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Some remarks on the taxonomy of the Plumerioideae (Apocynaceae)

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ABSTRACT

The family of the Apocynaceae is usually subdivided into two subfamilies, the Plumerioideae with the type genus *Plumeria* from tropical America, and the Apocynoideae, often named Echitoideae, with the type genus *Apocynum* from North America. These subfamilies show two characters which are more or less diagnostic for all members.

However, since the taxonomists have built up the present scheme of the Apocynaceae, phytochemists have observed that many plants belonging to the Plumerioideae contain alkaloids, and that many representatives of the Apocynoideae contain glycosides. Some of the alkaloids, e.g. those of *Catharanthus, Rauvolfia* and *Voacanga,* and some of the glycosides, e.g. those of *Funtumia* and *Strophanthus* are of medicinal interest.

In the present paper, the arrangement of the genera within the Plumerioideae is mainly that of Pichon (1949, 1950, 1953a, 1953b). He subdivided all tribes, except the Tabernaemontaneae, into subtribes, which is an excellent concept according to the present author. The latter, however, does not always agree with the delimitation of the genera. For instance, he does not accept the sinking of *Acokanthera* under *Carissa,* especially as the plants belonging to these genera show great differences in architecture (Hallé & Oldeman 1970; Hallé, Oldeman & Tomlinson, 1978), but he sinks several genera maintained by Pichon, e.g. *Ervatamia* under *Tabernaemontana* (1976).

RÉSUMÉ

QUELQUES REMARQUES SUR LA TAXONOMIE DES PLUMÉRIOÏDÉES (APOCYNACEAE)

La famille des Apocynacées est habituellement subdiviseé en deux sous-familles, les Plumérioïdées avec le genre-type Plumeria *d'Amérique tropicale et les Apocynoïdées souvent désigniées Echitoïdées, avec le genre-type Apocynum d'Amérique du Nord. Ces sous-familles montrent deux caractères qui sont plus ou moins diagnostiques pour tous leurs membres.*

Cependant, depuis que les taxonomistes ont établi la présente classification des Apocynacées, les phytochimistes ont observé que beaucoup de plantes appartenant aux Plumérioïdées contiennent des alcaloides, comme ceux des Catharanthus, Rauvolfia *et* Voacanga, *et certains des glycosides, comme ceux des* Funtumia *et* Strophanthus, *qui ont un intéret médicinal.*

*Dans la présente note, la classification des genres dans les Plumérioïdées est basée principalement sur celle de Pichon (1949, 1950, 1953a, 1953b). Celui-ci subdivisa toutes les tribus, excepté les Tabernaémontanées, en sous-tribus, ce qui est un excellent concept suivant le présent auteur. Ce dernier n'est cependant pas toujours d'accord avec la délimitation des genres. Par exemple, il n'accepte pas la synonymie d'*Acokanthera *avec* Carissa, *spécialement parce que les plantes appartenant à ces genres montrent de grandes différences dans leur architecture (Hallé & Oldeman 1970; Hallé, Oldeman & Tomlinson, 1978), mais il met en synonymie plusieurs genres maintenus par Pichon, par exemple* Ervatamia *avec* Tabernaemontana (1976).

The family of Apocynaceae is usually subdivided into two subfamilies, the Plumerioideae with the type genus *Plumeria* from tropical America, and the Apocynoideae, often named Echitoideae, with the type genus *Apocynum* from North America. These subfamilies show two characters which are more or less diagnostic for all members. The corolla lobes overlap to the left in the former and to the right in the latter; the stigma and/or style are free from the anthers in the first but stick to the connectives in the second. In the latter case the falling corolla carries the stigma and style with it. Although these characters are mostly useful to distinguish between the members of these sub-families, exceptions occur, e.g. in the Plumerioideae the corolla lobes of *Carruthersia, Holarrhena, Schizozygia* and a single *Callichilia* species, *C. subsessilis,* overlap to the right. The stigma of *Voacanga* sticks to the connectives of the anthers.

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In the present paper the arrangement of the genera within the Plumerioideae is mainly that of Pichon (1949, 1950, 1953a, 1953b). He subdivided all tribes, except the Tabernaemontaneae, into subtribes, which is an excellent concept according to the present author. The latter, however, does not always agree with the delimitation of the genera. For instance, he does not accept the sinking of *Acokanthera* under *Carissa,* especially as the plants belonging to these genera show great differences in vegetative architecture (Hallé & Oldeman 1970; Hallé, Oldeman & Tomlinson, 1978), and he sinks several genera maintained by Pichon, e.g. *Ervatamia* under *Tabernaemontana* (1976).

As far as is known, the representatives of the Tabernaemontaneae resemble one another much more closely phytochemically than the representatives of any of the other tribes of the Plumerioideae, e.g. the Carisseae and the Plumerieae. This observation is strongly supported by their morphology and basic structure. The Carisseae all have fleshy syncarpous fruits, but several other characters indicate that they are to be placed in several subtribes, as listed in the Appendix on p. 801 *Carissa* and *Acokanthera*, which constitute the Carissinae, have strikingly similar flowers and drupaceous fruits, but whereas *Carissa* is a repeatedly dichotomously branched shrub or climber with two large mostly branched, spines at each ramification, *Acokanthera* is an unarmed tree with a much less strict branching system. It must be stated, however, that the flowers and fruits of the two genera are so similar, that Pichon, who had no opportunity to see the living plants in the field, combined them.

The next subtribe, the Landolphiinae, which Pichon monographed (1953a), is much more uniform. The resemblance of the genera is so strong, that much confusion existed about their delimitation and interrelationship, before Pichon's excellent work was published. Although it is still difficult to distinguish the genera which he maintains, the present author is inclined to agree with him after having seen many species in the field. They all have berries, which are often tasty, e.g. these of *Ancylobotrys capensis* and *Landolphia dulcis*. In this whole subtribe, only a single architectural model occurs. Each module of a plant ends with a curled tendril, which may bear flowers. A lateral branch is a second module. The lateral branch opposite the second module may end with an inflorescence or with a never opening terminal bud. Its model strikingly resembles that of Koriba (Hallé & Oldeman, 1979; Hallé, Oldeman & Tomlinson, 1978).

The Pleiocarpinae which, like the Landolphiinae, are almost exclusively African, are remarkably similar in their flowers and fleshy indehiscent fruits. At least *Hunteria eburnea, H. ghanensis* and *Pleiocarpa mutica* have Troll's model (Hallé & Oldeman, 1970; Hallé, Oldeman & Tomlinson, 1978).

The Plumerieae show great variation, even within the subtribes. Their fruits are apocarpous and usually dry; fleshy fruits, which are even edible, are only known for *Geissospermum*. The seeds bear a terminal coma, e.g. in *Holarrhena* and *Carruthersia*, a basal and a terminal coma, e.g. in *Alstonia*, or none, e.g. in *Amsonia, Catharanthus* and *Plumeria*. Winged seeds occur in *Aspidosperma, Diplorhynchus* and *Pycnobotrya*, all three belonging, like *Geissospermum*, to the subtribe Aspidospermatinae. The known architectural models of this tribe, in which the flowers show remarkable resemblances, are that of Massart in *Aspidosperma* and that of Nozeran in *Geissospermum*.

In *Plumeria* at least two models are found, that of Koriba in *P. articulata* and that of Leeuwenberg in *P. rubra* (Hallé & Oldeman, 1970; Hallé, Oldeman & Tomlinson, 1978). In *Alstonia* at least three models can be distinguished, that of Koriba in *A. macrophylla* (also once observed by the present author in *A. boonei* in Gabon), that of Prévost in *A. boonei, A. congensis* and *A. scholaris*, and that of Leeuwenberg in *A. sericea*. Although it is difficult to decide on diagnostic characters for the Plumerieae, its subtribes appear to be quite natural.

The tribe Tabernaemontaneae, which is chemically remarkably uniform and pharmaceutically promising, is very uniform both in vegetative architecture and in fruits and seeds. All species show the model of Leeuwenberg, but mostly partly reduced. The present author only once observed the model complete in a specimen of *Tabernaemontana divaricata* in a private garden in Saul in French Guiana. The terminal inflorescence is composed of a pedicellate central flower supported by two peduncles each bearing a cyme supported by two branchlets. In all other specimens of this tribe, he observed that in the field several reductions occurred. Firstly, the terminal flower is missing, rendering the two lateral branches separate inflorescences. Secondly, one of these inflorescences, and often also one of the branchlets, may not develop. Especially in the latter case, the model cannot easily be recognized. The fruits are mostly apocarpous, fleshy and dehiscent. Syncarpous fruits occur in *Tabernanthe* and partly syncarpus fruits often occur in *Callichilia, Tabernaemontana* and *Voacanga*. *Schizozygia* bears dry fruits, whereas the fruits of several *Tabernaemontana* species are indehiscent, e.g. those of the Asian *T. aurantiaca* and the African *T. contorta* and *T. longiflora*. The usually more or less ellipsoid seeds are mostly embedded in a pulpy aril.

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APPENDIX: PLUMERIOIDEAE

Provisional incomplete survey of tribes, subtribes and genera, with number of species and parts of the world

1. *Carisseae*

Couminae
Parahancornia 6, Am.
Couma 6, Am.

Melodinae
Melodinus ±45, As.

Carissinae
Carissa ±20, Afr., As.
Acokanthera 5, Afr.

Lacmelleinae
Lacmellea ±15, Am.
Hancornia 1, Am.

Landolphiinae
Landolphia 54, Afr.
Chamaeclitandra 1, Afr.
Clitandra 1, Afr.
Orthopichonia 9, Afr.
Anthoclitandra 2, Afr.
Aphanostylis 3, Afr.
Pacouria 2, Am.
Dictyophleba 4, Afr.
Vahadenia 2, Afr.
Ancylobotrys 10, Afr.
Saba 3, Afr.

Willughbeiinae
Cylindropsis 1, Afr.
Willughbeia ±15, As.
Urnularia 5, As.

Leuconotidinae
Bousigonia 2, As.
Leuconotis 7, As.
Cyclocotyla 1, Afr.

Pleiocarpinae
Picralima 1, Afr.
Hunteria 10, Afr., As.
Pleiocarpa 7, Afr.

2. *Chilocarpeae*
Chilocarpus ±15, As.

3. *Ambelanieae*

Ambelaniinae
Ambelania 5, Am.

Macoubeinae
Macoubea 2, Am.

4. *Tabernaemontaneae*
Voacanga 14, Afr., As.
Tabernaemontana ±100, trop.
Tabernanthe 1, Afr.
Schizozygia 1, Afr.
Carvalhoa 1, Afr.
Callichila 7, Afr.
Stemmadenia 17, Am.
Crioceras 1, Afr.
Calocrater 1, Afr.

5. *Plumerieae*

Craspidosperminae
Craspidospermum 1, Madag.
Stephanostegia 3, Madag.
Dyera 1, As.

Plectaneiinae
Kamettia 1, As.
Gonioma 2, Afr.
Strempelopsis 2, Am.
Plectaneia 10, Madag.

Alstoniinae
Alstonia ±60, Afr., As.
Tonduzia 1, Am.

Aspidospermatinae
Diplorhynchus 1, Afr.
Pycnobotrya 1, Afr.
Aspidosperma ±70, Am.
Microplumeria 2, Am.
Cufodontia 3, Am.
Geissospermum 1, Am.

Catharanthinae
Rhazya 1, Mid. East
Amsonia 19, Am., As.
Catharanthus 6, Afr., As.
Vinca 3, Eur., As.

Haplophytinae
Haplophyton 1, Am.

Plumeriinae
Mortoniella 1, Am.
Plumeria 15, Am.

Holarrheninae
Holarrhena 4, Afr., As.
Carruthersia 4, As.
Spirolobium 1, As.

6. *Rauvolfieae*

Rauvolfiinae
Cabucala 16, Madag.
Petchia 1, Ceylon
Rauvolfia ±70, trop.
Podochrosia 1, N. Caled.

Alyxiinae
Alyxia ±70, As.
Lepinia 2, As.
Lepiniopsis 2, As.

Ochrosiinae
Ochrosia ±25, Masc., As.

Vallesiinae
Vallesia 10, Am.
Kopsia ±20, As.

Condylocarpinae
Rhipidia 1, Am.
Condylocarpon ±10, Am.

Anechitinae
Anechites 1, Am.

7. *Allamandeae*
Allamanda ±15, Am.