Stirtonia, a new genus of the tribe Podalyrieae (Leguminosae) from South Africa

Ben-Erik van Wyk and Anne Lise Schutte

Van Wyk, B-E. & Schutte, A.L. 1993. *Stirtonia*, a new genus of the tribe Podalyrieae (Leguminosae) from South Africa.– Nord. J. Bot. 14: 319–325. Copenhagen. ISSN 0107–055X.

The genus *Stirtonia* is described to accommodate three anomalous species, hitherto placed in *Podalyria*. The new genus differs from *Podalyria* mainly in the decussate (geminate) inflorescence structure (racemose in *Podalyria*), the yellow flower colour (purple, pink or white in *Podalyria*), the non-fleshy rim-aril of the seeds (seed aril invariably fleshy and collar-like in *Podalyria*) and in the diagnostically different combination of quinolizidine alkaloids. The major alkaloidal metabolites are carboxylic acid esters of lupanine and virgiline, but these compounds are totally absent in *Podalyria*. The morphology of inflorescences, leaves, flowers and seeds are described and illustrated. Chromosome numbers (2n = 18) are reported for the first time. A formal taxonomic treatment of the three species, *S. tayloriana, S. chrysantha* and *S. insignis*, is presented.

B.-E. van Wyk & A. L. Schutte, Department of Botany, Rand Afrikaans University, P.O. Box 524, Auckland Park 2006, Johannesburg, Republic of South Africa.

Introduction

As part of an ongoing reappraisal of generic circumscriptions in the Cape endemic tribes Podalyrieae and Liparieae, the morphology and alkaloid chemistry of *Podalyria* Willd. were examined in a detailed and rigorous way. During extensive in situ studies, fresh material and viable seeds became available for study. Important new taxonomic information came to light (Van Wyk et al. 1992; Van Wyk & Schutte in press). As a result, three anomalous yellow-flowered species are here excluded from *Podalyria* and described as a new genus. The superficial resemblance to *Podalyria* proves misleading, and the new generic concept should come as no surprise to those familiar with the taxonomy of Cape legumes.

Results

A summary of taxonomically important similarities and differences is given in Tab. 1. The inflorescence structure, seed morphology and alkaloids of the yellow-flowered group were not known before and provide an important new dimension to our understanding of relationships within the tribe. The apparent isolation of *Virgilia* Poir. and *Podalyria* now seems much less. *Virgilia* and the new genus have seeds with non-fleshy rim arils, while the seed arils of *Podalyria* and *Cyclopia* Vent. are invariably fleshy and collar-like. *Virgilia* and the new genus are also similar in their alkaloidal metabolites, notably the presence of pyrrolyl-carboxylic acid esters of lupanine and virgiline. Alkaloids appear to be totally absent in *Cyclopia*, but *Podalyria* accumulates large amounts of tetracyclic quinolizidine alkaloids. Esters of alkaloids, when present, are derived from angelic- or tiglic acid and never from carboxylic acid.

The new genus has a unique inflorescence structure: decussate 2-, 4- or 6-flowered inflorescences with a rachis extension. The rachis extends beyond the pedicels of the apical flower pair, the inflorescence thus ending in a sterile apex rather than a terminal flower. This character is not found in any other genus of the Podalyrieae, but does occur in *Liparia* L. and *Priestleya* DC. of the tribe

Accepted 15-10-1993

NORD. J. BOT. 14: 319–325

Tab. 1. Salient morphological and chemical characters in the tribe Podalyrieae. (Y, species with yellow flowers; P, species with purple, pink or white flowers)

Genera:	*Virgilia*	*Podalyria* (Y)	*Podalyria* (P)	*Cyclopia*
1. Flower colour	purple, pink or white	yellow	purple, pink or white	yellow
2. Inflorescence	racemose	geminate	racemose	single-flowered
3. Rachis extension	absent	present	absent	absent
4. Style base	glabrous	pubescent	glabrous	glabrous
5. Seed aril	non-fleshy rim-aril	non-fleshy rim-aril	fleshy, collar-like	fleshy, collar-like
6. Lens orientation	straight	oblique	straight	straight
7. Major types of Quinolizidine Alkaloids:				
bicyclic	+	–	–	–
tricyclic	+	–	–	–
tetracyclic	+	+	+	–
virgiline	+	+	–	–
8. Types of esters of alkaloids	carboxylic acid esters	carboxylic acid esters	angelic acid esters (when present)	–

Liparieae (Schutte & Van Wyk 1993; Van Wyk & Schutte in press.).

Conclusions

The three yellow-flowered species are superficially similar to *Podalyria* but there are no convincing synapomorphies to support the wide generic concept. The inflorescence structure, seed morphology and chemistry are so different that the exclusion of the species from *Podalyria* would result in a more natural and predictive classification:

Stirtonia Van Wyk & Schutte, gen. nov.

Podalyriae Willd. similis, sed inflorescentiis decussatis, 2-, 4- vel 6-floratis (in *Podalyria* racemosae, 1–2 (–5)-floratae), floribus flavis (in *Podalyria* purpurei, rosei vel raro albis), dimidio inferiori styli hirto (in *Podalyria* stylus omnino glaber), arillo succulento circum hilum semini absente (in *Podalyria* arillus succulentus colli similis semper adest) et axe lentis oblique (in *Podalyria* axis lentis rectus) differt.

Type species (designated here): *Podalyria insignis* Compton [now *Stirtonia insignis* (Compton) Van Wyk & Schutte].

Single-stemmed or multi-stemmed shrubs or small trees, 2–4 m high. Leaves alternate, simple, flat, obovate to ± orbicular, densely tomentose on both surfaces, with reticulate venation prominent abaxially, coriaceous; petiole present. Stipules paired. Inflorescences axillary, pedunculate, with 2–4 (–6) decussate (geminate) flowers. Bracts sheathing the pedicel, sometimes clasping the calyx; densely tomentose. Bracteoles absent. Corolla yellow, longer than the calyx; glabrous. Calyx with the base intrusive; upper two lobes fused higher up; lateral lobes often coherent with upper lobes or carinal lobe. Standard transversely elliptic; apex emarginate; claw thick, rigid. Wing petals oblong to obovate, slightly longer than the keel; the tips imbricate. Keel petals semi-circular, rostrate, auriculate; apex obtuse. Stamens diadelphous, free almost to the base, the vexillary filament totally free; anthers slightly dimorphic, 5 + 5, alternately dorsifixed and subbasifixed. Pistil sessile; style slender, slightly upcurved, densely hairy at least on the lower half; ovary with 5 or more ovules; densely sericeous to tomentose. Pods coriaceous, linear to obliquely-oblong, compressed to somewhat inflated, 5–8 -seeded; densely sericeous to tomentose. Seeds dark green to black or orange-brown to reddish orange, elliptic to obovate in side view, obliquely elliptic in hilar view; hilum elliptic, surrounded by a narrow, non-fleshy rim aril. Chromosome number 2n = 18! (in all 3 species). Carboxylic acid esters of lupanine and virgiline present as major alkaloids.

Notes. The new genus is similar to *Podalyria* but differs in the decussate, 2-, 4- or 6-flowered inflorescences (racemose and 1–2 (–5)-flowered in *Podalyria*), the yellow flowers (purple, pink or rarely white in *Podalyria*), the hairy lower half of the style (style totally glabrous in

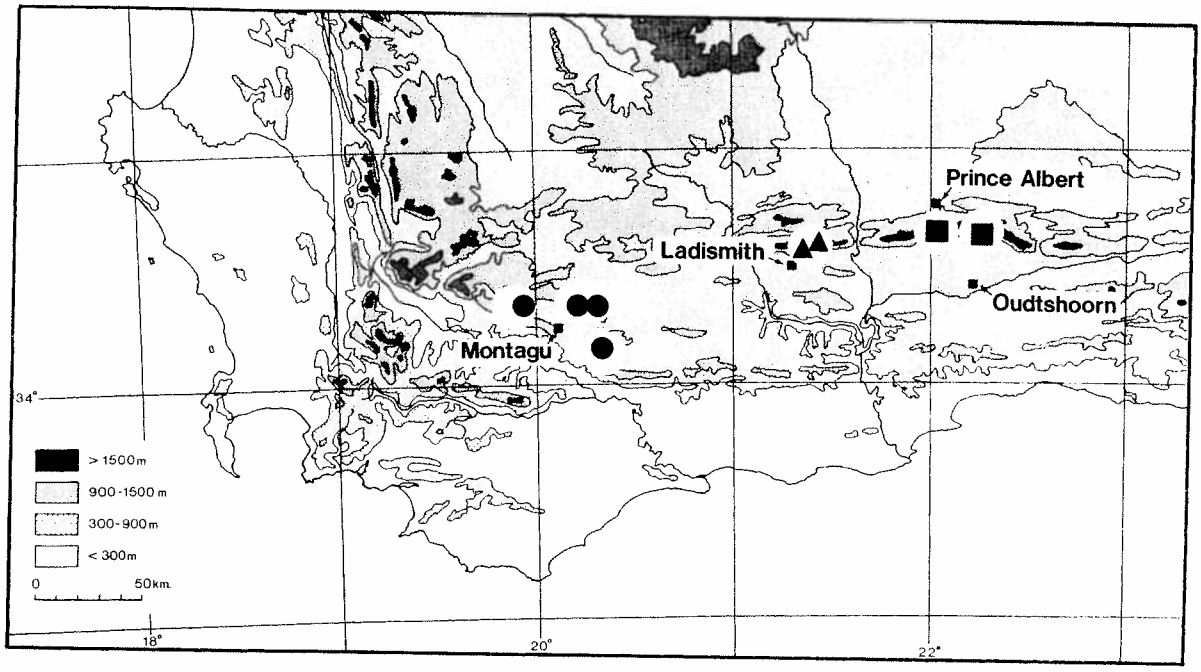


Fig. 1. The known geographical distribution of the genus *Stirtonia* in the south-western and southern Cape Province of South Africa: *S. tayloriana* (■), *S. chrysantha* (▲) and *S. insignis* (●).

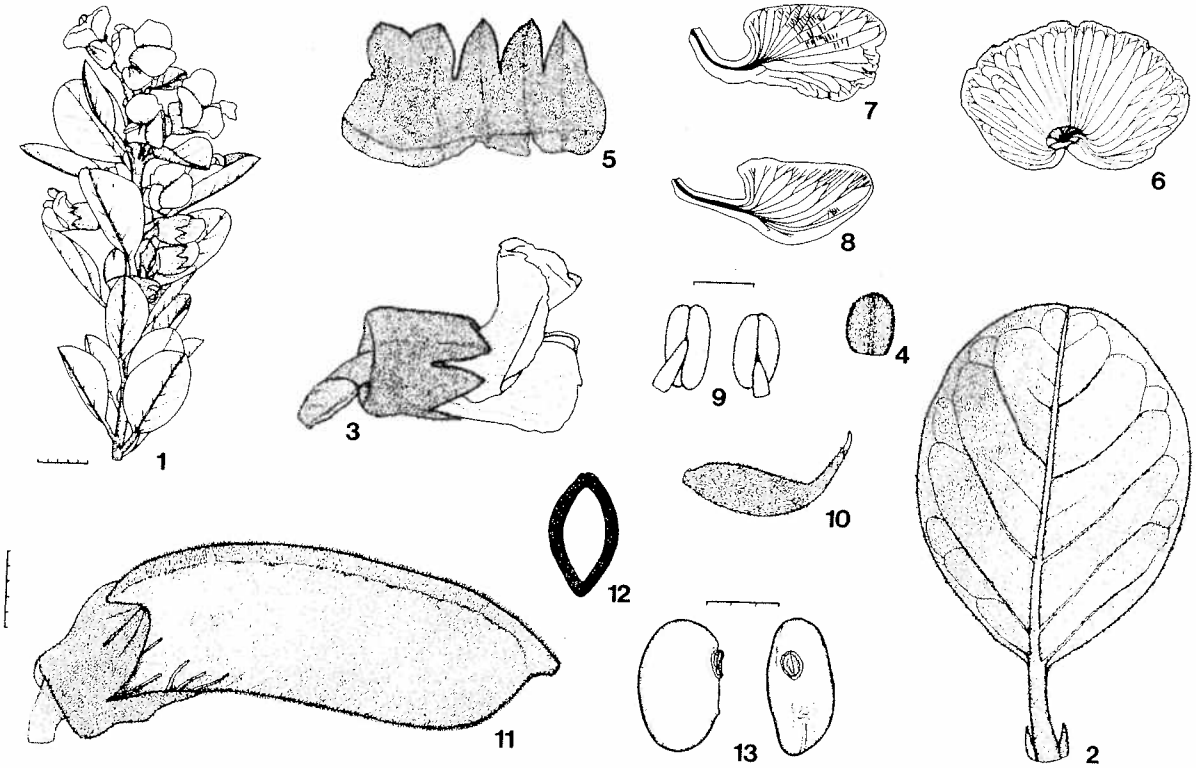


Fig. 2. *Stirtonia tayloriana*. 1. flowering branch, showing the arrangement of the flowers. 2. leaf, abaxial view. 3. flower in lateral view. 4. bract. 5. calyx (upper lobes to the left). 6. standard petal. 7. wing petal. 8. keel petal. 9.anthers. 10. pistil. 11. pod in lateral view. 12. pod in transverse section. 13. seed in lateral view (left) and hilar view (right) showing the non-fleshy rim aril and the oblique alignment of the lens axis. – Scales in mm.

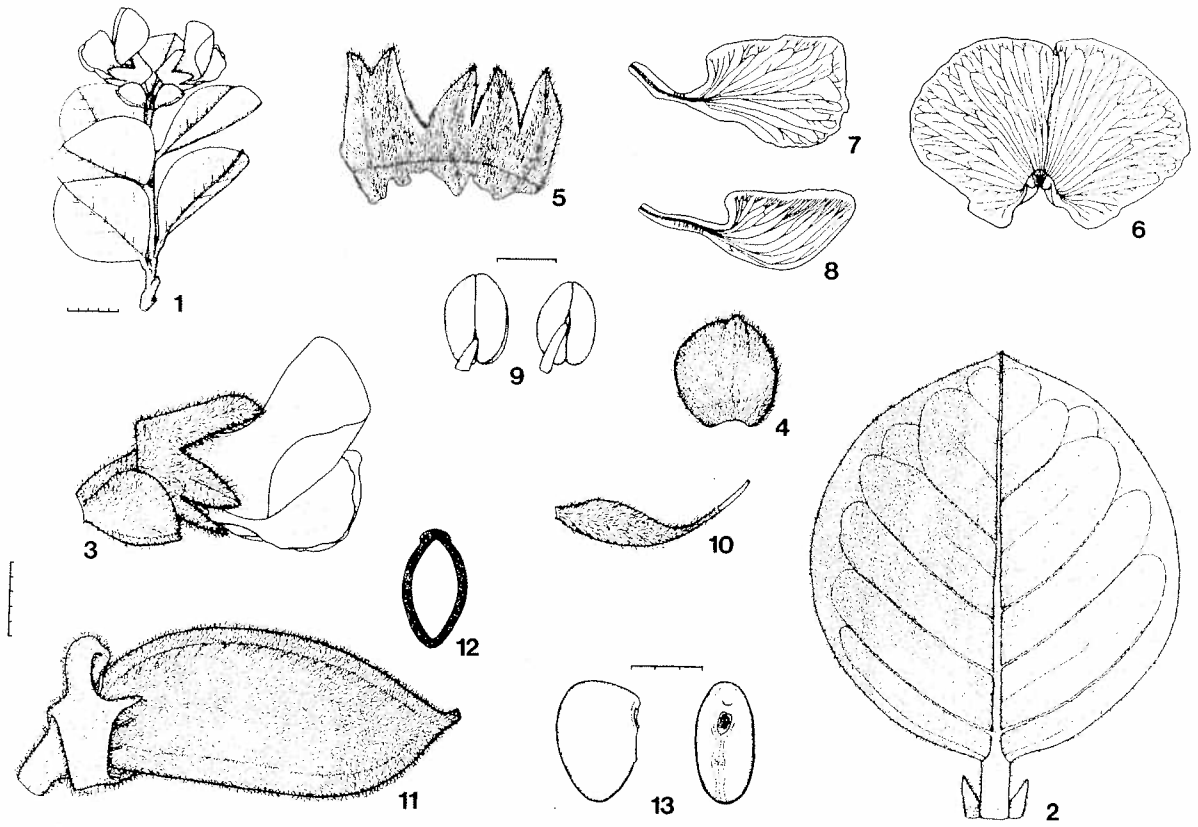


Fig. 3. *Stirtonia chrysantha*. 1. flowering branch, showing the opposite flowers. 2. leaf, abaxial view. 3. flower in lateral view. 4. bract. 5. calyx (upper lobes to the left). 6. standard petal. 7. wing petal. 8. keel petal. 9. anthers. 10. pistil. 11. pod in lateral view. 12. pod in transverse section. 13. seed in lateral view (left) and hilar view (right) showing the non-fleshy rim aril and the oblique alignment of the lens axis. – Scales in mm.

Podalyria), the absence of a fleshy aril around the hilum of the seed (a fleshy, collar-like aril invariably present in *Podalyria*) and in the oblique alignment of the lens axis (lens axis straight in *Podalyria*). The three species are known only from a few isolated localities in the south-western and southern Cape Province of South Africa (Fig. 1).

Stirtonia is named after Dr Charles Howard Stirton (Deputy director of the Royal Botanic Gardens, Kew) in recognition of his important contributions to the taxonomy of South African legumes.

Key to the species

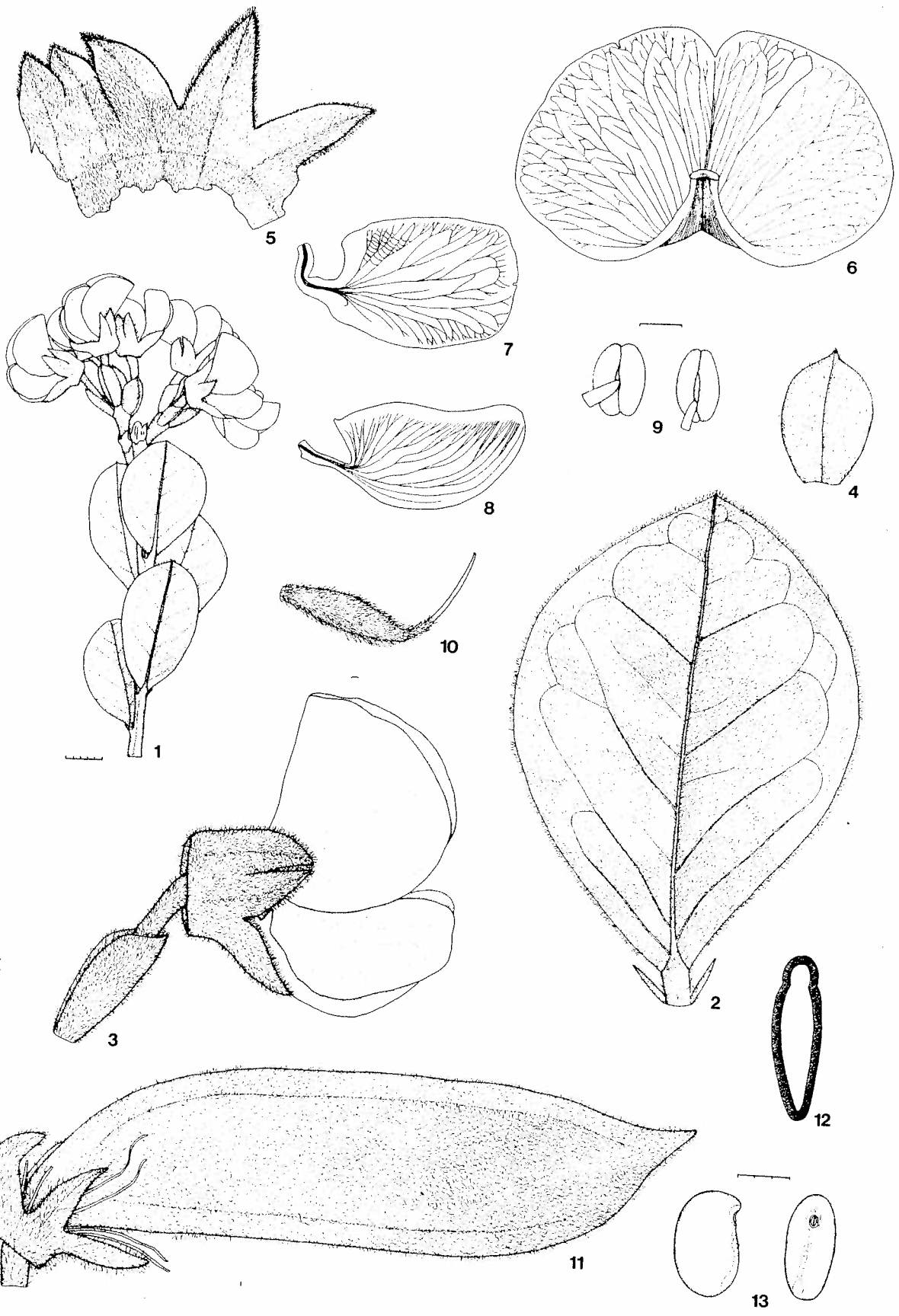
1. Bract longer than the pedicel, clasping the basal part of the calyx. . . . . 2. *S. chrysantha*
1. Bract shorter than the pedicel, not clasping the calyx. . . 2
2. Bract small, 3 mm long & 4 mm wide; fruit inflated; seeds dark green to almost black; single-stemmed reseeding shrub . . . . . 1. *S. tayloriana*
2. Bracts large, 10 mm long & 14 mm wide; fruit compressed; seeds orange to red; multi-stemmed resprouting shrub. . . . . 3. *S. insignis*

1. Stirtonia tayloriana (L. Bolus) Van Wyk & Schutte, comb. nov.

= *Podalyria tayloriana* L. Bolus, *Journ. Bot.* 72: 22 (1934). – Type: South Africa, Cape Province, Oudtshoorn division, Swartberg, among many other plants collected for exhibition in London, Oct. 1933, anon. s.n. (BOL 20839! lectotype, designated here; BM!, K!, isotypes).

A single-stemmed shrub or small tree, up to 4 m high, reseeding after fire. Branches divaricate, densely velvety

Fig. 4. *Stirtonia insignis*. 1. flowering branch, showing the decussate 4-flowered inflorescences. 2. leaf, abaxial view. 3. flower in lateral view. 4. bract. 5. calyx (upper lobes to the left). 6. standard petal. 7. wing petal. 8. keel petal. 9. anthers. 10. pistil. 11. pod in lateral view. 12. pod in transverse section. 13. seed in lateral view (left) and hilar view (right) showing the non-fleshy rim aril and the oblique alignment of the lens axis. – Scales in mm.


5
6
7
1
9
4
8
10
2
3
12
11
13

tomentose. Leaves obovate to elliptic, 20–45 mm long, 10–35 mm wide, densely silky; base cuneate, apex rounded; petiole 4–7 mm long. Stipules lanceolate, 2–3 mm long. Inflorescences 2–4 -flowered (arranged in groups of up to 20 flowers), mostly geminate and decussate, rarely 3 or 4 arranged in racemes; peduncle 5–6 mm long. Bracts shorter than the pedicel, 3 mm long, 4–5 mm wide, densely pubescent. Pedicel 5–6 mm long, densely tomentose. Flowers 14–15 mm long. Calyx 7–8 mm long; upper lobes obtuse, 3 lower lobes acute. Standard 9–10 mm long, 14–15 mm wide; claw 3 mm long. Wing petals 13 mm long; claw 4 mm long; lamina 8–9 mm long, 6 mm wide; petal sculpturing in 8 rows of intercostal lunae. Keel petals 12–13 mm long; claw 4–5 mm long; lamina 8–9 mm long, ± 5 mm wide. Anthers slightly dimorphic, alternately dorsifixed and subbasifixed. Pistil ± 11 mm long; ovary with 4 or more ovules, densely sericeous to tomentose. Pods 30–35 mm long, 10 mm wide, obliquely oblong, somewhat inflated, 5–8 -seeded; densely sericeo-pubescent. Seeds dark green (at maturity), 5–6 mm long, 3.0–3.5 mm wide. Fig. 2.

Stirtonia tayloriana is a highly localised species, known only from two small areas in Swartberg Pass (Fig. 1) where it is locally abundant.

Material examined. – 3322 (Oudtshoorn): Swartberg Pass, S side near "Hotelletjie" (–AC), Van Wyk & Schutte 3248a-c, 3269a-b, 3298, Schutte & Vlok 746 (JRAU); S side of Swartberg Pass just beyond the Pine Sample Plots and beyond TR 417 (–AC), Taylor 9382 (PRE); Swartberg Pass, frequent along streambank near Tollhouse ruins (–AC), Bond 1562 (NBG); De Rust, foot of Swartberg Mountain near Bloupunt (–AD), Schutte & Vlok 822b (JRAU). Without precise locality: Swartberg, anon. s.n. (BM, BOL 20839, K).

2. Stirtonia chrysantha (Adamson) Van Wyk & Schutte, comb. nov.

= *Podalyria chrysantha* Adamson, Journ. Bot. 72: 21 (1934). – Type: South Africa, Cape Province, Ladismith division, by stream at foot of Swartberg at Seven Weeks Poort, Sept. 1928, Pocock 1016 (BOL! lectotype, designated here; BM!, K!, isotypes).

A single-stemmed shrub or small tree, up to 4 m high, reseeding after fire. Branches divaricate, densely tomentose when young, glabrescent with age. Leaves very widely obovate to almost circular, 25–50 mm long, 15–50 mm wide, densely greyish white tomentose; base rounded, apex mucronulate; petiole 3–5 mm long. Stipules lanceolate-triangular, 3–4 mm long. Inflorescences 2-flowered (arranged in groups of up to 12 flowers), peduncle ±7 mm long. Bracts longer than the pedicel, 6–8 mm long, 10–12 mm wide, clasping the basal part of the calyx, tearing at anthesis, densely rusty tomentose. Pedicel 2–4 mm long, densely tomentose. Flowers 14–17 mm long. Calyx 6–8 mm long; upper lobes slightly longer than the 3 lower lobes; lobes triangular, acute, densely rusty tomentose. Standard 12–13 mm long, 19 mm wide; claw 3–4 mm long. Wing petals 13–16 mm long; claw 4–5 mm long; lamina 10–13 mm long, 7–10 mm wide; petal sculpturing absent. Keel petals 13–15 mm long; claw ± 5 mm long; lamina 8–10 mm long, 5–6 mm wide. Anthers slightly dimorphic, alternately dorsifixed and subbasifixed. Pistil ± 13 mm long; ovary with 4 or more ovules, densely tomentose. Pods 25–35 mm long, 10 mm wide, obliquely oblong, somewhat inflated, 5–6 -seeded; densely tomentose. Seeds dark green to almost black (at maturity), 5.0–-5.5 mm long, 3.0–3.5 mm wide. – Fig. 3.

Stirtonia chrysantha is closely related to *S. tayloriana* but can readily be distinguished when in flower. The two species are allopatric; *S. chrysantha* also has a very restricted geographical distribution and is known only from a small area of the Klein Swartberg near Ladismith (Fig. 1).

Material examined. – 3321 (Ladismith): Klein Swartberg, Peak Plaats (-AD), Marshall 123 (PRE); Swartberg Mountains, above Hoeko near Ladismith (–AD), Bayliss s.n. (PRE 1264); Kloof E of Waterkloof, where jeep track ends (–AD), Van Wyk & Schutte 3297 (JRAU); Seven Weeks Poort, at foothills of Swartberg, by stream (–AD), Pocock 1016 (BM, BOL, K); At base of Kleinswartberg (–AD), Wurts 1673 (NBG); Ladismith (–AD), Blythe s.n. sub NBG 101/65 (NBG).

3. Stirtonia insignis (Compton) Van Wyk & Schutte, comb. nov.

= *Podalyria insignis* Compton, Jl. S. Afr. Bot. 19: 109 & 110 (1953). – Type: South Africa, Cape Province, Montagu division, Dobbelaar's Kloof, 4000 ft. alt., 25 Sept. 1946, Compton 18441 (NBG! holotype; BOL!, isotype).

A robust multi-stemmed shrub, up to 2 m high, 2 m wide, resprouting after fire. Branches erect, densely tomentose. Leaves obovate to elliptic, 30–50 mm long, 20–40 mm wide, densely tomentose; base cuneate, apex mucronulate; petiole 3–4 mm long. Stipules 3–7 mm long, those below the inflorescences often fused with a much reduced leaf lamina to form a trifid bract. Inflorescences decussate, (2–) 4–6 -flowered, with rachis extention rarely present; peduncle 8–13 mm long. Bracts shorter than the pedicel, 10–13 mm long, 14 mm wide, sheathing the pedicel, occasionally trifid, densely tomentose. Pedicel up to 20 mm long, densely tomentose. Flowers up to 26 mm long. Calyx 10–14 mm long; lobes acute, densely tomentose. Standard 21 mm long, 35 mm wide; claw up to 7 mm long. Wing petals 21 mm long; claw 5 mm long; lamina 16 mm long, 12 mm wide; petal sculpturing in 2–4 rows of intercostal lamellae. Keel petals 20 mm long; claw 5 mm long; lamina 17–18 mm long, 9–10 mm wide. Anthers slightly dimorphic, alternately dorsifixed and subbasifixed. Pistil 18 mm long; ovary with 6–8 ovules, densely sericeous to tomentose. Pods 45–65 mm long, 14–16 mm wide, linear to obliquely oblong, compressed, 5–8 -seeded; densely sericeous to tomentose. Seeds orange-brown to reddish orange, 5.5–6.0 mm long, 4 mm wide. – Fig. 4.

A distinctive and spectacular species, known from only

a few localities in the mountains north and east of Montagu (Fig. 1).

Material examined. –3319 (Worcester): Kiesiesberg (–DB), Compton 18495 (NBG). –3320 (Montagu): Waboomsberg, between Brakkefontein and Highlands (–CA), Rourke 1162 (NBG); Waboomsberg, ca. 1 km from main gate to farm Pypsteelfontein towards Montagu (–CA), Schutte & Van Wyk 721a–b (JRAU); Dobbelaar's Kloof (–CB), Compton 18441 (NBG), Bond 337 (NBG); Klipbokkraal along slopes of mountains (–CD), Van Breda 1499 (PRE).

Acknowledgements – We thank the directors and staff of the listed herbaria for allowing us to study their material. Dr H.F. Glen kindly translated the diagnosis. Financial support from the Foundation for Research Development is gratefully acknowledged.

References

Schutte, A. L. & Van Wyk, B-E. 1993. The reinstatement of the genus *Xiphotheca* (Fabaceae). – Taxon 42: 43–49.

Van Wyk, B. E. & Schutte, A. L. Phylogenetic relationships in the tribes Podylarieae, Liparieae and Crotalarieae. – Advances in Legume Systematics Part 5. (In press).

Van Wyk, B.-E., Verdoorn, G. H. & Schutte, A. L. 1992. Distribution and taxonomic significance of major alkaloids in the genus *Podalyria*. – Biochem. Syst. Ecol. 20: 163–172.