

The Genus *Talinum* (Portulacaceae) in Southern Africa

by

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ABSTRACT

A revision of the five species of *Talinum* indigenous to South Africa has been undertaken. A key to the species is provided.

INTRODUCTION

During a visit to South West Africa observations were made on plants of *Talinum*, but it was very difficult to find correct names for them as seeds were not always available and seed structure is the major key character used. Indeed, the seed characters are very reliable in this genus and the specific patterns of the papillae on the seed membrane can be seen at an early developmental stage. However, specimens without seeds and more specifically male plants of *T. crispatum* could not be identified. This difficulty, particularly with regard to the four species with yellow flowers which are emphasized in this work, as well as the different interpretations of the species in the literature, indicated the need of taxonomic clarification of the species of this genus.

Further observations in the northern Cape Province convinced me that species can be recognized in the field even without flowers, which open only for a short time in the afternoon. The leaves, although they are very variable, show a few characteristics which may help in identification. For instance, the leaves of *T. crispatum* have typical crisped leaf margins and are never revolute (see Fig. 1: 3), a combination of characters not found in any of the other species, although young leaves of *T. arnotii* often have a crisped leaf margin. Occasionally specimens of the other three species, especially *T. arnotii*, do not show the revolute leaf margin when grown under particularly humid conditions. The leaves of *T. tenuissimum* and *T. caffrum* are usually linear, but in young plants of *T. caffrum* rather broad leaves are produced and these are so similar to those of *T. arnotii* that flowers and fruits are needed for identification. The leaves of *T. tenuissimum* are always linear and the whole plant is smaller and more delicate than those of *T. caffrum*. Diagnostic characters of these four yellow-flowered species are summarized in Table 1 to illustrate the differences and variation found in this complex. The table will also facilitate the identification of specimens without fruits and/or flowers.

When working on this revision, it was realized that many of the syntypes of species described by Dinter no longer exist at Berlin Herbarium where, according to Lanjouw & Stafleu (1954) in the index of collectors in Index Herbariorum, the original sets of Dinter specimens were deposited. This, and the occurrence of mixed collections found on certain sheets of syntype material seen, made it necessary to select lectotypes. In this connection, specimens from Berlin should get preference as the original set was deposited there and, in addition, Dinter's own herbarium is now in Berlin Herbarium, having been acquired at a more recent date.

TABLE 1.—Summary of differences between *Talinum arnotii*, *T. caffrum*, *T. tenuissimum* and *T. crispatum*

	<i>T. crispatum</i>				
	<i>T. arnotii</i>	<i>T. caffrum</i>	<i>T. tenuissimum</i>	male plants	female plants
Flesh of tubers.....	white becoming red-dish-brown	white.....	reddish-brown.....	white becoming brown	—
Branches.....	finely papillose, becoming glabrous	glabrous.....	glabrous.....	papillose to hairy.....	—
Leaves.....	lanceolate to broadly elliptic (1-) 2-4 (-5) cm long (0.5-) 1-2 (-3) cm broad	linear to oblong, mucronate (1.5-) 2-4 (-8) cm long (0.2-) 0.3-0.6 (-1.2) cm broad	linear..... (1.5-) 2-4 (-5) cm long 0.1-0.3 (-0.5) cm broad	lanceolate..... 1-1.5 (-2.5) cm long 0.4-0.6 (-0.8) cm broad	usually broadly lanceolate 1.2-2.5 (-3) cm long 0.6-1 (1.5) cm broad
Leaf margin.....	revolute, crisped when young; leaf blade recurving	revolute; leaf blade recurving	revolute; leaf blade recurving	crisped; leaf blade never recurved	—
Inflorescence.....	1-3-flowered.....	1 (2)-flowered.....	1-3 (4)-flowered.....	2-4 (5)-flowered.....	1 or 2 (3)-flowered
Peduncle.....	2-3.5 (-4.5) cm long	0.5-1.5 (-2.5) cm long	0.5-1.5 cm long.....	2-3 (-5) cm long.....	1-1.5 (-2.5) cm long
Pedicle of lateral flowers	1 or 0 pair of bracteoles	1 or 0 pair of bracteoles	often 2 pairs of bracteoles	2 (3) pairs of bracteoles	1 (2) pairs of bracteoles
Sepals.....	4-6 (-7) mm long.....	6-8 (-15) mm long....	3-4 (-5) mm long.....	4-5 mm long.....	3-4 (-5) mm long
Stamens.....	20-35 (-50).....	25-35 (-50).....	8-10 (-14).....	20-30 (-35).....	numerous staminodes
Style.....	(2-) 3-4 mm long, swollen below stigma	3-5 mm long, swollen below stigma	1-2 mm long, swollen	—	absent or very short
Ovules.....	25-40.....	25-40.....	10-12 (-15).....	—	10-12 (-15)
Seeds.....	reniform, fine to coarse papillae, often concentric rows	spherical with concentric ridges with papillae between	reniform with elongate papillae radiating out from the hilum	—	reniform with elongate papillae radiating out from the hilum
Habitat.....	sandy to clayey soils..	usually on rock outcrops	sandy soils.....	sandy soils.....	—

The author wishes to acknowledge with thanks the loan of specimens from the following herbaria: Albany Museum Herbarium; Herbarium Berlin-Dahlem; Royal Botanic Gardens, Kew; McGregor Museum Herbarium; National Botanic Gardens and South African Museum Herbaria at Kirstenbosch; Natal Herbarium; and Stellenbosch Herbarium.

TALINUM

Talinum *Adanson*, Fam. 2: 245 (1763); Benth. & Hook.f., Gen. Pl. 1: 157 (1862); Oliver in Fl. Trop. Afr. 1: 149 (1868); Sonder in Fl. Cap. 2: 385 (1862); von Poellnitz in Fedde Rep. 35: 1 (1934); Wild in Fl. Zamb. 1, 2: 369 (1961). Type species: *T. triangulare* (Jacq.) Willd.

Shrublets with annual branches from a perennial base, usually tuberous. *Leaves* linear to broadly elliptic, obovate, petiolate, succulent, alternate often irregularly spaced; stipules linear, setaceous, usually keeled, with membranous margin, 1–3 mm long, usually caducous. *Inflorescence* in panicles or axillary, cymose. *Sepals* 2, narrowly ovate to broadly-ovate, keeled, slightly hooded at the apex, green, usually with membranous margin. *Petals* (4) 5 (–7), ovate, pointed or mucronate, often faintly keeled at the apex. *Stamens* 10–30 (–50); filaments usually connate at the base. *Ovary* superior, one-chambered with three carpels, with 10–40 ovules on a free central placenta; style 1–3 mm long or absent; stigmas 3, papillose. *Fruit* a capsule, ovoid to conical, shiny yellow, dehiscent by 3 valves. *Seeds* spherical to reniform, often laterally compressed, with more or less distinct patterns of papillae, dark brown or black.

Species of *Talinum* occur in most parts of Africa, parts of Asia and North and South America. Five species are indigenous in South Africa and occur only in the summer rainfall areas. *T. paniculatum* (Jacq.) Gaertn. from North America is often cultivated and has been recorded a few times as a garden escape, but it does not seem to spread as a weed.

In the African species the pedicels are always swollen below the fruit and are more or less recurved when fruiting.

- Leaves obovate, obtuse or rounded at the apex; inflorescence terminal, paniculate, with pink flowers..... 1. *T. portulacifolium*
- Leaves linear, broadly elliptic to ovate, tapering towards the apex; inflorescence axillary, cymose, with yellow flowers:
- Leaf margin crisped, never revolute; leaves irregularly alternate with internodes rarely longer than 1 cm, varying in length on the same branch; plant dioecious:
- Leaves 1–1.5 (–2) cm long, 4–6 (–8) mm broad; anthers with pollen; ovary without ovules..... 4. *T. crispatum* (male)
- Leaves 1.5–2.5 (–3) cm long, 6–10 (–15) mm broad; anthers without pollen; ovary with 10–12 ovules..... 4. *T. crispatum* (female)
- Leaf margin rarely crisped when young, revolute; leaves usually alternate with internodes usually longer than 1 cm and not varying in length on the same branch; plant monoecious:
- Pedicel thread-like, with (1) 2 pairs of bracteoles; calyx 3–4 mm long; stamens 8–14; seeds 6–12 (–15) per capsule, 2–3 mm long..... 5. *T. tenuissimum*
- Pedicel not thread-like, with 0 or 1 pair of bracteoles; calyx 5–15 mm long; stamens 20–50; seeds 20–40 per capsule, c. 1 mm long:
- Inflorescence 1-flowered; seeds with concentric ridges perpendicular, elongate papillae between the ridges; leaves linear to oblong..... 2. *T. caffrum*
- Inflorescence 1 or 2 (3)-flowered; seeds without ridges, papillose (sometimes arranged in concentric rows, but without elongate papillae between them); leaves narrowly ovate to broadly elliptic..... 3. *T. arnotii*

1. ***T. portulacifolium*** (Forsk.) *Aschers. ex Schweinf.* in Bull. Herb. Boiss. 4, App. 2: 172 (1896); Wild in Fl. Zamb. 1, 2: 372 (1961). Type: Arabia.

Orygia portulacifolia Forsk., Fl. Aegypt.-Arab. 103 (1775).

Portulaca cuneifolia Vahl, Symb. Bot. 1: 33 (1790), nom. illegit. Type: the same as for *O. portulacifolia*.



FIG. 1.—1, *Talinum arnotii*, branch of broad leaved form, $\times 1$ (Tölken 1281); 1a, branch of narrow leaved form, $\times 1$ (Tölken 1284). 2, *T. caffrum*, branch with flower and fruits, $\times 1$ (Tölken 1293). 3, *T. crispatum*, branch of female plant, $\times 1$ (Tölken 1282); 3a, branch of male plant, $\times 1$ (Tölken 1283).

Talinum cuneifolium Willd., Sp. Pl. ed. 4, 2: 864 (1800), nom. illegit.; Burt Davy, Fl. Transv. 1: 166 (1926); von Poellnitz in Fedde Rep. 35: 14 (1934), partly, excl. specimens from S.W.A.

Shrubs with annual glabrous branches up to 1 m high from a perennial base. *Leaves* obovate, obtuse or rounded and mucronate at the apex, cuneate at the base, 2–6 (–10) cm long, 1–3 (–4) cm broad; petiole 1–3 mm long. *Inflorescence* terminal, paniculate, many-flowered, often with leaf-like bracts 5–15 mm long on the main axis, usually with one pair of pointed membranous bracteoles below each flower. *Sepals* broadly ovate, apiculate, 3–4 mm long, slightly keeled at the apex. *Petals* obovate, pointed at the apex, pink or mauve. *Stamens* 25–30 (–35) with terete filaments not connate at the base. *Ovary* spherical with 30–40 ovules; style 2–3 mm long, dividing into 3 stigmas 1–2 mm long, papillose. *Capsule* ovate, 5–8 mm long, 5–6 mm broad, shiny yellow. *Seeds* ovate to reniform, laterally compressed, up to 1 mm long, with indistinct elongate papillae radiating out from the hilum, black.

T. portulacifolium is a shade-loving plant in the northern and eastern Transvaal, but also occurs in most parts of Africa, Arabia and India.

TRANSVAAL.—Letaba: Rooirootse, *Van der Schijff* 3322; Gravelotte, *Van der Merwe* 2323. Messina: Messina, *Rogers* s.n. in BOL 19280 (BOL). Potgietersrus: Soutpan, *Bremekamp & Schweickerdt* 281. Sibasa: Klopperfontein, *Codd* 5417; *Van der Schijff* 3563. Waterberg: 42 miles north of Vaalwater, *Meeuse & Srey* 10454.

The type specimen of this species has not been seen, but Forskal's original description is so complete that there is no doubt as to the species concerned.

2. *T. caffrum* (Thunb.) Eckl. & Zeyh., Enum. 282, No. 1802 (1836); Sonder in Fl. Cap. 2: 385 (1862); von Poellnitz in Fedde Rep. 35: 12 (1934), partly, excl. specimens from S.W.A.; Wild in Fl. Zamb. 1, 2: 370 (1961). Type: Cape, *Thunberg* s.n. (UPS, 2 sheets; PRE, photo.!).

Portulaca caffra Thunb., Prod. 85 (1800).

Talinum minus Eckl. & Zeyh., Enum. 282, No. 1803 (1836). Type: Katriviersberg, *Ecklon & Zeyher* s.n. (SAM!). *T. caffrum* var. *minus* (Eckl. & Zeyh.) Sonder in Fl. Cap. 2: 385 (1862). *T. esculentum* Dinter & Schellenberg in Dinter, Veget. Feldkost D.S.W.A. 12 (1912); Fedde Rep. 23: 369 (1927); von Poellnitz in Ber. Bot. Ges. 51: 118 (1933); Fedde Rep. 35: 17 (1934); Podlech in Prodr. Fl. S.W.A. 29: 12 (1967). Type: Otavipforte, *Dinter* 730a (B, lecto.!).

Claytonia caffra (Thunb.) Kuntze, Rev. Gen. 1: 57 (1891).

Plant erect or decumbent; tubers branched, with white flesh. *Branches* glabrous or almost so, 15–25 (–40) cm long. *Leaves* linear to oblong, 2–4 (–8) cm long, (2) 3–6 (–10) mm broad, with margins revolute or recurving; first leaves on branch short and broadly oblong; petiole 1–3 mm long. *Inflorescence* axillary, cymose, 1 (2)-flowered. *Peduncle* 0.5–1.5 (–2.5) cm long, often keeled or laterally compressed, ending in two keeled bracts with membranous margins. *Pedicel* 1–1.5 (–2) cm long, swollen, often ridged below the ovary; bracteoles usually absent, rarely one lateral flower with one pair of bracteoles. *Sepals* lanceolate, pointed, 5–8 (–15) mm long, keeled, slightly hooded, with membranous margins. *Petals* 5, obovate to elliptic, yellow. *Stamens* 25–30 (–50), with filaments becoming broader towards the base, fused into a ring c. 1 mm high. *Ovary* conical, with 25–35 (–40) ovules; style 2–3 (–4) mm long, dividing into 3 stigmas 2 mm long, papillose. *Capsule* ovoid, 6–10 mm long, 6–7 mm broad, shiny, yellow. *Seeds* spherical to comma-shaped, hardly laterally compressed, c. 1 mm long, with ridges with perpendicular grooves between the ridges, dark brown or black. FIG. 1: 2.

This species occurs mainly on rocky outcrops and has mainly an eastern distribution in Africa from the eastern Cape to Kenya, but also extends across Rhodesia and Zambia into north-eastern South West Africa.

CAPE.—Albany: Glen Boyd, *Linstaedt* 47. Aliwal North: Elandshoek, *F. Bolus* 156. Beaufort West: 20 miles east of Beaufort West, *Adamson* D 176. Bedford: Eastpoort, *Burt Davy* 12219; Bedford, *Glane* 130 (GRA). Cathcart: Klipplaatrivier, *Ecklon & Zeyher* s.n. (SAM). Cradock: Mortimer, *Kensit* s.n. (BOL). De Aar: De Aar, *Lander* s.n. (GRA). Fort Beaufort: Alice, *Barker* 2325 (NBG); Kroomie, *Marloth* 9388. Graaff-Reinet: Ryneveld Pass, *Bolus* 372 (BOL, GRA). Kentani: Maquanauli, *Pegler* 639. Kimberley: on road to Boshof, *Brueckner* 29; 30 miles west of Kimberley, *Tölken & Schlieben* 1162. Komga: near Komga, *Flanagan* 1074. Kuruman: 4 miles south of Olifantshoek, *Tölken & Schlieben* 1181. Middelburg: Grootfontein, *Theron* 360. Port St. Johns: Port St. Johns, *Watt & Brandwijk* 1670. Prieska: Prieska, *Bryant* in STE 18287 (STE). Queenstown: Bongola Poort, *Galpin* 1984. Seymour: Katriviersberg, *Ecklon & Zeyher* s.n. (SAM). Stockenstrroom: Stockenstrroom, *Dyer* 712. Tarkastad: between Cradock and Tarkastad, *Adamson* D 230. Vryburg: Pitsani, *Cole* in NBG 43756 (NBG). Warrenton: Warrenton, *Adams* 128.

ORANGE FREE STATE.—Bloemfontein: Bloemfontein, *Pole Evans* H 19634. Boshof: between Boshof and Windsorton, *Burt Davy* 12447. Fauresmith: Fauresmith, *Smith* 5594; *Verdoorn* 1057; *Henrici* 1953. Jacobsdal: Mauretzfontein, *Esterhuysen* 761 (BOL). Kroonstad: Kroonstad, *Wagener* sub Marloth 13529.

TRANSVAAL.—Barberton: near Edwin Bray Battery, *Galpin* 1178. Bloemhof: Kameelpan, *J. J. Theron* S 469. Brits: Crocodile River, *Zeyher* s.n. (BOL, SAM). Cullinao: Rooikop, *Smuts and Gillett* 2003; 2115. Klerksdorp: Klerksdorp, *Lucy* 2 (GRA). Letaba: Tzaneen, *Rogers* 12411. Lichtenburg: Grasfontein, *Sutton* 385. Lydenburg: Sekukunie, *Barnard* 188. Marico: Zeerust, *Thode* A 1408. Piet Retief: Piet Retief, *Leipoldt* s.n. Pilgrim's Rest: Erasmus Pass, *Killick & Strey* 2519; Mariepskop, *Van der Schijff* 6374. Potchefstroom: Boskop, *Louw* 654; Potchefstroom, *G. C. Theron* 2; *Liebenberg* 1073. Potgietersrus: Potgietersrus, *Bolus* s.n. (BOL). Pretoria: Koedoespoort, *Smith* 1531; Brooklyn, *Mogg* 16046; Doornpoort, *Pole Evans* H 13262. Rustenburg: Rustenburg, *Pegler* 2001. Schweizer Renecke: *Burt Davy* 12776. Sibasa: Punda Milia, *Van der Schijff* 3595; Lang in TRV 32200 (BOL). Vereeniging: Vereeniging Estates, *Phillips* s.n. Warmbaths: Warmbaths, *Burt Davy* 5341. Waterberg: Mosdene, *Galpin* R 236. White River: 5 miles north of Malelane, *Codd* 5230; near Crocodile River Bridge, *Van der Schijff* 3276.

NATAL.—Camperdown: Camperdown, *Franks* sub Wood 11945 (BOL, NH). Eshowe: Umhlatuz-Valley, *Gerstner* in NH 22548 (NH). Estcourt: Estcourt, *Pentz* 494; *West* 502; *Acocks* 11393 (NH) Hlabisa: Hluhluwe Game Reserve, *Ward* 1755: 15 miles from Mtubatuba to Nongoma, *Strey* 5455. Louwsburg: near Magut, *Gerstner* 2424. Lower Umfolozi: 11 miles south-west of Empangeni, *Codd* 1880. Umzinto: Dumisa, *Rudatis* 2013 (STE).

LESOTHO.—Leribe: Thaba Phafva, *Dieterlen* 701. Maseru: Maseru, *Jacot-Guillarmod* 3212.

SWAZILAND.—Lubombo: Big Bend, *Compton* 30992 (NBG).

SOUTH WEST AFRICA.—Grootfontein: Aris-Aukas, *Dinter* 730 (B, SAM); Otavipforte, *Dinter* 730a (B). Otjiwarongo, *Pillans* in BOL 27947 (BOL).

This species has distinctive seeds, but is very variable in vegetative characters, especially the shape and size of the leaves. The broadly oblong leaves of young plants might be confused with those of *T. arnotii*. *T. caffrum*, can, however, be recognized by the presence of more than one flower per inflorescence on a short peduncle, while, in the more tropical areas where it sometimes produces more than one flower, the sepals are longer than 8 mm (see FIG. 1: 2).

Two sheets of this species are present in the Thunberg Herbarium (UPS) and both bear flowers and fruit.

The identity of *T. esculentum* Dinter & Schellenberg (1912) can be recognized from the original description on the basis of the characteristic linear leaves and the white flesh of the tuber, the combination of which applies only to this species. However, no specimens were cited together with this description. Of the specimens cited by Dinter (1927) under this species, two species are in Berlin Herbarium of which *Dinter* 730a is selected as lectotype. This specimen was collected in 1908, added to which it bears a note recording the white flesh of the tuber, thus providing evidence that it is probably one of the specimens on which the original description was based. The second specimen *Dinter* 730 in Berlin Herbarium, belongs to the same species, but on

the sheet of this number in SAM is a mixed collection and seeds of *T. esculentum* and *T. tenuissimum* are present in the capsule. *T. esculentum* is a synonym of *T. caffrum*, but t.42 in Neue und wenig bekannte Pflanzen Deutsch-Südwest-Afrikas appears to be a narrow-leaved form of *T. arnotii*. Several lateral flowers on a long peduncle and the recurved, narrowly ovate leaves are rarely found in *T. caffrum*. From the few specimens seen, it appears that *T. caffrum* is not as common in South West Africa as Dinter (1912) estimated.

3. *T. arnotii* Hook.f. in Bot. Mag. t. 6220 (1876); von Poellnitz in Fedde Rep. 35: 13 (1934); Wild in Fl. Zamb. 1, 2: 372 (1961). Type: Bot. Mag. t. 6220. *T. caffrum* sensu Dinter, Veget. Feldkost D.S.W.A. 12 (1912); Fedde Rep. 23: 369 (1927); sensu von Poellnitz in Fedde Rep. 35: 13 (1934), partly, including specimens from S.W.A.; sensu Podlech in Prodr. Fl. S.W.A. 29: 11 (1967). *T. cuneifolium* sensu von Poellnitz in Fedde Rep. 35: 15 (1934), partly, including specimens from S.W.A.; sensu Podlech in Prodr. Fl. S.W.A. 29: 12 (1967).

Shrublet, semi-erect, rarely decumbent; tubers long, branched, usually reddish-brown inside. Branches slightly hairy, becoming glabrous, succulent, 30–40 (–60) cm long. Leaves narrowly or broadly ovate or elliptic, mucronate, 2–4 (–5) cm long, 0.8–1.5 (–2.5) cm broad, with margins often irregularly recurved, appearing wavy; petiole 2–3 (–4) mm long. Inflorescence axillary, cymose, 1–3-flowered. Peduncle 2–3 (–4) cm long ending in two keeled bracts with membranous margins. Pedicel 0.5–1 cm long, swollen below the ovary, usually with lateral flowers with one pair of bracteoles. Sepals 5–6 (7) mm long, ovate, keeled and slightly hooded at the apex, with membranous margin. Petals (4) 5, ovate, mucronate, faintly keeled at the apex. Stamens 20–30 (–50); filaments slightly broadened towards the base, fused into a ring c. 1 mm high. Ovary conical with 25–40 ovules; style 2–3 (–4) mm long dividing into 3 stigmas 2–3 mm long, papillose. Capsule ovate, 8–9 mm long, 5–6 mm broad, shiny yellow. Seeds reniform, laterally compressed, 0.5–1.5 mm long, with fine elongate papillae or coarse papillae arranged in circular rows, dark brown or black. FIG. 1: 1, 1a.

This species occurs usually in sandy, but often also in clay soils, and is distributed in and around the Kalahari basin and well into the centre of South West Africa.

CAPE.—Barkly West: Boetsap, *Brueckner* 1263. Hay: La Dauphine, *Acocks* 227; Foot of Wolkaarskop, *Esterhuysen* 2451 (BOL); Dronfield, *Wilman* in KMG 1934 (KMG). Kimberley; Spytfontein, *Schweickerdt* 1119; near Rivermead Station, *Leistner* 2017; Kimberley, *Compton* 23945 (NBG); 25 miles west of Kimberley, *Tölken & Schlieben* 1160. Kuruman: 4 miles south of Olifantshoek, *Tölken & Schlieben* 1182. Postmasburg: Klipbok, *Repton* 4798. Prieska: Prieska, *Bryant* 567; J. 15. Vryburg: near Vryburg, *Rodin* 3525; 4 miles south of Vryburg, *Brueckner* 1114 (KMG). Warrenton: Warrenton, *Pole Evans* H. 11628.

ORANGE FREE STATE.—Fauersmith: Roodepoortje, *Henrici* 3033. Jacobsdal: Mauretzfontein, *Esterhuysen* 762 (BOL).

TRANSVAAL.—Groblersdal: Marble Hall, *Marais* 1099. Pietersburg: north of Blauwberg, *Obermeyer, Schweickerdt & Verdoorn* 93. Potgietersrus: Steilloop, *Tölken* 1126b. Thabazimbi: Near Northam, *Tölken* 1280; near Makoppa, *Tölken* 1281; 1284. Soutpansberg: between Salt Pan and Waterpoort, *Obermeyer, Schweickerdt & Verdoorn* 260.

SOUTH WEST AFRICA.—Bethanien: Aris, *Range* 1280 (SAM). Gobabis: 80 miles west of Gobabis, *De Winter* 2514; Sandfontein, *Gillman* 69 (SAM); Sturmfeld, *Tölken* 1301. Grootfontein: Grootfontein, *Schoenfelder* 310; *Borle* 49. Kaokoveld: 4 miles north of Ohopoho, *De Winter & Leistner* 5259; Kaross-Kamanjab, *Thorne* in SAM 35750 (SAM). Karibib: Okomitundo, *Seydel* 1270. Keetmanshoop: Kraikluft, *Pearson* 8208 (BOL); 8269 (BOL, GRA). Okahandja: Okahandja, *Dinter* 1851 (SAM). Okavango: Runtu, *De Winter* 4043; Nama Pan, *Story* 5256; Gautscha Pan, *Maquire* 2133. Otjiwarongo: Quickborn, *Bradfield* 110. Waterberg, *Liebenberg* 4752. Outjo: Outjo, *Barnard* in SAM 33224 (SAM). Rehoboth: Rehoboth *Fleck* 182 (Z); between Rehoboth and Uhlenhorst, *Wilman* in KMG 463; Büllspoor, *Herre* s.n. (BOL). Warmbad: near Dabaigabis, *Pearson* 4433 (BOL). Windhoek: 4 miles north of Windhoek, *Codd* 5787; Neudamm, *Van Vuuren* 1014; Gameros, *Dinter* 2671b (SAM).

T. arnotii is a very variable species. The leaves vary greatly in shape and size and are crisped along the margin when young. Among specimens of this species seen, two types of seeds were observed. Firstly, plants originating mainly from the northern Cape and southern and central South West Africa produce seeds with fine elongate papillae radiating out from the hilum. These seeds are very similar to those of *T. tenuissimum* and *T. crispatum*, but are never longer than 1.5 mm. The second form occurs in the northern parts of the Cape Province, Transvaal, Botswana and South West Africa and also in Rhodesia and Zambia. The papillae of the seed membrane are coarse, about as long as broad and arranged in concentric rows. In the northern parts of the distribution of this form, the papillae become less clearly arranged in concentric rows and the seeds are usually less than 1 mm long. In the Transvaal the two forms were found together at two localities (near Thabazimbi *Tölken* 1284, 1281; near Makapanstad, *Tölken* 1278, 1277). The corresponding plants can usually also be distinguished. The plants with finer papillae occur on the more clayey soils and produce narrower leaves and normally one, rarely many, flowers on a long peduncle (see FIG. 1: 1a). The plants with coarse seed papillae occur on sandy soils and have broad leaves usually irregularly reflexed and usually with three flowers per inflorescence (see FIG. 1: 1). However, intermediates to all these characters, except the seed characters, were found in both localities and also in herbarium material. Specimens seen from north-eastern South West Africa and northern Cape also indicate that the two forms apparently occur together in these areas without any definite intermediates. In addition, specimens from the eastern central South West Africa have seeds with fine papillae approaching those of the second type. Specimens with definite intermediate seed characters have not been seen, but in view of insufficient material seen from Botswana, the complex is not thoroughly understood and can thus not be fully evaluated.

4. *T. crispatum* *Dinter* in Fedde Rep. 23: 369 (1927); von Poellnitz in Ber. Bot. Dt. Ges. 51: 117 (1933); Fedde Rep. 35: 18 (1934); Podlech in Prodr. Fl. S.W.A. 29: 12 (1967); Wild in Fl. Zamb. 1, 2: 372 (1961), as *T. crispatum*, partly. Type: Grootfontein: Palmenhain, *Dinter* 2357 (SAM, lecto.!).

Plant dioecious, prostrate or decumbent; tubers branching from the top, with white flesh. *Male plants* with branches 25–40 cm long, little branched, papillose to hairy when young, becoming almost glabrous; internodes rarely longer than 1 cm, varying greatly in length on the same branch. *Leaves* narrowly ovate, 1–1.5 (–2) cm long, 4–6 (–8) mm broad, with margins crisped, never revolute; petiole 1–2 (–3) mm long. *Inflorescence* axillary, 2–4 (–5)-flowered. *Peduncle* 2–3 (–5) cm long, thread-like, ending in two keeled bracts with membranous margin. *Pedicel* 1–1.5 cm long, of the central flower with 0 or 1 pair of bracteoles, of the lateral flowers with (1) 2 (3) pairs of bracteoles. *Sepals* 2–4 (–5) mm long, lanceolate, keeled and slightly hooded at the apex, with membranous margin. *Petals* 5, lanceolate, tapering to the base, yellow. *Stamens* 20–30 (–35); filaments broadened towards the base, fused into a ring c. 1 mm high. *Ovary* almost spherical with no ovules developed; style absent; three stigmas c. 1 mm long, stiff erect, not papillose. *Female plants* with branches 20–30 cm long, branched, papillose to hairy when young becoming almost glabrous; internodes rarely longer than 1 cm, varying in length on the same branch. *Leaves* lanceolate, 1.5–2.5 (–3) cm long, 0.6–1 (–1.5) cm broad, with margins crisped, never revolute; petiole 1–3 (–4) mm long. *Inflorescence* axillary, 1–2 (3)-flowered. *Peduncle* 1–1.5 (–2.5 cm long), thread-like, ending in two keeled bracts with membranous margin. *Pedicel* 0.5–1.5 cm long, swollen below the ovary, of lateral flowers with 1 (2) pairs of bracteoles. *Sepals* 3–4 (–5) mm long, ovate, keeled and slightly hooded at the apex, with membranous margin. *Petals* 5, ovate, pointed, sometimes uneven, yellow. *Staminodes*

25–30, fine; filaments broadened towards the base, usually fused into a ring. *Ovary* almost spherical with 10–12 ovules; style absent or less than 1 mm long; stigmas 3, 2 (–3) mm long, papillose-plumose. *Capsule* conical, pointed, 5–6 mm long, 3–4 mm broad shiny yellow. *Seeds* reniform, laterally compressed, 2–2.5 mm long, with fine elongate papillae radiating out from the hilum, dark brown or black. FIG. 1: 3, 3a.

This species is common in sandy soils in and around the Kalahari basin.

CAPE.—Barkly West: Newlands, *Esterhuysen* in NBG 5474 (NBG). Hay: Rietkloof, *Acocks* 8552 (BOL, GRA); Bermolli, *Wilman* s.n. (GRA, KMG). Kuruman: Kuruman, *Esterhuysen* 759; 2436 (BOL); Batharos, *Silk* 228 (KMG); 4 miles south of Olifantshoek, *Tölken & Schlieben* 1190; 1191; Cotton End, *Swan* in KMG 5071 (KMG). Postmasburg: Klipbok, *Repton* 4794. Vryburg: between Armadillo Creek and Vergelegen, *Burt Davy* 11166; Armadillo Creek, *Burt Davy* 11180.

TRANSVAAL.—Potgietersrus: Steilloop, *Tolken* 1126a. Thabazimbi: near Makoppa, *Tölken* 1282; 1283.

SOUTH WEST AFRICA.—Gobabis: Gobabis, *Dinter* in SAM 74148 (SAM); Sandfontein, *Wilman* in SAM 27105 (SAM); Uitsig, *Merxmüller & Giess* 1105; Sturmfeld, *Tölken* 1302. Grootfontein, Palmenhain, *Dinter* 2357 (SAM). Okavango: east of Karakuise, *Maguire* 2065 (NBG); Gautscha Pan, *Maguire* 2133 (NBG). Otjiwarongo: Quickborn, *Bradfield* 361.

I do not agree with Podlech that the author of this species should be “*Dinter ex von Poellnitz*” as the crisped leaves and smaller flowers mentioned in *Dinter*’s diagnosis plus the type cited amount to more than a *nomen nudum* (see Int. Code of Bot. Nomenclature, Article 32, 1966).

Wild (1961) uses the name *T. crispatulatum* consistently, but there seems to be no reason to change the epithet from the originally published version, *T. crispatum*.

5. *T. tenuissimum* *Dinter*, Neue Pl. D.S.W.A. 55 (1914); Fedde Rep. 23: 369 (1927); von Poellnitz in Fedde Rep. 35: 18 (1934); Podlech in Prodr. Fl. S.W.A. 29: 12 (1967), partly, excluding specimens cited. Type: Kalkfontein–Gobabis, *Dinter* 2725 (B, lecto.!; SAM!). *T. transvaalense* von Poellnitz in Fedde Rep. 35: 34 (1934). Type: Transvaal, Sibasa, Baiandbai, *Lang* in TRV 32199. *T. dinteri* von Poellnitz in Fedde Rep. 35: 32 (1934), nomen subnudum. Type: Jakkalskuppe, *Dinter* 4204 (B, holo.!). *T. crispatulatum* sensu Wild in Fl. Zamb. 1, 2: 372 (1961), partly.

Plant semi-erect or decumbent; tubers rarely longer than 5 cm, rarely branched, with reddish-brown flesh. *Branches* glabrous, 15–20 (–30) cm long. *Leaves* linear, 2–4 (–5) cm long, 2–4 mm broad, margins revolute; petiole 1–2 (–3) mm long. *Inflorescence* axillary, 1–2 (3)-flowered. *Peduncle* 0.4–1.5 mm long, thread-like, ending in two keeled bracts with membranous margin. *Pedicel* 1–2.5 cm long, swollen below the ovary, of central and lateral flowers with (0) 1 or 2 pairs of bracteoles often uneven long. *Sepals* 3–4 mm long, keeled and slightly hooded at the apex. *Petals* 5, oblong, obtuse, mucronate, hardly tapering towards the base, yellow. *Stamens* 8–14; filaments slightly broadened towards the base, not fused into a complete ring. *Ovary* almost spherical with 10–12 ovules; style c. 1 mm long, swollen, dividing into three spreading stigmas c. 1 mm long, papillose. *Capsule* conical, pointed or almost beaked, 6–7 mm long, 3–4 mm broad, shiny yellow. *Seeds* reniform to comma-shaped, much laterally compressed, 2–2.5 mm long with fine elongate papillae radiating out from the hilum, dark brown to black.

T. tenuissimum occurs on sandy Kalahari soils in South Africa, but its distribution extends into Mozambique, Rhodesia, Zambia and Tanzania.

CAPE.—Barkly West: Newlands, *Esterhuysen* 760 (BOL). Gordonia: Tweegesigspan, *Liebenberg* 7049. Hay: Tygerkop, *Wilman* in KMG 2347 (KMG). Kimberley: 4.5 miles from Kimberley to Boshof, *Esterhuysen* 763 (BOL). Kuruman: near Kuruman *Esterhuysen* 2437 (BOL).

TRANSVAAL.—Brits: Welgefonden, *Obermeyer* in TRV 34762. Pietersburg: Swerwerskraal, *Irvine* 110; Herre in BOL 27950 (BOL). Sibasa: 28 miles west of Punda Milia, *Lang* in TRV 32199. Soutpansberg: north of Salt Pan, *Schlieben* 9216; *Obermeyer, Schweickerdt & Verdoorn* 193.

SOUTH WEST AFRICA.—Bethanien: Kuibis, *Dinter* 1194 (SAM). Gobabis: Gobabis-Kalkfontein, *Dinter* 2725 (B, SAM); Gobabis-Kehopo, *Dinter* in SAM 74153; Babi-Babi, *Wilman* in SAM 27106a (SAM). Lüderitz: Jakkalskuppe, *Dinter* 4204 (B). Okavandja: Okakeva, *Dinter* 3315 (SAM). Okavango: Kapupahedi Camp on Omuramba Omatako, *De Winter & Marais* 4632; Gautscha Pan, *Maguire* 2195 (NBG). Otjiwarongo: Quickborn, *Bradfield* 320B. Rehoboth: Klein Nauas, *Dinter* 1937 (SAM). Windhoek: Gameros, *Dinter* 2671a (B, SAM).

Wild (1961) includes this species under *T. crispatulatum* and his Tab. 71, A1 depicts a plant of typical *T. tenuissimum*. Although the seeds of the two species are very similar, *T. tenuissimum* has flowers with 8–14 stamens and linear leaves with revolute margins. In cultivation (*Dinter* in SAM 74152), the leaves become slightly broader, but they retain their linear shape. In *T. crispatum* the flowers always produce more than 20 stamens and the narrowly ovate leaves have crisped, never revolute margins.

T. dinteri von Poellnitz, a *nomen subnudum* based on *Dinter* 4204, is very similar to *T. tenuissimum* in that it produces linear leaves, more than one flower per peduncle, c. 12 stamens and 10 ovules. Unusual for *T. tenuissimum* is, however, the single pair of bracteoles on the pedicel, but this character is apparently variable as the absence of additional pairs of bracteoles can also be observed in the specimen *Dinter* 1794 (SAM), a specimen apparently growing under similar unfavourable conditions. This latter specimen, collected on sand dunes in the Bethanien district, provides a link between the distribution as well as the morphology of *Dinter* 4204 and the Kalahari population of *T. tenuissimum*.

The specimen *Pearson* 4162 (K!) collected at Jakkalskuppe confirms the identification of this plant as *T. tenuissimum* as it bears the typical seeds. This specimen is inscribed *T. lissospermum* C. A. Smith MS.

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