Stauffer HU. 1961. Santalales-Studien. VIII. Zur Morphologie und Taxonomie der Olacaceae-Tribus Couleae. Vierteljahrsschrift der Naturforschenden Gesellschaft in Zürich 106: 412-418

On the Morphology and Taxonomy of Olacaceae - Tribe Couleae

(Santalales-Studien VIII)

In his compilation of the Olacaceae SLEUMER in 1935 listed five genera under the tribe Couleae:

Coula BAILLON 1863
Ochanostachys MASTERS in HOOKER 1875
Eganthus VAN TIEGHEM1899
Endusa MIERS ex BENTHAM 1862
Minquartia AUBLET 1775

Soon thereafter he (SLEUMER 1936) moved *Endusa* into *Minquartia*. While *Coula*. *Ochanostachys* and *Minquartia* represent generously represented genera in the herbaria, strikingly, *Eganthus* was only known from the type specimen, POEPPIG Nr. 2880 from Ega. SLEUMER notes in 1935: "I have not seen the plant."

In 1886 the voucher POEPPIG 2880 from BAILLON was conceived as *Minquartia*. BAILLON gives a good analysis of the flower, he points out the variability of the number of stamens, which he compares with the conditions in *Coula* and *Heisteria*; he also recognizes the reason for this variability: The stamens opposite the petals can duplicate or not!

In 1899, VAN TIEGHEM established his new genus *Eganthus* on this voucher (POEPPIG 2880): “une plante que Baillon a identifiée à tort, en 1886, au Minquart de la Guyane.” [a plant that Baillon wrongly identified, in 1886, in the Minquart of Guyana] He gives the following differences to *Minquartia*:

No spicular cells in the leaf, but ± developed in *Minquartia*. Fifteen stamens, over ten in *Minquartia*. Three carpels, four to five in *Minquartia*.

It seemed to me of interest to examine the originals of *Eganthus* at the Paris Herbarium. The follow-up examination showed that no spicular cells could be found in the leaf, that the number of stamens changes, from usually two in front of the petals, but sometimes only one stamen can stand there, and that usually three, more rarely also four, carpels are involved in the structure of the ovary.

In order to be able to compare these findings with the conditions in *Minquartia*, for the time being a critical morphological and taxonomic examination of this genus was necessary. The following types have been described:

Minquartia guianensis AUBLET 1775, type species of the genus
Minquartia macrophylla DUCKE 1935
Minquartia parvifolia A. C. SMITH 1936
Minquartia punctata (RADLKOFER) SLEUMER 1936 (= *Endusa punctata* RADLKOFER 1886)

I have seen the type material of all species except *M. guianensis*, where I did not have material from AUBLET. However, due to the table and description by this author (excluding the fruit) there can be no doubt about this taxon and it includes numerous good recent herbarium collections.

As to species differences, only those of the vegetative parts, especially the size and growth form, the leaf size and number of side nerves, are named by the authors. A compilation of these

features from all available documents has shown that there are no separate species, but that there is a strong variability with respect to these conditions, which are illustrated by some examples in Table 8.

Table 8 Feature comarison for different *Minquartia* vouchers

	Leaf length cm	Leaf width cm	Number of side nerves on each side
KRUKOFF 6914 (Type *M. parviflora*)	5.6–11.5	2.2– 4.5	(6–) 9–10–11
DUCKE 16349	9 –12	3.1– 4.3	10–11–12
FROES 1773	5 –14	2.7– 5.8	9–11
SAGOT s. n. (1858)	(5–) 14 –23	(2–) 4.1– 7.7	(5–) 7–11–13
Bureau agr. et forest. Guyan. 6M	9.3–18.5	3.7– 6.0	6-12-14
Bureau agr. et forest. Guyan. 7582	16 –24	4.2– 7.7	13–14
PAVON s. n. (Type *Endusa punctata*)	16 –23	5.5– 8.5	14
DUCKE 23569 (Type *M. macrophylla*)	14 –28	5.5–11	14–17
KRUKOFF 1690	15 –24	5.0– 7.6	11–14–16
KRUKOFF 5159	13 –30	4.4–10	12–18–20

Also, in terms of habit, the conditions are very variable, small-leaved trees ("*parvifolia*" and "*guianensis*") are given 13.5 to 27 m high, macrophyllous ("*punctate*" and "*macrophylla*") 15 to 20 m high. The stems may or may not be perforated with large and small leaf types.

Additional evidence for the identity of all these species is provided by the wood anatomical and pollen morphological findings of REED 1955, as well as the complete agreement of the reproductive organs (inflorescences, flowers and fruits).

Minquartia must therefore be regarded as a monotypic genus with the single species *M. guianensis*.

Let us now compare the features in which *Eganthus* should deviate from VAN TIEGHEM:

Spicular cells: In *M. guianensis* very irregular and scattered, present in large and in small-leaved vouchers, demonstrated for example in KRUKOFF 5159, MELINON s. n., but not found, for example, in KRUKOFF 6914, PAVON s. n. (noted here by RADLKOFER), DUCKE 8510. BENOIST 1044. It is an uncertain and unreliable feature because it requires the study of very abundant leaf material in order to assert with some certainty that spicular cells do not yet exist.[3]

Stamen number: In front of the petal are one or two stamens; this changes within a flower, so that numbers from minimally A = 2 X P to A = 3 X P occur. There is therefore no reason not to include *Eganthus*.

Carpel Number: This varies between three and five on the various vouchers, with four carpels most common. Also for this reason *Eganthus* can not be excluded.

As *Eganthus* is also completely identical in leaf, inflorescences and flowers to *Minquartia*, *Eganthus Poepigii* VAN TIEGHEM must be considered identical to *Minquartia guianensis* AUBLET.

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[3] SOLEREDER 1908 also indicates the presence of spicular cells in *Eganthus*: "According to Van TIEGHEM, mesophyll contains sclerenchymal fibers of the same structure in *Minquartia* and *Eganthus* as in *Endusa*." Since VAN TIEGHEM explicitly notes that sphenoid cells do not occur in *Eganthus*, SOLEREDER is here scribally subverted, which was subsequently transferred to newer works (METCALFE et CHALK 1950, REED 1955).

The Couleae thus comprise three genera:

Coula, monotypic, Africa
Ochanostachys, monotypic, Asia
Minquartia, monotypic, South America

Following the conditions found in *Minquartia*, an investigation of the entire Couleae also seemed to be of interest:

Spicular cells: were found in the leaf except *Coula* (ZENKER 2085), but not in *Ochanostachys* (where they are given by METCALFE et CHALK 1950). It seems, therefore, that they are present in all genera sometimes, but not regularly.

Stamen numbers and diagram: It turned out that the number of stamens is variable in all genera, often within one flower, also within different flowers of the same voucher and between different collections. The episepalous whorl is always unchanged, while the stamens standing in front of the petals behave in different ways:

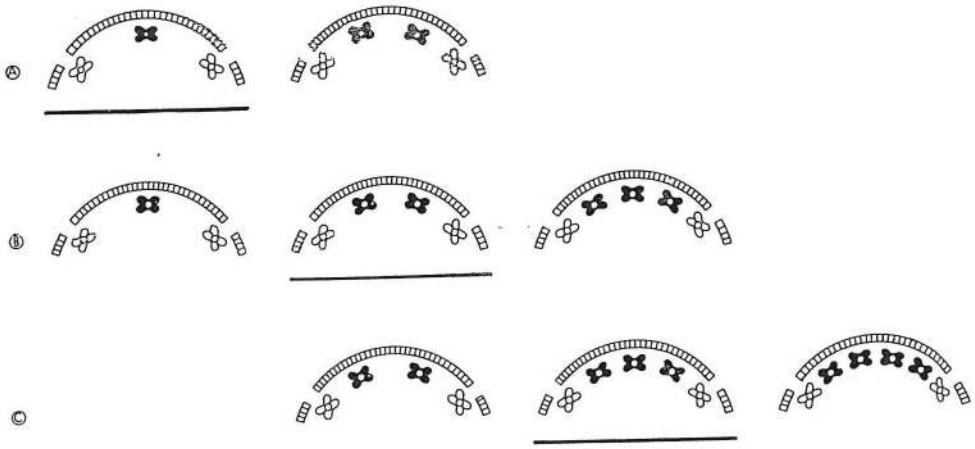

Fig. 8 Couleae: Variation in the epipetalous stamens
Row A: *Minquartia*, Row B: *Ochanostachys*, Row C: *Coula*
The most common case is underlined

The frequent change in the number of stamens is illustrated by a small statistic of *Ochanostachys* (RAHMAT SI BOEEA 9867) on eleven flowers with four petals each:

A12	Al3	A14	A15	A16
1	4	4	1	1

That this can not be a matter of failure of whorls [cycles], as VALETON, VAN TIEGHEM and SLEUMER assumed, should be sufficiently demonstrated. There is the typical case of splitting, as BAILLON interpreted in 1886 on the basis of his observations on POEPPIG 2880. It is striking that all stamens are always strictly in one whorl and no positional difference can be detected even for the two fundamental whorls.

The petal numbers and carpel numbers and their variations should also be given an overview. The sepals have always been found to be isomeric with the petals.

	Petal number	Carpel number
Minquartia	4–5–6–7	3–4–5
Ochanostachys	3–4–5	2–3–4
Coula	4–5–6	3–4

In the rare cases where there is isomerism of the carpels, these always alternate with the petals. This behavior corresponds to that in normal diplostemonous flowers.

Inflorescences: The inflorescences of *Coula* are described in the literature as paniculate, those of *Minquartia* and *Ochanostachys* as a spike of racemes [ährigtraubig]. The follow-up showed that all three genera have inflorescences of the same type. All have "simple" and branched inflorescences, but in the case of *Coula*, the branched are more common, in *Ochanostachys* and *Minquartia* the "simple".

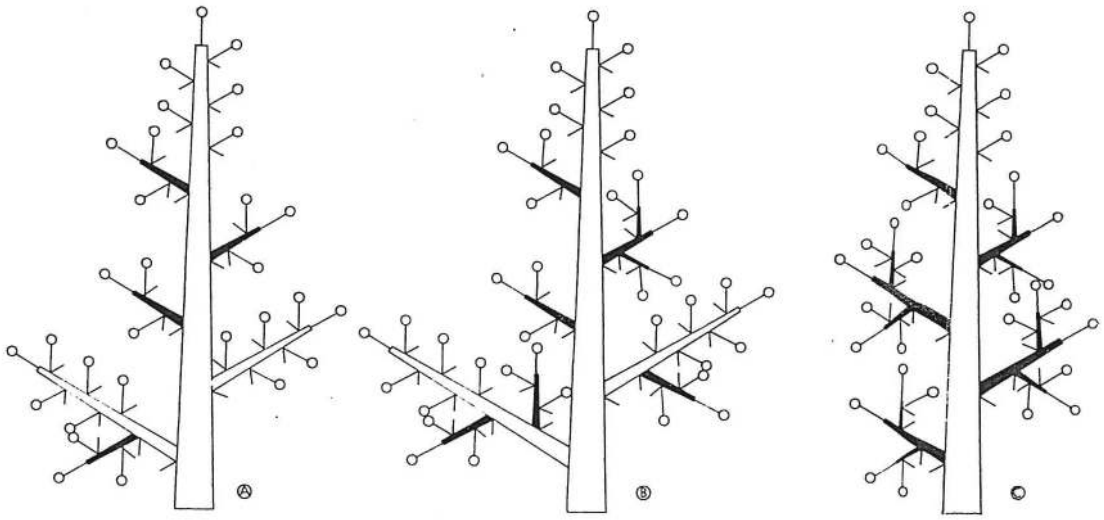

Fig. 9 Couleae: Inflorescence schemes (compressed axis parts black)
A *Coula*-Type, B Transition type (rarely found in *Minquartia* and *Ochanostachys*),
C *Minquartia*- and *Ochanostachys*-Types

At a terminal flower, at the major axis in twelfth position, there are first single side flowers, then triads, often also pentads or even richer cymose glomerules. In *Coula*, this section of the inflorescence is less developed, only triads could be observed. It is well developed in the other two genera. At the base of the inflorescence, side axes appear, which in principle repeat the construction of the main axis, albeit somewhat less developed. This section is usually well developed in *Coula*, often absent in *Minquartia* and *Ochanostachys*.

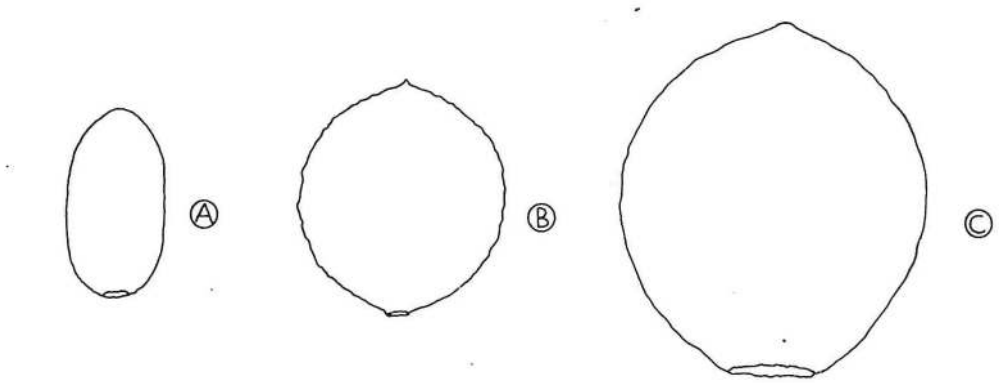

Fig. 10 Couleae: Fruit (outline drawing)
A *Minquartia*, 1:1 (DUCKE 10668), B *Ochanostachys*, 1:1 (KING's Collector 7860), C *Coula*, 1:1 (ZENKER 2563)

The close relations of the three genera manifest in all parts of the morphological and anatomical analysis; they were essentially already described by VAN TIEGHEM and have recently been supplemented by finding matched pollen structure (REED 1955).

The above investigations have also clearly shown these relationships and, in part, in new features. The fruits, which also coincide in the basic structure, show in their size formation and in the proportions relatively clear differences, to which a final illustration indicates.

Summary

The tribe Couleae consists only of the three monotypic genera *Minquartia*, *Ochanostachys* and *Coula*. *Eganthus Poepigii* VAN TIEGHEM and *Endusa punctata* RADLKOFER are identical to *Minquartia guianensis* AUBLET, as are the other species established for *Minquartia*.

The three genera of the Couleae are closely related. The leaves are consistent in anatomy, in particular by the regular occurrence of latex tubes and secretions, as well as by the sporadic appearance of spicular cells. The hairiness of the young parts (axes and leaves) and the inflorescences are consistent. The inflorescences can be derived from a basic type.

There are two stamen whorls, the episepalous one is always unchanged, the epipetalous one can double one or more times, and this behavior is within a flower (with one variation step), within the flowers of a voucher (with one variation step), within various collections of one species (with one to two variation steps) and within the tribe (with three variation steps). Sepal and petal counts as well as the number of carpels vary. In isomerism, the carpels alternate with the petals. The three genera can be distinguished by differences in the number ratios, in the adhesion of the petals, in the density of the hairiness of the vegetative parts and flowers, and in the shape and size of the leaves and fruits.

Summary

The tribe Couleae includes only the three monotypic genera *Minquartia*, *Ochanostachys* and *Coula*. *Eganthus Poepigii* VAN TIEGHEM, *Endusa punctata* RADLKOFER and all the species described in the genus *Minquartia* are identical with *Minquartia guianensis* AUBLET.

The three genera are closely allied. This is proved by anatomical and morphological characters.

The structure of the inflorescences and the number and position of the stamina are discussed.

Literature

AUBLET, F (1775): Histoire des plantes de la Guiane françoise, 2 et 4. London/Paris.
BAILLON, H. (1862/63): Deuxieme memoire sur les Loranthacees. Adansonia, 3, p. 50-128. - (1886): La place du *Minquartia* d'Aublet. Bull. mens. Soc. Linn. Paris, p.585/86.
BENTHAM, G. (1862): Olacineae. In BENTHAM et HOOKER, Genera plantarum, 1, p. 342-355.
DUCKE, A. (1935): Plant es nouvelles ou peu connues de la region amazonienne VIII. Arch. Inst. Biol. Veg., 2, p. 27-73.
MASTERS, M. T. (1875): Olacineae. In HOOKER, Flora of British India, 1, p.572-598.
METCALFE, C. R. et L. CHALK (1950); Anatomy of the Dicotyledons, 1. Oxford.
RADLKOFER, L. (1886): Neue Beobachtungen über Pflanzen mit durchsichtig punktierten Blättern und systematische Übersicht solcher. Sitzungsber. math.-phys. Classe Akad. Wissenseh. München, 16, S. 299-344.
REED, F. C. (1955): The comparative morphology of the Olacaceae, Opiliaceae and Octoknemaceae. Mem. Soc. Broteriana, 10, p. 29-79.
SLEUMER, H. (1935): Olacaceae. Nat. Pfl. Fam. Editio II, 16b, S. 5-32.
- (1936): Vermischte Diagnosen III. FEDDE Rep., 39, S. 274-282.
SMITH, A. C. (1936): Plantae Krukovianae V. Brittonia, 2, p. 145-164.
SOLEREDER, H. (1899): Systematische Anatomie der Dicotyledonen. Stuttgart.
- (1908): Systematische Anatomie der Dicotyledonen. Ergänzungsband. Stuttgart.
VAN TIEGHEM, P. (1895): Sur quelques plantes rapporte es du Congo par M. H. LECOMTE. 2. Sur le *Coula edulis* Baillon. Bull Mus. Hist. Nat.,1, p.166-168.
- (1896): Sur les phanérogames à ovule sans nucelle, formant le groupe des Innucellées ou Santalinées. Bull. Soc. Bot. France, 43, p. 543-577.
- (1897): Sur les phanérogames sans graines, formant la division des Inséminées. Bull. Soc. Bot. France, 44, p. 99-139.
- (1899a): Deux genres nouveaux po ur la famille des Coulacées. Bull. Mus. Hist. Nat., 5. p.97-100.
- (1899b): Sur les Coulacées. Journal de Botanique, 13, p. 69-,-79.
- (1899c): Sur les Coulacées. Annales Sei. Nat. Botanique, Serie VIII, 10, p.125-136.
VALETON, T. (1886): Critisch overzicht der Olacineae B. et H. Groningen.