

# *Commiphora otjihipana* (Burseraceae), a new species from the Kaokoveld, Namibia

W. Swanepoel \*

H.G.W.J. Schweickerdt Herbarium, Department of Botany, University of Pretoria, Pretoria 0002, South Africa

Received 23 August 2007; received in revised form 18 January 2008; accepted 6 March 2008

## Abstract

*Commiphora otjihipana* Swanepoel, here described as a new species, is only known from the Otjihipa Mountains, Kaokoveld Centre of Endemism, northwestern Namibia. It appears to be most closely related to *C. africana* (A. Rich.) Engl. Diagnostic morphological characters of *C. otjihipana* include the often spineless branches, smooth, non-peeling, pale grey, reddish brown or reddish grey bark, usually glabrous leaves and branches, and unisexual or bisexual flowers. Illustrations of the plant and a distribution map are provided.

© 2008 SAAB. Published by Elsevier B.V. All rights reserved.

**Keywords:** Burseraceae; *Commiphora*; Endemism; Kaokoveld; Morphology; New species

## 1. Introduction

Thirty-seven species of *Commiphora* Jacq. are presently known from the *Flora of southern Africa* region, twenty-nine of which occur in Namibia (Craven, 1999; Germishuizen and Meyer, 2003; Swanepoel, 2005, 2006, 2007). Twelve of these species are more or less endemic to the Kaokoveld Centre of Endemism, a biogeographical region in northwestern Namibia and adjacent southwestern Angola (Van Wyk and Smith, 2001; Curtis and Mannheimer, 2005). The Kaokoveld Centre is the principal focal point of endemism and diversity for *Commiphora* (Van Wyk and Smith, 2001) in southern Africa and new members of the genus continue to be discovered in this botanically poorly explored region.

In this contribution, a rare, new species of *Commiphora* from the Kaokoveld is described. During a botanical expedition to the remote Otjihipa Mountains in northwestern Namibia in July 2004, the author encountered an unfamiliar, spiny, *Commiphora* with smooth bark but leafless at the stage. On account of the spine-tipped branches and branchlets on the specific specimen, it

was at first thought to be a form of *C. africana* (A. Rich.) Engl. (Van der Walt, 1973). However, on subsequent visits to the locality more plants were found, several without spines. A comparative morphological study of leaves and flowers showed that the plants are not conspecific with *C. africana*, but belong to a still undescribed new species. Apparently no other collections of the new species exist, as no herbarium specimens could be found in either PRE or WIND.

All morphological characters in the following description are based on mature leaves, fresh flowering material and ripe fruit obtained from field studies of this species. Diagnostic features for *C. africana* were determined through examination of both plants in the field in northwestern and eastern central Namibia as well as from herbarium specimens and literature, notably Wild (1963), Van der Walt (1973), Van der Walt and Van der Schijff (1973), Van der Walt (1986), Gillett (1991) and Steyn (2003).

## 2. Description

*Commiphora otjihipana* Swanepoel, sp. nov. *Commiphorae africanae* (A. Rich.) Engl., proxima arbore parva, trunco singulari, caulibus saepe spinecentibus; foliis trifoliolatis, lamina obovata vel rhombica. Differt polygama vel dioecia et cortice trunci pallido-cineraceo, rubello-cineraceo vel rubello-fusco,

\* PO Box 21168, Windhoek, Namibia. Tel.: +264 811246174.

E-mail address: [monteiro@iway.com](mailto:monteiro@iway.com).

laevigato, non-decorticante; caulibus juvenibus plerumque glabris, raro puberulis, lamina foliorum terminalium numquam elliptica, lanceolata, elliptica-oblongata vel obovata-oblongata, vulgo glabra; petiolo plerumque glabro, 9–12 fasciculis vascularibus; pedicello calyceque semper glabris, praeditis vel non paucis brevibus piliis glanduliferibus; disco florum masculorum bisexualiumque sulco profundo inter lobos in margine disci intra discum extesum usque ad 1/3 disci vel ad fundum disci.

Type: Namibia, Kunene Region, plateau of 1836 m high peak, Otjihipa Mountains, 7 km ESE of Otjinhungwa, 1825 m a.s.l., 17-01-2005. *Swanepoel 239* (WIND! holo.; PRE! iso.).

Polygamous or dioecious small tree up to 3.5 m tall. *Trunk* single, cylindrical, straight, up to 1.8 m long before branching, up to 0.25 m in diam. *Bark* on trunk pale grey, reddish grey or reddish brown with transverse indentations and black spots in places, smooth, not peeling; on branches reddish grey or reddish brown with shallow longitudinal fissures visible under magnification. *Branches and branchlets* glabrous with small lenticels, occasionally spine-tipped; young growth glabrous, rarely puberulous, maroon or green; dwarf lateral branchlets often scarred. *Exudate* sparse, not aromatic, clear, not glutinous, drying to form a hard, cream-coloured resin. *Leaves* trifoliate, clustered on branches, spines and dwarf lateral branchlets, spirally on actively elongating shoots, discolorous, bright green and often shiny adaxially, paler green and dull abaxially, usually with few short glandular hairs in angles between marginal teeth, on lamina, midrib and lateral veins, otherwise usually glabrous, rarely with few simple hairs on lamina margin and/or midrib and lateral veins; lamina apex acute, truncate or rounded, extreme tip acute, rarely rounded; lamina of terminal leaflets obovate to broadly obovate or rhombic, (12–)30–40(–55) × (5–)20–30(–41) mm, base cuneate, often abruptly attenuate onto petiole, margin serrate over basal third, irregularly and coarsely serrate, crenate-serrate and/or lobed or dentate over apical two-thirds with 5–17 serrations on each side, midrib conspicuous towards lamina base abaxially, prominent abaxially, less so adaxially, yellowish green; lamina of lateral leaflets elliptic, less often suborbicular or ovate, asymmetrical, (5–)10–15(–21) × (4–)8–12(–15) mm, base cuneate or rounded, often abruptly attenuate onto petiole, margin serrate or crenate-serrate over basal third, irregularly and coarsely serrate, crenate-serrate and/or lobed or dentate over apical two-thirds with 3–9 serrations on each side, midrib conspicuous abaxially towards lamina base, prominently raised abaxially towards lamina base, plane adaxially, yellowish green; leaves petiolate, petiole with few short glandular hairs, otherwise glabrous, rarely with few simple hairs, 8–32 mm long, variable in t/s: ovate, triangular, pentagonal or crescent-shaped with 9–12 vascular bundles, sectional dimensions 0.8–1.2 × 0.8–1.2 mm; petiolule up to 2 mm long on terminal leaflets, lateral leaflets subsessile, short glandular hairs present, especially adaxially.

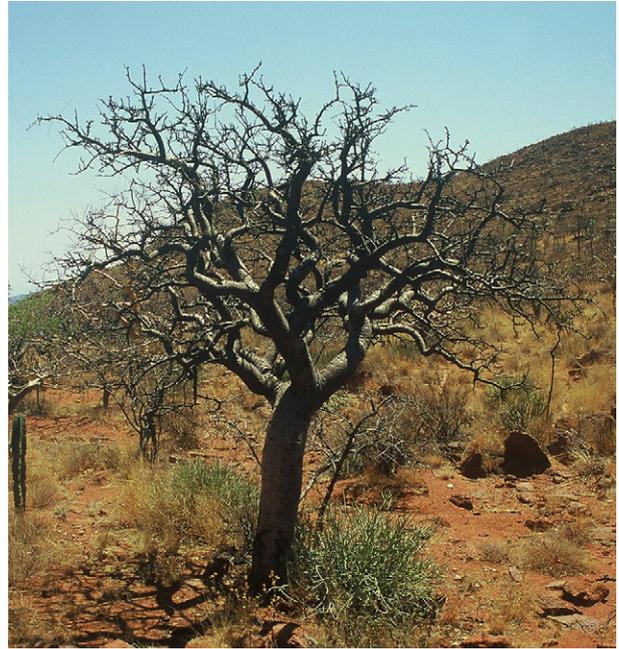
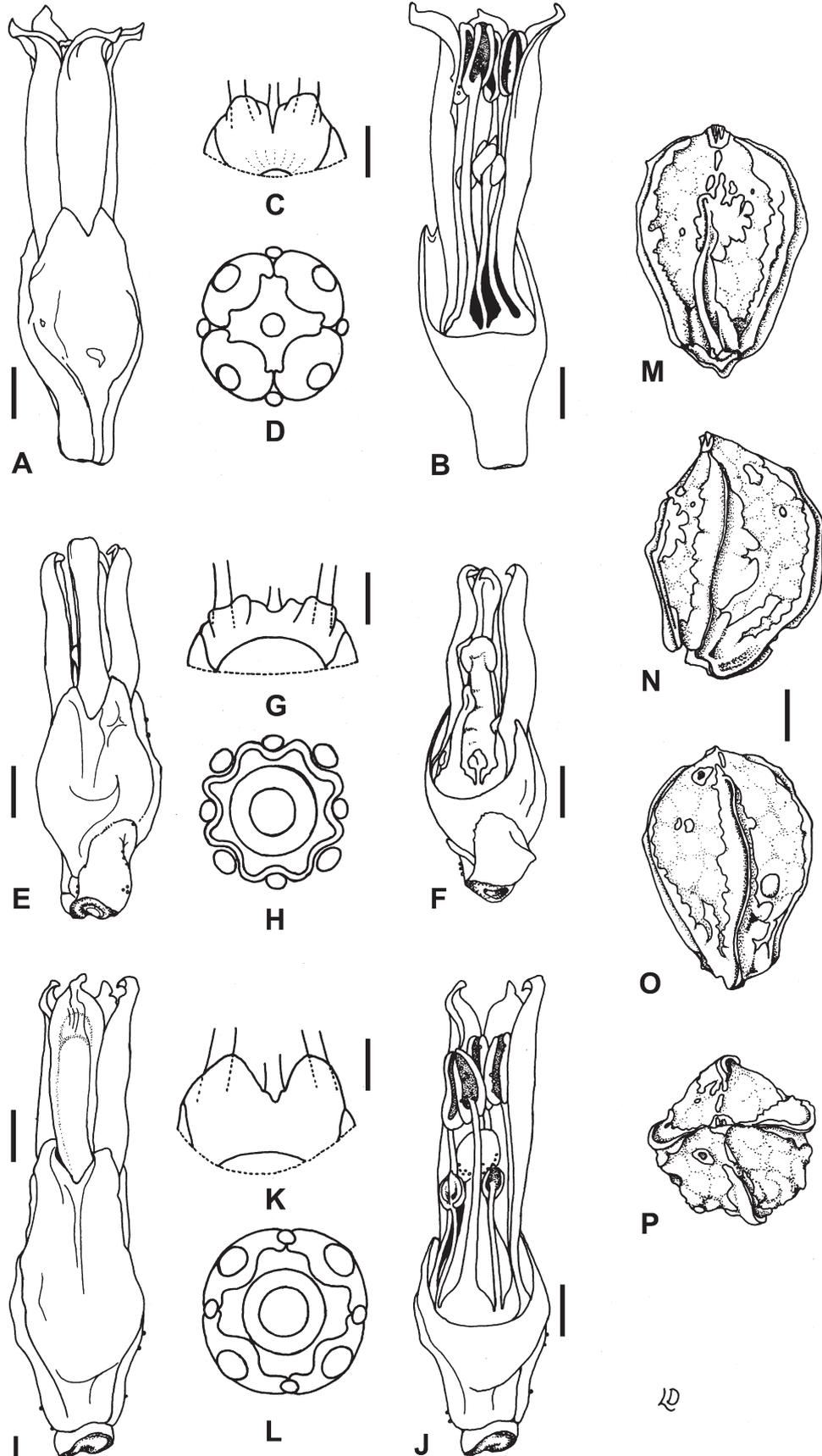


Fig. 1. *Commiphora otjihipana* in its natural habitat, 3 m tall.

*Inflorescence*: flowers borne in clusters, solitary or in reduced simple or dichasial cymes; peduncle up to 2 mm long, with short glandular hairs, otherwise glabrous; axillary. *Flowers* unisexual or bisexual, hypogynous, precocious or appearing with the leaves, pedicellate; pedicel 0.5–1.6 mm long, glabrous or with few short glandular hairs. *Bracts and bracteoles* triangular, apex acute, with few short glandular hairs; bracts up to 2.0 × 1.5 mm; bracteoles up to 1.1 × 0.7 mm. *Calyx* maroon or cherry red, often with few short glandular hairs, otherwise glabrous, lobes triangular or ovate, apex acute but extreme tip obtuse. *Petals* maroon or cherry red, glabrous, oblanceolate or linear-elliptic, spreading towards top but minute tip inflexed. *Disc* cylindrical with 4 distinct lobes, not adnate to calyx or corolla. *Male flowers* 6.0–6.7 mm long; calyx ± 2.2 mm long; calyx lobes ± 0.6 mm long; petals 4.6–5.0 × 1.0–1.1 mm; disc not very fleshy, with indentation between lobes deep, not bifid or obscurely bifid at apex, deep groove between lobes on top of margin extending downwards on inside of disc for up to third of distance to bottom of disc; stamens 8, 4 long ones with filaments 3.0–3.4 mm long, inserted on outside of disc just below apex; 4 short ones with filaments 2.0–2.2 mm long, inserted on outside of disc between lobes; anthers on long stamens 0.9–1.1 mm long; anthers on short stamens 0.5–0.6 mm long; filaments semiterete, not flattened or broadened at base; gynoecium rudimentary. *Female flowers* 4.4–4.8 mm long; calyx ± 2.2 mm long; calyx lobes ± 0.7 mm long; petals 3.3–3.5 × 1.0–1.1 mm; disc fleshy, with indentation between lobes

Fig. 2. *Commiphora otjihipana*. Flowers and seed. A–D: male flower; A and B, scale bar 1 mm, B, with calyx and corolla partly removed, showing stamens; C, disc as seen from the inside, scale bar 0.3 mm; D, disc as seen from above (schematic), not to scale. E–H: female flower; E and F, scale bar 1 mm, F, with calyx and corolla partly removed, showing pistil and rudimentary stamens; G, disc as seen from the inside, scale bar 0.3 mm; H, disc as seen from above (schematic), not to scale. I–L: bisexual flowers, I and J, scale bar 1 mm, J, with calyx and corolla partly removed, showing pistil and stamens; K, disc as seen from inside, scale bar 0.3 mm; L, disc as seen from above (schematic), not to scale. M–P, putamen, M, sterile locule; N, sutural view; O, fertile locule; P, as seen from above; scale bar 2 mm. Artist: Lesley Deysel. A–D: *Swanepoel 240*, E–H: *Swanepoel 241*, I–P: *Swanepoel 239*.



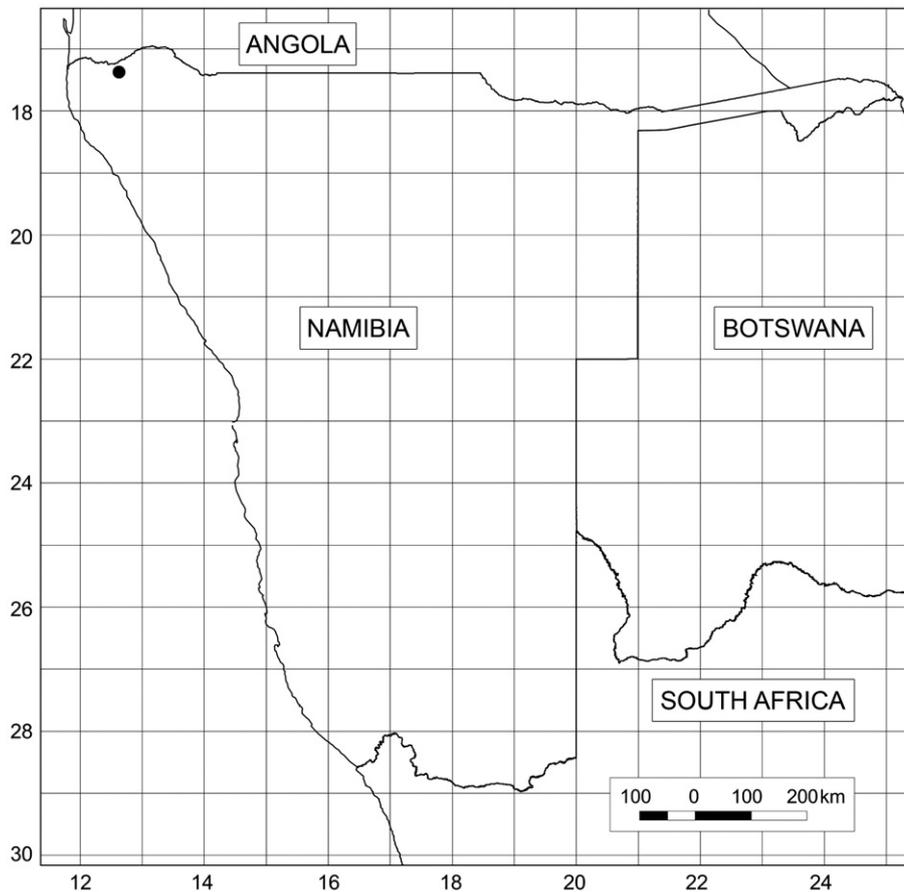


Fig. 3. Known distribution of *Commiphora otjihipana*.

deep, lobes bifid at apex, inside of lobes with slight folds; staminodes 8, 4 long and 4 short; ovary superior; style relatively short to relatively long, sutures not grooved; stigma 4-lobed,  $\pm 1.6$  mm below top of flower; pistil 2.1–2.5 mm long. *Bisexual flowers* 6.6–7.0 mm long; calyx  $\pm 3.2$  mm long; calyx lobes  $\pm 0.5$  mm long; petals 5.3–5.7  $\times$  1.0–1.1 mm; disc and stamens as in male flowers; ovary, style and stigma as in female flowers; stigma  $\pm 2$  mm below top of flower; pistil 2.7–2.9 mm long. *Fruit* a drupe, globose, subglobose or obovoid, often slightly flattened, asymmetrical, suture curved or rectilinear, 10–14  $\times$  8–12  $\times$  8–13 mm; pericarp 2-valved; exocarp glabrous, not glutinous, greenish red in ripe fruit; mesocarp fleshy; putamen not flattened, asymmetrical, ovoid, obovoid, ellipsoid or oblong-ellipsoid, with one fertile and one sterile locule, fertile locule very rugose, sterile locule less so; 6.5–9.8  $\times$  5.1–6.8  $\times$  5.4–6.7 mm; fertile locule convex, asymmetrically convex towards apex or rectilinear and tapering to base and apex, hemispherical in apical view; sterile locule convex or asymmetrically convex towards apex, convex to triangular in apical view, broadly ridged dorsally; suture convex towards fertile locule; angle between locules at apex 80–110°; pseudo-aril orange or red, fleshy, cupular, covering 25–33% of fertile locule and 33–67% of sterile locule, with 4 long, narrow to broad arms, commissural arms reaching apex, facial arms reaching apex or almost so, fertile locule often heavily dotted with fragments, sterile locule less so; apical pits large (Figs. 1 and 2).

### 2.1. Phenology

*Commiphora otjihipana* flowers from August to November and the fruit ripens from October to January. It is in leaf from November to May, corresponding with the rainy season.

### 2.2. Distribution and habitat

*C. otjihipana* is presently known from only one locality, situated in the northwestern-most part of the Otjihipa Mountains,  $\pm 80$  km from the coast. It is locally common on the two highest peaks in the area, at 1836 m and 1915 m a.s.l. and about 1.5 km apart (Fig. 3). Mean annual rainfall at the locality is  $\pm 150$  mm (Mendelsohn et al., 2002). Plants occur on level areas at altitudes of 1200–1915 m, growing on sandy-rocky substrate derived from granites of the Epupa Metamorphic Complex (Miller and Schalk, 1980; Mendelsohn et al., 2002). The Otjihipa Mountains are located in the Kaokoveld Centre of Endemism in northwestern Namibia (Van Wyk and Smith, 2001) and are bordered by the Kunene River in the north and Marienfluss in the west. The two mentioned peaks represent some of the highest points in the Kaokoveld part of the Escarpment and rises steeply almost 1600 m above the low-lying Kunene River and Marienfluss Valley. It seems likely that *C. otjihipana* may also be found to occur in the adjacent mountainous parts of

southwestern Angola, especially the Serra Cafema range. It may also prove to be more widespread on other peaks of the Otjihipa range, as well as some of the other mountain ranges of the Kaokoveld Centre of Endemism, most of which remains botanically poorly explored.

### 2.3. Conservation status

Although the known range of *C. otjihipana* is very restricted, its habitat is not prone to destruction by humans as it is located in a remote, uninhabited part of the Otjihipa Mountains.

### 2.4. Diagnostic characters

*C. otjihipana* is probably most closely related to *C. africana*, from which it differs in habit, bark, leaves, flowers and indumentum. Some of the more prominent morphological distinctions

between the two species are summarized in Table 1. *C. otjihipana* is a polygamous or dioecious small tree with a single trunk, up to 3.5 m tall (Fig. 1), whereas *C. africana* is a dioecious multi-stemmed shrub less than 1 m or a tree with a single trunk, up to 10 m tall. Young branches in *C. otjihipana* are glabrous or rarely puberulous and the branches are spinescent or spineless on different trees. In *C. africana* all plants are spinescent and young branches are densely pilose to tomentose.

Leaflets in *C. otjihipana* are glabrous or rarely with few simple hair on the margin and/or the midrib and lateral veins. In *C. africana* the leaflets are pilose to tomentose in the *Flora of southern Africa* region. In tropical Africa, the adaxial side of the lamina in *C. africana* var. *glaucidula* (Engl.) Gillett occasionally is glabrous, with hairs limited to the abaxial surface of the veins. The lamina in *C. africana* var. *oblongifoliolata* (Engl.) Gillett rarely is glabrous, but this variety should not be confused with *C. otjihipana* as the leaves are elliptic-oblong or obovate-

Table 1  
Comparative table of the more prominent differences between *Commiphora otjihipana* and *C. africana*

Character	<i>C. otjihipana</i>	<i>C. africana</i>
Habit	Polygamous or dioecious small tree with single trunk, up to 3.5 m tall.	Dioecious shrub less than 1 m or small tree with single trunk, up to 4 m tall ( <i>Flora of southern Africa</i> [FSA] region) or up to 10 m tall (tropical Africa)
Bark (on trunk)	Pale grey, reddish grey or reddish brown, smooth, not peeling	Grey, greyish green, dark green or yellowish; rough and fragmented in arid regions, in milder regions peeling in strips or flakes, exposing the green under-bark
Exudate (resin)	Not aromatic	Slightly aromatic
Branches		
Indumentum	Young branches glabrous, rarely puberulous	Young branches densely pilose or tomentose
Spinescence	Spinescent or spineless	Spinescent
Lamina		
Shape (terminal leaflets)	Obovate or rhombic	Obovate or elliptic (FSA region); in tropical Africa also rhombic or lanceolate, elliptic-oblong or obovate-oblong in var. <i>oblongifoliolata</i> (Engl.) Gillett, spatulate in var. <i>tubuk</i> (Sprague) Gillett
Size (terminal leaflets)	12–55 × 5–41 mm	8–100 × 6–60 mm
Length (lateral leaflets)	25–60% of terminal leaflets	10–75% of terminal leaflets
Colour	Bright green adaxially and often shiny, paler green abaxially	Green, olive-green, greyish green, pale reddish-brownish green; never shiny
Indumentum	Glabrous, rarely with few simple hair on margin and/or midrib and lateral veins	Pilose to tomentose, in tropical Africa occasionally glabrous adaxially with hairs limited to abaxial side of veins (var. <i>glaucidula</i> ) or rarely glabrous in var. <i>oblongifoliolata</i>
Petiole		
Shape in t/s	Ovate, triangular, pentagonal or crescent-shaped	Triangular
Number of vascular bundles	9–12	7–9
Indumentum	Glabrous, rarely with few simple hairs	Pilose to tomentose
Sexuality of flowers/plants	Bisexual or unisexual; plants polygamous	Unisexual; plants dioecious in FSA region
Pedicel	0.5–1.6 mm long; glabrous or with few short glandular hair	Up to 2.5 mm long; glabrous or pubescent in var. <i>rubriflora</i> (Engl.)
Calyx	Glabrous or with few short glandular hair	Glabrous, pubescent in var. <i>rubriflora</i>
Disc	Male and bisexual flowers with deep groove between lobes on top of disc margin extending downwards on inside of disc for up to third of distance to bottom of disc; lobes not bifid or slightly bifid at apex; disc not very fleshy	Male flowers with deep groove between lobes limited to top of disc margin; inside of disc with two grooves on lobes, continuing on inside to bottom of disc; lobes not bifid at apex; disc fleshy
Fruit (shape)	Globose, subglobose or obovoid	Subglobose to oblong-ellipsoid
Putamen (shape)	Ovoid, obovoid, ellipsoid or oblong-ellipsoid	Subglobose to oblong-ellipsoid or broadly ellipsoid
Pseudo-aril	Cupular with 4 long, narrow to broad arms	4 arms of variable size and form (FSA region) or almost completely covering the putamen except for small area at apex where irregularly 4-toothed
Distribution	Confined to Kaokoveld Centre of Endemism.	Polymorphic species, widespread in sub-Saharan Africa except extreme southern parts of continent

oblong (obovate or rhombic in *C. otjihipana*) and the midrib is deeply channelled especially towards the base (Gillett, 1991).

Flowers in *C. otjihipana* are either bisexual or unisexual whereas in *C. africana* they are unisexual only. The fruit in *C. otjihipana* is globose, subglobose or obovoid and in *C. africana* subglobose to oblong-ellipsoid.

Indumentum on all plants of *C. africana* seen by the author in Namibia and South Africa, including all herbarium specimens in PRE and WIND (inclusive of those from tropical Africa), were densely pilose to tomentose on the leaves and young growth. In contrast, *C. otjihipana* usually has the leaves and young growth glabrous with only a few short glandular hairs on the leaves. Only rarely, is the young growth puberulous and have the leaves a few simple hairs in addition, which are limited to the lamina margin and/or veins and petiole. On parts of *Swanepoel 241*, irregular patches of dense, shaggy, rust coloured hairs were observed on the young growth, the leaves and fruit. These irregular clumps of hairs seem abnormal and it was only observed on a single plant, limited to one branch.

### 2.5. Etymology

The specific epithet refers to the Otjihipa Mountains in the Kunene Region of northwestern Namibia, where the new species is found. I would like to propose the names otjihipa corkwood and *otjihipa-kanniedood* as English and Afrikaans vernacular names, respectively.

### 2.6. Other specimens examined

Namibia, Kunene Region:  
-1712 (Posto Velho): Plateau of 1836 m high peak, Otjihipa Mountains, 7 km ESE of Otjinhungwa (-BC), *Swanepoel 240, 241* (WIND).

### Acknowledgements

Prof. A.E. Van Wyk (University of Pretoria) for advice and support, Prof. J. Jacobs (UNISA) for translating the diagnosis into Latin, Ms Hester Steyn, (SANBI) for preparing the dis-

tribution maps and Ms Lesley Deysel for the line drawings. The curator and staff of the National Herbarium of Namibia for their assistance during visits to the herbarium. The curator of the National Herbarium in Pretoria for access to their collections; the assistance of Ms Marie Jordaan during visits to the herbarium is acknowledged. Mr Koos Verwey of Otjinhungwa for his hospitality and logistical support during visits to the Otjihipa Mountains. The University of Pretoria for financial support. For assistance and companionship during field trips, I am especially grateful to my wife Hannelie, Ernst Van Jaarsveld and Werner Voigt.

### References

- Craven, P. (Ed.), 1999. A checklist of Namibian plant species. Southern African Botanical Diversity Network Report No. 7. SABONET, Windhoek.
- Curtis, B.A., Mannheimer, C.A., 2005. Tree atlas of Namibia. National Botanical Research Institute, Windhoek.
- Germishuizen, G., Meyer, N.L. (Eds.), 2003. Plants of southern Africa: an annotated checklist. Strelitzia, vol. 14. National Botanical Institute, Pretoria.
- Gillett, J.B., 1991. Burseraceae. Flora of Tropical east Africa. Balkema, Rotterdam/Brookfield.
- Mendelsohn, J., Jarvis, A., Roberts, C., Robertson, T., 2002. Atlas of Namibia. Philip, Cape Town.
- Miller, R.McG., Schalk, K.E.L., 1980. Geological map of South West Africa/Namibia. Geological Survey of the Republic of South Africa and South West Africa/Namibia.
- Steyn, M., 2003. A field guide, southern Africa Commiphora / 'n Veldgids, Suider-Afrika Commiphora. Published by the author, Polokwane.
- Swanepoel, W., 2005. *Commiphora kaokoensis* (Burseraceae), a new species from Namibia, with notes on *C. dinteri* and *C. namaensis*. Bothalia 35, 47–53.
- Swanepoel, W., 2006. Two new species of *Commiphora* (Burseraceae) from southern Africa. Bothalia 36, 45–56.
- Swanepoel, W., 2007. *Commiphora kuneneana*, a new species from the Kaokoveld, Namibia. Bothalia 37, 40–48.
- Van der Walt, J.J.A., 1973. The South African species of *Commiphora*. Bothalia 11, 53–102.
- Van der Walt, J.J.A., 1986. Burseraceae. Flora of southern Africa 18, 5–34.
- Van der Walt, J.J.A., Van der Schijff, H.P., 1973. The anatomy of the petiole as an aid to the identification of South African *Commiphora* species. Kirkia 9, 95–108.
- Van Wyk, A.E., Smith, G.F., 2001. Regions of floristic endemism in southern Africa: a review with emphasis on succulents. Umdaus Press, Hatfield, Pretoria.
- Wild, H., 1963. Burseraceae. Flora Zambesiaca 2, 263–285.