

ON THE ABNORMALITIES OF THE FLOWERS OF MUSA SUPERBA AND MUSA PARADISIACA SUBSP. SAPIENTUM*

BY

S. P. AGHARKAR.

While examining flowers of *Musa superba* in August 1911, I observed in some of them an abnormality as regards the androeceum which attracted my attention. The abnormality in question was the occurrence of partial obovate of one of the stamens. It was such as could have been least-expected looking to the accepted ideas on the structure of the flower in Musaceae. I, therefore, decided to find out by examining a large number of flowers of the species whether I could get more evidence on the point. In October, 1911 some friends were good enough to procure for me three inflorescences of *M. superba* the examination of which yielded encouraging results.

I then decided to examine flowers of some of the cultivated varieties of *Musa paradisiaca*, these being available all the year round in Bombay. The first variety I examined was Rajola, the fruits of which are dried. I have examined 2618 flowers of this variety, and on detailed records of them the present note is based. The abnormalities I have observed relate to every whorl of the flower.

I shall first describe the abnormalities of each whorl separately, but it will be necessary later on to consider them together when interpreting the facts.

Four distinct types of perianth which can be arranged in a progressive series are found regularly in each inflorescence though the proportion in which each type is found has been found to vary in different inflorescences.

The first type, (Fig I which is obviously also the most primitive, has three separate and equally developed sepals and three separate and equally developed petals. The sepals are long and narrow, of a brownish red colour and almost leathery in texture. The petals are short and broad, white in colour and membranous in texture. It is

* The paper was originally written in 1912, but was not published at that time in the hope that it would be possible to do further work on the subject. My departure to Europe in 1914 and detention in Germany up to the end of 1919 proved further obstacles. I had hoped to carry it to completion after my return to India in 1920, but other work of a more pressing nature has prevented my paying attention to this subject. The paper as it now stands was read before the Madras Meeting of the Indian Science Congress in January 1922, and is now being published as I have given up hopes of being able to complete the investigation.

curious to see that they resemble the single posterior petal usually present, in size, shape, colour and texture. The odd sepal is anterior, and the paired ones postero-lateral in position. The petals alternate with these. This type is evidently the most primitive. It is of comparatively rare occurrence, having been found in only 16 cases out of 2168 or 61 per cent.

In the second type (Fig. II) the anterior and one of the postero-lateral sepals unite with the petal alternating with these to form a single body showing its composite nature by the number of teeth present. I have occasionally found specimens in which the union has not proceeded very far and these show us how union has progressively been brought about. The remaining sepal and two petals are free and well-developed. This type is of more frequent occurrence. I have found 224 specimens having it or a total of 8.56 per cent.

The third type (Fig. III) has all the sepals and one of the antero-lateral petals fused to form a broad strapshaped body placed anteriorly. The remaining antero-lateral petal shifts its position and comes to lie anteriorly inside the sepalo-petaline body, embracing the bases of the stamens. The posterior petal is well-developed and occupies its usual position. This type occurs less frequently than the second, the total number of cases being 86 or 3.25 per cent.

In the fourth type, (Fig. IV) all the sepals and the two paired petals unite to form a single structure placed anteriorly, the component parts being usually made out by the teeth present. [The union of parts is usually much more complete than shown in the figure.] The posterior petal is, as usual, free and well-developed. This is the normal type of flower, and 2292 or 87.55 per cent. flowers were found to have it.

The principal abnormalities of the androecium are variation in number of the stamens. In *M. paradisiaca* the number usually varies between 3 and 5, though I have come across instances with 6 stamens. Cases of chorisis occur occasionally. I have up to now noted about 30 cases where chorisis was seen. Cases where in addition to the well-developed stamens there are one or in rare cases two rudiments have also been noted. Of the total number of flowers examined 89.53 per cent. had five stamens, 8.79 per cent. had four, and 2.67 per cent. had three.

In *Musa superba*, flowers with 6 stamens are of more frequent occurrence, and in the small number of flowers I examined I came across instances having 7, 8, and 9 well-developed stamens, some of which showed bifurcation of part of their anthers. Cases of chorisis also occur more frequently and I have found, as stated in the beginning, a series of flowers showing stages in the bifurcation

process. My records of the examination of these flowers are defective and I am not in a position to give statistics.

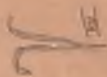
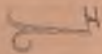
In the gynoecium, the only abnormality that has been observed is the separation of one of the styles from the others. (*cf.* Fig. 1) In some cases I have noticed that this separated style has become slender and passes between the anther lobes of one of the stamens in the manner which is characteristic of the zingiberaceae. In two cases I have noticed that the upper portion of the styles is trifid each bearing a stigma.

Coming to the question whether these abnormalities throw any light on the history or structure of the flower I think there will not be any difference of opinion when I say that in the four types of perianth, we have a series of stages along which the evolution of the perianth has taken place. There can not be much doubt that the first type of perianth with free sepals and petals is the most primitive, the second and third intermediate, and the 4th most specialised. The number of stamens which are found in flowers with the 2nd and 3rd types of perianth, however, point to these types having been independently derived from the 1st, instead of the 3rd having been derived from the 2nd.

It is possible to look at the variation in number of stamens in two ways. We can either regard the larger number as the primitive and the smaller derived from it by a process of reduction, or we may take the smaller number (three) as the primitive and regard the larger number as derived from it by a process of multiplication. The former view is largely held by botanists at present. The association of 3 and 4 stamens with the most primitive type of perianth, as well as the occurrence of chorisis of stamens would point to the opposite view being correct. In view of the other difficulties the acceptance of this hypothesis involves, I would defer judgment until further researches fully elucidate the point.

Other abnormalities of the androecium which are sometimes found, namely the turning of a stamen into a petaloid structure, the attainment of a curious form by the posterior petal, etc., do not seem to be of morphological importance.

The separation of one of the styles from the others and the trifid style of two of the flowers above noted seem to point to the three styles having been separate in the primitive flowers. But the fact that the separated style has become slender and in some cases is embraced by the anther lobes of one of the stamens, may also mean that the separation is a later not original condition. It is better, therefore to refrain from making a statement on this point until more evidence is collected.



Figs. I-IV, in all figures the spaces have been purposely leaved blank to show the same parts.
Figs. V-VIII, show the various degrees of contraction of the same.

