

Diversity of Apiaceae in Africa

B-E van Wyk* and PM Tilney

Department of Botany, Rand Afrikaans University, PO Box 524, Auckland Park, Johannesburg 2006, South Africa

* Corresponding author, email: bevww@na.rau.ac.za

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A preliminary checklist of 76 genera and 368 species of Apiaceae in sub-Saharan Africa is presented. The list shows that 40 of the 67 indigenous genera and 321 of the 355 indigenous species of Apiaceae are endemic to Africa (respectively 60% and 90% endemism). The relatively low number of genera does not accurately reflect the importance of the large number of basal genera (17 of an estimated total of 25) that are restricted to Africa. These genera are taxonomically isolated within the Apioideae and Saniculoideae, with no obvious relatives.

Amongst the unusual features pointing to a basal (ancestral) position within the Apiaceae are an arborescent or woody habit, deciduous leaves with dentate-aristate margins, unusual fruit wing patterns, woody endocarps, large rib oil ducts and the common occurrence of scattered crystals in the fruit. The anomalous African genera are of special significance in trying to understand the early divergence of the Apiaceae and the evolution of morphological characters.

Introduction

The extreme diversity of the Apiaceae on a global scale became better known through the important world generic checklist of Pimenov and Leonov (1993). This is the first comprehensive review and update of the nomenclature of the family since the classical system of Drude (1898), apart from the taxonomically and nomenclaturally somewhat imperfect overview of Hiroe (1979). The regional diversity of the family became known for the first time — for the whole of Africa and Madagascar, 126 genera were listed, including 50 endemic genera. Lebrun and Stork (1992) published the first species checklist for tropical Africa. This list includes 158 species and 43 indigenous genera. Burt (1991) presented an annotated checklist of the Apiaceae of southern Africa, listing 195 species and 38 indigenous genera, of which 19 are endemic. He emphasised the importance of the hitherto neglected (southern) African taxa in gaining a deeper understanding of relationships in the family. This valuable paper has done much to highlight the need for comparative studies and detailed taxonomic revisions. A further major contribution was that of Downie and Katz-Downie (1999) in which it was shown, using DNA sequence data, that several southern African genera are basal (ancestral) within the subfamily Apioideae. Recent papers by Plunkett (2001) and Downie *et al.* (2001, and earlier references cited therein) all point to the phylogenetic importance of the African contingent of Apiaceae.

The aim of this paper is to highlight the importance of African Apiaceae in terms of morphological diversity and to summarise the current knowledge of generic and species diversity, at least for sub-Saharan Africa. The list incorporates several recent revisions, some of which have not yet

been published. Mediterranean Africa — Morocco to Egypt — was excluded from the checklist because the Apiaceae flora of this region has strong links with southern European and Eurasian taxa.

Morphological Diversity in African Apiaceae

Ongoing studies on African genera are revealing unique and interesting characters and character states, many of which are presumed to be plesiomorphic within the Apiaceae. Figure 1 shows the distribution of some of these characters amongst the main lineages of the Apiaceae.

Woodiness

According to Oskolski (2001), about 20 genera of Apiaceae include shrubs or small trees, spread over all three traditional subfamilies (Hydrocotyloideae, Saniculoideae and Apioideae). Whereas some lineages (e.g. most hydrocotyloids) show clear evidence that woodiness has arisen secondarily, *Heteromorpha* Cham. & Schltdl., *Bupleurum* L. and *Melanoselinum* Hoffm. are a distinct group, characterised by helical thickening in the vessel walls, septate fibres and mostly homogeneous rays (Oskolski 2001). In the Apiaceae, the arborescent habit appears to be restricted to Africa and occurs in the genera *Steganotaenia* Hochst. (Figure 2a), *Heteromorpha* (Figure 2b) and *Polemanna* Eckl. & Zeyh. These genera also show an interesting adaptation to seasonal drought and are able to photosynthesise while in the leafless state due to a layer of chlorophyll below the thin, translucent bark (Figure 2c, d). Other African Apiaceae show

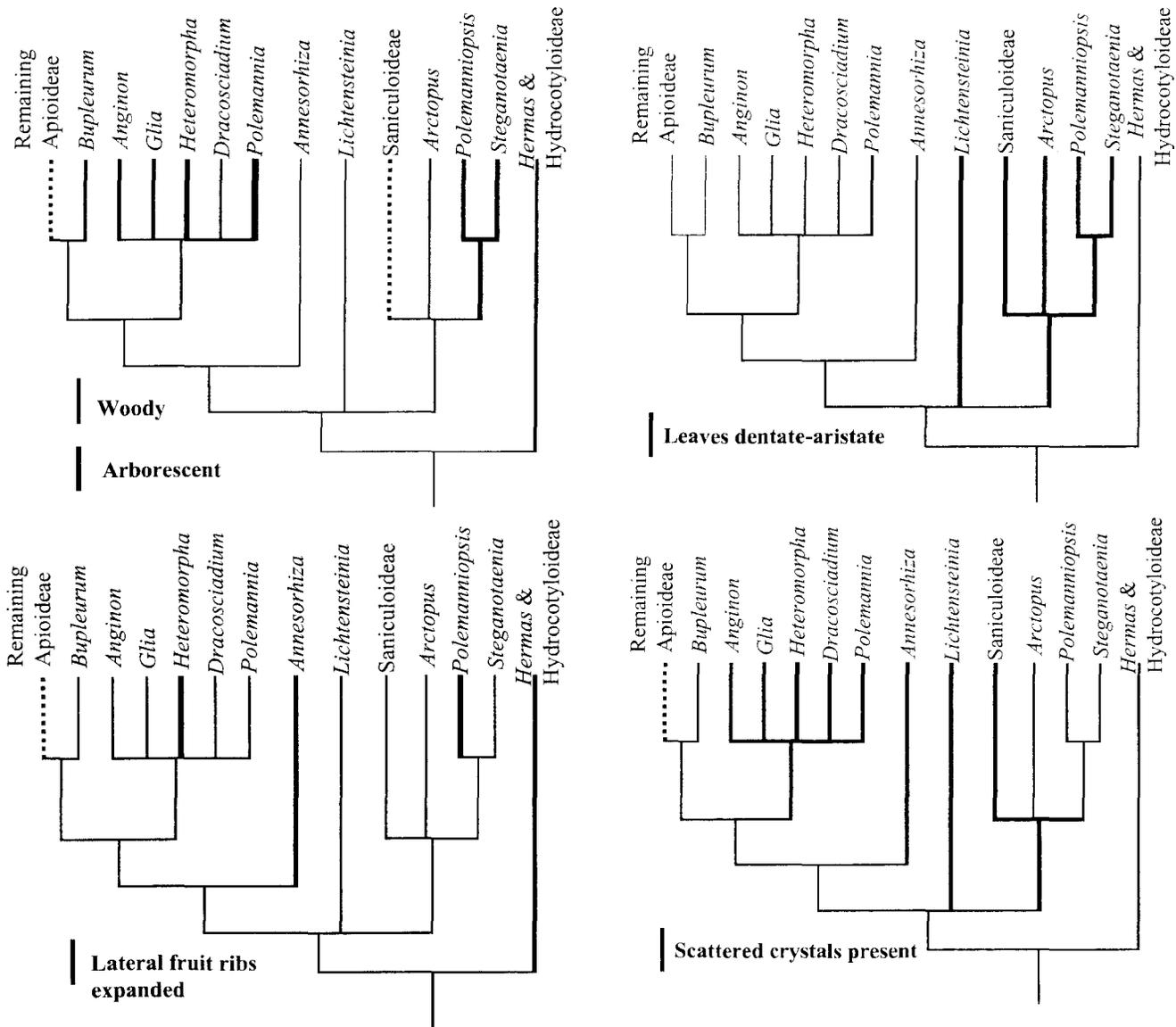


Figure 1: The distribution of some rare and unusual character states in the main lineages of Apiaceae (topology based on recently published DNA phylogenies of Downie *et al.* (1999) and Plunkett (2001)). Broken lines indicate rare or sporadic occurrences within a lineage

a wide diversity of growth forms (Figure 3), ranging from woody shrubs (as in species of *Anginon* Raf. and *Herma villosa* L., Figure 3a, d) to suffrutices (as in *Deverra denudata*, Figure 3b) and the more common perennial herbaceous habit (as in *Lichtensteinia lacera* Cham. & Schtdl., Figure 3c). The shrubby (woody) habit is present in many African genera, including *Centella* L., *Herma* L. (both traditionally placed in Hydrocotyloideae), *Polemanniopsis* B.L.Burt (associated with the Saniculoideae) and *Anginon* Raf., *Deverra* DC., *Diplophium* Turcz., *Glia* Sond., *Nirarathamnos* Balf.f., *Peucedanum* L. (*sensu lato*), *Pseudocarum* Norman, *Sciothamnus* Endl. and *Stenosemis* E.Mey. ex Harv. To these can be added some Madagascan genera, including *Andriana* B-E. van Wyk, *Cannaboides* B-E. van Wyk and *Tana* B-E. van Wyk (see Sales *et al.* 2004).

anatomical studies to obtain a clearer picture of which genera are primarily woody, such as *Heteromorpha* (Oskolski 2001) and in which ones woodiness is secondarily derived, such as in *Nirarathamnos* (Oskolski 2001). Of particular interest would be a comparison of *Steganotaenia* and *Polemanniopsis*, shown by recent studies (Downie and Katz-Downie 1999, Plunkett 2001) to be closely associated with the subfamily Saniculoideae.

Dentate-aristate leaf margins

Broad, often simple and dentate leaves, in which each tooth ends in a small hair-like bristle or sometimes a spine, is a feature associated with the subfamily Saniculoideae. Several African genera traditionally placed in the Apioideae



Figure 2: Arborescent habit (a–b) and unusual bark (c–d) of African Apiaceae. (a) *Steganotaenia araliacea* tree, (b) *Heteromorpha arborescens* var. *trifoliata* tree, (c) *Steganotaenia araliacea* bark (bright green photosynthetic layer below a thin yellow, somewhat flaky bark), (d) *Heteromorpha arborescens* var. *trifoliata* (bright green photosynthetic layer below the smooth, thin, reddish translucent bark). These deciduous trees have the ability to photosynthesise (in the stems) while in the leafless state. (photo a: P van Wyk; photos b–d: B-E van Wyk)

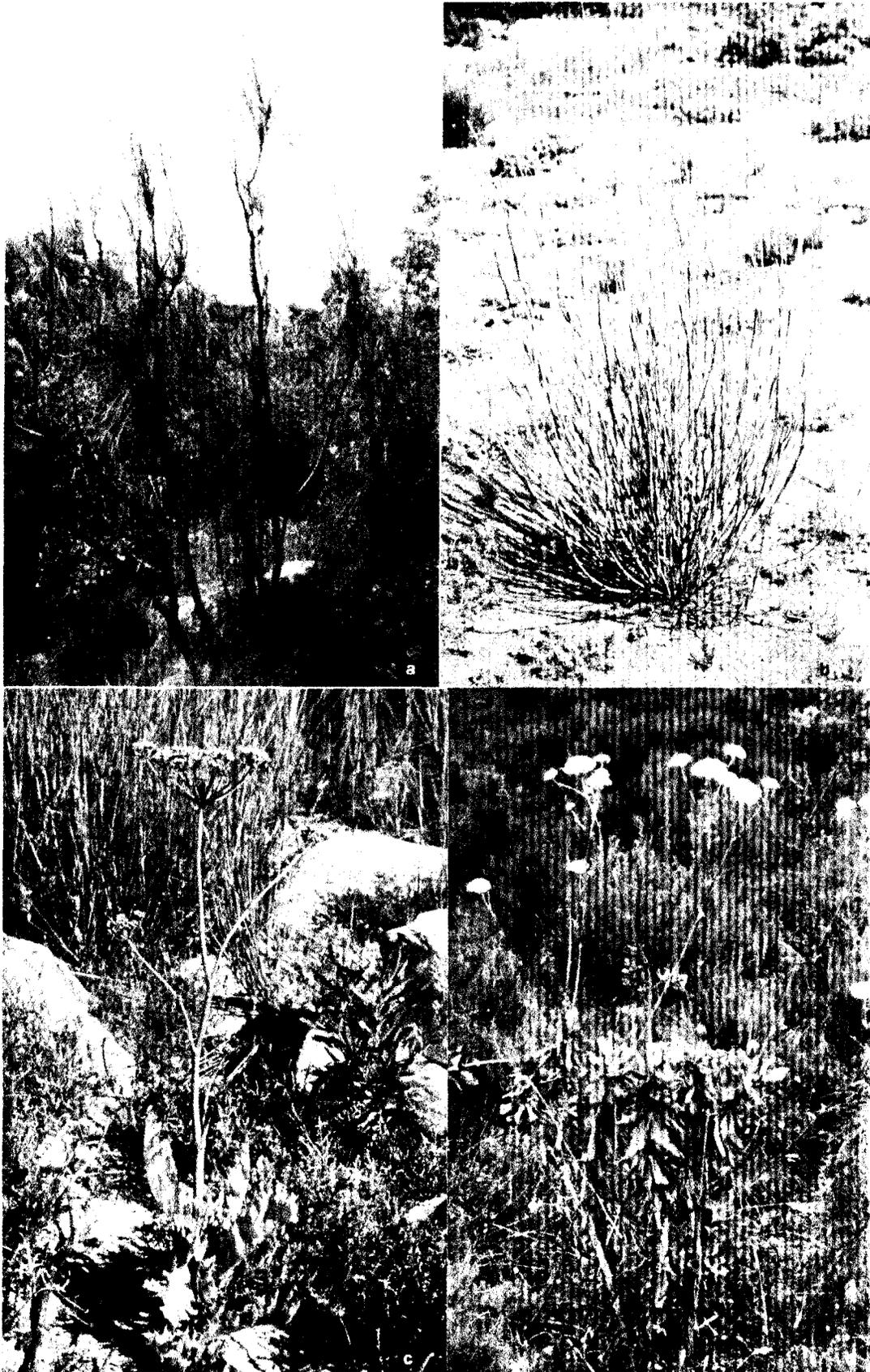


Figure 2: Selected African Apiaceae showing a variety of habits: (a) *Argemone ternatum* (sparse erect shrub), (b) *Deverra denudata* (virgate)

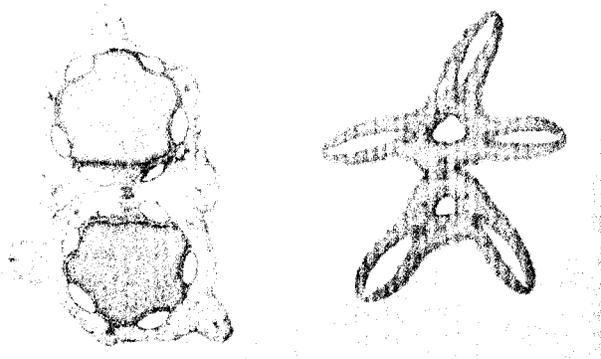


Figure 4: Unusual (heteromorphic) fruit and ovary structure in African Apiaceae. (a) Mature schizocarp of *Heteromorpha arborescens* (TS). (b) ovary of *Polemanniopsis marlothii* (TS). Note the two lateral wings on the lower mericarp/carpel and the single median and two marginal wings on the upper

varying degrees. Of special interest is the clear presence of this trait in *Steganotaenia*, *Polemanniopsis*, *Arctopus* L. and *Lichtensteinia* Cham. & Schltdl. (Figure 1b), which indicates some link with the Saniculoideae. It would be interesting to include *Pseudocarum* Norman in DNA studies, as this bitypic Afro-Madagascan genus (see Van Wyk *et al.* 1999) also has markedly dentate-aristate leaves. Morphological features such as the extremely long rays point to a further link to the tropical African genus *Aframmi* Norman.

Lateral fruit wings (heteromorphic fruits)

A broad comparative study of the taxonomic value of the fruit structure in Apiaceae has just been completed (Liu 2003). One of the most interesting morphological plesiomorphies uncovered by this study is the presence of expanded lateral wings (combined with the absence of median and marginal wings) in the fruit (Figure 1c). Lateral wings are a diagnostic feature of most genera of the hydrocotyloid tribe Mulineae but are present also in one of the two mericarps that form the typical heteromorphic fruit (Figure 4) of genera such as *Heteromorpha* (Figure 4a), *Polemanniopsis* (Figure 4b) and *Annesorhiza* Cham. & Schltdl. In these genera, the one mericarp typically has two lateral wings, while the other has one median and two marginal wings. Surprisingly, expanded lateral wings have also been found in the ovary of *Steganotaenia araliacea* Hochst. (Liu *et al.* 2003), this suggests that a wider survey of fruit ontogeny may yield interesting results. As is the case with woodiness, it appears that heteromorphic fruits may also be plesiomorphic in some genera (e.g. *Heteromorpha*) or secondarily derived (in Apiodeae that show extreme variability in their fruit wing configurations, such as *Dasispermum* Neck. ex Raf. and *Hohenackeria* Fisch. & C.A. Mey.).

Scattered crystals in the mesocarp

Perhaps the most useful indicator of basal Apiodeae is the presence of scattered crystals in the mesocarp of the fruit (Liu 2003, *op. cit.*). This feature is present in most of the

African genera now known to be part of the early branches of the Apiodeae-Saniculoideae phylogeny (Figure 1d). In aralioids and hydrocotyloids, crystals are confined to the area immediately adjacent to the endocarp, whereas the crystals are dispersed in the mesocarp in Saniculoideae and basal Apiodeae. Dispersed crystals appear to have a high predictive value (indicative of ancestral lineages in Apiodeae), as do large rib oil ducts and a lignified or partly lignified endocarp. A broader survey of woody taxa may reveal interesting new candidates for inclusion into the basal tribes.

Species Diversity in Sub-Saharan Africa

A list of species of Apiaceae in sub-Saharan Africa is presented in Table 1. The list is preliminary only, as ongoing studies are resulting in modifications to generic and species delimitations and the addition of new taxa. Nevertheless, it reflects recent revisions of genera and may serve as a useful starting point to quantify species richness and endemism on the continent. As explained above, northern Mediterranean Africa has been excluded from the list because it has numerous non-endemic genera and species with affinities in Europe and Asia. Only a few African-endemic (or near-endemic) genera occur in this region (such as *Deverra* DC. in the western part and *Lefebvrea* A.Rich. in the east). Macaronesia has a very high level of endemism and deserves special attention (Heywood 1973), but is not part of sub-Saharan Africa and therefore irrelevant here. Madagascar is also excluded, but an up-to-date list of genera and species is now available (Sales *et al.* 2004).

The diversity at generic and species levels is summarised in Table 2. By excluding parts of North Africa, the overall number of genera reported by Pimenov and Leonov (1993) for Africa and Madagascar drops from 126 to 76 (67 of them indigenous), but the number of endemic genera decreases less dramatically from 50 to 40. At species level, a first estimate of 368 species of Apiaceae is given here. Of these, 355 are indigenous to Africa and no less than 321 are endemic. This means that about 60% of the indigenous genera and 90% of the species are endemic.

A consideration of the distribution of genera and species of the three traditional subfamilies of the Apiaceae shows that Africa has a low diversity of Hydrocotyloideae — only four indigenous and three endemic genera (75% endemism) and 61 indigenous and 54 endemic species (nearly 90% endemism). Most of the diversity is represented by the near-endemic genus *Centella*, now known to include 45 species, of which only one (the pantropical *C. asiatica* (L.) Urb. *sensu lato*) also occurs outside southern Africa (Schubert 2000). The diversity of the Saniculoideae is equally low, with only two indigenous genera (one endemic) and 28 species (27 endemic). Apart from a single species of *Sanicula*, all the diversity is represented by the endemic genus *Alepidea* Delar. It should be noted, however, that a number of endemic genera appear to be related to the Saniculoideae (*Lichtensteinia*, *Marlothiella*, *Arctopus*, *Polemanniopsis* and *Steganotaenia*) but these have been included in the category of 'basal Apiodeae' in Table 2. This rather poorly defined group includes all genera with a combination of one or more of the plesiomorphic morphological characters discussed above (the genera are listed in the caption of Table 2). It is

Table 1: Preliminary checklist of African Apiaceae (Mediterranean Africa and Madagascar are excluded). Endemic taxa are given in bold and naturalised aliens are marked with an asterisk. In the literature column, revisions are indicated in bold. The genus *Hydrocotyle* is nowadays considered to be closer to the Araliaceae (Plunkett *et al.* 2004). *Centella* is sometimes excluded from the Apiaceae *sensu stricto* but is again considered to be part of Apiaceae (Plunkett *et al.* 2004)

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
Apiaceae:					
1.	Aframmi C.Norman	Trop. (Angola, Zambia)	2	A. angolense (C.Norman) C.Norman A. longiradiatum (H.Wolff) Cannon	Norman (1929) Cannon (1978)
2.	Afrocarum Rauschert	Trop.	1	A. imbricatum (Schinz) Rauschert	Townsend (1989)
3.	Afroligusticum C.Norman	Trop.	1	A. elliotii (Engl.) C.Norman	Townsend (1983)
4.	Afrosison H.Wolff	Trop.	3	A. djurense H.Wolff A. gallabatense H.Wolff A. schweinfurthii H.Wolff	Wolff (1912)
5.	Agrocharis Hochst.	NE, Trop., S	4	A. gracilis Hook.f. A. incognita (C. Norman) Heyw. & Jury A. melanantha Hochst. A. pedunculata (Bak.f.) Heywood & Jury	Heywood (1978) Jury (1978, 1986) Cauwet-Marc and Jury (1978) Townsend (1989)
6.	Alepidea Delar.	NE, Trop., S.	27	A. acutidens Weim. A. amatymbica Eckl. & Zeyh. A. angustifolia Schltr. & H.Wolff A. attenuata Weim. A. basinuda Pott A. capensis (Berg.) R.A.Dyer A. cirsiifolia Schltr. & H.Wolff A. comosa Dümmer A. delicatula Weim. A. duplidens Weim. A. galpinii Dümmer A. insculpta Hilliard & B.L.Burt A. jenkinsii Pott A. longeciliata Schinz ex Dümmer A. macowani Dümmer A. multisecta B.L.Burt A. natalensis Wood & Evans A. peduncularis A.Rich. A. pilifera Weim. (= A. ciliaris Delar.) A. pusilla Weim. A. reticulata Weim. A. serrata Eckl. & Zeyh. A. setifera N.E.Br. A. stellata Weim. A. thodei Dümmer A. woodii Oliv. A. wyliei Dümmer	Weimarck (1949) Townsend (1989) Burt (1991) A de Castro (unpublished honours project, Rand Afrikaans University (RAU))
7.	<i>Ammi</i> L.	*S	3–10?	* A. majus L.	Heywood (1973) Townsend (1989)
8.	Amodaucus Coss.	Trop.	1	A. leucotrichus Coss. & Dur.	Heywood (1978)
9.	<i>Anethum</i> L.	*Trop.	2	* A. graveolens L.	Townsend (1989)
10.	Anginon Raf.	S	12	A. difforme (L.) B.L.Burt A. fruticosum Allison & Van Wyk A. intermedium Allison & Van Wyk A. jaarsveldii B.L.Burt A. paniculatum (Thunb.) B.L.Burt A. pumilum Allison & Van Wyk A. rugosum (Thunb.) Raf. A. streyi (Merxmüller) Allison & Van Wyk A. swellendamense (Eckl. & Zeyh.) B.L.Burt A. tenuior Allison & Van Wyk A. ternatum Allison & Van Wyk A. verticillatum (Sond.) B.L.Burt	Allison and Van Wyk (1997)
11.	Angoseseli Chiov.	Trop. (Angola)	1	A. mossamedensis (Welw. ex Hiern) C.Norman	Norman (1934a) Heywood (1978)

Table 1 cont.

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
12.	Annesorhiza Cham. & Schlechtd.	S	12	A. altiscapa Schlechter ex H.Wolff A. burtii B-E. van Wyk A. fibrosa B-E. van Wyk A. flagellifolia Burt Davy A. grandiflora (Thunb.) Hiroe A. lateriflora (Eckl. & Zeyh.) B-E. van Wyk A. latifolia Adamson A. macrocarpa Eckl. & Zeyh. A. nuda (Ait.) B.L.Burt A. schlechteri H.Wolff A. thunbergii B.L.Burt A. wilmsii H.Wolff	Tilney and Van Wyk (2001)
13.	<i>Anthriscus</i> Pers.	Trop., S	12?	<i>A. sylvestris</i> (L.) G.F.Hoffm.	Townsend (1989)
14.	<i>Apium</i> L.	Trop., S	25	<i>A. australe</i> Thouars <i>A. crassipes</i> Reichb.f. <i>A. graveolens</i> L. <i>A. inundatum</i> (L.) Reichb.f. <i>A. nodiflorum</i> (L.) Lagasca <i>A. prostratum</i> Ventenat <i>A. repens</i> (Jacq.) Reichb.f.	Townsend (1989) CH Stirton (unpublished ms)
15.	Arctopus L.	S	3	A. dregei Sond. A. echinatus L. A. monacanthus Carmichael ex Sond.	Wolff (1913) Froebe (1979) Magin (1980)
16.	<i>Astydamia</i> DC.	NW	1	<i>A. canariensis</i> (Spreng.) DC.	Lebrun and Stork (1992)
17.	<i>Berula</i> W.D.J.Koch	NE, Trop., S	1	<i>B. erecta</i> (Huds.) Coville	Townsend (1989)
18.	<i>Bupleurum</i> L.	S	±190	<i>B. mundii</i> Cham. & Schlechtd. <i>*B. rotundifolium</i> L.	Burt (1991)
19.	Capnophyllum P.Gaertn.	S	2	C. africanum (L.) P.Gaertn. C. leiocarpon (Sond.) Manning & Goldblatt	Goldblatt and Manning (2000)
20.	<i>Carum</i> L.	Trop., S	30	<i>*C. carvi</i> L. <i>C. piovanii</i> Chiov.	Lebrun and Stork (1992)
21.	<i>Caucalis</i> L.	*S	1	<i>*C. platycarpus</i> L.	Burt (1991)
22.	<i>Centella</i> L.	NE, Trop., S	45	C. affinis (Eckl. & Zeyh.) Adamson C. annua M.T.R. Schubert & B-E. van Wyk C. asiatica (L.) Urb. C. brachycarpa M.T.R. Schubert & B-E. van Wyk C. caespitosa Adamson C. calcaria M.T.R. Schubert & B-E. van Wyk C. calliodus (Cham. & Schldt.) Drude C. capensis (L.) Domin C. cochlearia (Domin) Adamson C. cryptocarpa M.T.R. Schubert & B-E. van Wyk C. debilis (Eckl. & Zeyh.) Drude C. difformis (Eckl. & Zeyh.) Adamson C. dolichocarpa M.T.R. Schubert & B-E. van Wyk C. eriantha (Rich.) Drude C. flexuosa (Eckl. & Zeyh.) Drude C. fourcadei Adamson C. fusca (Eckl. & Zeyh.) Adamson C. glabrata L. C. glauca M.T.R. Schubert & B-E. van Wyk C. graminifolia Adamson C. gymnocarpa M.T.R. Schubert & B-E. van Wyk C. lanata Compton C. linifolia (L.f.) Drude C. longifolia (Adamson) M.T.R. Schubert & B-E. van Wyk C. macrocarpa (Rich.) Adamson C. macrodus (Spreng.) B.L.Burt C. montana (Cham. & Schldt.) Domin	MTR Schubert (2000, PhD thesis, RAU)

Table 1 cont.

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
				<i>C. obtriangularis</i> <i>C. pilosa</i> M.T.R. Schubert & B-E. van Wyk <i>C. pottebergensis</i> Adamson <i>C. restioides</i> Adamson <i>C. rupestris</i> (Eckl. & Zeyh.) Adamson <i>C. sessilis</i> Adamson <i>C. stenophylla</i> Adamson <i>C. ternata</i> M.T.R. Schubert & B-E. van Wyk <i>C. thesioides</i> M.T.R. Schubert & B-E. van Wyk <i>C. tridentata</i> (L.f.) Drude ex Domin <i>C. triloba</i> (Thunb.) Drude <i>C. umbellata</i> M.T.R. Schubert & B-E. van Wyk <i>C. villosa</i> L. <i>C. virgata</i> (L.f.) Drude <i>C. sp. 1</i> <i>C. sp. 2</i> <i>C. sp. 3</i> <i>C. sp. 4</i>	
23.	Chamarea Eckl. & Zeyh.	S	9	<i>C. capensis</i> (Thunb.) Eckl. & Zeyh. <i>C. esterhuyseniae</i> B.L.Burt <i>C. gracillima</i> (H. Wolff) B.L.Burt <i>C. longipedicellata</i> B.L.Burt <i>C. snijmaniae</i> B.L.Burt <i>C. sp. 1</i> <i>C. sp. 2</i> <i>C. sp. 3</i> <i>C. sp. 4</i> <i>C. sp. 5</i>	N Vessio (2001, MSc thesis, RAU)
24.	Choritaenia Benth.	S	1	<i>C. capensis</i> Benth.	Burt (1991)
25.	<i>Cyclospermum</i> Lag.	NE, Trop., *S	3	<i>C. leptophyllum</i> (Pers.) Eichler in Jessop & Toelken	Burt (1991)
26.	<i>Conium</i> L.	NE, Trop., S	6	<i>C. chaerophylloides</i> (Thunb.) Sond. <i>C. fontanum</i> Hilliard & Burt <i>C. maculatum</i> L. <i>C. sphaerocarpum</i> Hilliard & Burt <i>C. sp. 1</i> (see Hilliard & Burt 1985) <i>C. sp. 2</i> (see Hilliard & Burt 1985)	Hilliard and Burt (1985)
27.	<i>Coriandrum</i> L.	*S, *Trop.	2	* <i>C. sativum</i> L.	Lebrun and Stork (1992)
28.	<i>Cryptotaenia</i> DC.	NE, Trop.	6	<i>C. africana</i> (Hook.f.) Drude <i>C. calycina</i> C.C.Towns. <i>C. polygama</i> C.C.Towns.	Townsend (1989)
29.	<i>Cuminum</i> L.	*NE	4	* <i>C. cyminum</i> L.	Lebrun and Stork (1992)
30.	Cynorhiza Eckl. & Zeyh.	S	3	<i>C. olifantiana</i> Koso-Pol. <i>C. sulcata</i> Eckl. & Zeyh. <i>C. typica</i> Eckl. & Zeyh.	Pimenov and Leonov (1993)
31.	Dasispermum Neck. ex Raf.	S	1	<i>D. suffruticosum</i> (Berg.) B.L.Burt	Tilney and Van Wyk (1995)
32.	<i>Daucus</i> L.	*S, N, NW	22	* <i>D. carota</i> L.	Lebrun and Stork (1992)
33.	<i>Deverra</i> DC.	S	7	<i>D. hochstetteri</i> Braun ex Engl. <i>D. burchellii</i> (DC.) Eckl. & Zeyh. <i>D. denudata</i> (Viv.) Pfisterer & Podlech <i>D. scoparia</i> Coss. & Dur.	Pfisterer and Podlech (1986)
34.	Diplolophium Turcz.	NE, Trop., S	6	<i>D. africanum</i> Turcz. <i>D. buchananii</i> (Benth. ex Oliv.) C.Norman <i>D. diplolophoides</i> (H. Wolff) Jacq.-Fél. <i>D. marthozianum</i> Duvign. <i>D. somaliense</i> Verdc. <i>D. zambesianum</i> Hiern	Cannon (1978) Townsend (1989) Burt (1991)
35.	Dracosciadium Hilliard & B.L.Burt	S	2	<i>D. italae</i> Hilliard & B.L.Burt <i>D. saniculifolium</i> Hilliard & B.L.Burt	Hilliard and Burt (1986)
36.	<i>Eryngium</i> L.	*NE	250	* <i>E. foetidum</i> L.	Townsend (1989)

Table 1 cont.

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
37.	<i>Erythoselinum</i> Chiov.	NE, Trop.	1	<i>E. atropurpureum</i> (A.Rich.) Chiov.	Townsend (1989)
38.	<i>Ezoscium</i> B.L.Burt	S	1	<i>E. capense</i> (Eckl. & Zeyh.) B.L.Burt.	Burt (1991)
39.	<i>Ferula</i> L.	NE, Trop.	170	<i>F. communis</i> L.	Townsend (1989)
40.	<i>Foeniculum</i> Hill.	*Trop., *S	4–5	* <i>F. vulgare</i> Mill.	Townsend (1989) Burt (1991)
41.	<i>Frommia</i> H.Wolff.	Trop.	1	<i>F. ceratophylloides</i> H.Wolff	Cannon (1978) Townsend (1989)
42.	<i>Glia</i> Sond.	S	1	<i>G. prolifera</i> (Burm.f.) B.L.Burt	Burt (1991)
43.	<i>Haploscadium</i> Hochst.	NE, Trop.	1	<i>H. aethiopicum</i> Hochst.	Townsend (1989)
44.	<i>Heracleum</i> L.	NE, Trop.	65	<i>H. abyssinicum</i> (Boiss.) C.Norman <i>H. elgonense</i> (H.Wolff) Bullock <i>H. inexpectatum</i> C.Norman <i>H. taylorii</i> C.Norman	Townsend (1989)
45.	<i>Hermas</i> L.	S	9	<i>H. capitata</i> L.f. <i>H. ciliata</i> L.f. <i>H. gigantea</i> (L.f.) Spreng. <i>H. intermedia</i> C.Norman <i>H. pillansii</i> C.Norman <i>H. quinquedentata</i> L.f. <i>H. villosa</i> (L.) Thunb. <i>H. sp. 1</i> <i>H. sp. 2</i>	B de Villiers (2003, unpublished honours project, RAU)
46.	<i>Heteromorpha</i> Cham. & Schld.	NE, Trop., S	7	<i>H. arborescens</i> (Spreng.) Cham. & Schld. <i>H. gossweileri</i> (C.Norman) C.Norman <i>H. involucreta</i> Conrath <i>H. occidentalis</i> P.J.D.Winter <i>H. papillosa</i> C.C.Towns. <i>H. pubescens</i> Burt Davy <i>H. stenophylla</i> Welw. ex Schinz	Winter and Van Wyk (1996)
47.	<i>Hydrocotyle</i> L.	NE, Trop, S.	130	* <i>H. americana</i> L. <i>H. bonariensis</i> Lam. <i>H. mannii</i> Hook.f. <i>H. ranunculoides</i> L.f. <i>H. schlechteri</i> H. Wolff <i>H. sibthorpioides</i> Lam. <i>H. verticillata</i> Thunb.	Burt (1991) Townsend (1989)
48.	<i>Itasina</i> Raf.	S	1	<i>I. filifolia</i> (Thunb.) Raf.	Burt (1991)
49.	<i>Lefebvrea</i> A.Rich.	NE, Trop., S	6	<i>L. abyssinica</i> A.Rich. <i>L. brachystyla</i> Hiern <i>L. droopii</i> C.C.Towns. <i>L. grantii</i> (Hiern) Droop <i>L. longipedicellata</i> Engl. <i>L. upingtoniae</i> Schinz	Townsend (1989)
50.	<i>Lichtensteinia</i> Cham. & Schld.	S	7	<i>L. interrupta</i> (Thunb.) Sond. <i>L. kolbeana</i> L. <i>L. lacera</i> Cham. & Schld. <i>L. latifolia</i> Eckl. & Zeyh. <i>L. obscura</i> (Spreng.) Koso-Pol. <i>L. trifida</i> Cham & Schld. <i>L. sp. 1</i>	Goldblatt and Manning (2000)
51.	<i>Marlothiella</i> H.Wolff	S	1	<i>M. gummifera</i> H.Wolff	Burt (1991)
52.	<i>Nirarathamnos</i> Balf.f.	NE (Socotra)	1	<i>N. asarifolius</i> Balf.f.	Pimenov and Leonov (1993)
53.	<i>Oenanthe</i> L.	NE, Trop.	40	<i>O. mildbraedii</i> H.Wolff <i>O. palustris</i> (Chiov.) C.Norman <i>O. procumbens</i> (H.Wolff) C.Norman	Townsend (1989)
54.	<i>Oreoschimperella</i> Rauschert	NE, Trop.	3	<i>O. aberdarensis</i> (C.Norman) Rauschert	Townsend (1989)
				<i>O. arabiae-felicis</i> (C.C.Towns.) C.C.Towns. <i>O. verrucosa</i> (J.Gay ex A.Rich.) Rauschert	

Table 1 cont.

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
55.	<i>Pastinaca</i> L.	*S	14	* <i>P. sativa</i> L.	Burt (1991)
56.	<i>Peucedanum</i> L.	NE, Trop., S	120	<i>P. abyssinicum</i> Vatke <i>P. aculeolatum</i> Engl. <i>P. altum</i> Hiern <i>P. angolense</i> (Welw.) Cannon <i>P. angustisectum</i> (Engl.) C.Norman <i>P. articulatum</i> C.C.Towns. <i>P. cafferum</i> (Meisn.) Phillips <i>P. camerunensis</i> Jacq.-Fél. <i>P. capense</i> (Thunb.) Sond. <i>P. capillaceum</i> Thunb. <i>P. claessensii</i> C.Norman <i>P. dispersum</i> C.C.Towns. <i>P. elgonense</i> H.Wolff <i>P. englerianum</i> H.Wolff <i>P. eylesii</i> C.Norman <i>P. ferulaceum</i> (Thunb.) Eckl. & Zeyh. <i>P. friesiorum</i> H.Wolff <i>P. galbaniopse</i> H.Wolff <i>P. galbanum</i> (L.) Drude <i>P. gossweileri</i> C.Norman <i>P. graveolens</i> Benth. & Hook.f. <i>P. gummiferum</i> (L.) Wijnands <i>P. harmsianum</i> H.Wolff <i>P. heracleoides</i> Bak. <i>P. kamiesbergense</i> B.L.Burt <i>P. kerstenii</i> Engl. <i>P. linderi</i> C.Norman <i>P. lundense</i> Cannon <i>P. lynesii</i> C.Norman <i>P. madense</i> C.Norman <i>P. magalimontanum</i> Sond. <i>P. mattirolii</i> Chiov. <i>P. millefolium</i> Sond. <i>P. natalense</i> (Sond.) Engl. <i>P. nyassicum</i> H.Wolff <i>P. oblongisectum</i> C.C.Towns. <i>P. pearsonii</i> Adamson <i>P. petitionum</i> A.Rich. <i>P. platycarpum</i> Sond. <i>P. polyactinum</i> B.L.Burt <i>P. pungens</i> Sond. <i>P. quarrei</i> (C.Norman) Hiroe <i>P. rhodesicum</i> Cannon <i>P. runssoricum</i> Engl. <i>P. ruspolii</i> Engl. <i>P. scottianum</i> Engl. <i>P. stenospermum</i> C.C.Towns. <i>P. strictum</i> (Spreng.) B.L.Burt <i>P. tenue</i> C.C.Towns. <i>P. tenuifolium</i> Thunb. <i>P. trisectum</i> C.C.Towns. <i>P. thodei</i> T.Arnold <i>P. volkensii</i> Engl. <i>P. wildemanianum</i> C.Norman <i>P. wilmsianum</i> H.Wolff <i>P. winkleri</i> H.Wolff	Townsend (1987, 1989) Burt (1991) Lebrun and Stork (1992) Pimenov and Leonov (1993)
57.	<i>Phlyctidocarpa</i> Cannon & Theobald	S	1	<i>P. flava</i> Cannon & Theobald	Burt (1991)
58.	<i>Physotrichia</i> Hiern	Trop., S	10	<i>P. atropurpurea</i> (C.Norman) Cannon <i>P. heracleoides</i> H.Wolff	Cannon (1978) Townsend (1989)

Table 1 cont.

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
59.	<i>Pimpinella</i> L.	NE, Trop., S	150	<i>P. muriculata</i> (Hiern) Droop & C.C.Towns. <i>P. verdickii</i> C.Norman <i>P. welwitschii</i> Hiern <i>P. acutidentata</i> C.Norman <i>P. ahmarensis</i> D. Abebe <i>P. alimatifolia</i> C.C.Towns. <i>P. arussorum</i> Chiov. <i>P. buchananii</i> H. Wolff. <i>P. caffra</i> (Eckl. & Zeyh.) D. Dietr. <i>P. camptotricha</i> Penzig <i>P. duridentata</i> C.C.Towns. <i>P. erlangeri</i> Engl. <i>P. erythraeae</i> Armari <i>P. etbaica</i> Schweinf. <i>P. heywoodii</i> D. Abebe <i>P. hirtella</i> A.Rich. <i>P. homblei</i> C.Norman <i>P. huillensis</i> Engl. <i>P. hydrophila</i> H. Wolff <i>P. kassneri</i> (H. Wolff) Cannon <i>P. keniensis</i> C.Norman <i>P. krookii</i> H. Wolff <i>P. kyimbilaensis</i> H. Wolff <i>P. ledermannii</i> H. Wolff <i>P. lindblomii</i> H. Wolff <i>P. lineariloba</i> Cannon <i>P. mulanjensis</i> C.C.Towns. <i>P. neglecta</i> C.Norman <i>P. neumannii</i> Engl. ex H.Wolff <i>P. oreophila</i> Hook.f. <i>P. paludosa</i> C.C.Towns. <i>P. petrosa</i> D. Abebe <i>P. physotrichoides</i> C.Norman <i>P. pimpinelloides</i> (Hochst.) H.Wolff <i>P. praeventa</i> C.Norman <i>P. pseudo-caffra</i> C.Norman <i>P. pusilla</i> (Pich.-Serm.) Hiroe <i>P. richardsiae</i> C.C.Towns. <i>P. rigidistyla</i> C.C.Towns. <i>P. rigidiuscula</i> C.C.Towns. <i>P. rivae</i> Engl. <i>P. robynsii</i> C.Norman <i>P. schimperi</i> D. Abebe <i>P. schlechteri</i> H. Wolff <i>P. stadensis</i> (Eckl. & Zeyh.) D. Dietr. <i>P. tenuissima</i> C.Norman <i>P. transvaalensis</i> H. Wolff	Cannon (1978) Townsend (1985, 1989)
60.	<i>Polemanna</i> Eckl. & Zeyh.	S	3	<i>P. grossulariifolia</i> Eckl. & Zeyh <i>P. montana</i> Schltr. & H.Wolff <i>P. simplicior</i> Hilliard & B.L.Burt	Hilliard and Burt (1986)
61.	<i>Polemanniopsis</i> B.L.Burt	S	1	<i>P. marlothii</i> (H.Wolff) B.L.Burt	Burt (1988)
62.	<i>Pseudocarum</i> Norman	NE, Trop.	2	<i>P. emenii</i> (Engl.) H. Wolff	Townsend (1989)
63.	<i>Pseudoselinum</i> Norman	Trop.	1	<i>P. angolense</i> (C.Norman) C.Norman	
64.	<i>Pycnocycla</i> Lindl.	NE, Trop.	12	<i>P. glauca</i> Lindl. <i>P. ledermannii</i> H. Wolff	Hedge and Lamond (1973)
65.	<i>Sanicula</i> L.	NE, Trop., S	39	<i>S. elata</i> D.Don.	
66.	<i>Scandix</i> L.	*S	5–20	* <i>S. pecten-veneris</i> L.	Burt (1991)
67.	<i>Sciothamnus</i> Endl.	S	5	‘ <i>Peucedanum</i> ’ <i>camdeboense</i> B.L.Burt ‘ <i>Dregea</i> ’ <i>capensis</i> (Thunb.) Eckl. & Zeyh. ‘ <i>Peucedanum</i> ’ <i>dregeanum</i> D.Dietr. ‘ <i>Peucedanum</i> ’ <i>striatum</i> (Thunb.) Sond.	Pimenov and Leonov (1993) Van Wyk and Tilney (unpublished)

Table 1 cont.

Genus No.	Genus and author	Distribution (see Pimenov and Leonov 1993)	No. of species in genus	Species in Africa	Literature
68.	<i>Seseli</i> L.	Trop.	120	' <i>Dregea montana</i> Eckl. & Zeyh. <i>S. scopulorum</i> C.C. Towns.	
69.	<i>Sium</i> L.	Trop., S	14	<i>S. repandum</i> Welw. ex Hiern	Townsend (1989)
70.	<i>Sonderina</i> H.Wolff	S	4	<i>S. caruifolia</i> (Sond.) H.Wolff <i>S. hispida</i> (Thunb.) H.Wolff <i>S. humilis</i> (Meisn.) H.Wolff <i>S. tenuis</i> (Sond.) H.Wolff	Burt (1991)
71.	<i>Spuriodaucus</i> Norman	Trop.	3	<i>S. asper</i> C.Norman <i>S. atropurpureus</i> C.Norman <i>S. quarrei</i> C.Norman	Norman (1932)
72.	<i>Steganoaenia</i> Hochst.	NE, Trop., S	3	<i>S. araliacea</i> Hochst. <i>S. commiphoroides</i> Thulin <i>S. hockii</i> (C.Norman) C.Norman	Lebrun and Stork (1992) Norman (1934b)
73.	<i>Stenosemis</i> E.Mey. ex Harv.	S	2	<i>S. angustifolia</i> Sond. <i>S. caffra</i> (Eckl. & Zeyh.) Sond.	Burt (1991)
74.	<i>Stoibrax</i> Raf.	S	5	<i>S. capense</i> (Lam.) B.L. Burt	Burt (1991)
75.	<i>Torilis</i> Adans.	NE, Trop., S	15	<i>T. arvensis</i> (Hudson) Link	Lebrun and Stork (1992)
76.	<i>Trachyspermum</i> Link	NE, Trop.	15	<i>T. aethusifolium</i> Chiov. <i>T. ammi</i> (L.) Sprague [= <i>T. copticum</i> (L.) Link]	Townsend (1989)

Table 2: Summary of the diversity of Apiaceae in sub-Saharan Africa. 'Hydrocotyloideae' includes *Hydrocotyle* and *Centella*; Basal Apioideae is used in the sense of Plunkett (2001) and includes the tribe Heteromorphae (*Anginon*, *Dracosciadium*, *Glia*, *Heteromorpha* and *Polemanna*), together with *Aframmi*, *Annesorhiza*, *Arctopus*, *Bupleurum*, *Chamarea*, *Itasina*, *Lichtensteinia*, *Marlothiella*, *Nirarathamnos*, *Polemanniopsis*, *Pseudocarum* and *Steganoaenia*

Subfamilies and groups (approx. total no. of genera/species)	Number of genera in Africa			Number of species in Africa		
	Total	Indigenous	Endemic	Total	Indigenous	Endemic
'Hydrocotyloideae' (40/480)	4	4	3 ^a	62	61	54
Saniculoideae s.s. (8/320)	3	2	1	29	28	27
'Basal Apioideae' (c. 25/ c. 270) ^b	17	17	15 ^a	68	67	65
'Remaining Apioideae' (385/2 730)	52	44	21	209	199	175
All Apiaceae (458/3 800)	76	67	40	368	355	321

^a *Centella* and *Heteromorpha* are here considered to be African-endemic genera; in *Centella*, only one of the 45 species (*C. asiatica*) is not endemic to southern Africa; in *Heteromorpha*, one widespread species (*H. arborescens*) reaches the southern tip of the Arabian Peninsula (Yemen)

^b Including *Bupleurum*, which has c. 190 species but only one indigenous in Africa

estimated that this group will eventually include about 25 genera, once rigorous morphological and macromolecular studies have been completed on all genera. It is interesting to note the high number of African-endemics in this 'group': 15 genera and 65 species (respectively 88% and 97% endemism). As expected, endemism is slightly lower in the 'remaining Apioideae': 21 of the 44 genera are endemic and 175 of the 199 species (respectively 48% and 88% endemism).

As pointed out by Burt (1991), the relatively small African component of Apiaceae is important beyond its size. Many genera (some poorly known) show unusual morphological patterns that are of critical importance in understanding the early evolution of lineages within the family. Recent molecular systematic studies have confirmed the phylogenetic significance of the African genera and it is clear that a new clas-

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