

Two new species of *Commiphora* (Burseraceae) from southern Africa

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Keywords: Burseraceae, *Commiphora* Jacq., endemism, Gariiep Centre, Kaokoveld, morphology, Namibia, new species, South Africa, taxonomy

ABSTRACT

Commiphora steynii Swanepoel and *C. gariiepensis* Swanepoel, here described as new species, are known only from the Kaokoveld and Gariiep Centres of Endemism respectively. Illustrations of the plants and distribution maps are provided. Diagnostic characters of *C. steynii* include the pale ashy grey, non-peeling bark and the lack of wart-like projections around the large lenticels. Diagnostic characters of *C. gariiepensis* include the stamen number which varies between four and eight, and the milky-watery latex which does not squirt when branches are damaged. When without leaves or fruit, *C. gariiepensis* can easily be confused with several other species. Comprehensive tables with diagnostic morphological features to distinguish between the new species and closely related taxa are presented.

INTRODUCTION

Thirty-four species of *Commiphora* Jacq. are presently known from the *Flora of southern Africa* Region of which twenty-six occur in Namibia (Craven 1999; Germishuizen & Meyer 2003; Swanepoel 2005). Ten of these species are more or less restricted to the Kaokoveld Centre of Endemism, northwestern Namibia and four to the Gariiep Centre of Endemism along the Namibia–South Africa border (Van Wyk & Smith 2001; Curtis & Mannheim 2005).

In this contribution, two new species of *Commiphora* are described, *C. steynii* Swanepoel from the Kaokoveld Centre of Endemism and *C. gariiepensis* Swanepoel from the Gariiep Centre of Endemism. Collections of *C. steynii* were formerly regarded to be conspecific with *C. merkeri* Engl. (Van der Walt 1986) and more recently with *C. viminea* Burt Davy (Coates Palgrave 2002). *C. gariiepensis* is a newly discovered, rare species, with a limited geographical distribution.

MATERIALS AND METHODS

Diagnostic morphological features to differentiate between *C. steynii* and *C. viminea* (Van der Walt 1973) and between *C. gariiepensis*, *C. oblancoolata* Schinz and *C. dinteri* Engl. (Van der Walt 1974), are presented. Apart from examining the herbarium collections of *Commiphora* in the WIND and PRE herbaria, live material from numerous populations were studied in the field. Unless indicated otherwise, morphological characters were all determined from mature leaves and flowers and from ripe fruit.

Comprehensive comparative tables of salient diagnostic morphological characters to differentiate between *C. steynii* and *C. viminea* and between *C. gariiepensis*, *C. oblancoolata* and *C. dinteri* were compiled (Tables 1 & 2). Selected morphological differences between *C.*

steynii, *C. viminea*, *C. merkeri*, *C. habessinica* (O.Berg) Engl. and *C. spathulata* Mattick are presented in Table 3. For *C. steynii* and *C. viminea*, the diagnostic features were determined from herbarium specimens and plants in the field. In addition, some information regarding *C. viminea* was sourced from the literature. Regarding *C. merkeri*, *C. habessinica* and *C. spathulata*, all information presented was sourced from Gillett (1991).

***Commiphora steynii* Swanepoel, sp. nov.**, *C. viminea* Burt Davy cortice cum lenticellis magnis, ramis ramulisque glabris levibus nitidis, foliis simplicibus vel trifoliolatis similis, sed truncis simplicibus vel e terra multicaule, cortice sine prominentiis verruciformibus circum lenticellos, non vel exigue deglubenti, foliolis lateralibus usque ad $\frac{2}{3}$ terminalis longitudine, pseudo-arillo carnosus, e basi cum brachiis 4 insignitis differt.

TYPE.—Namibia, 1713 (Swarthoofdrif): Otjivora, south of Steilrandberg, 1 000 m, (–CD), 08-01-2004, *Steyn & Swanepoel 1* (WIND, holo.!, PRE, iso.!).

Illustrations: Steyn: 45, 46 & 87 (2003).

Dioecious small tree up to 3.5 m high, with or without spines; single or multi-stemmed from ground level; trunk and stems cylindrical, up to 200 mm in diam. *Bark* on trunk and older stems pale ashy grey, yellowish grey, greyish brown or khaki, smooth, peeling insignificant, in some specimens peeling in places in small, tough, flake-like pieces or in short, narrow, transverse strips, not papery, occasionally with few dark patches in places, lenticels transversely elongated, often almost completely encircling trunk and stems. *Branches and branchlets* glabrous, smooth, with small lenticels, shiny brown to dark brown, rarely maroon-brown or blackish grey, often with transversely alternating rings of dark and pale bark on older branches, often spine-tipped, spines slender; spines or spine-tipped lateral branchlets rarely in clusters of up to 5 or branched into 2 or 3 spines or spine-tipped lateral branchlets; new growth red or green, often with few glandular hairs, otherwise glabrous; dwarf lateral branchlets often scarred. *Exudate* milky, glutinous, not aromatic, drying to form a soft to hard yellowish cream or caramel-brown resin, often in beads, not transparent.

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TABLE 1.—Salient morphological differences between *Commiphora steynii* and *C. viminea*

Character	States	<i>C. steynii</i>	<i>C. viminea</i>	
Habit	Multi-stemmed tree	Often	Never	
	Single stemmed tree	Often	Always	
Bark	With wart-like projections on stem around lenticels	Never	Always	
	Peeling around stem in significant yellow papery strips	Never	Always	
	Peeling insignificant	Often	Never	
	Smooth	Often	Never	
Branches & branchlets				
Spines	Present	Often	Always	
	Slender	Always	Never	
	Robust	Never	Always	
Colour	Brown to dark brown	Usually	Never	
	Maroon-brown or blackish grey	Rarely	Never	
	Purple	Never	Always	
Exudate	Aromatic	Never	Always	
Lamina shape				
Simple leaves & terminal leaflets	Obovate or elliptic	Usually	Always	
	Broadly oblanceolate or suborbicular	Rarely	Never	
Lateral leaflets	Elliptic	Often	Always	
	Obovate, lanceolate or oblanceolate	Often	Never	
Lamina				
Base pubescence	Long, flexuous hairs	Always	Never	
Colour	Glaucous	Often	Always	
	Pale green, bright green	Often	Never	
Size of lateral leaflets	Length relative to terminal leaflets	Up to two thirds	Up to half	
Margin of simple & terminal leaflets	No. teeth on each side	1–15	1–6	
Petiole in t/s	Dimensions (mm)	0.9–1.8 × 0.6–1.3	1 × 0.8	
	No. vascular bundles	7–15	10 or 11	
Inflorescence	Flowers solitary	Rarely	Never	
	Clusters	Usually	Always	
	Cymes	Rarely	Never	
Flowers	Sessile or subsessile	Rarely	Never	
	Pedicellate	Usually	Always	
Male flowers	On common peduncle	Rarely	Never	
Pedicel				
Male flowers	Length (mm)	0.3–5.0	2–10	
Trichomes	Glandular hairs	Often	Never	
Calyx	Male flowers	Length (mm)	3.1–4.5	
	Female flowers	Length (mm)	1.6–3.3	
	Trichomes	Scattered short glandular hairs	Often	Never
		Long glandular hairs on lobe margins	Never	Rarely
Calyx lobes	Male flowers	Length (mm)	0.5–2.0	
	Female flowers	Length (mm)	0.5–1.0	
Petal shape	Male flowers	Cultrate, ensiform, linear or oblong	Always	
		Narrowly oblanceolate	Never	
	Female flowers	Linear or oblong	Always	
		Narrowly oblanceolate	Never	
Disc lobes	Indentation between lobes	Deep	Always	
		Shallow	Never	
	Male flowers	Deeply grooved on inside	Always	
		Shallowly grooved on inside	Never	
Female flowers	Grooved on outside	Never		
	Bifid at apex	Always		
	Grooves on outside limited to apical part	Always		
	Grooved on inside	Never		
Stamens, long	Inserted on outside of disc lobes, just below apex	Always		
	Inserted half way up on outside of disc lobes	Never		
Filaments: shape over basal part	Flattened & broadened	Never		
Anthers				
Long stamens	Length (mm)	0.8–1.6	1.3	
Short stamens	Length (mm)	0.7–1.2	0.9	
Pistil	Length (mm)	1.7–2.8	3.0–3.4	
Stigma	Protruding above petal	Often		
	Below top of flower	Often		

TABLE 1.—Salient morphological differences between *Commiphora steynii* and *C. viminea* (cont.)

Character	States	<i>C. steynii</i>	<i>C. viminea</i>
Fruit			
Shape	Apex bent over towards sterile locule	Often	Never
Apex	Very apiculate	Never	Always
Putamen			
Shape	Ovoid	Often	Never
Apex	Angle between locules (degrees)	(55–)60–70(–92)	(44–)65–75(–83)
Suture	Rectilinear	Often	Always
	Convex towards fertile locule	Often	Never
Texture	Very rugose on fertile locule	Often	Never
	Slightly rugose	Never	Often
Dimensions	Length (mm)	6.3–8.2 × 3.9–5.9 × 3.5–4.2	6.9–10.2 × 3.3– 5.1 × 3.3–4.9
Fertile locule	Narrowly ridged transversely one third from base	Never	Always
Sutural view	Convex	Always	Never
	Triangular	Never	Always
Apical view	Convex	Usually	Often
	Triangular	Rarely	Never
	Rectilinear	Never	Often
Sterile locule: sutural view	Either rectilinear and tapering to apex, rectilinear with 2 (1) humps, rectilinear with indentation in centre	Always	Never
	Triangular	Never	Always
Pseudo-aril			
Shape	Four distinct arms	Always	Never
	All enveloping	Never	Always
Thickness	Membranous	Never	Always
	Fleshy	Always	Never
Colour	Red or orange	Never	Often
	Yellow	Always	Often

Leaves simple or trifoliate; clustered on branches and dwarf lateral branchlets, spirally on shoots; glaucous or pale green with a dullish lustre, bright green when young, occasionally retaining bright green colour, different shades of green occasionally together on same tree but on different branches; simple leaves and terminal leaflets with few glandular and long, shaggy, flexuous hairs adaxially at base, few short, glandular hairs on both sides of lamina, especially adaxially on midrib, very short glandular hairs clustered in corners of serrations and occasionally on lamina margin, otherwise glabrous; lateral leaflets with few glandular hairs adaxially on midrib, with or without long flexuous hairs ad- and abaxially on midrib, short glandular hairs clustered in corners of serrations, otherwise glabrous; minute lateral leaflets with few glandular and long flexuous hairs abaxially, otherwise glabrous; all long flexuous hairs achromatous at first, becoming brown with age; lamina of simple leaves and terminal leaflets usually narrowly obovate to broadly obovate, elliptic to broadly elliptic or rarely broadly oblanceolate or suborbicular, (5–)12–35(–58) × (3–)6–22(–36) mm, apex acute, obtuse, truncate or retuse, minute tip usually acute, base cuneate, acuminate or shortly attenuate onto the petiole; margin usually crenate-serrate with (1–)5–9(–15) teeth on each side, basal third to half usually entire, occasionally crenate-serrate from base, margin occasionally almost entire; lamina of lateral leaflets narrowly elliptic to elliptic or narrowly obovate, often asymmetric especially over basal part, up to two thirds length of terminal leaflets, (2–)4–20(–30) × (1–)2–10(–15) mm, apex acute, base cuneate or acuminate, margin crenate-serrate with (1)2–4(5) teeth on each side, basal third to half entire, margin occasionally almost entire; where clustered, lamina of lateral leaflets very small, lanceolate, oblanceolate or narrowly elliptic, often

asymmetric, (0.5–)5.0–12.0(–15.0) × (0.2–)3.0–6.0(–8.0) mm, apex acute, base cuneate, margin entire; midrib conspicuous abaxially, broadest at base, gradually narrowing towards apex, prominently raised adaxially, less so abaxially, on lateral leaflets often curved, especially over basal part, in minute lateral leaflets often obscure; leaves subsessile or petiolate; petiole with few glandular hairs and long flexuous hairs adaxially, otherwise glabrous, from less than 1 mm up to 5 mm long, crescent-shaped in t/s with 7–15 vascular bundles, sectional dimensions (0.9–)1.1–1.5(–1.8) × (0.6–)0.8–1.1(–1.3) mm; petiolules up to 1 mm long or leaflets sessile.

Inflorescence: flowers borne in clusters, solitary or male flowers rarely in much-reduced, simple or dichasial cymes with peduncle up to 1 mm long; axillary. *Flowers* sessile, subsessile or pedicellate; pedicel often with short glandular hairs; unisexual, hypogynous, precocious or appearing with or after leaves. *Bracteoles and bracts* narrowly triangular, apex acute, with glandular and long hairs, bracteoles up to 1.5 mm long, bracts up to 2.3 mm long. *Calyx* greenish yellow, yellow or greenish red, often with scattered, short, glandular hairs, otherwise glabrous, lobes triangular, apex acute. *Petals* greenish yellow, yellow, greenish red or red, glabrous, recurved towards top but minute tip inflexed. *Disc* cylindrical with 4 distinct lobes, not adnate to calyx or corolla. *Male flowers* 4.9–12.5 mm long; pedicel 0.3–5.0 mm long; calyx 3.1–4.5 mm long; calyx lobes 0.5–2.0 mm long; petals cultrate, ensiform, linear or oblong, 3.0–8.5 × 0.6–1.0 mm; disc with indentation between lobes deep, disc lobes very fleshy, not bifid at apex, deeply grooved on inside over basal part; stamens 8, 4 long ones with filaments 1.4–4.7 mm long, inserted on outside of disc lobe just below apex; 4 short ones with filaments 0.6–2.8 mm long, inserted on outside of disc

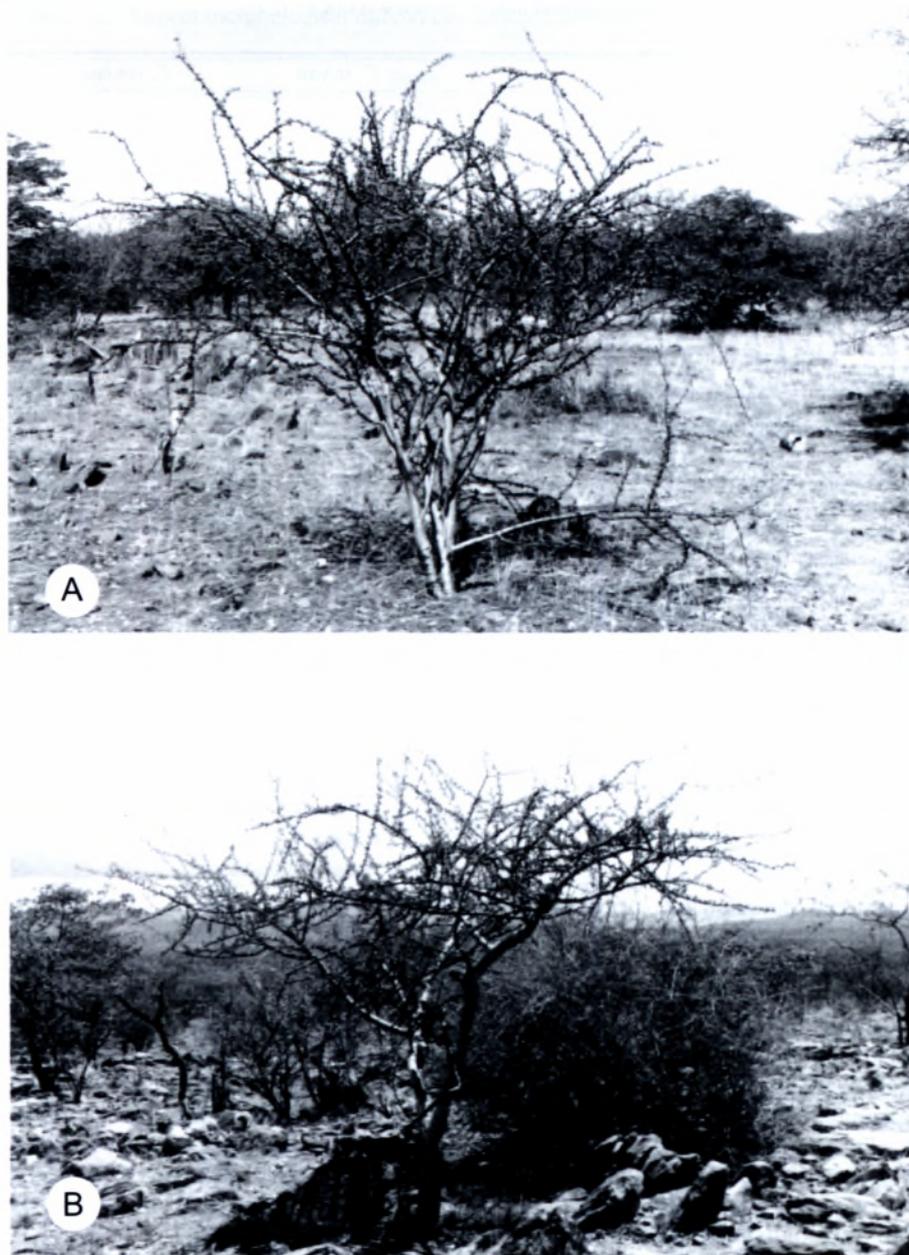


FIGURE 1.—*C. steynii*. A, multi-stemmed tree, 2.5 m tall; B, tree with single stem, 3 m tall.

between lobes; anthers on long stamens 0.8–1.6 mm long; anthers on short stamens 0.7–1.2 mm long, usually 0.1–0.2 mm shorter than anthers on long stamens or anthers rarely equal in size; filaments slender, thread-like, not flattened or broadened over lower part; gynoecium rudimentary. *Female flowers* 3.5–4.7 mm long; pedicel 0.3–0.8 mm long; calyx 1.6–3.3 mm long, calyx lobes 0.5–1.0 mm long; petals linear or oblong, 2.8–4.4 × 0.6–0.9 mm; disc lobes not very fleshy, bifid at apex, grooved on outside over apical part; staminodes 8, 4 long and 4 short; ovary superior; style relatively long, sutures deeply grooved; stigma obscurely 4-lobed, either protruding up to 0.5 mm above petals, level with petals or 1.4 mm below top of flower; pistil 1.7–2.8 mm long.

Fruit a drupe, obovoid, ellipsoid or oblong-ellipsoid, apiculate, slightly flattened, asymmetrical, 10–14 × 8–9 × 7–8 mm, apex occasionally bent over towards sterile locule; pericarp 2-valved; exocarp glabrous, not glutinous, reddish green or red in ripe fruit; mesocarp fleshy; putamen flattened, asymmetrical, ovoid, obovoid, ellipsoid or

oblong-ellipsoid, with one fertile and one sterile locule, rugose; fertile locule often very rugose, 6.3–8.2 × 3.9–5.9 × 3.5–4.2 mm, fertile locule convex in sutural view and convex or triangular in apical view; sterile locule dorsally ridged, variable in sutural view, either rectilinear and tapering to apex, rectilinear with a hump near apex and occasionally with an additional smaller hump near base, or rectilinear with an indentation in centre, triangular in apical view; suture rectilinear or convex towards fertile locule; angle between locules at apex (44–)65–75(–83)°; pseudo-aril greenish yellow or yellow, fleshy, with 4 long narrow arms from base of putamen, commissural arms reaching the 2 large apical pits, facial arms reaching apex, arm on fertile locule usually broader than arm on sterile locule. *Flowering time*: August to March. Figures 1–4.

Diagnostic characters and affinities: *Commiphora steynii* probably is most closely related to *C. viminea* (until recently misidentified as *C. merkeri* in southern Africa), the species with which it has hitherto been confused (Table

TABLE 2.—Salient morphological differences between *Commiphora gariensis*, *C. oblanceolata* and *C. dinteri*

Character	States	<i>C. gariensis</i>	<i>C. oblanceolata</i>	<i>C. dinteri</i>
Exudate	Watery	Never	Always	Never
	Milky-watery	Always	Never	Never
	Milky	Never	Never	Always
	Squirts when branches damaged or cut	Never	Always	Never
Lamina shape				
	Terminal leaflets			
Lateral leaflets	Oblanceolate	Usually	Always	Never
	Cultrate	Rarely	Never	Never
	Obovate	Never	Never	Always
Simple leaves	Oblanceolate	Often	Always	Never
	Narrowly elliptic	Often	Never	Never
	Elliptic	Never	Never	Always
	Cultrate	Often	Never	Never
Simple leaves	Lanceolate-oblong	Often	Never	Never
	Oblong	Often	Never	Never
	Narrowly elliptic	Often	Often	Never
	Oblanceolate	Often	Often	Never
	Deeply trilobed	Rarely	Often	Never
	Obovate, elliptic, ovate, cordate, obovate, slightly oblong	Never	Never	Always
Lamina				
Terminal leaflets	Dimensions (mm)	5–36 × 2–13	7–45 × 3–9	6–22 × 4–15
Lateral leaflets	Dimensions (mm)	3–25 × 1–10	8–45 × 3–9	3–12 × 2–9
Margin	Serrate	Often	Never	Never
	Serrate-dentate	Often	Usually	Rarely
	Crenate-serrate	Rarely	Rarely	Usually
Teeth on margin				
Terminal leaflets	No. on each side	3–11	1–45	3–16
Lateral leaflets	No. on each side	2–9	1–38	4–10
Inflorescences	Simple dichasial cymes up to 3 mm long	Often	Never	Never
	Simple dichasial cymes up to 13 mm long	Never	Often	Never
	Thyrsoid	Never	Rarely	Never
	Clusters	Never	Never	Often
Flowers	Sessile	Often	Never	Never
	Subsessile	Often	Never	Always
	Pedicellate	Often	Always	Never
Petal shape				
Male flowers	Oblanceolate	Never	Often	Often
	Narrowly elliptic	Often	Never	Often
	Narrowly obovate	Often	Often	Never
Female flowers	Oblanceolate	Never	Often	Often
	Oblong	Never	Often	Never
	Lanceolate	Never	Often	Never
	Narrowly obovate	Always	Never	Never
	Narrowly elliptic	Never	Never	Often
Disc lobes				
Male flowers	Distal part not adnate to hypanthium	Always	Never	Always
	Distinctly bifid at apex	Often	Never	Always
	Obscurely bifid at apex	Often	Always	Never
Female flowers	Distinctly bifid at apex	Often	Never	Never
	Obscurely bifid at apex	Often	Never	Always
	Not bifid at apex	Often	Always	Rarely
Stamens	No. per flower	4–8	4	8
Filaments				
Long stamens	Length (mm)	1.1–2.9	0.8–1.9	1.4–2.2
Short stamens	Length (mm)	0.6–1.8	Never	0.7–1.3
Anthers	Length (mm)	0.7–1.3	1.0–1.1	0.6–1.1
Pistil	Glandular	Never	Always	Always
Fruit				
Shape	Globose	Never	Often	Never
	Subglobose	Never	Often	Rarely
	Ovoid	Often	Never	Often
	Ellipsoid	Often	Often	Often
	Obovoid	Never	Rarely	Rarely
Apex	Bent over towards sterile locule	Never	Often	Never
	Apiculate	Never	Often	Usually
Exocarp	Distinctly glutinous	Always	Never	Usually
	Slightly glutinous to non-glutinous	Never	Always	Rarely

TABLE 2.—Salient morphological differences between *Commiphora gariensis*, *C. oblancoolata* and *C. dinteri*. cont.

Character	States	<i>C. gariensis</i>	<i>C. oblancoolata</i>	<i>C. dinteri</i>
Putamen Shape	Ellipsoid	Always	Often	Often
	Obovoid	Never	Often	Never
	Ovoid	Never	Never	Often
	Subglobose	Never	Often	Rarely
Apex Suture	Angle between locules (degrees)	70–105	(55–)70–90(–104)	(51–)80–105(–120)
	Convex towards fertile locule	Always	Never	Never
Texture	Rectilinear	Never	Often	Never
	Rectilinear but curved at apex	Never	Often	Always
	Slightly rugose	Always	Often	Always
Sterile locule shape: sutural view	Smooth	Never	Often	Never
	Convex	Always	Often	Often
	Triangular	Never	Often	Often
Pseudo-aril Size	Varying from convex at base to concave at apex	Never	Never	Rarely
	Extent of commissural arms relative to length of putamen (pseudo-aril removed) (%)	80–90	72–97	57–95
Colour	Proportion of fertile locule covered by cup (%)	24–30	19–53	15–41
	Proportion of sterile locule covered by cup (%)	40–50	35–70	21–49
Colour	Orange	Always	Often	Often
	Red	Never	Often	Often

1). It also shows morphological resemblance to a number of Central and East African species, in particular to *C. merkeri*, *C. habessinica* and *C. spathulata* (Gillett 1991). *C. steynii* differs from these taxa (Table 3) mainly in habit, bark, exudate, internal features of the flowers, in the fruit and in geographical distribution. *C. steynii* differs conspicuously from *C. viminea* in that its bark does not peel, or peels

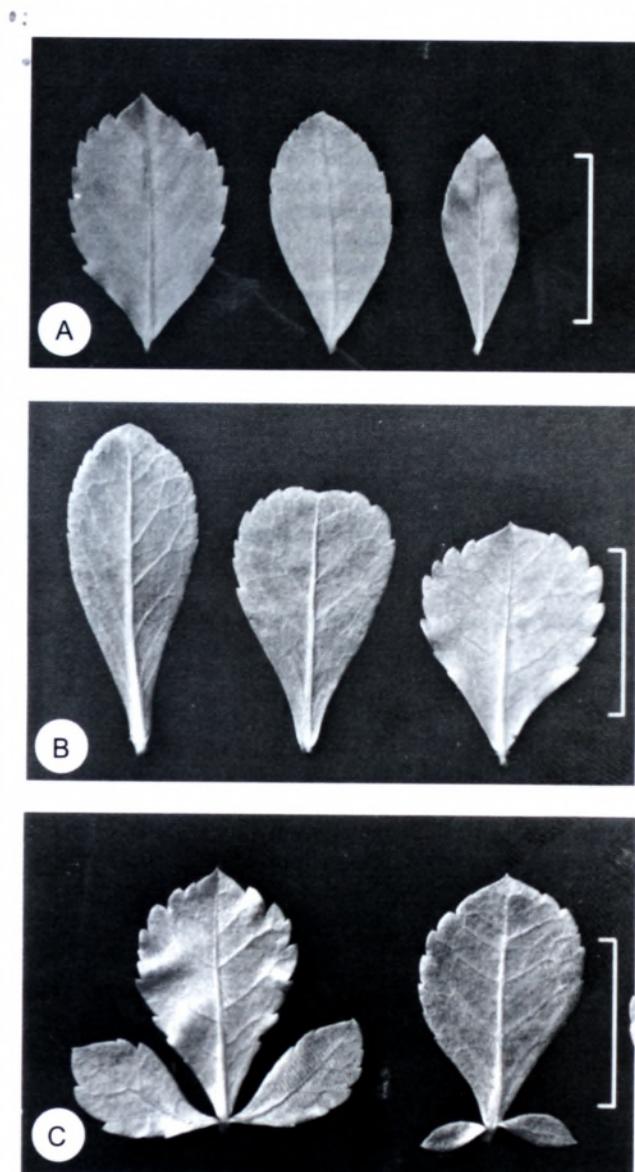
FIGURE 2.—*C. steynii*. Bark.FIGURE 3.—*C. steynii*, leaves: A, B, simple; C, trifoliate. Scale bars: 20 mm.

TABLE 3.—Selected morphological differences between *Commiphora steynii*, *C. viminea*, *C. merkeri*, *C. habessinica* and *C. spathulata*

Character	States	<i>C. steynii</i>	<i>C. viminea</i>	<i>C. merkeri</i>	<i>C. habessinica</i>	<i>C. spathulata</i>
Bark	Peeling significant	Never	Always	Always	Always	Always
Branches & branchlets: colour	Brown	Usually	Never	Never	Never	Never
	Purple	Never	Always	Always	Never	Often
Exudate	Grey	Rarely	Never	Never	Always	Often
	Strongly aromatic	Never	Always	Always	Never	Never
Leaves	Faintly aromatic	Never	Never	Never	Always	Never
	Simple only	Never	Never	Always	Never	Never
Lamina shape	Simple with varying no. trifoliate leaves	Always	Always	Never	Always	Always
	Sub-orbicular	Rarely	Never	Never	Never	Never
Lamina margin on simple & terminal leaflets	No. teeth on each side	1–15	1–5	3–5	6–16	3–6
Inflorescence	Cymes	Rarely	Never	Often	Always	Never
Pedicels: male flowers	Length (mm)	0.3–5.0	2–10	5–6	0–1.5	± 1.0
Calyx: male flowers	Length (mm)	3.1–4.5	2.0–3.2	± 2.6	2.2–2.5	± 1.7
Calyx lobes: male flowers	Length (mm)	0.5–2.0	0.6–0.9	± 0.6	± 0.6	± 0.7
Filaments						
Long stamen	Length (mm)	1.4–4.7	Up to 5.0	3.7	3.5–4.0	2.0
Short stamen	Length (mm)	0.6–2.8	Up to 3.5	2.0	2.5–3.0	1.5
Anthers						
Long stamens	Length (mm)	0.8–1.6	1.3	0.9	0.7	0.7
Short stamens	Length (mm)	0.7–1.2	0.9	0.6	0.5	0.5
Pseudo-aril	All enveloping	Never	Always	Never	Never	Always
	Arm on fertile locule broadest	Never	Never	Always	Never	Never
	Arm on sterile locule shortest	Never	Never	Never	Always	Never
	Facial arms longer than sutural arms and reaching apex	Always	Never	Never	Never	Never

insignificantly only and is without the characteristic wart-like projections around the large lenticels. At a distance, the bark appears pale ashy grey to white. Young branches are brown or blackish grey in colour. In *C. viminea* the bark peels around stems in significant, yellow, papery strips and young branches are purple. *C. steynii* is a small, single or multi-stemmed tree up to 3.5 m tall, with or without slender spines, whereas *C. viminea* is a larger tree up to 5 m tall, single-stemmed, always spinescent with robust spines. In *C. steynii* the exudate is non-aromatic, whereas in *C. viminea* it is aromatic. The lamina margin on simple and terminal leaflets of *C. steynii* are with up to 15 teeth on each side and the lateral leaflets are up to two thirds the length of terminal leaflets. The petiole in *C. steynii* is usually thicker in *t/s*, 0.9–1.8 × 0.6–1.3 mm, and it has 7–15 vascular bundles. In *C. viminea*, the lamina margin on simple and terminal leaflets has only up to 6 teeth on each side and the lateral leaflets are only up to half the length of terminal leaflets, the petiole is usually smaller, 1.0–0.8 mm in transverse section and with 10 or 11 vascular bundles. The flowers and fruit provide additional distinguishing features. In *C. steynii* the pedicel and calyx are often with short glandular hairs and the pseudo-aril is yellow and fleshy, with four long, narrow arms. In *C. viminea* the pedicel and calyx are always glabrous, the putamen has the fertile locule narrowly ridged transversely one third from the base and the pseudo-aril is membranous, yellow, orange or red and covers the stone completely (Table 1). A study of herbarium material in PRE shows that collections from the Zambezi River Valley are true *C. viminea* and not *C. steynii*. These plants also have the typical peeling bark with black patches characteristic of *C. viminea*.

Eponymy: the specific epithet honours Marthinus H.

Steyn, born in 1935, tree enthusiast, amateur botanist, author and publisher of *A field guide, southern Africa*, *Commiphora* (2003), and various other field guides on southern African trees. Marthinus was the first person to propose that *C. steynii* should be regarded as a distinct taxon (Steyn 2003). I would like to propose the names ring-bark corkwood and *ringbaskannedood* as the English and Afrikaans vernacular names, respectively.

Distribution: *C. steynii* is only known from the Kaokoveld Centre of Endemism (Van Wyk & Smith 2001), in northwestern Namibia (Figure 5). It most probably also occurs in southern Angola, as it was collected within only 1 km from the Namibian/Angolan border near Ruacana in the Kunene River Valley. *C. steynii* varies from locally common to uncommon or rare within its range. It is absent from many areas with seemingly suitable habitat.

Habitat and ecology: *C. steynii* occurs in the Kaokoveld, including the pro-Namib Desert, the escarpment and to the east on the inland plateau. It occurs 70–260 km from the coast at altitudes of 800–1 200 m, where the annual rainfall is 75–300 mm. It grows mainly in *Colophospermum-Commiphora* woodland, where it prefers rocky areas and mixed soil and gravel substrates on hill slopes and plains. In the extreme south of its range at Palm and Gomakoukous, it occurs on Etendeka basalt of the Damaraland Igneous Province. In the Sesfontein area, it grows on sedimentary dolomite and metasedimentary schist of the Damara Supergroup and in the Omuhiva area on calcrete. South of the Steilrandberg and in the Roodrom area it occurs on quartzite of the Damara Supergroup. In the northeast of its range at Ruacana, it is found on limestone of the Karoo Supergroup (Miller &

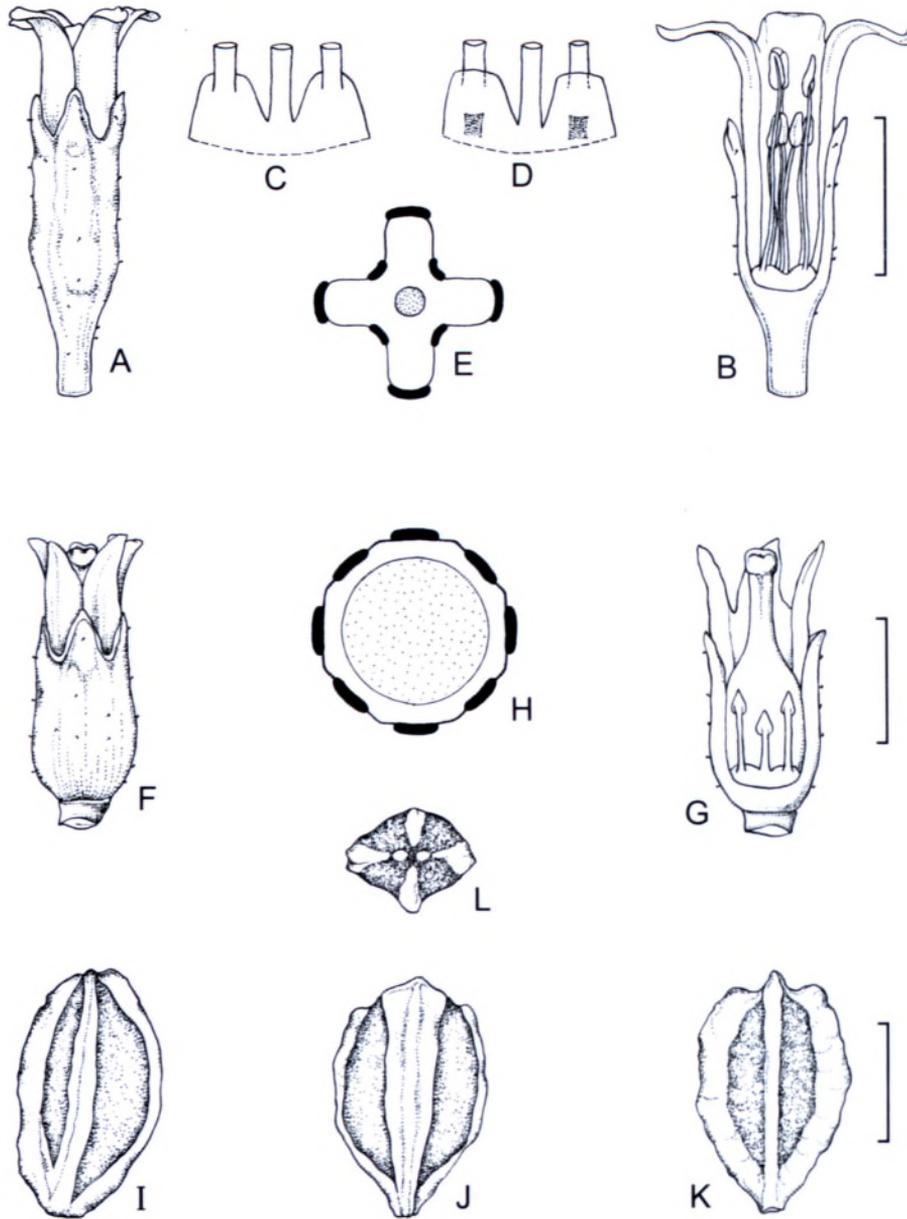


FIGURE 4.—*C. steynii*. A–E, male flower: B, calyx and corolla partly removed. C–E, disc: C, from outside; D, from inside; E, from above to depict position of stamens (black) and rudimentary ovary (circle). F–H, female flower: G, calyx and corolla partly removed; H, disc as seen from above to depict position of stamens (black). I–L, putamen with pseudo-aril: I, lateral view, fertile locule right, sterile locule left; J, fertile locule; K, sterile locule; L, apical view. A, B, *Steyn & Swanepoel 1*; F, G, *Swanepoel 109*; I–L, *Swanepoel 145*. Scale bars: A, B, 5 mm; F, G, 2 mm; I–L, 4 mm. Artist: Charmaine Baardman.

Schalk 1980; Mendelsohn *et al.* 2002).

Other specimens examined

NAMIBIA.—1712 (Posto Velho): 5 km W of Rooidrom, (–CD), *Swanepoel 135* (WIND); 2 km S of Rooidrom, (–DC), *Swanepoel 109* (WIND). 1713 (Swartbooisdrif): Etanga, (–CC), *Swanepoel 99, 100* (WIND); 19°50.3' S, 13°16.2' E, (–CD), *Swanepoel 101* (WIND). 1714 (Ruacana Falls): 8 km W of Ruacana Falls in Kunene River Valley, (–AC), *Swanepoel 133*. 1812 (Sanitatas): between Sanitatas and Otjikongo, (–BA), *Merxmüller & Giess 1457* (PRE, WIND). 1813 (Opuwo): Omuhiva, (–AD), *Swanepoel 88* (WIND); along road from Opuwo to Marienfluss via Etanda, (–BB), *Hilbert 177* (WIND); Outuwo, (–CB), *Swanepoel 136* (WIND); 13 km SW of Tomakas, (–CC), *Swanepoel 134* (WIND); 2 km S of Okovikuti, (–CD), *Swanepoel 141* (WIND); Orurupiza, (–CD), *Swanepoel 144* (WIND); 3 km S of Robbiespas, (–DA), *Swanepoel 142* (WIND); Otjikondavirongo, (–DC), *Owen-Smith 298* (WIND), *Swanepoel 145* (WIND). 1913 (Sesfontein): 3 km N of Otjondundu Fountain, (–BB), *Swanepoel 143* (WIND); near Gomakukous on Palmwag to Sesfontein road, (–DB), *Swanepoel 127* (WIND); 32 km N of Palmwag on Sesfontein road, (–DB), *Swanepoel 128, 129, 130* (WIND); near Gomakukous, N of Palmwag on Palmwag–Sesfontein road, (–DB), *Swanepoel 131, 138, 158* (WIND); near Gomakukous, (–DB), *Swanepoel 137, 139, 140* (WIND). 1914 (Kamanjab): 49 km SE of Sesfontein on road to Otjovasandu, (–AC), *Van der Walt 239* (PRE, WIND); Farm Palm OU 708, (–CC), *Giess 7727* (PRE, WIND).

***Commiphora gariensis* Swanepoel, sp. nov.**, *C. oblanceolatae* Schinz habitu et foliis plerumque trifoliatis cum paucis simplicibus similis; exsudato lacteo-aquoso non emicanti ubi rami laesi vel secti, foliolis terminalibus oblanceolatis ve; cultratis, lateralibus oblanceolatis, anguste ellipticis vel cultratis, lamina pro ratione latiori, staminibus 4–8 in quoque flore differt.

TYPE.—Namibia, 2819 (Ariamsvlei): escarpment of Blydeverwacht Plateau, 31 km SSW of Ariamsvlei, 950 m, (–BD), 09-12-2003, *Swanepoel 148* (WIND, holo.!, PRE, iso.!).

Dioecious shrub or small tree, 0.6–3.0 × 0.7–2.2 m; trunk short, branching repeatedly above ground level into thick stems with succulent appearance; younger branches slender. *Bark* greenish brown, greenish grey or pale grey with small dark spots and longitudinal, narrow, dark markings in places, transverse folds at base of stems and at bends of older branches, usually with few parallel longitudinal ridges on stems and older branches in places, otherwise smooth, not peeling. *Branches* glabrous with few small lenticels, glutinous when young, not spine-

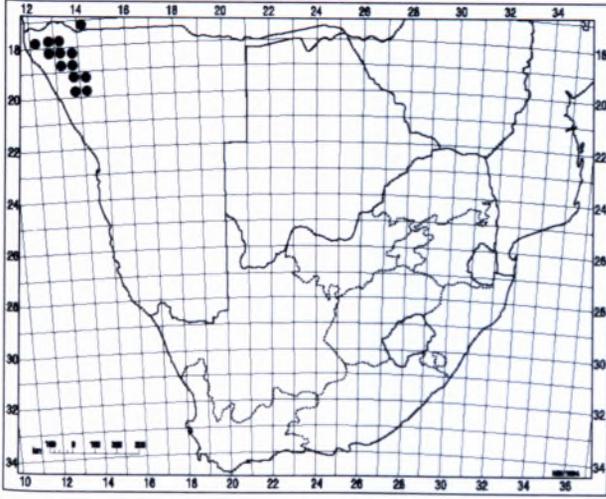


FIGURE 5.—Known distribution of *C. steynii*.

tipped. *Exudate* watery-milky (initially watery, followed by a milky secretion), not squirting upon branches or branchlets being damaged or cut, glutinous, aromatic, forming a soft, transparent, pale cream-yellowish resin.

Leaves trifoliolate with in addition a few scattered, simple and occasionally few, intermediate leaves, clustered on dwarf lateral branchlets, spirally on shoots, glabrous, green; lamina of terminal leaflets oblanceolate or rarely cultrate, (5–)10–18(–36) × (2–)4–8(–13) mm, apex acute to obtuse, base cuneate or slightly acuminate; lamina of lateral leaflets narrowly elliptic, oblanceolate or cultrate to broadly cultrate, often asymmetrically, up to (50–)60–70(–100)% as long as terminal leaflet, (3–)6–14(–25) × (1–)3–6(–10) mm, apex acute to obtuse, base cuneate or slightly acuminate; lamina of simple leaves lanceolate-oblong, oblong, narrowly elliptic, oblanceolate or deeply trilobed, (10–)12–18(–20) × (5–)6–8(–10) mm or when trilobed (10–)17–26(–30) × (15–)19–23(–26) mm, apex acute to obtuse, base cuneate or obtuse; margin serrate, serrate-dentate or rarely crenate-serrate or margin rarely subentire with teeth on terminal leaflets 3–7(–11), on lateral leaflets 2–6(–9) and on simple leaves 5–9(–13) on each side, entire near base; midrib either

slightly raised, plane or sunken ad- and abaxially; petiole usually slightly grooved adaxially especially over basal part, 1–18 mm long on trifoliolate and 1–8 mm long on simple leaves, variable in t/s: circular, reniform, elliptic, triangular, crescent-shaped or pentagonal with 3–5 vascular bundles, sectional dimensions (0.4–)0.6–0.7(–0.9) × (0.4–)0.5–0.6(–0.7) mm, leaflets sessile or subsessile.

Inflorescence: flowers borne in much reduced or short simple dichasial cymes, up to 3 mm long, glandular, or flowers solitary, axillary. *Flowers* sessile, or when solitary, subsessile or pedicellate, unisexual, perigynous, appearing before leaves and often continuously while in leaf. *Bracteoles* ovate, up to 0.4 mm long, apex acute, glandular. *Calyx* green, continuous with hypanthium, glandular otherwise glabrous, lobes triangular to ovate, apex acute. *Petals* green to yellowish green, occasionally sparsely glandular, otherwise glabrous, narrowly elliptic or narrowly obovate, recurved apically but the minute tip inflexed, inserted on hypanthium. *Disc* cylindrical, with 4 fleshy lobes, adnate to hypanthium but distal part of lobes free. *Male flowers* 2.6–4.7 mm long with pedicel up to 0.3 mm long; calyx 2.1–3.3 mm long; calyx lobes 0.8–1.3 mm long; petals 2.6–4.8 × 0.8–1.6 mm; disc lobes with apices distinctly to obscurely bifid; stamens 4–8, 4 long ones with filaments 1.1–2.9 mm long, inserted on top of disc lobes, 1–4 short ones with filaments 0.6–1.8 mm long, inserted on top of disc between lobes, short stamens rarely completely absent; anthers 0.7–1.3 mm long, equal in length on short and long stamens; filaments rarely flattened and broadened over lower part; gynoecium rudimentary. *Female flowers* 2.5–4.0 mm long; pedicel up to 0.7 mm long; calyx 2.3–2.9 mm long; calyx lobes 0.8–1.0 mm long; petals 1.3–2.5 × 0.7–1.2 mm; disc lobes distinctly bifid to entire; staminodes present; ovary short to relatively long, sutures deeply grooved; stigma obscurely 4-lobed; pistil with stigma from 0.9 mm below top of flower to level with top of flower, 1.7–2.4 × 0.9–1.2 mm.

Fruit a drupe, ovoid or ellipsoid, 8.2–9.3 × 6.7–7.4 × 5.6–6.0 mm, flattened, asymmetrical, pericarp 2-valved;

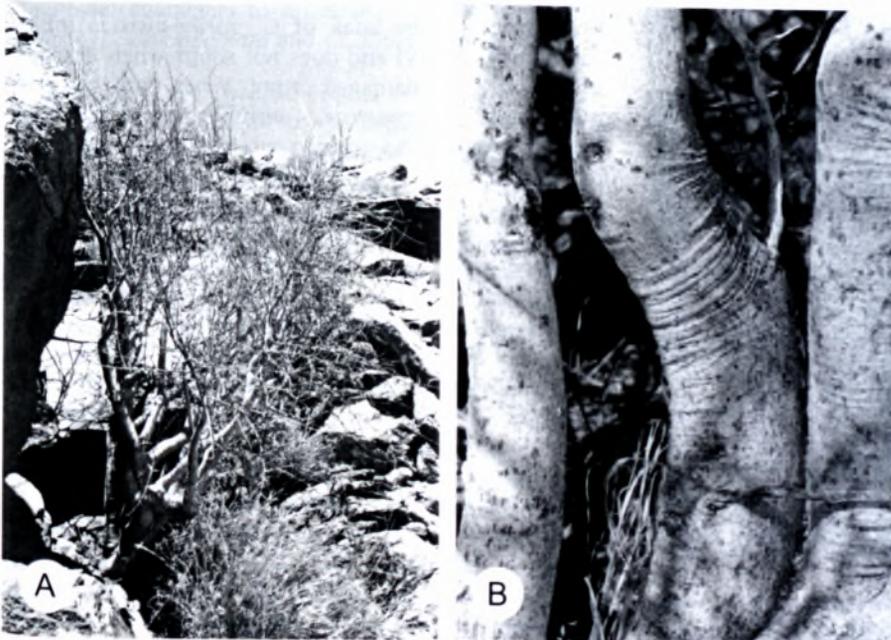


FIGURE 6.—*C. gariopensis*. A, natural habitat, tree ± 2.5 m tall; B, bark.

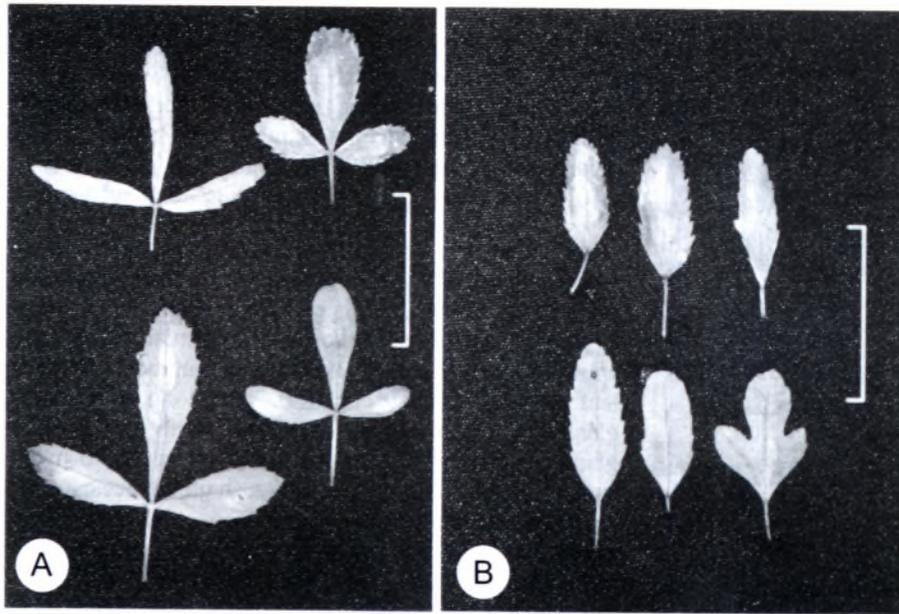


FIGURE 7.—*C. gariensis*, leaves: A, trifoliolate; B, simple. Scale bar: 20 mm.

exocarp glabrous, glutinous, green, greenish brown or red when ripe; mesocarp not very fleshy; putamen flattened, asymmetrical ellipsoid with one fertile and one sterile locule, $6.8-7.4 \times 4.8-5.2 \times 3.9-4.3$ mm, slightly rugose; fertile locule convex in sutural and apical view; sterile locule convex in sutural view, convex or triangular in apical view, often broadly ridged dorsally; suture convex towards fertile locule, especially towards apex; angle between locules at apex $70-105^\circ$; pseudo-aril orange, fleshy, cupular, covering 24–30% of fertile locule and 40–50% of the sterile locule, with 2 commissural arms and short facial lobe on sterile locule, extent of commissural arms relative to length of putamen (with pseudo-aril removed) 80–90%, facial lobe convex or triangular, 0.6–0.8 mm long, apical pits small. *Flowering time*: September to February. Figures 6–9.

Diagnostic characters and affinities: *C. gariensis* has the same habit as *C. oblancoolata* and *C. gracilifronsosa* Dinter ex J.J.A. van der Walt, but differs from them mainly in the shape of the leaves, in the morphology of the flowers and in the type of exudate. All three of these taxa have trifoliolate leaves, but *C. gariensis* and *C.*

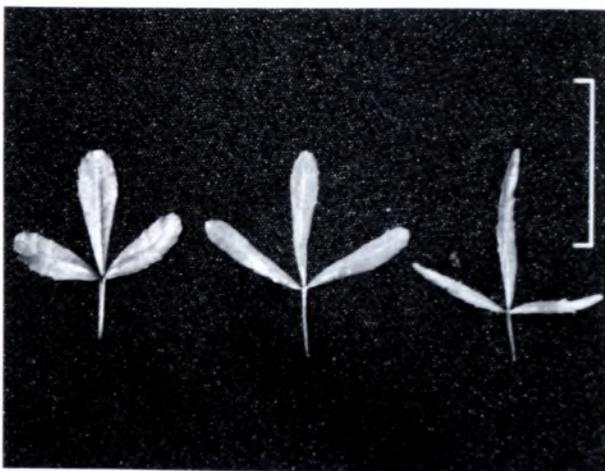


FIGURE 8.—Trifoliolate leaves: left, *C. gariensis*; centre, *C. oblancoolata*; right, *C. gracilifronsosa*. Scale bar: 20 mm.

oblancoolata have simple leaves in addition. Trifoliolate leaves in *C. gariensis* have the lamina on terminal leaflets oblanceolate or rarely cultrate with up to 11 teeth on each side of the margin, whereas the lamina in lateral leaflets is narrowly elliptic, oblanceolate or cultrate to broadly cultrate with up to nine teeth on each side of the margin. In *C. oblancoolata* the lamina on both terminal and lateral leaflets is always oblanceolate, with up to 45 and 38 teeth respectively on each side of the margin. In *C. gracilifronsosa*, the linear or cultrate leaflets, very variable in size and form, distinguish it from the other two taxa. The leaves of some specimens of *C. gariensis* and *C. gracilifronsosa* resemble each other superficially (Figures 7 & 8). However, the leaves of *C. gariensis* are broader than those of *C. gracilifronsosa* for corresponding length. In *C. gariensis* the flowers are borne in much reduced or short cymes up to 3.0 mm in length, in *C. oblancoolata* in thyrses or cymes up to 13 mm long and in *C. gracilifronsosa* on cymes up to 50 mm long. The flowers of *C. gariensis* have 4–8 stamens per flower, whereas those of *C. oblancoolata* and *C. gracilifronsosa* have four stamens only. Unlike *C. oblancoolata* and *C. gracilifronsosa*, the latex of *C. gariensis* is milky-watery (not watery) and does not squirt when branches or branchlets are damaged or cut. When without leaves or flowers, *C. gariensis* is virtually indistinguishable from *C. gracilifronsosa* with which it shares the same habitat. The only notable difference then between the two taxa, is the milky-watery exudate which does not squirt in *C. gariensis*, as opposed to being copious and only watery in *C. gracilifronsosa*. Although they share the same habitat throughout the known range of *C. gariensis*, *C. gracilifronsosa* is common and much more widespread. Some specimens of *C. gariensis* could easily be mistaken for *C. oblancoolata* due to the similarity of the leaves. However, the geographical distribution of the two taxa differs markedly, *C. gariensis* being restricted to the Gariiep Centre of Endemism and *C. oblancoolata* to the northern Central Namib and the Kaokoveld Centre of Endemism (Van der Walt 1986). Herbarium specimens of *C. dinteri* and *C. gariensis* with leaves only, could also be confused. However, the leaves of *C. dinteri* are \pm twice as broad as those of *C.*

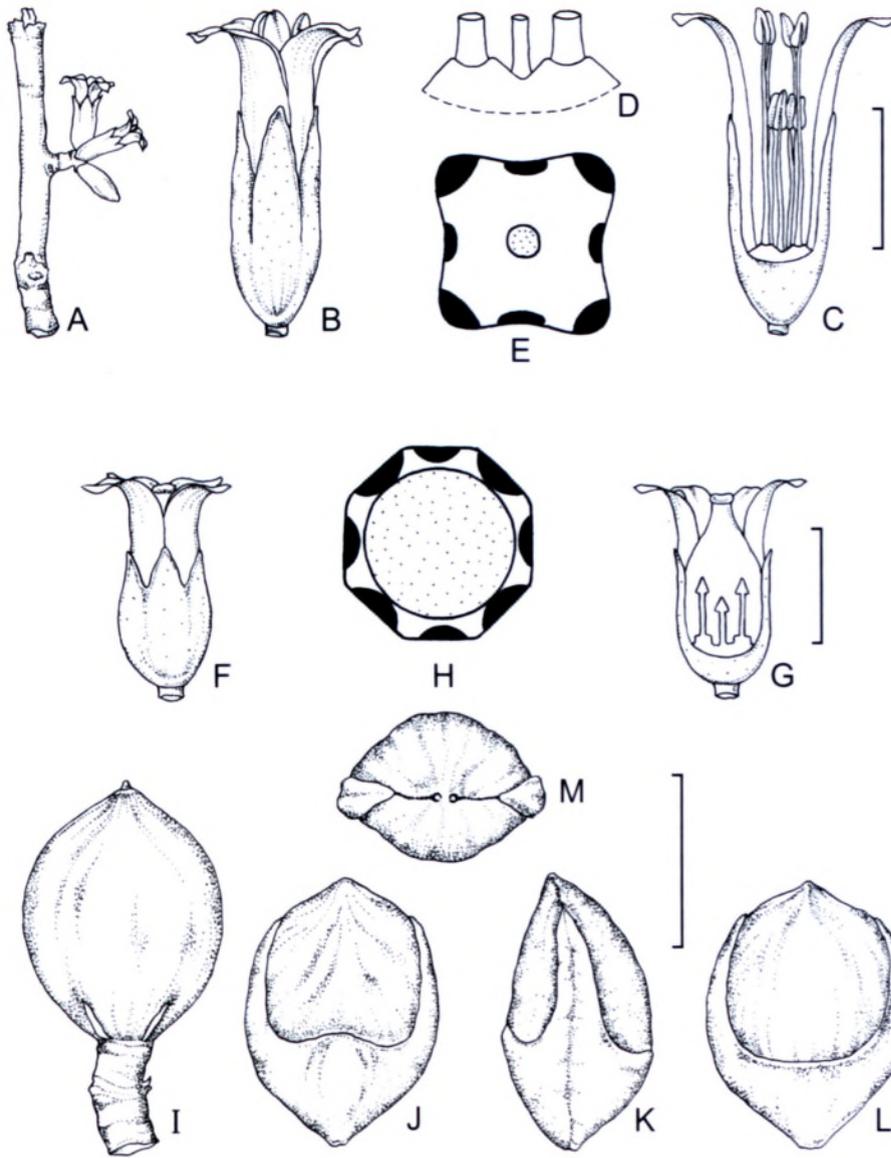


FIGURE 9.—*C. gariensis*. A, male inflorescence. B–E, male flower: C, calyx and corolla partly removed; D, disc, depicting insertion of stamens; E, disc as seen from above to depict position of stamens (black) and rudimentary ovary (circle). F–H, female flower: G, calyx and corolla partly removed; H, disc as seen from above to depict position of stamens (black). I, fruit. J–M, putamen with pseudo-aril: J, sterile locule; K, lateral view, fertile locule right, sterile locule left; L, fertile locule; M, apical view. A–C, Swanepoel 148; F, G, I–M, Swanepoel 157. Scale bars: B, C, F, G, 2 mm; I–M, 5 mm. Artist: Charmaine Baardman.

gariensis for corresponding length. The distribution of the two taxa does not overlap, with *C. dinteri* occurring from south central Namibia northwestwards (Van der Walt 1986). For a comprehensive comparative table of diagnostic characters to differentiate between *C. gariensis*, *C. oblanceolata* and *C. dinteri* see Table 2.

Etymology: the specific epithet refers to the Gariiep Centre of Endemism along the lower Orange River in western southern Africa, the region to which *C. gariensis* is endemic. *Gariiep* is the Khoekhoe name for the Orange River. As English and Afrikaans vernacular names, I propose Gariiep corkwood and *Gariiep-kanniedood*, respectively.

Distribution: *C. gariensis* is known from three localities, all within the Gariiep Centre of Endemism. It is rare in these areas, growing in loose colonies of a few plants each, in association with *C. gracilifronsosa* (Figure 10).

Habitat and ecology: habitat preferences of *C. gariensis* are quite specific. It occurs in the hot, arid Orange River Valley, at altitudes of 300–1 000 m, where the annual rainfall is 50–150 mm, at the base of rocky outcrops and on rocky slopes of escarpments

and river valleys. It is restricted to biotite rich gneiss of the Namaqua Metamorphic Complex/Province at the Blydeverwacht Plateau and at the Bak River, and to the gneisses of the Haib Group along the Goodhouse Poort (Miller & Schalk 1980; Van der Walt 2000; Mendelsohn *et al.* 2002).

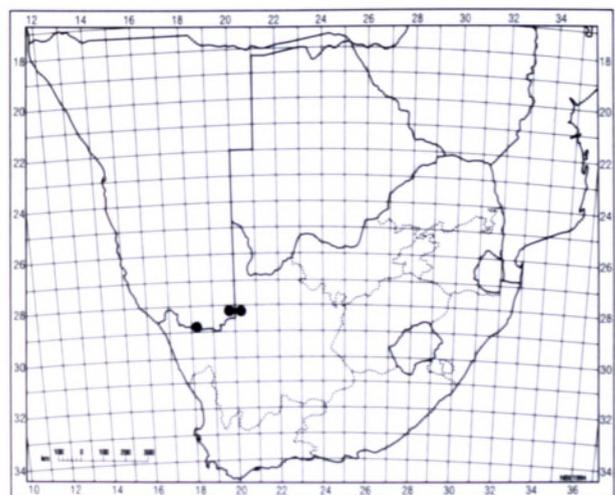


FIGURE 10.—Known distribution of *C. gariensis*.

Other specimens examined

NAMIBIA.—2818 (Warmbad): near river, road D208, (–CC), *Mannheimer CM 2318* (WIND); up valley off road D208, (–CD), *Mannheimer CM 2312* (WIND). 2819 (Ariamsvlei): 32 km SSW of Ariamsvlei at base of rocky outcrop, escarpment of Blydeverwacht Plateau, (–BC), *Swanepoel 146* (WIND); 31 km SSW of Ariamsvlei on hill slope, escarpment of Blydeverwacht Plateau, (–BD), *Swanepoel 98, 147, 157* (WIND).

NORTHERN CAPE.—2820 (Kakamas): slopes of Bak River Valley, 21 km SW of Naroegas Station, (–AC), *Swanepoel 149* (PRE); slopes of Bak River Valley 22 km SSW of Naroegas Station, (–AC), *Swanepoel 150* (PRE).

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