

Studies in Teratology

BY

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With Plate I.

1. PROLIFIGATION IN *RUDBECKIA AMPLEXICAULIS*.

From Mr. J. J. Smith (Java) I received three remarkable specimens of the above plant, which he collected in the Botanical Gardens August 1905. One of these specimens showed a series of ligulate florets turned downwards and altogether normal, next a zone, 2 cM. wide, of tubular *proliferous* florets and finally a great number of *normal* tubular florets.

In the first place I wish to say a few words about the proliferous florets. For clearness' sake it should be mentioned that the *normal* tubular florets do not show much peculiarity: from fig. 1 it appears that the style is orbiculate at its base and bifurcates at the top into two stigmas covered with rather bristly hairlets.

The prolificed florets are in the first place *peduncled* and show a corolla of which the inferior part is urceolate and the upper part infundibuliform quinquedentate (fig. 2). The urceolate part encloses no ovary but lets the peduncle pass which rises more or less above the corolla and always ends in a secondary headlet.

The pistil is, consequently, not present, that is to say in its ordinary shape, but as a matter of fact it is split up into two leaflets (carpels) which are either hidden in the floret

or come out of it. The carpels have consequently become superior, a deviation which calls to mind the superior ovary mentioned by Masters ¹⁾ in an abnormal specimen of *Rudbeckia spec.* and of a monstrous *Cichorium Intybus* described by Prof. A. Bétékoff ²⁾.

Instead of two carpels I found now and then 3 and even 4 of them in a whorl (fig. 3c).

In another flower, also with 4 carpels in a whorl, two of them reached beyond the others on account of their having grown together with the lengthened thalamus and their being a little longer. One of these two split up into two in such a way that the one lobe showed the peculiarities of an ordinary stigma (fig. 4).

It may, however, also happen that the carpels are altogether lost, as shown in fig. 5. Here is no distance between the floret and the headlet, consequently it seems very probable that the carpels have taken the qualities of the bracts and have lost themselves between those.

Once only 1 carpel was found, once on the contrary 5 of them.

In — a long but fruitless — search of florets with a superior ovary on the boundary of the normal and the proliferous tubular florets I came across two carpels of deviating shape, fig. 6a and b. In a a stigma-like appendage near the base is to be seen, but in b it is a division into three parts that draws attention.

Thus much on the carpels, next some remarks about the *stamens*. These are without an exception free, viz. in no connection with one another (fig. 7). ³⁾ And as to their

1) Masters. Pflanzen-teratologie, p. 103. Also Transact. Linn. Soc. Vol. XXIII, p. 365.

2) Mémoires de la Société nationale des sciences nat. de Cherbourg. T. XXI (1877).

3) The same thing was observed by Bétékoff l. c.

insertion, they are usually springing from the corolla, sometimes however from the lengthened thalamus (fig. 8). With respect to their shape they are as a rule normal, once, however, I found the whole whorl affected in the direction tending to petalody. Fig. 9 represents two of them; although the outlines of the anthers are recognisable, they proved on examination perfectly foliaceous.

The *corolla* is generally not longer than $4\frac{1}{2}$ mM. and not shorter than $3\frac{1}{2}$ mM., consequently about half as long as the fullgrown tubular florets. The mouth of the shortened tube is wider.

As has already been stated the lengthened thalamus ends in a secondary headlet. The length of the peduncle bearing the headlet, is, as shown in the figures (fig. 10 excepted, on which see *infra*) limited rather narrowly. The headlet is — like a primary head — surrounded by a series of bracts and consists of tubular florets only, all of which are closed in the specimens at my disposal. The construction of the florets is normal, indications of a second proliferation were not to be seen. The secondary headlets produced by *tubular* florets consist in fact of tubular florets, nevertheless I found a small number, and these close to the margin, which moreover possessed a few ligulate florets.

Of the same specimen I have also examined the *ligulate* florets. Some of them proved to prolify. The whole appeared to consist of a peduncled ligulate corolla the centre of which bore a peduncled headlet. This secondary headlet consisted of bracts and *ligulate* florets with (inferior) *ovary* and two stigmas. Apparently these secondary florets were *fertile* thus differing from the primary *sterile* florets.

The *second* specimen was much poorer of proliferations and deserves on account of the slight difference from the specimen just described, no special description.

The *third* specimen, however, attracted attention at first

sight by the extraordinary lengthening of the secondary peduncles and the circumstance of their originating, with only a few exceptions, from the *ligulate* florets. The secondary headlets consequently protrude a long way or droop far downwards, the peduncle varying between 1 and $7\frac{1}{2}$ c.M. I have chosen to examine one of them in detail (comp. fig. 10): peduncle $3\frac{1}{2}$ c.M., at the base enclosed by the primary ligulate flower. Higher up, about halfway, a semi-amplexicaulous bract springs from it, close under the headlet a second, a little smaller one. It is not probable that these bracts are to be compared with carpels: firstly on account of the ordinary absence of the pistil in the ligulate flowers of *Rudbeckia*, but secondly especially on account of their *non-opposition*. They might rather be compared with proliferous flowers.

The headlet itself consists of a few whorls of ligulate flowers and a compact mass of tubular ones, which are closed. The other ligulate florets are constructed on the same pattern, but as has been already said vary the length of their peduncles from 1 to $7\frac{1}{2}$ c.M.

Most of them spring from a small ligulate corolla, two only from tubular florets towards the centre.

The number of cases observed of median floral proliferation in the Compositae is not great; Masters mentions as such *Hieracium*, *Cirsium*, *Bidens*, *Calendula*, *Spilanthes*, *Carthamus* und *Coreopsis*. Penzig cites the said genera and has not much to add, e.c. *Tragopogon* (II p. 101).

On account of this circumstance I thought it worth while to augment the series with *Rudbeckia*.

2. RASPBERRIES ON A BIFURCATE THALAMUS.

In the summer of 1906 I was regaled with raspberries which were extraordinarily broad and on eating proved to

enclose a bifurcate thalamus (fig. 11). The question arose: is this bifurcation to be put down to subsequent rupture of the growing receptacle or to dichotomy in its youngest stage of development. My specimens — only eight of them were kept — showed the following:

1°. Sepals 6 outer and one inner alternating with two of the former. The receptacle (thalamus) is split up into two and even part of the peduncle is affected in the same way. Drupels have evidently been implanted on the outer surfaces of the parts of the receptacle. The whole thing makes the impression of bifurcation caused by a stronger growth of the periphery in contrast with the axis.

2°. Sepals 5. The cleft divides three from two sepals. For the rest as in 1°.

3°. Sepals 6, divided into two sets of 3.

In none of these cases has the calyx been completely split up showing cohesion near the top of the divided sepals.

4°. The cleft goes through the middle of two sepals in such a way that on the one side there is *one* entire sepal, on the other still *two*.

5°. The cleft divides three sepals from two. The peduncle is scarcely affected, but the calyx-tube is very distinctly split up.

6°. Two sepals divided from three, peduncle only a little affected. Two inner sepals, of which one is petaloid.

7°. Two sepals divided from three. There is an inner whorl of sepals, of which one is more or less petaloid. Peduncle distinctly but slightly split up.

8°. Two ordinary and one small sepal at both sides of the cleft. The two small ones might be the halves of a large one. Calyx-tube split up at one side only, the tops of the (double) receptacle strongly curved so as to touch one another.

From these eight cases it appears

a) that the calyx has been augmented, a fact calling to

mind, indeed, the double calyx described by Ch. Fermond¹⁾, which, however, owing to the impression that it makes, scarcely admits of the proposed comparison with the calyculus of the Pontentilleae,

b) that the innersides of the half receptacles are *never* covered with drupels,

c) that the cleft in several cases affects also the peduncle,

d) that in the majority of the cases one of two sepals are rent at the base together with the calyx-tube,

e) that the cleft divides the calyx either into equal or into unequal parts.

From *b*, *c* and *d* we must gather that here is a case of *subsequent splitting* of the growing receptacle but *not* of original dichotomy.

I draw special attention to this conclusion, because Godron who seems to be the only one who has described this deviation, has got a different impression from it, as appears from his words, which I quote

„Cette anomalie n'est pas rare sur les Framboisiers de mon jardin. La division a lieu dans la direction du plan médian de la fleur, elle va jusqu'à *la base* du réceptacle conique, mais les surfaces par lesquelles les parties séparées se regardent, sont complètement dépourvues de carpelles”²⁾.

Also the circumstance of his classing the anomaly with „partitions des axes végétaux” together with indubitable cases of bifurcation of the meristeme elucidates his opinion on this point.

For the rest the cases observed by Godron differ from mine by the less deep division of the receptacle „jusqu'à la base” and its direction „dans la direction du plan médian de la fleur”.

1) Penzig, Pflanzen-teratologie I, p. 425.

2) D. A. Godron, Mém. de la Soc. des sc. nat. de Cherbourg, 2e Série, Vol. VIII, p. 324.

The notes sub 1°—8° sufficiently show that in my case the direction lacks constancy.

That the tension of tissues causing the splitting up of both receptacle and peduncle, is in close connection with the increase of peripheric parts of the flower, is, I think, self-evident.

The origin of my raspberries being unknown, we must for the present forego further investigation into the causes of the case.

3. A THREEFOLD CHERRY.

In the summer of 1906 I received from Mr. D. N. Steenveld of Amsterdam a monstrous cherry, which is represented in natural size in the annexed figure 12. The right and the left one were perfectly normal, the one in the middle on the contrary shows an entirely deviating shape and proved on longitudinal section to lack a stone. That we have nevertheless to do with a grown out ovary appeared from the presence of the well-known dot left behind by the style.

It need be hardly mentioned that botanical literature is rich in notes on double cherries, that even 5 cherries on one peduncle have been registered. At the same time we know that the cause of such deviations is to be found either in synanthly, or in bifurcation of the receptacle or in augmentation of the carpels within the limits of the same flower. Besides we are aware of the great difficulty if not impossibility of these cases being distinguished when full-grown, in which stage they are generally come into our hands. But whether there have been registered cherries of the above description, I am not in a position to tell and that's why I thought it worth while to draw attention to it.

July 1907.

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