3. *Tradescantia zebrina* Heynh. ex Bosse

In: *Vollst. Handb. Bl.-gartn.*, ed. 2, 4: 655 (1849).

=*Zebrina flocculosa* G.Brückn.
=*Zebrina pendula* Schnizlein
=*Zebrina purpusii* G.Brückn.

Common names: wandering jew (English); wandelende jood (Afrikaans).

Perennial herb with decumbent or prostrate, slender, leafy stems rooting at nodes, often forming dense mats or colonies. **Leaves** distichous, sessile; blade lanceolate-elliptic to ovate-elliptic, 3–10 × 1.5–3.2 cm, fleshy, base oblique, cuneate, apex acute to acuminate, adaxially variegated, silver/white-striped green, occasionally with additional dark red stripes, abaxially reddish purple, glabrous or sparsely pilose on both surfaces, leaf sheath 8–12 × 5–8 mm, membranous, long-ciliate at mouth (distal leaf blades wider or narrower than sheaths when sheaths opened, flattened). **Inflorescence** terminal, consisting of pairs of sessile cymes enclosed in sheaths of spathaceous bracts, pedunculate; spathaceous bracts foliaceous, reduced, ciliate. **Flowers** subsessile. **Sepals** lanceolate to oblong-lanceolate, basally connate, 4–8 × 1.5 mm, hyaline. **Petals** clawed, claws basally connate forming slender white tube to 10 × 1.3 mm, lobes free, ovate, apex obtuse, 5–10 × 3–7 mm, pink. **Stamens** 6; filaments epipetalous, white, bearded below. **Fruit** a capsule, 3-locular, locules 2-seeded. **Seed** rugulose. **Distribution**: SA. (Fig. 263).

References: Faden (2010), Hong & DeFilipps (2010).

This species belongs to section *Zebrina*, which is represented in southern Africa by only this species. Although *Tradescantia zebrina* has been reported by some authors (e.g. Hunt, 2001) to not definitely be known in the wild state, it has more recently (Faden, 2008) been described as widespread and common in its native range within Mexico.

Fig. 263. Distribution map of *Tradescantia zebrina* Heynh. ex Bosse.

The flowers (Fig. 264) appear at irregular intervals throughout the year. With its prominently striped leaves (Fig. 265) and mat-forming habit (Fig. 266) it is unlikely that this species could be confused with any indigenous species. This species has naturalised in many warm countries—including China and Taiwan (Hong & DeFilipps, 2010)—on account of it being cultivated for its decorative leaves (Hunt, 2001). Several clones are cultivated, including 'Purpusii' with unstriped dark-red or red-green leaves and 'Quadricolor' with leaves metallic-green, striped with red, green and white (Bailey & Bailey, 1976; Hunt, 1984).

Fig. 264. Flowers of *Tradescantia zebrina* Heynh. ex Bosse. (Picture by Geoff R. Nichols)

Fig. 265. Leaves of *Tradescantia zebrina* Heynh. ex Bosse are striped.
(Picture by Neil R. Crouch)

Fig. 266. *Tradescantia zebrina* Heynh. ex Bosse invasion.
(Picture by Neil R. Crouch)

CRASSULACEAE J.St.-Hil.

(Stonecrop, Orpine or Houseleek family; *Plakkiefamilie*)

by

M. Walters

Perennial (rarely annual or biennial) herbs, subshrubs or shrubs (rarely aquatics, or tree-like, or epiphytic, or scandent), always with more or less fleshy leaves, sometimes with succulent stems, rhizomes, underground caudices or succulent roots. **Leaves** opposite and decussate or alternate and whorled, often arranged into rosettes, usually sessile/ subsessile rarely petiolate, simple (pinnate in *Bryophyllum*), usually entire, or crenate, rarely lobed or imparipinnate, glabrous or covered in hairs, papillae, bristles or wax; stipules absent. **Inflorescence** usually a many-flowered axillary or terminal cyme, corymb, or rarely true spike, raceme or panicle. **Flowers** bisexual or unisexual (then plants dioecious or rarely gynodioecious), actinomorphic (except *Tylecodon grandiflorus*), 3- to 32-merous (though often 5-merous). **Sepals** free or basally connate, persistent. **Petals** free or basally connate to form a short to long corolla tube. **Stamens** as many (in 1 series) or twice as many (in 2 series) as petals, free or fused to the petals; anthers 2-locular, basifixed, longitudinally and laterally dehiscent. **Ovary** superior or semi-inferior; carpels equal in number to petals, free or slightly fused basally, with a small to conspicuous nectary scale at or near the base; styles gradually tapering, short or elongated; ovules few to many. **Fruit** usually a dehiscent group of follicles, capsular. **Seeds** small, 1–20+ per carpel, elongate, up to 1.5–3 mm long, smooth, papillate to longitudinally ridged, mostly brownish, with little or no endosperm.

References: Eggli (2003), Heywood *et al.* (2007), Thiede & Eggli (2007), Moran (2009).

There are c. 1 500 species from c. 35 genera (Heywood *et al*., 2007) in Crassulaceae making it the third largest succulent plant family (after *Aizoaceae* Martynov. and *Cactaceae* Juss.; orchids excluded). Seven of these genera occur in southern Africa i.e. *Aeonium* Webb & Berthel., *Adromischus* Lem.*, Bryophyllum* Salisb.*, Cotyledon* L.*, Crassula* L.*, Kalanchoe* Adans. and *Tylecodon* Tölken. Of these, *Adromischus* and *Tylecodon* are endemic to the region, while *Bryophyllum* and *Aeonium* are entirely exotic genera. The Crassulaceae are distributed worldwide but have centres of endemism in South Africa, Madagascar, East Asia, Mexico and Macaronesia, while being poorly represented in the wet tropics, Australia and South America (Thiede & Eggli, 2007; Heywood *et al*., 2007).

There is still some uncertainty around the generic boundaries in this family. The family was traditionally divided into six subfamilies, a division long recognised as unnatural, but more recent work resulted in a division into only three subfamilies i.e. Crassuloideae Burnett [*Crassula* (including *Tillaea* L., *Rochea* DC., *Dinacria* Harv. & Sond. and *Pagella* Schönland) and *Hypagophytum* A.Berger], Kalanchoideae A.Berger (*Adromischus, Bryophyllum, Cotyledon, Kalanchoe* and

Tylecodon) and Sempervivoideae Arnott (all remaining genera) (Thiede & Eggli, 2007; Takhtajan, 2009).

Most members of the Crassulaceae prefer warm, dry regions and are frequently found in arid and/or rocky habitats. The most notable exceptions are the adaptation to aquatic environments some species display, and the adaptation to frosty conditions of others (Heywood *et al*., 2007).

Many species in the Crassulaceae are popular in the horticultural trade. The plants are frequently hardy and thus make good garden subjects. One species, *Hylotelephium spectabile* (Boreau) H.Ohba, is sometimes grown commercially for its flowers (Eggli, 2003). Plants of this family are extremely popular with succulent plant collectors and are well-known for their ability to grow easily from cuttings or even from single leaves, which has undoubtedly facilitated the movement of some species to gardens, window-boxes and pots throughout the world.

Many members of the Crassulaceae are eaten and/or used medicinally in many parts of the world (Plants for a Future, 2008; Arnold *et al*., 2002). Locally, however, they are used largely as medicinal plants. In southern Africa the genus *Crassula* is the largest and accordingly contains more medicinal species than the other genera. *Cotyledon orbiculata* L., however, is arguably the best known and most popular species for medicinal use in the region, where it is, for instance, frequently used for treating a number of skin conditions (like warts and boils).

Four species from two genera [*Aeonium* (1) and *Bryophyllum* (3)] are naturalised in southern Africa with a further four species having potential as garden escapes.

Key to the genera of Crassulaceae occurring in southern Africa [adapted from Dreyer and Makwarela (2000)]:

1. Stamens equal in number to petals . . . . . **(*Crassula*)**
1'. Stamens at least twice as many as petals **2**

2. Petals numbering 4 or 5 . . . . . **3**
2'. Petals numbering 6 or more . . . . . ***Aeonium***

3. Leaves opposite (rarely whorled) **4**
3'. Leaves spirally arranged **5**

4. Flowers 5-merous . . . . . **(*Cotyledon*)**
4'. Flowers 4-merous **6**

5. Leaves persistent; inflorescence a spike-like thyrse, rarely branched. . . . . **(*Adromischus*)**
5'. Leaves caducous; inflorescence a single-flowered to branched thyrse . . . . . **(*Tylecodon*)**

6. Flowers pendulous . . . . . ***Bryophyllum***
6'. Flowers erect . . . . . ***Kalanchoe***

Aeonium Webb & Berthel.

Biennial or mostly perennial shrubs, subshrubs or herbs**,** glabrous or pubescent. **Stems** ascending, simple or densely- to few-branched, woody or fleshy, often with distinct leaf scars. **Leaves** persistent, often in rosettes at ends of branches, spirally arranged, simple, sessile; blade obovate or obovate-spathulate, sometimes ovate, elliptic or trullate, 3–15 cm long, base broad, cuneate rarely attenuate, apex acute, acuminate or rounded, margins ciliate to pectinate, fleshy to succulent, green or yellowish green, sometimes pinkish or reddish variegated, veins not conspicuous. **Inflorescence** a terminal cyme, often semiglobose, ovoid or conical, with distinct, often densely leafy peduncle; pedicels 1–16 mm long, glabrous, puberulent or pubescent. **Flowers** erect or spreading, (6–)7- to 12-(–16) or 18- to 32-merous. **Sepals** fleshy, connate basally, equal, glabrous or pubescent. **Petals** free, spreading or somewhat recurved, distinct or nearly so, apex acute or acuminate, cream to deep yellow or whitish and then often reddish variegated. **Stamens** twice as many as petals; filaments adnate on corolla base, glabrous or puberulent. **Ovary** with rounded base; pistils erect; carpels as many as petals. Nectary scales small, mostly square or rectangular, or sometimes absent. **Fruit** many-seeded erect follicles. **Seed** ellipsoid, ribbed, brownish.

References: Thulin (1993), Nyffeler (2003), Moran (2009).

The genus *Aeonium* is indigenous to Macaronesia (Canary Islands, Cape Verde Islands and Madeira), southwestern Morocco, East Africa (Ethiopia, Somalia, Kenya, Tanzania and Uganda) and Yemen (Nyffeler, 2003). It comprises c. 39 species with centres of endemism in the Canary Islands and Madeira (Thulin, 1993).

Species of this genus are popular with succulent enthusiasts and have found their way into the horticultural trade. Some species, like *Aeonium glandulosum* Webb & Berthel. and *A. glutinosum* (Aiton) Webb & Berthel., are used medicinally within their natural distribution range (Rivera & Obón, 1995) but no uses for southern Africa have been recorded.

The genus name is derived from the Greek word ‘aionion’ meaning everliving plant (Nyffeler, 2003).

Aeonium arboreum (L.) Webb & Berthel.

In: *Histoire Naturelle des Îles Canaries* 3(2,1): 185 (1836).

Common name: tree aeonium (English).

Perennial subshrubs, rather open, up to 2 m high; stems branched, erect or ascending, 1–4 cm in diameter, fleshy; bark smooth. **Leaves** arranged in dense rosettes of 50–75-leaves 1–2.5 cm in diameter but smaller in the dry season, concave or flattish with young leaves tightly adpressed to each other, 5–15 × 1–4.5 cm, 1.5–3 mm thick; blade obovate to oblanceolate, apex acuminate, base cuneate, bright green often purplish variegated, shiny, glabrate, marginal cilia curved. **Inflorescence** a dense cyme, ovoid, 10–25 × 10–15 cm; peduncle up

to 20 cm long; pedicels puberulent. **Flowers** 9- to 11-merous, 2 cm in diameter. **Sepals** pubescent. **Petals** spreading, oblong to lanceolate, apex acuminate, 5–7 × 1.5–2 mm, bright yellow. **Filaments** glabrous. **Distribution**: SA. (Fig. 267).

References: Nyffeler (2003), Moran (2009).

Aeonium arboreum (Fig. 268) comprises three varieties. Material found naturalised in Kommetjie and Paternoster near Cape Town, in the Western Cape Province of South Africa (E. van Jaarsveld & U. Eggli, *pers. comm*.), belong to the typical variety, which can be distinguished from var. *holochrysum* H.Y.Liu and var. *rubrolineatum* (Sventenius) H.Y.Liu on pubescent pedicels and sepals (Nyffeler, 2003). Var. *arboreum* is native to Gran Canaria (Canary Islands) where it grows at altitudes of 200–1 200 m (Nyffeler, 2003), while on the Californian coast, where it is also naturalised, it grows at altitudes of 0–100 m (Moran, 2009). It is also naturalised in southern Europe and northern Africa, along the Mediterranean coast and in Australia (Forster, 1996; Moran, 2009).

The tree aeonium is of commercial value in the horticultural trade with several cultivars common in cultivation (Nyffeler 2003), some having beautiful variegated or dark purple-black foliage.

Fig. 267. Distribution map of *Aeonium arboreum* (L.) Webb & Berthel.

Fig. 268. The black-leaved form of *Aeonium arboreum* (L.) Webb & Berthel., known as 'Swartkop', is widely cultivated in South Africa, but it is the regular, green-leaved one that has become naturalised in South Africa. (Picture by Gideon F. Smith)

Bryophyllum Salisb.

Biennial or perennial succulent herbs (rarely subshrubs or shrubs or liana-like), sometimes suckering at the base; roots fibrous. **Stems** usually erect, succulent. **Leaves** persistent, usually opposite and decussate (rarely 3-whorled), simple and unlobed or lobed to pinnatifid, petiolate or rarely sessile, basally subclasping, usually flat but sometimes terete; blade obovate or triangular to lanceolate or elliptic-oblong, fleshy-succulent, sometimes with bulbils along the margins or apices, 2–50 cm long. **Inflorescence** a terminal cyme, lax to dense, sometimes with bulbils. **Flowers** 4-merous, large, numerous, usually pendent, pedicellate, bisexual, mostly brightly coloured. **Calyx** cylindrical to campanulate, sometimes basally dilated, persistent, accrescent in fruit. **Corolla** gamopetalous; tube tubular to urceolate, more or less distinctly 4-angled; lobes ovate, semi-circular or triangular, spreading or reflexed, usually shorter than the corolla tube, orange, yellow-green marked with lavender, pale yellow flecked with red, orange-red, scarlet, pink, lavender, yellow-green flecked with violet-red, or greenish white with maroon distally, corolla throat frequently basally constricted against pistils. **Stamens** 8 in 2 whorls, inserted at the base or below the middle of the corolla-tube; filaments more or less exserted. **Carpels** erect, free; style 2–4 times the length of the ovary. Nectary scales 4, free, suborbicular, quadrate or linear. **Fruit** consisting of erect follicles. **Seeds** many, ellipsoid, usually grooved, ridged or rugulose, small.

References: Fernandes (1983), Wickens (1987), Fu & Ohba (2001), Descoings (2003), Moran (2009).

The genus *Bryophyllum* is included in the subfamily Kalanchoideae of the Crassulaceae which contains c. 230 species. It is also sometimes included in the genus *Kalanchoe*, which then consists of the section *Bryophyllum* along with sections *Kalanchoe* and *Kitchingia* (Descoings, 2003; Thiede & Eggli, 2007). For the purposes of this book, we follow the classification of Berger (1930) and treat it as a separate genus. It consists of of c. 25 species that are endemic to Madagascar (Rauh, 1995; Descoings, 2003). Some species are widely naturalised elsewhere (e.g. Australia, Africa, Central and South America, China).

Species of the genus *Bryophyllum* are known for their ease of cultivation and can be easily grown from stem cuttings or rooted leaves (Descoings, 2003). Some species produce bulbils or plantlets on the margins or apices of their leaves, or on their inflorescences. This interesting reproductive trait has undoubtedly contributed to their popularity as garden plants. Some species are garden escapes in many parts of the world with a few becoming aggressive invaders, undoubtedly as a result of their ease of reproduction and propagation. The name *Bryophyllum* comes from the Greek words for ‘sprout’ and ‘leaf’ i.e. leaf-sprouter, which is certainly very apt (Gledhill, 2008).

Key to the 3 naturalised and 3 potential garden escapes from the genus *Bryophyllum* [adapted from Staples *et al*. (2002)]:

1. Leaves (at least lower ones) cylindrical or pencil-like, apex flaring, petiole absent or not distinct from blade. . . . . **1. *Bryophyllum delagoense* (=*B. tubiflorum*)**

1'. Leaves with a broad blade set off from narrower petiole **2**

2. All (or at least some) leaves compound **3**

2'. All leaves simple **4**

3. First leaves simple, rest mostly pinnate to 3- to 5-foliate, streaked with purple, with orange-red margins, leaflets petiolulate, cuneate to truncate at the base . . . . . **2. *Bryophyllum pinnatum***

3'. Leaves pinnatisect or pinnate, margins often purple, leaflets sessile on rachis or almost so, asymmetrical and decurrent at the base . . . . . **3. *Bryophyllum proliferum***

4. Leaves small, up to 5 cm long, blade broadest at or above middle, apex rounded . . . . . **5. *Bryophyllum fedtschenkoi***

4'. Leaves medium to large, 5–50 cm long, blade broadest near base, apex acute **5**

5. Leaves large, 13–50 cm long, brownish-green markings on both surfaces, crowded near base, with sinuate to coarsely crenate margins. . . . . **6. *Bryophyllum gastonis-bonnieri***

5'. Leaves medium sized, 5–25 cm long, purple-blotched on lower surface, evenly spaced, with serrate margins . . . . . **4. *Bryophyllum daigremontianum***

1. *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz

In: *Mémoires de l'Herbier Boissier* 10: 38 (1900).

=*Bryophyllum tubiflorum* Harv.
=*Bryophyllum verticillatum* (Scott-Elliot) A.Berger
=*Geaya purpurea Costantin* & Poisson
=*Kalanchoe delagoensis* Eckl. & Zeyh.
=*Kalanchoe tubiflora* (Harv.) Raym.-Hamet, nom. illeg.
=*Kalanchoe verticillata* Scott-Elliot

Common names: chandelier plant, mother of millions, pregnant plant (English); kandelaarplant (Afrikaans); indunjane (Zulu).

Biennial or semi-perennial herbs, monocarpic, pale green with violet-brown markings, glaucous, often forming dense stands; stems erect (sometimes procumbent), unbranched, terete, 0.2–1.2 m tall, sometimes suckering from the base**. Leaves** ternate or alternate in adult plant, opposite on young shoots, evenly spaced, simple, ± caducous when flowering, seemingly sessile; blade narrowly oblong, subcylindric with adaxial groove, erect to nearly horizontally spreading, with 2–9 small conical teeth at apex frequently with bulbils borne in their axils, 3–15 cm × 3–6 mm, reddish green to gray-green with dark green or reddish brown

spots, surfaces not glaucous. **Inflorescence** a terminal, rounded thyrse, with densely clustered dichasia, up to 20 cm in diameter with long peduncles; pedicels 5–30 mm long. **Flowers** pendulous, conspicuous. **Calyx** campanulate, 8–16 mm long, reddish to green striped with red; tube 3–6 mm long; lobes triangular-lanceolate, apex acute, 5–10 × 3.7–5.7 mm. **Corolla** much exceeding the calyx, 2.2–4 cm long, pale orange to deep purpulish red; tube funnel-shaped, constricted just above the carpels and widening in middle and at throat; lobes oblong-obovate, obtuse or truncate, apiculate, spreading, 7–12 × 6–9 mm. **Stamens** included, inserted below the middle of the corolla tube; anthers broadly ovate, 2–2.5 mm long. **Carpels** ovate-oblong, 5.5–6.5 mm long, fused for c. 1.6 mm; styles up to 2 cm long. Nectary scales semicircular to trapeziform, tip rounded, 0.7–2 × 0.8–1.4 mm. **Seed** obovoid, 0.6–2.5 mm long. **Distribution**: B, L, N, S, SA. (Fig. 269).

References: Fernandes (1983), Tölken (1985), Rauh (1998), Descoings (2003), Moran (2009).

Bryophyllum delagoense (Fig. 270, 271) is endemic to Madagascar, occurring mainly in the central and southern regions, where it is commonly found in open wooded grasslands, rocky slopes, and on sandy or rocky ground (Descoings, 2003). It is naturalised in many countries with warmer climates possibly including every country in southern Africa and also in southern Europe, Africa, Asia, Australia, New Zealand, southern USA and Hawaii, West Indies, northern South America and Macaronesia (PIER, 2010). In Brazil it is sometimes even pollinated by hummingbirds despite being exotic and regarded as non-ornithophilous (Mendonça and Anjos 2005). In South Africa, where it was introduced as a garden ornamental (Wells 1986) around 1765 (Witt *et al*., 2004; Witt & Nongogo, 2010), it is naturalised in all 9 provinces (Fig. 272).

The plant is poisonous to both humans and livestock (Henderson, 2001; Kellerman *et al*., 2005). In Australia *Bryophyllum delagoense* has been reported to cause stock losses and was found to effect myocardial degeneration (McKenzie & Dunster, 1986). Further investigation showed the cardiac glycosides (bufadienolides) responsible to be bryotoxins, also present in four other naturalised *Bryophyllum* species (McKenzie *et al*., 1987; Steyn & Van Heerden, 1998). Despite its reported toxicity to livestock, no stock losses by *B. delagoense* have been reported in South Africa.

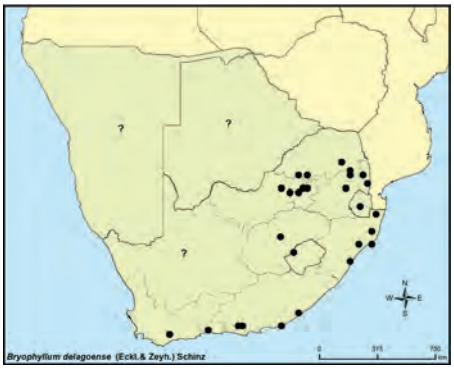

Fig. 269. Distribution map of *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz.

Fig. 270. *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz.
(Picture by Neil R. Crouch)

Fig. 271. Flowers of *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz.
(Picture by Neil R. Crouch)

Bryophyllum delagoense is traded in South Africa (Von Ahlefeld *et al*., 2003) as a protective charm as it is a species that is 'hard to kill', with obvious reference to its drought tolerance. Many Crassulaceae, both indigenous and exotic, are cultivated around homesteads, including this species, to confer protection, e.g. from lightning, disease or evil spirits, on the inhabitants (N.R. Crouch, *pers. comm.*, October 2010).

Bryophyllum delagoense grows very easily and reproduces by means of seed, basal suckers and abundantly produced leaf bulbils (Fig. 273) thus facilitating its spread to new areas. Severed leaves and bulbils root very easily and it is often found spreading from sites where garden waste is dumped.

In South Africa this species is a declared weed (Henderson, 2001) which means it is prohibited and must be controlled. For areas of small infestations simply pulling the plants up by hand will be sufficient, but care has to be taken not to dislodge the bulbils or leave any parts behind as it will simply resprout. It is best to burn unwanted material to prevent further spread. In a recent study Witt and Nongogo (2010) found that high intensity and low intensity fires were respectively found to kill 89 and 45% of plants. Plants may grow tall with a tree-like habit. Taller plants and those growing in dense stands were more likely to escape destruction. They speculate that fire has prevented this species from becoming a major weed in South Africa as it is in Australia, where fires have a lower frequency and intensity.

Bryophyllum delagoense is a potential target for biological control. Two species of stem-boring weevils (*Alcidodes sedi* and *Osphilia tenuipes*) were recently identified as candidate biocontrol agents (Witt, 2004; Witt *et al*., 2004). These weevils are, however, not host-specific and can complete their development on other Crassulaceae species in the region. They can also complete their life cycle on commercially grown *Kalanchoe blossfeldiana* Poelln., thus constituting a possible threat to horticultural businesses. It may be considered an option for use in Australia as there are very few indigenous Crassulaceae species that could serve as alternative hosts (Witt, 2004). Further studies are required to determine whether the weevils are safe for release in southern Africa.

Plants may be distinguished from other similar species in the region by their terete leaves (Fig. 274) measuring no more than 6 mm in width. The other *Bryophyllum* species have flatter and broader leaves, which are sometimes pinnately lobed with three or more 'leaflets'. The plants cannot be confused with any indigenous species.

Fig. 272. *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz invasion. (Picture by Neil R. Crouch)

Fig. 273. Bulbils are produced at the apex of leaves of *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz. (Picture by Neil R. Crouch)

Fig. 274. Leaves of *Bryophyllum delagoense* (Eckl. & Zeyh.) Schinz are tubular. (Picture by Geoff R. Nichols)

2. *Bryophyllum pinnatum* (Lam.) Oken

In: *Allgemeine Naturgeschichte* 3(3): 1966 (1841).

=*Bryophyllum calycinum* Salisb.
=*Cotyledon pinnata* Lam.
=*Kalanchoe pinnata* (Lam.) Pers.
=*Verea pinnata* (Lam.) Spreng.

Common names: air plant, Canterbury bells, cathedral bells, curtain plant, floppers, Goethe Plant, good luck leaf, Hawaiian air leaf, leaf of life, life plant, Mexican love plant, miracle leaf, miracle plant, monkey ears, monkey's ear, mother-in-law, mother-of-thousands, never die, resurrection plant, sprout leaf plant, sprouting leaf, tree of life (English).

Perennials, completely glabrous, succulent, monocarpic; stems up to 2 m tall, stout, nearly woody below, erect or ascending, terete, simple or little branched, with red stripes or spots. **Leaves** decussate, scattered, petiolate, first leaves simple, the rest mostly pinnate to 3- to 5-foliate, sometimes some or all reduced to terminal leaflet, leathery-fleshy, green, streaked with purple, edged with orange-red; petiole subterete, amplexicaul, broadened towards the base, 2.5–10 cm long; blade of simple leaf ovate to oblong, up to 10 × 5 cm, apex obtuse, base cuneate to truncate, margins broadly crenate, doubly crenate or crenate-dentate, with bulbils produced in the notches of leaf margins; compound leaf leaflets ± as the simple leaves or

oblong-circular, 6–20 × 4–12 cm, terminal leaflet the largest. **Inflorescence** a lax paniculate cyme, 1–8 dm in diameter with branches up to 12 cm; pedicels 1–2.5 cm long. **Flowers** pendulous. **Calyx** campanulate, inflated, thinly succulent /herbaceous at anthesis, becoming papery, pale yellow to green with red to violet lines; tube 2–4 cm long; lobes ovate-triangular, apex acute-acuminate, 7–11 mm long. **Corolla** ± cylindrical, tube greenish white where hidden by the calyx, the rest red or maroon to greenish-reddish; tube basally contracted, 2.5–4 cm, sometimes somewhat glandular-pubescent; lobes oblong-ovate to triangular, apex acute-acuminate, 9–14 × 4–6.5 mm. **Stamens** inserted below the middle of the corolla tube, mostly included; anthers ovate, 2.5–3 × 1.6–2.2 mm. **Carpels** ovoid, 1.2–1.4 cm long, basally connate; style up to 3 cm long. Nectary scales ± rectangular, 1.8–2.6 × 1.4–1.8 mm, apex obtuse or emarginate. **Seed** obovate, obtuse, c. 0.8 mm long. **Distribution**: S, SA. (Fig. 275).

References: Descoings (2003), Moran (2009).

Bryophyllum pinnatum is endemic to Madagascar but is naturalised in many regions of the world (with the exception of temperate and temperate-cold regions as it does not stand frost) e.g. southern Europe, Africa, Asia, Australia, North, Central and South America, and many islands (GBIF, 2010; PIER, 2010).

This species is the best-known in the genus (Descoings, 2003). It has large light green leaves with marginal indentations (Fig. 276) and flowers are lantern-shaped, pale yellow to green with red to violet lines that turn denser as they mature (Fig. 277, 278). It is widely grown as an ornamental and medicinal plant. No medicinal uses have been recorded for southern Africa but it is used extensively elsewhere, for instance, further north in Africa (Githens, 1949; Burkill, 1985a; Oliver-Bever, 1986; Neuwinger, 2000), Brazil (Muzitano *et al*., 2006) and the West Indies and India (Ayensu, 1981; Oliver-Bever, 1986). Conditions treated vary widely and include skin conditions (e.g. abscesses, ulcers and inflammation), deafness, snoring, epilepsy, whooping cough and it even features in an incantation for the acquisition of money (Burkill, 1985a; Oliver-Bever, 1986; Neuwinger, 2000).

Bryophyllum pinnatum is a garden escape and has naturalised in coastal KwaZulu-Natal, South Africa (Fig. 279), where it is a proposed category 1 plant and no new planting, trade or propagation is permitted (ARC-PPRI, 2007).

Fig. 275. Distribution map of *Bryophyllum pinnatum* (Lam.) Oken.

Fig. 276. Leaves of *Bryophyllum pinnatum* (Lam.) Oken have indentations.
(Picture by Geoff R. Nichols)

Fig. 277. Lighter flowers of *Bryophyllum pinnatum* (Lam.) Oken.
(Picture by Neil R. Crouch)

Fig. 278. Darker flowers of *Bryophyllum pinnatum* (Lam.) Oken.
(Picture by Neil R. Crouch)

Fig. 279. *Bryophyllum pinnatum* (Lam.) Oken invasion. (Picture by Helmuth G. Zimmermann)

3. *Bryophyllum proliferum* Bowie ex Hook.

In: *Botanical Magazine* t. 5147 (1859).

=*Bryophyllum rubellum* Baker
=*Kalanchoe prolifera* (Bowie ex Hook.) Raym.-Hamet

Common names: blooming boxes, green mother of millions (English).

Succulent perennials, stout, up to 3 m tall, glabrous; stems robust, up to 5 cm in diameter, erect to procumbent, ± 4-angled, simple, almost woody below, with basal offsets. **Leaves** decussate, petiolate, pinnatisect or pinnate (rarely undivided), up to 30 cm long, fleshy, green; petiole broadened at the base, amplexicaul, up to 16 cm long; segments or leaflets asymmetrical and decurrent at the base, oblong, lanceolate to ovate-elongate, 7–15 × 1.5–5 cm, apex obtuse, margins crenate to dentate, often purple. **Inflorescence** a very large compound panicle, 40–80 × 20–40 cm, frequently with numerous aborted flowers and bulbils; pedicels thin, 8–15 mm long, densely papillose. **Flowers** pendulous. **Calyx** inflated, campanulate, 4-angled, green, papillose; tube 13–16 mm long; lobes semi-orbicular, acuminate-cuspidate, 3–4 × 5–7 mm. **Corolla** tubular, green where hidden by calyx, the rest red; tube constricted above carpels, suburceolate above constriction, 1.5–2.5 cm, greenish yellow; lobes subovate, acuminate-cuspidate, 2.7–4 × 3–4 mm. **Stamens**

inserted below the middle of the corolla tube, exserted; anthers ovate, 2–2.6 × 1.3–1.4 mm. **Carpels** basally connate, 7–8 mm long; styles 1.7–2 cm long, exserted. Nectary scales orbicular to trapeziform, 1.3–1.6 × 2–2.5 mm. **Fruit** not seen. **Distribution**: SA. (Fig. 280)

Reference: Descoings (2003).

Bryophyllum proliferum is one of the largest plants (Fig. 281) in the genus and native to Madagascar where it grows on the Central Plateau (Rauh 1995). It is cultivated as an ornamental (Wells 1986) probably for its pretty box-like flowers (Fig. 282), pinnatisect or pinnate leaves (Fig. 283) and the tendency to produce a proliferation of bulbils on the inflorescence (Fig. 284). It has become widely naturalised in numerous countries, including throughout the tropics, as a garden escape (Fernandes 1983; Rauh 1995).

Green mother of millions is used medicinally in Madagascar for treatment of local abscesses and rheumatism (Githens 1949). No medicinal use has been recorded for southern Africa (Watt and Breyer-Brandwijk 1962), but the plant is grown around rural homesteads (Fig. 285) as an intelezi plant i.e. protecting the inhabitants from any harm.

In South Africa it is a proposed category 1 plant and no new planting, trade or propagation is permitted (ARC-PPRI 2007). These plants establish easily from discarded material and it is preferable to burn or bury any unwanted plants.

Fig. 280. Distribution map of *Bryophyllum proliferum* Bowie ex Hook.

Fig. 281. *Bryophyllum proliferum* Bowie ex Hook. (Picture by Neil R. Crouch)

Fig. 282. Flowers of *Bryophyllum proliferum* Bowie ex Hook. (Picture by Neil R. Crouch)

Fig. 283. Leaves of *Bryophyllum proliferum* Bowie ex Hook. (Picture by Neil R. Crouch)

Fig. 284. Inflorescence of *Bryophyllum proliferum* Bowie ex Hook. produces bulbils. (Picture by Neil R. Crouch)

Fig. 285. *Bryophyllum proliferum* Bowie ex Hook. grown around rural homestead. (Picture by Neil R. Crouch)

Species of Crassulaceae to keep an eye on:

The following three species of *Bryophyllum* and one *Kalanchoe* are present and cultivated ornamentally in southern Africa. All of them have become invasive elsewhere, outside of their natural distribution ranges, and are included here as species to watch for future signs of potential naturalisation.

4. *Bryophyllum daigremontianum* (Raym.-Hamet & H.Perrier) A.Berger

In: *Die natürlichen Pflanzenfamilien*, Zweite Auflage 18a: 412. (1930).

=*Kalanchoe daigremontiana* Raym.-Hamet & H.Perrier

Common names: alligator plant, devil's backbone, maternity plant (English).

Perennial, glabrous, monocarpic herbs, with purple blotches; stems stout, mostly unbranched, erect or decumbent, terete, 5–25 dm × 0.5–2 cm. **Leaves** opposite, evenly spaced, succulent, simple, larger leaves subpeltate; petiole subterete, 1–5 cm long; blade triangular to oblong-lanceolate, 5–25 × 3–12 cm, margins serrate, apex acute, purple-blotched on lower surface, surfaces glaucous, with bulbils produced in the notches of leaf margins. **Inflorescence** a lax paniculate cyme, branches up to 15 cm long; pedicels 5–15 mm. **Flowers** pendulous or spreading, 4-merous, large, bisexual. **Calyx** not inflated, gamosepalous, 6–10 mm long, green or purplish; tube 3–4 mm; lobes triangular, acute, 3–7 × 2–4 mm, glabrous. **Corolla** campanulate, 20–30 mm long, pinkish to reddish or purple; lobes obovate, acute, 6–8 × 3.5–4.5 mm. **Stamens** inserted below the middle of corolla-tube, upper parts exserted. **Carpels** 4; ovules numerous per locule; style 11–14 mm long. Nectary scales rectangular, c. 0.6 × 1 mm. **Seed** oblong, longitudinally ridged, 0.6–1 × 0.2–0.3 mm.

References: Sarwar (2002), Descoings (2003), Moran (2009).

Bryophyllum daigremontianum (Fig. 286) is native to Madagascar, but a declared noxious weed in Australia (PlantNET, 2010) and an aggressive weed in parts of the USA (Moran, 2009). It has serrate leaves, that are purple-blotched on the lower surface (Fig. 287). It has been reported naturalised in other regions like parts of tropical and subtropical Africa and Asia. In Australia the hybrid between *Bryophyllum daigremontianum* and *B. delagoense*, known as *Bryophyllum* ×*houghtonii* (D.B.Ward) P.I.Forst., is widely naturalised in the Queensland and New South Wales regions (Moran, 2009; PlantNET, 2010).

Fig. 286. *Bryophyllum daigremontianum* (Raym.-Hamet & H.Perrier) A.Berger.
(Picture by Neil R. Crouch)

Fig. 287. Leaves of *Bryophyllum daigremontianum* (Raym.-Hamet & H.Perrier) A.Berger. (Picture by Neil R. Crouch)

5. *Bryophyllum fedtschenkoi* (Raym.-Hamet & H.Perrier) Lauz.-March.

In: *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences* 278: 2508 (1974).

=*Kalanchoe fedtschenkoi* Raym.-Hamet & H.Perrier

Common names: kalanchoe stonecrop, lavender-scallops (English).

Perennial, tuft-forming herbs, up to 50 cm tall, gray-green to green to purple, glabrous, sometimes glaucous; stems thin, branched, erect to prostrate, often creeping and rooting, terete, up to 80 × 1 cm, frequently purple. **Leaves** opposite, evenly spaced, densely arranged, succulent, simple; petiole short, 1–6 mm long; blade obovate-subcircular, obovate or obovate-oblong, 1–5 × 0.5–2.5 cm, base cuneate, apex rounded to obtuse, margins crenate throughout or only in upper half, often red-purple, with a purplish waxy bloom, with bulbils sometimes produced in the notches of leaf margins, mostly of fallen or damaged leaves. **Inflorescence** a lax paniculate corymb, up to 20 cm in diameter, with branches up to 5 cm long; pedicels 7–10 mm long. **Flowers** pendulous, 4-merous. **Calyx** yellow-green with red to blue or violet flecks; tube 12–14 mm long; lobes deltoid, 4–7 × 6–6.5 mm,

apex acute. **Corolla** subtubular to subcampanulate, basally contracted, orange-red with red streaks; tube 17–19 mm long; lobes obovate, obtuse to rounded, 5–8 × 4.2–4.6 mm. **Stamens** inserted below the middle of corolla-tube, upper parts exserted; anthers subreniform, c. 1 mm long. **Carpels** 9–10 mm long; styles 13–15 mm. Nectary scales semi-orbicular, c. 0.8 × 1 mm. **Seed** obovate, c. 0.6 mm long.

References: Descoings (2003), Moran (2009).

Lavender scallops (Fig. 288, 289) is endemic to Central and southeastern Madagascar where it grows on siliceous rocks. It is widely encountered in cultivation and a variegated form with whitish-yellowish leaves is particularly popular (Descoings, 2003). It is naturalised in several countries (e.g. USA, India, Australia, Galapagos) where it most commonly spreads from waste places and gardens (Moran, 2009; PIER, 2010). In South Africa it is persistent and vegetatively spreading on the periphery of old homesteads (Fig. 290).

Fig. 288. *Bryophyllum fedtschenkoi* (Raym.-Hamet & H.Perrier) Lauz.-March.
(Picture by Neil R. Crouch)

Fig. 289. Flowers of *Bryophyllum fedtschenkoi* (Raym.-Hamet & H.Perrier) Lauz.-March. (Picture by Neil R. Crouch)

Fig. 290. *Bryophyllum fedtschenkoi* (Raym.-Hamet & H.Perrier) Lauz.-March. on the periphery of an old homestead. (Picture by Neil R. Crouch)

6. *Bryophyllum gastonis-bonnieri* (Raym.-Hamet & H.Perrier) Lauz.-March.

In: *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences* 278: 2508 (1974).

=*Kalanchoe adolphi-engleri* Raym.-Hamet
=*Kalanchoe gastonis-bonnieri* Raym.-Hamet & H.Perrier
=*Kalanchoe gastonis-bonnieri* Raym.-Hamet & H.Perrier var. *ankaizinensis* Boiteau ex Allorge-Boiteau

Common names: donkey ears, life plant, palm beachbells (English).

Perennial or sometimes biennial herbs, monocarpic, glaucous or not; stems mostly simple and usually short, terete, glabrous. **Leaves** subrosulate, crowded near base, simple, thick and fleshy, whitish-pruinose above, green or grey-green with brownish-green markings; petiole broad, amplexicaul, 3.5–6.5 cm long; blade ovate-lanceolate, 13–50 × 4.5–10 cm, folded lengthwise, apex acute with bulbils producing roots while still attached, margins sinuate to coarsely crenate, glaucous or not. **Inflorescence** a lax cyme, corymbiform, 20–30 cm in diameter; peduncle up to 50 cm long; pedicels 5–15 mm long. **Flowers** pendulous or somewhat spreading. **Calyx** inflated, 1.8–2.5 cm long, pale green, with red or violet lines, glabrous; tube cylindrical, 1.3–1.6 cm long; lobes deltoid, acute, contracted basally, 5–6 × 4.2–5.3 mm. **Corolla** 4–5 cm long, yellow-green marked with violet or red lines, sparsely glandular-pubescent; tube cylindrical c. 3 cm long, contracted basally; lobes triangular-ovate, apex acuminate, 9–11 × 5.5–7.5 mm. **Stamens** inserted below the middle of corolla-tube, upper parts slightly exserted; anthers reniform, c. 3 mm long. **Carpels** 9–11 mm long; style 1.6–2.4 cm. Nectary scales square, emarginate, 1.2–2 mm long. **Seed** obovate, c. 0.8 mm long.

References: Descoings (2003), Moran (2009).

Bryophyllum gastonis-bonnieri (Fig. 291, 292, 293) is grown as an ornamental in southern Africa and it is apparently naturalised in Florida, USA (PIER, 2010).

Fig. 291. *Bryophyllum gastonis-bonnieri* (Raym.-Hamet & H.Perrier) Lauz.-March.
(Picture by Neil R. Crouch)

Fig. 292. Base of a plant of *Bryophyllum gastonis-bonnieri* (Raym.-Hamet & H.Perrier) Lauz.-March. (Picture by Neil R. Crouch)

Fig. 293. Flowers of *Bryophyllum gastonis-bonnieri* (Raym.-Hamet & H.Perrier) Lauz.-March. (Picture by Neil R. Crouch)

Kalanchoe Adans.

Biennial or perennial or sometimes annual succulent herbs, sometimes undershrubs, shrubs or small trees, with branches spreading, fleshy but somewhat tough and woody towards base. **Leaves** usually opposite and decussate, connate at the base, sessile or petiolate; blade undivided or rarely pinnatifid, entire, crenate or serrate, usually flat, sometimes semi-terete, fleshy-succulent, persistent or deciduous. **Inflorescence** a terminal thyrse, panicle or corymb, consisting of several dichasia usually ending in monochasia with few to many flowers; peduncle present or absent with gradual transition from leaves to shorter bracts below flowers. **Flowers** spreading or stiffly erect, 4-merous, ± pedicellate, medium-sized or ± large. **Calyx** shorter than or sometimes equalling the corolla tube, completely green or with purple or red lines; sepals almost free or connate, rarely up to or beyond the middle. **Corolla** gamopetalous, along at least the lower ⅔; tube ± distinctly 4-angled, rounded and swollen near the base, usually constricted upwards; lobes four, shorter than the fused part, spreading or reflexed or erect and sometimes connivent, ± stiff, sometimes minutely papillate above, usually apiculate. **Stamens** 8, in two whorls; filaments glabrous and fused to corolla tube at about the middle; anthers included, ovate or oblong, with ± spherical terminal appendage. **Carpels** 4, free, with ovary gradually constricted into styles; stigma terminal. Nectary glands 4, free, semi-orbicular to linear, entire, crenulate or ± emarginate at the top. **Fruit** consisting of erect follicles. **Seeds** numerous, ellipsoid, covered with longitudinal ridges and dense horizontal striations in grooves between them.

References: Fernandes (1983); Tölken (1985); Dreyer & Makwarela (2000).

Members of the genus are found in tropical Africa, Madagascar, southern and southeastern Asia, and number c. 200 (Dreyer & Makwarela, 2000). In southern Africa there are 14 indigenous species, mainly restricted to the summer-rainfall areas excluding most parts of southern Namibia and the Great Karoo (Tölken, 1985).

Kalanchoe beharensis Drake

In: *Bulletin du Muséum d'Histoire Naturelle* 9: 41 (1903).

=*Kalanchoe van-tieghemii* Raym.-Hamet

Common names: elephant's ear kalanchoe, felt bush/feltbush, felt plant; velvet bush, velvet elephant ear, velvet leaf, velvet leaf kalanchoe (English); donkie-oor (Afrikaans).

Shrubs or small trees up to 3 m tall; stems simple below and branched above, erect, 2–12 cm diameter, pubescent, with conspicuous leaf scars with sharp projections on either side, toughly woody when old. **Leaves** crowded towards branch tips, petiolate; petiole terete and fleshy, up to 10 cm long; blade deltoid to peltate, sometimes lobate, 7–40 × 8–30 cm, base emarginate, apex acute, glabrous and pruinose to ± densely white to brownish pubescent. **Inflorescence** axillary, many-flowered panicles, 20–30 cm tall; peduncle 40–50 cm long; pedicel 4–13 mm long.

Flowers placed in all directions, pubescent. **Calyx** yellow-green with reddish lines; tube 1–3 mm long; lobes deltoid, 5–13 mm long, apex acute. **Corolla** urceolate, tube 6–10 mm; lobes ovate, 5–13 × 3–6 mm acute, pink-greenish to green-yellow. **Stamens** inserted near the top of the corolla tube, exserted. **Carpels** 5–12 mm long; style 5–10 mm long. Nectary glands rectangular, basally connate, c. 1 × 1.5–3 mm. **Seed** obovate, c. 0.7 mm long.

Reference: Descoings (2003).

Kalanchoe beharensis (Fig. 294, 295) is native to Madagascar where it occurs in the south and southwestern parts of the country in xerophytic forests (Descoings, 2003).

It is a popular garden plant and mature leaves are often silvery in colour (Fig. 296) or a brownish colour above and silvery below. The fine hairs covering the leaves of plants can, however, vary in colour and density even within populations, and some forms with leaf surface outgrowths are being marketed as cultivars in the horticultural trade (Descoings, 2003).

Kalanchoe beharensis grows in four camps within the Kruger National Park in South Africa, where it has shown signs of naturalisation (Foxcroft *et al*., 2008). It has potential as a garden escape, especially in subtropical parts of South Africa, due to its hardiness and prolific production of seedlings. Plants are frost-sensitive and will not easily survive the winter climates of South Africa above the Great Escarpment.

Fig. 294. *Kalanchoe beharensis* Drake. (Picture by Geoff R. Nichols)

Fig. 295. Flowers of *Kalanchoe beharensis* Drake. (Picture by Geoff R. Nichols)

Fig. 296. Leaves of *Kalanchoe beharensis* Drake. (Picture by Geoff R. Nichols)

DRACAENACEAE Salisb.

(Dragon-tree family; *Skoonma-se-tong-familie*)

by

M. Walters

Shrubs to large trees or rhizomatous xerophytic perennials; stems fibrous and partly or wholly subterranean and rhizomatous, or more rarely pachycaul and enormous or occasionally absent. **Leaves** often in rosettes crowded at branch tips or tips of subterranean rhizomes, spirally arranged or occasionally distichous, entire, stiff, simple, narrowly linear to ovate and sessile, sometimes conspicuously succulent and terete, usually fibrous, venation parallel. **Inflorescence** a raceme or panicle, axillary and pedunculate, emerging either from rosette near the ground or on branch ends. **Flowers** small but numerous, bisexual, hypogynous, 3-merous, pedicellate, generally very fragrant; pedicels with an often discoid articulation. **Tepals** 6, in two whorls, petaloid, elongate, all equal, usually basally connate into a short to very long tube with free tips, brownish, purple-violet or white. **Stamens** 6, in two whorls, arising at the base of the lobes, exserted; filaments filiform to inflated; anthers versatile, introrse. **Ovary** superior, 3-carpellate, 3-locular; ovule 1 per locule, anatropous; style often long and simple; stigma 3-lobed or capitate. **Fruit** a globose berry, red or orange. **Seeds** 1–3, globose or elongate, dirty white.

References: Archer (2000), Walker (2001), Heywood *et al*. (2007).

The Dracenaceae is sometimes included in a broadly circumscribed Asparagaceae but is here treated as a separate family. It consists of two genera i.e. *Dracaena* L. and *Sansevieria* Thunb. (Archer, 2000) (though the inclusion of *Sansevieria* in *Dracaena* which has been discussed by various authors, would make the family monogeneric), with c. 100 species (Heywood *et al*., 2007).

The family is mostly tropical, occurring worldwide in rainforests or arid areas (Heywood *et al*., 2007). It is distributed throughout subtropical and tropical Africa, Asia and Australasia, with one species of *Dracaena* from Mesoamerica (Walker, 2001; Heywood *et al*., 2007). Species in this family have a centre of distribution in Africa (Walker, 2001).

Certain species of Dracaenaceae are cultivated as garden or house plants e.g. *Dracaena draco* (L.) L. (the dragon tree) (Heywood *et al*., 2007) and *Sansevieria trifasciata* Prain (mother-in-law's tongue), of which variegated cultivars are usually grown (Walker, 2001).

Only one succulent species from one genus is naturalised in southern Africa.

Sansevieria Thunb.

Caulescent or acaulescent, very drought-hardy perennials, sometimes branching near base with subterranean rhizomes or runners above ground, forming colonies; rhizome thick, fibrous, bearing early deciduous cataphylls. **Leaves** solitary, few

or many, distichous or rosulate, succulent or leathery, lanceolate, linear or lorate and flat, or cylindrical or semi-cylindrical and usually with a groove on adaxial side, sessile, sometimes narrowed at the base resembling petiole, plain green or often with irregular lighter and darker green transverse bands. **Inflorescence** a terminal, paniculate or simple spike-like raceme, sometimes capitate, dense or lax, with extrafloral nectary glands associated with the bracts. **Flowers** numerous, subsessile, solitary or in irregular clusters along scape, bracteate, pedicellate, actinomorphic, often nocturnal and opening for one night only, sweetly scented; pedicel articulated. **Tepals** united at the base to form a tube with 6 free lobes curling back at anthesis, mostly whitish. **Stamens** 6, erect, much exserted, exposed at anthesis by curling back of tepals, fused to tube below; filaments filiform. **Ovary** 3-locular, ovoid; style simple, filiform and as long as stamens or slightly longer, exserted early from closed perianth at anthesis. **Fruit** a berry, smooth or tuberculate. **Seeds** 1–3, with thick softly verrucose epidermis, dirty white.

References: Obermeyer (1992), Archer (2000), Newton (2001).

The genus consists of c. 60 species from Africa, southern Asia (India, Sri-Lanka, Myanmar), Madagascar, Comoro Islands and the Arabian Peninsula (Yemen) (Newton, 2001; Mabberley, 2008). Only seven species in the genus are native to southern Africa (Klopper *et al*., 2006). A number of *Sansevieria* species are naturalised in other regions of the world (PIER, 2010).

Members of the genus *Sansevieria* are used as medicine or protective charms and the fibres are used for making nets, string, sails and paper in various African countries (Watt & Breyer-Brandwijk, 1962; Mabberley, 2008).

Sansevieria trifasciata Prain

In: *Bengal Plants* 2: 1054 (1903).

Common names: bowstring hemp, mother-in-law's tongue, snake plant (English); skoonma-se-tong (Afrikaans); isikuha, isikusha, sikuha, sikusha (Ndebele).

Acaulescent, rhizomatous herb; rhizome 1.3–2.5 cm in diameter. **Leaves** 1–2 (–6) per branch, erect, linear-lanceolate, 30–122 × 2.5–7 cm, narrowed gradually from the middle or somewhat above to a channeled petiole, with 3–4 mm green subulate tip, with alternating transverse bands of light green or whitish green and deep green to almost blackish green with slight glaucous bloom, margin green, surface smooth. **Inflorescence** a simple, spike-like raceme, 30–76 cm long, lax, with 3–8 flowers per cluster; peduncle green with pale-green dots; bracts ovate, acute or acuminate, 1–4 mm long; pedicel 2–4 mm long. **Flowers** whitish or greenish-white sometimes slightly red-tinged outside. **Tepals** united at the base; tube c. 1 cm long; lobes 1.2–1.5 cm long. **Stamens** exserted. **Ovary** 3-locular, ovoid. **Fruit** a berry. **Seeds** 1–3. **Distribution**: SA. (Fig. 297).

Reference: Walker (2001).

Two varieties of *Sansevieria trifasciata* are recognised and the plant occurring in

southern Africa can be ascribed to the typical variety (Fig. 298). The var. *laurentii* differs from var. *trifasciata* in having yellow leaf margins up to 1 cm wide (Walker, 2001).

Fig. 297. Distribution map of *Sansevieria trifasciata* Prain.

Fig. 298. *Sansevieria trifasciata* Prain in a healer garden. (Picture by Neil R. Crouch)

This species hails from Nigeria and the Democratic Republic of the Congo (Walker, 2001). In southern Africa it has been found growing in natural vegetation in the Westville area of the KwaZulu-Natal Province of South Africa (Fig. 299). This species should be monitored for further spread and escape from gardens elsewhere. It has also become naturalised or invasive in other countries, for example, Australia, Ecuador, Samoa and the USA (PIER, 2010).

Sansevieria trifasciata is widely cultivated as both an indoor and outdoor plant, with numerous cultivars in existence. These may differ in their leaf sizes, degrees of variegation and shades of green (Walker, 2001). The leaves are known to contain haemolytic compounds and organic acids (Watt & Breyer-Brandwijk, 1962).

Fig. 299. *Sansevieria trifasciata* Prain invasion. (Picture by Neil R. Crouch)

EUPHORBIACEAE Juss.

(Spurge or Milkweed Family; *Noors-* or *Melkbosfamilie*)

by

E. Figueiredo

Dioecious or monoecious herbs, shrubs or trees, with or without a milky latex or coloured sap. **Leaves** usually alternate, sometimes opposite or whorled, mostly petiolate, simple or compound, entire lobed or toothed, sometimes with a gland at the base of the petiole; stipules present or absent. **Inflorescence** terminal, axillary, lateral or leaf-opposed, cymose, paniculate, racemose, spicate or cyathial, or with the flowers fasciculate or solitary. **Flowers** unisexual, usually actinomorphic and small. **Calyx** usually with 3–6 lobes or sepals. **Corolla** with 3–6 free (rarely united) petals or absent. Disc of free or united glands, or lobed, annular, cupular or absent. **Stamens** 1–many. Pistillode sometimes present. **Ovary** superior, usually sessile, usually 3-locular; styles usually 3; staminodes sometimes present. **Fruit** usually schizocarpic, often dehiscing into 3 bivalved cocci leaving a persistent columella, or fruit drupaceous indehiscent. **Seeds** 1–2 per locule, or by abortion 1 per fruit, carunculate or not.

Reference: Carter (2002).

The Euphorbiaceae is a large family with c. 300 genera and 5 000 species (Carter, 2002). It is subcosmopolitan but mostly occurs in the humid tropics and subtropics of both hemispheres (Carter, 2002). It includes groups of genera that are sometimes segregated into other families by some authors (Androstachydaceae, Antidesmataceae, Bischofiaceae, Hymenocardiaceae, Phyllanthaceae, Pedilanthaceae, Picrodendraceae, Porantheraceae, Putranjivaceae, Ricinocarpaceae, Scepaceae, Stilaginaceae, Trewiaceae and Uapacaceae). However, some parts of the Euphorbiaceae that were separated from it (such as the Phyllanthaceae and Picrodendraceae) may be combined again (Stevens, 2008). For that reason the family is accepted here in a broadly defined sense (Carter, 2002).

Many species of Euphorbiaceae have economic importance. The family is well-known as the main source of rubber (*Hevea* Aubl.) but also as the source of widely consumed edible products such as cassava and tapioca (*Manihot* Mill.) (Heywood *et al*., 2007). Other products include oils such as tung oil (*Aleurites* J.R.Forst. & G.Forst.) and castor oil (*Ricinus* L.), medicines and insecticides (Burkill, 1994; Carter, 2002; Smith & Crouch, 2002). Several species are ornamental, particularly in the genera *Euphorbia* L. (e.g. poinsettia) and *Codiaeum* Rumph. ex A.Juss. (garden croton) (Heywood *et al*., 2007)

Only four succulent species from two genera of the Euphorbiaceae are naturalised in southern Africa.

These two genera can be distinguished on the inflorescence being composed of cyathia in *Pedilanthus*, while *Jatropha* has inflorescences with lateral male flowers and terminal female flowers (Carter, 2002).

Jatropha L.

Monoecious or rarely dioecious trees, shrubs or herbs, with clear, whitish or reddish latex. Indumentum simple, sometimes glandular or absent. **Leaves** alternate, sometimes crowded, petiolate or sessile; blade usually lobed, usually with glands at petiole apex; stipules multifid and glandular or spiny, usually palmatilobed. **Inflorescence** terminal or subterminal, cymose, usually with a solitary female flower terminating each primary axis and lateral cymules of male flowers. **Male flowers:** sepals 4–6, imbricate and slightly connate at the base; petals 5, imbricate, disc entire or of 5 free glands; stamens 6–10, often in 2 whorls, outer whorl opposite petals; pistillode filamentous or absent. **Female flowers:** sepals and petals as in male flower but larger; sepals usually persistent in fruit; staminodes sometimes present; disc entire, 5-lobed or of 5 free glands; ovary 1–5-locular; style entire or bifid. **Fruit** schizocarpic, dehiscing septicidally or loculicidally, rarely subdrupaceous and ± indehiscent. **Seed** with caruncle.

References: Radcliffe-Smith (1986, 1987, 1996), Gilbert *et al*. (1993), Carter (2002), Li & Gilbert (2008a), Mabberley (2008).

Jatropha is a pantropical genus extending to North America and South Africa. It includes c. 175 species of which 70 are native to Africa (Gilbert *et al*., 1993). Several *Jatropha* species are known for their ornamental value in domestic horticulture, the most commonly cultivated species being *Jatropha podagrica* Hook. (Mabberley, 2008). This bottle-trunked species carries small, but magnificent, crimson red inflorescences in summer. It grows well in mild areas in open ground or in containers as a stoep plant. Extracts of two species (*Jatropha curcas* and *J. multifida* L.) are used locally as a purgative (Van Wyk & Gericke, 2000; Van Wyk *et al*., 2002). *Jatropha* is also used to produce fuel from seed oil.

Key to the three succulent species of *Jatropha* naturalised in southern Africa [adapted from Li & Gilbert (2008a); note that succulence is little developed in *J. gossypiifolia* and *J. curcas*]:

1. Petioles with gland-tipped hairs along their length, 8–12 cm long, sticky; leaf blade reddish-brown to bronze coloured at least in young leaves . . . . . **2. *Jatropha gossypiifolia***

1'. Petioles without gland-tipped hairs, 10–20 cm long, not sticky; leaf blade green to grey-green **2**

2. Stipules scalelike, minute, caducous; petals fused in lower half, greenish-yellow; leaves unlobed or shortly 3–5-lobed . . . . . **1. *Jatropha curcas***

2'. Stipules divided, spinose or setose, persistent; petals free or almost so, red; leaves shortly lobed . . . . . **3. *Jatropha podagrica***

1. *Jatropha curcas* L.

In: *Species Plantarum* 2: 1006 (1753b).

Common names: Barbados nut, fig nut, pig nut, purging nut (tree), physic nut (English); purgeerboontjie (Afrikaans); mathlapametse (Tswana); inhlakuva (Zulu).

Shrubs or small trees up to 7 m tall with olive grey-green, peeling bark; branchlets semisucculent. Latex watery. **Leaves** alternate; petiole 3–20 cm long, glabrous; blade broadly ovate in outline, pentagonal or shallowly 5-lobed, 5–15 × 5–15 cm, cordate, margins usually entire, glabrous, 7–9-nerved from the base; stipules subulate, 0.5 mm long, caducous. **Inflorescence** subterminal or supra-axillary, subcorymbiform, up to 12 cm long; peduncle up to 6 cm long; bracts up to 8 mm long, acute. **Male flowers:** pedicels up to 4 mm long; sepals c. 2 mm long united at base; petals c. 7 × 3 mm, united to middle, oblong, greenish-yellow, pilose within; disk glands 5; stamens 8, in two whorls, 5 outer and 3 inner, 5–6 mm long; filaments glabrous; anthers c. 2 mm long. **Female flowers:** pedicels up to 3 mm long, extending in fruit; calyx lobes obtuse, entire, 5–7 mm long, puberulous; petals elliptic-oblong, c. 6.5 × 3 mm, greenish-yellow, pilose within; disk glands 5, free; staminodes 10, up to 1 mm long; ovary ovoid-ellipsoid, somewhat 3-lobed, c. 2.5 × 2 mm; style c. 2.5 mm long; stigma bifid. **Fruit** a ellipsoid, slightly 3-lobed capsule, 2.5–3 × 2–2.5 cm, loculicidally dehiscent, green. **Seed** ellipsoid to subcylindric, up to 2 × 1 cm, blackish; caruncle depressed-conic. **Distribution**: S, SA. (Fig. 300).

References: Radcliffe-Smith (1986, 1996), Gilbert *et al*. (1993), Carter (2002), Henning (2007), Li & Gilbert (2008a).

Jatropha curcas (Fig. 301, 302, 303, 304) is a small to medium-sized leafy tree with pale yellowish pealing bark. As indicated by its common names, the seeds (Fig. 305) of *Jatropha curcas* contain a strong purgative oil (curcas oil), which is used medicinally. In West Africa, for instance, it is part of a local remedy for paralysis, leprosy and skin diseases (Burkill, 1994; Oliver-Bever, 1986). It is also used to anoint the body, as a lubricant and in the manufacturing of soap, paint, candles, and for lighting (Burkill, 1994; Henning, 2007; Li & Gilbert, 2008a). Seeds have also been shown to have anti-tumour activity (Mabberley, 2008). Leaves, bark, roots and latex are also used medicinally in various ways (Burkill, 1994). Although roasted seeds are used as a purgative (Hutchings *et al*., 1996) seeds are poisonous when chewed and a common cause of human poisoning in South Africa (Van Wyk *et al*., 2002). Given the plant's toxic properties it has also been used as a vermifuge, insecticide, fish, bird or mammal poison, and arrow-poison (Burkill, 1994). The sap is used as a black dye.

Fig. 300. Distribution map of *Jatropha curcas* L.

Jatropha curcas is also widely cultivated in the tropics as a living fence, for erosion control, demarcation of boundaries and for protection (Henning, 2007; Burkill, 1994), which contributed to it becoming naturalised. It has been increasingly used for bio-fuel (Henning, 2007). It is thought that it will become a major source of renewable energy in the drier rural areas of tropical and subtropical Asia, Africa and America and much research is being done to improve its viability in cultivation (Henning, 2007).

The origin of *Jatropha curcas* is somewhat uncertain but it is thought to be native to Mexico or the neighbouring regions of central America. Portuguese seafarers took it to Cape Verde, where it became an export crop. It was distributed all over the world long ago and is now naturalised throughout the tropics and subtropics (Henning, 2007). It is commonly cultivated in the Old World tropics and Australia which has contributed to its widespread naturalisation in these regions (Radcliffe-Smith, 1996).

In Africa it is widely cultivated for the oil-producing seeds and also as living hedges and stockades, which contributed to it becoming naturalised. In South Africa, it is said to have been introduced by Sekukuni's [Sekhukhune] ancestors when the tribe invaded the north of the country (Smith, 1966).

Jatropha curcas occurs in semi-arid tropical and warm subtropical frost-free climates, on degraded, sandy or gravelly and even saline but not waterlogged soils (Henning, 2007).

Fig. 301. *Jatropha curcas* L. (Picture by Neil R. Crouch)

Fig. 302. Leaves of *Jatropha curcas* L. (Picture by PPRI)

Fig. 303. Inflorescence of *Jatropha curcas* L. (Picture by Geoff R. Nichols)

Fig. 304. Fruits of *Jatropha curcas* L. (Picture by Geoff R. Nichols)

Fig. 305. Seeds of *Jatropha curcas* L. (Picture by Geoff R. Nichols)

2. *Jatropha gossypiifolia* L. var. *elegans* (Pohl) Müll.Arg.

In: De Candolle, *Prodromus Systematis Naturalis Regni Vegetabilis* 15(2): 1087 (1866).

Common names: bellyache bush, cotton-leaved physic nut, red fig-nut, red fig-nut flower, red physic nut, wild cassada, wild cassava (English).

Erect shrubs up to 2–3 m tall. Young shoots exuding brownish latex. **Leaves** alternate; petiole 3–13 cm long, with stipitate glands adaxially; blade broadly ovate in outline, 6–10 × 8–14 cm, 3(5)-lobed, cordate, reddish-brown to dark bronze-coloured, glabrous, 3–5-nerved from the base; lobes obovate to oblanceolate, middle lobe 4–10 × 2–5 cm, margins glandular and minutely toothed; stipules multifid, 4–8 mm long. **Inflorescence** leaf-opposed, paniculate, up to 8–18 cm long; peduncle 6–8 cm long. **Male flowers:** sepals c. 2.5 mm long; petals obovate, c. 3.5 mm long, dark red; disk glands 5; stamens 8, in two whorls, 2–3 mm long. **Female flowers:** calyx and petals as in the male flowers but twice larger; disk 5-lobed; ovary 3-lobed to subglobose, c. 2 × 2 mm; style c. 1.5 mm long, stigma bifid. Fruit a 3-lobed to subglobose capsule, c. 1 × 1 cm, septicidally and loculicidally dehiscent. **Seed** compressed ellipsoid-ovoid, 7 × 4 mm, light brown; caruncle multifid. **Distribution**: SA. (Fig. 306).

References: Radcliffe-Smith (1986, 1996), Carter (2002).

Jatropha gossypiifolia (Fig. 307) is native to the West Indies, and Central and South America (Radcliffe-Smith, 1986). It was introduced into the Old World tropics where it was planted as a quick-growing hedge and boundary plant. It is also grown ornamentally for its striking dark red young foliage (Fig. 308). It is widely planted as an ornamental and medicinal plant in villages of the tropics (Kawanga, 2007). It escaped and became naturalised throughout tropical Africa, but only sporadically in northern South Africa.

Fig. 306. Distribution map of *Jatropha gossypiifolia* L. var. *elegans* (Pohl) Müll.Arg.

The plant is used medicinally in tropical Africa mostly as a purgative and to expel internal parasites (seed oil). The oil is also applied internally as an abortifacient (Kawanga, 2007). Leaves, bark and sap are used for a variety of diseases and conditions. In the West Indies, for instance, it is used to treat, amongst others, diarrhoea, colds, asthma and diabetes (Ayensu, 1981). The seed oil can also be used as lamp oil and fuel (Kawanga, 2007).

Jatropha gossypiifolia var. *elegans* is an opportunistic invader of disturbed sites where it can become weedy. In southern Africa it has only been recorded as naturalised in South Africa (Limpopo). It is a short-lived plant, often only annual in cultivation and became naturalised in regions with a pronounced dry season, occurring along roads, on waste areas, in grassland and shrub vegetation (Kawanga, 2007).

Fig. 307. Flowers and fruit of *Jatropha gossypiifolia* L. var. *elegans* (Pohl) Müll.Arg. (Picture by Geoff R. Nichols)

Fig. 308. Leaves of *Jatropha gossypiifolia* L. var. *elegans* (Pohl) Müll.Arg. (Picture by Geoff R. Nichols)

3. *Jatropha podagrica* Hook.

In: *Botanical Magazine* 74: pl. 4376 (1848).

Common names: gouty-stalked jatropha (English); bottelplant, vetvoet (Afrikaans).

Erect shrubs up to 2 m tall, with woody stem swollen at base or lower part, completely glabrous with short fleshy branches. **Leaves** with petiole 8–20 cm long, glabrous; blade peltate, entire or shallowly 3–5-lobed, round to elliptic, 8–18(–25) × 6–16 cm, base truncate or obtuse, apex obtuse, shiny green on upper surface, grey-green on lower surface, glabrous; stipules spiniform, divided to c. 5 mm, glandular, becoming hardened, leaf scars persistent, prominent. **Inflorescence** a terminal corymb up to 26 cm long; peduncle up to 20 cm long; branches short, red. **Male flowers:** calyx c. 2 mm long; sepals round, c. 0.6 mm long, erose or emarginate at apex; petals obovate-oblong, c. 6 mm long, scarlet; nectary glands urceolate; stamens 6–8, basally connate, 5 mm long; anthers c. 2 mm long, orange. **Female flower:** sepals ovate-lanceolate, c. 2 mm long, apex obtuse, entire; petals 6–7 mm long; nectary glands free; ovary ellipsoid, 3–4 × 2.5 mm, glabrous; styles 3, bifid. **Fruit** a capsule, ellipsoid, c. 1.5 × 1.3 cm, septicidally and loculicidally dehiscent. **Seed** ellipsoid, c. 12 × 6 mm, smooth, brown; fluted caruncle. **Distribution**: SA. (Fig. 309).

References: Radcliffe-Smith (1987), Carter (2002), Li & Gilbert (2008a).

Fig. 309. Distribution map of *Jatropha podagrica* Hook.

Jatropha podagrica is native to central America but has been dispersed to many tropical countries as a garden-plant (Burkill, 1994). It has beautiful showy red inflorescences and a bottle-shaped trunk (Fig. 310, 311, 312) making it a striking garden subject and popular among succulent enthusiasts. In southern Africa it has been recorded as naturalised on the south coast of KwaZulu-Natal in South Africa. It is frost-sensitive and does not easily survive in South Africa's climatically severe interior.

Apart from its use as an ornamental it is also cultivated for medicinal purposes. In Africa it is used for treating wounds, skin ailments and as an antipyretic, diuretic, choleretic and purgative (Burkill, 1994; Neuwinger, 2000) and has been shown to have anti-bacterial activity (Oliver-Bever, 1983).

Fig. 310. *Jatropha podagrica* Hook. (Picture by Gideon F. Smith)

Fig. 311. Flower of *Jatropha podagrica* Hook. (Picture by Neil R. Crouch)

Fig. 312. Fruit of *Jatropha podagrica* Hook. (Picture by Neil R. Crouch)

Pedilanthus Neck. ex Poit.

Shrubs or small trees with woody or fleshy branches. Latex white. **Leaves** alternate, distichous, entire, shortly petiolate, or absent; stipules small. **Inflorescence** with cyathia in dichotomous axillary or terminal bracteate cymes; bracts persistent. **Cyathia** pedunculate, involucre with 5 bracts, obliquely shoe- or boat-shaped, with 2–6 glands at the base, often brightly coloured. **Male flowers:** many, each reduced to 1 stamen, in 5 groups. **Female flower:** solitary at center of involucre, pedicellate, with the perianth reduced to a rim below the ovary; ovary 3-locular, with 1 ovule per locule; styles 3, united; stigmas bifid. **Fruit** a capsule, 3-lobed, usually dehiscent. **Seeds** smooth or tuberculate, without a caruncle.

References: Carter & Leach (2001), Carter (2002), Li & Gilbert (2008b).

Pedilanthus is a genus with c. 15 species from Central America, northern South America and the West Indies (Carter & Leach, 2001; Li & Gilbert, 2008b), sometimes included in *Euphorbia*. It includes a few species cultivated in tropical regions. In the whole of Africa only *Pedilanthus tithymaloides* subsp. *smallii* has been recorded as naturalised, in South Africa.

Pedilanthus tithymaloides (L.) A.Poit. subsp. *smallii* (Millsp.) Dressler

In: *Contributions from the Gray Herbarium of Harvard University* 182: 152 (1957).

=*Pedilanthus smallii* Millsp.
=*Euphorbia tithymaloides* L. subsp. *smallii* (Millsp.) V.W.Steinm.

Common names: bird cactus, jacob's ladder, slipperplant (English); swaelblom (Afrikaans); ibunga labesutu (unrecorded language).

Shrubs up to 1–3 m tall with markedly zigzag stems. **Leaves** distichous; petiole 2–5 mm long; blade broadly ovate to lanceolate, 3.5–8 × 2.5–3.5 cm, base rounded or obtuse, apex ± acuminate, entire, fleshy, sometimes variegated with yellowish-green or pink, slightly glaucous, glabrescent, deciduous; stipules small, caducous. **Inflorescence** a cyme, in terminal and axillary clusters on leafless stems. **Cyathia** with many male flowers and 1 female flower; involucres slipper-shaped, deep-red or purple-red, glabrous, apex nearly labiate, bifid, 3-serrulate, other lobe boat-shaped, with 4 glands. **Male flowers:** pedicel slender, 2.5–4 mm long, similar to filaments; anther globose. **Female flower:** inserted at center of involucres, exserted; pedicel 6–8 mm long; ovary fusiform; styles usually united; stigmas 3, bifid. **Fruit** 5–6 mm in diameter. **Distribution**: SA. (Fig. 313).

References: Carter & Leach (2001), Carter (2002), Li & Gilbert (2008b).

This taxon originates from North America and Cuba (Carter, 2002). It is naturalised in many parts of the world such as Australia (Forster, 1996) and China (Li & Gilbert, 2008a). It is often grown for its showy inflorescence and ornamental foliage. The subsp. *smallii* (Millsp.) Dressler is particularly widespread due to the attractiveness of the accentuated zigzag stems and variegated foliage (Fig. 314, 315). The

species is also grown as a hedge (Mabberley, 2008) and it is used medicinally locally (Von Ahlefeldt *et al*., 2003) and in other regions as an antidote to venomous bites or stings, as an emetic or for the treatment of fractures (Burkill, 1994; Li & Gilbert, 2008a).

Fig. 313. Distribution map of *Pedilanthus tithymaloides* (L.) A.Poit. subsp. *smallii* (Millsp.) Dressler.

Fig. 314. Zigzag stems of *Pedilanthus tithymaloides* (L.) A.Poit. subsp. *smallii* (Millsp.) Dressler. (Picture by Estrela Figueiredo)

Fig. 315. Variegated leaves of *Pedilanthus tithymaloides* (L.) A.Poit. subsp. *smallii* (Millsp.) Dressler. (Picture by Estrela Figueiredo)

LAMIACEAE Martinov.

(Mint family; *Saliefamilie*)

by

N.R. Crouch

Perennial or annual, aromatic, mesophytic to xerophytic herbs, shrubs or trees, rarely succulent; roots fibrous, occasionally succulent; stems usually 4-angled. **Leaves** decussate or whorled, simple, sometimes succulent, rarely pinnatifid or digitately compound, usually gland-dotted, without stipules. **Inflorescence** a terminal (rarely axillary) raceme or panicle (rarely spikes or corymbs). **Flowers** strongly zygomorphic (rarely actinomorphic), normally bisexual, rarely unisexual, usually 5-merous, bracts present, foliaceous, often caducous. **Calyx** of 5 fused sepals, tubular, campanulate to spreading, often persistent and enlarged in fruit; lobes often toothed. **Corolla** with 5 united petals, tubular (straight or geniculate), often 2-lipped at the throat or subregular and 4–5-lobed. **Stamens** 4 (rarely 2), subequal or didynamous, epipetalous at corolla mouth or in tube; filaments occasionally connate, sometimes with a crest or projection near base; anthers 1–2-locular. **Ovary** superior, often deeply 4-lobed, seated often on entire or lobed nectariferous disc, of 2 united carpels divided into 2–4 locules; ovule 1 per locule, erect, basal or sub-basal; style gynobasic. **Fruits** usually 4 (or by abortion fewer) 1-seeded nutlets, ± enveloped by the persistent calyx, usually smooth, rarely

rugose or winged, dry at maturity, otherwise if ovary entire the fruit a drupe with 4 pyrenes.

References: Codd (1985), Retief (2000), Van Jaarsveld (2002), Heywood *et al*. (2007).

Lamiaceae is a well-known family of c. 230 genera and 4 000–7 000 species. It has a worldwide distribution, except in Antarctica and is best represented in the Mediterranean region. The majority of the genera belong to the subfamily Nepetioideae (Heywood *et al*., 2007). Succulence is scattered throughout seven genera, which (with the exception of *Tetradenia* Benth.) belong to subfamily *Ocimoideae. Plectranthus* is the largest of these genera. Leaf succulence is found in the family particularly in southern and tropical Africa, but caudiciform, swollen stems are also encountered in some representatives.

Many species of Lamiaceae are frequently cultivated both for medicinal, culinary or ornamental value. They include common kitchen herbs such as basil (*Ocimum* L.), rosemary (*Rosmarinus* L.), thyme (*Thymus* L.), mint (*Mentha* L.) and oregano (*Origanum* L.), used on account of their flavoursome essential oils. Many very attractive garden plants such as numerous species of *Salvia* L. and *Leonotis* (Pers.) R.Br. are frequently encountered in cultivation. Many taxa are grown commercially for their essential oils such as basil (*Ocimum*) and *Pogostemon* Desf. (product patchouli). Some species of *Plectranthus* L'Hér. and *Solenostemon* Thonn. are popular house plants. *Plectranthus esculentus* N.E.Br. and *Solenostemon rotundifolius* (Poir.) J.K.Morton have been cultivated in southern Africa for their edible potato-like root-tubers (Van Jaarsveld, 2002).

Two exotic species from the genus *Plectranthus* are naturalised in southern Africa.

Plectranthus L'Hér.

Annual, biennial or perennial herbs, subshrubs or shrubs up to 3.5 m tall, herbaceous, fleshy or sometimes succulent; roots fibrous or rarely fleshy or tuberous. **Leaves** decussate, simple, often succulent, usually crenate-dentate, petiolate. **Inflorescence** terminal or in the upper leaf axils, spike-like, often branched and paniculate. **Flowers** zygomorphic, arranged in verticils, few-flowered cymes or dichasia, occasionally solitary, bracts small. **Calyx** 2-lipped to sub-equally 5-toothed; when 2-lipped, upper lip consisting of a single broad lobe scarcely longer than the lower lip which comprises 4 lanceolate-deltoid to subulate teeth, tube glabrous or villous within, sometimes gibbous at base. **Corolla** 2-lipped, mauve, white, purple or yellow; tube longer than calyx, gibbous or produced into a spur on the upper side, usually bent and variously expanded near the base, occasionally expanding gradually, rarely straight; upper lip usually 4-lobed, shorter than the lower boat-shaped entire lip. **Stamens** 4, rarely 2 abortive; filaments free or variously fused near the base, arising at corolla mouth, declinate in lower lip; anthers circular to oblong, medifixed, 1-locular. **Ovary** deeply 4-lobed; style gynobasic, declinate with stamens in lower corolla lip; stigma shortly bifid. **Fruit** a nutlet, oblong to ovoid, smooth or slightly granular.

References: Codd (1985), Retief (2000), Forster & Van Jaarsveld (2002).

Plectranthus is an Old World genus of c. 350 species, c. 70 of which have succulent stems, leaves, roots or a combination thereof (Forster & Van Jaarsveld, 2002). Historically, the tuberous roots of some species have been cultivated and eaten as a starch staple: *Plectranthus esculentus* is the most prominent example (Crouch & Styles, 2010). Many non-succulent or fleshy species are commonly cultivated as garden subjects, and a few of the succulent species are in general cultivation. Various regional species are used in traditional medicine, and at times used as herbs to flavour foods [e.g. soup mint, *P. amboinicus* (Lour.) Spreng.] (Codd, 1985). One species, *P. unguentarius* Codd is even used by the Himba of Namibia as a deodorant in their red ochre body lotion (Van Jaarsveld, 2006).

Both succulent *Plectranthus* species naturalised in southern Africa belong to the subgenus *Calceolanthus*. Members of this subgenus are characterised by the pubescence of their inner calyx.

Key to all *Plectranthus* species of subgenus *Calceolanthus* native [*P. neochilus* Schltr., *P. caninus* Roth, *P. tetensis* (Bak.) Agnew, *P. pentheri* (Gürke) Van Jaarsv. & T.J.Edwards] or naturalised in southern Africa [from Van Jaarsveld (2006)]:

1. Bracts rounded; stems procumbent . . . . . .(***Plectranthus tetensis***)
1'. Bracts acute, forming imbricate coma; stems decumbent or erect **2**

2. Branches decumbent or erect to 50 cm high; leaves medium-sized **3**
2'. Branches erect, 0.9–4 m high; leaves large . . . . . .**1. *Plectranthus barbatus* var. *grandis***

3. Roots distinctly tuberous . . . . . .(***Plectranthus pentheri***)
3'. Roots not tuberous **4**

4. Plants annual; corolla less than 1 cm long . . . . .(***Plectranthus caninus***)
4'. Plants perennial; corolla longer than 1 cm **5**

5. Corolla 1–2 cm long . . . . . **(*Plectranthus neochilus*)**
5'. Corolla 2–2.5 cm long . . . . . .**2. *Plectranthus ornatus***

1. *Plectranthus barbatus* Andrews var. *grandis* (L.H.Cramer) Lukhoba & A.J.Paton

In: *Kew Bull*. 58: 915 (2003).

=*Coleus grandis* L.H.Cramer
=*Coleus kilimandschari* Gürke
=*Plectranthus grandis* (L.H.Cramer) R.H.Willemse

Common names: woolly plectranthus, bearded spurflower (English); baardspoorsalie (Afrikaans).

Aromatic, perennial sub-shrub or succulent shrub 0.9–4 m tall. **Stems** erect or

ascending, fleshy, creeping at base, purplish above, pubescent to villous with glandular hairs, shiny glandular hairs and red sessile glands. **Leaves** spreading to ascending, succulent, soft, velvety, sometimes folded along midrib on drying; petiole 3–50 mm long; blade broadly ovate, widest near base, 1.5–20 × 0.8–11 cm, base subcordate to broadly cuneate, sharply cuneate at petiole, apex acute to rounded, margins serrate or crenate, densely hairy to woolly with reddish sessile glands. **Inflorescence** with glandular, sticky axis, lax with 10–14-flowered verticils; cymes sessile, 5(–7)-flowered; bracts ovate to lanceolate, apiculate, 2–20 mm long, cucullate, enclosing buds, falling as buds start to develop; pedicels 3–7 mm long. **Calyx** (at flowering) 3–4 mm long, sparsely pubescent to villous with red and yellowish sessile glands, purplish; at fruiting 6–10 mm long, shortly tubular, slightly curved, densely hairy in throat. **Corolla** (7–)12–26 mm long, pale blue, blue or purple, with scattered red glands or hairs on lobes; tube sigmoid, dorsally gibbous to saccate at second bend, 5–12 mm long; upper lip 4-lobed, reflexed against tube, much shorter than lower lip; lower lip ascending to horizontal, deeply cucullate, enclosing stamens, 8–10 mm long. **Stamens** fused. **Nutlets** broadly ovate, slightly flattened, 1.5–2 mm long, pale or dark brown to black, smooth, with dark gland dots, producing copious speckled mucilage when wet. **Distribution**: S, SA. (Fig. 316).

In southern Africa, plants flower (Fig. 317) during summer but peak in autumn (Van Jaarsveld, 2006).

Given the wide variety of names that have been applied to the two varieties of *Plectranthus barbatus*, and the relatively recent resolution of its taxonomy, it is difficult to unequivocally attribute historical traditional usage accounts to particular varieties. Accordingly, in reviewing the ethnobotany of the *Plectranthus* species of East Africa, Lukhoba *et al*. (2006) reported on the collective literature that has referred to *P. barbatus*, under all synonyms. The species in its broadest sense is evidently extremely well utilised medicinally across its range by a variety of ethnic groups; readers are referred to the review of Lukhoba *et al*. (2006) and references cited within for further information. Given the range of medicinal applications it is likely that dispersal of this species is in part synanthropic, evidenced by its current anthropogenic tendency (Fig. 318).

Fig. 316. Distribution map of *Plectranthus barbatus* Andrews var. *grandis* (L.H.Cramer) Lukhoba & A.J.Paton.

Fig. 317. Flowers of *Plectranthus barbatus* Andrews var. *grandis* (L.H.Cramer) Lukhoba & A.J.Paton. (Picture by Neil R. Crouch)

Plectranthus barbatus var. *grandis* (Fig. 319) has for long been historically confused both with the typical variety (also present in East Africa), which is an altogether smaller plant with elliptic leaves, and with *P. comosus* Sims from Asia. This is reflected in the literature, particularly that pertaining to horticulture (e.g. Forster, 1997), fieldguides (Agnew, 1974) and even accounts of the taxon as an alien invader (Wells *et al*., 1986; Henderson, 2001). However, this taxonomic issue has been resolved by Lukhoba and Paton (2003) following the earlier research of Cramer (1978) and Ryding (1999). The native range of *P. barbatus* var. *grandis* is imprecisely known as it has been widely disseminated by humans. Its origin appears to be East Africa, but it is cultivated elsewhere in Africa as well as in India and Sri Lanka. It is, however, a common garden subject and is widely cultivated in rural areas as a fast-growing but drought-tolerant hedging plant, which is the reason for its spread in South Africa.

Plectranthus barbatus var. *grandis can* be distinguished from other South African species by its size, large leaves and sticky inflorescencse. The indigenous *P. ecklonii* Benth. attains a similar height but is a smaller-leaved and shade-loving species that has flowers with straight rather than sigmoid tubes.

The species was first identified as a local problem plant by Wells *et al*. (1986) who described it as a competitive species of moist terrestrial zones. Henderson (2001) further noted its invasion of roadsides, rocky sites and forest margins (Fig. 320). As *Plectranthus barbatus* var. *grandis* has in the past mistakenly been referred to as *P. comosus*, it is the latter taxon that has accordingly been declared a category 3 invader. Trade in this species, including the variegated cultivar 'Vicki', is not permitted.

Fig. 318. *Plectranthus barbatus* Andrews var. *grandis* (L.H.Cramer) Lukhoba & A.J.Paton near a village. (Picture by Geoff R. Nichols)

Fig. 319. *Plectranthus barbatus* Andrews var. *grandis* (L.H.Cramer) Lukhoba & A.J.Paton. (Picture by Geoff R. Nichols)

Fig. 320. *Plectranthus barbatus* Andrews var. *grandis* (L.H.Cramer) Lukhoba & A.J.Paton invasion. (Picture by Neil R. Crouch)

2. *Plectranthus ornatus* Codd

In: *Bothalia* 11: 393 (1975).

=*Coleus comosus* Hochst. ex Gürke

Common names: ornamental spurflower (English); skutblaarsalie, tuinspoorsalie (Afrikaans).

Perennial, decumbent, succulent herb, branching freely at base, up to 30 cm tall. **Leaves** succulent; petiole 2–10 mm long; blade broadly obovate, 20–30 × 15–25 mm, base wedge-shaped, apex obtuse, margin finely crenate-dentate in the upper half, finely to densely downy, lower surface with orange gland-dots, strongly veined below. **Inflorescence** a terminal dense spike-like raceme, 4–9 cm long; bracts large, forming a 4-angled apical cap, greenish white to purple, tipped with dark purple, soon deciduous. **Flowers** in 3-flowered sessile cymes, forming 6-flowered verticils; verticils crowded; pedicels erect. **Calyx** 2-lipped, 6 mm long in fruit, red gland-dotted, densely villous inside. **Corolla** 2–2.5 cm long, bluish mauve, with purple mottling on the upper lip; tube slightly deflexed and expanding towards the throat; upper lip c. 6 mm long, lower lip boat-shaped, 1.2–1.5 cm long, sometimes bifurcate at the apex. **Stamens** 1.2–1.4 cm long, united at the base for 3–4 mm. **Nutlets** 2 mm long, dark brown. **Distribution**: SA. (Fig. 321).

Reference: Van Jaarsveld (2000).

Fig. 321. Distribution map of *Plectranthus ornatus* Codd.

Plectranthus ornatus (Fig. 322) is often confused with the indigenous *Plectranthus neochilus* but may be distinguished on account of its shorter, more compact inflorescence (Fig. 323) and its longer corolla (those of *P. neochilus* attain lengths of only 1.2–2 cm), especially the longer upper lip; the lower lip is additionally often split longitudinally at the apex (Codd, 1975). Both species possess leaves that are unpleasantly scented. *P. caninus* is also closely related to *P. comosus* but has much shorter and less showy corollas (8–10 mm long), and is an annual rather than a perennial (Codd, 1975).

Plectranthus ornatus is native to East Africa including Tanzania and Ethiopia (Codd, 1975), and was introduced for its showy flowers as a horticultural subject

to South Africa, where it subsequently naturalised. It may often be found growing in sites where garden refuse has been dumped, usually close to habitation. It has been encountered fully naturalised away from habitation in remote rural regions such as the lower Thugela Valley.

Fig. 322. *Plectranthus ornatus* Codd. (Picture by Neil R. Crouch)

Fig. 323. Inflorescences of *Plectranthus ornatus* Codd. (Picture by Neil R. Crouch)

MONTIACEAE Raf.

(Rock purslane family; *Klip-porseleinfamilie*)

by

M. Walters and E. Figueiredo

Annual to perennial herbs, rarely subshrubs or semi-aquatic, with or without stems, with or without thickened roots or stems. **Leaves** spiral, frequently rosulate, often succulent, sometimes amplexicaul, usually glabrous with naked leaf axils. **Inflorescence** terminal or lateral, often a cyme, frequently scorpioid or with solitary, axillary flowers. **Flowers** sessile or pedicellate, usually bisexual (both bisexual and unisexual in *Hectorella*), actinomorphic. **Sepals** 2–9, often dry and persistent in fruit. **Petals** 4–5 or up to 19 (*Lewisia*), usually free but sometimes basally connate. **Stamens** as many as petals or numerous (to 100). **Ovary** superior, 1-locular with 2–8 united carpels. **Fruits** 2–3-valved capsules, valves persistent (rarely deciduous) or basally circumscissile, or 1-seeded utricles, dehiscent or not, or 1–2-seeded indehiscent capsules disintegrating with time, sometimes with deciduous calyptra. **Seed** often minutely papillate, with strophiole or elaiosome or not, rarely with thin, fleshy chartaceous aril.

References: Nyffeler & Eggli (2010).

This family (excluding the genera *Hectorella* Hook.f. and *Lyallia* Hook.f.) was until recently considered part of the Portulacaceae, which has been split into four families namely the Portulacaceae, Anacampserotaceae (a newly created family), Montiaceae and Talinaceae (both family names long disused) (Nyffeler & Eggli, 2010; Ocampo & Columbus, 2010). The Montiaceae now includes 15 genera and c. 225 species (Nyffeler & Eggli, 2010). In southern Africa it is represented by a single exotic genus (*Calandrinia* Kunth) and one species (Germishuizen *et al*., 2006; Klopper *et al*., 2006).

The Montiaceae is distributed worldwide but most notably in North and South America (mainly in the west) northern Asia to northern Europe, Australia and New Zealand (Nyffeler & Eggli, 2010) with some species naturalised elsewhere.

Many of the species in this family are used by humans, for both medicinal purposes and as a source of food. The Native Americans for instance use species of *Lewisia* Pursh to treat pleurisy and diabetes while some species of *Claytonia* L. are used as an anti-convulsive and to treat rheumatic pains (Moerman, 2009). In southern Africa no local usage, medicinal or otherwise, has been recorded.

Only one species of Montiaceae is reported as naturalised in southern Africa.

Calandrinia Kunth

Annual or perennial herbs with prostrate to erect stems, simple to branched from the base with glabrous nodes, rarely with tuberous taproots, with unicellular trichomes. **Leaves** alternate, often with the appearance of rosettes, slightly to markedly

amplexicaul; blade linear to oblanceolate, or ovate to spathulate, flattened, glabrous or sparsely covered with unicellular hairs, without stipules. **Inflorescence** with solitary flowers in basal leaf axils or an elongate raceme, bracteate; bracts leaflike, narrowing towards the base of the flowers. **Flowers** bisexual, long pedicellate. **Sepals** 2, often unequal, ovate, distinctly angled or keeled, green, persistent in fruit, glabrous or with unicellular hairs. **Petals** 5–7, usually deep red-purple or rarely white. **Stamens** 3–15, usually opposite petals, free, inserted. **Ovary** with 6–many ovules; style 1; stigmas 3. **Fruit** a 3-valved capsule longitudinally dehiscent from the top, valves persistent and reflexed after dehiscence, margins involute. **Seeds** 10–20, ellipsoid, reticulate or tuberculate, shiny black.

References: Jordaan (2000a), Kelley (2003).

Calandrinia has 14 species native to Australia and North and South America (Jordaan, 2000a) with most of the diversity found in western South America (Kelley, 2003). Several species are cultivated elsewhere as ornamental plants and some of them are edible (Mabberley, 2008).

Calandrinia ciliata (Ruiz & Pav.) DC.

In: *Prodromus Systematis Naturalis Regni Vegetabilis* 3: 359 (1828c).

=*Calandrinia ciliata* (Ruiz & Pav.) DC. var. *menziesii* (Hook.) J.F.Macbr.
=*Talinum ciliatum* Ruiz & Pav.

Common names: desert rock purslane, fringed redmaids, red maids/redmaids (English).

Annual herb up to 3–40 cm high, with prostrate to ascending stems, nearly glabrous to somewhat ciliate. **Leaves** linear to narrowly oblanceolate, up to 1–10 cm long, fleshy, glabrous or with elongate, unicellular hairs. **Inflorescence** racemose with leafy bracts. **Flowers** pedicellate; pedicel 0.4–2.5 cm long. **Sepals** keeled, 2.5–8 mm long, often ciliate on midrib and margins. **Petals** 5, 4–15 mm long, white, pink, red or purple. **Stamens** 3–15, c. ⅔ the length of the petals. **Fruit** a capsule ovoid, 4–5 mm long, slightly larger than the calyx. **Seeds** 10–20, 1–2.5 mm wide, finely reticulate. **Distribution**: SA. (Fig. 324)

Fig. 324. Distribution map of *Calandrinia ciliata* (Ruiz & Pav.) DC.

References: Shreve & Wiggins (1964), Kelley (2003).

This is an ornamental species much cultivated for the solitary, attractive flowers, which can be pink, red, purple or white (Fig. 325). It shows great variation in vegetative characters, especially in size.

Calandrinia ciliata was introduced to southern Africa as an ornamental plant and it has become naturalised in the Western Cape, South Africa (Germishuizen *et al*., 2006). In its native habitat it prefers open grassy areas and meadows at lower elevations, often occurring in cultivated fields or orchards (Thomas, 1991; Vizgirdas & Rey-Vizgirdas, 2009).

Native Americans prized the seed of this plant which they dried over coals, ground and pressed into cakes for eating. They also ate the roots and young stems and leaves (Vizgirdas & Rey-Vizgirdas, 2009). While the leaves and young shoots can be eaten, it should be done in moderation because of their high oxalic acid content (Cribb & Cribb, 1981). No use has been reported from southern Africa.

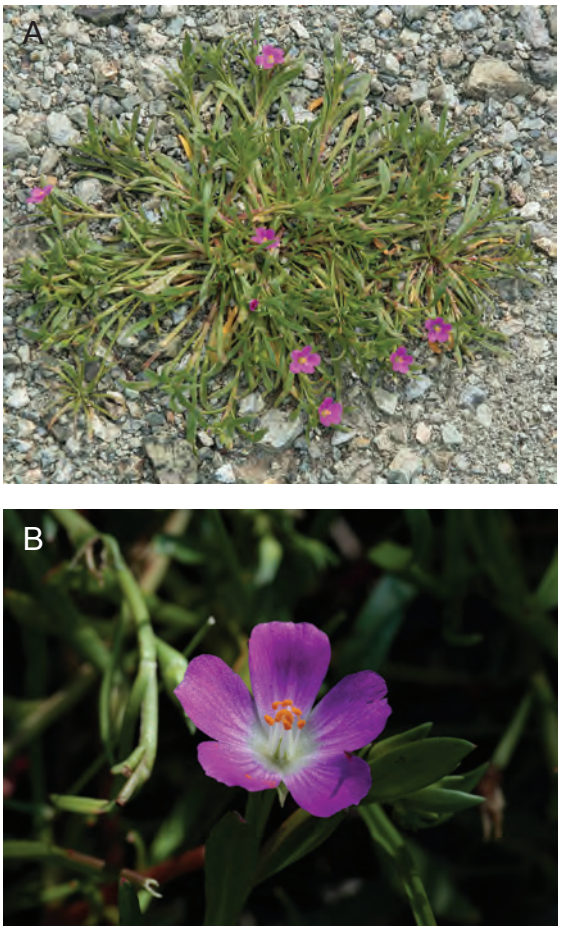

Fig. 325. *Calandrinia ciliata* (Ruiz & Pav.) DC. A. Habit; B. Flower. (Pictures by Lynn Watson)