

A NOTE ON SOME ABNORMAL FLOWERS OF *HIBISCUS ESCULENTUS* L.

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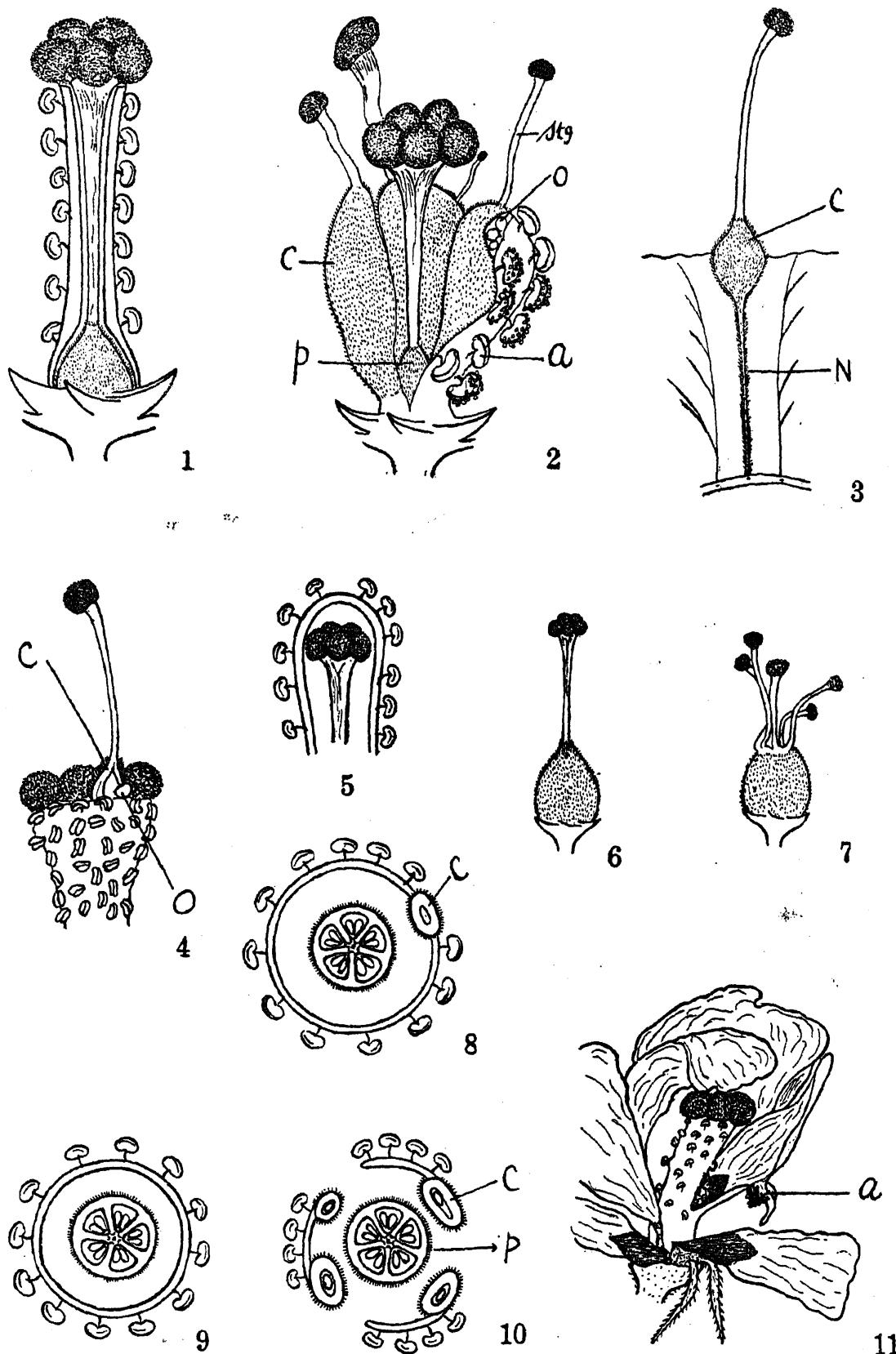
SOME interesting examples of abnormalities in the floral structures in plants of several natural orders have been recorded from time to time. Many such cases have been recorded in some species of *Gossypium* and *Hibiscus*; but, as far as the author is aware, only very few instances of such abnormalities in the flowers of *Hibiscus esculentus* have so far been reported upon.

The occurrence of intracarpellary fruits has been recorded by Delavaud (1858) in *Hibiscus tiliaceus*, and by Harris (1913) in *Hibiscus esculentus*. Such an instance has also been reported by Bergman (1932) in some hybrid forms of *Hibiscus*. The presence of extra-carpellary outgrowths has also been recorded in *Hibiscus esculentus*. Saksena (1932) found a few outgrowths from the syncarpous fruits of this species, and Venkataramani (1945) observed a second rudimentary ovary with a separate style and stigma of its own in a flower of the same species.

Wilcox and Holt (1913) and Bergman (1932) have recorded another type of abnormality in some hybrid *Hibiscus* in which a second flower was produced through an extension of the central axis of the primary flower.

Instances of petalody have been recorded in some species of *Gossypium* and *Hibiscus* (Sankaran, 1931; Ramanatha Ayyar and Sankaran, 1934; and Singh, 1935). The production of stalked stigma-like structures from the staminal tube of the flower has been recorded in *Hibiscus esculentus* by Venkataramani (1945). In this abnormal flower from the free end of the staminal tube were produced two thread-like structures resembling the style, each ending in a stigma-like body. The same flower showed another abnormality, viz., the doubling of the epicalyx—there were two whorls of epicalyx one over the other.

The occurrence of carpellody in *Hibiscus esculentus* has been recorded by Agharkar (1927). In all the cases of carpellody observed by him one to three of the topmost stamens of the staminal tube were modified into carpellary structures. According to him, the basal part of the filament became



Text-Figs. 1-11.—Diagrammatic sketches showing the abnormalities in some flowers of *Hibiscus esculentus* L.

Fig. 1. Showing a section of the staminal tube of a normal flower and the pistil.
 Fig. 2. Staminal tube modified into three portions with carpel-like structures. *a*, anther;

o. ovules; *stg.* style and stigma; *p.* normal pistil in the middle of the three staminal portions; *c.* carpel-like structure. Fig. 3. A portion of the staminal tube with a stamen modified into a carpel-like structure (viewed from inside the staminal tube). *C.* broadened carpillary portion on the staminal tube; *N.* narrow, slender portion of the carpel with hairs extending to the base on the inner surface of the staminal tube. Fig. 4. A part of the staminal tube with a number of stamens on the outer surface and the modified carpillary structure. *C.* carpel; *O.* exposed ovule. Fig. 5. Staminal tube completely covering the stigmatic lobes. Fig. 6. A normal pistil with a single stylar column and five separate stigmatic lobes at the top. Fig. 7. An abnormal pistil with five separate styles, each ending with a separate stigma. Fig. 8. Diagrammatic sketch of the staminal tube in section showing a single stamen modified into a carpel (*C*). The normal ovary is in the centre. Fig. 9. Diagrammatic sketch of the staminal tube and ovary of a normal flower. Fig. 10. Diagrammatic sketch of the staminal tube and ovary of an abnormal flower showing the staminal tube modified into three portions. *C.* carpel-like structure; *p.* normal ovary. Fig. 11. Flower showing petalody. Note the position of the petaloid structure. *a.* anther lobe showing a few pollen grains.

broader and bore one or two ovules on the margins, thus resembling an open carpel; the middle part of the filament developed into the style while the anther was replaced by the bushy stigma.

The writer came across five types of abnormal flowers in *Hibiscus esculentus* during the years 1946-47 in the experimental plots of the University Botany Laboratory, Madras. As these types of abnormal flowers do not appear to have been recorded previously they are briefly described below in this communication.

1. *The complete covering of the stigmatic lobes by the staminal tube.*—This was observed in a flower (variety, "Podugu") which had been bagged for self-pollination. The flower was found shed, and on examination it was found that the stigmatic lobes were completely enclosed within the staminal tube (Plate III, Fig. 9; Text-Fig. 5) and were, therefore, prevented from being pollinated. The shedding of the flower was evidently due to the failure of pollination.

2. *Separation of the styles.*—This type of abnormality was met with in a flower of another variety, "American Long Green". There were five separate styles, each with a stigma of its own and all the five styles arising from the top of the ovary, unlike in the normal flower where there is a single stylar column which divides only at the top into five or more separate stigmatic lobes. In this abnormal flower four of the stigmatic lobes were observed to come out tearing through the staminal tube (Plate III, Figs. 7 and 8; Text-Figs. 6 and 7).

3. *Petalody.*—Two instances of petalody were observed by the author in the flowers of *Hibiscus esculentus*. In both the cases one of the stamens was modified into a petaloid structure (Plate III, Figs. 1 and 3). In one of

these two cases an anther lobe with apparently normal pollen grains was found on the margin of this modified structure (Plate III, Fig. 2; Text-Fig. 11). In the second flower, however, no such anther lobe was found.

4. *An instance of Carpellody.*—An interesting case of carpellody was observed in a flower of the variety P-15 originally obtained from the Punjab. In this abnormal flower the staminal tube was split lengthwise into three portions (Plate III, Figs. 5 and 6; Text-Fig. 2). In two of these three portions one of the stamens was modified into a carpel-like structure, while in the third two stamens were similarly modified into carpillary structures (Text-Fig. 10). In each of the two former portions the modified carpel was broad and elongated and was attached to the staminal tube portion on one side. The staminal tube portion was normal with the usual large number of stamens. The new carpel-like structure had a long style ending in a large and round stigma. The upper portion of the carpel was slightly open exposing some of the ovules. The outer surface of the carpillary portion was covered with hairs as in the normal carpel of the flower.

In the third portion of the divided staminal tube two stamens were modified into carpel-like structures and between these two was seen the attached staminal tube portion (Text-Fig. 10). One of the carpels on the staminal tube portion was large and similar to the carpel of the other two portions of the staminal tube with the upper portion slightly open exposing some of the ovules. The other carpel was smaller and had a very short style with a small stigma at the top. This carpel was not open but was completely closed.

This abnormal flower differed from the normal one in that the staminal tube was modified to contain within the normal style and five stimagtic lobes at the top (Plate III, Fig. 6; Text-Fig. 2).

5. *A second instance of Carpellody.*—A second instance of carpellody was observed in a flower of another variety, "Pal". In this case one of the stamens of the staminal tube was modified into a carpel-like structure. The staminal tube was complete and otherwise quite normal (Plate III, Fig. 4; Text-Fig. 4). When the staminal tube was split open the small modified carpillary structure was seen slightly broadened at the top of the staminal tube with the lower portion of the carpel very narrow and continued downward on the inner face of the staminal tube (Text-Fig. 3). It had a long style terminated by a capitate stigma. The surface of the carpel and its narrow lower portion were covered with hairs as in the normal carpel of the flower. The broadened upper portion of the carpillary structure was open

towards the outside above the level of the staminal tube exposing a single ovule (Plate III, Fig. 4; Text-Fig. 4).

This modification resembles to a certain extent the one recorded by Agharkar (1927). But in the case of Agharkar's specimens one to three stamens were modified into carpels, whereas in the present case only a single stamen was modified into a carpellary structure.

It may be interesting to note that all these abnormal flowers were observed on old plants at the end of the growing season. Agharkar (1927) has also mentioned that the flowers showing carpellody observed by him were almost always borne on old plants.

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REFERENCES

1. Agharkar, S. P. .. "On the occurrence of carpellody in the stamens of *Hibiscus esculentus* L., and some abnormalities resulting from it," *J. Indian Bot. Soc.*, 1927, **5**, 17-18.
2. Bergman, H. F. .. "Intracarpellary fruits and other central proliferations of the floral axis in *Hibiscus*," *Amer. J. Bot.*, 1932, **19**, 600-03.
3. Delavaud, C. .. "Note sur quelques anomalies et monstruosités végétales," *Bull. Soc. Bot. France*, 1858, **5**, 685-89 (cited by Bergman, 1932).
4. Harris, J. A. .. "Proliferation of the fruit of Okra, *Hibiscus esculentus*," *Torreya*, 1913, **13**, 33-35 (cited by Bergman, 1932).
5. Ramanatha Ayyar, V., and Sankaran, R. .. "Petalody in Cotton," *Indian J. Agric. Sci.*, 1934, **4**, 938-42.
6. Saksena, K. L. .. "On the teratology of certain Angiosperms," *Proc. Indian Sci. Congr.*, 19th Session, Abstracts, 1932, Sec. Bot. abst. 117.
7. Sankaran, R. .. "Petalody of the Androcium in Cotton," *Madras Agric. J.*, 1931, **19**, 144-45.
8. Singh, T. C. N. .. "Notes on the teratology of certain Indian plants—VIII," *J. Indian Bot. Soc.*, 1935, **14**, 313-24.
9. Venkataramani, K. S. .. "Some abnormal flowers of *Hibiscus esculentus*," *Madras Agric. J.*, 1945, **33**, 208-09.
10. Wilcox, E. V., and Holt, V. S. .. "Ornamental *Hibiscus* in Hawaii," *Hawaii Agric. Exp. Sta. Bull.*, 29, 1913 (cited by Bergman, 1932).

EXPLANATION TO PLATE III

FIG. 1. Flower showing petalody.

FIG. 2. An enlarged view of Fig. 1. Note the position of the petaloid structure and the anther lobe with some pollen grains (A).

FIG. 3. Another flower showing petalody. Note the position of the petaloid structure on the staminal column.

FIG. 4. A portion of the staminal tube with one of the stamens modified into a carpel-like structure. Note the open carpel with a single exposed ovule (o).

FIG. 5. An abnormal flower showing the staminal tube modified into three portions.

FIG. 6. Another view of Fig. 5 showing the modified staminal portions and the normal pistil in the middle of the three staminal portions.

FIG. 7. The abnormal flower showing four stigmatic lobes coming out tearing through the staminal tube.

FIG. 8. A normal pistil, and the abnormal pistil with five separate styles each with a stigma of its own.

FIG. 9. Flower showing the staminal tube completely covering the stigmatic lobes.



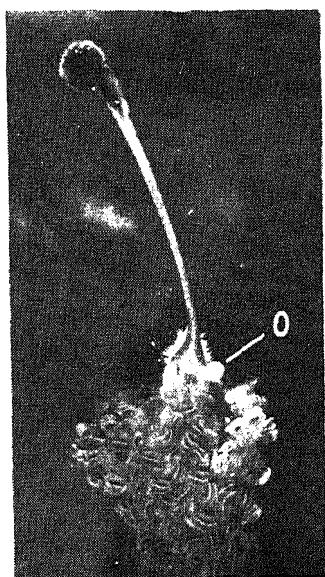
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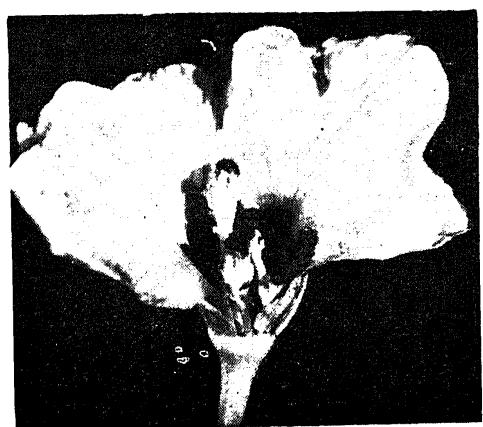
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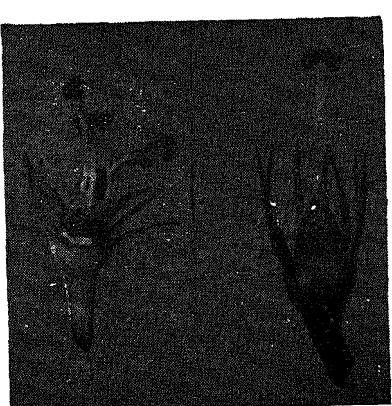
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