# The Indian Mango.

By Dr. P. Maheshwari,
*Agra College, Agra.*

THE original home of the mango is not known with certainty, but it has long been one of the most familiar trees about villages in India. There are many orchards of the finer varieties and the fruit is greatly praised. Many roads are lined with stately trees, giving a welcome shade during the hot season, as the tree is evergreen.

The different varieties of *Mangifera indica* L. produce flowers at slightly different times and blooming is somewhat earlier in the southern part of the peninsula than in the north. In the United Provinces of Agra and Oudh the height of blooming is in February and early March. The flowers are borne in large pyramidal profusely branched panicles with the ultimate branchlets cymose. The number of flowers in each inflorescence may vary from 1,500 to 4,000, and the varieties with better fruit seem to have the largest inflorescences.

The flower usually consists of 5 sepals, 5 petals, 5 stamens and a single carpel. There is some variation in the number of stamens and occasionally a flower may show primordia of all ten stamens—a rather common thing in other members of the family. Characteristically, however, only one stamen develops and the other four remain abortive. The ovary contains a single anatropous ovule. The style arises from the edge of the slightly compressed ovary. The fertile stamen is on the opposite side of the flower and is of the same diameter as the style. Rarely 2 carpels and less rarely 2 fertile stamens may develop.

In spite of the large number of flowers produced in a single inflorescence, it is well known that ordinary village trees produce on an average only 2-3 fruits per inflorescence and even the best varieties do not commonly have more than half a dozen. Most of the flowers dry up soon after blooming and fall off. A study of microtome sections reveals the fact that these have an abortive ovary and can function only as pollen-producers. Perhaps only 5-10% of the flowers that open have normal-looking ovaries. After a slight enlargement most of the ovaries turn yellowish, shrivel up, and the entire flower drops off. Of the few that remain, most drop off at the size of a small pea. The very few that survive this period usually continue to develop further. The flowers with normal-looking ovaries occur mostly towards the apex of the inflorescence and are mainly the primary flowers of the little cymes and to a less extent the secondaries; a tertiary flower of the cymelet almost never produces a good ovary. Later appearing tertiaries and quaternaries are likely to fall off while they are still small buds.

Besides the high mortality of the flowers, it is also a matter of common experience that while fruits are produced in fairly large quantities one year, there is a great paucity of them in the next. In North India mangoes were very cheap in 1933, but in the 1934 season the mango crop has been an almost complete failure. This kind of alternate fruiting is, however, also found in several other fruit trees, though perhaps not so well marked as in the mango.

An account of the floral morphology of the Philippine varieties of the mango has recently been given by Juliano and Cuevas.* The present study† which was started more than 10 years ago confirms their observations in a general way, but there are a few differences which are sufficiently noteworthy to be mentioned here. Some other points not mentioned by these authors are also dealt with briefly.

*The Anther.*—The development of the anther follows the usual course laid down for angiosperms, except that the sporogenous tissue is rather late in differentiating and is clearly distinguishable only after the walls are practically completed. There is an epidermis, endothecium, two middle layers and tapetum enclosing the mass of sporogenous cells within. At about the time of the first meiosis, the tapetal nuclei divide and the cells become binucleate. The reduction divisions in the microspore mother cells seem to go through in a normal way. The nuclear cavity is about 10 microns in diameter at the time of the greatest enlargement and

* *Philippine Agriculturist*, 1932, **21**, 449–472.

† My teacher, the late Dr. Winfield Dudgeon of Allahabad, had started some work on the morphology of the mango in the year 1920. For various reasons this could not be brought to a finish, and after his unexpected death on December 26, 1932, all his slides and rough notes were forwarded to me by Mrs. Dudgeon with a request to complete the work.

the chromosome pairs at diakinesis are so small and so closely applied to the nuclear membrane and clumped together amongst themselves that exact counting became impossible. There are, however, approximately 26 (24-28) pairs of chromosomes. Wall formation is simultaneous and comes on after the second reduction division is completed.

The development of the male gametophyte follows the usual course. A minute lenticular generative cell is cut off at one end of the pollen grain, but it soon moves inward and divides to form 2 male nuclei. Here my observations differ from those of Juliano and Cuevas (1932) who report that the pollen grains are uninucleate at the time of shedding. This appears to me to be very doubtful. The real fact is that there are widespread degenerations in the anther at this stage and even in those pollen grains which develop further there is so much starch that the nuclei become obscured in a great majority of the cases.

*The Carpel.*—Comparable with the anther, the archesporil cell is so inconspicuous in the nucellus that it cannot be distinguished with certainty. Only after the wall cell has been cut off and has divided once or twice, is the megaspore mother cell enough larger than the surrounding cells to be identified distinctly. The wall cells soon undergo many divisions so that the megaspore mother cell becomes deeply placed in the nucellus.

So many of the mother cells degenerate that it was not possible for me to have a sufficiently close series of stages for the study of the development of the embryo sac. But from what I have seen of the few good preparations I possess, I have no doubt that the development proceeds in the normal way as reported by Juliano and Cuevas. The mature embryo sac has an egg, two synergids, three antipodal cells and two polar nuclei which fuse early. The fusion nucleus lies almost in contact with the egg.

*Pollination and Fertilisation.*—The flowers open in the afternoon and remain fresh-looking till next day. Then the sepals and petals become reflexed, gradually wither and drop off. Pollination seems to be insufficient, for the stigma is poorly developed and there is a large percentage of defective pollen. Insects, specially flies, visit the flowers, but pollination through gravity and wind is not excluded. As the air is dry enough pollen can merely drop on from the higher inflorescences to the lower.

Actual fertilisation has not been seen, but in several embryo sacs in which endosperm formation had begun, I could see a small nucleus lying close to the egg nucleus and in slightly later stages 2 nucleoli in the nucleus of the zygote.

*Endosperm and Embryo* —The primary endosperm nucleus seems to divide at once after fertilisation. Free nuclear division continues and a peripheral layer of endosperm nuclei is formed in the rapidly enlarging embryo sac. The embryo shows a remarkable delay in development. There are evidences that, occasionally, the fusion nucleus may be fertilised but not the egg. This seems to explain the statement of Juliano and Cuevas that "Some pistils have been observed to enlarge without any seed within."

The first division of the zygote occurs very late. An ovule with a 3-celled embryo had over 950 endosperm nuclei—a record for delayed development of the embryo in angiosperms, so far as I know.

Further stages have not yet been observed and a fuller account will be published as soon as sufficient material has accumulated.

## The British Polar Year Expedition to Fort Rae, N. W. Canada, 1932–33.

MR. J. M. STAGG, in a paper presented at the Aberdeen meeting of the British Association for the Advancement of Science, dealt with some results of the "intensive observations in Meteorology and such allied fields of investigation as terrestrial magnetism, aurora and atmospheric electricity." Upwards of forty countries co-operated in the world-wide organisation and probably "over sixty special stations and expeditions, many of them in high northern latitudes, participated in the general programme." An expedition of six men was sent by Britain to reoccupy the station at Fort Rae on the Great Slave Lake, N. W. Canada. "The reduction of the data brought home by the expedition is now in an advanced stage of preparation. But the work of adequate discussion and co-ordination with the data for all the other Polar Year Stations, will be a matter of several years."