

CHERIMOYA INVESTIGATIONS

At Point Loma Homestead

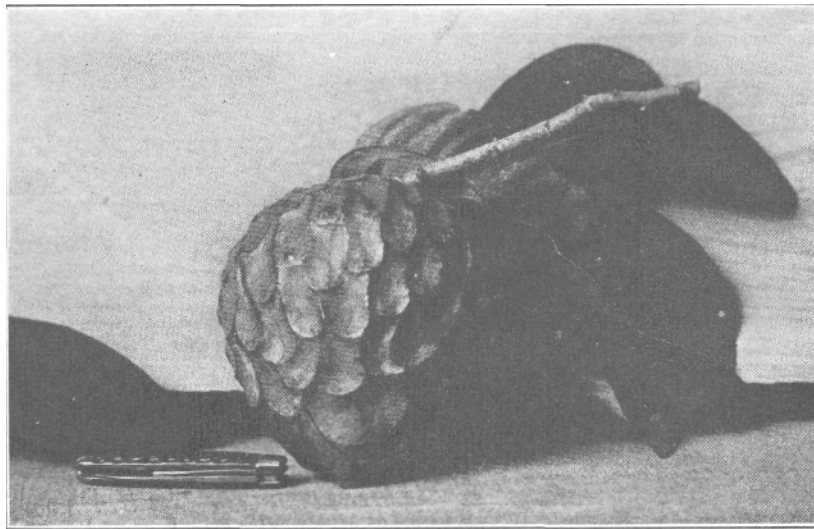
Orange I. Clark

More varieties of fruits can be found in the gardens and orchards of California than are grown in any other country in the world. Among these one that is still rare is the Cherimoya (*annona cherimola*), also called Custard' apple, produced on broad-leaved trees of luxuriant beauty, which are planted in some of the gardens and a few small orchards in more or less frostless locations from Santa Barbara southward to Mexico. Except a few of the most recently planted of these, almost all are seedling trees from unselected seeds, and most of them have produced but few fruits of very poor or uncertain quality. However, during the past few years enterprising nurserymen and others have discovered a few superior trees producing more and better fruits, ripening from December to April. From those trees they have propagated new varieties by budding and grafting. One of the new varieties is called the Loma, of which a limited number is being propagated for home use by student-orchardists from a large tree on the grounds of the International Theosophical Headquarters at Point Loma. It was on these grounds that most of the observations described in this report were made as part of the educational and horticultural work established and directed by Mme. Katherine Tingley. These Cherimoya investigations are still in the early stage and further observations may possibly require modification of the conclusions contained in this report. This report of progress was requested in order that the information acquired may be shared by the progressive horticulturists and growers of California.

In the orchards on these grounds some of the new budded varieties are being given a trial. From the behavior of these improved varieties it is certain that when they, and probably others, become more generally known they will entirely displace seedling trees, and a wider interest may be developed in this fruit. But commercial plantings cannot safely be made until productive and suitable varieties are well proven. Some varieties produce better shaped fruits than others. Trees bearing the heaviest crops are not in some cases producers of the best-shaped nor the best-flavored fruits. One variety produces many fruits, no two of which are alike in size or shape, and this characteristic has been transmitted to its budded and seedling progeny. The great difference between varieties gives need for the most careful selection.

These Point Loma orchards are producing over two hundred varieties of the best flavored and most productive fruits in the world, and none are here considered superior in quality to the best Cherimoyas. This agrees with the judgment of some of the most famous travelers and pomologists. The fruits, if not roughly handled, keep here without refrigeration from three to eight days after picking. In time they may become well-known on fruit stands and tables as a high-priced fruit.

The Cherimoya is believed to be a native of the highlands of Peru, Ecuador, and Guatemala. Representations of the fruit with its natural sculptured markings have been found on vases recovered from prehistoric graves of the ancient civilization of Peru. Authoritative writers state that it is not successfully grown in the tropics except in some of the upper highlands, and is not identical with, though it somewhat resembles, several tropical fruits often known by the same or similar names. It is said to succeed in only a few favored localities on the globe. It is reported as not having succeeded anywhere in the United States except in Southern California in locations free from killing frosts where the winters are warm and the summers cool.



A large Cherimoya, showing the naturally carved surface.



A Cherimoya tree which bears well without cross-pollination. This tree has grown its present top since the unusual frost of 1913 when it was killed to the ground.

In the few locations free from frost and wind the Cherimoya has only a very short leafless period in the springtime when other trees are in most vigorous growth. The Cherimoya has an unusual bud formation, the bud being completely covered and hidden within the base of the leaf -stalk. The old leaf is pushed off by the growing new bud, much as a child loses its milk-teeth by the growth of the later ones, and the well-formed bud is then disclosed in the scar left by the old leaf. These buds are used in the ordinary ways for propagation.

Cherimoya trees here have proved decidedly less particular as to soil than many other fruit trees, but they have responded well to fertiliser and adequate irrigation. They have also proved free from the common nematodes, a new but already widespread pest in California. The trees remain enduringly and strikingly vigorous and healthy, even though surrounded by the most badly-infested soil. Where Cherimoya and fig roots are growing thickly matted together and the fig roots are very badly infested the Cherimoya roots are entirely uninjured by nematodes. Though no record can be found of this having been demonstrated previously, the evidence here is convincing. They have also been found free from other pests, but very tender to frosts.

In the absence of definite knowledge it had been believed in California that cross-pollination may be necessary to produce heavy regular crops of Cherimoyas. After a first report of investigations here had been published, but before the beginning of renewed observation during the present blooming season, a copy of Wister's report of investigation of Cherimoya pollination in Florida came into the writer's hands. This is here quoted to show some similarities and some differences between distant localities and climates.

Wister says:

"The sterility of the Cherimoya in Florida has undoubtedly been due to the scarcity of blooms, and to an insufficient number of insects to assist in the pollination of the flowers." *

Blooms are very abundant in California, but careful observers here during blossoming seasons extending over a period of several years have never yet seen pollen-bearing insects visiting the Cherimoya flowers, though some heavy crops have resulted from those flowers. Thrips are sometimes seen in the pollen-shedding flowers, but when they crawl out from among the pollen grains they quickly and completely free themselves from the few grains that sometimes adhere to them. It is their habit thus to frequently cleanse themselves, especially before taking flight. If thrips are numerous enough it seems probable that their injury to the flowers might cause sterility.

The nature and quantity of Cherimoya pollen is such as to show that nature has not intended it to be effectively carried by the wind. Even if the pollen could be carried by the wind it could seldom reach the receptive stigmas of other flowers as most of the flowers hang downward and the stigmas are closely surrounded by the fleshy petals. Wister found this to be the case in Florida also.

If, as all the evidence shows, neither insects nor wind carry the pollen, cross-pollination is impossible, except when pollen is transferred by hand for experimental purposes. But cross-pollination is not indispensable as is shown by the productiveness of the original

trees of the Loma and Golden Russet varieties in isolated positions, and by the productiveness of several other isolated trees known to the writer. So far as the writer has seen or heard, groups of Cherimoya trees have not proved good bearers in California, certainly not as good bearers as some isolated trees. Were cross-pollination beneficial the contrary would be true.

Careful and recorded observations here have shown that the numerous stigmas possessed by each flower usually remain fresh-appearing for one day or more after the flower opens, and appear fully receptive until after the shedding of pollen has taken place. During pollen-shedding the pollen-covered anthers cover and press against about half of the mass of stigmas. When the anthers release the pollen it falls directly on to the fresh-appearing and evidently fully receptive stigmas, which, with the remainder of the flower, soon after that turn brown. The entire mass of stigmas are thus well dusted with fresh pollen, which can be seen adhering to their sticky surfaces. During most of the blooming season no normal flower patiently watched failed to be thus abundantly self-pollinated, except when unfavorable weather or poor tree-condition prevented the normal functioning of the flowers. Such failures as there were to pollinate properly seemed to be caused as follows: Cool weather caused a failure to release pollen; unusually dry windy weather caused a failure of the pollen to adhere to the stigmas. There was indication that lack of irrigation at blooming-time, even though the leaves did not wilt, caused a general weakening of the flowers and the premature drying of the stigmas. These facts were observed on the Loma, the Deliciosa, and other budded varieties, and on the flowers of seedling trees.

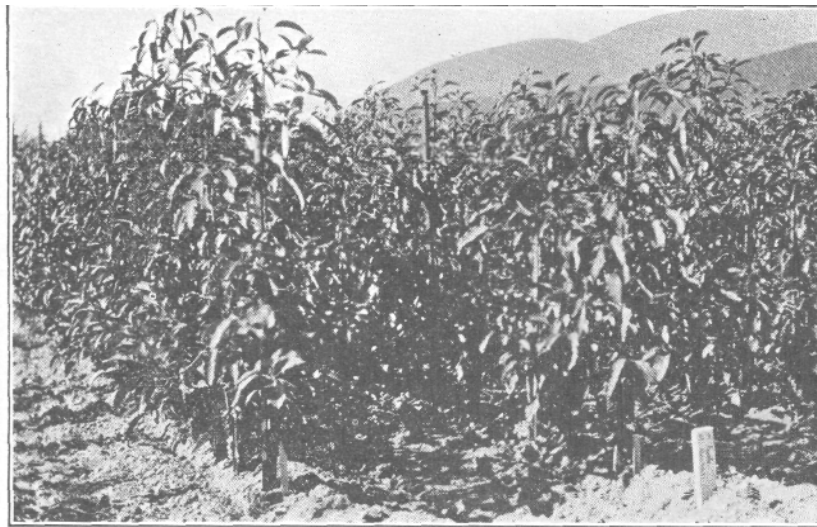
It was noted that trees, whether of the same budded variety or not, opened their flowers and shed their pollen during the same hours on all the trees observed. Even if pollen-carrying insects were present the interplanting of varieties or seedlings could not therefore increase the number of pollinations, nor cause pollinations to take place at a better time. While the flowers are shedding their pollen many of the first of a new set of flowers open on the same tree, and are, according to Wister, at their best stage to receive pollen. If insects carried the pollen, pollination would take place between flowers in different stages on the same tree more frequently than cross-pollination from adjoining trees. Wister's hand-pollination experiments in Florida proved such inter-pollination of flowers on the same tree to be highly productive if done when, or soon after, the stigmas were first receptive, but not productive if done later. In making hand-pollinations he used only one Cherimoya tree and pollinated some of its flowers with pollen from older flowers on the *same* tree, and also pollinated some flowers with pollen from other species of *anonas*. He evidently did not try, and his report does not discuss, the cross-pollination of the Cherimoya with pollen from another Cherimoya tree. Wister's report says:

"The extraordinary productivity of a few individual trees suggests a change in regard to the pollination of the flowers of these trees, possibly due to synacmy (anthers and stigmas being mature during the same period) and self-pollination."

Pollen-shedding is not the same in all details here and in Florida. Apparently partial synacmy and somewhat delayed self-pollination are the means by which the fruits which develop here are produced. Nature has evidently provided that cross-pollination shall be seemingly unnecessary as well as practically impossible.



A California Avocado Nursery, showing Mexican Seedling stock shaded with shingles



Field-grown Budded Avocado Trees ready for digging. In California the old method of growing trees in pots and boxes has been abandoned in favor of field-grown stock.

We know of no indications that the behavior of the flowers elsewhere in California where the trees thrive and bear is essentially different from that observed here. If there are localities where they fail to bear it might be due to a difference in the behavior of the flowers, as the flowers are more or less affected by weather conditions.

Evidently, then, so far as present knowledge shows, there is no practical way to assist nature in the pollination of the Cherimoya except by maintaining good tree condition, after planting in favorable locations. What first needs to be done is to determine the best and most productive of the budded varieties.

Point Loma Homestead, Point Loma, California. June 13, 1925.

*Bul. Torrey Botanical Club, Vol. 31, No. 11.