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GENERIC LIMITS IN PLECTRANTHUS, COLEUS AND ALLIED GENERA

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In recent years there has been a revaluation of the distinctions previously drawn between the genera *Plectranthus* L'Hérit. (1784), *Coleus* Lour. (1790) and various segregate genera. The historical background and the reasons for placing certain usually accepted *Coleus* spp. (including the type of the genus, *C. amboinicus* Lour.) in *Plectranthus* have been well sketched by Morton (1962) in his review of the West African species, and Launert (1968) when considering the species of South West Africa.

Morton correctly states: "The difficulties centre round defining generic limits and around the large number of closely allied species, many of which are inadequately known from scanty herbarium material. Ideally an attempt to re-define these genera should await a revision of all the species throughout their range." Unfortunately this stage has not yet been reached and my comments are derived mainly from a knowledge of the South African species, while attention is drawn to certain implications based on a somewhat superficial study of species occurring in the rest of Africa and beyond its borders.

In addition to *Plectranthus* and *Coleus*, the genera of this complex discussed by Morton are: *Solenostemon* Schum. (1827), *Englerastrum* Briq. (1894), *Neomuellera* Briq. (1894) and *Burnatastrum* Briq. (1897)*. To these must be added: *Isodon* (Benth.) Kudo (1929), *Holostylon* Robyns & Lebrun (1929), *Ascocarydion* G. Tayl. (1931), *Amethystanthus* Nakai (1934) and *Homalocheilos* J. K. Morton (1962). The group is well represented in Africa south of the Sahara and extends through southern Arabia to tropical and eastern Asia and the Pacific islands with a few outliers in nothern Australia.

Of this complex, by far the largest genera are the two oldest, namely *Plectranthus* and *Coleus*, and a quick count in Index Kewensis yielded about 490 names in the former and 312 in the latter. Many of these have resulted from the transfer of species from one genus to the other, while a critical study of the species will no doubt result in quite a reduction in their number.

* The genus *Germanea* Poir. (1786) is omitted as being a straightforward synonym of *Plectranthus*.

The segregate genera are either monotypic or include, at present, only a few species. Thus the union of the entire group into *Plectranthus* would not result in too unwieldy a genus. Several groupings of species showing distinct similarities may be recognized, however, and the question arises whether these are worthy of giving separate generic status.

The conventional distinction between *Plectranthus* and *Coleus,* based on the stamens being free in the former and fused into a sheath in the latter, breaks down frequently and is now generally accepted as being unreliable. There are, however, certain other characters which may have value in supporting a separation of genera, such as the bracts being leaf-like or reduced, the structure of the inflorescence and the shape of the calyx. Cytological information is conflicting due partly to the confusion which exists in the classification of the species and to other reasons pertinently outlined by Merxmüller (1970). Within the South African species, the somewhat scanty cytological information gives support to a classification based on morphological characters, on the lines of that proposed by Morton (1962).

In addition to *Plectranthus,* which remains the repository for species which cannot be satisfactorily excluded, it is proposed that the following genera should be upheld: *Solenostemon* (as amended by Morton), *Englerastrum, Isodon* and *Holostylon.* They may be keyed out as indicated below.

Bracts small, sharply differentiated from the leaves:
  Style shortly bifid:
    Calyx variously shaped, but the lower two teeth not fused for more than half their length and the lateral teeth subequal to the lower . . . . . 1. *Plectranthus*
    Calyx with the lower two teeth fused for more than half their length, the lateral pair of teeth much shorter than the rest or obsolete . . . . . 2. *Solenostemon*
  Style entire . . . . . 5. *Holostylon*
Bracts leaf-like, becoming gradually smaller towards the apex of the inflorescence:
  Flowers in slender axillary racemes . . . . . 3. *Englerastrum*
  Flowers in dichotomously branched cymes . . . . . 4. *Isodon*

It is evident that Bentham, in his classic work on the Labiatae (1832, 1848), recognized certain of these groupings and gave them sectional status. Unfortunately, his classification became obscured by the emphasis placed on the importance of the stamens being fused in certain species.

1. PLECTRANTHUS L'Hérit.

A good deal of variation is apparent within the genus and a tentative grouping into five sections is presented. The first section, containing the

"typical" species, is again subdivided into three subsections. These subdivisions are not given formal names at this stage.

The main character used to separate *Plectranthus* from *Englerastrum* and *Isodon* is the reduction of the bracts so that there is a sharp transition from leaves to bracts in *Plectranthus*. *Englerastrum* and *Isodon* also have a distinctive facies each with its characteristic inflorescence structure which assists in their recognition.

Section 1, which includes the so-called "typical" species, is defined as having: (a) the flowers in verticils or in short cymes; (b) the upper tooth of the calyx conspicuously larger than the other four, usually erect in the mature stage and often decurrent on the calyx tube; and (c) the stamens are usually free to the base.

Subsection (i) narrows the field to those species in which the bracts are persistent and the corolla tube is deflexed and saccate to spurred at the base. These species are prevalent in Africa, particularly southern Africa, and extend at least to India. The South African species in this category which have been cytologically examined by DE WET (1958) have 2n = 28 chromosomes, namely: *P. ciliatus* E. MEY. ex BENTH., *P. dolichopodus* BRIQ., *P. elegantulus* BRIQ., *P. fruticosus* L'HÉRIT., *P. grallatus* BRIQ. (2n = 28, 56), *P. nummularius* BRIQ., *P. rehmannii* GUERKE, P. *saccatus* BENTH., *P. strigosus* BENTH., *P. suluensis* T. COOKE and *P. thunbergii* BENTH. Other records in this affinity recorded by MORTON (1962) are: *P. punctatus* L'HÉRIT. (2n = 28) and *P. purpuratus* HARV. (2n = 30, 56): It would be interesting to compare the last-mentioned result with naturally occuring South African plants, but this has not yet been done.

Subsection (ii) includes plants with persistent bracts, but with the corolla tube straight or curved and not saccate at the base. Species in this subsection occur in southern and tropical Africa and those examined by DE WET (1958) all have 2n = 28: *P. ambiguus* (BOL.) CODD, of which *P. dregei* CODD is a synonym, *P. ecklonii* BENTH., *P. laxiflorus* BENTH. and *P. petiolaris* E. MEY. ex BENTH.

Subsection (iii) consists of portion of BENTHAM's *Plectranthus* Sect. Coleoides and includes plants with deciduous bracts (shed before the flowers open) and with the corolla tube deflexed and saccate at the base. Difficulty may be found in deciding whether a species belongs in this subsection or in Section 4 but, in this subsection the stamens are free to the base while in Section 4 the stamens are almost invariably united. Although the stamen character is unreliable in Sections 2, 3 and 5, it seems to work fairly satisfactorily between this subsection and Section 4. Species in this subsection occur mainly in southern and east tropical Africa, extending to southern Arabia, India and northern Australia. Species limits are particularly difficult to determine between certain of the species. Specimens for cytological examination by DE WET were, therefore, carefully selected to be as representative as possible of the species names used, and all were found to have 2n = 42, namely: *P.*

grandidentatus Guerke, *P. hirtus* Benth. (wrongly recorded by Morton, 1962, as 2n = 28), *P. pachyphyllus* Guerke ex T. Cooke, *P. tomentosus* Benth. and *P. woodii* Guerke.

Section 2 includes the genera *Neomuellera*, *Burnatastrum* and *Ascocarydion* and is characterized by (a) the inflorescence structure, which consists of paired cincinni or paired scorpioid cymes, usually on a short peduncle; and (b) the calyx is more or less equally 5-toothed and often ventricose or circinnate (see Morton 1962, Fig. 4B). Consideration was given to placing this group as a separate genus, but intermediates occur between these species and those of Section 1. Also, the inflorescence structure in *P. cylindraceus* Hochst. ex Benth., which appears to belong here, is difficult to interpret because of the congested flower clusters. The distribution of the section extends from South Africa to Angola and east tropical Africa. Chromosome counts by de Wet (1958) yielded the following results: *P. cylindraceus* Hochst. ex Benth. (= *P. villosus* T. Cooke), 2n = 28; *P. myrianthus* Briq., 2n = 28; *P. spicatus* E. Mey. ex Benth., 2n = 28; *P. mirabilis* (Engl.) Launert, 2n = 42. The last mentioned is a particularly handsome plant and was separated as the monotypic *Ascocarydion mirabile* (Engl.) G. Tayl. Other numbers recorded for this section are 2n = 28 by Morton (1962) for *Coleus frederici* G. Tayl. (= *Neomuellera angolensis* Briq.), and 2n = 30 for *P. myrianthus* by Morton (1962) and for *P. hereroensis* Engl. by Nordenstam (1969). These last two names are probably conspecific and so here is a discrepancy with de Wet's results that calls for further investigation.

Section 3 includes the single species *Coleus amboinicus* Lour. It is characterized by producing the flowers in dense clusters while the upper calyx tooth, though distinctly larger than the other four, is horizontal, not erect. The distinctions do not appear to be sufficient to warrant separate generic status. The species is widely cultivated in the tropics of both hemispheres but, as stated by Launert (1968), it probably originates in Africa. The chromosome number 2n = 32 has been reported by Scheel under the name of *C. aromaticus* Benth. (a synonym of *C. amboinicus* Lour.) fide Morton (1962).

Section 4 includes the majority of species placed by Bentham as *Coleus* Sect. *Calceolus* Benth. In this section (a) the bracts are clearly differentiated from the leaves and are early deciduous; (b) the inflorescence is verticillate and often subspicate; (c) the upper calyx tooth is distinctly larger and is erect while, in certain species the calyx tube becomes hirsute on the inside; and (d) the stamens are united at the base. The Section occurs in southern and east tropical Africa, extending through southern Arabia to India. Species examined cytologically by de Wet are: *Coleus pentheri* Guerke (now regarded as a synonym of *P. neochilus* Schltr.), 2n = 32; *C. comosus* Hochst., 2n = 32; and *C. vagatus* E. A. Bruce, 2n = 32. The number 2n = 32 was also recorded in *C. barbatus* (Andr.) Benth., which is a member of this group, by Hakeem & Rife (1966). While the species mentioned above clearly be-

long to this Section, certain others are somewhat intermediate between this Section and Section 1.

Section 5. *Plectranthus esculentus* N. E. Br. is separated because of several odd characters. Its has tuberous roots and the flowers are produced on pseudo-racemes after the leaves have shed, while the upper calyx tooth is only slightly larger than the four lower. Its position in *Plectranthus* is somewhat anomalous and it has been placed in *Coleus* and in *Englerastrum*. The chromosome number according to de Wet (1958) is 2n = 24. This species is distributed from southern to tropical Africa and the tropical African *P. defoliatus* Hochst. ex Benth. appears to be closely related to it.

2. SOLENOSTEMON Schum.

Solenostemon Schum. is based on the single species *S. ocymoides* Schum. & Thonn. which is generally regarded as a synonym of *S. monostachyus* (P. Beauv.) Briq. The genus is characterised by the markedly 2-lipped calyx in which the lower lip, formed from the two fused lower teeth, is upturned and closes the mouth of the tube, while the median teeth are obsolete. The species (of which several subspecies are recognized by Morton, 1962), appears to be restricted to West Tropical Africa.

Allied to this species in a superficial way is a group with a large number of species names, extending from West Tropical Africa to South and East Africa and thence to Asia and the Pacific area. In this group, which is placed as *Solenostemon* Sect. *Coleoidea* by Morton, the lower two teeth of the calyx are fused for more than half their length, producing an oblong, curved lip with a forked or emarginate apex, while the two lateral teeth are short and deltoid to truncate (see Morton, 1962, Fig. 4 L). The calyx and corolla characters are remarkably uniform throughout the entire range of the group, so that species have been based mainly on vegetative differences. Over 60 names, mainly in *Coleus*, belonging to this group have been noted but a critical study is required before making a wholesale transfer to *Solenostemon*.

The decision to separate Sect. *Coleoidea* from *Plectranthus* seems to be well founded. Whether the group is correctly placed in *Solenostemon* is open to question, but the alternative would be to erect another genus to accommodate the species.

It is of interest to note that Schumacher & Thonning (1827) described a member of this group as *Ocymum guineense* Schum. & Thonn., indicating that they did not associate it with their genus *Solenostemon*. Bentham (1832, 1848) placed a number of species belonging to this group as *Coleus* Sect. *Solenostemon* Benth. from which he excluded the type of *Solenostemon*, *S. ocymoides* Schum. & Thonn. Briquet (1894) maintained the group as *Coleus* Sect. *Solenostemoides* Briq., and upheld *Solenostemon* Schum. as a distinct genus. A few combinations were made in *Solenostemon* by Baker

(1900), who was not consistent in his treatment, and by MORTON (1962), who decided that the group is best included in *Solenostemon*, though as a separate section.

The available cytological information supports the view that at least two sections are involved in the emended concept of *Solenostemon*. The typical Section, consisting of *S. monostachyus* and its subspecies, was found by MORTON (1962) to have 2n = 14 and 28. In Section *Coleoidea*, South African plants reasonably typical of *Plectranthus tysonii* GUERKE and *Coleus rehmannii* BRIQ. were studied by DE WET, who recorded 2n = 24 and 2n = 48 and 60, respectively. These two "species" can scarcely be separated from *Solenostemon latifolius* (HOCHST. ex BENTH.) J. K. MORTON, for which MORTON found 2n = 48. A similar count was found for the commonly cultivated *Coleus blumei* BENTH., which also belongs in Sect. *Coleoidea*. On the other hand, MORTON records the following disjunct 2n numbers: *Solenostemon chevalieri* BRIQ., 28; *S. decumbens* (HOOK. f.) BAK., 22; *S. mannii* (HOOK. f.) BAK., 28; *S. repens* (GUERKE) J. K. MORTON, 30; and the rather odd species with edible, tuberous roots, *S. rotundifolius* (POIR.) J. K. MORTON, with 2n = about 80.

3. ENGLERASTRUM BRIQ.

This is a small genus of delicate herbs with a characteristic appearance. The bracts are not clearly differentiated from the leaves and the flowers are arranged in slender pseudo-racemes and the calyx is more or less equally 5-toothed. The genus was enlarged by Th. FRIES (1924) but restored to its former extent by HUTCHINSON & DANDY (1926), and the latter view is supported by MORTON (1962). On the present basis the distribution of the section is mainly in central and west tropical Africa. MORTON (1962) investigated two species and records the following chromosome numbers: *E. schweinfurthii*, 2n = 24; *E. gracillimum*, 2n = 28, 42 and 56. The genus appears to be closely related to *Isodon* and is separated mainly on the grounds of the pseudo-racemose inflorescence.

4. ISODON (BENTH.) KUDO[1]

KUDO (1929) erected the genus *Isodon*, basing it on several sections of *Plectranthus* separated by BENTHAM (1932) as Sect. *Isodon*, Sect. *Amethystoides*, Sect. *Melissoides* and Sect. *Pyramidium*. The last mentioned has a somewhat different facies from the rest but can probably be included here. *Amethystanthus* NAKAI (1934) is based mainly on Sect. *Amethystoides* BENTH. and should rather remain in *Isodon* KUDO. This genus has the greatest concentration of species in eastern Asia and the Pacific area, but there are two or three outliers in tropical Africa. It was on one of these, *Plectranthus ra-*

1 BLAKE (1971) has pointed out that the genus *Isodon* should be included in *Rabdosia* (BL.) HASSK.

mosissimus Hook. f., that Morton (1962) based his genus *Homalocheilos* (see Codd, 1968).

Characteristics of the genus are: (a) the leaf-like bracts which gradually become smaller towards the apex of the flowering branch; (b) the dichotomously branched cymose inflorescence; and (c) the more or less equally 5-toothed calyx (see Morton, Fig. 6).

A chromosome count of 2n = 42 was obtained by Morton for the species *P. ramosissimus*, while de Wet (1958) recorded 2n = 28 for the South African species *P. calycinus* Benth. The latter species belongs in the Sect. *Pyramidium* Benth. and thus differs in certain respects from typical *Isodon*.

5. HOLOSTYLON Robyns & Lebrun

This is a small genus of three or four species based originally on two tropical African species by Robyns & Lebrun (1929). It is related to *Plectranthus*, with the calyx subequally 5-toothed and stamens united at the base, the chief differentiating feature being the entire style. This appears to be a relatively minor character but, until a more thorough evaluation of it is made, it seems advisable to uphold it as a distinct genus. No cytological work on the genus has been undertaken.

In conclusion I may add that I have recently had some correspondence with Prof. van Steenis of Leiden in connection with the preparation of an account of the Labiatae for Flora Malesiana (see Keng, 1969). It seems that their view is that the distinctions drawn between *Plectranthus* and the allied genera upheld above are somewhat tenuous. This brings home the fact that a classification which works well in one region may not be satisfactory in another region. *Plectranthus* in the narrow sense is not well represented in the Malesia area. Here the majority of species fall within the genera *Solenostemon* and *Isodon* as here defined, and it is obvious that a good deal more study is required throughout the whole range of the complex in order that an acceptable classification can be produced.

Appendix

A cursory examination of material in various herbaria revealed a number of species, mainly described in *Coleus*, which have the characteristic calyx and facies of *Solenostemon* Sect. *Coloidea* Morton. The list below is given as a guide and does not claim to be exhaustive. It is obvious that a critical study of the material will reveal that many of the species names will be reduced to synonymy.

AFRICAN CONTINENT:

Coleus autrani Briq.
C. betonicoides Bak.
C. chevalieri Briq.
C. collinus Lebrun & Touss.
C. dewevrei Briq.
C. eetveldianus Briq.
C. heterotrichus Briq.
C. monticola Guerke
C. parviflorus Benth.

C. platystomoides Rob. & Lebr.
C. quarrei Rob. & Lebr.
C. ringoetii de Wild.
C. welwitschii Briq.
C. briquetii Bak.
C. claessensii de Wild.
C. copiosiflorus Briq.
C. dupuissii Briq.
C. giorgii de Wild.
C. marquesii Briq.
C. myrianthellus Briq.
C. phymatodes Briq.
C. punctatus Bak.
C. ramulosus Briq.
C. rehmannii Briq.
C. seretii de Wild.
C. shirensis Guerke

Plectranthus porpeodon Bak.
P. schizophyllus Bak.
P. tysonii Guerke

MADAGASCAR:
Coleus bojeri Benth.
C. goudotii Briq.
C. latidens S. Moore
C. bernieri Briq.
C. gracilifolius Briq.

PACIFIC AREA:
Coleus acuminatus Benth.
C. blumei Benth.
C. forsteri Benth.
C. grandifolius Bak.
C. laciniatus (Bl.) Benth.
C. malabaricus Benth.
C. pumilus Blanco
C. atropurpureus Benth.
C. crispiflorus Merr.
C. gaudichandii Briq.
C. igolotorum Briq.
C. macranthus Merr.
C. multiflorus Benth.
C. scutellarioides (L.) Benth.

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