

STUDIES IN TROPICAL TERATOLOGY

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by

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To collect and codify the facts of Variation is, I submit, the first duty of the naturalist. This work should be undertaken if only to rid our science of that excessive burden of contradictory assumptions by which it is now oppressed.

W. BATESON, Materials for the study of variation, etc. London, 1894.

Dr J. J. SMITH is best known by his studies about Orchidaceae. But since 1904 he published regularly in collaboration with Dr J. C. COSTERUS in the "Annales du Jardin Botanique de Buitenzorg", the results of their researches in teratology of tropical plants. Some years ago, Dr J. J. SMITH was so kind to ask me if I would like to continue their studies in tropical teratology; I accepted this invitation.

Although botanists appreciate this part of the botanical science in more than one way, and although even the opinion about the definition of a monstrosity differs, it must be stated that what has been done by COSTERUS and SMITH in this field of the botanical science, deserves our high appreciation as they have described and pictured for the first time a large number of tropical monstrosities.

Once the study of variability was placed in the center of biological science, BATESON (3) and recently STROHL (27) strongly advocated this study, writing "dasz nicht genug geschehen kann, um Sinn und Verständnis für das Wesen und die Mannigfaltigkeit des Variationsgeschehens im lebendigen zu stärken und zu fördern, und dass gelegentlich auch unvollkommene Beiträge dazu Anregungen zu bieten vermögen".

Though the study of monstrosities has different aspects, I am compelled to give only descriptions, illustrated by a number of figures. COSTERUS and SMITH did the same. This lies in the nature of the material;

dried plant fragments, or others conserved in liquor, picked up often by amateurs, make it e.g. impossible in some cases to distinguish between galls and monstrosities. Neither is it, in many cases, possible to distinguish between primary and secondary monstrosities (STROHL, 27). Even the morphological significance of a certain phenomenon cannot be discussed, if the material is not sufficiently collected. Notwithstanding these and other difficulties mere description of monstrosities has its value. DRIESCH (13) wrote in 1911: "Die reine Beschreibung hat als "Vorbereitung für den eigentlichen Wissenschaftsbetrieb eine sehr grosse "vorläufige Rolle in allen Teilen der Biologie zu spielen". And recently it was HARTMANN (16), who in a brilliant discourse pointed out the high value of the pure inductive method for the biological science.

It is from this point of view that we have to appreciate highly the work done by COSTERUS and SMITH to the study of tropical teratology. They have broadened our knowledge of the variability (*s. l.*) of tropical plants to a great extent. I sincerely hope for these two gentlemen that the study of teratology has given them much satisfaction and may lead, as ALDROVANDI (1642) said: "ad oblitterandum admirationem" and "ad exterminandum sciendi appetitionem" for many years.

Here follows a short description or characteristic about a number of plant monstrosities of species not mentioned by PENZIG (22) in his well-known "Pflanzen-Teratologie" nor in one of the publications by COSTERUS and SMITH in the *Annales du Jardin Botanique de Buitenzorg* (see the bibliography of J. J. SMITH¹⁾) so that there is a reasonable chance that they are new to science.

Acknowledgements. The monstrosities here described form a part of a collection sent to the Herbarium of the Botanic Gardens of Buitenzorg by various persons, which will be mentioned in each case separately. I have to thank all for their valuable help in collecting these abnormalities.

The author is greatly obliged to the editors of the monthly "De Tropische Natuur", who continuously drew the attention to the study of teratology by means of a permanent advertisement as well as to Dr D. F. VAN SLOOTEN and Dr J. G. B. BEUMÉE, Director and former Director respectively of the Buitenzorg Herbarium, for keeping and sending the material.

I express my high gratitude to Prof. J. JESWIET, Director of the Institute of Plant Taxonomy and Geography, Wageningen, not only for

¹⁾ Bull. Jard. bot. Buitenzorg, Sér. III, Vol. XIV².

his permission to proceed these studies, but for many useful suggestions. In particular I wish to thank Prof. W. ROEPKE, Wageningen; the draughtsman of the latter, Mr N. CORSTANJE, having made a great part of the figures (marked N.C.). The other pictures are made by Mr AMIR HAMZAH, draughtsman at the Herbarium at Buitenzorg (marked A. H.).

That this first number of a new series will be published in this special volume of "Blumea", dedicated to Dr SMITH, is due to the kindness of Prof. H. J. LAM, Editor of "Blumea". To him I offer with special pleasure my thanks for the encouragement and sympathy he has given me.

PODOCARPACEAE.

Podocarpus imbricata BL.

Legit: TH. ETTY, JÁVA, Res. Besoeki, Pantjoer, December 1930.

Det.: J. G. B. BEUMÉE.

Fasciation of a branch, splitting into two parts, both fasciated and strongly curved; branchlets normally developed. A similar case is described by COSTERUS and SMITH (10) for *P. macrophylla* DON. Recently the terms fasciation, dichotomy and connation, so often used in different manners in teratological literature, are highly purified and sharply defined by SCHOUTE (24). I follow here his terminology. According to SCHOUTE fasciation is due to a disharmonic growth, the central zone of the vegetative cone being delatated by tangential growth of the surrounding zone of differentiating organs. Dichotomy is a spontaneous development of two centres in the neutral zone of a vegetative cone. Connation is due to confluence of the neutral zones of neighbouring vegetative cones during young stages, in which no induction zones have been formed as yet by these cones. From this point of view it is not very probable that the fasciated branch of *P. macrophylla* described by COSTERUS and SMITH, shows dicho- and trichotomy. This will be also a case of splitting, no doubt a result of unequal distribution of growth vigour.

GNETACEAE.

Gnetum Klossii MERR., fig. 1.

Legit: J. and M. S. CLEMENS, Dallas, 3000 feet, August 4th, 1931 (no. 26003 of their Plants of Mount Kinabalu, Brit. North Borneo, 1931—1932).

Det.: C. G. G. J. VAN STEENIS.

After a pair of leaf-whorls (binding whorls) the phyllotaxis is changed into a case of biastrepsis. Prof. J. C. SCHOUTE, Groningen, was so kind to affirm this view. Biastrepsis seems to be very rare in the Gnetales. PENZIG (22) mentions not a single case, and SCHOUTE does neither (25). Concerning the relation between binding whorls and biastrepsis, see SCHOUTE (25).

PALMAE.

Cocos nucifera L., fig. 2.

Legit: D. F. VAN SLOOTEN, Buitenzorg, August 1933.

We received a photograph and a picture showing a germinating coconut-plant, producing some small fruits. From a copy of the diary of Mr ROOKMAKER (then 1st class Civil Service Officer in the Rokan district, Sumatra), we learn that this plant was 6 months old. It showed 7 leaves; one of these leaves was bi-partite. Its maximum height was 40 cm. Usually these trees (called *kelapa boekit* by the natives) bear fruits after 3 years. At that moment the tree is about 2 m high. The Governor of Sumatra's East-Coast was so kind to send these pictures and notes to the Herbarium at Buitenzorg. We did not receive the original material, so our description is incomplete.

We can compare this monstrosity with a case, described by COSTERUS and SMITH (8) and called by them "paedogenesis". What has been described by COSTERUS and SMITH is a flowering plant; in the Gardener's Chronicle of 1893 a parallel phenomenon is to be found. This last abnormality is also mentioned by GOEBEL (15).

ARACEAE.

Amorphophallus spec.

Legit: ?, July 1931.

We received only a fine hand-coloured figure of an *Amorphophallus* spec. showing a leaf-like spathe. According to COSTERUS and SMITH (7) and SMITH (26) the phenomenon of splitting of the spathe of *A. variabilis* Bl. is not uncommon. But I am not sure that the spathe we consider here, shows only splitting. The picture gave us the impression that the spathe has developed excessively, and that specially this abnormally developed part shows a leafy character. We can distinguish between a basal part or the real spathe and an apical part, which is more leafy. According to ARBER (1) the spathe is a modified leaf borne on the inflorescence axis. She also pointed out that in various genera evidence may be found

that the spatha is a leaf-base structure. I mention here only what is said about *Calla palustris* L.: "The spatha is small in size, but it is interesting "as showing the solid tip which is not infrequently characteristic of these "leaf-base structures, and which may, I think, be explained as a vestigial "petiole". The abnormal spatha here described can perhaps support the view that also in *Amorphophallus* the spatha possesses a leaf base nature.

LEGUMINOSAE.

Leucaena glauca BENTH.

Legit: Chief-Forester of Garoet, Garoet, Res. Priangan, Java, Nov. 24th, 1933.

Det.: D. F. VAN SLOOTEN.

a. Fasciation of the stem; the stem is partly split longitudinally into two parts, both dorso-ventral (GEORGESCU, 14), hardly curved and bearing a small number of normally developed branchlets. There are also 1—4 normally developed branchlets below the top. Before splitting the stem is folded over a small distance.

b. Dorso-ventral fasciation of the stem, not folded; the stem is partly split longitudinally into two parts, both strongly curved. The smaller part ends in a number of buds, the larger one in 4 normally developed branchlets.

Lonchocarpus cyanescens BENTH.

Cult. in Hort. Bog. XVIII. W. 96.

Fasciation of a stem, split into two parts half-way down. The smaller part shows splitting again below the top. At each top of the three fasciated axes the buds are crowded. The tops are but very little curved.

OXALIDACEAE.

Oxalis sepium ST. HIL. var. *picta* PRAG.

Legit: A. RANT, Java, Soerabaja, *in suo horto*, May 15th, 1932.

Det.: C. G. G. J. VAN STEENIS.

Fasciation of the stem; top curved, ending in a number of buds, branchlets normally developed.

This phenomenon seems to be very rare in the species of the genus *Oxalis*. According to PENZIG (22) it is only mentioned for *O. crenata* JACQ. by CRÉPIN, CATTIE (6), HUS (17) and KUNTZE (18). PENZIG has cited CRÉPIN incorrectly; he mentions an article: "Recueil de faits tera-

tologiques, 2" in the "Bull. de la Soc. Roy. de Botanique de Belgique" (Vol. 4, p. 276, 1865).) In the Volume referred to a fasciation of *Oxalis crenata* is not yet mentioned.

RUTACEAE.

Citrus spec., figs 3—5.

Legit: W. J. D. TOOROP, Java, Buitenzorg, cult. in horto at Batoetoelis.

Fruit consisting of one carpel (fig. 3). There is a septum of a cartilaginous constitution (like the base of the emergentia) sometimes partly developed (fig. 4), sometimes dividing the fruit into two parts (fig. 5). It is perhaps a fusion of emergentia. Separation of the carpels (dialysis) is not uncommon in *Citrus*. Well-known is e.g. *Citrus medica* L. var. *digitata* (LOUR.) RISSO (= *C. medica* L. var. *sarcodactylis* [SIEB.] SWINGLE) with separate carpels, called Buddha's Fingers (VON WETTERSTEIN, 30; BERGER, 4). But PENZIG (22), who has made a special study of *Citrus* monstrosities, never found less than 4 carpels. Our fruit resembles more or less the picture given by MASTERS (19) in his work "Vegetable Teratology" on page 74 (fig. 32) (German Edition, p. 95, fig. 33), but in the text he refers not to this figure.

BOMBACACEAE.

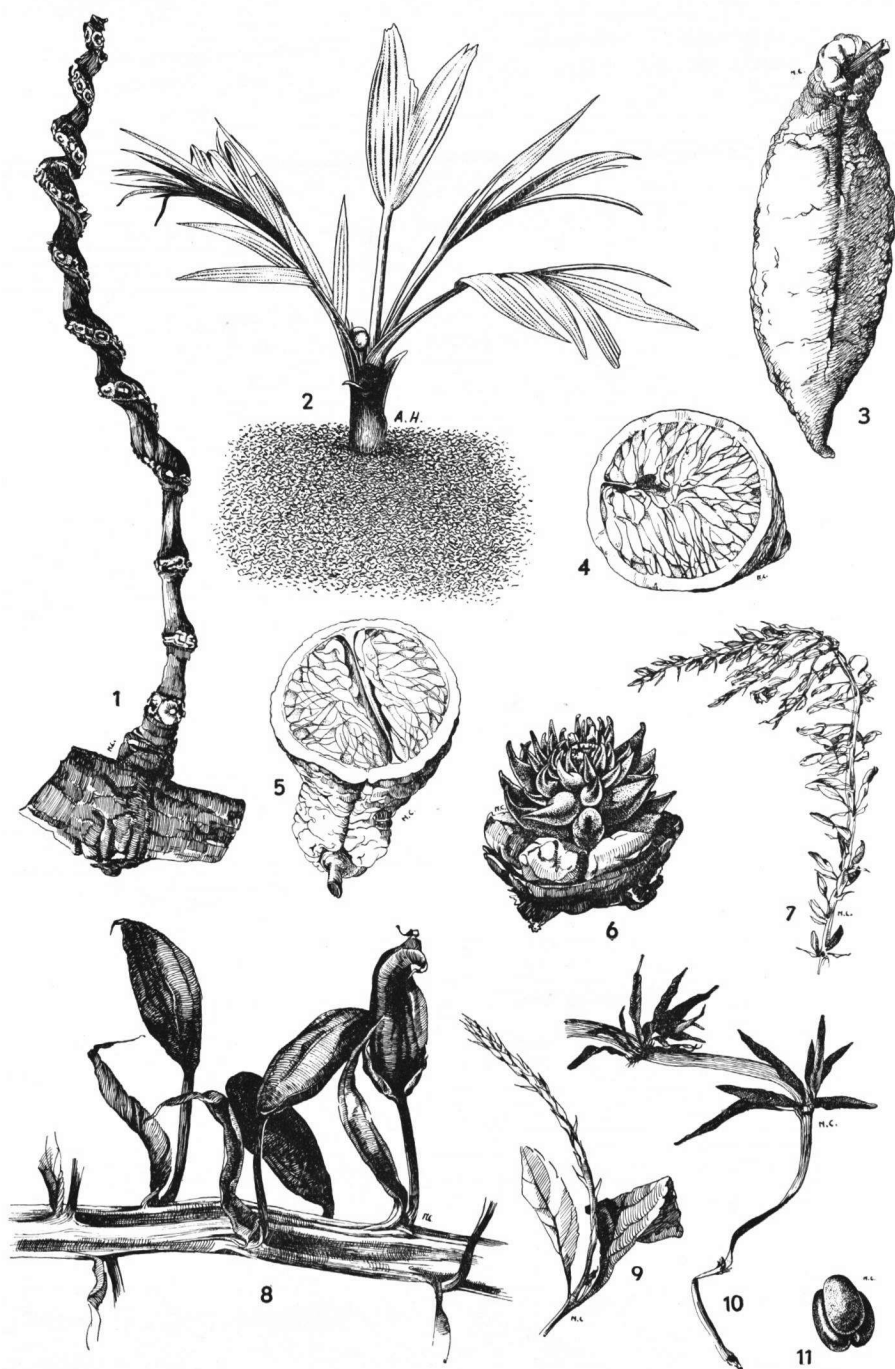
Durio zibethinus MERR., fig. 6.

Legit: A. RANT, Java, Soerabaja, Febr. 27th, 1933.

Det.: A. RANT.

A body found in a ripe fruit of *Durio*, high 13 mm, broad 17 mm. Though the material at hand not allowed to determine the position of this body in the fruit, it seems to me that we can compare it wholly with a parallel case already described, first by J. J. OCHSE (21) and later on the same object by COSTERUS and SMITH (12). It was already known to RUMPHIUS (23), who called it a "fructus in fructu". It is perhaps a case of median proliferation, with a tendency to apocarpy.

The phenomenon seems to be very rare. After RUMPHIUS it was OCHSE who was the first to find a second example. It is undoubtedly interesting to learn the original latin passus of RUMPHIUS, which runs as follows: "Rarum Durionis monstrum obortum fuit anno 1687 in arbore "crescente in *Passo Baguala*, quae duobus subsequentibus anni temporibus monstrosum fructuum genus produxit: Hique exterius formam vulgarium Durionum referebant, oblongiores tamen erant ac minores, ac intus in ordinarias quinque cellulas divisi, quarum quatuor repletæ



Figs 1—11 — Explanation in the text.

"erant ordinariis suis ossiculis ac eduli nucleo seu medulla, in quinta vero cellula continebatur alius parvus oblongus Durio, similibus spinulis obsessus ac reliqui Duriones, omnibus lutescentibus. In huius medio nullae distinctae erant cellulae, sed spongiosa tantum medulla, per quam lignosus transibat nervus fructus pedunculo nexus, ac superiore parte digitum longus, protuberans: Haec autem plantarum augmentatio in aliis quoque Indiae observatur arboribus et herbis, praesertim in *Pompelmoes* fructu, ubi unus alteri increscit fructus".

VERBENACEAE.

Stachytarpheta cayennensis VAHL.

Legit: SAPEÏ, on a river bank, Tjiomas near Buitenzorg, December 18th, 1930.

Det.: C. G. G. J. VAN STEENIS, 1930.

Only the terminal inflorescence is fasciated. The fasciation is a bilateral one (GEORGESCU, 14) and is slightly twisted. Normally the flower buds are placed in excavations of the axis. This is also in the lower and middle part of this fasciated inflorescence, but not in the apical part; here the hollows have completely disappeared or nearly so.

Stachytarpheta indica (L.) VAHL, *figs* 7—9.

Legit: A. RANT, Amboina, Benteng, Oct. 25th, 1931 (no. 565).

Det.: R. C. BAKHUIZEN VAN DEN BRINK.

a. Normally the flowers are sessile or nearly so. The flowers of one inflorescence of this specimen are distinctly pedicellate near the top. The pedicel is at least but little smaller than the bract. Some of these flowers bear also two bracteoles. These abnormal flowers are followed by a number of inflorescences, also spikes (racemes). Usually these spikes end in a number of bracts (bracteomania). The last flowers of the main axis are more or less pedicelled, and at the top they are sessile. There is therefore first an increasing of the monstrosity, and then a distinct and rapid diminution, so that the last flowers are normal (*fig.* 7). Bracteomania is also described in *S. jamaicensis* VAHL (COSTERUS and SMITH, 9). There is, however, a difference. The abnormal spike of *S. jamaicensis* is seemingly racemose, but in fact we have to do with elongate thalami, covered with bracts. In our case the axes of the 1st order are really spikes. The reappearance of the prophylla is very interesting (*fig.* 8). BRIQUET (5) writes in his description of the Verbenaceae: "Die Vorblätter sind bald beide entwickelt, bald auf 1

"reduziert, bald ganz unterdrückt (z. B. Arten von *Verbena*, *Lippia*, "*Bouchea*, *Stachytarpheta*).“ — Also DANSER (12) in his description of *Stachytarpheta* species never mentions prophylla.

b. A second abnormally developed inflorescence is about 8 cm long. It consists of a large number of bracts; near the top they are closely placed together. Only the basal part shows well developed internodia and only some bracts of this part bear sessile buds (fig. 9). COSTERUS and SMITH describe bracteomania of lengthened thalami of *S. jamaicensis*. Here we have certainly not bracteomania of a thalamus, but of the spica axis.

SCROPHULARIACEAE.

Russelia equisetiformis CHAM. et SCHL.

Legit: MACLAINE PONT; Java, Soerabaja, Modjokerto-Trowoelan, March 20th, 1921.

Det.: D. F. VAN SLOOTEN.

a. A weakly developed fasciation. The stem gradually broadens in the sagittal plane. In accordance with the slowly broadening of the stem the number of developing buds and branchlets increases regularly. We noted the following number in succeeding nodes:

2 buds + 10 branchlets	(12)
9 buds + 4 branchlets	(13)
7 buds + 8 branchlets	(15)
13 buds + 2 branchlets	(15)
19 buds + 2 branchlets	(21)
22 buds + 1 branchlet	(23)
32 buds + 1 branchlet	(33)
34 buds + 1 branchlet	(35)

The last mentioned whorl is the 4th from the top. It is not well possible to count the buds of the last 3 whorls, without destroying the material. The top is folded, split into two parts, which are but very little curved. A similar case is described by COSTERUS and SMITH (10) for *R. juncea* ZUCC.

a. A very strongly developed fasciation of the stem, folded in its upper part. The position of the branchlets in whorls is in many cases strongly disturbed and changed into a spirally one. The axis shows further torsion and splitting into two parts. One of these parts shows also splitting into two parts, both curved, whereas the other is folded.

RUBIACEAE.

Borreria stricta MEY., fig. 10.

Legit: ?, Philippines, Luzon, Rizal Province, Mount Ramos, October 1913.

Det.: C. G. G. J. VAN STEENIS.

A fragment of a plant, showing a fasciated axis.

Coffea spec., fig. 11.

Legit: W. C. VAN HEURN, Java, Buitenzorg, Cultuurtuin (Experiment Garden), March 1932.

According to the label a fruit with three seeds. I only received the seeds. BAILLON (2) writes: "Le gynécée se compose d'un ovaire infère, ordinairement biloculaire" and in a foot-note: "il est quelquefois triloculaire". I suppose that there are in this case three carpels forming three loculi, each containing one ovule. It seems not very probable to me, that there are here two loculi, one with two seeds, the other with only one, though in some related genera there are one or two ovula in each loculus (*Lachnastoma*) or one (?) to many ovula in each loculus (*Diplospora*) (VALETON, 28).

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