

## FLORA OF GRÃO-MOGOL, MINAS GERAIS: COMPOSITAE (ASTERACEAE)<sup>1</sup>

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### Key to tribes

1. Phyllaries uniseriate, sometimes with a calyculus
  2. Style-arms with conspicuous appendages; capitula always homogamous and discoid; phyllary margins free; florets all hermaphrodite, never yellow; corolla-lobes relatively short and broad; basal anther appendages obtuse; mature achenes black ..... 7. **Eupatorieae**
  - 2'. Style-arms lacking conspicuous appendages, usually conical, sometimes apically penicillate; capitula heterogamous and radiate or disciform, or homogamous and discoid; phyllary margins partly or wholly connate; florets heterogamous, outer female, or homogamous, usually yellow, sometimes white or purple; corolla-lobes short and narrow or sometimes comparatively long and narrow; basal anther appendages usually sagittate; achenes dark brown or black
    3. Phyllaries with linear glands; achenes black; involucre without calyculus ..... 8. **Heliantheae**
    - 3'. Phyllaries without linear glands; achenes not black; involucre calyculate ..... 6. **Senecioneae**
- 1'. Phyllaries 2- to many- seriate, never with calyculus
  4. Anther bases obtuse to sagittate, but never tailed
    5. Corolla-lobes long-villose pubescent; corolla-lobes erect and uncoiled; corolla pubescent inside and out; pappus uniseriate ..... 1. **Barnadesieae**
    - 5'. Corolla-lobes minutely pubescent or penicillate but never long villose; corolla-lobes usually strongly recurved; corolla glabrous at least inside; pappus of 2 or more series ..... 2. **Mutisieae**
  - 4'. Anther bases tailed
    6. Phyllaries often papery and white or coloured in upper part; corollas regular or radiate; corolla lobes short; leaf bases often decurrent ..... 4. **Inuleae**

- 6'. Phyllaries herbaceous or chartaceous, occasionally with scarious margin; corollas bilabiate or long 5-lobed; corolla lobes long; leaf-bases not decurrent
- 7. Capitula homogamous and all florets hermaphrodite
  - 8. Style-arms acute, narrow and long; corolla-lobes l:b ratio > 2; achenes not black; pappus usually of hairs or sometimes scales in two series; leaves usually alternate ..... 3. **Vernonieae**
  - 8'. Style-arms obtuse,  $\pm$  club-shaped, conspicuous and long-exserted; corolla-lobes short l:b ratio < 2; achenes black; pappus of hairs or scales in one series; leaves usually opposite ..... 7. **Eupatorieae**
- 7'. Capitula heterogamous or homogamous, if homogamous then florets unisexual
  - 9. Pappus of awns or scales; achenes usually black; receptacle paleate ..... 8. **Heliantheae**
  - 9'. Pappus of capillary hairs, a corona or absent; achenes often flattened with 2 marginal veins, occasionally ribbed, never black; receptacle naked or glandular ..... 5. **Astereae**

### Tribe 1. **Barnadesieae**

Herbs, shrubs or trees. Leaves always alternate, sometimes with axillary spines, rigid to coriaceous, usually pubescent, hairs uniseriate, rarely malpighiaceous, and never stipitate-glandular, margins entire, rarely serrate, apices usually acute, usually unarmed, sometimes spiny. Inflorescence scapose or paniculate, terminal to subterminal. Capitula medium sized to massive, campanulate, homogamous and discoid, rarely heterogamous and disciform with outer florets functionally female; involucre imbricate; phyllaries multiseriate, membranous to subcoriaceous but never leaf-like; receptacle paleaceous or epaleaceous. Florets  $\infty$ , yellow, white, red or violet; corolla actinomorphic and 5-lobes or slightly zygomorphic with one or two sinuses deeper than others between lobes, or completely zygomorphic, subbilabiate or subligulate, corolla-lobes long villose, rarely shorter and more rigid, lobes usually erect and uncoiled; basal anther appendages shortly sagittate or long-tailed, apical anther appendages tapering but not apiculate; style glabrous or papillose; style-arms short, thickened apically. Achenes turbinate to cylindrical, never beaked, usually terete to indistinctly ribbed, truncate, setuliferous, setulae long-villose, tapering; pappus setae uniseriate, usually appearing plumose, rachis broadened with short to  $\pm$  long lateral branches.

A tribe of nine genera and ca. 88 species restricted to South America with the greater part of the tribe being found in the Andes.

#### 1. *Dasyphyllum* Kunth

Erect or procumbent shrubs or small trees. Stems usually pubescent at first becoming glabrous, often persistently axillary spiny, sometimes unarmed. Leaves alternate, shortly petiolate or pseudopetiolate, coriaceous, strongly single-veined or more usually trinervate or pentanervate from base, margins entire, apex usually mucronate or spiny. Inflorescence corymbose or racemose, or capitula solitary; capitula small medium or large, sessile or pedicellate; involucre campanulate, imbricate; phyllaries multiseriate, outer series gradually smaller and narrower, apex frequently mucronate or spiny; receptacle  $\pm$  flat, pubescent, sometimes scaly but not uniformly scaly, scales membranous, lanceolate. Florets 5- $\infty$ , usually hermaphrodite, sometimes unisexual by atrofication of anthers or styles, homomorphic or slightly heteromorphic, white to cream or yellowish; corolla sometimes tubular, actinomorphic, 5-lobed, or slightly zygomorphic with one or two sinuses deeper than others between lobes, or completely zygomorphic, subbilabiate or subligulate, throat usually pubescent inside, glabrous or villous outside; corolla-lobes erect, ascending or usually recurved, usually densely long pubescent towards apex outside, rarely  $\pm$  glabrous; basal anther-appendages shortly sagittate, apical appendage bilobed, emarginate or rarely truncate; style glabrous, sometimes papillose in upper part; style-arms short, barely divided, usually papillose in upper part. Achenes obovoid, usually densely long-setuliferous, rarely glabrous; pappus-setae often much longer than corolla, plumose.

A genus of 36 species (Cabrera 1959), largely restricted to the mountains of Brazil, Paraguay and Argentina.

- 1. Leaves glabrous above and beneath at maturity; phyllaries glabrous ..... *D. sprengelianum*
- 1'. Leaves  $\pm$  densely pubescent beneath at maturity (glabrous or glabrescent above); phyllaries densely pubescent ..... *D. candolleianum*

1.1. *Dasyphyllum candolleianum* (Gardner) Cabrera, Revista Mus. La Plata, Secc. Bot. 9: 86. 1959.

Shrub to 2 m. tall. Stems at first whitish-tomentose becoming glabrescent, striate, spiny bearing a pair of axillary spines, spines 0.5-2.5 cm long. Leaves subsessile to short-petiolate, to ca. 5 mm long, oblanceolate or elliptic, 2.5-5 cm × 1-2 cm, base acute to obtuse, ± densely tomentose beneath, sparsely long-pubescent above, appearing glabrescent or becoming glabrescent with age, margins entire, apex acute to ± obtuse, usually short-mucronate. Inflorescence a solitary terminal capitulum. Capitula sessile often subtended by a terminal cluster of leaves; involucre 2-2.6 cm tall × ca. 2.5 cm diam., campanulate; phyllaries 8-9-seriate, castaneous, densely white pubescent, margins ciliate, apices acute, mucronate. Florets 20-25, white to cream; corolla ca. 7 mm long, markedly five-lobed, long-pubescent, hairs sparse to numerous; corolla-lobes ca. 8 mm long, apices densely long-pubescent. Achenes 4-4.5 mm long; pappus ca. 1.8 cm long, whitish.

*Oliveira et al. CFCR 13091* (K, SPF); *Pirani et al. CFCR 10892* (K, SPF).

Apparently widespread in Bahia, Distrito Federal, Goiás, Minas Gerais and Pernambuco.

Woodland margins. Flowering time: May - August.

This species is very similar to the variable *D. velutinum* (Baker) Cabrera, but has smaller fewer-flowered capitula. The long-pubescent corolla-tube suggests more variability in this character than indicated by Cabrera (1959).

1.2. *Dasyphyllum sprengelianum* (Gardner) Cabrera var. *sprengelianum*, Revista Mus. La Plata, Secc. Bot. 9: 92. 1959.

Shrub ca. 0.75(-2.5) m tall. Stems striate, glabrous, nodes persistently spiny, spines 5-18 mm long. Leaves alternate, subcoriaceous, short-petiolate or pseudo-petiolate, elliptic to oblanceolate, 2-6 cm × 0.9-2.5 cm, trinervate, young leaves villous on both surfaces, hairs long, simple, eglandular, adult leaves becoming glabrous on both surfaces, margins entire, apex acuminate. Inflorescence axillary or terminal; capitula solitary, essentially sessile, on short leafy shoots; involucre campanulate, 2.5-3 cm tall × 1.1-1.8 cm diam.; phyllaries glabrous, shiny, margins densely ciliate, apices acute, mucronate. Florets 40-60, cream; corolla-tube 8.5-9 mm long, slightly dilated towards base, glabrous outside or sometimes with few scattered long simple hairs, densely hairy inside throat and corolla-tube, main sinus 4-7 mm deep, corolla-lobes 2-2.5 mm long, with few scattered long simple hairs, penicillate at apex, hairs 1.5-2 mm long; anther-appendages ca. 1 mm long, deeply bifid; style glabrous; style-arms shortly papillose. Achenes 5-6 mm long; pappus-setae ca. 1.3 cm long. (Fig. 1. A-B)

*Cavalcanti et al. CFCR 8500* (K, SPF); *Mello-Silva & Cordeiro CFCR 10073* (K, SPF); *Oliviera et al. CFCR 13132* (K, SPF); *Silva et al. CFCR 13412* (K, SPF).

Widespread in eastern Brazil. Cerrado. Flowering time: June - September.

Variable in spination and leaf shape. Cabrera (1959) recognised two varieties.

## Tribe 2. Mutisieae

Annual or perennial herbs, subshrubs, shrubs, or less commonly trees or rarely climbers. Leaves alternate or rarely opposite, sometimes with axillary spines, sometimes rosulate, herbaceous or coriaceous, sometimes ± fleshy, usually unarmed, sometimes spiny; lamina entire, dentate or pinnatifid, rarely dissected. Inflorescence scapose or of variously aggregated capitula, rarely as synflorescences. Capitula heterogamous and radiate or subradiate or homogamous and discoid; phyllaries often chartaceous, multiseriate, rarely herbaceous and few-seriate; receptacle usually naked, or short-pilose or fimbriate, rarely paleaceous. Florets few to many, yellow, white, pink, or blue to purple. Corolla bilabiate (in ray florets, outer lobe with three, rarely four teeth, in disc florets, corolla usually 2-fid with a 3-toothed outer and 2-toothed inner lobe, or rarely equally 5-toothed), or rarely all florets equally 5-toothed or all ligulate; anther bases conspicuously tailed, sometimes branched, apical appendages usually very long, sometimes coloured; style-arms often short, obtuse, glabrous or pilose, or truncate and fringed, sometimes penicillate. Achenes turbinate or obconic, truncate, terete or ribbed, glabrous or hairy, attenuate or beaked; pappus of one or more series of simple, barbellate or plumose setae, or paleaceous and scale-like, sometimes absent, white, straw-coloured, red or purple.

A tribe of four subtribes containing ca. 90 genera and 970 species, chiefly tropical in distribution. About half the genera are monotypic, and the largest, *Gochnatia*, has more than 60 species. The main centre of distribution of the tribe is tropical and subtropical America, with few representatives in Africa, Asia, Australia and Hawaii.

1. Disc-florets bilabiate or ligulate; corollas bright yellow; leaves viscid ..... *Trixis*
- 1'. Disc-florets five-lobed, lobes subequal; corollas purple, white, or cream but never bright yellow, leaves never viscid
  2. Receptacle paleaceous; pappus setae  $\pm$  subpaleaceous, scarcely barbellate; capitula massive; leaves large ..... *Wunderlichia mirabilis*
  - 2'. Receptacle naked; pappus setae of  $\pm$  capillary bristles, barbellate; capitula small to medium; leaves small to medium
    3. Trees or shrubs; pappus biseriate, setae free at base; inflorescences corymbose or racemose, of numerous capitula; capitula only discoid; plants dioecious or gynodioecious ..... *Gochnatia*
    - 3'. Subshrubs or herbs; pappus uniseriate, setae connate at base; inflorescences scapose or laxely cymose with few capitula; capitula radiate or discoid; plant monoecious ..... *Richtera*

## 2. *Gochnatia* Kunth

Dioecious or gynodioecious shrubs or trees, rarely suffrutescent. Stems frequently tomentose, indumentum of simple crisped, stellate or 'T'-shaped hairs. Leaves alternate, petiolate, rarely sessile, usually tomentose or lanose beneath, margins entire or dentate, coriaceous or subcoriaceous. Inflorescence corymbose, racemose with numerous capitula; capitula sessile or pedicellate; involucre campanulate or turbinate; phyllaries multiseriate, imbricate, usually coriaceous; receptacle epaleaceous, rarely with some paleae,  $\pm$  alveolate, usually glabrous, rarely glandular or pubescent. Florets few to many, isomorphic, cream to yellow or white; corolla actinomorphic, glandular-punctate, stipitate-glandular or glabrous; corolla-lobes linear, apices acute, recurved, much shorter, equal or much longer than corolla-tube; basal anther-appendages linear, entire or lacinate, with antrorse or retrorse lacinia, apical anther-appendages lanceolate, contracted at apex into  $\pm$  broad point; style shortly bifid or bilobed; style-arms rounded at apices lacking collecting hairs. Achenes turbinate, densely setuliferous, glandular-punctate; pappus-setae 2- or more seriate, of numerous unequal rigid barbellate setae, setae free to base.

A genus of 66 species, mostly neotropical. Many species are extremely variable and several are very similar in appearance. Many species are certainly under-recorded in Brazil.

2.1. *Gochnatia floribunda* Cabrera, Revista Mus. La Plata, Secc. Bot. 12(66): 125. 1971.

Shrub to small tree to 3.5 m tall, dioecious. Stems densely grey-tomentose. Leaves petiolate, petiole to 1 cm, lamina elliptic-lanceolate, 9-16 cm  $\times$  3-18 cm, subcoriaceous, base attenuate, grey-tomentose beneath, hairs malpighiaceous, sessile, glabrous and shiny above, margins entire, apex acute to obtuse. Inflorescence terminal and subterminal, paniculate, capitula many. Capitula pedicellate, pedicels 1-5 mm long, ebracteolate; hermaphrodite involucre campanulate, female involucre turbinate, 5-6 mm tall  $\times$  ca. 5 mm diam.; phyllaries 4-seriate, outer sparsely pubescent, inner glabrous, margins ciliate, apices acute. Florets 8-10, creamish-yellow;

corolla-tube ca. 3 mm long, glabrous; corolla-lobes ca. 3 mm long, linear, glabrous. Achenes ca. 2.5 mm long; pappus-setae 4.5-5 mm long, whitish. (Fig. 1. C-E)

*Oliviera et al. CFCR 13196* (SPF); *Pirani et al. CFCR 13301* (K, SPF) (♀).

Widespread from Bahia, Distrito Federal, Goiás, Minas Gerais, Rio de Janeiro and São Paulo. Common in cerrado in stony soil. Flowering time: June - September. Collecting notes indicate that the florets have an agreeable, sweet smell and are visited by bees. I am not sure if there is any useful distinction between this taxon and *Gochnatia hatschbachii* Cabrera, except the less dense indumentum mentioned in the protologue of the latter.

## 3. *Richtera* Kuntze

Subshrubs or herbs, often single-stemmed, with alternate leaves or stems effectively and leaves rosulate, stem of most species with dense basal tuft of long, often straw-coloured or ferruginous hairs. Leaves sessile, distinctly petiolate or long-pseudopetiolate, lamina linear, obovate or spatulate, leaf surfaces glabrous or lanate at first, glabrescent in age, hairs with extremely long flagelliform apices which are soon lost leaving stocky erect basal portion, sometimes also glandular-punctate, leaf margins entire or denticulate, flat or revolute, apices acute or

obtuse. Inflorescences of solitary capitula and scapiform or in a few-headed panicle; pedicels barbate, bracteoles scale-like; capitula radiate or discoid; involucre campanulate to hemispherical or turbinate; phyllaries multiseriate, gradate, imbricate, sericeous outside, margins entire, apices long-acute; receptacle flat to slightly convex, alveolate, glabrous, epaleaceous. Ray florets, when present, uniseriate, white, pink or purplish; corollas bilabiate, outer lip 3- or sometimes 4-toothed, the inner lip of two long lobes (or one if outer lip 4-toothed); inner corolla lobes tightly coiled, sometimes with few deciduous long eglandular hairs; staminodes with long apiculate apices, bases caudate and pilose; style arms glabrous, moderately long, scarcely divergent. Disc florets numerous, multiseriate, hermaphrodite, fertile, white, creamish or pink; corolla actinomorphic, deeply 5-lobed; corolla tube slightly expanded at very base, expanding slightly towards throat, sometimes with simple, long, eglandular hairs; corolla lobes tightly coiled, densely glandular-punctate towards apices, occasionally with long persistent hairs, sometimes with deciduous long hairs; apical anther appendages acuminate to apiculate; basal anther appendages caudate, lacinate; style arms relatively short, sometimes scarcely divergent. Achenes cylindrical, densely setuliferous, setulae of 'twin hairs'; carpodium annular, pappus setae uniseriate, setae basally connate, barbellate, white to off-white or straw-coloured.

A genus of c. 10 species, endemic to Brazil and restricted to campos rupestres and cerrado. Several species belonged to *Gochnatia* 'sect. *Discoseris* (Endl.) Cabrera'.

3.1. *Richterago discoidea* (Less.) Kuntze, Rev. gen. pl. 1: 360. 1891.

Subshrub 0.2-1 m tall. Stems ascending or erect, simple or occasionally branched, leafy in the upper part, densely tomentose. Leaves usually few,  $\pm$  coriaceous, lower shortly petiolate, upper sessile, densely rufescent-tomentose, lamina elliptic or ovate, (3-)7-15 cm  $\times$  (1-) 2.5-4(-7) cm, base rounded, tomentulose to scattered pubescent and glandular-punctate beneath, tomentulose or glabrous above, margins entire or shortly denticulate, apex rounded, rarely acute. Inflorescence terminal, few-headed in a lax cyme; capitula pedicellate, pedicels 1-6.5 cm long, tomentose; involucre campanulate, ca. 1 cm tall  $\times$  ca. 1.5 cm diam.; phyllaries 4-5-seriate, linear-

lanceolate, acute, sericeous-tomentose outside, glandular-punctate. Florets numerous, hermaphrodite, cream to white; corolla-tube stipitate-glandular; corolla-lobes stipitate-glandular and penicillate. Achenes ca. 3 mm long; pappus-setae 6-8 mm long.

*Cavalcanti et al. CFCR 8452* (K, SPF); *Giulietti et al. CFCR 9930* (K, SPF); *Hatschbach 41538* (MBM, SPF); *Pirani et al. CFCR 12913* (K, SPF, TEX/LL).

A widespread species occurring in Matto Grosso, Minas Gerais and Bahia. Usually common in sandy soil in campos rupestres and marshy areas in open campo. Flowering time: June - October.

A very variable species in the number, shape and pubescence of the leaves, and also the number of capitula.

#### 4. *Trixis* P. Browne

Perennial herbs, subshrubs or shrubs. Stems often winged, usually leafy. Leaves alternate, sometimes in a basal rosette, usually with decurrent leaf bases. Inflorescences corymbose, paniculate or rarely solitary. Capitula homogamous, subsessile to distinctly pedicellate; involucre cylindrical, campanulate or hemispherical; phyllaries imbricate, usually biseriate, rarely uniseriate or triseriate; receptacle flat, pilose. Florets few to many, hermaphrodite, yellow to orange; corolla bilabiate, outer lobe tridentate, inner profoundly bifid; basal anther-appendages sagittate; apical anther-appendages lanceolate, apices acute; style-arms truncate and penicillate at apex. Achenes 5-ribbed, cylindrical to turbinate,  $\pm$  beaked, usually setuliferous; pappus-setae 2-3-seriate, barbellate, white, yellowish or reddish.

A New World genus of about 60 species ranging from the USA south to Chile and Argentina.

1. Leaf bases decurrent on stems; pubescence of two sorts, simple eglandular hairs /and stipitate-glands; outer series of phyllaries narrowly-lanceolate, similar to inner, apices long-attenuate, stipitate-glandular ..... *T. vauthieri*
- 1'. Leaf bases not decurrent; pubescence of long simple hairs only; outer series of phyllaries broadly-lanceolate, foliaceous, apices acute, eglandular ..... *T. ophiorhiza*

4.1. *Trixis ophiorhiza* Gardner, London J. Bot. 6: 461. 1847.

Shrub to 2 m tall. Stems poorly branched towards apex, wingless, tomentose becoming glabrescent. Leaves sessile, oblong-lanceolate, 5-15 cm × 1.5-3(-5) cm, discoloured, densely grey-green tomentose beneath, darker green tomentose above, pubescence less dense, margins barely revolute, apex acute to acuminate. Inflorescence terminal, corymbose-paniculate, leafy, tomentose. Capitula subsessile to pedicellate; involucre campanulate, ca. 1.5 cm tall × ca. 8 mm diam.; phyllaries biseriate, outer series foliaceous, broadly lanceolate, about 2/3 of inner, tomentose. Florets ca. 20, yellow; corolla-tube ca. 1 cm long, glabrous. Achenes ca. 6 mm long, setuliferous; pappus-setae ca. 1 cm long, straw-coloured. (Fig. 1. F-G)

*Hatschbach et al. 52113* (SPF).

A scattered distribution in Goiás and northern Minas Gerais. Cerrado and campos rupestres in sandy soil. Flowering time: May - July.

The material from Grão-Mogol has entire leaf margins whilst much other material of this species has finely serrate margins.

4.2. *Trixis vauthieri* DC., Prodr. 7: 69. 1838.

Shrub or small tree to 1-2.5 m tall. Stems striate to winged. Leaves alternate, sessile, lanceolate, 3.5-11 cm × (0.3-)0.7-1.3(-2) cm, velutinous to beneath, pilose, viscid with short stipitate-glandular hairs above, margins entire, apex acute to attenuate. Inflorescence terminal, densely corymbose; capitula pedicellate; involucre ± cylindrical; phyllaries biseriate; receptacle ± flat, fimbriate. Florets ca. 20-25, yellow; corollas throat pilose, corolla-tube 5-6 mm long, bilabiate, all segments stipitate-glandular outside towards apex, ± penicillate at apex, glabrous inside. Achene ca. 5 mm long, contracted towards apex, densely covered with broad setulae; pappus setae 6.5-8 mm long, united at base into narrow disc, fragile, densely coarsely barbellate, whitish or pale reddish.

*Esteves et al. CFCR 13283* (K, SPF); *CFCR 9835* (K, SPF); *Pirani et al. CFCR 12902* (SPF), *CFCR 13414* (SPF).

Widespread in Brazil: Bahia, Minas Gerais, Mato Grosso, Piauí, Rio de Janeiro. Amongst rocks in carrasco and cerrado. Flowering time July-October.

This species appears to be very variable in leaf size and the size of the inflorescences.

## 5. *Wunderlichia* Riedel ex Benth. & Hook.f.

Shrubs or trees. Stems usually virgate when young, glabrous or tomentose. Leaves alternate, deciduous, pinnately veined, initially tomentose becoming glabrate with age, margins entire. Inflorescence solitary, of terminal capitula, densely paniculate, or laxly racemose; capitula medium or large, homogamous, discoid; involucre campanulate, globose or infundibuliform; phyllaries 5-10-seriate, imbricate, persistent, glabrous or tomentose; receptacle flat to convex, paleaceous; paleae simple or divided, apices usually acicular. Florets actinomorphic, many (-300+), yellowish to cream; corolla glabrous; corolla-lobes linear, coiled throughout, or only at apex; filaments long, often 'swan-necked' at anthesis; anther-cylinder usually well exerted; basal anther-appendages sagittate; style glabrous, long exerted; style-base enlarged or not enlarged; style-arms short, scarcely divided. Achenes 10-ribbed, glabrous or setuliferous; pappus-setae 3-4-seriate, falling as a unit, subpaleaceous, sometimes barbellate below and densely plumose above.

A genus of five species endemic to Brazil, found in the States of Bahia, Espírito Santo, Goiás, Minas Gerais, and Rio de Janeiro.

5.1. *Wunderlichia mirabilis* Riedel ex Baker in Mart. & Eichler, Fl. bras. 6(3): 343. 1884.

Tree, 3-10 m tall, bark deeply and irregularly fissured. Leaves petiolate, lamina coriaceous, broadly ovate, obovate or suborbicular, (8-)16-25 cm × (6-)14-25 cm, strongly pinnately veined, venation prominent beneath, base obtuse to ± acute, both surfaces densely tomentose becoming glabrate, sparsely to ± densely glandular-punctate beneath, apex rounded. Inflorescence a solitary massive terminal capitulum.

Capitula pedunculate, peduncle densely lanate or tomentose, bracteolate; involucre campanulate, ca. 5 cm tall × 8-9 cm diam.; phyllaries 4-6-seriate, densely tomentose, hairs to ca. 1.5 cm long, margins inconspicuously scarious; receptacle paleaceous, paleae flat, simple or divided, ca. 2 cm long. Florets 300+, cream; corolla-tube 3.4-3.7 cm long, corolla-lobes 2-2.4 cm long; anthers ca. 2 cm long, pale-yellow to cream. Achenes ca. 1 cm long, densely setuliferous; pappus-setae ca. 2.5 cm long, straw-coloured to pinkish at base. (Fig. 1. H-K)

*Assis et al. CFCR 11410* (SPF, UEC); *Campos et al. CFCR 13447* (K, SPF); *Harley et al. 25057* (K, SPF); *Magalhães & Maguire 49234* (RB, NY); *Maguire et al. 49282* (RB, NY); *Mello-Silva & Cordeiro CFCR 10018* (K, SPF); *Zappi et al. CFCR 8373* (K, SPF).

Widespread in Bahia, Espírito Santo, Goiás and Minas Gerais. Commonly found growing in drier sandy soil amongst rocks in campos rupestres. Flowering time: June - December.

### Tribe 3. Vernonieae

Perennial herbs, rarely annuals, shrubs, climbers or trees. Rootstock fibrous or a woody xylopodium, sometimes subfleshy. Stems variously pubescent or glabrous, often glandular-punctate. Leaves usually alternate, sessile or petiolate, occasionally lobed, lamina variously pubescent, sometimes glandular-punctate. Inflorescences few- to many-headed, sometimes with reduced capitula and syncephalous. Capitula homogamous, 1- to many-flowered. Involucre usually ovoid or globular, phyllaries many, closely or loosely imbricate in several series, rarely few in a single series; receptacle flat or  $\pm$  convex, smooth or pitted, rarely alveolate, sometimes with scales. Florets usually hermaphrodite, rarely unisexual. Corollas tubular, usually regular and 5-lobed, deep purplish-red to white or blue, rarely cream or yellowish, often glandular; anthers with a terminal appendage, sagittate at base, auricles obtuse, acute or rarely tailed; style-arms semi-cylindrical, long, slender, apices acute or obtuse, usually short-hirsute throughout, rarely glabrate. Achenes variable, terete or slightly flattened, often 10-ribbed, often scutiferous, sometimes glandular-punctate; pappus usually elongate and barbellate, sometimes flattened and biseriata, outer series often reduced, rarely absent.

A tribe of about 70 genera and 1400 species, chiefly tropical in distribution. About half the genera are monotypic and the largest genus, *Vernonia* Schreb., contains ca. 1000 species. The main centres of distribution are Brazil and tropical Africa.

1. Capitula simple (i.e. only with primary phyllaries and individual capitula easily recognizable and no secondary receptacle present)
  2. Herbs ..... *Vernonia*
  - 2'. Trees or shrubs
    3. Pappus appearing capillary, although setae often flattened, barbellate
      4. Capitula with 1-3 florets; leaves coriaceous, glabrous above ..... *Moquinia racemosa*
      - 4'. Capitula with 5 or more florets; leaves membranaceous or subcoriaceous, variously pubescent ..... *Vernonia*
    - 3'. Pappus broad and paleaceous, margins laciniate
      5. Rosettiform subshrub; leaves concolorous, densely silvery- to grey-sericeous pubescent, margins flat; phyllary apices erect to spreading,  $\pm$  spiny and long-attenuate ..... *Proteopsis argentea*
      - 5'. Scandent, erect or ascending shrubs, or trees; leaves discolorous, or if concolorous never sericeous pubescent, margins usually revolute; phyllary apices never spiny, erect and never spreading, obtuse, acute or acuminate
        6. Capitula all axillary in dense clusters; phyllaries rapidly deciduous ..... *Piptocarpha*
        - 6'. Capitula terminal, solitary or numerous, or aggregated into synflorescences; phyllaries usually persistent and only very tardily deciduous
          7. Plants ericoid; leaves sticky; capitula solitary or aggregated but never on a secondary receptacle; pappus of two subequal series ..... *Piptolepis*
          - 7'. Plants not ericoid; leaves not sticky; capitula aggregated onto secondary, usually paleaceous receptacles; pappus obviously biseriata, outer series shorter ..... *Lychnophora*
  - 1'. Capitulescence a synflorescence (i.e. usually with 2° phyllaries, and small 1° capitula) or usually with a recognizable secondary receptacle of glomerules
    8. Leaves lanceolate or linear ..... *Lychnophora*
    - 8'. Leaves elliptical, ovate to obovate or oblong
      9. Pappus 3-4-seriate; glomerules numerous, in cymes ..... *Eremanthus*
      - 9'. Pappus biseriata; glomerule solitary, axillary or terminal
        10. Leaves petiolate; glomerules solitary, distinctly pedunculate ..... *Paralychnophora bicolor*
        - 10'. Leaves sessile or subsessile; capitulescence of numerous racemose-paniculately arranged glomerules ..... *Lychnophora*

NB. Generic affinities of several taxa in this tribe have been questioned by a number of authors and, although these problems have not been fully resolved, identification of the plants should not be affected.

## 6. *Eremanthus* Less.

Subshrubs, shrubs or trees. Stems lanate-tomentose or grey lepidote-tomentose, branches few to many. Leaves alternate, cauline, coriaceous to membranous, usually restricted to the ends of branches, subsessile to petiolate, lamina elliptic to obovate, base acuminate to obtuse, sometimes auriculate, panduriform or retuse, pubescent to lepidote beneath, glabrate to lepidote above, margins entire, apex acuminate to obtuse. Inflorescences terminal on branches, of 8-60 (-100) glomerules, densely corymbose, cymose or clustered in synflorescences or glomerulescences, peduncles bracteate, bracts leaf-like; glomerules hemispherical to spherical containing 1-100 capitula per glomerule; capitula homogamous, discoid, few-flowered, typically 1-flowered; involucre obconic or cylindrical, subimbricate; phyllaries 4-7-seriate, inner series deciduous at maturity, margins  $\pm$  scarious, entire to  $\pm$  fimbriate, surface glabrate to lanate- or lepidote-tomentose. Florets 1-3 (4) per capitulum, reddish to purple or white; corollas glabrous; anther-appendages glabrous; style-base lacking basal node; style-arms filiform, pubescent beneath. Achenes usually 10-ribbed, prismatic or slightly obcompressed, glandular-punctate, glabrous or sericeous, apex constricted; pappus-setae 3-5-seriate, outer series 0.4-3 mm long, paleaceous, inner pappus 3-8 mm long, persistent to promptly deciduous, filiform, barbellate, straw-coloured, white or purplish.

A genus of eighteen species essentially restricted to the Central Plateau of Brazil and often a dominant feature of the landscape. Robinson's concept of the genus (Robinson 1996) is a broad concept including *Paralychnophora* MacLeish, I feel (Hind 2000c) that this is unjustified and that *Paralychnophora* can be perfectly easily distinguished and separated based on a number of characters.

1. Glomerule appearing hemispherical to spherical, individual capitula  $\pm$  completely fused to each other; pappus often whitish or straw-coloured ..... *E. incanus*
- 1'. Glomerules of scarcely fused, or  $\pm$  free capitula; pappus often purple, sometimes straw-coloured
  2. Capitula 9-20 per glomerule, closely appressed and coherent by ca.  $\frac{1}{2}$  length; florets 1 per capitulum; inner phyllaries glabrous ..... *E. polycephalus*
  2. Capitula 6-12 per glomerule, slightly appressed, free; florets 3-4 per capitulum; inner phyllaries tomentose ..... *E. eleagnus*

6.1. *Eremanthus eleagnus* (Mart. ex DC.) Sch.Bip., Jahreshber. Pollichia 20/21: 395. 1863.

Small tree to 5 m tall. Stems grey lepidote-tomentose. Leaves coriaceous, sessile to petiolate or pseudopetiolate, lamina narrowly-elliptic, 5-12 cm  $\times$  1.5-3 cm, base acute to acuminate, densely grey lepidote-tomentose beneath, sparsely lepidote above, appearing glabrous, margins entire, apex acute to rounded. Inflorescence a compound cyme of 10-60 glomerules, glomerules 0.5-1 cm tall  $\times$  1-1.5 cm diam., hemispherical. Capitula 9-20 per glomerule, closely appressed basally but otherwise free; involucre cylindrical, 0.5-1 cm tall  $\times$  2.5-4 mm diam.; phyllaries 4-5-seriate, outer surfaces tomentose. Florets 3-4 per capitulum, cream, sometimes purplish; corolla-tube 2.5-3 mm long; corolla-lobes 2-2.5 mm long, glandular-punctate outside. Achenes 2.5-3 mm long, body setuliferous, glandular-punctate; pappus-setae 3-4-seriate, outer series 1-1.5 mm long, inner series 6-6.5 mm long, straw coloured (in flora material) but usually purple. (Fig. 1. L-M)

*Esteves et al. CFCR 13293* (SPF); *Mello-Silva et al. CFCR 9844* (K, SPF); *Pirani et al. CFCR 12927* (K, SPF); *Simão-Bianchini et al. CFCR 13174* (K, SPF).

Apparently restricted to the Serra do Espinhaço in northern Minas Gerais. Often in dense stands in sandy soil in cerrado, and carrasco etc. Flowering time: August - September.

6.2. *Eremanthus incanus* (Less.) Less., Linnaea 6: 682. 1831.

Tree 2-10 m tall. Stems grey-brown lepidote. Leaves coriaceous, petiolate; lamina elliptic to ovate, 5.5-14 cm  $\times$  2-6 cm, grey lepidote beneath, glabrate above, base acute, margins entire, apex rounded to obtuse. Inflorescence a glomerulescence, pedunculate, peduncle to 27 cm long, grey lepidote, inflorescence a compound cyme of 8-50 glomerules; glomerules 0.5-1.5 cm tall  $\times$  0.7-1.5 cm diam., subtended by a cluster of reduced leaf-like bracts; capitula 30-100 per glomerule; involucre 2.5-

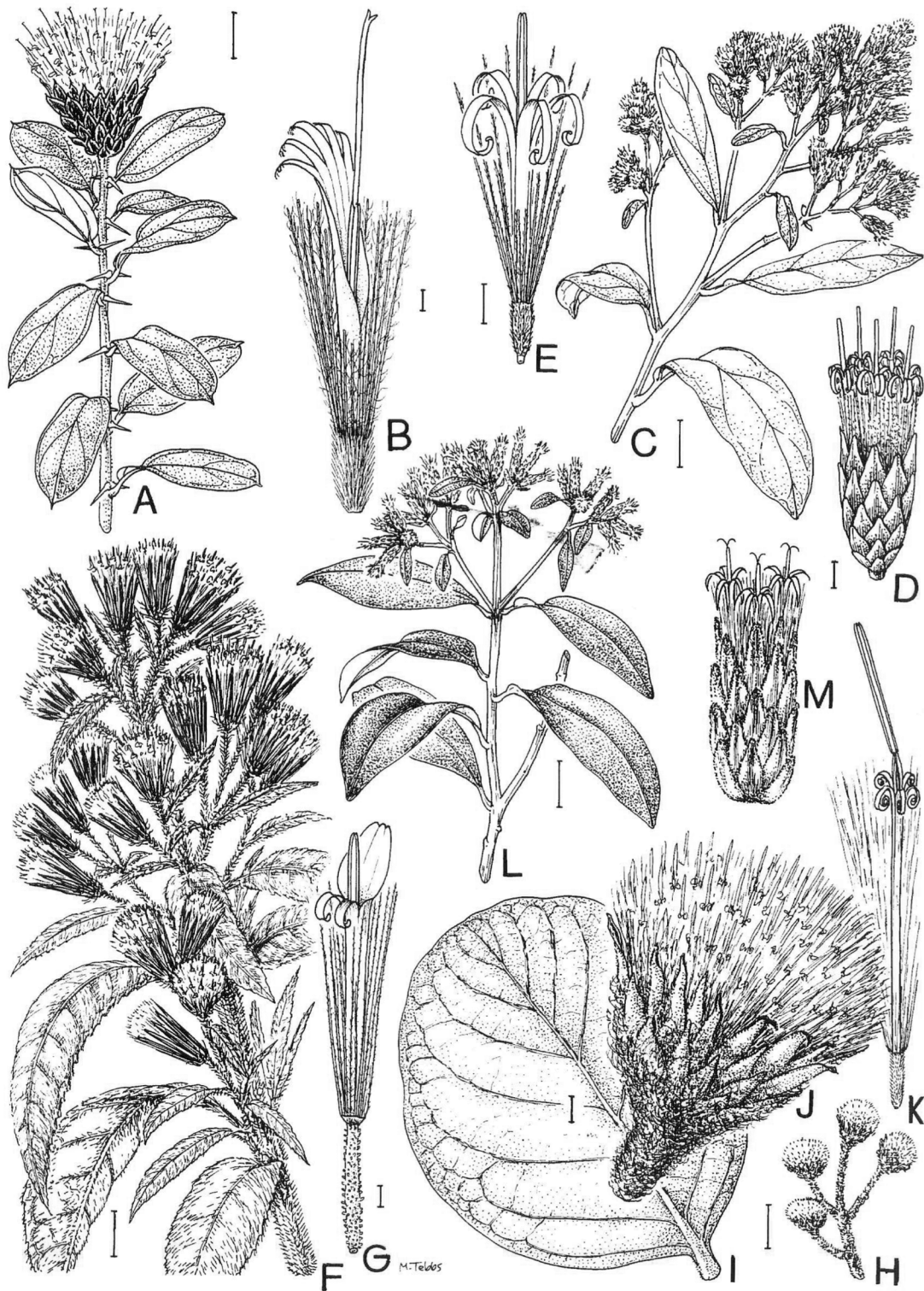


Fig. 1. COMPOSITAE. BARNADESIOIDEAE: A-B. *Dasyphyllum caudoleanum*: A. flowering shoot; B. floret (Cabrera 1989). MUTISIEAE: C-E. *Gochnatia floribunda*: C. flowering shoot; D. capitulum; E. floret (Gardner 4805, isoelectotype); F-G. *Trixis ophiorrhiza*: F. flowering shoot; G. floret (Gardner 4959, isosyntype); H-K. *Wunderlichia mirabilis*: H. flowering shoot; I. leaf; J. capitulum; K. floret (Harley et al. 25057). VERNONIEAE: L-M. *Eremanthus eleagnus*: L. flowering shoot; M. capitulum (Simão-Bianchini et al. CFCR 13174). Scale bars: B, D/M, E, G, K = 1 mm; A, C, F, I/J, L = 10 mm; H = 15 mm.

5 mm tall, 0.3-1.5 mm diam., cylindrical; phyllaries 4-5-seriate, outer phyllaries triangular, inner narrowly angular-obovate, tomentose, margins entire, apex acuminate. Florets 1 per capitulum, pale purple to white; corolla-tube 2.5-3 mm long, glabrous; corolla-lobes ca. 2.5 mm long, glabrous. Achenes  $\pm$  cylindrical, 2-2.5 mm long, 15-20-ribbed, glandular-punctate, sparsely sericeous; pappus-setae 3-4-seriate, outer series 1-1.5 mm long, inner series 5-6 mm long, subcoroniform, barbellate, off-white to purple (often at base of setae).

*Cordeiro & Mello-Silva CFCR 10058* (K, SPF); *Pirani et al. CFCR 13081* (SPF), *CFCR 13294* (K, SPF), *CFCR 13467* (K, SPF).

Widespread in Minas Gerais and Bahia. Cerrado, secondary forest and caatinga. Flowering time: July - October.

Collecting notes indicate that the florets of this species are perfumed. *Eremanthus incanus* is similar to *E. glomerulatus* Less. from which it differs by its indumentum colour and type, greyish versus reddish-brown, and lepidote versus lanate-tomentose.

6.3. *Eremanthus polycephalus* (DC.) MacLeish, Ann. Missouri Bot. Gard. 74: 283. 1987.

Large shrub or small tree to 3.5 m tall. Stems grey-

brown lepidote. Leaves membranaceous to  $\pm$  coriaceous, sessile to petiolate or pseudopetiolate, lamina lanceolate, 4.5-7 cm  $\times$  1-1.8 cm, base acuminate to attenuate, grey lepidote and  $\pm$  obscurely glandular-punctate beneath, glabrous and glandular-punctate above, margins entire, apex acute to obtuse. Inflorescence a compound cyme of ca. 100 glomerules, often  $\pm$  densely bracted, glomerules 5-7 mm tall  $\times$  4-8 mm diam., hemispherical. Capitula 6-12(13) per glomerule, connate by ca.  $\frac{1}{2}$  length of phyllaries by matted pubescence; involucre cylindrical, 4-5.5 mm tall  $\times$  0.5-2 mm diam.; phyllaries 6-7-seriate, outer phyllaries lepidote, inner phyllaries deciduous, glabrous throughout or sparsely pubescent towards apex, apices glandular-punctate. Florets 1 per capitulum, purple to pinkish; corolla-tube 3-3.5 mm long, glabrous; corolla-lobes 2.5-3 mm long; corolla-lobes glandular-punctate. Achenes 1.5-2.8 mm long, 10-ribbed, scattered glandular-punctate towards base; pappus-setae 3-4-seriate, outer series 0.2-1 mm long, inner series 3-5.5 mm long, paleaceous, margins lacinate, white to more usually purplish, deciduous.

*Pirani et al. CFCR 13365* (K, SPF), *CFCR 13509* (K, SPF); *Zappi et al. CFCR 9895* (K, SPF).

Apparently restricted to Minas Gerais, along the Serra do Espinhaço. Campo rupestre, in sandy soils amongst rocks. Flowering time: June - November.

## 7. *Lychnophora* Mart.

Shrubs or, more frequently, pachycladous trees. Stems often densely pubescent, sometimes glabrous, often with conspicuous leaf-scars. Leaves often densely crowded on current season's growth, entire, tomentose to lanate or felted beneath, glabrous, or becoming glabrous above, margins usually strongly revolute, rarely flat. Inflorescence terminal, rarely on specialised axillary shoots, usually composed of dense synflorescences with or without a distinct 2<sup>o</sup> involucre or leaf-like bracts, synflorescence a single glomerule or many at branch apices; 1<sup>o</sup> capitula sessile, homogamous; 1<sup>o</sup> involucre  $\pm$  cylindrical; 1<sup>o</sup> phyllaries 2-3-seriate; 1<sup>o</sup> receptacle small, flat, glabrous,  $\pm$  alveolate; 2<sup>o</sup> receptacle usually present, highly conical, usually paleaceous. Florets 1-20 per capitulum, pink to lilac, often perfumed; corolla glabrous or glandular-punctate; corolla-lobes glabrous or sparsely pubescent, usually glandular-punctate; basal anther-appendages sagittate, apical appendages acute, usually much longer than wide; style glabrous in lower part, distinctly pubescent in upper part; style-arms subulate, pubescent. Achenes  $\pm$  cylindrical, usually distinctly 8-10-ribbed, glabrous, rarely setuliferous on ribs, body usually glandular-punctate; pappus biseriate, squamelliform, squamellae either of one type with both series long and deciduous, or of two types, a persistent shorter outer series and a deciduous, longer, often twisted inner series.

Largely restricted to Eastern Brazil, commonly in Minas Gerais, Goiás and Bahia. Commonly found in campos rupestres or cerrado forming a characteristic vegetation type. Hybrids are not uncommon.

1. Inflorescences of racemose-paniculate glomerules; leaves elliptical, oblong to ovate, but never subulate, margins crenate to serrate, flat ..... *L. markgravii*
- 1'. Inflorescence of solitary terminal glomerules; leaves linear, lanceolate, often subulate, margins entire, often highly revolute
2. Plants appearing acaulescent; stems simple,  $\pm$  subterranean ..... *L. uniflora*

- 2'. Plants with distinct trunks; stems usually profusely branched in upper half or sometimes poorly branched
3. Leaves > 8 mm long; outer pappus squamellae very short, < 0.3 mm long ..... *L. passerina*
- 3'. Leaves > 10 mm long; outer pappus squamellae > 0.5 mm long
4. Capitula 1-flowered; leaf bases cordate to cordate-auriculate, margins becoming markedly more revolute towards apex ..... *L. granmogolense*
- 4'. Capitula 3-8-flowered; leaf bases cuneate to long and broad attenuate, margins flat or consistently revolute throughout
5. Leaf margins flat to narrowly revolute, leaf bases with tufts of long hairs at nodes; corolla-lobes 6-7 mm long; achenes 3.5-4.5 mm long; inner pappus-setae ca. 10 mm long ..... *L. salicifolia*
- 5'. Leaf margins broadly revolute, leaf bases lacking any tufts of long hairs at nodes; corolla-lobes ca. 4 mm long; achenes 1.5-4 mm long; inner pappus-setae 5.5-8 mm long
6. Midrib obscured by indumentum; robust candelabrum tree; leaves densely spiralled ..... *L. ericoides*
- 6'. Midrib usually glabrescent; ± weak ericoid shrub to small tree; leaves ± laxly spiralled ..... *L. pinaster*

7.1. *Lychnophora ericoides* Mart., Denkschr. Bayer. Bot. Ges. Regensburg 2: 151. 1822.

Candelabrum tree to 3 m tall. Branches densely white to grey tomentose gradually darkening with age. Stems densely leaf towards apex. Leaves densely spiralled, sessile, linear to linear-lanceolate, 1.5-15 cm × 1-2.5 mm, persistently tomentose beneath, tomentose when young and becoming glabrous above, margins revolute, apex acute to acuminate, often mucronate. Inflorescences of simple terminal leafy glomerules, glomerules hemispherical, 2-3 cm tall × 3-5 cm diam. Capitula cylindrical, 7-9 mm tall × 3-5 mm diam.; phyllaries 4-5-seriate, outer pubescent, inner glabrous. Florets 3-5, lilac to purple; corolla-tube 9-10 mm long; corolla-lobes 4-5 mm long, glandular-punctate. Achenes 2-4 mm long, glabrous, glandular-punctate; pappus-setae readily deciduous, 6-8 mm long.

"Habitat in monte adamantio Serra de S. Antonio sive de Gram Magor dicto. Julio lecta". *Martius s.n.*

Once common in the Distrito Federal, Goiás and Minas Gerais. Cerrado. Flowering time: April - August.

This species is widely collected as a medicinal plant in many localities and as a result is becoming rarer and in several localities populations have become decimated by over collection by the locals.

7.2. *Lychnophora granmogolense* (Duarte) D.J.N.Hind, Kew Bull. 49(3): 513. 1994.

Small much-branched tree to 3.5 m tall. Branches greyish to white tomentose. Leaves densely spiralled, usually imbricate, ascending, sessile, ovate to subulate, 1-2.5 cm × 0.3-1 cm, base cordate to cordate-auriculate, white tomentose beneath, midrib ± prominent, glabrous

with insculcate midrib above, margins markedly revolute, apex acute, mucronate, mucro long, pungent. Inflorescence terminal, a loose synflorescence ± hemispherical, scarcely subtended by secondary involucre and capitula interspersed by leaf-like bracts. Capitula ± cylindrical; involucre 6-7 mm tall × 2-3 mm diam.; phyllaries 4-6-seriate, glabrous, margins entire to lacinate, apices ± obtuse to acute. Florets 1, lilac to magenta, slightly perfumed; corolla-tube 3-4 mm long, glabrous; corolla-lobes ca. 4 mm long, glabrous. Achenes 3-4 mm long, 8-ribbed, glabrous, glandular-punctate between ribs, dark-brown; outer pappus-setae free, ca. 1 mm long, apices acute to erose, inner 7-8 mm long, margins lacinate, white.

*Duarte 12957* (holotype RB); *Harley et al. 25068* (K, SPF, UEC); *Hatschbach 41248* (C, MBM, US); *Pirani et al. CFCR 855* (SPF); *Semir et al. CFCR 9668* (K, SPF); *Silva et al. CFCR 13511* (K, SPF).

Probably endemic to Minas Gerais. Common to dominant in some areas of cerrado, often growing on sandstone outcrops on white sand. Flowering time: October - April.

This taxon was based upon material from Grão-Mogol, and the distribution according to Semir (1991) extends into Bahia, where it is common on the Chapada Diamantina and towards the Serra do Sincorá - the type locality of *L. phyllicifolia* DC. *Lychnophora phyllicifolia* is apparently a narrow endemic of the Serra do Sincorá area according to Semir although I believe it to occur in the Rio de Contas area.

7.3. *Lychnophora markgravii* G.M.Barroso, Arq. Jard. Bot. Rio de Janeiro 14: 260, fig. 2-3. 1956.

Tree to 5 m tall. Main trunk tomentose at apex

becoming glabrescent with age. Leaves imbricate,  $\pm$  rosulate, sessile, rarely subsessile, penninervate, elliptical, oblong or ovate, 8-30 cm  $\times$  3.5-14 cm, base attenuate and decurrent, lamina discolorous or sometimes concolorous, lower surface densely greyish-green tomentose, upper surface tomentose to glabrescent, margins crenate to  $\pm$  serrate, apex acute, obtuse or slightly rounded. Inflorescence of racemose-paniculate glomerules, inflorescence branches leafless or leafy, leaves 2-14 cm  $\times$  1-6.5 cm, glomerules hemispherical to  $\pm$  spherical, 1-3 cm tall  $\times$  1.3-3.5 cm diam. Capitula sessile, sometimes bracteate; involucre cylindrical, 0.8-1.5 cm tall  $\times$  3-5 mm diam.; phyllaries 4-6-seriate, outer phyllaries tomentose, glandular-punctate. Florets 4-5, lilac; corolla-tube 6-8 mm long, glabrous; corolla-lobes 3-4.5 mm long, sparsely pubescent and glandular-punctate. Achenes 3.5-5 mm long, vary sparsely setuliferous towards apex, body glandular-punctate; pappus-setae biseriate, outer series 1-2 mm long, free, margins lacinate, apices acute, inner series 5-8 mm long, caducous, spiralled, margins appearing barbellate, whitish.

*Hatschbach 41221* (MBM, US); *Hatschbach 52025* & *Zelma* (MBM, US); *Margraff 3480*, *Mello Barreto* & *Brade* (holotype RB, isotype RB); *Mello-Silva et al. 446, 450* (K, SPF), *CFCR 8495* (SPF); *Pirani et al. CFCR 12933* (K, SPF); *Semir et al. CFCR 9606* (K, SPF); several other collections are cited in Semir (1991).

Endemic to Minas Gerais. Often a dominant feature of the vegetation, growing amongst rocks in the campos rupestres. Flowering time: November - June.

7.4. *Lychnophora passerrina* (Mart. ex DC.) Gardner, London J. Bot. 5: 230. 1846.

Erect profusely branched shrub to 1.5 m tall. Stems white tomentose, becoming glabrescent with age. Leaves sessile, ascending, lanceolate to linear or subulate, 5-7 mm  $\times$  ca. 1 mm, exposed surface beneath white tomentose, glabrous above, margins strongly revolute, apex acute and distinctly caudate. Inflorescence of terminal glomerules of 20-40(-80) capitula; glomerules 1-1.5 cm diam.,  $\pm$  spherical, subtended by 2° involucre of slightly reduced leaf-like bracts. Capitula sessile, cylindrical; involucre 5-6 mm tall  $\times$  ca. 4 mm diam.; phyllaries 3-4-seriate, margins scarious, lacinate, densely glandular-punctate below apex, apex obtuse, acuminate, often purplish; receptacle flat, naked. Florets 1, pink; corolla-tube 3.5-4 mm long, scattered glandular-punctate; corolla-lobes 3-3.5 mm long, glandular-punctate throughout outside, glabrous inside. Achenes ca. 1.5 mm diam.  $\times$  1.5-2 mm tall, 8-ribbed, dark-brown,

shiny, obscurely glandular-punctate; pappus biseriate, outer series scale-like, ca. 0.2 mm  $\times$  ca. 0.3 mm, apex emarginate, inner series 4-5 mm  $\times$  0.4-0.6 mm, margins lacinate, apex acute, white. (Fig. 2. A-C)

*Duarte 13770* (type of *Haplostephium pinnifolium* Duarte - holotype RB); *Martinelli 5876* (RB); *Semir et al. CFCR 9710* (K, SPF, UEC).

Widespread in Minas Gerais and Bahia. Cerrado and campos rupestres. Flowering time: October - February.

7.5. *Lychnophora pinaster* Mart., Denkschr. Bayer. Bot. Ges. Regensburg 2: 152. 1822.

Erect subshrub to small shrub to ca. 2.5(-3.5) m tall. Stems densely tomentose, reddish-brown to silvery. Leaves densely imbricate, sessile, linear to linear-oblong, (0.5-)2-6(-12) cm  $\times$  1-2 mm, white-tomentose beneath, tomentose at first above becoming glabrous and shiny, usually rugose to bullate, margins strongly revolute, apices obtuse, rarely  $\pm$  acute. Inflorescence terminal, usually on short side branches, of hemispherical synflorescences, 1-1.5 cm tall  $\times$  2-3 cm diam. Capitula campanulate to cylindrical; involucre 6.5-8 mm tall  $\times$  3-5 mm diam.; phyllaries 3-4(5)-seriate, margins entire to emarginate often lacinate, apices obtuse to  $\pm$  rounded; receptacle naked. Florets 3-5, lilac to purple; corolla-tube 4-6 mm long, glabrous; corolla-lobes ca. 4 mm long, glabrous. Achenes 1.5-3 mm long, glabrous, glandular-punctate, dark-brown; pappus biseriate, outer series 0.5-2 mm long, inner series 5.5-6 mm long, margins lacinate, whitish.

*Markgraf et al. 3388* (F); *Semir et al. CFCR 9668* (SPF, UEC).

Widespread in Minas Gerais. Campos rupestres and cerrado. Flowering time: October - May.

7.6. *Lychnophora salicifolia* Mart., Denkschr. Regensburg. Bot. Ges. 2: 157; tab. 10. 1822.

Erect tree to 2.5 m tall. Stems persistently pubescent, rarely becoming longitudinally fissured with age. Leaves sessile, ascending, rarely spreading, narrowly-lanceolate to linear-lanceolate, 2-12 cm  $\times$  3-8(-12) mm, base cuneate to long and broad attenuate, usually with a basal tuft of long hairs, tomentose beneath, midrib prominent beneath, glabrous, widening at extreme base, glabrous above, margins entire, revolute, apex acute or obtuse to rounded. Synflorescences terminal; secondary involucres hemispherical 2-3.5 cm tall  $\times$  1.5-3.5 cm diam.; secondary phyllaries 2-3.5 cm  $\times$  3-5 mm; primary

capitula broadly cylindrical; primary involucre ca. 2 cm tall × ca. 5 mm diam.; primary receptacles flat, glabrous, ± alveolate. Florets 4-8(-12), lilac to bright-pink; corolla-tube 6.5-7.5 mm long, glabrous or sparsely glandular-punctate and then sometimes markedly glandular punctate at base of corolla-tube; corolla-lobes 6-7 mm long, glabrous but with few often deciduous long hairs (ca. 1 mm long) towards apex. Achenes 3.5-4.5 mm long, 3-4-angled, 8-10-ribbed, body glandular-punctate; pappus squamellae biseriate, outer series persistent, ca. 1.5(-3.8) mm long, fused at base, erose, inner squamellae rapidly deciduous, ca. 1 cm long, linear, straight to twisted along length, margins entire to erose, apex acute.

*Duarte 13653* (RB, UEC); *Lima et al. 1017* (RB); *Markgraaf et al. 3391* (HBMB); *Rossi et al. CFCR 1007* (SPC, UEC).

Widespread in Bahia and Minas Gerais. Cerrado de altitude and campos rupestres. Amongst rocks and in open campo. Flowering time: November - May.

7.7. *Lychnophora uniflora* Sch.Bip., Jahresber. Pollichia 20/21: 347. 1863.

Distinctive rosetteform subshrub with a well developed woody xylopodiaceous rootstock. Stems short, woody, simple or poorly branched, subterranean, bearing dense rosettes of leaves at ground level. Leaves erect at first becoming spreading to recurved, sessile, base expanded, lamina subulate to linear-lanceolate, 9.5-14.5(-23) cm × 2-3(-4) mm, densely appressed pubescent beneath, midrib prominent, pubescent above, becoming glabrous, margins entire, broadly revolute, glabrous, apex acute. Inflorescences axillary, borne below main rosette of leaves, usually bearing a whorl of 3-6 branches in upper half, each bearing a terminal synflorescence, leafy throughout, inflorescence branches densely leafy. Synflorescence 1.5-2 cm tall

× 1.8-2.5 cm diam.; secondary-involucre of leaf-like multi-seriate phyllaries; synflorescence-receptacle highly conical; primary-involucre ca. 6 mm tall × ca. 2 mm diam., laterally compressed; primary-phyllaries 2-3-seriate, glabrous below, apex ± densely pubescent, sometime deciduous on inner phyllaries, glandular-punctate, margins entire below becoming erose above, apex acute; primary-receptacle small, glabrous. Florets solitary, pink, lightly perfumed; corolla-tube 5-6 mm long; corolla-lobes 3.5-4 mm × ca. 0.5 mm, glabrous at base but pubescent towards apex and with short papillae on margins, glandular-punctate, apex obtuse to rounded, entire to lacinate. Achenes 1.5-2 mm long, ribbed, glabrous; pappus-setae biseriate, outer and inner series ± uniform in length, 0.5-1 mm long, margins lacinate, apex acute.

*Martius 517* (M).

Probably widespread in Minas Gerais and Bahia. Cerrado de altitude and campos rupestres in sandy soil amongst rocks, but also known from campo gerais. Flowering time: November - February.

Although the type material of this species has not been seen there appears to be a strong similarity with *L. bahiensis* Mattf. (see Hind 1995) where this description is taken. Semir (1991) was of the opinion that this species, although described from Grão-Mogol is in fact Bahian, at the same time reducing *L. bahiensis* to synonymy of *L. rosmarinifolia* Mart. Luetzelburg's collection (*Luetzelburg 12460*) is certainly identical to flowering material of a taxon that is widespread in Bahia but certainly not the erect candelabriform shrub it is identified with by Semir. It remains to be seen if *L. uniflora* and *L. bahiensis* are conspecific. The Martius collections cited by Semir are not used by Martius (1822) and the corresponding numbers in *Herbarium Florae brasiliensis* (Martius 1841) refer to quite different plants in other families!

## 8. *Moquinia* DC. *emend.* Gamorro

Monoecious or gynodioecious shrubs or trees. Stems tomentose, often glandular-punctate and glandular-stipitate. Leaves dense, alternate, petiolate, lamina coriaceous or subcoriaceous, various pubescent, cuneiform or obovate, base long-attenuate, margins entire, flat or slightly revolute, apex rotund, truncate of ± retuse. Inflorescence densely racemose or corymbose; capitula numerous, sessile or shortly pedicellate; involucre campanulate or cylindrical; phyllaries 4-5-seriate, imbricate, inner phyllaries deciduous, ovate to lanceolate, tomentose or pilose and glandular-punctate outside, margins fimbriate or pilose, apex acute or subacute, reddish; receptacle naked. Florets few, hermaphrodite or sometimes male sterile, white, pink or purplish; corolla actinomorphic, tubular or ± infundibuliform, deeply 5-lobed, corolla-lobes lanceolate, often recurved, glandular-punctate outside, glabrous inside; anther-appendages ± acute; style dilate above, pubescent; style-arms short, ± acute, papillate. Achenes turbinate or prismatic, setuliferous and sparsely glandular-punctate; carpodium annular; pappus-setae indistinctly biseriate, subequal, connate at base, flattened, margins barbellate, white to light brown.

A genus of two very distinctive species.

8.1. *Moquinia racemosa* (Spreng.) DC., Prodr. 7: 23 1838.

Shrub or small tree to 4 m tall. Stems well branched white-tomentose becoming  $\pm$  glabrescent often still glandular-punctate. Leaves alternate, petiolate, lamina oblanceolate to narrowly obovate or  $\pm$  elliptic, 5-15 cm  $\times$  1.5-6(-7) cm, base attenuate, densely whitish-tomentose and obscurely glandular-punctate beneath, glabrous, glandular-punctate, dark green and shiny above, margins entire, apex obtuse. Inflorescence terminal or subterminal, spicate, simple or markedly branched, "headed, capitula sessile or subsessile, pedicel to 1.5 mm long, densely tomentose and obscurely glandular-punctate; involucre campanulate, 5-6(-8) mm tall;

phyllaries multiseriate, obscurely tomentose. Florets 4-5, lilac, purplish, white or white with pink to purple throat, distinctly perfumed; corolla-tube 4-5(-6) mm long; corolla-lobes 3-4(-5.5) mm long, glandular-punctate towards apex outside. Achenes 2.5-3 mm long, densely setuliferous, carpopodium large, annuliform; pappus-setae 7-8(-10) mm long, densely barbellate, light brown. (Fig. 2. D-F)

*Campos et al. CFCR 13486* (K, SPF); *Cordeiro & Mello-Silva CFCR 10042* (K, SPF).

Widespread in Minas Gerais and Bahia. Campo rupestre and brejos in cerrado. Flowering time: September - November.

9. *Paralychnophora* MacLeish

Small poorly branched trees. Branches tomentose at first becoming glabrescent with age, usually with characteristic 'V'-shaped leaf-scars on younger branches, often with persistent old synflorescences. Leaves alternate, subcoriaceous, sessile, subsessile or distinctly petiolate, petiole bases usually amplexicaul, grooved above, persistently tomentose, lamina oblong, obovate, elliptical to sometimes  $\pm$  orbicular, discolorous, bases usually oblique, attenuate or cuncate, sometimes cordate-auriculate, venation penninervate, midrib prominent beneath, persistently tomentose beneath, pubescence of simple and stellate to substellate hairs, upper surface eventually glabrous or glabrescent, margins  $\pm$  flat, apex acute, obtuse or rounded. Inflorescences usually of solitary axillary spherical or hemispherical glomerules, pedunculate, peduncles bracteolate or ebracteolate, secondary receptacle  $\pm$  spherical, naked. Capitula cylindrical, sessile; phyllaries 3-6-seriate, outer series variously pubescent, inner  $\pm$  glabrous. Florets 2-12(-26), bright lilac to pink; corolla-tube glabrous, often glandular-punctate towards base; corolla-lobes penicillate or glabrous at apices; style glabrous; style-arms pubescent throughout. Achenes angled, often with conspicuous nectary at apex, glabrous, glandular-punctate; carpopodium annuliform, narrow; pappus-setae  $\pm$  spreading, outer series flattened, inner series  $\pm$  filiform, straight, deciduous to  $\pm$  persistent, brownish to off-white.

A genus of about six species following the accounts by Semir (1991) and Hind (2000c), although in the former the species are recognised as members of *Lychnophora* sec. *Sphaeranthus* Baker. The genus is a characteristic element of the campos rupestres of Bahia and Minas Gerais. Robinson (1996) included the species within *Eremanthus*.

9.1. *Paralychnophora bicolor* (Mart. ex DC.) MacLeish, Taxon 33: 106. 1985.

Erect tree to 4(-5) m tall. Leaves petiolate, lamina oblong, broadly elliptical, sometimes almost orbicular, 4.5-16 cm  $\times$  2-8.5 cm, leaf base oblique, midrib and penninervate venation prominent beneath, at first brown tomentose above and beneath, becoming paler beneath with age tomentum becoming  $\pm$  whitish, but becoming glabrous above, margins entire, apex acute, obtuse or rounded. Synflorescence terminal on leafy axillary shoots, globular, to 3.5 cm diam.; capitula cylindrical, sessile; involucre ca. 8 mm tall  $\times$  ca. 5 mm diam.; phyllaries 4-5-seriate, densely tomentose towards apex, margins entire, apex acute. Florets 10, bright purple to pink; corolla-tube 3.5-5 mm long, glabrous, except for very base which is glandular-punctate, corolla-lobes 3.5 mm long, penicillate, occasionally appearing

glabrous. Achenes 3-3.5 mm long, terete or occasionally 4-angled, glabrous, pale brown with darkened ring at constriction below corona, remnant nectary pronounced on apex of achene, carpopodium annuliform, small; pappus-setae spreading, broadened and flattened, barbellate, deciduous, inner series less so, outer series 1-1.5 mm long, inner series 4-5 mm long, off-white. (Fig. 2. G-H)

*Cavalcanti et al. CFCR 8518* (K, SPF); *Cordeiro & Mello-Silva CFCR 10009* (K, SPF); *Cordeiro et al. CFCR 11407* (K, SPF); *Pirani et al. CFCR 13078* (K, SPF).

Apparently restricted to Minas Gerais although a similar taxa are present in the campos rupestres of Bahia. Sometimes locally common and a prominent feature of the vegetation. The species is typically found amongst rocks in sandy soil. Flowering period (July-) September - February.

10. *Piptocarpha* R.Br.

Scandent to subscandent shrubs, trees, or occasionally climbers. Stems terete or conspicuously 5-angled, branchlets with stellate hairs or silvery scales. Leaves usually alternate, sometimes becoming opposite or subopposite on upper branches, sessile, pseudopetiolate or petiolate, lamina lower surface pubescent with stellate hairs or with silvery scales, upper surface usually glabrous, often shiny, sometimes pubescent over midrib, margins entire, dentate, sometimes remotely so. Inflorescence axillary, or as dense corymbose clusters, or pseudo-umbels, often on short lateral branchlets, capitula solitary to few, sessile or pedicellate; capitula homogamous, discoid; involucre ovoid to campanulate or turbinate; phyllaries 3-5(-7)-seriate, imbricate, outer series persistent or deciduous, glabrous to arachnoid pubescent or tomentose on margins, inner phyllaries deciduous; receptacle flat, naked. Florets few to several [(1-)3-21(-35)], reddish-purple, pale purple to white, often scented; corolla deeply 5-lobed, usually glabrous, sometimes shortly-pubescent, eglandular to glandular-punctate; corolla-lobes often glandular-punctate towards apices; basal anther-appendages caudate, thecae purplish to white; style pubescent below branching of style-arms; style-arms linear. Achenes turbinate, 4-angled or 10-ribbed, minutely glandular-punctate or eglandular between angles or ribs, apex truncate; pappus-setae capillary, biseriate, outer series short, inner series as long as corolla, white to straw coloured.

A neotropical genus of over 45 species. A problematic genus largely because of the deciduous nature of the phyllaries.

1. Scandent shrubs; inflorescence of clusters of 20-50 capitula; capitula 3-flowered ..... *P. oblonga*  
 1'. Trees to 25 m; inflorescence of clusters of 5-12 capitula; capitula 12-21-flowered ..... *P. macropoda*

10.1. *Piptocarpha macropoda* (DC.) Baker in Mart. & Eichler, Fl. bras. 6(2): 123. 1873.

Trees or very large shrubs to 25 m tall (although not in the flora area). Stems densely brown stellate-tomentose, striate. Leaves alternate, petiolate, petiole 1.5-3.5 mm long, densely brown stellate-tomentose, grooved above, lamina (8-)9-13(-20) cm × 3.8-6(-11) cm, elliptic, (ovate or lanceolate), base oblique, upper surface at first densely brown to ferruginous stellate-pubescent, later glabrescent, the hairs remaining above midrib, lower surface persistently cinereous stellate-tomentose, margins entire, apex acute. Inflorescences axillary, with dense clusters of 5-12 capitula; capitula sessile; involucre 9-13 mm tall × 4-7 mm diam., ± turbinate; phyllaries 5-6-seriate, usually glabrous except for base which is sparsely glandular-punctate and apices which are densely stellate-tomentose, margins scattered ciliate with long simple hairs, apices acute; receptacle distinctly cylindrical, glabrous. Florets 12-21, fragrant; corollas whitish to dark pink, corolla-tube 4-5 mm long, glabrous, corolla-lobes 2-3 mm long, the outer surface pilose. Achenes 5-5.7 mm long, 4-angled, glabrous; pappus biseriate, outer setae ca. 2 cm long, broad and flattened with lacinate margins, inner setae ca. 7 mm long, moderately to sparsely barbellate, off-white to pale straw-coloured; carpopodium annular slightly paler than body of achene and ± procurent on the base of achene.

'MGS & STS' 502 (BHCB, US).

Widespread in south-eastern Brazil, from the Distrito south to São Paulo and Paraná. Often frequent in mata ciliar, sometimes in cerrado. Flowering time: October - January.

The material present in the flora area corresponds to var. *crassifolia* Baker. I have taken several parts of the description from material outside the flora area as the only collection available lacked corollas and intact capitula. I prefer to accept a broader concept of the species at present. If the variety is recognized this can be separated from the typical material by few florets, a small involucre and longer and narrower leaves.

10.2. *Piptocarpha oblonga* (Gardner) Baker var. *oblonga* in Mart. & Eichler, Fl. bras. 6(2): 121. 1873.

Scandent shrub. Stems long, pendulous, terete, densely stellate-tomentose, scattered glandular-punctate or resin-dotted. Leaves alternate, petiolate, petiole 1-2.5 cm long, lamina oblong, elliptic, ovate to lanceolate, 6-13 cm × 2-6 mm, base oblique or ± rounded to obtuse, discolorous, densely canescent stellate-tomentose beneath and scattered glandular-punctate or resin-dotted, darker and glabrous above, margins entire to sparsely toothed, apex acuminate to acute. Inflorescence axillary, of dense globose clusters of 20-50 capitula; capitula sessile; involucre 6-8 mm tall × 2.5-3 mm diam., cylindrical to narrowly turbinate; phyllaries 4-5-seriate, margins long lacinate, apices ± acute to obtuse. Florets 3, cream; corolla-tube 2.5-3 mm long, glabrous; corolla-

lobes 3-3.5 mm long, glandular-punctate towards apices. Achenes 3.5-4 mm long, 3-angled, glabrous; pappus-setae 6-7 mm long, outer series capillary to flattened, to 2.5 mm long, inner series 6-7 mm long, capillary, white to straw-coloured. (Fig. 2. I)

*Cavalcanti et al. CFCR 10172 (K, SPF).*

Widespread in Distrito Federal, Goiás, and Minas Gerais. Woodland margins. Flowering time: August - November.

### 11. *Piptolepsis* Sch.Bip.

Few- to well-branched shrubs. Stems alternate or verticillate, laxly to densely leafy. Leaves sessile, subsessile, to distinctly petiolate, lamina linear, lanceolate or ovate, discolorous, tomentose or lepidote beneath, often viscid, glabrous above, margins entire, often revolute. Inflorescence terminal or axillary, sessile, usually solitary or 2-6 capitula in dense terminal cluster. Capitula homogamous, discoid; involucre turbinate to campanulate; phyllaries 3-seriate, imbricate, inner series deciduous, pubescent; receptacle concave to flat, naked. Florets hermaphrodite, 9-25, purplish; corolla glandular-punctate outside, 5-lobed; basal anther-appendages sagittate; apical anther-appendages; style with swollen basal node; style-arms subulate, pubescent. Achenes 10-ribbed, glabrous, glandular-punctate; pappus-setae biseriate, setae flattened, margins laciniate, outer series sometimes shorter than inner, inner deciduous, white, brownish or purplish.

A genus of nine species endemic to Brazil.

11.1. *Piptolepsis ericoides* Sch.Bip., Jahresber. Pollichia 20/21: 383. 1863.

Well-branched shrubs to ca. 1 m tall. Stems alternate or verticillate, laxly to densely leafy. Leaves sessile, to subsessile, linear, 0.7-2.2 cm × 1-1.5 mm, tomentose beneath, often viscid, glabrous and dark green above, margins entire, apex acute. Inflorescence terminal, usually solitary. Capitula homogamous, discoid; involucre ca. 7 mm tall × ca. 5 mm diam., turbinate to campanulate; phyllaries 3-seriate, imbricate, inner series deciduous, sparsely pubescent, margins coarsely long-lacinate, apices acute to acuminate, purplish. Florets

9-12, lilac to purple; corolla-tube ca. 5 mm long, scattered glandular-punctate, corolla-lobes ca. 2.5 mm long, glandular-punctate outside, occasionally with few scattered short-hairs towards apex. Achenes ca. 2.5 mm long; pappus-setae outer series ca. 2 mm long, inner series 5.5-6 mm long, brownish. (Fig. 2. J-K)

*Harley et al. 25066 (K, SPF); Hatschbach 42925 (SPF); Pirani et al. CFCR 12621 (K, SPF), CFCR 13161 (SPF).*

Apparently restricted to Minas Gerais. Campo rupestre and cerrado, amongst rocks. Flowering time: August - May.

### 12. *Proteopsis* Mart. & Zucc. ex Sch.Bip.

Rosettiform caespitose subshrub, stem and leaves characteristically silvery- to grey-sericeous pubescent. Stems simple, unbranched, with rosette of leaves at apex of short shoot. Rosette leaves sessile, lanceolate, stem leaves alternate. Inflorescence terminal, ± densely paniculate to ± umbellate on a secondary receptacle, or corymbose, forming a few- to several-headed glomerule. Capitula pedicellate, homogamous, discoid; involucre campanulate; phyllaries multiseriate, apical margins entire to lacinate, apex with an erect to spreading long-attenuate, straw-coloured, spiny appendage; receptacle naked, alveolate. Florets ∞, lilac to reddish purple; corolla glabrous, corolla-tube long, corolla-lobes about half tube length, penicillate at apices; basal anther-appendages long, acute; style glabrous; style-arms pubescent. Achenes 10-ribbed, glabrous; carpogonium very small; pappus uniseriate, caducous.

A very characteristic monotypic genus endemic to Brazil.

12.1. *Proteopsis argentea* Mart. & Zucc. ex Sch.Bip., Jahresber. Pollichia, 20/21: 378. 1863.

Rosettiform caespitose subshrub; inflorescence stem 0.4-1.5 m tall. Rosette leaves lanceolate, 10-35 cm × 1-4.5

cm, stem leaves 6-12 cm × 1.2-2.5 cm, ± amplexicaul, bases sheathing peduncle, margins entire, apex attenuate to acute. Inflorescence terminal, ± densely paniculate to ± umbellate on a secondary receptacle, or corymbose, forming a glomerule, few to several-headed,



Fig. 2. COMPOSITAE. VERNONIEAE: A-C. *Lychnophora passerina*: A. flowering shoot; B. leaf, abaxial surface; C. capitulum (Stannard & Silva H52782). D-F. *Moquinia vacemosa*: D. flowering shoot; E. section of leaf surface showing trichomes; F. capitulum (Hatschbach 1989). G-H. *Paralychnophora bicolor*: G. flowering shoot; H. corolla (Mexia 5038). I. *Piptocarpha oblonga* var. *oblonga*: flowering shoot; J-K. *Piptolepis ericoides*: J. flowering shoot; K. capitulum (Arbo et al. 5224). L-N. *Proteopsis argentea*: L. plant with inflorescence; M. capitulum; N. floret (Cavalcanti et al. 39424). Scale bars E = 0.5 mm; B, C, F, H, K, N = 1 mm; M = 5 mm; A, D, G, I, J, L = 10 mm.

glomerule subtended by broad obovate to lanceolate bracts, 3.5-4.5(-9) cm × 1.5-3 cm. Pedicels 0.5-1 cm long. Involucre campanulate, ca. 2 cm tall × 1.2-2 cm diam.; phyllary apical margins entire to laciniate, spiny appendage 4-6 mm long, straw-coloured; receptacle flat to ± concave. Florets ∞; corolla-tube ca. 1.3 cm long, corolla-lobes ca. 6.5 mm long; apical anther-appendages at least twice as long as wide, apices acute. Achenes 2.5-3 mm long, 10-ribbed; pappus-setae uniseriate, caducous,

1.1-1.2 cm long, flattened, margins barbellate, pale-yellow. (Fig. 2. L-N)

*Martinelli et al. 11263* (K, RB); *Semir et al. CFCR 9639* (K - inflorescences only, SPF).

Endemic to Minas Gerais. Fairly common in sandy soils in rocky campos rupestres. Flowering time September - April.

### 13. *Vernonia* Schreb.

Perennial herbs, shrubs, lianes, or (small, sometimes large) trees, or rarely annuals. Rootstock fibrous or sometimes woody and xylopodial, rarely subfleshy and napiform. Stems often pubescent, sometimes scabrid, often glandular-punctate, unbranched to densely branched, terete to ± angular, often striate. Leaves alternate, rarely opposite, sometimes in a basal rosette in some herbaceous perennials, sessile to distinctly petiolate, simple, pinnately veined, lamina linear, lanceolate, ovate, elliptic, or obovate, concolorous or discolorous, herbaceous to subfleshy, glabrous to variously pubescent, eglandular or glandular-punctate, margins entire to serrate, flat to revolute. Inflorescences terminal or upper axillary often scorpioid-cymes, panicles, corymbs, with axillary capitula solitary or in groups, or inflorescences rarely reduced to scapes, or capitula numerous and in dense glomerules or synflorescences. Capitula discoid, homogamous, sessile to distinctly pedicellate, deciduous with age or persistent; involucre broadly hemispheric or campanulate, occasionally cylindrical; phyllaries subimbricate to strongly imbricate, rarely ± 'eximbricate', (2)3-9-seriate, few to numerous (ca. 15-500), recurved, patent or erect, inner phyllaries progressively longer, usually unappendaged, sometimes distinctly appendaged, apices acuminate to aristate; receptacle flat to subconvex or convex, glabrous, often alveolate. Florets 4-60; corolla tubular, regular, 5-lobed, often glandular-punctate, deep reddish purple to whitish or pinkish; corolla-lobes glabrous, or sometimes pubescent at tips, sometimes glandular-punctate; basal anther-appendages sagittate; apical anther-appendages eglandular, rarely glandular-punctate; style-base with or without an expanded node; style-arms elongate, filiform-subulate, outer surface pubescent throughout, with stigmatic papillae on inner surfaces. Achenes usually strongly 5- or 10-ribbed, sometimes terete, setuliferous, often densely so, or glabrous, commonly glandular-punctate, sometimes with resiniferous cells; carpophodium usually distinct, annular, cylindrical, 'stopper-shaped' or turbinate, sometimes decurrent on ribs; pappus-setae usually biseriate, series heteromorphous, rarely of heteromorphous subequal series, purple, white to straw-coloured, outer short, squamelliform with laciniate margins or capillary and barbellate, inner capillary, terete, or slightly flattened, usually barbellate or laciniate, usually easily deciduous.

A very large genus of c. 1000 species. Recent papers by Robinson (e.g. 1987, 1988a, b, 1990, 1992, 1999a, b, etc.) have suggested that the genus can be split up into many genera in both the Old and New Worlds. Many of the criteria used to recognize the genera I have not accepted in past papers (e.g. Hind 1993a, 1994, 1995, 2000a, b) and still prefer to treat the majority of taxa as belonging to *Vernonia* s.l.

1. Tree; leaves large, > 90 mm long; corolla-lobes densely pubescent outside with 'T'-shaped hairs ..... *V. hatschbachii*
- 1'. Herbs, subshrubs or shrubs; leaves small to medium, usually < 90 mm long; corolla-lobes pubescent with simple hairs or glabrous, sometimes glandular-punctate
  2. Stems herbaceous, leaves predominantly basal ..... *V. herbacea*
  - 2'. Stems woody, leaves terminal or evenly spaced throughout, sometimes densely so
    3. Leaves ± densely imbricate, upper surface shiny ..... *V. pycnostachya*
    - 3'. Leaves lax, sometimes longer than internodes but not imbricate, upper surface pubescent or matt but not shiny
      4. Capitula pedicellate
        5. Leaves broad, 5-15 mm, long, 25-55 mm; margins flat; inflorescence lax, few-headed; florets ca. 40 ..... *V. subulata*
        - 5'. Leaves narrow, 1-4 mm, short, to 20 mm; margins revolute; inflorescence many-headed; florets ca. 20 ..... *V. stricta*

- 4'. Capitula sessile
- 6. Leaves persistently densely pubescent on both surfaces; involucre  $8 \times 10$  mm; corolla tube ca. 6 mm ..... *V. warmingiana*
  - 6'. Leaves glabrous or sparsely hairy above; involucre  $3-4 \times 3-8$  mm; corolla tube  $< 5$  mm
  - 7. Pubescence densely brown-tomentose; corolla-lobes glabrous ..... *V. lilacina*
  - 7'. Pubescence white-sericeous or hairs sparse; corolla-lobes with few to numerous hairs
  - 8. Leaves linear to narrowly lanceolate, to 2.5 mm wide; plants often appearing  $\pm$  leafless ..... *V. spixiana*
  - 8'. Leaves narrowly lanceolate to elliptic,  $> 10$  mm wide; plants distinctly leafy
  - 9. Leaves  $\pm$  densely glandular-punctate above and beneath, margins obscurely serrate or regularly dentate; florets 8-10; corolla-lobes densely hairy ..... *V. fruticulosa*
  - 9'. Leaves lacking glandular punctae, margins entire; florets  $> 13-15$ ; corolla-lobes with sparse or several hairs at tip
  - 10. Stems densely brown pubescent at first; leaf bases attenuate; leaves densely brown pubescent beneath; involucre  $3 \times 3$  mm ..... *V. subverticillata*
  - 10'. Stems white sericeous at first; leaf bases cordate to rounded; leaves white sericeous beneath; involucre  $3 \times 6$  mm ..... *V. salzmannii*

13.1. *Vernonia fruticulosa* Mart. ex DC., Prodr. 5: 53. 1836.

Shrub to 1.5 m tall. Stems striate, well branched, tomentose, obscurely glandular-punctate. Leaves alternate, pseudopetiolate, lanceolate to elliptic, (0.4-)1-2.5 cm  $\times$  3-9 cm, pubescent and  $\pm$  densely glandular-punctate beneath, upper surface sparsely to densely pubescent and with numerous to dense glandular-punctate, midrib prominent,  $\pm$  densely pubescent, margins entire, apex acute. Inflorescence terminal and subterminal on scarcely leafy branches, scorpioid-cymose, many-headed. Capitula sessile; involucre campanulate to cylindrical, 5-8 mm tall  $\times$  3-4 mm diam.; phyllaries 4-5-seriate, often purple-tinged, spreading after achene dehiscence, outer series densely pubescent, inner series pubescent, apices attenuate; receptacle flat to slightly convex, scarcely alveolate. Florets 8-10, pink to white; corolla-tube ca. 3.5 mm long, glabrous, corolla-lobes 3-3.5 mm long, pubescent throughout and with numerous to dense glandular-punctae. Achenes 1.5-2 mm long, body  $\pm$  densely setuliferous and densely glandular-punctate; carpodium narrow annuliform; pappus-setae biseriate, outer series ca. 1.5 mm long, squamelliform, flattened, margins lacinate, inner series 5.5-6 mm long, flattened, margins lacinate, fragile and deciduous, light brown to straw-coloured.

*Bidá et al. CFCR 11942* (K, SPF); *Giulietti et al. CFCR 3424* (K, SPF); *Kral et al. 72711* (SPF); *Simão-Bianchini et al. CFCR 12866, CFCR 12930* (K, SPF); *Zappi et al. CFCR 9806* (K, SPF).

Widespread in Bahia, Goiás, and Minas Gerais. Common in cerrado and campos rupestres, usually on sandy soil. Flowering time: April - July.

Robinson (1990) provided an extensive synonymy of *V. rufogrisea* St.-Hil. The inclusion of such dissimilar entities as *V. tricephala* Gardner and *V. saxicola* Sch.Bip. ex Baker tend to indicate that the concept of species, *V. rufogrisea*, be treated with caution. I still consider the inclusion of *V. eremophila* Mart. ex DC. a little dubious, largely on the absence of the characteristic pubescence of the corolla-lobes. Further collections throughout the range of *V. fruticulosa* are needed.

13.2. *Vernonia hatschbachii* (H.Rob.) D.J.N.Hind, Kew Bull. 49(3): 514. 1994.

Small tree to 3 m tall. Trunk to 20 cm diam., usually unbranched except towards the apex, bearing characteristic scars of petioles bearing characteristic apical tuft of leaves. Leaves alternate, petiolate, lamina broadly lanceolate to ovate or broadly ovate, 8-19.5(-23) cm  $\times$  2.5-8 cm, base rounded to oblique, shortly tomentose beneath, midrib prominent, glabrous above, midrib  $\pm$  prominent to exsculptate, margins entire, apex acute to  $\pm$  obtuse. Inflorescence usually subterminal as loose verticels of leafy flowering branches, secondary inflorescence branches with paniculate inflorescences, rarely of solitary axillary capitula. Capitula erect or ascending, pedicellate, pedicels 0.5-3.5 cm long, white tomentose, bracteolate below involucre; involucre campanulate, ca. 1 cm diam.; phyllaries 4-5-seriate, tomentose, sometimes glabrescent over midrib, apices acute to acuminate. Florets ca. 45, cream; corolla-tube 5-6 mm long, glabrous, corolla-lobes 4-5 mm long, spreading, densely pubescent  $\pm$  throughout length,  $\pm$  obscurely glandular-punctate. Achenes 3.5-4 mm long, terete to  $\pm$  angled, body setuliferous throughout, scattered glandular-punctate throughout but densely so

towards base; carpopodium annular, narrow; pappus-setae biseriate, outer series 0.5-1.5 mm long, inner series 5-6 mm long, flattened, deciduous, sparsely laciniate at base but becoming more distinctly so towards apex, apex  $\pm$  enlarged, straw-coloured to rufous.

*Giulietti et al. CFCR 3542* (K, SPF); *CFCR 9864* (K, SPF, TEX/LL); *Hatschbach et al. 52026* (holotype MBM, isotype US); *Hensold et al. CFCR 3441* (K, SPF); *Mello-Silva et al. CFCR 9700* (SPF); *Pirani et al. CFCR 13148* (K, SPF, TEX/LL); *Zappi et al. CFCR 12042* (K, SPF).

Endemic to Grão-Mogol. A dominant tree along the ridges of the serras around Grão-Mogol, common in campos rupestres. Flowering time: May - July.

Zappi (pers. comm.) reports that leaves are often much larger in mature specimens, but these are rarely collected from the tops of the trees.

Robinson (1992) has described this taxon and placed it into the monotypic genus *Anteremanthus*, which he placed in the subtribe *Lychnophorinae* along with several other disparate elements. The species described above is a good *Vernonia* with parallels in morphology with several species in the genus. It is certainly not related to the subtribe, bearing no relation to any of the central genera.

13.3. *Vernonia herbacea* (Vell.) Rusby, Mem. Torrey Bot. Club 4: 209. 1895.

Few-stemmed suffrutex to ca. 0.5 m. Rootstock a xylopodium. Stems simple, erect, usually leafy towards base with reduced leaves, or leafless towards inflorescence, densely golden-brown tomentose beneath, white tomentose towards inflorescence. Leaves alternate, sessile, 25-90  $\times$  15-50 mm, base attenuate, lamina densely golden to brownish tomentose beneath, midrib and primary venation prominent beneath, upper surface less densely pubescent, margins serrate to undulate, apex acute. Inflorescence terminal, usually a dense panicle of short cymose branches, branches densely white sericeous. Capitula sessile, ultimate capitula on branches pedicellate; involucre campanulate, (5-) 8-10 mm tall  $\times$  (4.7-) 8-9 diam.; phyllaries loosely imbricate, 2-3-seriate, outer phyllaries with dense to numerous hairs, inner often sparsely pubescent, margins laciniate, often purple tinged, apex acute to acuminate; receptacle  $\pm$  flat, alveolate. Florets 10-20, reddish-purple; corolla-tube 5-6 mm, glabrous, corolla-lobes 4-4.5 mm, glabrous except for a few hairs at apices. Achenes 2-3 mm,  $\pm$  terete, setuliferous; carpopodium narrow annuliform; pappus-setae biseriate, outer series 0.7-1.8 mm, flattened, inner setae (5-) 7.5-8 (-10) mm, flattened, barbellate, white.

*Harley et al. 25022* (K, SPF).

Widespread in Central and Eastern Brazil, and present in Bolivia and Peru.

Often common in cerrado, characteristically flowering after fires. Flowering time: September - November.

Robinson (1988) in transferring this taxon to *Chrysolaena* commented on the presence of glandular-punctate anther-appendages common in the genus (*Chrysolaena*). However, I have been unable to find these glands in this and two other members of the genus, as outlined by Robinson, during work on material for the *Flora of the Pico das Almas* (Hind 1995).

13.4. *Vernonia lilacina* Mart. ex DC., Prodr. 5: 48. 1836.

Poorly branched shrub to 2 m tall. Stems terete,  $\pm$  striate, young stems densely brownish tomentose, glandular-punctate. Leaves usually alternate, rarely subopposite to opposite, shortly petiolate, petioles 2-5 mm long, lamina 2.5-6.5 cm  $\times$  1-2.5 cm, lanceolate to narrowly ovate, base attenuate to oblique and obtuse, lower surface with numerous to  $\pm$  dense long simple hairs,  $\pm$  densely glandular-punctate, midrib and primary venation prominent and  $\pm$  densely pubescent, upper surface sparsely pubescent and sparsely glandular-punctate, midrib more densely pubescent, margins entire, apex acute. Inflorescence of terminal spike-like scorpioid-cymes, inflorescence branches densely brown-tomentose, glandular-punctate. Capitula sessile, usually solitary; involucre campanulate, ca. 7 mm tall  $\times$  ca. 4 mm diam.; phyllaries 3-4-seriate; receptacle  $\pm$  flat, scarcely alveolate. Florets ca. 10, white to pinkish; corolla-tube ca. 4 mm long, glabrous, corolla-lobes ca. 2.5 mm long, glabrous. Achenes 1.5-2 mm long, turbinate,  $\pm$  terete, body with numerous setulae in alternating bands with dense glandular-punctae; carpopodium small, annular; pappus-setae biseriate, outer series 0.5-1 mm long, flattened, margins laciniate, persistent, inner series ca. 4 mm long, fragile, deciduous, barbellate, straw-coloured.

*Kral et al. 72693* (SPF); *Mello-Silva & Pirani CFCR 10833* (K, SPF); *Pirani et al. CFCR 13129* (K, SPF).

Widespread in Minas Gerais and Espírito Santo. Relatively common in cerrado. Flowering time: May - July.

13.5. *Vernonia psilophylla* DC., Prodr. 5: 28. 1836.

Erect to decumbent xylopodiaceous subshrub to ca.

80 cm tall. Stems usually single stemmed, few-branched, glabrous, relatively sparsely leafy, leaves ascending. Leaves alternate, sessile, linear to very narrowly lanceolate, 4.5-9.5(-13) cm  $\times$  1.7-3 mm, glabrous above or rarely sparsely adpressed pubescent and glabrescent, moderately to  $\pm$  densely glandular-punctate beneath, midrib prominent beneath and scarcely prominent above, margins entire, usually markedly revolute (sometimes flat outside of flora area), apices very long-acute. Inflorescence a lax scorpioid cyme, usually relatively few-headed [2-5(-8)], capitula borne opposite leaves in upper part of stem, inflorescence leaves considerably reduced, 3.5-5 cm  $\times$  1-1.5 mm, often overtopping the subtending capitulum. Capitula pedicellate, pedicels 6-20 mm, glabrous to very sparsely short-pubescent. Involucre ca. 1 cm tall  $\times$  5-6 mm diam., broadly cylindrical to campanulate; phyllaries 5-6-seriate, outer series scale-like at base of involucre, mid- and inner-phyllaries narrowly lanceolate, margins often purplish coloured, densely pubescent throughout, the inner slightly less so, margins laciniate, apices acute or obtuse, apiculate; receptacle concave, glabrous. Florets 20-25, corollas lilac to magenta, corolla-tube ca. 3 mm long, glabrous; corolla-lobes glabrous, ca. 1.7 mm long, glabrous. Achenes ca. 2.3 mm long, densely setuliferous, setulae of twin hairs; pappus outer series ca. 1.3 mm long, flattened, ca. 0.3 mm broad, margins laciniate, inner series 6-6.5 mm long, dark grey, densely barbellate, apices expanded; carpophodium a distinct annulus.

*Hatschbach 41537* (MBM, US).

A fairly widespread species ranging from Rio Grande do Sul in the south northward to the Distrito Federal and Goiás. Occasional in cerrado grassland. Flowering time: January - July.

Minor variation has been recognized in this species accounting for different size capitula. I prefer to treat it as a variable species.

13.6. *Vernonia pycnostachya* DC., Prodr. 5: 58. 1836.

Subshrub or shrub to 0.7 (-1.0) m. Stems often poorly branched, young stems white tomentose becoming brown and glabrescent when older, densely leafy towards apices. Leaves alternate, sessile, (7-) 12-40 (-70)  $\times$  (3-) 7-18 (-30) mm, obovate, white tomentose beneath, midrib prominent and glabrescent, secondary venation  $\pm$  prominent with numerous hairs, glabrous and shiny above, midrib and secondary venation prominent, margins entire, weakly revolute, apex acute to obtuse. Inflorescence terminal, formed from solitary axillary capitula and a terminal pseudo-umbel or modified panicle, sometimes appearing racemose (in material

from Serra do Cipo). Capitula pedicellate, pedicels 7-27 mm, ebracteolate; involucre campanulate, 9-12 mm tall  $\times$  7-12 mm diam.; phyllaries 4-5-seriate, outer series sparsely to densely pubescent towards apices, inner sparsely pubescent to glabrescent, margins finely laciniate, apex acute to obtuse, finely laciniate, often tinged purple; receptacle flat to slightly convex, distinctly alveolate. Florets ca. 30, lilac; corolla-tube 7-7.5 mm, narrow but expanding abruptly below corolla-lobes, glabrous throughout, corolla-lobes ca. 3.5 mm, glabrous, sometimes with few short hairs towards apex, or more usually somewhat mamillate. Achenes ca. 3.5 mm, body long setuliferous; carpophodium annular; pappus-setae biseriate, outer series paleaceous, 1.5-2.5 mm, margins fimbriate, inner series 5.5-6.5 mm, flattened, margins laciniate, expanded towards apex. (Fig. 3. A-B)

*Pirani et al. CFCR 12669* (K, SPF).

Apparently widespread in the Chapada Diamantina in Minas Gerais, and also present in São Paulo. Open cerrado. Flowering time: December - April.

13.7. *Vernonia salzmannii* DC., Prodr. 5: 55. 1836.

Shrub to 1.5 m tall. Stems terete,  $\pm$  striate, poorly branched, densely white sericeous. Leaves sessile to subsessile, alternate, lanceolate, 3.5-9.5 cm  $\times$  1.4-3.5 mm, base cordate to rounded, lower surface  $\pm$  silvery sericeous, upper surface green becoming glabrescent with only trichome bases present, margins obscurely serrate, apex acute to acuminate. Inflorescence of  $\pm$  dense terminal panicles of branches, axillary branches bearing scorpioid cymes, densely sericeous. Capitula sessile, usually solitary but sometimes in clusters of up to 4; involucre campanulate, 6-7 mm tall  $\times$  3-4 mm diam.; phyllaries 3-4-seriate, outer phyllaries  $\pm$  densely long sericeous, apices long-acuminate, inner phyllaries more sparsely pubescent, apices long-acuminate; receptacle  $\pm$  flat, alveolate. Florets ca. 15, lilac to white; corolla-tube 2.5-3 mm long, glabrous, corolla-lobes 3-3.5 mm long, glabrous except for several hairs towards apex. Achenes 1.5 mm long (immature), densely setuliferous; pappus-setae biseriate, outer 0.5-1 mm long, flattened, margins laciniate, inner 4-4.5 mm long, barbellate, fragile and deciduous, white.

*Mello-Silva & Pirani CFCR 10873* (K, SPF, TEX/LL).

Widespread in Central and southern America. Apparently favouring shady areas amongst rocks in open woodland adjacent to streams. Flowering time: April - June.

13.8. *Vernonia spixiana* Mart. ex DC, Prodr. 5: 53. 1836.

Shrub 0.5-0.75 m. Rootstock a xylopodium with apical trunk, branching at or above ground level. Stems striate, usually sparingly branched, often appearing leafless, pubescent, hairs adpressed, at first numerous becoming sparse on older branches. Leaves sessile, alternate, linear to narrowly lanceolate, 10-35 × 1-2.5 mm, flat to slightly fleshy, pubescent beneath, hairs numerous, adpressed, glandular punctae numerous, pubescence and glandular punctae slightly less dense above, apex long attenuate. Inflorescence terminal, inflorescence branches with leaf-like bracts, bearing few-headed scorpioid cymes, or sometimes dense terminal clusters. Capitula sessile; involucre campanulate to ± cylindrical, ca. 8 mm tall × 3 mm diam.; phyllaries 3-4-seriate, outer series densely appressed pubescent, margins lacinate, apices attenuate, inner series eventually deciduous, less pubescent, scattered glandular-punctate, margins lacinate, apices acute to long attenuate, reddish; receptacle convex, foveolate. Florets 8-10, pale pink; corolla-tube 4-4.5 mm, sparsely glandular-punctate, corolla-lobes 2.5-3 mm, glandular punctae numerous to dense towards apices, apices also with several hairs below tip. Achenes ca. 2 mm, turbinate, densely setuliferous; carpopodium narrowly annular, oblique; pappus-setae biseriate, outer and inner series ± identical, flattened, margins lacinate to barbellate, whitish.

*Harley et al.* 25026 (K, SPF, TEX/LL); *Harley et al.* 25027 (SPF, photo K) (larger right hand specimen).

Probably endemic to Minas Gerais. Apparently found in disturbed *cerrado*. Flowering time: October - December.

13.9. *Vernonia subulata* Baker in Mart. & Eichler, Fl. bras. 6(2): 108. 1873.

Erect herb, or subshrub, to ca. 1 m tall. Stems simple to poorly branched, terete, markedly striate, leafy throughout, pubescent, hairs simple, adpressed. Leaves opposite, sessile, 2.5-5.5(-10) cm × 0.3-1.5(-2) cm, lanceolate, base attenuate to obtuse, densely pubescent on midrib at base, lamina discolorous, whitish pubescent beneath, ± sparsely pubescent above, light green, margins entire, flat, apex acute. Inflorescence terminal of few branches, branches of lax few-headed, scorpioid cymes. Capitula pedicellate, pedicels 1-3.5 mm long, pubescent with adpressed ascending hairs; involucre turbinate, ca. 1.2 cm tall × ca. 1.2 cm diam.; phyllaries apices pungent, margins finely lacinate. Florets ca. 40, pink or violet to magenta; corolla-tube 5-5.5 mm long,

glabrous, corolla-lobes ca. 3.5 mm long, glabrous, apices mamillate to almost short pubescent or papillate. Achenes ca. 1.5 mm long (immature), densely long-setuliferous; carpopodium annular; pappus-setae biseriate, outer series ca. 1 mm long, flattened, margins lacinate, inner series 6-7 mm long, barbellate, fragile, straw-coloured to light reddish-brown and conspicuous in bud.

*Pirani et al.* CFCR 13021 (K, SPF, TEX/LL).

Goiás and Minas Gerais. Campo rupestre, amongst rocks and in sandy soils alongside gallery forest. Flowering time: March - June.

Except for a less dense pubescence and less regularly adpressed hairs this specimen resembles other material from the Serra do Espinhaço near Diamantina, and the fewer-headed type (*Burchell* 8751) from Porto Real in Goiás. The type material has exceptionally long pedicels, to 9 cm, compared with specimens from the Serra do Espinhaço and Grão-Mogol.

This taxon has been included in the genus *Echinocoryne* by Robinson (1987) whose distinctive pedicellate capitula, and numerous slender phyllaries are very characteristic but not worthy of generic recognition. Most species probably possess a xylopodiaceous rootstock.

13.10. *Vernonia subverticillata* Sch.Bip. ex Baker in Mart. & Eichler, Fl. bras. 6(2): 99. 1873.

Sparingly branched shrub to 2 m tall. Stems terete, striate, densely brown to greyish pubescent becoming glabrescent. Leaves alternate to spiralled, pseudopetiolate, narrowly-elliptic to elliptic or oblong-ob lanceolate, 3.5-11 cm × 1-3.5 cm, base attenuate, lower surface ± densely pubescent, upper surface shiny, often hispid, margins regularly denticulate, teeth glabrous beneath, apex acute or acuminate to ± obtuse. Inflorescence of ± massive terminal or subterminal panicles. Capitula sessile; involucre campanulate, 3-5 mm tall × 3-6 mm diam.; phyllaries ca. 3-seriate, outer sparsely to ± densely pubescent, inner phyllaries glabrous, glandular-punctate towards apex. Florets 10-15, pale lilac to whitish; corolla-tube 3-3.5 mm long, glabrous, corolla-lobes ca. 3 mm long, glabrous except for apices, apices mamillate or sometimes with one or two short hairs. Achenes ca. 3 mm long, body setuliferous, often mostly on ribs, body glandular-punctate; carpopodium annular, upper portions procurent along lower ribs; pappus-setae biseriate, outer series 0.5-1 mm long, flattened, inner series 5-6 mm long, barbellate, whitish.

*Pirani et al.* CFCR 11476 (K, SPF), CFCR 12491 (K, SPF, TEX/LL).

Probably widely distributed in Bahia and Minas Gerais. Campo rupestre, common amongst rocks and on woodland margins. Flowering time: November - May.

This species was first described from the Serra da Jacobina, Bahia. This appears to be the first record in Minas Gerais thus establishing a further link between the campos rupestres of the two States.

13.11. *Vernonia warmingiana* Baker in Mart., Fl. bras. 6(2): 68. 1873.

Erect well branched shrub or subshrub to 1.25 m. Rootstock a xylopodium, root  $\pm$  thickened. Stems usually few per rootstock, simple at base but becoming well branched towards apex, at first densely white tomentose, eventually becoming glabrescent, leafy only towards apex and on short flowering branches. Leaves sessile, alternate, patent, ovate to suborbicular or cordiform, 10-35  $\times$  7-25 mm, base cordate to obtuse, surfaces discolorous, densely white-tomentose, rarely rufous, beneath with prominent midrib, hairs simple, crisped,

indumentum less dense above, surface grey-green, margins entire to finely and obscurely dentate, apex rounded to obtuse, rarely  $\pm$  acute. Inflorescence of solitary, usually axillary, capitula on short flowering branches eventually forming a cymose flowering structure. Capitula sessile; involucre campanulate, 10-13 mm tall  $\times$  8-10 mm diam.; phyllaries 3-4 (-6)-seriate, densely white-tomentose, apices long-attenuate, persistent, spreading at dehiscence; receptacle flat to  $\pm$  convex, alveolate, naked. Florets 10-12, lilac to purple; corolla 6-6.5 mm, glabrous, corolla-lobes ca. 3 mm, pubescent outside towards apex. Achenes 2.5-3 mm,  $\pm$  densely setuliferous, glandular-punctate throughout; carpodium distinct; pappus-setae biseriate, outer series ca. 1 mm, flattened, barbellate, inner series 5-6 mm, flattened, sometimes  $\pm$  expanded towards apex, barbellate, whitish to straw-coloured.

*Harley et al.* 25025 (K, SPF).

Endemic to Minas Gerais. Scattered in cerrado. Flowering time: October - November.

#### Tribe 4. Inuleae

Annual or perennial herbs or shrubs. Branches usually unarmed, rarely terminating in a thorn. Leaves usually alternate, or opposite, rarely distichous, sometimes decussate, sessile or petiolate, bases often decurrent on stem, lamina usually simple, entire or dentate, serrate or lobed, rarely pinnatifid or pinnatisect, variously pubescent, often glandular-punctate. Inflorescences usually corymbose, or paniculate, terminal or axillary, rarely solitary, sometimes arranged in synflorescences, these sometimes surrounded by leaf-like bracts; capitula heterogamous and radiate or homogamous and discoid, or heterogamous and disciform, usually many-flowered, rarely single-flowered, large, or very small; phyllaries usually multiseriate, imbricate, cartilaginous or herbaceous, with or without a divided stereome, with or without a papery lamina, often coloured; receptacle flat, concave or convex, paleaceous or epaleaceous. Outer florets usually female, sometimes rayed, rays yellow, purple or white, or filiform and rayless, fewer, as many as or outnumbering disc-florets; inner hermaphrodite or functionally male, corolla glabrous or pubescent, corolla-lobes usually short, usually yellow, sometimes white or purple; basal anther-appendages caudate or sagittate; style bifid; style-arms with sweeping stigmatic hairs, apices truncate, obtuse or acute, sometimes apically penicillate. Achenes cylindrical or subcylindrical, usually terete, rarely triquetrous, sometimes rostrate, glabrous or setuliferous, sometimes densely so, hairs globular or elongate, glandular or eglandular; pappus or capillary barbellate or plumose setae, white, straw-coloured or purple, or of rigid awns or scales, connate at base or free, sometimes absent.

A tribe with ca. 180 genera and 1200 species, with the main centres of distribution in southern Africa, Australia, South America and the Mediterranean region. It is apparently only represented by two genera in the flora area, and by common species. It is probable several other taxa have not been collected such as *Pluchea*, *Epaltes*, and *Lucilia*.

1. Annual herbs; pappus-setae plumose, connate at base into annulus; phyllaries usually brownish ..... *Gnomochoeta pennsylvanica*
- 1'. Perennial herbs; pappus-setae barbellate, free; phyllaries white, pinkish or yellow ..... *Achyrocline*

14. *Achyrocline* DC.

Perennial herbs, rarely subshrubs. Stems winged or wingless, usually poorly branched, or branched only from base. Leaves alternate, straight, sessile, usually with decurrent leaf-bases, lamina linear or lanceolate, rarely ovate, surfaces tomentose, eglandular, margins flat, entire. Inflorescences of loose, flat-topped terminal or axillary corymbs. Capitula heterogamous, disciform; involucre cylindrical; phyllaries multiseriate, imbricate, papery, monomorphic, entire, stereome divided, monochromous, white, yellow or reddish; receptacle flat, epaleaceous. Florets few; marginal florets 4-6, filiform, female; disc-florets 1-2, hermaphrodite, fertile, corolla 5-lobed; basal anther-appendages sagittate; style-arms truncate. Achenes small, oblong, usually glabrous, sometimes with few short myxogenic hairs; pappus-setae uniseriate, capillary, barbellate, base with patent ciliae, apical cells subclavate.

A genus of over 30 species, predominantly from South America with some species in Africa and Madagascar. It is probable that the Old World species do not belong to the genus. Anderberg (1991) has commented on the affinities between *Achyrocline*, *Pseudognaphalium* Kirp. and *Stenophalium* Anderb. Some useful distinctions were made by Hind (1993a).

1. Stems winged; leaf-bases long decurrent ..... *A. alata*  
 1'. Stems wingless; leaf-bases not decurrent ..... *A. saturejoides*

14.1. *Achyrocline alata* (Kunth) DC., Prodr. 6: 221. 1838.

Aromatic decumbent, erect or ascending few to many stemmed, perennial herb to 1.5 m tall. Stems usually simple or with few branches, densely lanose/tomentose, becoming less densely so beneath, winged,  $\pm$  leafy throughout. Leaves 1-12 cm  $\times$  0.1-1.2 cm, sessile, lanceolate, base decurrent, laxly lanose above and beneath, usually denser over midrib and towards margins, margins entire, apex acute. Inflorescence of dense terminal corymbs, almost glomerule-like, forming a narrow or broad panicle; capitula  $\pm$  cylindrical; involucre 3.5-5 mm tall; phyllaries 9-14, base of outer phyllaries of outermost capitula densely lanose outside, most phyllaries glandular-punctate at base, whitish yellow to  $\pm$  pinkish yellow. Florets 4-11; outer florets female, 3-9, 2.5-4 mm long; inner florets hermaphrodite, 1-3, 2.5-4 mm long. Achenes 0.6-1 mm long, ellipsoidal, light brown, smooth or densely papillate; pappus-setae ca. 4 mm long, barbellate. (Fig. 3. C-E)

*Harley et al.* 25115 (SPF).

Widespread in South America. Brejos or in damp

areas in campos rupestres. Flowering time: September - May.

14.2. *Achyrocline saturejoides* (Lam.) DC., Prodr. 6: 220. 1838.

Erect or ascending perennial herb to 1 m tall. Stems branched towards base, ascending or decumbent, leafy, densely lanose. Leaves sessile, without decurrent leaf-bases, 0.8-3(-7.5) cm  $\times$  3-7 (-9) mm, linear-lanceolate, lanceolate, or oblanceolate, discolorous, paler beneath, densely lanose above and beneath. Inflorescence of dense terminal corymbs; involucre 4-6 mm tall; phyllaries yellow, shiny in upper part, base lanose, with glandular hairs, 9-14. Florets 4-8; female florets, 3-6, 3.5-4.5 mm long; hermaphrodite florets, 1-3, 3-4.5 mm long. Achenes 0.7-0.8 mm long, ellipsoidal, minutely papillose; pappus-setae ca. 4.5 mm long, barbellate.

*Zappi et al.* CFCR 13092 (SPF).

Widespread in South America and very variable. On tracksides among rocks, marshes and damp flushes. Flowering time: June - February.

15. *Gamochaeta* Wedd.

Annual or rarely perennial herbs. Leaves alternate, sessile, tomentose, eglandular, margins flat, entire. Inflorescences in head-like clusters or spiciform. Capitula small, ovoid to campanulate, heterogamous, disciform; phyllaries papery, monomorphic, brownish, transparent, margins hyaline, stereome undivided; receptacle flat, epaleaceous. Corolla purplish. Marginal florets filiform, female, 2- $\infty$ -seriate; disc-florets few, 2-5, hermaphrodite, fertile; anthers bases shortly tailed; apical anther-appendages flat; style-arms short, truncate, papillose at apex. Achenes small, oblong, setuliferous with globular myxogenic hairs; pappus-setae uniseriate, capillary, barbellate, basally connate and usually falling as a unit, apical cells not clavate.

A genus of over 15 species, predominantly from the New World but with one or two pantropic weeds.

15.1. *Gamochaeta pensylvanica* (Willd.) Cabrera, Bol. Soc. Argent. Bot. 9: 375. 1961.

Annual to 0.5 m tall. Stems erect to procumbent, usually poorly branched from the base, leafy into inflorescence, basal leaves sometimes persisting into flowering. Leaves pseudopetiolate, oblanceolate to obovate-spathulate, 1.5-8 cm × 0.4-1.8 cm, margins flat to sinuate, apex apiculate. Inflorescence continuous from vegetative stem, of axillary to lateral glomerules; capitula in dense clusters, campanulate, sessile; involucre 2.5-3 mm tall × 1.5-2 mm diam.; phyllaries 3-4-seriate, outer ovate triangular, arachnoid to

tomentose and often matting capitula together, middle usually rounded at apex, glabrous, inner linear-oblong, glabrous; receptacle deeply concave. Outer florets ca. 1.5 mm long, numerous. Disc florets 3; corolla-tube ca. 1.5 mm long; corolla-lobes often purplish. Achenes ca. 0.5 mm long, sparsely glandular, greenish-brown; pappus-setae 1.2-1.5 mm long, white. (Fig. 3. F-G)

*Harley et al.* 25056 (K, SPF)

Widespread pantropic weed. In sandy depressions alongside river. Probably capable of flowering all year.

### Tribe 5. **Astereae**

Perennial or sometimes annual herbs, or often shrubs or sometimes small trees. Leaves usually alternate or sometimes basal, entire or toothed, rarely divided. Capitula mostly heterogamous and radiate, rarely homogamous and discoid or occasionally dioecious; involucre usually campanulate; phyllaries usually imbricate, in several series, rarely only biseriate; receptacle usually naked. Outer florets usually radiate and female, inner florets usually tubular and hermaphrodite or male, usually regular and 5-lobed; corollas yellow, blue, violet, pink or white; anther bases usually obtuse, apical appendages ± triangular; style-arms in hermaphrodite florets semi-orbicular in section, tipped with subulate to triangular appendages covered with collecting hairs. Achenes variable, often setuliferous and laterally compressed, rarely rostrate; pappus usually of several series of barbellate bristles, rarely coroniform or absent.

A tribe of ca. 135 genera and ca. 2500 species. The main centres of distribution are generally outside of the tropics in North and South America, South Africa and Australia.

### 16. *Baccharis* L.

Subshrubs, shrubs, or rarely small trees, dioecious. Rootstock fibrous or a xylopodium. Stems and branches cylindrical or conspicuously winged or flattened, leafy or essentially leafless, simple or well-branched. Leaves usually alternate, rudimentary and often rapidly deciduous, or fully developed and ± seasonally deciduous, glabrous to variously pubescent, margins entire to variously dentate or serrate. Inflorescences scapose, cymose or paniculate, occasionally forming synflorescences; capitula sessile or pedicellate, small to medium, discoid; involucre campanulate or cylindrical; phyllaries 3-8-seriate, margins scarious, hyaline, ciliate or fimbriate, inner phyllaries often deciduous; receptacle flat or convex, naked or rarely paleaceous, often alveolate. Female capitula smaller or larger than male; female florets few to many, filiform, usually expanded towards base, corolla glabrous or with few scattered hairs towards apex, corolla-lobes subequal to zygomorphic and minutely rayed; style glabrous; style-arms smooth, glabrous or pubescent, usually long-exserted. Male capitula with hermaphrodite florets, sterile; male florets few to many, cylindrical, actinomorphic, 5-lobed; anthers usually well exserted from corolla, basal anther-appendages subauriculate, apical anther-appendages about twice as long as wide, acute; style-arms coherent or slightly to well divided. Achenes of male capitula abortive, achenes of female capitula usually 5-ribbed, or 10-12-ribbed, body glabrous, setuliferous or glandular-punctate; pappus-setae usually uniseriate, often crisped at base, sometimes crisped throughout, setae of male capitula usually shorter than those of female capitula, barbellate, white to fawn.

A large genus of at least 400 species restricted to the New World and most from South America. Many of the species of *Baccharis* seen in the field appear to demonstrate differences in habit and stature, and frequently size

differences in vegetative parts, between male and female plants. These observations do not appear to have been mentioned in the literature, unlike the size and shape differences of the capitula. It is highly probable that several species groups will have to be reworked when more material becomes available. Detailed population studies of several species and species complexes would be a useful addition to the study of this complicated genus.

1. Inflorescences agglomerated at branch apices into glomerule-like capitulescences, pedicels often flattened; leaves with penninervate venation ..... *B. platypoda*
- 1'. Inflorescences free and never forming glomerule-like capitulescences, pedicels capillary if present; leaves with reticulate venation
  2. Leaf-margins serrate throughout ..... *B. serrulata*
  - 2'. Leaf-margins remotely serrate or leaf apex  $\pm$  3-lobed
    3. Capitula axillary on short side shoots ..... *B. subdentata*
    - 3'. Capitula in distinct terminal corymbose inflorescences ..... *B. ligustrina*

16.1. *Baccharis ligustrina* DC., Prodr. 5: 421. 1836.

Erect or ascending sparingly branched shrub to 1.5 m tall. Stems simple, rarely branched, striate. Leaves sessile, linear-lanceolate to linear-spathulate, base long-attenuate, lamina 1.5-10.5 cm  $\times$  4-8 mm, essentially uninervate but often appearing weakly trinervate, midrib prominent beneath, apex acute, minutely serrate. Inflorescence terminal, corymbose, inflorescence branches with scattered long simple eglandular hairs. Female capitula sessile, subsessile or short-pedicellate, pubescent; involucre  $\pm$  campanulate, 2.5-3 mm tall; phyllaries 3-seriate, green, margins scarious, apices acute to attenuate; florets 20-30; corolla ca. 3 mm long, scattered pubescent throughout; style glabrous; style-arms shortly papillose; achenes ca. 2 mm long, 5-ribbed, ribs setuliferous, hairs often simple, sometimes bifid at apex, body glabrous; pappus-setae 4.5-5 mm, barbellate. Male capitula pedicellate; involucre  $\pm$  campanulate, 3-3.5 mm tall; phyllaries 3-seriate, margins scarious; florets 40-45; corolla 3-3.5 mm long, ca. 2 mm diam. across lobes, pubescent; style glabrous; style-arms long-papillose, dilated towards base, tapering towards tip; pappus-setae 3-3.5 mm long, barbellate, not broadened and flattened towards apex.

*Campos et al. CFCR 13470* (K, SPF) ( $\sigma$ ).

Widespread in Minas Gerais, Goiás, Distrito Federal and Bahia but under collected. Also known from Guyana and Bolivia. Often common around brejo and stream margins, sometimes amongst rocks in streams. Flowering time: June - October.

16.2. *Baccharis platypoda* DC., Prodr. 5: 409. 1836.

Erect poorly branched shrub to 2 m tall. Stems usually few-branched, densely leafy towards apex. Leaves spirally arranged, coriaceous, petiolate, bases attenuate, lamina 2.5-8.5(-10) cm  $\times$  1.2-5.5(-6.5) cm,

obovate, occasionally elliptic to oblong, penninervate venation distinctive and  $\pm$  prominent, obscurely glandular-punctate, margins  $\pm$  remotely serrate, apex acute or obtuse, occasionally truncate. Inflorescences of two types, male inflorescences lax often  $\pm$  umbellate occasionally appearing glomerule-like, terminal or axillary, peduncles and pedicels flattened, female inflorescences at first terminal forming glomerules, later appearing  $\pm$  verticillate. Female capitula sessile, inflorescences with many smaller bracteoles throughout; involucre 5-6 mm tall  $\times$  ca. 5 mm diam.,  $\pm$  cylindrical; phyllaries 4-5-seriate, margins hyaline towards apex, apex acute to obtuse; florets to 20, fragrant; corolla 3.5 mm long, 5-lobed, glabrous; style-arms shortly papillose; achenes ca. 2.5 mm long, glabrous, 10-ribbed, ribs pale, body dark-brown; pappus-setae ca. 5 mm long, barbellate, easily detached, reddish-fawn. Male capitula pedicellate, often flattened, peduncles mostly flattened, bracteolate at base; involucre campanulate, ca. 6 mm tall  $\times$  5-6 mm diam.; phyllaries 3-4-seriate, glandular-punctate towards apex, somewhat viscid, margins subentire, erose or lacinate towards apex, apex acute or obtuse; florets 40-50; corolla 4-4.5 mm long, ca. 2 mm diam., corolla-tube pubescent towards apex only; style-arms dilated basally, long papillose at base  $\pm$  short papillose towards apices; pappus-setae 3.5-4 mm long, barbellate, broadened and flattened apically, reddish. (Fig. 3. H-L)

*Giulietti et al. CFCR 9914* (K, SPF) ( $\sigma$ ); *Harley et al. 25093* (K, SPF) ( $\sigma$ ); *Hensold et al. CFCR 3448* (K, SPF) ( $\sigma$ ); *Pirani et al. CFCR 13101* (K, SPF) ( $\sigma$ ).

Widespread in Eastern Brazil from Bahia south to São Paulo. Often frequent, usually amongst scrub and open woodland on campos rupestres margins, and brejos in sandy soil between rocks. Flowering time: September - June (although probably much longer).

Somewhat variable in leaf-size and margin toothiness although this does not correspond to any geography.

Collecting notes indicate that the plant is odoriferous and the inflorescences perfumed.

16.3. *Baccharis serrulata* (Lam.) Pers. (incl. *B. lundii* DC.), Syn. Pl. 2: 423. 1807. [non DC. = *Baccharidastrum triplinervium* (Less.) Cabrera, nec Baker = pp. *Baccharis medullosa* DC.]

Well branched shrub 0.75-2 m tall. Stems viscid, leafy in upper part only, striate, pubescent. Leaves alternate, viscid, petiolate, often winged, laminae trinervate, ovate to lanceolate, 2.5-6(-12) cm × 1.2-3.5(-5) cm, membranous, base attenuate to truncate, mid- to dark green and glandular-punctate, pubescent, paler beneath, pubescent, margins coarsely to finely serrate, apex acute to acuminate. Inflorescence terminal or subterminal in ± dense leafless corymbs, in male plants generally laxer and longer. Female capitula rarely sessile or subsessile, more usually pedicellate, pubescent, viscid; involucre ± campanulate, 3-4 mm tall × 3-4 mm diam.; phyllaries 3-seriate, margins scarious, apex obtuse on outer phyllaries, acute on inner; florets 30-40; corolla ca. 1.5 mm × 0.1 mm, scattered pubescent; style-arms shortly papillose; achenes 1-1.3 mm long, 8-10-ribbed, ribs and body setuliferous, fawn; pappus-setae 2.5-3 mm long, barbellate, off-white. Male capitula occasionally sessile to subsessile, usually pedicellate, pubescent, viscid; involucre ± campanulate, ca. 2 mm tall × 1.5-2 mm diam.; phyllaries 2-3-seriate, essentially glabrous, margins scarious, lacinate, apex obtuse to acute; florets 30-40; corolla 2-2.5 mm long, ca. 1 mm diam. across lobes, glabrous or scattered pubescent; style-arms ± long papillose; pappus-setae ca. 2 mm long, barbellate, broadened and flattened towards apex.

*Freire-Fierros et al. CFCR 12580* (K, SPF)(♀); *Harley et al. 25128* (K, SPF)(♂).

Widespread in eastern Brazil from Pernambuco

south to São Paulo. Locally common, occasionally dominant forming dense stands in campo or the margins of gallery forests, often in short scrubby vegetation and in disturbed areas of cerrado, and campos rupestres. Flowering time: September - May.

16.4. *Baccharis subdentata* DC., Prodr. 5: 408. 1836.

Shrub to 1.5 m tall. Stems laxly branched, striate, glabrous. Leaves alternate, pseudopetiolate, lamina 1.5-4.5 cm × 0.5-1.5 cm, obovate to oblong, coriaceous, base attenuate, usually strongly trinervate from near base, margins remotely serrate with 1-4 pairs of coarse teeth, rarely entire, apex acute to obtuse. Inflorescences axillary, on short branches and in terminal clusters on branches, distinctly leafy with reduced, usually entire, leaf-like bracts throughout. Female capitula ca. 7 mm tall × ca. 2 mm diam. Florets 15-20; corolla-tube ca. 4 mm long; achenes ca. 4 mm long. Male capitula very shortly pedicellate to sessile, pedicels to ca. 1.5 mm; involucre ca. 4 mm tall × ca. 2.5 mm diam., cylindrical; phyllaries 3-4-seriate, margins narrowly hyaline, subentire to lacinate, apex acute; florets 10, cream; corolla-tube ca. 3 mm long, scattered pubescent but denser towards corolla-lobes, corolla-lobes ca. 0.5 mm long; style-arms shortly papillose; achenes abortive; pappus-setae ca. 3 mm long (immature), barbellate, ± broadened and flattened apically, fawn.

*Cordeiro et al. CFCR 8855* (K, SPF)(♂).

Widespread in Minas Gerais, Goiás and the Distrito Federal and Mato Grosso. Cerrado, open campo and woodland margins. Flowering time: September - May.

A species in a very difficult group, the *B. linearifolia*-group, showing large variations in leaf size. The group is characterised by possessing capitula grouped at the apices of short to long axillary branches.

## Tribe 6. Senecioneae

Annual or perennial herbs or shrubs, rarely trees, sometimes scandent, sometimes succulent. Leaves usually alternate, rarely opposite or rosulate, simple, sessile or petiolate, herbaceous to coriaceous or fleshy. Inflorescence commonly compound cymose, corymbose, paniculate, or occasionally scapose. Capitula heterogamous and radiate or disciform, or homogamous and discoid; involucre hemispherical to obconical or cylindrical; phyllaries usually uniseriate, free or sometimes connate, with or without a few smaller outer basal bracts forming a calyculus; receptacle flat or convex, sometimes alveolate, naked. Outer florets female, rayed, rays usually yellow, sometimes white or purple, or filiform and rayless, or outer florets absent; disc-florets hermaphrodite or functionally male; corollas yellow, white, purple, pink, red, orange or brownish, usually 5-lobed, lobes short or sometimes comparatively long and narrow; anther-collar cylindrical to flattened, sometimes dilated; basal anther-appendages sagittate, less often rounded or tailed, sometimes caudate; apical anther-appendages ovate, lanceolate or oblong, obtuse to acute; style-base often swollen; style-arms with separate, contiguous or confluent stigmatic lines, truncate, conical or variously

appendaged, sometimes apically penicillate. Achenes usually distinctly 5- or 8-10-ribbed, usually columnar, sometimes flattened or smooth, sometimes compressed, glabrous or setuliferous, sometimes glandular-punctate; pappus-setae uni- to multi-seriate, barbellate, rarely absent, persistent or deciduous, white, straw-coloured, pinkish, reddish or purple.

A tribe of about 110 genera and ca. 3000 species, of world-wide distribution, including several pantropic weeds.

1. Stems glabrous, glaucous; capitula discoid, with 5 florets and 5 phyllaries; style-arms rounded at apex lacking penicillate appendage but with dorsal hairs; shrubs ..... *Hoehnephytum trixoides*
- 1'. Stems variously pubescent, sometimes glandular pubescent; capitula discoid or radiate, with more than 5 florets and 5 phyllaries; style-arms truncate or triangular with penicillate appendage; outer florets rayed or very short filiform without limb, or lacking; herbs, perennial subshrubs or shrubs ..... *Senecio*

### 17. *Hoehnephytum* Cabrera

Shrubs. Stems glaucous, simple or branched, glabrous, leafy throughout or in upper part only. Leaves alternate, glaucous, subfleshy, sometimes fragile, glabrous, sessile or petiolate, margins entire or rarely with a few remote teeth. Inflorescence terminal, a lax to dense corymb. Capitula homogamous, discoid; involucre  $\pm$  cylindrical; phyllaries uniseriate, 5, margins ciliate, sometimes penicillate at apex; receptacle naked, strongly foveolate to alveolate. Florets 5, yellowish to cream or whitish. Corolla actinomorphic, 5-lobed; anther-appendages about twice as long as wide, apex obtuse; style-arms rounded at apex, with short dorsal hairs. Achenes cylindrical, 10-ribbed, densely setuliferous; pappus-setae capillary, barbellate, fragile, whitish.

A genus of three species from Minas Gerais and Bahia.

17.1. *Hoehnephytum trixoides* (Gardner) Cabrera, Brittonia, 7: 53. 1950.

Erect shrub to 1.5-2 m tall, poorly branched below, fastigiate sub-umbellate to paniculate branching above. Stems striate to angled, glabrous, leafy towards apices. Leaves subsessile to shortly petiolate, subfleshy, spiralled, imbricate, linear-oblong to ovate-elliptical, 1.5-5 cm  $\times$  0.8-2.5 cm, reducing only slightly in size towards stem apex and then  $\pm$  uniform on branches, glabrous, margins pinkish, entire, sometimes remotely long-ciliate, midrib prominent, secondary venation  $\pm$  obscure, apex obtuse, often mucronate. Inflorescence terminal, corymbose, compact, many-headed; capitula pedicellate; pedicels ca. 1 cm long, bracteolate, bracteoles 5, linear-

subulate; phyllaries 6.5-8 mm long, bright-green, glabrous excepting penicillate to ciliate apex, margins entire, scarious, rarely remotely ciliate. Florets cream to yellowish; corolla 6-6.5 mm long, glabrous; corolla-lobes ca. 2 mm long. Achenes ca. 3.5 mm long (immature), densely setuliferous; pappus-setae 6-8 mm long, biseriate, barbellate, deciduous, fragile, whitish. (Fig. 3. M-N)

*Cordeiro & Mello-Silva CFCR 10156* (K, SPF); *Pirani et al. CFCR 13342* (K, SPF).

Widespread in Minas Gerais and Bahia. Occasional in campos rupestres and cerrado de altitude. This species was originally discovered near Formigas, not far from Grão-Mogol.

### 18. *Senecio* L.

Annual, biennial, triennial or perennial herbs, subshrubs, shrubs, rarely climbers or trees. Stems simple, poorly branched or well-branched, glabrous or variously pubescent. Leaves alternate, very rarely opposite, sometimes radicle, sessile or petiolate, glabrous or variously pubescent, margins entire or serrate. Inflorescence terminal or axillary, scapose or corymbose. Capitula heterogamous, discoid, disciform or radiate. Involucre calyculate, cylindrical or campanulate, sometimes  $\pm$  hemispherical; phyllaries uniseriate; receptacle flat or  $\pm$  convex, glabrous, alveolate. Outer florets female, uniseriate, fertile, sometimes lacking limb, limb when present small to conspicuous, white, yellow, orange, red, or purple. Disc-florets hermaphrodite, numerous, corolla tubular, 5-lobed; anther bases sagittate;

style-arms truncate or triangular at apex, penicillate. Achenes cylindrical, ribbed, glabrous or setuliferous; pappus-setae multiseriate, capillary, barbellate, fragile and usually caducous, usually white.

A cosmopolitan genus of about 1000 species. The genus is represented on all continents except the Antarctic. These are several widespread weedy species and some are considered as noxious weeds.

- 1. Achenes 5-ribbed, capitula discoid ..... *S. gertii*
- 1'. Achenes 10-ribbed, capitula discoid or radiate
  - 2. Capitula discoid; florets pink; achenes setuliferous ..... *S. pohlii*
  - 2'. Capitula radiate; ray florets yellow; achenes glabrous ..... *S. adamantinus*

18.1. *Senecio adamantinus* Bong. Mém. Acad. Imp. Sci. Saint-Pétersbourg. Sér. 6, Sci.Math., Seconde Pt. Sci. Nat. 6(2): 31. 1838.

Herb to ca. 1.2 m tall. Rootstock a xylopodium. Stems erect, usually simple, striate, white-tomentose to arachnoid-pubescent, becoming glabrescent beneath, leafier in lower half, pith hollow in mature plants. Leaves alternate, sessile, lanceolate to oblanceolate, 8-18 cm × 2-4 cm, base amplexicaul, lamina discolorous, white-tomentose to arachnoid pubescent beneath, glabrous and green above, margins irregularly and usually coarsely toothed to sinuate-dentate, apex obtuse. Inflorescence terminal, paniculate, branches densely corymbose, arachnoid pubescent to tomentose. Capitula radiate, pedicellate, tomentose to arachnoid-pubescent; involucre 5-6 mm tall × ca. 4 mm diam., campanulate; phyllaries 10-12, glabrous or pubescent, margins scarious, entire to coarsely lacinate towards apex, apices acute, ± densely pubescent below apex, sparsely glandular-punctate. Ray-florets 1-3, female, ray ca. 5 × ca. 1 mm, glabrous, yellow. Disc-florets ca. 10, hermaphrodite; corolla-tube ca. 6 mm long, glabrous. Achenes 2.5-3 mm long, glabrous; pappus-setae 5-6 mm long, barbellate, fragile, deciduous, white. (Fig. 3. O-P)

*Mello-Silva et al. CFCR 11511* (K, SPF).

Widespread in Minas Gerais, Paraná, Rio de Janeiro and São Paulo. Moderately common in sandy soil in grassy areas in campos rupestres. Flowering time: November - May.

NB. This material corresponds to *S. adamantinus* var. *adamantinus* in the sense of Baker (1884) and Cabrera (1950).

18.2. *Senecio gertii* Zardini, Bol. Mus. Bot. Munic. 37: 1. 1979.

Erect herb or subshrub, 1-2 m tall. Stems erect,

usually simple, sometimes poorly-branched, densely white-tomentose, ± striate, usually densely leafy towards apex. Leaves sessile, alternate, 6-24.5 cm × 2-12 cm, ovate to oblanceolate, base auriculate, lamina greenish-grey tomentose beneath, greener above, indumentum becoming ± arachnoid, primary venation pinnate, midrib and primary venation prominent beneath, margins very coarsely and irregularly dentate, apex acute to obtuse. Inflorescence terminal, to ca. 1 m tall; capitula pedicellate, greenish-grey tomentose; involucre 0.9-1 cm tall × 7-9 mm diam., campanulate; phyllaries ca. 8 mm long, 10-13, yellowish-grey tomentose, apices attenuate. Florets ca. 25, yellow; corolla-tube 3-3.5 mm long, expanded towards base, ± abruptly expanded to corolla-throat, glabrous; corolla-throat 2.5-3 mm diam., glabrous; corolla-lobes 1.5-2 mm long, glabrous, apices slightly mamillöse outside, acute. Achenes 3-3.5 mm long, 5-ribbed, body rugulose, dark brown to black, shiny, ribs appearing whitish, with dense vesiculate setulae in several series; carpopodium a very narrow ± inconspicuous annulus; pappus-setae biseriate, series ± equal, 6.5-7 mm long, barbellate, fragile, breaking off at base leaving distinctive ring of bases at achene apex, white.

*Cavalcanti et al. CFCR 8505* (K, SPF); *Hatschbach 41467* (holotype MBM, isotype LP); *Martinelli et al. 11253* (K, RB); *Mello-Silva & Cordeiro CFCR 10099* (K, SPF); *Pirani et al. CFCR 13438* (K, SPF).

Endemic to the Grão-Mogol area. Campo rupestre, in sandy soil amongst rocks. Moderately common. Flowering time: July - September.

Collection notes on *Cavalcanti et al. CFCR 8505* indicate that the florets are scented. The robust habit, sessile auriculate-based leaves, discoid capitula and the characteristic achenes of the plant provided a variety of characters that suggest closer affinities with *S. dumetorum* Gardner (sect. *Tomentecio* Cabrera), especially with the absence of a distinctive carpopodium. The type material appears to be smaller in leaf size than some other collections.

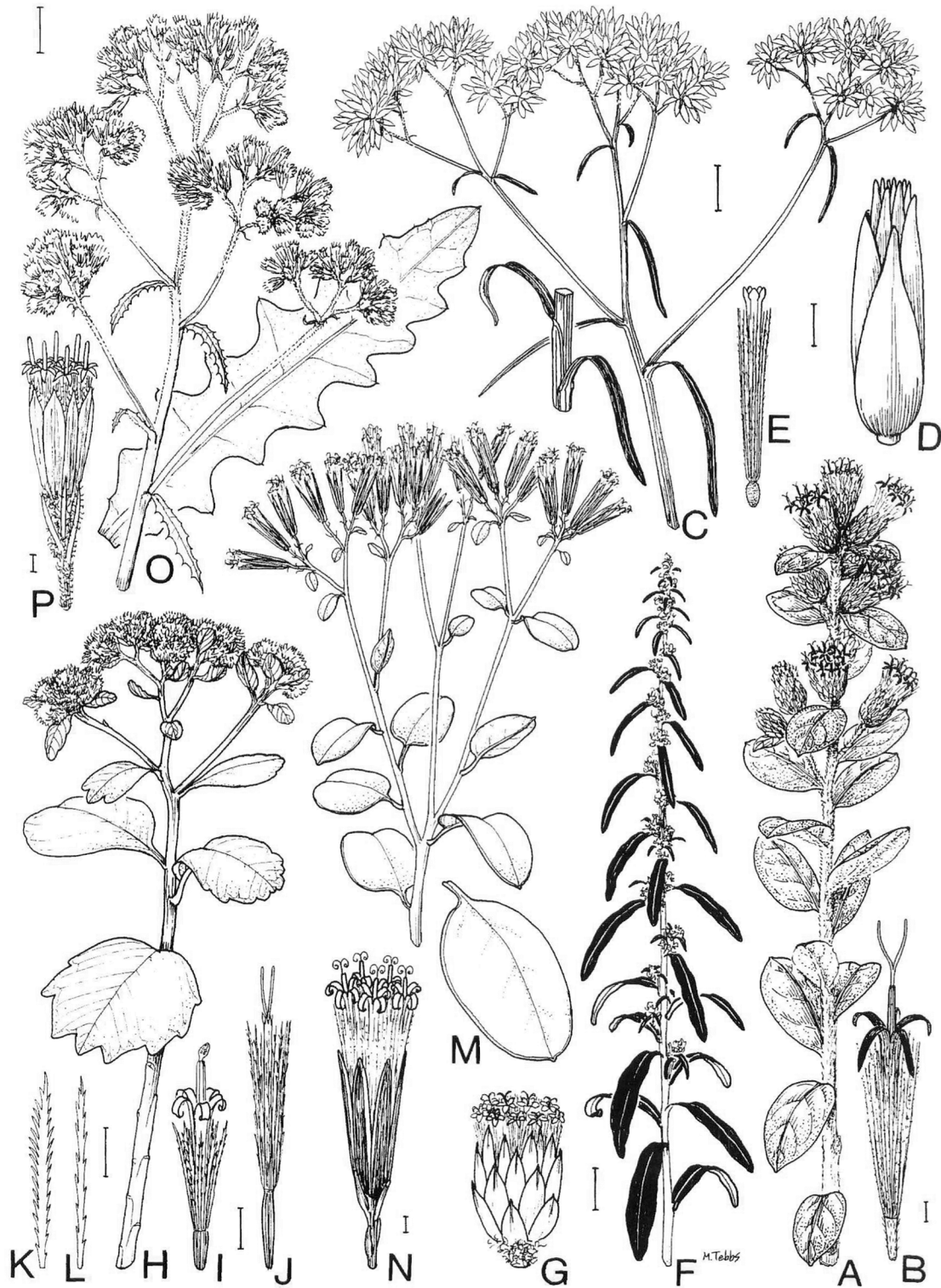


Fig. 3. COMPOSITAE: VERNONIEAE: A-B. *Vernonia pycnostachya*: A. flowering shoot; B. floret (Harley et al. 25270). INULEAE: C-E. *Achyrocline alata*: C. flowering shoot, with portion of winged stem; D. capitulum; E. hermaphrodite floret (Ganev 986); F-G. *Gamochaeta americana*: F. flowering shoot; G. capitulum (Harley et al. H50635). ASTEREAE: H-L. *Baccharis platypoda*: H. flowering shoot of male plant; I. hermaphrodite floret; J. female floret; K. apex of pappus seta from hermaphrodite floret; L. apex of pappus seta from female floret (Harley et al. 25093). SENECEONEAE: M-N. *Hoehnephytum trixoides*: M. flowering shoot, with mature leaf (Gardner 4938, lectotype); N. capitulum (Irwin et al. 7862). O-P: *Senecio adamantinus*: O. flowering shoot with mature leaf; P. capitulum (Mello-Silva et al. CFCR 11511). Scale bars K, L = 0.5 mm; B, D, E, G, I, J, N, P = 1 mm; A, C, F, H, M, O = 10 mm.

18.3. *Senecio pohlii* Sch.Bip. ex Baker in Mart. & Eichler, Fl. bras. 6(3): 303 1884.

Annual to biennial herb to ca. 1 m tall. Stems erect, simple or poorly branched, terete, sparsely pubescent or glabrous, leafy largely in lower half. Leaves alternate, sessile, lower leaves lanceolate, 8-16 cm × 0.8-2.5 cm, base long-attenuate, lamina usually glabrous above and beneath, sometimes with sparse hairs, margins irregularly serrate, apex acute to acuminate; upper leaves with auriculate bases, narrowly-lanceolate, 3-10 cm × 0.4-1 cm, apex long-attenuate. Inflorescence terminal, corymbose. Capitula pedicellate, pedicels 0.5-1.5 cm, glabrous or glandular-stipitate; involucre narrowly campanulate, 0.8-1 cm tall × 6-9(-14) mm diam., calyculate; phyllaries 10-20, glabrous. Florets 40-80, pink; corolla-tube 6.5-7 mm long, glabrous; corolla-lobes

slightly mamilllose outside at apices. Achenes ca. 3 mm long, setuliferous; pappus-setae 7-9 mm long, finely barbellate, white.

*Mello-Silva et al. CFCR 8995 (K, SPF).*

Widespread in Minas Gerais, Rio de Janeiro and São Paulo. Common in grassy areas amongst rocks in campos rupestres. Flowering time: December - March. A variable species especially in leaf size, involucre size, and floret number.

This species was combined, incorrectly, into *Pseudogynoxys pohlii* (Sch.Bip. ex Baker) Leitão Filho (Leitão Filho 1977). The lack of the distinctive conical or attenuate appendage of the style-arms in this taxon, which helps separate *Pseudogynoxys* from other members of the tribe (q.v. Hind 1993b), maintains the species in the genus *Senecio sensu stricto*.

### Tribe 7. Eupatorieae

Herbs, shrubs, or climbers, rarely small trees. Leaves usually opposite, rarely strictly alternate, sessile to long-petiolate, lamina usually simple, sometimes lobed, rarely with strongly dissected margins. Inflorescence usually a flat topped or dome shaped corymbose panicle, sometimes spicate, rarely scapiform or scapose. Capitula homogamous, discoid; involucre imbricate, subimbricate or eximbricate; phyllaries few or numerous, uniseriate or in several series; receptacle flat to convex, rarely highly conical, usually naked, occasionally paleaceous or hairy. Florets few (rarely one, often four or five) to many, whitish, reddish, violet or bluish but never yellowish. Corollas funnelform to tubular, corolla lobes relatively short, commonly five, rarely four, outer surfaces glabrous, occasionally glandular-punctate, sometimes variously pubescent, usually glabrous on the inner surface, rarely papillate; anther-bases obtuse; style-base glabrous or pubescent, sometimes with a swollen node; styles usually very conspicuous and much exserted; branches clavate, obtuse. Achenes obovoid or oblong and possessing phytomelanin in achene walls, usually 3-5-ribbed, sometimes 10-ribbed, rarely flattened, base sometime stipitate, usually with a distinct carpododium; pappus of capillary setae or rarely of scales or coroniform, sometimes absent, commonly barbellate or laciniate, rarely plumose.

A tribe of 185 genera and ca. 2000 species. The tribe appears to be nearly restricted to the Western Hemisphere suggesting a Neotropical origin. The subtribes show a mixed distribution pattern, with explosive speciation in several, especially in Mexico, the West Indies, Colombia, and Brazil. There are many pantropical and pansub-tropical weeds in the tribe.

1. Phyllaries and florets 5 ..... *Mikania*
- 1'. Florets 5 or more, phyllaries more than five, bi- to many-seriate
  2. Pappus plumose; corolla lobes densely pubescent
    3. Leaves sessile or with a narrow petiole; apical anther-appendages rounded to ± retuse; stems with ± distinctive ridges ..... *Trichogonia*
    - 3'. Leaves petiolate, petiole broad and winged; apical anther-appendages bifid or deeply notched; stems ± smooth ..... *Trichogoniopsis adenantha*
  - 2'. Pappus if present barbellate, but never strongly so, or laciniate; corolla lobes lacking dense pubescence
    4. Phyllaries completely deciduous, apices usually coloured ..... *Chromolaena barbacensis*
    - 4'. Outer phyllaries persistent, apices concolorous
      5. Phyllaries ± equal; receptacle conical ..... *Conocliniopsis prasiifolia*
      - 5'. Phyllaries of unequal series; receptacle flat or slightly convex

- 6. Pappus of scales, awns or absent
  - 7. Receptacles paleaceous ..... *Acritopappus irwinii*
  - 7'. Receptacles epaleaceous ..... *Ageratum*
- 6'. Pappus of capillary setae, occasionally flattened
  - 8. Leaves narrow, linear, usually densely spirally arranged; style-base enlarged and pubescent ..... *Pseudobrickellia*
  - 8'. Leaves lanceolate, ovate; style-base not enlarged and glabrous or enlarged and glabrous or papillate
    - 9. Style base swollen
      - 10. Style-arms long-papillose; style-base glabrous; achenes only setuliferous ..... *Ayapana amygdalina*
      - 10'. Style-arms short-papillose; style-base long-papillate; achenes setuliferous and glandular ..... *Ayapanopsis oblongifolia*
    - 9'. Style base lacking swollen node
      - 11. Florets 15-20 ..... *Koanophyllon adamantium*
      - 11'. Florets 5
        - 12. Plants pubescent, sometimes with stipitate-glandular hairs
          - 13. Apical anther-appendages retuse; leaves opposite ..... *Symphyopappus*
          - 13'. Apical anther-appendages acute; leaves densely spirally arranged ..... *Disynaphia praeficta*
        - 12'. Plants glabrous, sometimes sticky
          - 14. Style-base pubescent; leaves concolorous, lamina narrowly ovate to elliptic, margins crenate in upper 2/3 ..... *Stomatanthes polycephalus*
          - 14'. Style-base glabrous; leaves discolorous, lamina deltoid, margins serrate ± to base ..... *Bejaranoa semistriata*

#### 19. *Acritopappus* R.M.King & H.Rob.

Erect sparsely to moderately branched shrubs or small trees. Stems terete to 6-angled, often striate, usually glabrous. Leaves opposite, coriaceous to subcoriaceous, usually short- to long-petiolate, sometimes sessile, lamina ovate, ovate-elliptical, lanceolate, or linear, base usually acute, sometimes rounded or truncate, glabrous or pubescent, often viscid, secondary veins usually pinnate, tertiary veins forming ± prominent reticulum, margin serrate to subserrulate or nearly entire, apex obtuse or acute to long-acuminate. Inflorescence terminal on leafy sometimes short branches, branches densely subcymose; pedicels usually short, puberulous or glabrous; phyllaries 5-25, 2-3-seriate, sometimes appearing ± uniseriate, eximbricate, somewhat unequal to subequal; receptacle flat to convex, paleaceous, paleae linear, outer often merging with phyllaries. Florets 5-30, usually pale lavender or pink; corollas narrowly funnelform, glandular-punctate or glandular-stipitate on outer surfaces; corolla-lobes triangular, usually slightly longer than wide, inner surface usually with short papillae; anther-appendages oblong-triangular, usually slightly longer than wide; style-base not enlarged, glabrous; style branches linear, densely short-papillose. Achenes 5-ribbed, prismatic, glabrous; carpopodium distinct, short; pappus reduced or appearing absent, sometimes with a short crown, or with few awns.

A genus of ca. 25 species with the majority of species occurring in Bahia. Easily distinguished from *Ageratum* by raised glands on the leaf surfaces, its shrubby or tree-like habit, pinnate venation, the broadly corymbose or subcymose inflorescences and the ± flat paleaceous receptacle.

19.1. *Acritopappus irwinii* R.M.King & H.Rob., Phytologia 24(5): 402. 1972.

Glabrous shrub to 2.5 m tall. Stems sparsely branched, terete, striate. Leaves pendent, viscid, petiolate, petioles 0.5-2.5 cm long, narrow, lamina ovate-lanceolate, 5-12 cm × 1-4 cm, base rotund, margins subentire to irregularly serrate, apex narrowly

acuminate. Inflorescence terminal or axillary, many-headed, capitula pedicellate, pedicels 1.5-10 mm long; capitula 7-9 mm tall; involucre campanulate ca. 5 mm diam. × 5-6 mm tall; phyllaries 2-3-seriate, ca. 15, glabrous, margins scarious, coarsely laciniate, apices obtuse to rotund. Florets ca. 25-30, pale lilac; corolla-tube 4.5-5 mm long, glabrous, eglandular. Achenes 2-

2.5 mm long; pappus of few (0-5) setae, or coroniform. (Fig. 4. A-B)

*Cordeiro et al. CFCR 840* (SPF); *Kameyama et al. CFCR 9000* (SPF); *Zappi et al. CFCR 13190* (SPF).

Apparently restricted to Minas Gerais around Grão-Mogol. In dense cerrado in sandy soil amongst rocks. Flowering time: January - April.

The paratype material of this species has much wider phyllaries than given in the protologue, up to 3 mm, and even the isotype material approaches 2 mm. This species is easily distinguished from the more widespread *A. confertus* (Gardner) R.M.King & H.Rob. and the similar *A. longifolius* (Gardner) R.M.King & H.Rob. by its rounded leaf-bases, the larger fewer capitula and the longer achenes. King and Robinson (1972) provided a useful key to the three species.

## 20. *Ageratum* L.

Erect branching herbaceous annuals or short-lived sub-shrubby perennials. Stems terete, striate, sparsely puberulous to sparsely hirsute. Leaves opposite, ovate, petiolate, dentate. Inflorescence cymose to subcymose or corymbose, sometimes subumbellate, pedicels short to moderately long; capitula small, homogamous; involucre campanulate; phyllaries 30-40, 2-3-seriate, subequal, linear or oblong-lanceolate; receptacle naked, occasionally paleaceous, convex. Florets 20-125, white, blue, or lavender; corollas tubular, 5-lobed; corolla tube papillose on the inner surface, occasionally hispidulous on the outer surface; anther-appendages somewhat longer than wide,  $\pm$  acute; style-base not enlarged, glabrous; style-branches elongate, exerted, obtuse at the tip. Achenes oblong, 4-5-ribbed, glabrous or ribs setuliferous; carpopodium distinct, usually large and asymmetrical; pappus lacking, coroniform or of about 5 aristate scales, broadened somewhat at base.

A genus of over 40 species, ranging from Mexico and Central America to the West Indies and South America. Two species, *A. conyzoides* and *A. houstonianum*, escaping readily from cultivation.

1. Annual herb; pappus present as 5 awned scales; achenes setuliferous in ribs ..... *A. conyzoides*  
 1'. Shrub; pappus reduced to a very short corona; achenes glabrous ..... *A. fastigiatum*

### 20.1. *Ageratum conyzoides* L., Sp. pl.: 839. 1753.

Rank-smelling, usually annual herb, 10-70 cm tall. Stems terete, whitish-pilose. Leaves petiolate, petioles hirsute to 50 mm long; lamina 2-10 cm  $\times$  1.5-7 cm, base truncate, rounded or cuneate, margins crenate, apex obtuse or subacute, hirsute on both surfaces with long spreading hairs, lower surface studded with glistening sessile glands. Inflorescences terminal, corymbose, corymbs of about 5-15 capitula, capitula pedicellate, pedicels 5-20 mm long, bracteolate, bracteoles linear; involucre 3-4 mm diam.; phyllaries 2-seriate, oblong-lanceolate, 3-4 mm  $\times$  ca. 1 mm, acute or rather abruptly acuminate, 2-3-nerved, margins scarious, erose or dentate in the upper part, subglabrous or with a few pubescent eglandular hairs at the margin. Florets numerous (60-100), white, blue, or mauve; corollas 1.75-2 mm long; styles exerted ca. 1mm beyond corolla mouth. Achenes narrowly oblong, 1.5-1.75 mm long, black, minutely and sparsely whitish setuliferous on the ribs; carpopodium large, annuliform, asymmetrical; pappus-setae 5, ca. 2 mm long, lanceolate, finely scabrous on the margins, acuminate into a bristle-like point.

*Harley et al. 25051* (K, SPF).

Pantropical weed. Common around cultivation and in disturbed areas. Flowering time: throughout the year.

### 20.2. *Ageratum fastigiatum* (Gardner) R.M.King & H.Rob, Phytologia 24(2): 114. 1972.

Erect subshrub or shrub to 1.5 m tall. Stems poorly branched, often with very short side shoots or with fascicles of leaves at nodes, striate, reddish-green, velutinous, hairs simple, eglandular, becoming sparser towards base. Leaves alternate, pseudopetiolate, laminas elliptic to oblanceolate, 1-4 cm  $\times$  0.5-1.5 cm, base attenuate, puberulous beneath, hairs simple, eglandular and largely restricted to venation, alveolae markedly glandular-punctate, light green, more sparsely pubescent above, less densely glandular-punctate, mid-green, margins remotely serrate, apex  $\pm$  acute, obtuse or rounded. Inflorescence terminal or subterminal, inflorescence branches alternate, lax, terminating in dense, rarely lax, corymbs, capitula pedicellate, pedicels 1-3 mm long, densely puberulous, obscurely glandular-punctate excepting larger glands below capitula, often bracteolate, bracteoles lanceolate, margins ciliate, apex acute; involucre ca. 3 mm diam.; phyllaries biseriate in 2  $\pm$  equal series, sparingly pubescent, glandular-punctate towards

apex (sometimes densely so), margins ciliate, apex attenuate; receptacle conical, paleaceous, palcae ca. 3-3.5 mm long, margins coarsely ciliate, apex attenuate. Florets ca. 20-25, corolla ca. 2 mm long, corolla-tube expanded towards base, stipitate-glandular, at first pink, later becoming white, corolla-lobes papillose inside, glandular-punctate outside; anther-appendages at least twice as long as wide; style not enlarged at base, glabrous throughout; style-arms shortly papillose, pink. Achenes ca. 2 mm long, 5-ribbed, ribs and body concolorous, black,

glabrous, carpopodium large, asymmetrical, annuliform; pappus present as a very short corona. (Fig. 4. C-D)

*Harley et al.* 25116 (K, SPF).

Widespread in Brazil in Bahia and Minas Gerais. Amongst rocks in sandy soil in campos rupestres. Flowering time: October - December.

A very variable species, especially in leaf shape and size.

## 21. *Ayapana* Spach

Erect perennial herbs, or subshrubs, vegetative parts unbranched or sometimes basally branched. Stems terete or somewhat hexagonal. Leaves mostly opposite, sessile pseudopetiolate, lamina narrowly ovate to elliptical, pinnately to trinervately veined, margin entire to serrulate. Inflorescence laxly paniculate, with laxly or densely corymbose to subcymose branches; capitula pedicellate, sometimes sessile; phyllaries 15-35, sub-imbricate, 4-5-seriate, persistent, lanceolate, spreading at maturity; receptacle convex, glabrous. Florets 5-40; corollas white or pink, narrowly funnelform to nearly tubular, glabrous on inner surface, corolla-lobes triangular, glandular-punctate on outer surface, smooth on inner surface; anther-appendages triangular to oblong, slightly longer than wide; style-base enlarged, glabrous; style-arms filiform or with short tapering recurved appendages, densely long-papillose. Achenes 5-ribbed, prismatic, ribs setuliferous; carpopodium stopper-shaped; pappus-setae 20-40, slender, barbellate, persistent.

A genus of 14 species according to King & Robinson (1987), ranging from Costa Rica into South America and the West Indies. The greatest concentration of species is in the Andean region of Bolivia, Colombia and Ecuador. Apparently only one species present in Minas Gerais which is widespread in Brazil and rather variable.

21.1. *Ayapana amygdalina* (Lam.) R.M.King & H.Rob., *Phytologia* 20(3): 211. 1970.

Subshrub 20-75 cm tall. Rootstock woody. Stems simple or poorly branched, glabrous or hirsute, striate. Leaves ovate, oblong, broadly linear-lanceolate, (1.5-)3-10 cm × (0.5-)0.9-3.5 cm, opposite, coriaceous, sessile or pseudopetiolate, glabrous, glandular-punctate, or hirsute and glandular-punctate above and beneath, margins entire or with remote serrations, sparsely ciliate, apex acute, obtuse or rounded. Inflorescence terminal, branches ascending, sometimes divaricately branched, glandular-punctate and densely puberulent on pedicels, or hirsute and glandular-punctate; involucre ca. 4 mm diam., turbinate-campanulate; phyllaries ca. 4-seriate, deep pink to purple, spreading at maturity, outer surface pubescent especially over veins and towards margins,

sometimes densely so becoming glandular-punctate or stipitate-glandular towards apex, margins ciliate to fimbriate towards apex, apex acute to acuminate. Florets 30-40; corolla 6-8 mm long, bright pink, glabrous to shortly stipitate-glandular especially towards lobes, corolla-lobes ± stipitate-glandular. Achenes ca. 2 mm long, setulose on ribs and body; carpopodium distinct, stopper-shaped; pappus-setae ca. 4 mm long, white, barbellate, united into corona at base. (Fig. 4. E-F)

*Esteves et al.* CFCR 13519 (SPF).

Very widespread in Central and South America. Cerrado de altitude, and disturbed cerrado. Flowering time: September - December.

A somewhat variable species throughout the Brazilian part of its range, even in one population!

## 22. *Ayapanopsis* R.M.King & H.Rob.

Erect poorly branched perennial herbs or subshrubs. Stems terete, striate, pubescent to subglabrous. Leaves opposite, distinctly to indistinctly petiolate, petioles with or without wings, lamina elliptical or ovate to deltoid, base cuneate to cordate, pinnately to weakly trinervately veined, margin serrate to ± entire apex acute to acuminate. Inflorescence a corymbose panicle with corymbose to weakly cymose branches; capitula pedicellate; phyllaries 30-50, subimbricate, 3-4-seriate, persistent, narrowly oblong to lanceolate; receptacle slightly convex, glabrous to

shortly pubescent. Florets 35-150; corollas pink to violet, narrowly funnelform; corolla-lobes triangular, as long as wide or longer, outer surface usually glandular-punctate, sometimes with eglandular hairs, inner surface smooth; anther-appendages ovate 0.6-1.5 times as long as wide; style-base distinctly enlarged, glabrous to densely pubescent; style branches linear, almost smooth to slightly mamillate. Achenes 5-ribbed, prismatic to fusiform, setuliferous, glandular-punctate; carpophodium large, with distinct upper rim, short-cylindrical; pappus-setae 15-40, barbellate, persistent, apical cells acute to subacute.

A genus of 14 species throughout South America. Only one widespread Brazilian species is present in the Grão-Mogol area.

22.1. *Ayapanopsis oblongifolia* (Gardner) R.M.King & H.Rob., Phytologia 49(1): 3. 1981.

Erect shrub to 1.5 m tall. Stems simple or branched only from base, densely long stipitate-glandular with few long eglandular hairs, upper part of stem very viscid. Leaves elliptical to lanceolate, ca. 8 cm × ca. 3 cm, pseudopetiolate, base to 1 cm wide, velutinous beneath, densely stipitate-glandular, ± hirsute above, stipitate-glandular, margins serrate, apex acute. Inflorescence terminal, a large corymbose-panicle (ca. 35 cm × ca. 30 cm), capitula pedicellate, pedicels 10-25 mm long, stipitate-glandular; involucre 1.2 cm tall × 6 mm diam., cylindrical, subimbricate; phyllaries 3-4-seriate, inner

ca. 7 mm × ca. 1.5 mm, densely stipitate-glandular, margins ciliate, apex acute to acuminate. Florets pink; corolla ca. 7 mm long, upper tube scattered glandular-stipitate, corolla-lobes scattered glandular-stipitate. Achenes ca. 4.5 mm long, ribs and body concolorous, ± densely stipitate-glandular; carpophodium distinct, stopper-shaped; pappus-setae 5-6 mm long, coarsely barbellate. (Fig. 4. G-H)

*Cordeiro & Mello-Silva CFCR 10040* (K, SPF).

Restricted to eastern Brazil. Usually uncommon in bogs or marshes. Flowering time: September - December. Collection notes indicate this plant is odoriferous.

### 23. *Bejaranoa* R.M.King & H.Rob.

Erect subshrubs or shrubs, moderately to rather densely branched. Stems terete, striate, densely pubescent and stipitate-glandular. Leaves alternate or sometimes opposite, distinctly short-petiolate; lamina ovate or ovate-lanceolate, base obtuse and trinervate, discolorous, margin serrate to doubly serrate. Inflorescence terminal on leafy stems, with densely corymbose branches; capitula sessile or short-pedicellate; involucre campanulate; phyllaries 2-4-seriate, 8-15, subimbricate, unequal and somewhat graduated, persistent; receptacle flat to minutely conical, glabrous or subglabrous. Florets 4-10, white to pale lavender; corollas narrowly funnelform, glabrous inside, outside glandular-punctate; corolla-lobes ovate-triangular, scarcely longer than wide, outer surface densely glandular-punctate and minutely papillose near apices, margins ± thickened; anther-appendages oblong, longer than wide; style-base not enlarged, glabrous; style-arms linear, slightly minutely mamillate, slightly broadened distally. Achenes 5-ribbed, prismatic, setuliferous and glandular-punctate, narrowed below; carpophodium short and stopper-shaped, with distinct upper rim; pappus-setae uniseriate, ca. 30-55, persistent, barbellate.

A genus of two species, one endemic to Brazil.

23.1. *Bejaranoa semistriata* (Baker) R.M.King & H.Rob., Phytologia 40(1): 53. 1978.

Herb or shrub to ca. 1 m tall. Stems pubescent, hairs simple or stipitate-glandular. Leaves opposite, petiolate, petioles 0.6-1.5 cm long, lamina deltoid, 2-4 cm × 1.5-3 cm, base attenuate to truncate, margins crenate, apex acute. Inflorescence terminal or on subterminal branches; capitula pedicellate to sessile and paired at pedicel apices; involucre ± campanulate, ca. 4 mm tall × ca. 2 mm diam.; phyllaries pubescent, hairs ± numerous, glandular-punctate, more densely so towards

apex, margins ciliate; receptacle glabrous. Florets 5; corolla 3.5-4 mm long, whitish; corolla-lobes glandular-punctate outside, sometimes ± densely so towards apex. Achenes 2-2.5 mm long, 5-ribbed, ribs ± sparsely setuliferous, body sparsely glandular-punctate, denser below callus; carpophodium oblique, annular, setuliferous around upper rim; pappus-setae 3.5-4 mm long, whitish. (Fig. 4. I-J)

*Pirani et al. CFCR 13298* (K, SPF).

Widespread in eastern Minas Gerais and especially

in Bahia. Growing in sandy soil in cerrado, carrasco and campo. Flowering time: September - January.

Whilst agreeing in most of the characters with the type material the collection from Grão-Mogol is almost

void of glandular-punctae on the lower surface of the leaves and is also densely pubescent rather than with sparse to numerous hairs.

#### 24. *Chromolaena* DC.

Erect to somewhat scandent perennial herbs or shrubs, sparingly to densely branched. Stems terete to hexagonal, mostly pubescent. Leaves usually opposite, sometimes alternate, rarely verticillate, sessile to shortly or moderately petiolate, lamina mostly ovate or triangular to elliptical, sometimes linear, weakly to strongly trinervate from or near base, rarely pinnate with ascending veins, margins subentire to lobed. Inflorescence usually thyrsoid to candelabriform with laxly- to densely- corymbose branches, rarely with solitary capitula on long erect pedicels. Capitula usually pedicellate; involucre cylindrical to campanulate; phyllaries 18-65, 4-6-seriate, densely imbricate, completely deciduous, outer phyllaries falling first, ovate to lanceolate, often with expanded herbaceous or coloured apices; receptacle flat to slightly convex, glabrous, sometimes paleaceous. Florets 6-75, white, blue, lavender, or purple; corolla cylindrical with scarcely narrower base, outer surface smooth below lobes, sparsely stipitate-glandular, often with rather stiff hairs; corolla-lobes oblong or ovate, slightly to distinctly longer than wide, usually densely papillose on inner surface, sometimes smooth; anther-appendages large, oblong, ca. 1.5 times as long as wide, entire or crenulate at tip; style-base not enlarged, glabrous; style-arms linear to slightly broadened distally, slightly mamillate to densely long-papillose. Achenes 5-ribbed, rarely 3-ribbed, prismatic, ribs setuliferous, sometimes glandular-punctate; carpopodium distinct, short-cylindrical or narrowed below; pappus-setae ca. 40, uniseriate, capillary, barbellate, persistent, sometimes scarcely broadened distally.

A genus of 2 subgenera and 165 species (King & Robinson 1987). The main distribution of the genus appears to be Central and Southern America, with the greatest concentration of species in Brazil. One or two species have become notable weeds.

##### 24.1. *Chromolaena barbacensis* (Hieron.) R.M.King & H.Rob., Phytologia 20(3): 199. 1970.

Shrub to 1.4 m tall. Stems few, usually simple, terete, scarcely striate, at first densely pubescent and obscurely glandular-punctate, becoming glabrescent. Leaves opposite to subopposite, rarely appearing alternate, petiolate, lamina ovate, 0.5-2.5 cm × 0.4-1.5 cm, base short-attenuate, moderately to densely pubescent beneath and glandular-punctate, sparsely pubescent above, margins serrate, apex acute. Inflorescence a dense terminal corymb. Capitula pedicellate, pedicels 1-7 mm long, pubescent, bracteolate, glandular-punctate below; involucre cylindrical, 0.8-1 cm tall × ca. 3 mm diam.; phyllaries 7-9-seriate, glabrous except for small tuft of hairs towards apices, margins lacinate, apex acute to obtuse,

sometimes purplish. Florets 20-25, bluish-lilac; corolla-tube ca. 4 mm long, glabrous, very sparsely glandular-punctate; corolla-lobes ca. 0.5 mm long, glandular-punctate towards apices. Achenes 3.5-4 mm long, body glabrous or only with few scattered setulae towards callus, ribs whitish, setuliferous; pappus-setae 5-6 mm long, barbellate, straw-coloured. (Fig. 4. K-M)

*Hatschbach & Ribas 52006* (MBM, US); *Pirani et al. CFCR 12838* (K, SPF).

Probably endemic to Minas Gerais. Cerrado, in grassy areas. Flowering time: March - June.

This species is very similar to *Ch. cylindrocephala* (Sch.Bip. ex Baker) R.M. King & H.Rob. and may well prove to be synonymous with it; the differences are apparently ones of stature.

#### 25. *Conocliniopsis* R.M.King & H.Rob.

Erect subshrubs or shrubs, with few to many branches. Stems terete, striate, hirtellous and minutely stipitate-glandular. Leaves opposite, becoming ± alternate above, distinctly petiolate, lamina ovate, base often truncate, margin strongly crenate. Inflorescence a dense corymbose panicle or cyme; capitula short-pedicellate, pedicels sometimes slender; phyllaries 12-16, ca. 3-seriate, eximbricate, subequal, persistent; receptacle markedly conical, glabrous, strongly foveolate. Florets 20-30, blue or lavender; corollas narrowly funneliform, with outer surface glanduliferous, inside glabrous; corolla-lobes triangular, twice as long as wide, inner surface mamillate, outer



Fig. 4. COMPOSITAE. EUPATORIEAE: A-B. *Acritopappus irwinii*: A. flowering shoot; B. floret (Irwin et al. 23520, isotype); C-D. *Ageratum fastigiatum*: C. flowering shoot; D. floret (Harley et al. 25300); E-F. *Ayapana amygdalina*: E. flowering shoot; F. floret (Harley et al. 25756); G-H. *Ayapanopsis oblongifolia*: G. flowering shoot; H. floret (Harley et al. 25786); I-J. *Bejaranoa semistriata*: I. flowering shoot; J. floret (Ganev 404); K-M. *Chromolaena barbacensis*: K. flowering shoot; L. capitulum; M. floret (Pirani et al. CFCR 12838). Scale bars B, D, F, H, J, L, M = 1 mm; A, C, E, G, I, K = 10 mm.

surface somewhat papillose distally; anther-appendages ovate, longer than wide; style-base not enlarged, glabrous; style-arms filiform, scarcely broader distally, densely papillose. Achenes 4-5-ribbed, prismatic, setuliferous on ribs and body, eglandular; carpophodium very prominent, annuliform with projecting setuliferous upper rim; pappus-setae 30-35, uniseriate, persistent, barbellate.

A monotypic genus widespread in Brazil, and also known from Colombia and Venezuela.

25.1. *Conocliniopsis prasiifolia* (DC.) R.M.King & H.Rob., *Phytologia* 23(3): 308. 1972.

Erect subshrub or shrub to 0.6 m tall. Stems often poorly branched. Petiole 0.4-1.5 cm, leaf-base truncate or cordate, lamina 1.2-4 cm × 1-2 cm, ovate, ± densely pubescent beneath with long simple eglandular hairs, glandular-punctate, dark-green above, coarsely pubescent, hairs ± less numerous than beneath, glandular-punctate, margins crenate, often coarsely and deeply so, apex acute. Pedicels 0.5-2 mm long, tomentose with long, simple, eglandular hairs, glandular-punctate; involucre ca. 4-5 mm diam., ± campanulate; phyllaries 3-seriate, coarsely hairy,

glandular-punctate. Corollas ca. 3 mm long; style glabrous. Achenes ca. 2 mm long; carpophodium oblique; pappus-setae 2.5-3 mm long, united at base into broad corona. (Fig. 5. A-B)

*Harley et al.* 25048 (K, SPF).

Widespread, especially in eastern Brazil, also in Colombia, Venezuela and Paraguay. Campos rupestres and cerrado but also in disturbed ground, often in sandy soil. Flowering time: October - February.

Very variable in stature, branching and leaf shape and size.

## 26. *Disynaphia* Hook. & Arn. ex DC.

Erect shrubs or subshrubs, many-branched. Stems terete, faintly to conspicuously striate, pubescent. Leaves alternate, usually densely spirally inserted, sessile to subsessile, lamina linear to oblong or oblanceolate, midrib prominent above and beneath, margins entire to minutely serrulate. Inflorescence terminal, corymbose-paniculate; capitula shortly pedicellate, pedicels prominently pubescent; phyllaries ca. 11-15, 2-3(4)-seriate, subimbricate, sparsely to densely pubescent; receptacle slightly convex or flat, glabrous to slightly pubescent. Florets 5, white, or pink to purple; corolla-lobes as long as wide; anther base hastate; anther-appendages large as long as wide often emarginate; style-base not enlarged, glabrous. Achenes 4-5-ribbed, prismatic, glabrous to slightly glandular-punctate, some species setuliferous; carpophodium indistinct; pappus-setae ca. 35, persistent on callus and falling as unit, barbellate.

A genus of about 16 species. The taxon present in the flora area has occupied a problematic position in the subtribe since it was first described. Robinson (1923) suggested its allies, in *Eupatorium* sect. *Dasynaphia*, but its position was far from clarified by subsequent authors (King & Robinson, 1971, 1987) although King and Robinson (1975) transferred the species to *Disynaphia* still highlighting exceptional characters. It is retained in *Disynaphia* until additional research is carried out.

26.1. *Disynaphia praeficta* (B.L.Rob.) R.M.King & H.Rob., *Phytologia* 32(3): 284. 1975.

Shrub 0.4-1.5 m tall. Stems branching dichotomously, sometimes fasciculately, branches ascending, densely leafy at apices. Leaves spirally arranged, 2-7 cm × 1.8-4.5 mm, linear to narrowly lanceolate, glandular-punctate and viscid above and beneath, margins remotely crenate to serrate, apex acute. Inflorescence corymbose, many-headed. Capitula 2.5-3 mm × 4.5 mm, pedicellate, pedicels 3-10 mm long, glandular-punctate to short stipitate-glandular; involucre campanulate, 3.5-4 mm tall × 2.5-3 mm diam.; phyllaries 10-12, biseriate, outer surface glandular-punctate, margins lacinate,

apex acute. Florets white to whitish-pink; corolla-tube 5-6 mm long, glabrous; corolla-lobes ca. 1 mm long, apices acute. Achenes 2.5-3.5 mm long, 5-ribbed, ribs setuliferous, body glabrous at base becoming setuliferous below callus, sometimes ± densely so, sometimes short stipitate-glandular or glandular-punctate below callus; carpophodium very narrow annular, upper portion usually setuliferous; pappus-setae 4-6.5 mm long, flattened, margins barbellate. (Fig. 5. C-D)

*Mello-Silva et al.* CFCR 8531 (SPF).

Endemic to Minas Gerais. Sandy soil amongst rocks. Flowering time: August - September.

27. *Koanophyllon* Arruda

Shrubs or small trees, rarely vines with few to many branches. Stems terete, striate. Leaves opposite, rarely alternate, distinctly petiolate, petioles usually short, lamina broadly lanceolate to elliptical, base acute, truncate or cordate, surfaces glabrescent, rarely densely pubescent, glandular-punctate, margins entire to serrate. Inflorescence paniculate to corymbose, capitula pedicellate, pedicels short; phyllaries 2-4-seriate, eximbricate to strongly subimbricate, spreading at maturity, inner sometimes deciduous; receptacle flat to convex, glabrous, epaleaceous. Florets 5-20, whitish to greenish yellow, rarely violet; corolla-lobes broadly triangular as long as or longer than wide, glandular-punctate to stipitate-glandular outside, rarely with few eglandular hairs; anther-appendages usually shorter than wide, sometimes very short, sometimes notched apically; style-base not enlarged, glabrous; style-arms distinctly broadened, smooth. Achenes 5-ribbed, prismatic, ribs and upper body setuliferous, glandular-punctate few or absent; carpopodium distinct, 'stopper-shaped' or cylindrical; pappus-setae 30-35, uniseriate, barbellate, persistent.

A genus of over 100 species from the New World with the greatest concentration of species in Central and northern South America.

27.1. *Koanophyllon adamantium* (Gardner) R.M.King & H.Rob., *Phytologia* 32(3): 254. 1975.

Shrub to 2 m tall. Stems densely pilose, glandular-punctate, striate, moderately branched. Leaves opposite, ovate-elliptical, petiolate, petiole 7-20 mm long, lamina 2-5.5 cm × 1-4 cm, base cuneate, ± strigose above, velutinous beneath, glandular-punctate on both surfaces, venation pinnate, margins entire to remotely serrate, sometimes ± revolute, apex obtuse to rounded. Inflorescence terminal, paniculate, capitula pedicellate, pedicels pilose, glandular-punctate, bracteolate; involucre

turbinate; phyllaries ± 2-seriate, ca. 8 × ca. 0.5 mm, lanceolate, pilose, glandular-punctate, apex long-acuminate. Florets 15-20, whitish, corolla-tube with scattered glands, corolla-lobes with short-capitate glands and short blunt-ended hairs on outer surface. Achene ca. 3 mm long, 5-ribbed, setuliferous on ribs, glandular on faces; pappus-setae 3.5-4 mm long, barbellate. (Fig. 5. E-F)

*Hatschbach 41520* (K, SPF).

Widespread. Amongst rocks in cerrado and campos rupestres. Flowering time: July - September.

28. *Mikania* Willd.

Usually climbers or vines, or spreading weak shrubs, sometimes erect perennial herbs, subshrubs or shrubs. Stems terete to hexagonal, striate to rarely winged, glabrous or variously pubescent. Leaves opposite or in verticels of 3-4, sessile to long-petiolate, lamina narrowly linear to broadly ovate, sometimes dissected into broad or narrow segments, base narrowly cuneate to cordate or hastate, margins entire to toothed or lobed, apex rounded to short-acuminate, venation trinervate to pinnate, lower surface with or without glandular punctatae. Inflorescence paniculate with diffuse, thyrsoid, racemose, spicate, corymbose, or subcymose branches. Capitula sessile or with short pedicels, capitula usually immediately subtended by subinvolucral bract; phyllaries 4, eximbricate, subequal, uniseriate, persistent, often with swollen bases; receptacle flat, glabrous. Florets 4, usually white, sometimes pink. Corollas funnelform or with distinct basal tube and campanulate limb, glabrous to pubescent or glandular-punctate on outer surface, inner surface of throat smooth or rarely short-papillose, corolla-lobes mostly triangular and long as wide, sometimes narrowly oblong to 3 times as long as wide, papillate or epapillate on inner surface, often with fringe of hair-like cells along inside of margin; anther-appendages large, ovate to oblong, 1-2 times as long as wide; style-base often stout, not or gradually narrowed upwardly on shaft, usually smooth; style branches narrowly linear, without enlarged tip, densely papillose. Achenes 4-10-ribbed, prismatic, glabrous or setuliferous or glandular-punctate; carpopodium short-cylindrical; pappus-setae 1-2-seriate, 35-60, capillary, barbellate, persistent, often somewhat broadened distally.

A genus of about 300 species that has in the past been subdivided into a number of superficial groups. The genus is pantropical with a few apparent natives in the Old World tropics, the others American, chiefly in the tropics and almost half of them Brazilian. Other species extend into temperate, eastern North America; a few others are known from Central America.

1. Plants subshrubs, or shrubs, never climbers
  2. Leaves deltoid-cordiform ..... *M. officinalis*
  - 2'. Leaves elliptical, obovate, sometimes triangular
    3. Plants with pubescent stems and leaves ..... *M. hartbergii*
    - 3'. Plants glabrous, sometimes glaucous
      4. Leaves with rounded or obtuse apex; stems leafy in lower portion only ..... *M. alvimii*
      - 4'. Leaves with acute apices; stems leafy in upper portion only ..... *M. glabra*
- 1'. Climbers
  5. Leaf base obtuse to acute or rounded
    6. Leaf margins crenate-dentate; plants tomentose ..... *M. citriodora*
    - 6'. Leaf margins entire; plants glabrous ..... *M. ramosissima*
  - 5'. Leaf base cordate or sagittate to  $\pm$  hastate
    7. Leaves and stems  $\pm$  densely pubescent; petioles lacking stipule-like appendages; achenes setuliferous and eglandular ..... *M. hirsutissima*
    - 7'. Leaves and stems glabrous, lamina glandular-punctate beneath; petioles with stipule-like appendages; achenes glabrous and glandular-punctate ..... *M. reynoldsii*

28.1. *Mikania alvimii* R.M.King & H.Rob., Phytologia 45(2): 124. 1980.

Subshrub with erect stems to 0.7 m tall; rootstock probably a xylopodium. Stems erect or ascending, glabrous, often whitish beneath becoming purplish above, usually branching just below ground level. Leaves opposite, sessile, 4-7 cm  $\times$  1.2-2.8 cm, glabrous, elliptic or obovate, margins entire, apex rounded or obtuse. Inflorescence terminal corymbose panicles, main peduncle ca. 20 cm long, inflorescence branches ca. 8 cm, bracteolate, bracteoles glabrous except directly below panicles; involucre 5-6 mm tall; phyllaries glabrous. Florets white, perfumed; corolla ca. 8 mm long, with few scattered hairs on outside of corolla lobes, denser on margins. Achenes 3-4.5 mm long, ribs lighter coloured, body with very few scattered long hairs, several short hairs below apex; pappus-setae 5-6.5 mm long, whitish. (Fig. 5. G-I)

*Pirani et al. CFCR 11505* (K, SPF).

Originally considered endemic to Bahia, and described from the Pico das Almas. Campo rupestre in sandy soil or in wet soil adjacent to bogs, marshes or streams. Flowering time: November - February.

Collecting notes suggest that this is an aromatic plant.

28.2. *Mikania citriodora* W.C.Holmes, Phytologia 70(1): 47. 1991.

Plants herbaceous to scandent shrubs or vines. Rootstock xylopodiaceous (knotty caudices - *sic!*). Stems terete, at first tomentose becoming glabrate. Leaves petiolate, petioles 1-1.3 cm, tomentose, lamina ovate to ovate-deltoid, 2.2-4 cm  $\times$  1.3-4 cm, base obtuse to

truncate, trinervate from base, surfaces tomentose and glandular-punctate, margins crenate-dentate, apex  $\pm$  obtuse to rounded. Inflorescence corymbose, branches terete, tomentose. Capitula pedicellate, pedicels 1.5-5 mm, tomentose; involucres ca. 8 mm tall; phyllaries 5.5-7 mm, tomentose, apices acute. Florets cream. Corolla-tube 1.7-2.5 mm long, throat funnellform to  $\pm$  campanulate, ca. 1 mm diam., corolla-lobes 1.1-1.5 mm long. Achenes 2.6-3.5 mm long, 7-ribbed, ribs and body setuliferous, setulae branched below callus; pappus-setae 5-5.5 mm long, barbellate, white.

*Holmes 5064* (holotype MBM, isotypes BAYLU, IBE, NLU, TEX), *5070* (BAYLU, IBE, MBM, NLU, TEX).

Probably endemic to the Grão-Mogol area. Common in sandy soil over sandstone rocks. Flowering time: June - July.

As material of this species was not examined the description is modified from the protologue. Holmes (1991) also comments on the faint smell of lemons present when fresh stems are injured.

28.3. *Mikania glabra* D.J.N.Hind, Kew Bull. 49(3): 515. 1994.

Glabrous subshrubs to 70 cm tall. Stems simple or few-branched, striate, leafy in upper part only, internodes much shorter than leaves, 0.6-1.5 cm long. Leaves opposite, petiolate, petiole to 2 mm, lamina glaucous, lanceolate to elliptic, 1.5-3 cm  $\times$  0.7-1.5 cm, base rounded to obtuse, venation reticulate, margins irregularly serrate, apex acute. Inflorescence terminal, appearing densely cymose. Capitula pedicellate, pedicels 1.5-5 mm long, bracteolate, bracteoles 2-3 mm long, margins ciliate; phyllaries ca. 3.5 mm long, margins lacinate, apices obtuse. Florets cream; corolla-tube ca.

2 mm long, glabrous, expanded towards base,  $\pm$  abruptly campanulate throat ca. 2 mm diam., glabrous; corolla-lobes ca. 0.5 mm long, glabrous except for few short hairs at apices. Achenes ca. 2 mm long, body glabrous and eglandular, ribs whitish; pappus-setae ca. 4.5 mm long, whitish.

*Silva et al. CFCR 13435* (SPF, UEC).

Probably endemic to Minas Gerais. Amongst rocks in campos rupestres. Flowering time: September - October.

Collector's notes indicate that the plant is odoriferous.

28.4. *Mikania hartbergii* W.C.Holmes, Phytologia 70(1): 49. 1991.

Shrub to 1.3 m tall. Stems usually branched from base, otherwise simple, terete, striate, with numerous brown simple hairs. Leaves opposite, to subopposite, simple, petiolate, petioles 3-4 mm long, lamina ovate, 3-6 cm  $\times$  1.3-3.5 cm, base cordate or rounded to obtuse, lamina discolorous, lighter beneath, hairs few becoming glabrescent with age, darker above, hairs few, venation densely brown pubescent above, margins coarsely serrate-dentate, scarcely revolute, apex obtuse to acute. Inflorescence terminal, paniculate. Capitula pedicellate, pedicels 1-2 mm long, sparsely pubescent; involucres bright green; phyllaries ca. 3.5 mm long, margins lacinate, apices obtuse to rounded. Florets white to cream; corolla-tube ca. 2 mm long, glabrous, campanulate throat 1.5-2 mm diam., glabrous, corolla-lobes ca. 1 mm long, glabrous except for small group of hairs at apices. Achenes ca. 2 mm long, glabrous, eglandular, ribs whitish; pappus-setae ca. 5.5 mm long, distinctly enlarged towards apices, whitish.

*Giulietti et al. CFCR 9938* (K, SPF); *Holmes 5068* (BAYLU, IBE, MBM, NLU, TEX), *5071* (holotype MBM; isotypes BAYLU, IBE, NLU, TEX); *Simão-Bianchini CFCR 13071* (K, SPF).

Apparently endemic to Minas Gerais. Sandy soil amongst rocks. Flowering time: June - July.

Holmes (1991) has likened this species to *M. neurocaula* DC., although greater affinities I feel are with *M. premnifolia* Gardner. Barroso (1959) comments that the leaves of the latter species are often rounded although comparable material appears to be ovate, and the pappus of the two collections cited is off-white, not rufescent as in the Gardner type material. It is possible that the three are conspecific.

28.5. *Mikania hirsutissima* DC., Prodr. 5: 200. 1836.

Climber. Stems and branches striate, hirsute at first becoming glabrescent. Leaves petiolate, petiole 1.2-5 cm, hirsute, lamina cordate-ovate, 12-18(-30) cm  $\times$  7-10(-22) cm, base distinctly 5-veined, lamina hirsute, hairs numerous beneath and only dense over venation, few above, margins entire to denticulate, apex acuminate. Inflorescence paniculate, branches often dense. Capitula pedicellate, pedicels pilose, 2-3 mm long; phyllaries ca. 5 mm  $\times$  ca. 1.3 mm, apices pilose, acute. Florets cream; corolla-tube ca. 2 mm long, swollen at base, scattered pubescent throughout, campanulate upper portion ca. 1.5 mm long, corolla-lobes ca. 0.75 mm long, with few long hairs at apices. Achenes ca. 3.5 mm long, attenuate towards base, body with sparse, long setulae becoming denser towards callus, ribs whitish; pappus-setae 4-4.5 mm long, white.

*Pirani et al. CFCR 8421* (K, SPF, TEX/LL); *Silva et al. CFCR 13461* (K, SPF).

Widespread in Bahia, Minas Gerais, Paraná, Rio Grande do Sul, Rio de Janeiro, and São Paulo. Common in disturbed forest and mata ciliar. Flowering time: August - February.

The corolla of this material is longer than that indicated by Barroso (1959) although vegetatively it agrees. Type material of *M. sepiaria* and *M. martiana* have been examined and both agree largely with the material from Grão-Mogol in that they possess sparsely setuliferous achenes and the long hairs at the apices to the corolla lobes.

28.6. *Mikania officinalis* Mart., Isis (Munich) 1(6): 587. 1824.

Herb or subshrub to ca. 1 m tall, possibly with a xylopodium. Stems few, well branched above, tinged purple at base, glabrous, or with scattered long hairs becoming very dense at nodes, glandular-punctate. Leaves sessile or petiolate, petiole with scattered scabrid hairs, usually densely glandular-punctate, 2-8 mm long, lamina 1-2 cm  $\times$  ca. 1(-2) cm, deltoid-cordiform, sometimes glabrescent, usually scabrid more densely so towards margins, occasionally subfleshy, moderately glandular-punctate beneath, margins subentire or profoundly dentate, apex acute. Inflorescence in terminal corymbose panicles; capitula pedicellate, pedicels ca. 2 mm long, pilose; involucre 3-4 mm tall; phyllaries ca. 5 mm long, pilose outside, sometimes glabrous, glandular-punctate, with broad scarious ciliate margins. Florets white to cream; corollas ca. 4 mm long, corolla-lobes glandular towards apex;

anther-appendages  $\pm$  longer than wide; style-arms papillose. Achenes ca. 2.5 mm long, ribs concolorous with body, glandular-punctate; pappus setae ca. 3.5 mm long, barbellate.

*Irwin et al.* 23406 (UB, NY, US).

In marshy areas and wet flushes. Widespread throughout Brazil (Bahia, Minas Gerais, São Paulo) and Bolivia. Flowering time: November - February.

Barroso (1959) preferred to distinguish between the typical species, with dentate leaf margins, and the var. *brachypoda* (DC.) Malme, which has entire margins. Until further detailed fieldwork is carried out I prefer to keep the variety under the species as a synonym (c.f. Baker 1876), rather than recognize a separate variety.

28.7. *Mikania ramosissima* Gardner, London J. Bot. 5: 483. 1846.

Glabrous climber to 2-3 m tall. Stems much branched, reddish-brown. Leaves opposite, petiolate, petioles 3-15 mm long, lamina 2-6 cm  $\times$  0.8-2.5 cm, base obtuse to acute or rounded, discolorous, lighter beneath, midgreen above, margins entire, apex obtuse to acute. Inflorescence terminal, paniculate with spicate branches to ca. 5.5 cm long. Capitula sessile to very shortly pedicellate; involucre 3.5 mm tall; phyllaries often with narrow scarious margins, apices obtuse to rounded. Florets yellowish, aromatic, often smelling of honey; corolla-tube ca. 1 mm long, campanulate upper portion ca. 1.5 mm long including lobes, corolla-lobes ca. 1 mm long. Achenes ca. 2 mm long, ribs whitish, body sparsely setuliferous towards base, becoming densely so towards callus; pappus-setae 2.5-2.8 mm long, broadened distally, pale yellowish-brown.

*Campos et al.* CFCR 13464 (K, SPF); *Harley et al.* 25117 (K, SPF); *Mello-Silva & Cordeiro* CFCR 10014 (SPF, UEC); *Pirani et al.* CFCR 8311 (K, SPF), CFCR 13460 (SPF).

Endemic to Minas Gerais. Not uncommon on the margins of woodlands and amongst scrub adjacent to campos rupestres. Flowering time: September - October.

28.8. *Mikania reynoldsii* W.C. Holmes, Phytologia 73(2): 164. 1992.

Climber to 6 m tall. Stems terete, striate, glabrate. Leaves opposite, petiolate, petioles 2-4.5 cm long, petiole bases with stipule-like appendages, ca. 1.5 mm  $\times$  ca. 5 mm, margins serrate to fimbriate or lobed, leaf lamina triangular, 5-8 cm  $\times$  3.5-5 cm, base sagittate to  $\pm$  hastate, trinervate from base, glandular-punctate beneath, glabrous above, margins entire to remotely serrate, apex acute to acuminate. Inflorescences corymbose. Capitula pedicellate, pedicels 0.5-3.5 mm long, glabrous; phyllaries ca. 4 mm long, glabrous except towards short-pubescent apex, margins lacinate towards apex, apex acute. Florets white to cream; corolla-tube ca. 2.5 mm long, corolla-lobes ca. 0.6 mm long. Achenes ca. 2.4 mm long, glandular-punctate; pappus-setae 2.5-3 mm long, barbellate, white.

*Hatschbach et al.* 55084 (holotype MBM, isotype BAYLU); *Holmes* 5069 (BAYLU, MBM).

Apparently endemic to Grão-Mogol. No details are available for the ecology of this species. Flowering time: February - June.

The description and other details are taken from the protologue, including the poor accompanying illustration.

## 29. *Pseudobrickellia* R.M. King & H. Rob.

Erect often somewhat fasciculately branching shrubs or small trees. Stems essentially terete, marked with short ridges or scars from leaf insertions, puberulous. Leaves densely spirally inserted, sessile or indistinctly short-petiolate; lamina narrowly linear, without evident lateral veins, glabrous. Inflorescence terminal on leafy branches, densely corymbose to somewhat pyramidal; pedicels usually rather short, glabrous or short-puberulous; phyllaries 12-18, 3-4-seriate, subimbricate, strongly unequal, persistent, spreading when old or dry, oblong to lanceolate, usually straw-coloured or reddish brown on outer surface, weakly striate; receptacle flat, epaleaceous (with a few marginal paleae?), glabrous. Florets 2-4(-8?), greenish white; corollas tubular or  $\pm$  funnelform, glabrous on outer surface; corolla-lobes oblong, about twice as long as wide, erect, smooth on both surfaces; anther-appendages broadly ovate, about as long as wide; style-base enlarged, hirsute with short, contorted, hairs; style-arms long-clavate, flattened only on inner surface, scarcely mamillate below, smooth apically. Achenes 5-10-ribbed, prismatic, body distinctly setuliferous; carpelodium distinct, narrowly annuliform to short stopper-shaped; pappus-setae ca. 35, 2-seriate, barbellate, persistent.

Both species in the genus were first described from Minas Gerais but are widespread in Bahia and Minas Gerais.

1. Leaves flat, glabrous, apex gradually narrowing, ascending to  $\pm$  spreading; achenes 5-ribbed..... *P. angustissima*  
 1'. Leaves carinate, margins sparsely ciliate, apex  $\pm$  abruptly narrowing,  $\pm$  spreading; achenes 10-  
 ribbed ..... *P. brasiliensis*

29.1. *Pseudobrickellia angustissima* (Spreng. ex Baker) R.M.King & H.Rob., Phytologia 24(2): 75. 1972.

Well branched shrub or small tree 0.6-2 m tall. Stems glabrous, densely leafy in apical portion only. Leaves linear, 2-5 cm  $\times$  1-1.5 mm, ascending to  $\pm$  spreading, glabrous, gradually narrowing to acute apex. Inflorescence terminal, corymbose; capitula pedicellate, pedicels shortly puberulous; phyllaries subimbricate,  $\pm$  3-seriate, strongly unequal, inner 7-8 mm  $\times$  ca. 1.3 mm, oblanceolate, glabrous, yellowish-green drying reddish-brown, margins scarious, ciliate, apex rounded, often hooded; receptacle flat, probably epaleaceous. Florets 5; corolla cylindrical, ca. 4.5 mm long, greenish-white, glabrous. Achenes ca. 3.5 mm long, 5-ribbed, ribs with numerous setulae, ribs  $\pm$  concolorous with body, body with scattered setulae, dense below pappus; carpodium annuliform; pappus-setae ca. 4.5 mm long, spreading, barbellate to subplumose. (Fig. 5. J-K)

*Zappi et al. CFCR 8533* (K, SPF).

Widespread. Cerrado de altitude. Flowering time: September - December.

29.2. *Pseudobrickellia brasiliensis* (Spreng.) R.M.King & H.Rob., Phytologia 24(2): 75. 1972.

Moderately branched shrub to 2 m tall. Stems glabrous becoming shortly pubescent on short side-branches and below inflorescences, striate, branched from the base and below inflorescences. Leaves  $\pm$  densely spirally inserted, often carinate, 1-1.3 cm  $\times$  1-1.5 mm, glabrous except for sparsely ciliate margin, abruptly narrowing to acute apex. Inflorescences terminal, corymbose, minutely bracteolate; phyllaries 3-4-seriate, with chestnut-brown midrib and apex,  $\pm$  flat, inner ca. 7 mm  $\times$  ca. 1 mm, margins  $\pm$  scarious, markedly ciliate; receptacle flat. Florets 3; corollas greenish-white, ca. 4-5 mm long. Achenes ca. 3.5-4 mm long, 10-ribbed, setuliferous on pale ribs, scattered setuliferous on body; carpodium annuliform; pappus-setae ca. 5 mm long,  $\pm$  spreading, long barbellate to subplumose.

*Cordeiro & Mello-Silva CFCR 10105* (K, SPF); *Silva et al. CFCR 13351* (K, SPF).

Widespread. Cerrado de altitude. Flowering time: September - December.

### 30. *Stomatanthes* R. M. King & H. Rob.

Perennial herbs, subshrubs or shrubs, sparsely to densely branched. Stems terete, striate. Leaves alternate, opposite or ternate, shortly-petiolate, lamina elliptic or oblanceolate to ovate or orbicular, margins entire to coarsely dentate. Inflorescence usually pyramidal to thyrsoid paniculate; capitula shortly-pedicellate or sessile; phyllaries 2-3-seriate, 4-12, 'eximbricate' to weakly subimbricate, unequal to subequal, narrowly oblong to lanceolate, apices obtuse to acute; receptacle  $\pm$  convex, glabrous. Florets 4-11, white; corolla funnelform or nearly tubular, glabrous or glandular-punctate, pubescent outside; corolla-lobes triangular, as long as wide or longer than wide; anther-appendages ovate or slightly shorter than wide; style-base not enlarged, pubescent; style-arms linear to filiform or with clavate tips, papillose below. Achenes 5-8-ribbed, prismatic, densely setuliferous and sometimes glandular-punctate; carpodium usually distinct; pappus-setae barbellate, persistent.

A genus of 15 species showing an interesting distribution with three species occurring in Africa.

30.1. *Stomatanthes polycephalus* (Sch.Bip. ex B.Rob.) H. Rob., Phytologia 20: 337. 1970.

Shrub or subshrub to 1 m. Stems terete, striate,  $\pm$  well branched in upper part,  $\pm$  densely leafy in upper part, young stems tomentose,  $\pm$  obscurely scattered glandular-punctate, older stems becoming glabrescent. Leaves opposite to subopposite, petiolate to pseudopetiolate, narrowly ovate to elliptic, 15-35  $\times$  10-24 mm, base attenuate, grey-green tomentose above and

beneath, obviously glandular-punctate amongst pubescence, venation reticulate,  $\pm$  prominent, upper surface slightly greener, margins coarsely to  $\pm$  finely crenate in upper half to 2/3, apex acute to obtuse or rounded. Inflorescence terminal, or on lateral branches, paniculate-corymbose. Capitula sessile pedicellate, pedicels to ca. 3 mm, bracteolate; involucre campanulate, 4-4.5 mm tall  $\times$  2-2.5 mm diam.; phyllaries weakly subimbricate, outer phyllaries pubescent, hairs denser over midrib, margins lacinate, apices acute; receptacle

small. Florets 4-5, cream; corolla-tube ca. 3.5 mm,  $\pm$  sparsely glandular-punctate in lower half, corolla-lobes ca. 0.5 mm,  $\pm$  densely glandular-punctate below apices. Achenes 1.5-2 mm, 5-ribbed, body sparsely setuliferous and sparsely glandular-punctate, ribs setuliferous; carpopodium annuliform; pappus-setae 3.5-4 mm, usually spreading upon dehiscence, flattened, margins

coarsely barbellate to almost subplumose, straw-coloured to whitish., (Fig. 5. L-M)

*Harley et al. 25023* (SPF).

Widespread in Minas Gerais. Cerrado. Flowering time: September.

### 31. *Symphyopappus* Turcz.

Erect, usually viscid, moderately branched shrubs or small trees. Stems terete, striate, puberulous. Leaves opposite, sometimes becoming alternate below inflorescence, subsessile to shortly petiolate, lamina ovate-lanceolate, midvein prominent or exsculptate on both upper and lower surfaces, margins serrate, apex acute to obtuse. Inflorescence  $\pm$  densely corymbose; capitula short-pedicellate, pedicels glabrous with prominent decurrent ridges; phyllaries ca. 15, 3-4(5)-seriate, subimbricate, inner unequal and graduated in length,  $\pm$  straw-coloured, usually mostly persistent, rarely totally deciduous; receptacle flat or slightly convex, glabrous or with numerous stiff hairs. Florets 5, white, rose, or purple-pink; corolla expanded below, slightly broadening above, rarely narrowly funnellform throughout; corolla-lobes triangular to oblong-triangular, slightly longer than wide, to twice as long as wide, inner surface smooth, outside glabrous except for papillose and often sparsely glandular-punctate apices; basal anther-appendages pointed, apical anther-appendages large, triangular, about twice as long as wide; style-base not enlarged, glabrous; style-arms linear, densely short-papillate. Achenes 4-5-ribbed, short, prismatic, glabrous or sparsely stipitate-glandular, often appearing transversely banded; carpopodium short-cylindrical, procurent on lower part of ribs; pappus-setae ca. 40, usually biseriate, flattened, connate at base and usually falling as unit.

A genus of eleven species endemic to Brazil, ranging from Bahia in the north to Rio Grande do Sul in the south.

1. Leaves ovate-lanceolate or lanceolate to narrowly elliptic, petiolate, apex  $\pm$  acuminate; pappus setae reduced to 6 - 10, apices uncinata ..... *S. uncinatus*
- 1'. Leaves rotund to oblanceolate, sessile, apex rounded to obtuse, rarely  $\pm$  acute, never acuminate; pappus setae numerous, apices always straight
  2. Leaf base rotund; lamina broadly ovate; leaves usually shorter than or equal to internodes ..... *S. decussatus*
  - 2'. Leaf base cuneate; lamina oblong to oblanceolate; leaves much longer than internodes ..... *S. reticulatus*

31.1. *Symphyopappus decussatus* Turcz., Bull. Soc. Imp. Naturalistes Moscou 21: 584. 1848.

*Sano et al. CFCR 12683* (K, SPF).

Glabrous shrub to ca. 2 m tall. Stems terete, striate, densely leafy towards apex. Leaves opposite decussate,  $\pm$  sessile to shortly petiolate, petioles ca. 2 mm long, lamina broadly ovate, 1-3.5 cm  $\times$  1-2.5 cm, shiny above, apex obtuse to rounded. Capitula pedicellate to subsessile, pedicels 1-6 mm; involucre 6-7 mm tall  $\times$  3-4 mm diam., cylindrical to campanulate; phyllaries 5-seriate, often completely deciduous, margins laciniate, apices acute to obtuse or rounded, scarious; receptacle  $\pm$  flat. Florets pinkish, perfumed; corolla-tube ca. 3 mm long, glabrous. Achenes 2.5-3 mm long, 5-ribbed, contracted towards apical callus, glabrous, scattered glandular-punctate, usually denser towards apical callus; pappus-setae ca. 3.5 mm long, subequal, coarsely barbellate except  $\pm$  entire apical portion, apices obtuse, whitish. (Fig. 5. N-O)

Widespread in Minas Gerais and Bahia. Gallery forest and cerrado. Flowering time: December - January.

This species is a little variable in the relative length of the leaves to internodes. King & Robinson (1987) have illustrated a plant with relatively long internodes.

31.2. *Symphyopappus reticulatus* Baker in Mart. & Eichler, Fl. bras. 6(2): 367. 1876.

Odoriferous viscid, shrub, or subshrub, to 60 cm tall. Stems terete, striate, leafy only in upper part, dry remains of old inflorescences persistent. Leaves pseudopetiolate, oblong to oblanceolate, (2-)4-8 cm  $\times$  0.7-2.1 cm, base cuneate to attenuate, margins remotely coarsely serrate, apex acute to obtuse or  $\pm$  rotund. Capitula pedicellate, pedicels to 6 mm long; involucre cylindrical, ca. 8 mm tall  $\times$  3-3.5 mm diam.; phyllaries 3-4-seriate, apparently totally deciduous leaving markedly convex

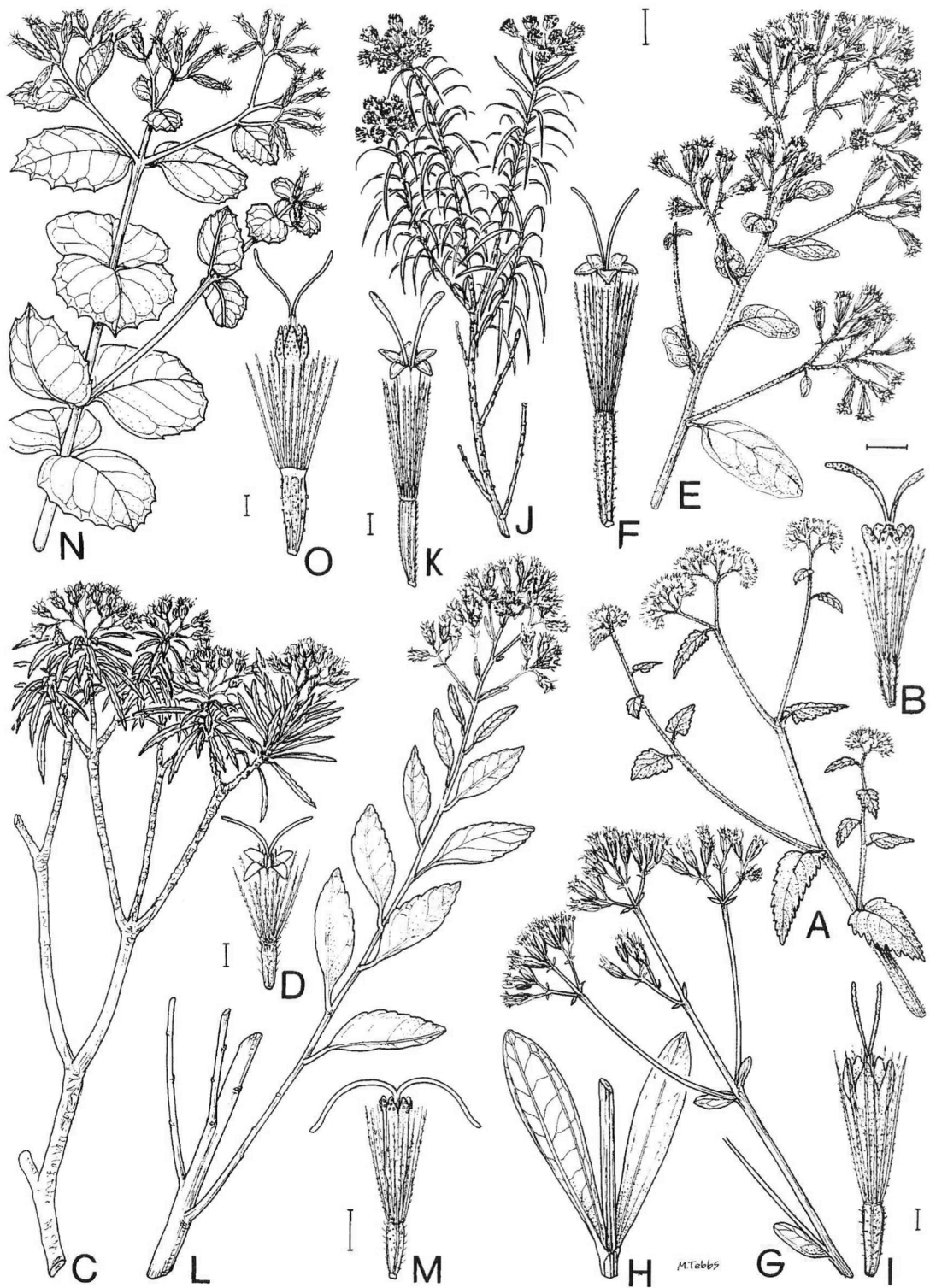


Fig. 5. COMPOSITAE. EUPATORIEAE: A-B. *Conocliniopsis prasiifolia*: flowering shoot; B. floret (Harley et al. 50006); C-D. *Disynaphia praeficta*: C. flowering shoot; D. floret (Cavalcanti et al. 44706); E-F. *Koanophyllon adamantium*: E. flowering shoot; F. floret (Ganev 861); G-I. *Mikania alvimii*: G. flowering shoot; H. pair of mature leaves; I. floret (Harley et al. 27315); J-K. *Pseudobrickellia angustissima*: J. flowering shoot; K. floret (Harley et al. 25362); L-M. *Stomatanthes polycephalus*: L. flowering shoot; M. floret (Harley et al. 25023); N-O. *Symphyopappus decussatus*: N. flowering shoot; O. floret (Lewis et al. SPF 36578). Scale bars B, D, F, I, K, M, O = 1 mm; A, C, E, G, H, J, L, N = 10 mm.

receptacle. Florets pinkish-white; corolla-tube 3-3.5 mm long, glabrous; corolla-lobes ca. 1 mm long, glabrous, very shortly papillate at apices. Achenes 3-3.5 mm long, 5-ribbed, body glabrous or with very few short eglandular hairs; pappus-setae 3.5-4 mm long, margins laciniate, whitish.

*Freire-Fierros et al. CFCR 12489 (K, SPF).*

Widespread and probably relatively common in São Paulo, Rio de Janeiro and Minas Gerais. Campo rupestre amongst rocks. Flowering time: December - March.

This species appears to be close to *S. cuneatus* Sch.Bip. ex Baker but differs largely in the absence of a distinct petiole, and with its leaves much longer than the internodes.

31.3. *Symphypappus uncinatus* H. Rob., Compositae Newsletter 38: 52. 2002.

Viscid shrub or small tree to 3 m. Stems striate, glabrous, glandular-punctate. Leaves ovate-lanceolate or lanceolate, petiolate, petioles 7-15 mm, lamina elliptical, (20-) 40-75 (-85) × 8-35 mm, 3-veined, base cuneate, densely glandular-punctate above and beneath, margins

serrate, apex acute, almost acuminate. Inflorescence terminal, densely corymbose, inflorescence branches usually strongly compressed; capitula pedicellate, pedicels 1-2 mm, glabrous; involucre ± cylindrical, ca. 7 mm tall × 2-3 mm diam.; phyllaries 3-4-seriate, strongly 3-veined, glandular-punctate, apex scarious, erose; receptacle ± flat. Florets 5 per capitulum; corollas 4-4.5 mm, pink; corolla-tube glabrous; corolla-lobes glandular-punctate. Achenes ca. 2.5 mm, dark brown to black, 5-ribbed, concolorous, glabrous or with few scattered eglandular hairs, especially around callus, carpopodium small, cylindrical; pappus-setae 4-5 mm, reduced to 6-10 setae, barbellate and apices distinctly hooked, whitish.

*Harley et al. 25065 (K, SPF).*

Apparently restricted to Minas Gerais. Cerrado scrub and campos rupestres, often in damper scrubby areas. Flowering time: September - November.

This species was first confused by the author with the more widespread *S. compressus* (Gardner) B. L. Rob. which it resembles vegetatively and which has conspicuously more, but completely straight, pappus setae. The hooked apices of the few setae in *S. uncinatus* can easily be seen with a hand lens.

### 32. *Trichogonia* (DC.) Gardner

Erect perennial herbs or subshrubs, sparingly branched above base. Stems terete, with prominent longitudinal ridges, short-pubescent, often stipitate-glandular. Leaves usually alternate, sometimes opposite beneath, short- to long-petiolate, lamina linear to broadly cordate, variously pubescent, margin usually crenulate to crenate. Inflorescence a lax to dense cymose or corymbose panicle; capitula short- to ± long- pedicellate; phyllaries 10-25, 2-3-seriate, eximbricate, subequal to equal, often strongly veined, persistent and reflexed at maturity; receptacle flat to slightly convex, glabrous. Florets 10-60 per capitulum, pink, purple, or white; corollas narrowly funnelform, glabrous, sometimes with scattered pubescent, expanding to ± campanulate limb, limb and lobes densely pubescent, lobes triangular, wider than long to slightly longer than wide, inner surface smooth, outer surface densely pubescent, rarely stipitate-glandular; anther-appendages slightly shorter to distinctly longer than wide, with rounded or retuse apices; style-base not enlarged, glabrous; style-arms linear or expanded towards apices, densely papillose or mamilllose except on expanded apices. Achenes 5-ribbed, base short- to long-stipitate, setuliferous at least on ribs; carpopodium a narrow annulus; pappus-setae uniseriate, plumose or strongly barbellate, persistent, sometimes some or (rarely) all achenes epappose.

A widespread genus in South America but with most of the species found in Brazil and the highest concentration in Bahia.

1. Leaves sessile, linear, usually appearing single-veined ..... *T. villosa*
- 1'. Leaves shortly to distinctly petiolate, ovate to cordate, venation pinnate
  2. Leaves usually narrow, to 8 mm wide, lower surface with relatively few stipitate-glandular hairs, margins ± serrate-crenate; achenes to ca. 4.5 mm long ..... *T. crenulata*
  - 2'. Leaves usually broad, to 20 mm wide, lower surface densely pubescent with numerous stipitate-glandular hairs, margins serrate to deeply crenate; achenes to ca. 3 mm long ..... *T. hirtiflora*

32.1. *Trichogonia crenulata* (Gardner) D.J.N.Hind, Kew Bull. 48(2): 411. 1993.

Shrub 0.5-2.5 m tall. Stems sparsely to well branched, usually in upper part only, densely leafy in upper part, terete, striate and often distinctly ridged, densely pubescent over ridges, hairs simple or stipitate-glandular, very sparsely glandular-punctate. Leaves shortly petiolate, petiole 1-2 mm long, lamina ovate, 0.6-1.5 cm × 3-8 mm, base cordate, lower surface densely short pubescent, hairs simple, sparsely stipitate-glandular, ± sparsely glandular-punctate between venation, upper surface sparsely short pubescent, margins indistinctly serrate or ± crenate, apex acute to obtuse. Inflorescence terminal, few-headed (3-7), rarely solitary. Capitula pedicellate, pedicels 1-1.3 mm long, densely pubescent, hairs simple or glandular-stipitate, sparsely glandular-punctate; involucre campanulate, ca. 8 mm tall × ca. 5 mm diam.; phyllaries ± biseriate, margins densely ciliate, apices acute to obtuse. Florets 30-40, bright pink to purple; corolla ca. 3.5 mm long, densely short pubescent and sparsely glandular-punctate towards apex. Achenes ca. 3 mm long, base long stipitate, ribs coarsely setuliferous, body sparsely stipitate-glandular and very sparsely glandular-punctate, apical callus often densely glandular-punctate; carpopodium a narrow oblique annulus; pappus-setae ca. 2.5-3 mm long. (Fig. 6. A-B)

*Assis et al. CFCR 11465* (K, SPF); *Barreto, Brade & Markgraf 3485* (RB); *Ferreira et al. 756* (RB); *Harley et al. CFCR 6485* (K, SPF); *Irwin et al. 23520* (RB); *Lima et al. 992* (RB, type of *T. margarethiae*); *Pirani et al. CFCR 12490* (SPF); *CFCR 12829* (K, SPF); *Zappi et al. CFCR 8458* (K, SPF).

Probably restricted to Minas Gerais. Not uncommon on sandy soil in campos rupestres. Flowering time: (July -) October - December (- February).

Herbarium material of Gardner's *Eupatorium crenulatum* is taxonomically identical with *T. margarethiae*, and is distinct from other material of *T. hirtiflora* from Minas Gerais and Rio de Janeiro (Hind 1993c). Further work may show *T. hirtiflora* to be variable enough to include *T. crenulata* but they are kept separate in this account.

32.2. *Trichogonia hirtiflora* (DC.) Sch.Bip. ex Baker in Mart. & Eichler, Fl. bras. 6(2): 214. 1876.

Shrub to 1 m tall. Stems sparsely branched usually in upper part only, upper part ± densely leafy, terete, striate and often distinctly ridged, densely pubescent over ridges, hairs simple or stipitate-glandular, sparsely glandular-punctate. Leaves petiolate, petiole 2-4 mm

long, lamina cordiform to broadly ovate, 1-2.5 cm × 0.8-2 cm, base cordate, lower surface ± densely pubescent, hairs simple or stipitate-glandular, densely glandular-punctate between venation, upper surface pubescent, margins serrate to deeply crenate, apex acute, obtuse to rotund. Inflorescence corymbose, terminal and sub-terminal, few- to many-headed. Capitula pedicellate, pedicels 0.7-1.2 cm long, densely stipitate-glandular; involucre campanulate, 8 mm tall × ca. 6 mm diam.; phyllaries ca. 25, ca. 6 mm × 1.5-2 mm, pilose and glandular-stipitate, sparsely glandular-punctate, margins densely ciliate, apex acute to obtuse, often purplish. Florets ca. 50, pink to purple; corolla ca. 4 mm long, densely short pubescent and sparsely glandular-punctate towards apex. Achenes ca. 4.5 mm long, base long stipitate, ribs coarsely setuliferous, body sparsely setuliferous and sparsely stipitate-glandular and glandular-punctate, apical callus often densely glandular-punctate; carpopodium a narrow oblique annulus; pappus-setae 3-4.5 mm long.

*Harley et al. CFCR 6485* (K, SPF); *Pirani et al. CFCR 12484* (K, SPF).

Endemic to Minas Gerais. First described from the Serra do Cipó. A relatively uncommon plant growing amongst rocks in campos rupestres. Flowering time: November - December.

This species is superficially very similar to the following but is easily distinguished by the larger leaves, ± serrate margins, and the pubescence of fewer simpler hairs with denser stipitate-glandular hairs. See also discussion following the next species.

32.3. *Trichogonia villosa* (Spreng.) Sch.Bip. ex Baker in Mart. & Eichler, Fl. bras. 6(2): 213. 1876.

Erect or ascending subshrub or shrub to 1.5 m tall. Stems well branched, young stems densely leafy, branches erect or ascending, densely stipitate-glandular, striate. Leaves sessile, linear, 1.2-3(-5) cm × 1.5-3 mm, midrib and margins with simple eglandular hairs and stipitate glands beneath, lamina stipitate-glandular, margins subentire or remotely serrate, revolute, apex acute. Inflorescence terminal, corymbose, 5-15-headed; capitula pedicellate, pedicels 1.2-2.5 cm long, densely stipitate-glandular; involucre campanulate; phyllaries stipitate-glandular, margins ciliate, apex glandular-punctate on lamina, apex margin densely ciliate to penicillate. Florets 40-60, pale purple; corolla 4-5.5 mm long. Achenes 4-4.5 mm long, ribs light-coloured, setuliferous, body greyish, with scattered setulae and scattered stipitate-glandular, base long-attenuate, carpopodium narrow, annuliform; pappus-

setae 4.5-5 mm long, uniseriate, setae connate and glabrous at base, plumose.

*Rossi et al. CFCR 1027 (K, SPF).*

Widespread in Bahia, Espírito Santo and Minas Gerais. Campos rupestres. Flowering time: November-April.

A variable species especially in leaf morphology. Several varieties have been described.

### 33. *Trichogoniopsis* R.M.King & H.Rob.

Erect perennial herbs or subshrubs, with few branches. Stems terete, scarcely striate or  $\pm$  smooth, pubescent. Leaves alternate or opposite, distinctly petiolate, with broadened winged petioles; lamina ovate, base cuneate to cordate, margins serrate. Inflorescence a lax cymose or corymbose panicle, usually of few to many capitula; capitula  $\pm$  long-pedicellate. Phyllaries ca. 18-25, biseriate, eximbricate, subequal; receptacle flat or shallowly convex, glabrous. Florets 25-50, white to pale lilac; corollas narrowly funnelform, outer surface with few or no hairs above; corolla-lobes broadly triangular, ca. 5 times as long as wide, outer surface smooth and sparsely glandular-punctate, inner surface smooth; anther-appendage ovate, shorter than wide, strongly retuse to bilobed; style-base not enlarged, glabrous; style-arms long-clavate, slightly mamillate. Achenes 5-ribbed, prismatic, base narrow-stipitate, setuliferous on body and ribs; carpopodium small, short-cylindrical; pappus-setae ca. 30, uniseriate, plumose, persistent, mostly smooth on outer surface.

A genus of four species differing from *Trichogonia* in lacking the pubescent corollas, possessing cleft anther-appendages and have terete stems. Distinctions between the species are difficult to envisage especially based on the key provided by Soares Nunes (1981) and the characters suggested by King and Robinson (1980). Characters of the indumentum on the phyllaries and inflorescence branches appear to be variable, and the anther-appendages apex type is not as useful as it might first appear.

33.1. *Trichogoniopsis adenantha* (DC.) R.M.King & H.Rob., *Phytologia* 24(3): 180. 1972.

Erect perennial herbs or subshrubs 0.4-1 m tall, with few branches. Stems terete, scarcely or not striate, densely stipitate-glandular. Leaves alternate or opposite, slightly viscid, distinctly petiolate, with broadened winged petioles; lamina ovate, 2-8 cm  $\times$  0.8-5.5 cm, base cuneate to cordate, lower surface sparsely pubescent, often densely stipitate-glandular over venation, sparsely to densely glandular-punctate and shortly stipitate-glandular in alveolae, upper surface with numerous stipitate glands, margins finely to coarsely serrate, apex acute to attenuate. Inflorescence a lax cymose or corymbose panicle, usually of few capitula; capitula moderately long pedicellate. Phyllaries 18-25,

eximbricate, biseriate, subequal, persistent, apices long-attenuate. Florets 25-50; corollas pale lilac, narrowly funnelform, outer surface glabrous above; corolla-lobes broadly triangular, ca. 5 times as long as wide, sparsely glandular-punctate outside. Achenes ca. 4 mm long, setuliferous on body and ribs, setulae numerous, stipitate-glandular below callus; pappus-setae 4-5.5 mm long. (Fig. 6. C-D)

*Sano et al. CFCR 12366 (SPF).*

Flowering time: November - January.

This species is the most variable and widely distributed in the genus. None of the variation seems to warrant infraspecific status at present although collections are still relatively few.

## Tribe 8. **Heliantheae**

Subshrubs, shrubs, annual or perennial herbs. Rootstock fibrous, tuberous, or woody in the form of a xylopodium. Stems prostrate, procumbent or erect, terete. Leaves opposite, rarely alternate, sessile or petiolate, entire, lobed, dissected, or pinnatifid, usually pubescent with coarse often scabrid indumentum, usually unarmed rarely spiny. Capitula either heterogamous radiate, heterochromous or homochromous, rarely disciform, or homogamous, discoid, homochromous, florets usually hermaphrodite, rarely unisexual; synflorescences rarely with secondary or tertiary aggregation of capitula; involucre usually herbaceous, rarely membranous or scarious; phyllaries in 1 to many series, when uniseriate often gland-dotted; receptacle paleaceous, rarely epaleaceous. Florets commonly yellow; disc-florets sometimes dark-coloured, corollas short-lobed; style-arms truncate or appendiculate; anther-thecae usually blackened at maturity, bases obtuse to sagittate, rarely tailed; pollen mostly echinate, but smooth in

some wind-pollinated genera. Achenes usually black or dark-brown with phytomelanin in the walls; pappus usually of awns or scales, sometimes absent, rarely of hairs.

A tribe of over 200 genera, placed in up to 35 subtribes mostly from the New World. The tribe includes many plants of horticultural and agricultural use and several pantropic weeds.

1. Phyllaries uniseriate with translucent oil-glands; plants glabrous, usually glaucous; capitula discoid, homogamous ..... *Porophyllum*
- 1'. Phyllaries 2- or more seriate, lacking glands; plants variously pubescent; capitula usually radiate, (in the flora area)
  2. Achenes winged; pappus of two awns ..... *Verbesina*
  - 2'. Achenes never winged, usually ribbed, angled or  $\pm$  terete; pappus of squamellae, or awns and squamellae or coroniform
  3. Pappus of retrose barbed aristae ..... *Bidens*
  - 3'. Pappus of squamellae, squamellae and awns or coroniform
    4. Pappus a fused crown; achenes usually with bifid setulae; ray florets sterile; anthers black ..... *Aspilia*
    - 4'. Pappus a crown of squamellae or squamellae and awns, usually fused at very base; achenes with simple setulae; ray florets fertile; anthers yellow ..... *Calea*

#### 34. *Aspilia* Thouars

Perennial herbs, subshrubs or shrubs. Rootstock fibrous or a xylopodium. Stems herbaceous or woody, hispid. Leaves sessile or petiole, surfaces scabrous, margins entire or serrate. Inflorescences terminal or subterminal, of solitary capitula or corymbs or few to many capitula. Capitula heterogamous, radiate, pedicellate, pedicels very short or elongate; involucre campanulate to hemispherical; phyllaries 2-4-seriate, monomorphic or heteromorphic and of two types, outer herbaceous and longer than and scarious inner; receptacle convex, paleaceous, paleae oblong to lanceolate, conduplicate about disc-florets. Ray-florets 7-12, neutral, uniseriate, corolla tube glabrous, limb sparsely pubescent outside, apex distinctly 2-3-toothed, yellow. Disc-florets hermaphrodite, fertile, 30-50; corolla glabrous, dull yellow, corolla-lobes papillose outside, long-papillose inside; basal anther-appendages truncate, apical anther-appendages about as long as wide, apex obtuse; anthers black; style glabrous; style-arms long pubescent, appendages short or elongate. Achenes angled or compressed laterally, pubescent often with numerous to dense bifid hairs; pappus coroniform sometimes with free apical portions appearing aristate.

A genus of more than 50 species in Brazil with a few species in Africa and Madagascar. Recently Robinson (1992) transferred the type species to *Wedelia*, followed a little later by Turner (1992) who transferred most of the South American species of *Aspilia* to *Wedelia*. Much of the reasoning for this was centred around the problems that many authors had in distinguishing the two genera. However it is important to remember that most of their considerations are of New World taxa and do not take into account the Old World taxa. It is highly probable that the taxa in the New World are not congeneric with those in the Old World. Until a complete revision of the Brazilian elements is available the large number of combinations necessary will have to wait. It is probable that the genus *Anomostephium* DC. will have to be recognized to accommodate the changes.

1. Tall erect to spreading shrub; phyllaries imbricate and gradate in c. 3 series, the inner series longest; pedicels 10-20 mm; ray-florets c. 12, limb 10-12  $\times$  4 mm ..... *A. almasensis*
- 1'. Decumbent subshrub; phyllaries biseriate with herbaceous outer series slightly longer than inner; pedicels 25-55 mm; ray-florets 7-8, limb c. 8  $\times$  3.5-4 mm ..... *A. decumbens*

34.1. *Aspilia almasensis* D.J.N.Hind, Kew Bull. 48(2): 273. 1993.

Erect to spreading shrub or subshrub to ca. 1 m tall. Stems erect to ascending, terete, striate, poorly to moderately branched. Leaves opposite, sessile to very

shortly petiolate, petiole to 1 mm long, mid-green, lanceolate, 1-4.5 cm  $\times$  0.3-1.7 cm, base obtuse, lamina with numerous to  $\pm$  dense  $\pm$  scabrid hairs beneath, scabrid above, midrib prominent beneath, margins flat to revolute, entire, apex acute. Inflorescence terminal or subterminal, solitary, occasionally in dichasia,

capitula pedicellate, occasionally bracteolate; capitula radiate; involucre 0.7-1 mm tall  $\times$  6-8 mm diam., campanulate; outer phyllaries  $\pm$  patent, scabrid outside, inner phyllaries  $\pm$  erect to patent; receptacle convex, paleae ca. 1.1 cm long, conduplicate. Ray-florets ca. 12, corolla-tube 3.5-4 mm long, glabrous, limb ca.  $8 \times 3$ -4 mm, sparsely shortly pubescent outside, glabrous inside, deeply 2-toothed, bright yellow; disc-florets dull yellow, corolla ca. 7 mm long, corolla-tube constricted basally, glabrous, corolla-lobes papillose outside, densely long-papillose inside. Achenes ca. 4.5 mm  $\times$  1.5-2 mm, body covered with numerous bifid hairs, apex truncate below pappus; pappus squamellae fused into short corona ca. 0.5 mm tall, rarely with free apical portions, very rarely extending to longer awn, margin of corona denticulate, squamellae glabrous except for two lines of pubescence over compression ridges.

*Cordeiro et al. CFCR 11397* (K, SPF); *Harley et al. CFCR 6484* (K, SPF, TEX/LL); *Pirani et al. CFCR 13115* (SPF, UEC); *Silva et al. CFCR 12485, CFCR 12685* (K, SPF).

Restricted to localized areas in Bahia and Minas Gerais. Cerrado and campos rupestres, although sometimes found in forest margins. Flowering time: November - January.

The material from Grão-Mogol appears slightly smaller in some of its parts than the material from Bahia. Originally described from the Pico das Almas, Bahia, this species appears to be another element in the flora of Grão-Mogol that demonstrates the link with the Chapada da Diamantina in Bahia, q.v. *Mikania alvimii* R.M.King & H.Rob.

34.2 *Aspilidium decumbens* D.J.N.Hind, Kew Bull. 49(3): 517. 1994.

Subshrub to c. 0.4 m. Rootstock probably a

xylopodium. Stems decumbent, simple or sparingly branched, usually leafy in upper half, upper stems densely hispid or becoming glabrescent and woody below. Leaves opposite, sessile or pseudopetiolate, narrowly lanceolate, 15-37  $\times$  2-6 mm, base attenuate, weakly trinervate,  $\pm$  concolorous, both upper and lower surfaces  $\pm$  uniformly hispid hairy, margins entire, apex acute. Inflorescence of solitary terminal pedicellate capitula, pedicels 25-55 mm; capitula radiate, campanulate; involucre 9-10 mm tall, ca. 10 mm diam.; phyllaries 2-seriate, outer series herbaceous, slightly longer than inner, hispid with few closely appressed hairs, margins ciliate, apices acute to obtuse, inner series chartaceous, surfaces glabrescent or hispid with fewer shorter hairs, margins lacinate, apices obtuse to rounded; receptacle paleaceous, paleae conduplicate about disc-achenes, margins lacinate, ventrally winged, apex with expanded flap-like appendage, 1.5-2  $\times$  ca. 1.5 mm, overtopping pappus awns, margins lacinate. Ray-florets 7-8, sterile, limb ca.  $8 \times 3$ -4 mm, glabrous above and beneath, apex deeply notched, bright yellow. Disc-florets 15-20, dull yellow; corolla-tube ca. 2.5 mm, expanded into throat, throat 3-3.5 mm, glabrous throughout; corolla-lobes ca. 0.5 mm, triangular, apices acute, short-papillate outside, long-papillate inside. Achenes 5-5.5 mm, body  $\pm$  densely setuliferous; pappus of two awns, ca. 1.5 mm and a lacinate corona, ca. 0.5-1 mm. (Fig. 6. E-G)

*Pirani et al. CFCR 12684* (holotype SPF, isotype K).

Open cerrado. Currently only known from the type collection but probably endemic to the Grão-Mogol area. Flowering time: December.

In the protologue this species was allied to *Aspilidium hispidantha* H. Rob. a species from Bahia, although that species has larger capitula and leaves, and an obviously erect habit.

### 35. *Bidens* L.

Annual or perennial herbs or shrubs, rarely scandent vines. Stems terete or tetragonal, variously branched, glabrous or pubescent, hairs simple or rarely stellate. Leaves opposite, rarely whorled, sessile or petiolate, simple to deeply and irregularly 2-3-pinnatisect, lamina or segments linear to broadly ovate, margins entire, denticulate, serrate or variously incised. Capitula usually radiate, heterogamous, erect at anthesis, pedunculate, solitary and terminal or arranged in lax cymes; involucre biseriate; outer phyllaries herbaceous,  $\pm$  leaf-like, inner phyllaries membranous, often with scarious margin; receptacle flat to conical, paleaceous; paleae membranous, white to yellowish-brown, usually oblong-linear. Ray-florets usually neuter or rarely functionally female, rarely absent or rudimentary; rays oblong to oblanceolate, yellow or white. Disc-florets few to numerous, hermaphrodite; corolla-lobes papillose, yellow, orange or brownish-orange; anthers brown to black and shiny, base caudate or sagittate, apex triangular-ovate or ovate-lanceolate; style-base bulbous; style-arms with acute or acuminate appendages. Achenes linear-oblong to broadly obovate, obcompressed or 3-4-angled, strigose or glabrous, margins setulose, winged or variously thickened, or without any such structures; pappus 2-4 awns, paleaceous or setaceous, naked or barbed.

A genus of probably more than 200 species. There are several centres of speciation including North America, Mexico, the West Indies, and the Hawaiian Islands. The species concept in this genus is still very problematical with few modern accounts on the genus in South America.

35.1. *Bidens patula* Gardner, London J. Bot. 7: 405. 1848.

Scandent shrub to ca. 3 m. Stems terete, striate, sparingly branched, glabrous. Leaves simple, opposite, petiolate, petiole 10-30 (-35) mm, lamina lanceolate to ovate-lanceolate, 50-105 × 15-45 (-55) mm, base rotund or obtuse to acute, sometimes attenuate on petiole, lamina discolorous, lighter beneath, sparsely pubescent beneath, more so above, margins finely to coarsely serrate, apex acute to long acuminate. Inflorescence terminal or subterminal, corymbose to paniculate. Capitula radiate, pedicellate, pedicels 5-20 mm, with scattered hairs; involucre ca. 8 mm tall × ca. 6 mm diam., pubescent at base of phyllaries; inner phyllaries with narrow scarious margins, margins with very few scattered hairs, apices short-pubescent. Ray florets 5-7; ray 15 × 4 mm, glabrous, yellow. Disc florets ca. 15, dull yellow; corolla-lobes sparsely pubescent to papillate

outside. Achenes ca. 10 mm, flattened, margins with numerous straw-coloured long setulae; pappus of two awns, ca. 5 mm, patent, brown. (Fig. 6. H-J)

*Cordeiro et al. CFCR 1000* (K, SPF); *Pirani et al. CFCR 882* (K, SPF).

Probably widespread in Goiás and Minas Gerais. Cerrado and mata ciliar. Flowering time: March - May.

Sherff (1937) and Schulz (1911) both placed this species as a variety with simple leaves of a taxon with three or more leaflets, Sherff placing it with *B. segetum* Mart. ex Colla, a plant Colla described (1834) as having simple or divided leaves. This, I feel, overlooks the fact that there are no divided-leafed *Bidens* that produce simple leaves except as juvenile leaves and this character alone is distinct enough to recognize Gardner's species. It is close to the other vine-like species, *B. rubifolius* Kunth, which appears to be widespread in Brazil.

### 36. *Calea* L.

Coarse perennial herbs, subshrubs or shrubs, rarely vines. Rootstock fibrous or a xylopodium. Stems prostrate or erect, glabrous or scabrid. Leaves opposite, sometimes fasciculate, rarely alternate, simple, rarely pinnatifid, surfaces often scabrid, margins entire or toothed to coarsely serrate. Inflorescence of solitary capitula or corymbose to ± umbellate with few to many capitula. Capitula heterogamous and radiate or homogamous and discoid, sessile to long pedicellate; involucre campanulate or cylindrical; phyllaries usually multiseriate, imbricate, striate, or ± outer 4 herbaceous or with herbaceous apices; receptacle convex to conical, paleaceous or epaleaceous, paleae membranous, conduplicate about base of florets, apically toothed. Florets few to many (5-100+). Ray-florets uniseriate when present, female, fertile, limbs white or yellow, rarely reddish. Disc-florets hermaphrodite, corolla 5-lobed, glabrous, often glandular-punctate, rarely pubescent outside, dull to bright yellow; basal anther-appendages auriculate, apical anther-appendages ovate or spoon-shaped, divergent; anthers usually yellow; style-arms elongate, apices obtuse or ± truncate, pubescent outside. Achenes 4-5-ribbed or angled or marginal achenes compressed, body usually non-striate, black; pappus of flattened squamellae, rarely absent, usually free, sometimes connate at base, sometimes lacking in either ray-florets or in all florets, ca. 12 and shorter than body of achene (sect. *Meyeria*), ca. 10 and ± as long as achene (sect. *Lemmatium*), or ca. 20 and considerably longer than body (sect. *Calea* and sect. *Leontophthalmum*), margins usually lacerate, apex obtuse to awned.

A genus of about 100 species of tropical America.

1. Inflorescence scapose ..... *C. multiplinervia*
- 1'. Inflorescence usually corymbiform (if appearing scapose then pedicel much less than 16 cm long)
  2. Leaves verticillate, elliptic-ovate; pappus with or unequal squamellae ..... *C. semirii*
  - 2'. Leaves opposite, ovate lanceolate or lanceolate; pappus of ± equal squamellae
    3. Receptacle paleaceous; pedicels 20-50 mm long; achene glabrous on angles ..... *C. teucrifolia*
    - 3'. Receptacle epaleaceous or weakly so with 1 or 2 paleae; pedicels to 16 cm long; achenes setuliferous on angle ..... *C. hatschbachii*

36.1. *Calea hatschbachii* Pruski & D.J.N.Hind, Kew Bull. 53(3): 695 1998.

Erect herb or subshrub to 1 m tall. Stems ascending, terete to angled, scabrid/hispid, becoming  $\pm$  woody below, usually well branched, upper internodes long, to ca. 13 cm long. Leaves opposite, sessile, lanceolate, 2-6.5 cm  $\times$  0.3-1.2 mm, margins entire, subentire or markedly serrate,  $\pm$  revolute, lamina scattered pubescent beneath,  $\pm$  numerous glandular-punctae, scattered scabrid pubescent above, apex acute to attenuate. Inflorescence terminal, capitula solitary, or in few-headed cymes, capitula pedicellate, pedicels  $\pm$  scattered scabrid pubescent; capitula radiate; involucre campanulate, ca. 8 mm tall  $\times$  8-10 mm diam.; phyllaries 3-seriate, outer series  $\pm$  herbaceous, margins and venation short-pubescent, inner series membranous, margins hyaline, laciniate, apices obtuse or rounded to acute; receptacle  $\pm$  conical, epaleaceous. Ray florets 8, limb 7.5-9 mm  $\times$  2.5-3 mm, glandular-punctate beneath, yellow, apices 3-toothed, corolla tube ca. 1.5 mm long. Disc florets dull yellow; corolla ca. 2.5 mm long, glabrous, glandular-punctate above expansion into throat; corolla-lobes ca. 0.5 mm long. Achenes 3.5-4 mm long, trigonous to  $\pm$  4-angled, angles with adpressed hairs, also flecked with white; carpopodium distinct, oblique, upper margins decurrent along ribs; pappus of squamellae, 0.7-1.2 mm long, apices rounded to obtuse, erose.

*Campos et al. CFCR 13300* (K, SPF); *Hatschbach 41238* (MBM, NY); *Hatschbach et al. 55057* (holotype MBM, isotype NY); *Kameyama et al. CFCR 8871* (K, NY, SPF, UEC); *Lewinsohn et al. PIC95685* (US); *Pirani et al. CFCR 12389* (K, SPF); *Zappi et al. CFCR 12017* (K, SPF, US).

Cerrado, carrasco and campo, in sandy soil amongst rocks. Flowering time: October - June.

The colour notes on 'Vale do Rio Itacambiruçu, ca. 16°36'S-42°55'W. ca. 670 m. 14.VI.1990. *Pirani et al. CFCR 12942* (K, SPF)' suggest that the rays are reddish not yellow - this is also the tallest plant.

36.2. *Calea multiplinervia* Less., Linnaea 5:159. 1830.

Erect perennial herbs or subshrubs. Stems usually simple and with 3-4 pairs of leaves, the lowermost highly reduced. Leaves in basal portion of stem, opposite, sessile, lamina (1.5-)4.5-12(-22) cm  $\times$  (0.4-) 0.9-1.5 cm, narrowly lanceolate to linear, chartaceous, upper surface sparsely to moderately pubescent, hairs uniseriate, multicellular, eglandular, lower surface trinervate from base, main venation prominent beneath, moderately glandular-punctate with amber coloured exudate, margins entire or remotely and occasionally serrate, slightly

revolute, apices long-acute. Inflorescence of a single, long-pedicelled capitulum, pedicel 17-35(-40) cm long, ebracteolate, moderately to sparsely pubescent and sparsely glandular-punctate throughout much of length except beneath capitulum when it is densely pubescent, hairs simple, eglandular. Capitulum radiate, heterogamous; involucre hemispherical to broadly campanulate, phyllaries 2-3-seriate, outermost narrowly ovate, short-pubescent at base otherwise glabrous, sparsely glandular-punctate towards apex, margins sparsely laciniate in lower half, otherwise entire, apices acuminate, somewhat thickened, innermost series narrowly obovate to obovate, glabrous, margins erose, apices usually obtuse, the innermost often broadly-acute; receptacle paleaceous, paleae linear, ca. 1 cm long, exceeding achenes. Ray florets 10-12, ray limb 1.7-2 cm  $\times$  4-5 mm, bright yellow, glabrous, disc florets hermaphrodite, numerous, glabrous, dull yellow, corolla-tube ca. 2 mm long, cylindrical, expanded at base and constricted above below corolla-tube, corolla-lobes ca. 1.5 mm long. Achene 3-3.5 mm long, body angular, obscurely ribbed, moderately setuliferous, setulae of forked twin-hairs; pappus setae squamelliform, 7-8 mm long, margins finely laciniate, apices long-acute; carpopodium annular on markedly oblique achene base.

*Markgraf 3387, Mello-Barreto & Brade* (US).

Distrito Federal, Minas Gerais and Goiás. Usually reported to be a common species. Flowering time: November - January.

36.3. *Calea semivii* Pruski & D.J.N.Hind, Kew Bull. 53(3): 698. 1998.

Herbs or more usually subshrubs, to 1.5 m tall. Stems erect, rarely  $\pm$  prostrate,  $\pm$  terete, coarsely striate, puberulent to pubescent, internodes as long or longer than leaves. Leaves whorled usually with 3 per verticil, sessile, lamina subcoriaceous, elliptic-ovate (1-)2-4.5 cm  $\times$  (1.3-)1.5-4 cm, base cuneate to rounded, venation trinervate, sparsely to  $\pm$  densely pubescent beneath, pale green, rugulose, glabrous to sparsely pubescent and brownish green above, margins coarsely serrate, apex obtuse to rounded, sometimes acute. Inflorescence terminal, cymose of few to many capitula, capitula pedicellate, pedicels 5-30 mm long, pubescent; capitula heterogamous, radiate; involucre cylindrical to turbinate, 10-13.5 mm tall  $\times$  8-11.5 mm diam., turbinate to cylindrical; phyllaries 3-5-seriate, imbricate, graduate, outer scarious, pubescent, middle and inner series glabrous, margins laciniate, apices obtuse; paleae ca. 8 mm long, apices long-attenuate. Ray-florets 8-10,

limb ca. 1.2 cm × ca. 3.5 mm, yellow, glabrous. Disc-florets ca. 30, corolla tube ca. 2 mm long, upper campanulate portion ca. 1.5 mm long; corolla-lobes ca. 2 mm long, glabrous, golden-yellow. Achenes 4-4.5 mm long, 4-angled, angles coarsely setuliferous, body glabrous; pappus of 6-8 irregularly unequal squamellae, 1-3 mm long, two conspicuously longer than others, margins laciniate, apices acute to acuminate. (Fig. 6. K-M)

*Mello-Silva* ♂ *Pirani* CFCR 10804 (holotype SPF; isotypes NY, UEC); *Semir et al.* CFCR 9644 (K, NY, SPF, UEC).

Probably endemic to the Grão-Mogol area. Campo rupestre, amongst large rocks. Flowering time: February - May.

This species was previously highlighted by Pruski & Urbatsch (1988) in their commentary on *C. heteropappa* Pruski & Urbatsch, a similar species from the Serra do Cipó.

36.4. *Calea teucrifolia* (Gardner) Baker in Mart. & Eichler, Fl. bras. 6(3): 259. 1884.

Shrub to ca. 60 cm. Stems well-branched, terete, striate, at first ± densely pubescent becoming glabrescent. Leaves opposite simple, pseudopetiolate, ovate

lanceolate, 1-2 cm × 0.8-1.5 cm, base cuneate, lamina discolorous, slightly lighter beneath, hairs numerous to ± dense, with numerous to ± dense glandular-punctae, upper surface with sparse long-hairs, margins coarsely serrate, apex acute. Inflorescence terminal or subterminal, of solitary capitula, capitula pedicellate, pedicels 2-5 cm long, long-pubescent; capitula radiate; involucre campanulate, ca. 7 mm tall × ca. 8 mm diam.; phyllaries 3-seriate, outer series foliaceous, densely pubescent, spreading to recurved, middle series sparsely to ± densely pubescent towards margins, margins scarious, inner series glabrous, margins scarious, ± yellowish, usually entire; receptacle convex, paleae ca. 6 mm, conduplicate about achene, apex apiculate, erose. Ray florets 10-12, ray glabrous, sparsely glandular-punctate outside, bright yellow. Disc florets ca. 20; corolla-tube ca. 2.5 mm long, glabrous; corolla-lobes ca. 2 mm long, yellow, glabrous. Achenes 4-5 mm long, 4-angled, body glabrous but setuliferous just below callus; pappus squamelliform, squamellae ca. 15, 0.5-1 mm long, apices rounded.

*Freire-Fierros* CFCR 12378 (SPF, UEC), CFCR 12575 (K, SPF); *Irwin et al.* 23344 (K, NY); *Pirani et al.* CFCR 12627 (K, SPF).

Probably widespread in Minas Gerais and Goiás. Cerrado. Flowering time: November - April.

### 37. *Porophyllum* Guett.

Annual or perennial herbs, subshrubs, or sometimes large shrubs, glabrous, rarely pubescent, often glaucous. Rootstock fibrous or a xylopodium. Stems simple, poorly-branched, or well branched. Leaves alternate opposite or both, simple, sessile to petiolate, lamina filiform to broad ovate, herbaceous to ± fleshy, margins entire to sinuate usually with translucent oil-glands, sometimes lacking. Inflorescences terminal or subterminal, cymose, corymbose or paniculate. Capitula homogamous, discoid, pedicellate, pedicels filiform or clavate below involucre; involucre cylindrical or sometimes campanulate; phyllaries uniseriate, 5-9, free or connate at base, glanduliferous with linear to oblong translucent oil-glands in two rows or occasionally one row above midrib or submarginally; receptacle small, convex, naked. Florets 12-80+; corolla actinomorphic to ± bilabiate, sparsely pubescent throughout, whitish, greenish, yellow or purplish; basal anther-appendages rounded to ± sagittate, apical anther-appendages slightly longer than wide, acute; style glabrous; style-arms subulate, long-papillose. Achenes striate, setuliferous, rarely glabrous, narrowing towards apex; pappus-setae capillary, often coarsely barbellate, whitish, straw-coloured or purple.

About 30 species from the New World ranging from the USA south to Argentina. At least one species is a notable weed and several are highly toxic or fatal when eaten (by cattle or man).

37.1. *Porophyllum obscurum* (Spreng.) DC., Prodr. 5: 651. 1836.

Erect, glabrous, ± glaucous annual herb or perennial subshrub to 1 m tall. Stems green to purplish, becoming brownish-purple with age, terete, striate, few branched.

Leaves opposite or alternate, sessile to short-petiolate, lamina linear to lanceolate or oblanceolate, 1-5 cm × 0.2-1.7 cm, thin, margins with scattered glands, apex acute. Inflorescence terminal, capitula solitary or in panicles, pedicels 1-7 cm long, slightly to moderately clavate. Phyllaries greenish, 1.1-1.45 cm × 1.5-3 mm,

apex acute. Florets pale to dark-purple of olive green, 10. Corolla 6-8.5 mm long, pubescent. Achene 5-8 mm long, setuliferous; pappus-setae 9-11.5 mm long, barbellate, straw-coloured to purplish. (Fig. 6. N-O)

*Mamede et al. CFCR 3479* (K, SPF, TEX/LL); *Mello-Silva & Pirani CFCR 10779* (K, SPF); *Pirani et al. CFCR 13028* (K, SPF), *CFCR 13165* (K, SPF).

Widespread throughout South America, to southern Peru and northern Argentina. Cerrado and campos

rupestres. Common in areas. Flowering time: May - July, but probably flowering throughout the year.

The most variable of the South American species, especially in leaf dimensions, leaf placement, habit, and pappus colour. Johnson's revision (1969) is apparently in error in using the name *P. lanceolatum* DC. for this species. The earliest published name ascribable to this taxon is that of Sprengel. De Candolle (1836) made the necessary combination even though it was placed within *Species vix notae et versimiliter à genere excludendae* the species is clearly a *Porophyllum* from Sprengel's description.

### 38. *Verbesina* L.

Annual or perennial herbs, shrubs or trees. Stems terete or winged. Leaves sometimes opposite, sometimes most or all alternate, often rough, base decurrent, petiole sometimes auriculate, surfaces strigose, or glabrous, sometimes tomentose, margins serrate, dentate or variously lobed. Inflorescence corymbose with numerous capitula, sometimes of solitary capitula on long terminal pedicels. Capitula heterogamous and radiate or homogamous and discoid, small to large; involucre hemispherical or campanulate; phyllaries 2-6-seriate, imbricate; receptacle conical, paleaceous, paleae persistent, conduplicate about achenes, usually hooded. Ray-florets female and fertile, sometimes female and sterile or sometimes neutral, limb usually long and showy, sometimes short and  $\pm$  exerted, orange-yellow, yellow or cream to white. Disc-florets hermaphrodite, fertile; style-arms acute or attenuate at apex. Achenes strongly compressed laterally and conspicuously winged, wings usually white, cartilaginous, often ciliate, body glabrous or setuliferous towards apex; pappus of two deciduous or persistent awns, rarely absent or rudimentary.

A large genus of about 200 species mostly from Tropical America. The whole genus is in need of a modern revisionary treatment and the Brazilian material is in need of reassessment as it is evident from much of the material studied that many more species are present than accounted for by Baker (1884) or Robinson & Greenman (1899).

38.1. *Verbesina pseudoclaussenii* D.J.N.Hind. Kew Bull. 49(3): 419. 1994.

Shrub or small tree to 2.5 m tall. Stems poorly to well branched, densely pubescent at first becoming glabrescent. Leaves alternate, petiolate, lamina narrowly ovate, 7-14 cm  $\times$  2.5-6 cm, base long-attenuate, white-tomentose beneath, pubescent with numerous hairs above, hairs eventually deciduous except for basal portion, green, margins entire in basal third, remotely finely serrate, apex acute to acuminate. Inflorescence terminal, many-headed. Capitula disciform, pedicellate, tomentose; involucre hemispherical, ca. 6 mm tall  $\times$  6-8 mm diam.; phyllaries 2-3-seriate, pubescent, hairs numerous, glabrous towards apex, apices rotund to obtuse; paleae ca. 4.5 mm long, sparsely to  $\pm$  densely pubescent towards apex, apices rounded, entire to erose. Florets yellow; corolla-tube 3.5-4 mm long, glabrous to

sparsely pubescent, hairs often in vertical lines; corolla-lobes ca. 1 mm long, apices acute, short-papillate along margins, sometimes with few hairs. Achenes ca. 3 mm long (very immature), body sparsely setuliferous, broadly winged, wings ciliate along margins; pappus awns ca. 2.5 mm long (very immature), sparsely coarsely-barbellate. (Fig. 6. P-Q)

*Freire-Fierros et al. CFCR 12508* (isotype K, holotype SPF).

Probably endemic to Minas Gerais. Scattered amongst rocks in campos rupestres. Flowering time: December - February.

This species is similar to *V. clausenii* Sch.Bip. but differs in several characters. The capitula are more numerous and much smaller, the phyllaries fewer seriate, the paleae are less densely pubescent, and the corolla-lobes are  $\pm$  glabrous.

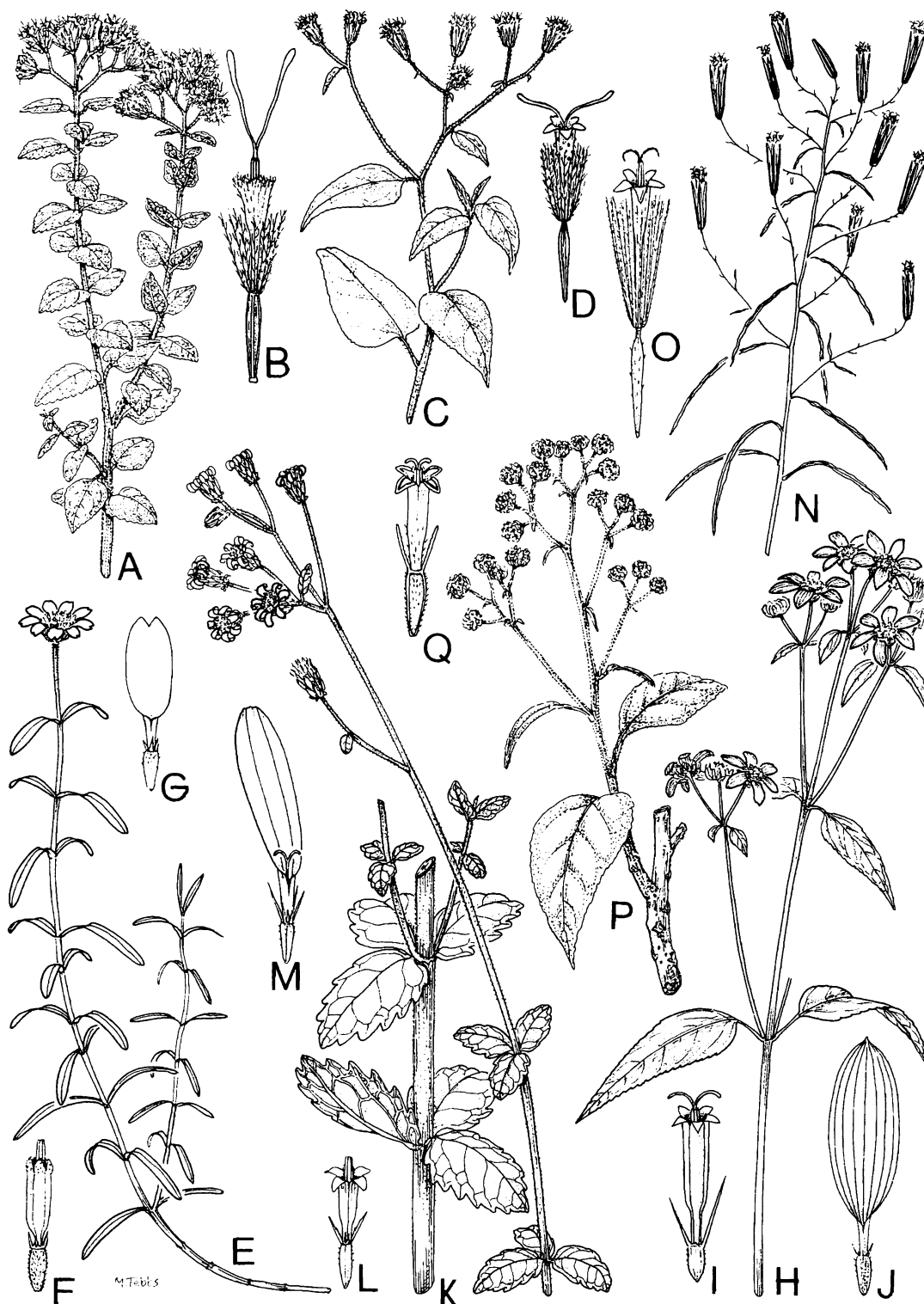


Fig. 6. COMPOSITAE. EUPATORIEAE: A-B. *Trichogonia crenulata*: A. flowering shoot; B. floret (Harley et al. 36085); C-D. *Trichogoniopsis adenantha*: C. flowering shoot; D. floret (Harley et al. H51336). HELIANTHEAE: E-G. *Aspilia decumbens*: E. flowering shoot; F. disc floret; G. ray floret (Pirani et al. CFCR 12684, isotype); H-J. *Bidens patula*: H. flowering shoot; I. disc floret; J. ray floret (Pirani et al. CFCR 22810); K-M. *Calea semirii*: K. flowering shoot; L. disc floret; M. ray floret (Mello-Silva & Pirani CFCR 10804); N-O. *Porophyllum obscurum*: N. flowering shoot; O. floret (Pirani et al. CFCR 13165); P-Q. *Verbesina pseudoclausenii*: P. flowering shoot; Q. floret (Freire-Ferreira et al. CFCR 12508, isotype). Scale bars B, D, F, G, I, J, L, M, O, Q = 1 mm; A, C, E, H, K, N, P = 10 mm.