

## ON THE TERATOLOGY OF CERTAIN INDIAN PLANTS—VI<sup>1</sup>

BY  
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The collection forming the subject matter of this paper was made from different sources enumerated below. It deals with abnormalities of seedling, leaf, stem and seed in the following species of angiospermous plants:—

PALMAE: <i>Areca catechu</i> L.	...	From Indore, C. I.
MORACEAE: <i>Ficus religiosa</i> L.	...	„ Patna, B & O.
LEGUMINOSAE: <i>Acacia arabica</i> Willd.	...	„ Indore, C. I.
EUPHORBIACEAE: <i>Ricinus communis</i> L.	...	„ Daltonganj, B. & O.
CARIOACEAE: <i>Carica papaya</i> L.	...	„ Indore, C. I.
OLEACEAE: <i>Jasminum sambac</i> Ait.	...	„ Lyallpur (Punjab).
CONVOLVULACEAE: <i>Ipomoea pulchella</i> .	...	„ Lucknow, U. P.
COMPOSITAE: <i>Zinnia elegans</i>	...	„ Indore, C. I.

### *Areca catechu* L. (Betel-nut).

*Areca catechu* L., is a member of the Palmae and is largely cultivated in tropical Asia for its seeds (betel-nut) which in thin slices are usually chewed with Betel pepper.<sup>2</sup>

A double nut of this plant was obtained from a Panwalla (Betel-seller) at Indore through the courtesy of a friend<sup>3</sup> of mine. The abnormality consists in the two seeds having fused to each other by their posterior sides (Fig. 3). Each portion of the double-nut, has its own hilum (scar) at the top and is normal both in external and internal morphology.

### *Ficus religiosa* L. (Pipal).

*Ficus religiosa* L., a very big-sized tree. Its leaf is characterised by the presence of a long acuminate apex (drip-tip). An abnormal leaf of this plant was chancedly met with in a heap of dry pipal leaves at Patna.<sup>4</sup>

<sup>1</sup> Singh, T. C. N. (1930), p. 16.

<sup>2</sup> Willis, J. C. (1919), p. 52.

<sup>3</sup> Babu Nihal Singh.

<sup>4</sup> Nanbmahian mahalla.

The leaf has two drip-tips (Fig. 5) but has a single petiole. The mid-rib is common for nearly more than half-way where it forks into two, each of them continuing right up to the tip of the drip-tips. The sinuation of the leaf-margin and venation are quite normal.

***Acacia arabica* Willd. (Babool).**

The abnormal specimens described here were got from young *babool* trees growing on the river-side of the Residency Gardens at Indore. These specimens looked like tiny dried woody 'coniferous' cone-like bodies studded irregularly on the rachis and shoots. On close examination it has been found that they are formed as if, by the secondary rachis or the whole leaf itself being 'telescoped' at a point, thus resulting in a close packing of the pinnules together, simulating a tiny cone (Fig. 6).

These bodies, when formed of a full leaf, occur between the fork of the two spines. The fact that these cone-like bodies are of the nature of leaves is identified by the presence of a bud in their axils and in the case where they are of the nature of secondary rachis they occur on the primary rachis in a homologous position as the secondary rachis. The tiny woody 'scales' forming the cones are virtually the pinnules which have become dry and woody yet their venation is of the normal type.

***Ricinus communis* L. (Castor-oil).**

In the summer vacation of 1923 while at Daltonganj (Bihar), out of a large number of castor-oil seedlings growing wild, a few of them were found to possess three cotyledonary leaves (Fig. 1) instead of the normal two. Of three such leaves, two of them (one big and one small on the left) are confluent at the very base, looking as if they have resulted in ontogeny by the splitting of a normal cotyledon. The lamina of the cotyledonary leaves are sinuate and their corresponding petioles although channelled are not glandular, else the description is in close agreement with that given by Sir John Lubbock for normal seedlings.<sup>1</sup> In two of the bigger cotyledons, there are five veins springing from the point of junction of the lamina and the petiole, but in the abnormal third cotyledon there are only four such veins and a mid-rib has been found to be absent.

***Carica papaya* L. (Pawpaw).**

In this species also, several cases of tricotyledony were met with in a culture of seedlings which were being raised for transplantation. The cotyledon on the right (Fig. 4) is quite normal, but the two

<sup>1</sup> Lubbock, Sir J. (1892), p. 489.

on the left as in *Ricinus communis*, L., appear to have originated in ontogeny by chorisis. The top left one, is of nearly the same size and shape as the right one. The lower left one, of course of the same shape, is smaller than both of them. The venation is quite normal in all the three cotyledons. The margin is entire.

### *Zinnia elegans*.

It is very commonly grown in gardens. In a culture of seedlings seven tri-cotyledonous seedlings were noticed. (Figs. 7 and 8). The cotyledons were of the same form and size, each with one vein running medianly. The three cotyledons alternated with the vegetative leaves above.

The full life-history of the di-cotylous (normal) and the tri-cotylous seedlings was studied for the sake of comparison. In the di-cotylous one, it was found that the successive leaves throughout its ontogeny were opposite and alternated with the pair of leaves below. While in the tri-cotylous one, the sequence was as follows:—

1. First leaves, in a whorl of three, alternating with the three (whorled) cotyledons below.
2. Second leaves, in a whorl of three, alternating with the lower whorl.
3. Third leaves, in a whorl of only TWO leaves (in position as if alternating)
  - (a) one leaf being normal
  - (b) the other being double (with a common petiole, two leaf-tips, and forked mid-rib).
4. Fourth leaves, in a whorl of two, alternating with lower whorl, but with crumpled margins.
5. Fifth leaves, in a whorl of two, alternating with the lower pair but with lamina very much crumpled.
6. The subsequent leaves very much deformed and crumpled, although plant bore normal capitula.

A very interesting case of a di-cotylous seedling of *Zinnia elegans* was met with, in which the first leaves were fused together by their posterior edges (Fig. 2). Each had a mid-rib to itself, being common towards the base. The stalk (petiole) attachment to the lamina was also common. Presumably the stalk was of a compound origin having been formed by the complete fusion of two petioles. The cotyledonary leaves were one veined.

Instances of tri-cotyledony are known among the Angiosperms, e. g. in *Silene odontipetala*, *Papaver Rhoeas*, *Acer Rhoeas* and others,<sup>1</sup>

<sup>1</sup> Gager, C. S. (1920), p. 222.



and Gymnosperms, e.g., in conifers.<sup>1</sup> The occurrence of these extra cotyledons besides the normal two, among the Dicotyledons has been regarded by Gager and Bucholz as reversions to the ancestral condition which is fully displayed in the polycotyledonous embryos of the Conifers. In a more recent paper Bugnon,<sup>2</sup> too, has expressed the same view. It may, however, be remembered that Professor Julius Sachs, as far back as fifty years, was the first to point out that the polycotyledonous condition amongst the Dicotyledons is a reversion phenomenon.

### **Jasminum sambac Ait.**

*Jasminum Sambac* Ait. is the *motia* or *bela* cultivated in gardens for its sweet-scented flowers.

Ernest and Dammer have described fasciation of shoot in this species. Dammer has also mentioned synanthia and Regel has described double flowering forms, which indeed are produced by the petaloidy of the stamens, while Jaeger has observed even serial doubling of the petals.<sup>3</sup> All these observations have been confirmed in my specimens also (fig. 9). In addition, fasciation of the peduncle has been noticed. The flattened axis (peduncle) appears to have been formed by several peduncles being bundled up into one. Crowded up at its apex may be seen a large number of flowers of the type noted by Dammer, Regel and Jaeger.

### **Ipomaea pulchella (Railway creeper).**

It is commonly known as railway-creeper. Fasciation of the stem is quite a common phenomenon in this species. The abnormality consists in a flattened axis which looks as if several twining stems have become fused to each other without much losing their identity. The leaves arising on them are quite normal of the usual palmate type.

### **Summary.**

Abnormalities have been described in the following species of the flowering plants belonging to the families; Palmae, Moraceae, Leguminosae, Euphorbiaceae, Caricaceae, Oleaceae, Convolvulaceae and Compositae.

- (1) Occurrence of tri-cotyledony: in *Ricinus communis*, *Carica Papaya* and *Zinnia elegans*.
- (2) Double leaf: in *Ficus religiosa* and *Zinnia elegans*.

<sup>1</sup> Bucholz, J. T. (1919), pp. 118-9.

<sup>2</sup> Bugnon, P. (1926), pp. 1088-94.

<sup>3</sup> Penzig, O. (1921-22), p. 35.

- (3) Double nut : in *Areca catechu*.
- (4) Fasciation of : (a) stem in *Ipomaea pulchella*.  
(b) peduncle in *Jasminum sambac*.
- (5) *Acacia arabica* : Peculiar tiny woody cone-like bodies occur on the stem and the rachis. On close examination it has been found that they are formed as if by the secondary rachis or the leaf as a whole being 'telescoped' at a point, thus resulting in a close packing of pinnules together, simulating a tiny cone.

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### Explanation of Text-Figures.

- Fig. 1. *Ricinus communis* L. : A tricotyledonous seedling.  $\times 1/3$ .
- Fig. 2. *Zinnia elegans* : A seedling showing the first pair of leaves fused together.  $\times 1/3$ .
- Fig. 3. *Areca Catechu* L. : A double nut.  $\times 2/3$ .
- Fig. 4. *Carica Papaya* L. : A tricotyledonous seedling.  $\times 1/3$ .
- Fig. 5. *Ficus religiosa* L. : A leaf with two drip-tips.  $\times 1/3$ .
- Fig. 6. *Acacia arabica* L. : A shoot showing a 'cone'-like body present between the two spines.  $\times 1/2$ .
- Figs. 7-8. *Zinnia elegans* : Tricotyledonous seedlings.  $\times 1/3$ .



Figure 9. *Jasminum Sambac* Ait.: Two inflorescences showing fasciated peduncles.