

43. A Note on the Floral Mechanism of *Typhonium trilobatum*.

By MAUDE L. CLEGHORN, F.L.S., F.E.S.

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(With Plate XXXII.)

Typhonium trilobatum, Schott, the Ghet-Kachu, is a tuberous rooted plant found growing among grass in thickets in most parts of tropical India. It is easily recognized, when in flower during the hot weather and early rains, by its broad dark reddish purple spathe about nine inches in height, and the carrion-like odour given off at dusk. It has three or four rather large 3-lobed leaves, with long petioles, which raise the leaf blades well above the grass among which it usually grows.

The erect spathe, which partly encloses the spadix, stands close to the ground with its base half buried in the soil. It varies much in size. In small plants it is sometimes only three inches high, while in a large specimen it may attain a height of about twelve inches. The upper part of the spathe unfurls completely into the broad reddish purple limb of the spathe, which tapers off into a fairly long slender tip. The margins of the spathe in the lower portion, below the constriction, do not unroll, but remain overlapping, to form a short barrel-shaped cavity (the tube of the spathe) opening above at the constriction (Fig. 1).

The erect spadix, which is shorter than the spathe, has the lower part enclosed in the tube. The upper exposed part, which stands out of the spathe above the constriction, consists of (a) the long smooth reddish purple appendage which forms the greater part of the exposed portion of the spadix, and which tapers to a blunt point, and (b) a pale reddish purple cylindrical portion, about a quarter of the appendage in length, bearing numerous closely packed minute staminate flowers. At the constriction, and a little below it, enclosed within the tube, the spadix is very slender and quite bare; this slender portion is about equal in length to that of the staminate portion and so allows of a clear passage into the lower part of the cavity of the tube, where the pistillate flowers are situated. Low down in the tube, near the base, the spadix bears, (c) a tangled mass of long thread-like bodies (rudimentary neuter flowers), which partly hang over (d) the green pistillate flowers situated at the bottom of the tube. The pistillate flowers are a little larger than the staminate ones. They are considerably

fewer in number, and the portion of the spadix occupied by them is about half that taken up by the staminate flowers (Fig. 4).

On examining a spathe at sundown, when the strong unpleasant odour is being given off, it will be found that the narrow constricted part is open, forming a passage down into the lower chamber, where the pistillate and thread-like neuter flowers are concealed (Fig. 1).

The margins of the spathe at the constriction are wide apart, and the slender portion of the spadix stands close against the spathe, leaving a clear passage down into the tube. At this, the first stage, the stigmas are very sticky and the strong carrion-like odour is given off from the pistillate flowers: but the staminate flowers will be found to be still immature, with no pollen shed. If examined on the following morning, when in the second stage, the spathe will be found to present a very different appearance. There is no disagreeable odour and the beautiful upper portion of the spathe is hardly recognizable, having faded into a dull pale purplish colour and fallen back, away from the spadix, with the tip dangling on the ground (Fig. 2). The opening leading down into the tube is also closed by the margins of the spathe having overlapped tightly round the base of the staminate portion of the spadix (Fig. 2 and plant to left in Fig. 3). In the afternoon the opening will still be found closed; but on closer examination the staminate flowers will be found to have started shedding their pale pink pollen. On the following morning, when in the third stage, the spathe will be found in a still more faded condition, and the whole of the exposed part of the spadix, consisting of the appendage and staminate portion, also fallen back, and the passage into the tube again wide open, but not quite as fully open as on the evening of the first day. At this stage the staminate flowers have matured and have shed all their pollen. The pollen collects at the mouth of the tube and on the spathe. The upper part of the spadix, having fallen back over the spathe, prevents the pollen from falling into the tube (Fig. 4).

On cutting open the tube of a spathe in the second stage, when the passage is tightly closed, a number of small brown Lamellicorn beetles (belonging to the dung-frequenting sub-family Coprini) will be found imprisoned inside. They had evidently been attracted into the spathe by the strong disagreeable odour during the first stage, when the passage was wide open, and they were being kept prisoners till their release in the third stage.

It is clear that the floral mechanism of the spathe is of the nature of a trap, and by this ingenious method the plant ensures cross-pollination, for the beetles carry the pollen from one spathe to another.

Observations made by me on the opening and closing of

the passage into the tube of the spathe in a potted Ghet-Kachu are as follows:—

- May 12, 3 p.m. Spathe begins to open.
1913. 5 p.m. Spathe completely open.
6 p.m. Has started giving off a strong unpleasant scent, and the constriction is open forming a passage into the lower part.
9 p.m. The constricted part appears to have widened still more, and the slender bare portion of the spadix, below the staminate flowers, is resting against the spathe and so the opening is as little blocked by it as possible.
11-45 p.m. Lobes of the spathe begin to wrap round the spadix at the constricted part.
11-55 p.m. Scent not strong, lobes more closely wrapped round and the opening is *almost* completely closed.
May 13, 2 p.m. Completely closed; no space for even a very small insect to pass up or down at the constricted part.
8 a.m. Spathe still closed.
5 p.m. Remained closed all day.
8 p.m. The margins of the spathe at the narrow part have begun to unfold and the passage is reopening.
Midnight. Opening is almost as wide as it was in the first stage, and there is a collection of pollen at the mouth of the opening.

On examining other Ghet-Kachus, in various stages of flowering, I found that the time of opening and closing of the spathe is, on the whole, very regular, and that the spathe, in its first stage, captures quite a number of beetles by about 9 p.m.

Unfortunately beetles seldom came to potted Ghet-Kachus kept in an upper verandah, but when the plants were taken down into the garden, the beetles were soon captured.

The beetles remain among the pistillate flowers during their term of imprisonment in the second stage, but by the evening, when the spathe has reopened in its third and last stage, the beetles are most anxious to make good their escape, and soon crawl out of the mouth of the tube and up the lower staminate portion of the spadix, and so become covered with pollen before flying away, only to be deceived and recaptured, by another spathe in the first stage. While among the pistillate flowers of the fresh spathe the pollen with which they are covered adheres to the sticky stigmas, and thus cross-pollina-

tion is readily effected. The thread-like neuter flowers appear to keep the beetles among the pistillate flowers after the disagreeable odour ceases, for they seem to like going in and out under them during the day, in the second stage of the spathe.

The trap-mechanism of the Ghet-Kachu resembles that of the Cuckoo-pint (*Arum maculatum*) in the entrance and exit, being *above* through the *same* opening at the constriction of the spathe, but it differs from it in the deliberate opening and closing of the passage leading down into the tube of the spathe, and in the staminate flowers being situated on the exposed upper part of the spadix and not within the tube.

The floral-mechanism of the Ghet-Kachu differs much from that of the common Kachu (*Colocasia antiquorum*), in which the entrance for the flies is formed by the margins of the spathe opening slightly only in front below the constriction, and the exit by the spathe opening only partly above. However it resembles that of *C. antiquorum* by having no neuters at the constriction and by the closing of the constricted part of the spathe after the first stage, but again differs from it by the constriction reopening in the second stage.

The floral-mechanism of the Ghet-Kachu does not seem to be so perfect as that of *C. antiquorum*, the common Kachu, but it appears to be an advance on that of the Cuckoo-pint.