On the Position of the Genus Okoubaka Pellegrin et Normand
Santalales - Studies I
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1. The Past Classification

The genus *Okoubaka* is based on vouchers from the The Ivory Coast (Aubréville, Nrn. 603, 1503, 1788), those first mentioned in Aubrévilles "Flore forestiere de la Côte d'Ivoire" (1), are still without diagnoses, admittedly incomplete since only fruits were present. Aubréville placed the mentioned tree in the Olacaceae as an addendum [anhangsweise] by the native name "Okoubaka", stressing, however, the provisional character of this dispatching. Also after flowers could be collected, the tree was described in 1937 as *Octoknema Okoubaka* by Aubréville and Pellegrin (2). The authors justify its generic dispatching (S.391) as follows:

"Par ses fleurs, il est voisin des *Octoknema* Pierre et plus particulièrement de *O. Klaineana* Pierre, type de la petite famille des Octoknemaceae*,* détachée des *Olacacées,* mais il est tout different par ses feuilles et par ses fruits."

"By its flowers, it is close to *Octoknema* Pierre and more particularly to *O. Klaineana* Pierre, type of the small family of Octoknemaceae, detached from Olacacées, but it is completely different by its leaves and its fruits."

On the following page we find to the far remark: "Cette espèce très parliculière surtout par ses feuilles et la grosseur de ses fruits mériterait presque d'être considérée comme le type d'un genre spécial." [This species very particular especially by its leaves and the size of its fruits would almost deserve to be regarded as the type of a special genus.]

In 1944 Normand (8) drew attention to the important differences, from the anatomy of the wood, between *Octoknema Okoubaka* and the remaining species of the genus, and due to these differences and the deviations mentioned by Aubréville and Pellegrin (2) in that external morphology the separation of *Octoknema* and list of its own genus (together with Pellegrin) as: *Okoubaka Aurevillei* Pellegrin et Normand. Normand mentions the close relations that exist in wood anatomy to the Santalaceae, however, does not dare, for this reason alone, to exclude *Okoubaka* from the family Octoknemaceae.

As a consequence the new genus is announced also from the Gold Coast in the same species by Normand and Pellegrin (9) and from the Belgian Congo by Leonard (4) a variety (var. *glabrescentifolia*), who finally described in 1950 a further species from the Belgian Congo by Leonard and Troupin (5): *O. Michelsonii*, whereby the genus here and in the "Flore Belgian Congo Huanda Urundi." (6) is always treated as Octoknemacee.

Due to comparative embryological investigations of *Octoknema*, Fagerlind1948 had demanded (3), that the family Octoknemaceae be waived and be combined again with Olacaceae. Fagerlind was not presented material of *Okoubaka*, it remained thus to be clarified as to whether the second genus placed in the Octoknemaceae was to be likewise counted in Olacaceae; such an investigation promised at the same time to enlighten Fagerlind's results from the morphology.

2. Analysis of *Okoubaka*

At the Herbarium of the Paris museum I had the opportunity to analyze the type material of

Okoubaka Aubrevillei Pellegrin et Normand. In doing so I found a few as yet little considered morphological characteristics, which are of importance to the systematic position:

The axes show clear articulation. The leaves are alternate, standing at the base of the side axils ± opposite prophyllar scales. The pubescence of the leaves and axes consists of long, pointed, simple hairs, more rarely do these ever stand alone in existing bundles (tufts). The bundles consist only of 2-3 hairs, the hairs are always normal.

The inflorescences occur axillary on older branches. They are panicles from spicate partial inflorescences (Teilinfloreszenzen), occasionally is a 2/5-arrangement of the flowers recognized at the ends of axes. From a bract one or rather more frequently three flowers rise, whereby (the middle) is somewhat further-developed and the two laterals different. The inflorescence axes are closely pubescent, the hairs correspond to that of the flowers.

The shortly pedicellate ♀ flowers (examined Aubréville1503: Fig. 1 A) show a conical receptacle, into which the ovary is encompassed. The pedicel stands articulated on the inflorescence axis. The receptacle is without a suggestion of a limbus ("calyx seam") and without articulation between the (usually 5) valvate tepals, is not extended beyond the ovary. The gynoecium is covered by a flat-shelled [flask-shaped?] disk above, which runs out between the staminodia into short obtuse lobes and is closely short-haired on the top side. The receptacle and the tepals are outside closely felty-hairy, in which the felt consists of normal, orange-brown, standing tufts, pointed hair, which is shorter than the hair at axes and leaves. The hair bundles on the flowers and inflorescence axes are more numerous (7 to 10) than hairs on the vegetative parts. The staminodia are the same number as and opposite the tepals, behind every one is clearly to be noticed *a small bundle of longer hair* on the tepal, which is stuck together with the back of the anther. In all other respects the tepal is finely short-hairy inside. The staminoidium is in-curved over the disk, introrse; each thecum opens with a longitudinal fissure. The ovary is inferior, the column-like style from a flat disk is crowned by an irregularly four-lobed, fringed at the edge, stigma.

The small *ovary is unseptate*, the wall smooth. At the base stands the free-central placental column (Fig. 1 B), on recent flowers is ± 0.5 mm high. It carries at the apex 3 ovules, which are inclined diagonally downward and change without a clear funiculus with increasing thickening into the placenta.

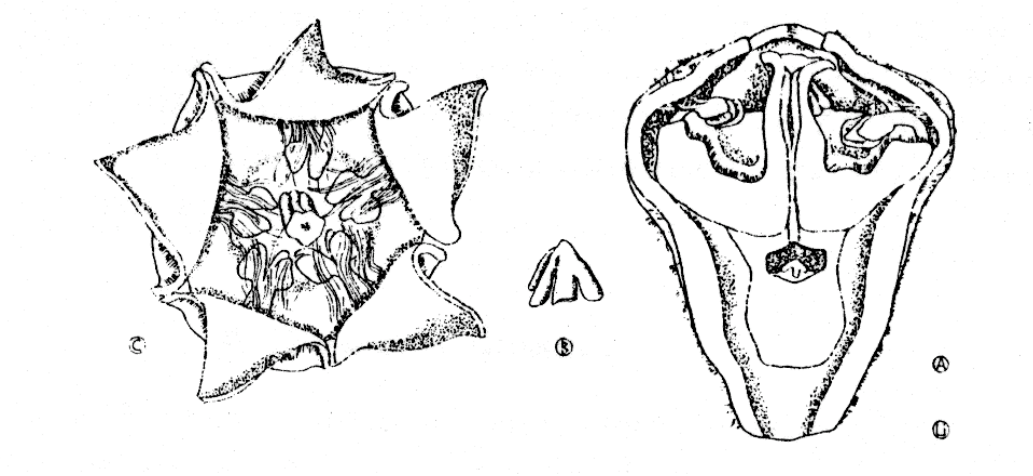

Figure 1. *Okoubaka Aubrevillei* Pellegrin & Normand - A. Longitudinal section through a ♀ flower (X 7); B. placenta (X 15); C. ♂ flower from above (X 7) (A and B after Aubréville 1503. C after St. Clair – Thompson 4368)

The ♂ flowers (examined St. Clair - Thompson 4368: Fig. 1 C) are clearly pedicellate, the receptacle is flat, lined by the disk; it carries in the middle a small cylindrical pistillodium. The (fertile) stamen is in-curved against the disk, it is built like the staminodium, only the flaps of the locule are somewhat larger, very clearly one sees on the tepals behind each stamen the bundled longer filaceous hairs while the tepals are otherwise outside and inside only short haired.

The fruit is a drupe, crowned by the persistent tepals, the disk and the style; it is ellipsoidal, long on the Type ± 9 cm long and ± 5 cm in cross section. The exocarp is membranous, the mesocarp fleshy, the endocarp hard-crustaceous, outside ridged-pitted, inside smooth. One seed per fruit is present, with plentiful endosperm and a small embryo.

I have not seen material from *O. Michelsonii* Leonard et Troupin, but from the description and illustration of the authors (5) it comes out that this species essentially agrees in the placentation and in the rest of construction of the flowers with *O. Aubrevillei*. The hair bundles behind the stamens were neither described nor represented in the diagram, nevertheless these might occur, however, since they are also not indicated there for example in the "Flora of the Belgian Congo" (6) for *O. Aubrevillei* (also the placentation is incorrectly shown).

3. Discussion

The found characteristics deviate strongly from conditions available for *Octoknema*. There ♀ flowers appear with a reduced calyx (calyx seam) or nevertheless clear articulation of the tepals, the pubescence always consists of bundle- or scale-hair with occasionally short stalks (Stämmchen), which are strongly reduced staminodia (anthers missing), on the tepals are *missing* the *hair bundles*, the *ovarian locule is chambered far up*, the ovules show a clear funiculus and (after Fagerlind [3]) two integuments; the fruit possesses inside at the endocarp protruding borders. In the ♂ flower the disk strongly deviates from *Okoubaka*, on the inside of the tepals it is missing the clear hair bundle behind the stamens. The leaf pubescence and the axils consists of bundle hairs, simple hairs are lacking.

The mentioned characteristics of *Okoubaka* assign the genus to the Santalaceae, where hair bundles behind the stamens form the rule, where the described hair types occur like with *Okoubaka*, where in particular also the placentation shows the same conditions, i.e. with many genera completely unseptate ovarian locule with a free-central placenta, from which the integumentless ovules hang, without being sectionalized (? abgegliedert) by a clear funiculus.

The allegation is repeated for *Okoubaka* that this tree causes other trees growing in its environment to die. It may be accepted that the genus, as covers the remaining Santalaceae, are half parasites and the observed feature of the parasitism of the large tree can thus be explained.

Within the Santalaceae *Okoubaka* stands next to the genera *Scleropyrum* and *Pyrularia*, both likewise trees with large drupes, with *Pyrularia* which approximately reaches the extent (size) of *Okoubaka*. Particularly close relations exists with *Scleropyrum*, on the one hand, by external morphology: in the inflorescence (here particularly with *O. Michelsonii*, where as with *Scleropyrum* spicate inflorescences individually or numerous arise from older branches, while *O. Aubrevillei* shows a more primitive, paniculate inflorescence), in the construction of flowers, in the concurrent evidence for the construction of the fruit, then particularly by the anatomy of the wood, to which Normand (8) referred for the first time. It appears, apart from the apparent size differences, that there is complete agreement in the construction of the wood with the genera, both concerning the vessel arrangement, the construction of the ray initials and the distribution of the wood parenchyma, as a comparison of the illustrations given by Normand (8) with the appropriate figures of *Scleropyrum Ridleyi* and *S. Maingayi* shown in Swamy (11).

The wood of the genus *Octoknema* deviates strongly from that of *Okoubaka* and shows a close relationship with the Olacaceae, in particular with Couleae and *Heisteria* (one compares the data and illustrations of Normand [8] with the descriptions and the pictorial material of Reed [10]). It is proved by wood anatomy that the dispatching of *Octoknema* to the Olacaceae is entitled, which was demanded by Fagerlind (3) due to the gynoecium conditions. Likewise the morphology of the pollen justifies this dispatching, and finally also the hair type agrees anatomically with conditions in Olacaceae Couleae as well.

4. Summary [from German]

The genus *Okoubaka*, so far posed in the Octoknemaceae, is to be placed in the Santalaceae and shows in this family particularly close relations with *Scleropyrum*, both concerning external morphology and wood anatomy. The genus *Octoknema* is to be placed, after the suggestion of Fagerlind, into the Olacaceae, both because of the gynoecium conditions and because of the agreement of the anatomy of the wood, the hairs, and because of the construction of the pollen. The family Octoknemaceae is to be annuled.

Résumé

Le genre *Okoubaka* Pellegrin et Normand, qui était placé dans les Octoknémacées, doit être transféré dans les Santalacées, ou il est voisin surtout avec *Scleropyrum,* aussi bien par la morphologie extérieure que par l'anatomie du bois.

Comme proposé par Fagerlind, le genre *Octoknema* est à placer dans les Olacacées, pour sa placentation, pour l'anatomie du bois et des poils et pour la structure du pollen.

La familie des Octoknémacéee doit être supprimée.

[The genus *Okoubaka* Pellegrin and Normand, which was placed in Octoknémacées, must be transferred in Santalacées, or it is close especially with *Scleropyrum*, as well by external morphology by the anatomy of wood. As proposed by Fagerlind, the genus *Octoknema* is to be placed in Olacacées, for its placentation, the anatomy of wood and the hairs and for the structure of pollen. The familie of Octoknémacéee must be removed.]

Summary [English]

Evidence is given by external morphology as well as by wood anatomy, that the genus *Okoubaka* Pellegrin et Normand, treated hitherto as genus of the *Octoknemaceae,* must be transferred into *Santalaceae,* where it is especially related with *Scleropyrum.*

As proposed by Fagerlind, the genus *Octoknema* belongs to *Olacaceae,* not only because of the structure of its ovary and the placentation, but also because of wood and hair anatomy and pollen structure.

The family *Octoknemaceae* therefore is to annul.

The available study became possible by investigations at the Herbarium of the Paris museum, which I could implement during a longer stay there. I am very gratefully for the generous support, which I enjoyed, of the director, Professor H. Humbert, and the whole staff. My wife, Lisa Stauffer-Imhoof, enriched the study by the enclosed [included] drawing.

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