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ON LOXANTHERA, AMYLOTHECA AND TREUBELLA, THREE NEW GENERA FOR
THE TRIBE ELYTRANTHEES IN THE FAMILY LORANTHACEAE
by M. Ph. VAN TIEGHEM.

We know, from a recent communication (1), that the Loranthaceae family is broken down into three sub-families: the Nuytsioideae, the Lorantheoideae and the Viscoideae. We also know that the subfamily of the Lorantheoideae is in turn divided, according to the conformation of the pistil, the fruit and the seed, into four tribes. Two of these tribes have the unilocular ovary, with a whole set of characters associated with this arrangement; but, while in the one, that of the Lorantheae, the seed is provided with endosperm, in the other, that of the Psittacanthae, it is devoid of it. The other two tribes have the plurilocular ovary, with a whole series of correlative characters of this structure; but, while in one, that of Elytranthae, the fruit is a berry with a whole endospermous seed, in the other, that of Gaiadendreae, the fruit is a drupe with a seed with ruminant endosperm. While pursuing, from the double point of view of the structure of the vegetative apparatus and of the floral organization, the comparative study of the species which compose the various genera of the tribe of Lorantheae, I have encountered some which differ from all the others by the whole of their characters and in particular by the conformation of the pistil, of which the ovary is plurilocular, as in Elytranthae and Gaiadendreae; so that these species must, in my opinion, be withdrawn not only from the genera where they were classified until now, but also from the very tribe of Lorantheae, to be transferred, the fruit being a berry there, in the tribe of Elytranthae. As they belong moreover to three different groups, they will also, at the same time, constitute in this tribe three distinct genera, next to the three genera *Macrosolen*, *Elytranthe* and *Lepostegeres*, which alone composed it until now.

One of these three types was distinguished from the *Loranthus* with gamosepalous calyx [note what Tieghem calls the calyx is in fact the corolla] or *Dendrophthoe* by Blume, as early as 1829, under the name of *Loxanthera*, because of the singular mode of attachment of the anthers, which are dorsifixed and yet not versatile. But this genus, ignored as such during the following year by A.-P. de Candolle, was not admitted; it is to be restored. The other two genera have so far remained completely unnoticed; they are to be established and named.

In one, the calyx is gamosepalous, as in *Loxanthera*, and therefore the species are currently classified as *Dendrophthoe*. I propose to name it *Amylotheca*, in consideration of the fact that the primitive compartments of the ovary are occupied there, after their early obliteration, by so many bundles of starchy cells of epidermal origin, a character which is moreover common to all the *Elytranthae* and all *Gaiadendreae*, as was said in a previous Note.

In the other, the calyx is dialysepalous, and consequently the species are classed at present among *Loranthus* proper. I propose to name it *Treubella*, in honor of my learned friend Mr. Treub, director of the Botanical Garden of Buitenzorg in Java, correspondent of our Academy of Sciences, which we owe, among so many beautiful works on tropical plants, several research series on the development of the flower and fruit of Loranthaceae.

Let us now consider each of these three genera separately, in order to define them better, by limiting ourselves to the principal characters drawn from the floral organization, and reserving all the details, in particular all that concerns the structure of the vegetative apparatus, for the Memoir which will be published later.

1. ON THE GENUS LOXANTHERA Blume.

As early as 1829, in a letter to A.-P. de Candolle, and the following year in his *Flora Javae*, Blume established the genus *Loxanthera* for a very remarkable Lorantheae discovered by him in the forests of Java, *Loxanthera speciosa*, whose flowers with long tubular bright red calyx reach and exceed one decimeter in length (2). The only character on which it relies to distinguish it from *Dendrophthoe* and also to name it is the very particular conformation of the stamens, of which the anther is attached to the filament at the back, towards the third of its length from the bottom; to this end, the filament curves horizontally at the top and expands there longitudinally to unite with the connective, so that the anther, while being dorsifixed, is in no way versatile. Unique among the Lorantheae, this arrangement also seems very rare elsewhere.

This singular character, perhaps because of its singularity, nevertheless seemed insufficient to A.-P. de Candolle, who, as early as 1830, even before the publication of *Flora Javae*, included this species in the genus *Loranthus* under the name of *L. loxantherus*, not even considering it as a type of section, but only as a subdivision of its *Notanthera* section (3). Thus nipped in the bud, so to speak, the genus *Loxanthera* has not since been recognized by proponents of the generic unit *Loranthus*, such as MM. Oliver, Bentham, Hooker, Baillon, etc., it goes without saying, not even by the partisans of a rather extensive fractionation, as is Mr. Engler; all agree, however, in attributing the value of a section to it. Only the few supporters of such an extreme division, like Miquel, sided with Blume's opinion.

Later, M. Beccari collected in Borneo and distributed in 1872, under the number 1357, a Lorantheae which has the same floral conformation, notably the same mode of insertion of the anthers, as *L. speciosa*, with more leaves. narrow, longer and pointed at the top. It is obviously a different species of the same genus, which has not been, it seems, neither named nor described until now: it will be *Loxanthera Beccarii* (4).

I have studied the organization of the flower in these two species; it offers the same characteristics; I will therefore limit myself to describing it in the *L. Beccarii*.

The inflorescence is a short axillary raceme, the thick axis of which bears only three to five large pedicels, each terminated by a triad of flowers, all three pedicellate, the median of which has no bract at its base, while that the sides have a little protruding. Each flower, 10 to 12 centimeters long, has a tubular gamosepalous calyx, formed of six sepals, with as many superimposed stamens, having the anthers attached to the filament as described above (5).

Axile longitudinal section of the inferior ovary shows that the outer parenchyma, as well as the calyculus, is devoid of sclereids, that the lignified cup is narrow and long, glove finger-shaped, and that the inner parenchyma is traversed throughout its length, from the bottom of the cup to the base of the style, by two parallel bundles of large starch cells, taking the place of two obliterated primitive locules, the transverse sections of which will better show the real number and arrangement. We also see that the style has, around its base, a free nectariferous collar and that after blooming it detaches to the level of the ovary, leaving a kind of well in this collar.

The successive transverse sections of the inferior ovary show that, towards the bottom of the lignified cupule, the central cylinder of the pedicel resolves into six fibrovascular bundles, on an outer circle, for the sepals and the superimposed stamens, and six smaller bundles, alternate, on an inner circle, for carpels. Higher up, four locules, obliterated by the fusion of the amyloiferous epidermis, appear inside the cup, in exact superposition with four of the carpellar bundles, and continue upwards to the base of the style; the two bundles which do not have a starchy locule inside them, and which are moreover from the beginning more slender than the others, gradually

become thinner, first lose their wood, then finally cease altogether . Of the six alternisepalous carpels which are represented by their fibrovascular bundles in the plane of the flower, four therefore develop normally and close by circumscribing as many cells, the other two abort.

In summary, the absence of sclereids, the glove-finger shape of the lignified cup, but above all the closure of the carpels and the plurilocularity of the ovary which results from it, are characters which separate *Loxanthera* not only from *Dendrophthoe*, but still of all the Lorantheae, and which closely compare this genus to the *Macrosolen*, *Elytranthe* and *Lepostegeres*, beside which it is henceforth necessary to classify it in the tribe of the Elytrantheae.

On the other hand, the arrangement of the flowers in triads, the very particular conformation of the stamens, the existence of a nectar-bearing collar around the base of the style and the complete fall of the latter are characters that none of these three genera possesses and which ensures *Loxanthera* as an independent plant next to them.

2. ON THE NEW GENUS AMYLOTHECA.

The genus *Amylothea* currently comprises five species. Two of them have already been described and named as *Loranthus* or, because of their gamosepalous calyx, as *Dendrophthoe*, for those who admit the autonomy of this genus: these are the *Loranthus dictyophlebus* F. Mueller, from Australia and the *L. Hollrungii* K. Schumann, from New Guinea. The other three exist in the herbaria, notably in the Museum herbarium, where I studied them, without having yet been, it seems, described and named. These are: 1° the plant collected in Manila, by Cuming and distributed under number 4969; I will name it *Amylothea Cumingii*; 2° the plant collected in Macassar by Zollinger and distributed under number 3295, which will be *A. Zollingeri*; 3° finally the one that the same traveler collected in Sumbawa and distributed under number 3425; it will be *A. sumbawensis*.

To make known the floral organization of these plants, it will be enough for us to take for type the *Amylothea dictyophleba*, and then to add a few words for each of the four other species.

Amylothea dictyophleba (F. Mueller). - Described by M. F. de Mueller as *Loranthus* (6), this species grows in Australia (Queensland and New South Wales). The inflorescence is an axillary umbel, composed of three to five pedicels, each terminated by a triad with a sessile median flower and pedicellate lateral flowers; the triad is sometimes incomplete by default of either the middle flower or one of the side flowers. Each flower has a tubular, thin and transparent gamosepalous calyx formed of six sepals concrescent in three quarters of the length, with as many superimposed stamens with narrow and basifixed anthers.

Axile longitudinal section of the ovary shows that the external parenchyma, as well as the calyculus, is devoid of sclereids, that the lignified cup is narrow and long, in the shape of a glove finger, and that the central parenchyma is traversed throughout its entire length from the bottom of the cupule to the very interior of the swollen base of the style, by two parallel bundles of large starch cells, coming from the fusion of the epidermis in each of the primitive cells, thereby obliterated. We can also see that the style, devoid of a free nectariferous collar around its base, is swollen in a pyramid in its lower portion, which remains adherent after its fall and persists in the form of a point at the top of the fruit.

Successive transverse sections of the inferior ovary show that, below the bottom of the lignified cupule, the pedicel has produced six larger outer bundles, for the sepals and stamens, and six smaller inner ones, alternate with the former, for the carpels. On the way up, we see two of these carpellar bundles, already more slender than the others, thinning and stopping, while

opposite each of the other four is established a locule, full of amyloiferous epidermal cells. Of the six normal alternisepalous carpels which constitute the pistil, four therefore develop regularly, while the other two abort.

The four starchy locules are found to be distinct even in this base of the style swollen in a hexagonal pyramid, which persists on the fruit, as has been said above; it is only higher up, in the deciduous part, that they unite to form the stylar canal.

In short, the absence of sclereids, the tubular shape of the lignified cup, the absence of a free collar around the style which, on the other hand, bulges into a pyramid at the base, the persistence of this swollen base of the style, but above all the closure of the carpels, which leads to the plurilocularity of the ovary, and the abortion of two out of six carpels, all these characters move this plant away from *Dendrophthoe* and, on the contrary, closely resemble *Macrosolen*, *Elytranthe* and *Lepostegeres*, which possess them all in common with it. It is therefore, without a doubt, an Elytrantheae. The difference, and this is the only one that prevents it from being classified in the genus *Macrosolen*, is in the inflorescence, which here is a cluster of triads, while it is a cluster of solitary flowers with three bracts in all *Macrosolen*. It is therefore necessary to see in it the type of a new genus, close to *Macrosolen*.

Amylothea Hollrungii (K. Schumann). - This plant was collected in New Guinea (Kaiser Wilhelmsland) by M. Hollrung, in 1887, and described two years later as *Loranthus* by M. K. Schumann (7).

The inflorescence is an axillary raceme, with numerous, tight pedicels, all projected on the same side of the axis and short enough to simulate a unilateral spike. Each pedicel ends in a triad of flowers which are usually every three sessile, the laterals of which are sometimes briefly pedicellate. The calyx is tubular, narrow, rigid, and the six sepals which form it separate deeply, so as to leave, after complete development, only a rather short tube.

The structure of the flower, and in particular the pistil, is exactly the same as in *A. dictyophleba*, with the difference that here three of the six carpellar bundles, more slender than the others, soon stop and that only three starchy locules are established in correspondence with the three others; in short, three carpels abort there, out of six. But this difference in the number of aborted carpels is unimportant and can be observed between the various flowers of the same plant, as can be seen in particular in *Macrosolen*.

Amylothea Cumingii. - This species was collected in Manila by Cuming and appears in the herbaria under the number 1969, without further determination. However its outward resemblance to a *Macrosolen* has not escaped the insight of Bentham and Hooker, who cite it as belonging to one of the subdivisions (b, *Densiflorae*) of the *Macrosolen* section of their genus *Loranthus* (8).

The inflorescence is an axillary, long raceme with a rather thick axis and each pedicel of which bears a triad of flowers, all three sessile. The calyx is formed of six sepals which, when fully developed, separate almost to the base, so as to leave only a very short tube, sufficient however to certify that it is gamosepal. The structure of the pistil is the same in all respects as in the preceding species. The flowers studied had only three well-developed carpels, out of six, and three corresponding starchy stalls.

Amylothea Zollingeri. - Harvested in Macassar by Zollinger and distributed under number 3295, this plant has a label bearing the name *Loranthus tetragonus* Blume. This is a manifest

error. It is the plant collected in Java by the same Zollinger and distributed under number 2355, which is *Macrosolen tetragonus* Blume, and it differs markedly from this one. The cluster, in particular, is formed there of solitary flowers with three bracts, as in all *Macrosolen*.

Here, on the contrary, the inflorescence is a long axillary raceme, provided with short pedicels, numerous and tight, all projected on the same side and each carrying a triad of sessile flowers, sometimes reduced to two flowers. The calyx is swollen at the base, and, when fully developed, its six sepals separate into this swelling, leaving only a short tube. The structure of the flower, in particular the pistil, offers all the characters observed in the preceding species. Of the six normal carpels, two abort, the other four having only each a starchy locule.

Amylotheca sumbawensis. - Harvested by Zollinger in Sumbawa and distributed under number 3425, without further mention, this plant closely resembles the previous one, from which it is however specifically distinct. The inflorescence is also a cluster of triads with sessile flowers and the calyx, not swollen at the base, also retains, after blooming, only a short tube bearing the six sepals. In the flowers examined, the pistil had only three well-developed carpels, with three corresponding starch locules.

Together, the five species we have just studied form a distinct genus, which will undoubtedly grow later (9), and this genus is much more closely related to the *Macrosolen* than are the *Loxanthera*. In fact, it hardly differs from the *Macrosolen* except by the constant arrangement of the flowers in triads, that is to say, almost as, among the Loranthaceae, the *Phthirusa* differ from the *Dendropemon*.

3. ON THE NEW GENUS TREUBELLA.

The genus *Traubella* currently consists of four species with dialysepalous calyx, already described and named as *Loranthus*, namely: *Loranthus Forsterianus* Schultes, from the Society Islands, *L. vitiensis* Seemann, from Viti, *L. indicus* Desrousseaux, from Timor and *L. triflorus* Spanoghe, also from Timor (10).

To study the floral organization of these plants, let us take as a type the *Traubella Forsteriana*; it will then suffice to add a few words about each of the other two species.

Traubella Forsteriana (Schultes). - This plant, collected in the Society Islands by Forster, was named and described as *Loranthus*, in 1829, by Schultes. I studied the flowers on a sample from Forster and on several other samples brought back from Haiti par Bertero and Mœhrenhout, in 1831, and since by various other travelers.

The inflorescence is an axillary cluster of triads with a sessile median flower and pedicellate lateral flowers. The calyx is formed of six sepals, entirely free at the opening, and each carrying a superimposed stamen with a basifixed anther.

The axile longitudinal section of the inferior ovary shows that the external parenchyma, as well as the calyculus, are devoid of sclereids, that the lignified cupule is narrow and long, in the shape of a glove finger, that the base of the style, devoid of bulging free, is swollen in a pyramid and persistent, finally that the central parenchyma is crossed in all its length, until in the persistent base of the style, by two bundles of starch cells, occupying the place of two obliterated primitive locules.

The series of transverse sections of the inferior ovary shows, at the base of the lignified cup, six external fibrovascular bundles for the sepals and superimposed stamens, and six smaller

internal bundles, alternate with the former, for the carpels. On the way up, the latter are soon reduced to three, opposite each of which a small cell is formed, filled with starchy epidermal cells. Of the six carpels represented in the plane of the flower by their fibrovascular bundles, only three therefore develop and close, constituting as many compartments, the other three abort.

By all these characteristics, the plant shows itself to be an Elytrantheae, not a Lorantheae. In this regard, it is interesting to note that A.-P. de Candolle, after having classified it in section 7, *Stylosi* of its genus *Loranthus*, immediately added: "An hujus sectionis (11)?" [Is this section (11)?] We see today how well this doubt was founded.

Traubella vitiensis (Seemann). - This plant, collected by Seemann in the Viti Islands, was described by him, in 1865, as *Loranthus* (12).

The inflorescence is a cluster of triads; the calyx is dialysepalous; the ovary is trilocular, with a persistent style base: in a word, the floral organization is the same as in *T. Forsteriana*. This species is therefore also a *Traubella*.

Traubella indica (Desrousseaux). - This plant, which grows in Timor, was described as *Loranthus* by Desrousseaux, in 1809, in Lamarck's Dictionary.

The inflorescence is a fairly long axillary raceme, with short and numerous pedicels, projected on the same side, each terminated by a triad of sessile flowers. The calyx has six sepals entirely free, each bearing a superimposed stamen with a basifixed anther. The structure of the pistil is exactly the same as in *T. Forsteriana* and *vitiensis*, with three starch cells and three aborted carpels.

Traubella triflora (Spanoghe). - It is not without some hesitation that I relate to the *Loranthus triflorus* described by Spanoghe, in 1841, the samples collected by Hombron, in 1841, in the same locality, that is to say around Koepang, in Timor; the spikes are, in fact, axillary, while Spanoghe says them terminal. Miquel doubtfully compared this *Loranthus triflorus* of Spanoghe to *Macrosolen* (13); we will see that this reconciliation is perfectly founded.

The inflorescence is an axillary spike, formed of triads with all sessile flowers. The calyx has six free sepals, each bearing a superimposed stamen with a basifixed anther. The structure of the inferior ovary is in all respects the same as in the three preceding species, with the only difference that here, of the six carpels, only two usually abort, the other four developing with starch in their locules.

Together, the four species that we have just studied, and whose number will undoubtedly increase thereafter (14), constitute a distinct genus, belonging to the tribe of Elytrantheae, but different from all the genera currently known of this tribe by the dialysepalous calyx. This genus comes closest to the *Amylothea*; it differs from it scarcely except in the independence of the sepals, much as, among the *Loranthus*, the *Loranthus* properly so called differ from the *Dendrophthoe*.

4. CURRENT CONSTITUTION OF THE TRIBE OF ELYTRANTHEAE

From all that precedes, we see that the tribe of Elytrantheae, established in my previous Note with only three genera: *Macrosolen*, *Elytranthe* and *Lepostegeres*, now has six. And as the three newly introduced genera differ more from the old ones than the latter differ from one another, it follows that this tribe is thereby considerably enlarged. We observe, in fact, now, both in the

inflorescence and in the floral organization, several modifications parallel to those which one notices from one genus to another in the Lorantheae tribe. It has, for example, types with flowers in triads, next to types with solitary flowers provided with three bracts which it had only so far; it has a genus with a dialysepalous calyx, next to the genera with a gamosepalous calyx which it had only until now; it contains, finally, a genus with dorsifixed anthers and where the style provided with a collar falls entirely, next to the genera with basifixed anthers and where the style without collar leaves its swollen base persisting, that it contained alone at first.

To finish, it is useful to summarize, in the following table, the current constitution of the tribe of Elytrantheae and the main characters of the six genera which compose it:

Elytrantheae

Calyx	{ dialysepalous. Raceme of triads <i>Traubella</i> . { gamosepalous. { dorsifixed. Raceme of triads <i>Loxanthera</i> . anthers { basifixed. { in triads <i>Amylothea</i> . Flowers { solitary. { in raceme <i>Macrosolen</i> . { in spike <i>Elytranthe</i> . { in capitulum <i>Lepeostegeres</i> .	
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The study of the structure of the vegetative apparatus and of the floral organization in the various species which compose the tribe of Lorantheae has not only led me to exclude some from this tribe in order to form new genera a different tribe, as we have just seen in this Note, it also made me see the need to constitute others in the state of distinct genera in this same tribe. This is what I hope to show the Society in a future communication.

FOOTNOTES

- (1) Ph. Van Tieghem, Sur la classification des Loranthacées (Bull. de la Soc. bot., séance du 23 février 1894).
- (2) Blume, Flora Java, Loranthaceae, p. 15, 1830.
- (3) A.-P. de Candolle, Prodrumus, IV, p. 316, 1830.
- (4) Bentham et Hooker (Genera, III, p. 210, 1883) ont bien apprécié les affinités de cette plante, dont ils disent: "Specimina Beccariana, n. 1357, plantae Blumeanae adsocianda videntur, sed specifice distincta."
- (5) Miquel (Flora van Nederlandsch Indië, p. 822, 1835), Bentham et Hooker (Genera, III, p. 210, 1889), as well as M. Engler (Nat. P. Pflanzenfamilien, III, p. {86, 1889) attribute to *Loxanthera* a pentameric flower. This may sometimes be the case, but all the flowers, both *L. speciosa* and *L. Beccarii*, that I have studied were hexameric. From the point of view of affinities of this genus, this remark is important.
- (6) F. de Mueller, Rep. Burdek. Exped., p. 14, 186.
- (7) Schumann et Hollrung, Flora von Kaiser Wilhelmslande, 1889.
- (8) Bentham et Hooker, Genera, III, p. 210, 1883.
- (9) Since the session of April 43, while studying the Loranthaceae collected in New Caledonia by Deplanche, Pancher and Balansa, I recognized eight new species similar to *Amylothea*, but probably having to constitute a distinct genus. (Note added during printing.)
- (10) I have not yet been able to study *L. signatus* F. Mueller, from Australia, very close, it seems, to *L. indicus*, and which is probably also a *Traubella*.

- (11) A.-P. de Candolle, *Prodromus*, IV, p. 295, 1830.
- (12) Seemann, *Flora vitiensis*, p. 120, 1865.
- (13) Miquel, *Flora der ned. Indië*, p. 831, 1855.
- (14) Since the session of April 13, I have found a fifth species of *Treubella*, in a plant collected at Nouka-Hiva (Marquesas), by M. Mercier, in 1847. (Note added during printing.)