floral scent. *Tinospora fragosa* subsp. *fragosa* is hysteranthous, flowering in winter (when the leaves have dropped) and also during spring or rarely in summer. The fruits are carried in clusters of conspicuous red berries, relished and spread by frugivorous birds. Twiners, creepers and climbing plants, such as *T. fragosa* subsp. *fragosa*, do not have to rely on woodiness and direct all their energy to lengthening and taking advantage of other plants for support. Climbing to the top of the mopane (*Colophospermum mopane* (J.Kirk ex Benth.) J.Kirk ex J.Léonard), helicopter tree (*Gyrocarpus americanus* Jacq. subsp. *africanus* Kubitzki) and white syringa (*Kirkia acuminata* Oliv.), one of us (EJv) was able to observe the plant and its flowers at close range. Here lichens establish on the stems of *T. fragosa* subsp. *fragosa* (see plate) due to moisture-laden winds from the warm Indian Ocean along the subtropical Mozambique coast.

The ability to sprout from aerial roots is not only confined to *Tinospora* and has been observed in other succulent plants, such as *Cissus tuberosa* DC. from Mexico.

Tinospora fragosa subsp. *fragosa* is at once distinguished from the other two *tinosporas* by its much thicker stems of 30–50 mm in diameter, and abbreviated side branches from where



FIGURE 2.—The male inflorescence of *Tinospora fragosa* subsp. *fragosa* (Gonarezhou National Park, Zimbabwe). Photograph: E.J. van Jaarsveld.

the male or female flowers appears. The short elongated inflorescences are oblong in male plants (Figure 2) and somewhat rounded in female plants. The heart-shaped leaves of the others are more or less similar to our species and they also have the ability to grow aerial roots when soil contact is lost. *Tinospora caffra* (KwaZulu-Natal and further north) has thinner and knobbly stems, whilst *T. tenera* has yellowish striated stems.

The plants are used locally as medicine by various indigenous peoples. The Sotho named it *penualeng* in the Lydenburg district where stems and leaves are used against rheumatism and sore bodies (Verdoorn 1941). De Wet & Van Wyk (2008) reported that the twigs are chewed and sap swallowed to relieve sore throats and treat coughs (De Wet et al. 2016), and the plant is fed to cattle to prevent anthrax. In Ovamboland, Namibia the Kwanyama people knows the plant by the name *omapos* or *omaphsha* (Rodin 1985). It is also used as a good luck charm to prevent snakes from entering their dwellings (De Wet & Van Wyk 2008).



FIGURE 3.—*Tinospora fragosa* subsp. *fragosa* in habitat growing on a mopane tree (*Colophospermum mopane*) in the Gonarezhou National Park, Zimbabwe. Photograph: E.J. van Jaarsveld.

The vegetation over most of the habitat of *Tinospora fragosa* subsp. *fragosa* consists of mopaneveld (Figure 3), which is part of the Savanna Biome (Mucina & Rutherford 2006). Plants grow at an altitude of 450 to 1 000 m above sea level. However, near Polokwane (Limpopo Province) plants have been observed on granite outcrops and also east of Chuniespoort in the dry savanna of the Olifants River Valley and near Steelpoort. The region is dry in winter, with cool evenings, and very high summer temperatures (sometimes up to 40°C) with associated humidity. The average daily summer maximum is 26–29°C and the average daily winter temperature about 13–17°C. Rainfall is mainly from late spring through summer, November to May, and ranges between 300 and 500 mm per annum. *Tinospora fragosa* subsp. *fragosa* plants sprout during November and during times of very hot conditions, with temperatures above 35°C, their leaves may change, becoming smaller, more coriaceous and pointed, and slightly glaucous with the margin undulating and crisped (Figure 4). The plant becomes deciduous during April or May when the leaves turn yellow, continuing its growth in November.

At Gonarezhou Nature Reserve (Figure 5) one of us (EJv) has observed *Tinospora* sharing its habitat with various other succulents at the Chivilila Falls on the banks of the Runde River. Associated succulents includes *Adansonia digitata* L., *Sterculia rogersii* N.E.Br., *Aloe globuligemma* Pole-Evans, *A. chabaudii* Schönland, *Pachypodium saundersii* N.E.Br. and



FIGURE 4.—The leaves of *Tinospora fragosa* subsp. *fragosa* become coriaceous and glaucous with crisped margins during very hot weather. Photograph: E.J. van Jaarsveld.



FIGURE 5.—Adventitious roots from *Tinospora fragosa* subsp. *fragosa* growing in a mopane tree (*Colophospermum mopane*) at Gona-rezhu National Park. Photograph: E.J. van Jaarsveld.

Sansevieria hallii Chahinian. Our species is not a soil specialist and grows in various types, including granite-, dolerite- and shale-derived soils. Their arboreal nature also ensures that they are less affected by occasional fires.

Tinospora fragosa subsp. *fragosa* grows well as a curiosity plant such as on a protected window sill in warmer climates. The stems can be hung and when the root appears, it is best to place a pot below it, allowing the plant to establish. Provide enough moisture during the active growing phase, but also withhold water during the dry winters to enable the plants to rest. One of us (EJv) has been growing the plants at the Botanical Society Conservatory at Kirstenbosch National Botanical Garden for more than 20 years. Stems were hung up near the roof of the building and the growth rate of the roots measured at about 10–20 mm per day. The plant rapidly establishes and continues its growth once it comes in contact with soil. The initial root gradually thickens (flaking longitudinally) becoming stem-like. It is best grown in bushveld gardens (Van Jaarsveld 2010). Stems can be placed in trees or fences and growth is rapid. Once fruits are set it should attract frugivorous birds. Propagation is easily achieved by pruning the stem into various parts, of which each should sprout during the growing season.

Description.—Winter deciduous, sparingly branched succulent-stemmed dioecious twining liana in trees and shrubs, growing to 15 m high or higher. Roots fibrous, initial aerial

root free-hanging, 1 mm in diameter at first, fast growing (10–15 mm per day), gradually thickening to 10 mm in diameter, greyish-green and developing longitudinally peeling bark with age. *Young branches* initially green, smooth, becoming grey, later becoming greyish-brown to dark brown and scaling periderm, covered in lenticels, scars and sometimes lichens, 30–50 mm in diameter, the distal part with abbreviated ascending to spreading lateral branches up to 10 mm long from where the flowers appear. *Mature branches* fragile, becoming detached with aerial root that grows only during rainy season, free hanging, re-establishing the plant. *Leaves* simple, greyish green, alternately arranged, firm, coriaceous, broadly ovate, often v-shaped and cordate at base, 30–80(100) mm long, 30–80(100) mm broad, petioles to 100 mm long, pulvinus yellowish green, margin entire, sometimes wavy (during hot spells), glabrous, nerves palmate. *Inflorescence* racemose, up to 50 mm long, cauliflorous. *Bracts* 1–3, 5 mm long, linear. *Flowers* small, greenish, inconspicuous, 1–3 per bract. *Male inflorescence* a simple false raceme 40–50 mm long; sepals 6, ovate, outer three 1.5 mm long, 1 mm broad, inner three 3.5 mm long, 2.5 mm broad; petals 6, obovate, 2 mm long 1.5 mm broad, often obscurely subcrenate; stamens 6, connate at the base, 2.5 mm long; filaments 1.5 mm long; anthers longitudinally fissured, dehiscing from the side. *Female flowers* on shorter racemes, 20 mm long; sepals 6, outer three 2 mm long, 1.25 mm broad, inner three concave, 4 mm long, 3 mm broad; petals 6, obovate, 2 mm long, 1.5 mm broad; staminodes 6, opposite petals, 2 mm long; carpels 3, abbreviated stipitate; ovary stipitate at base, articulated, obliquely ovoid; stigma sessile, terminal. *Fruit* ripen after leaves appear, reddish, bean-shaped drupe, 8–10 mm long, 5–7 mm in diameter, exocarp a fleshy pulp; endocarp cartilaginous, smooth. Plate 2324.

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