

Hand Pollination Effects in the Cheyrimoya (*Annona cherimola*)

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Although the cherimoya was introduced into California about 1870 its culture here has never attained commercial importance. Small orchard plantings have been made occasionally, but most of these have not persisted for any length of time and the cherimoya remains here primarily a door-yard tree. While the sensitiveness of the tree to frost has limited its culture somewhat, other major factors responsible for this situation are the unsatisfactory bearing behavior of the tree and the high percentage of small and misshapen fruits produced.

Assuming that irregular bearing behavior results from inadequate pollination, several growers have tried pollination by hand with results which in some instances were successful, but in others failed.

The purpose of the investigation reported here was to determine the facts with reference to the effects of hand pollination of this fruit in Southern California. This paper is offered as a progress report on investigations of the cherimoya being carried on at the University of California, Los Angeles.

Wester (3) in Florida, and Ahmed (1) in Egypt, both have reported increased sets of fruit in the cherimoya from hand pollination. Because of the failure to obtain setting from pollinations at the time of pollen shed and success from pollinations made about 24 hours earlier, Wester concluded that protogyny (maturity of the pistils before pollen is shed) is the normal situation in the cherimoya. Ahmed's pollination procedure clearly infers the probable existence of protogyny. However, Clark (2) concluded that protogyny did not occur under California conditions at Point Loma although he presented no experimental evidence.

Methods and Materials

Proceeding on the assumption that a probable tendency toward protogyny exists in the cherimoya, the method of hand pollination mainly employed in this investigation was briefly the following. Unopened flowers, the petals of which were starting to separate at the tips (Figure 1-a) were gathered for their pollen in late afternoon. Examination of many such flowers showed that in this stage the anthers were white and the pollen had not yet shed, but that the pistils were mature. These flowers were placed in paper bags each containing a piece of damp toweling to maintain the humidity. In order to allow sufficient air circulation the flowers were not piled up or crowded in the bag. By the following morning the petals had relaxed, the anthers become cream colored and the pollen was shedding. The pollen together with loose anthers was shaken into a small vial (Figure 2) which was kept loosely stoppered with moist paper until ready for use

when the paper stopper was replaced by a cork through which a soft, camel's hair brush was inserted. For convenience the vial was carried in a holder suspended from a string around the neck.

The flowers selected for pollination were in the same stage as those employed for pollen collection, the petals starting to separate, but pollen not yet shed. Pollination was done by spreading the petals apart and brushing in a mass of anthers and pollen from the vial (Figure 3) giving the brush a twirl to distribute the pollen evenly over the pistils. Where available, an un-pollinated control flower in a comparable stage of development was selected on an adjacent node.

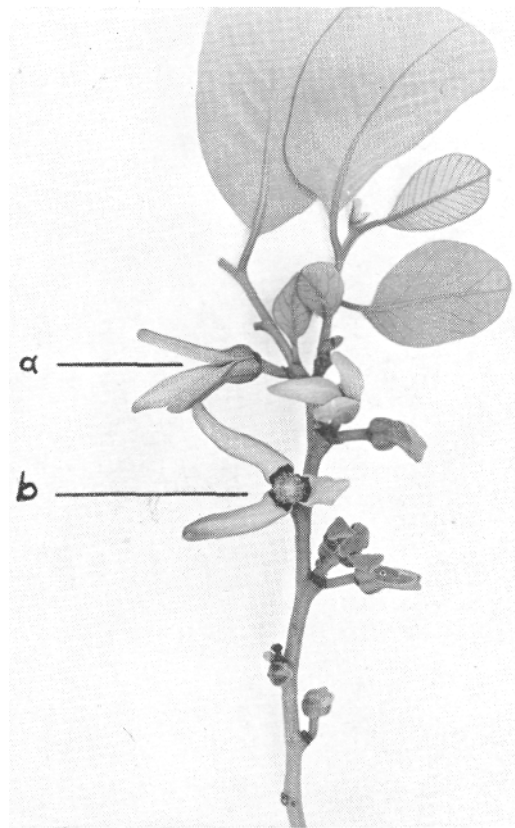


FIG. 1 CHERIMOYA FLOWERS

- a. Flower just starting to open, but pollen not shedding.
- b. Flower open and pollen shedding.

The materials employed in the present experiments consisted of 29 trees differing in age and variety, but all located in the southern coastal climatic zone. The pollinations were made during the period August 2-September 20, 1940, and observations on fruit quality and characteristics during the period January-March of the following year.

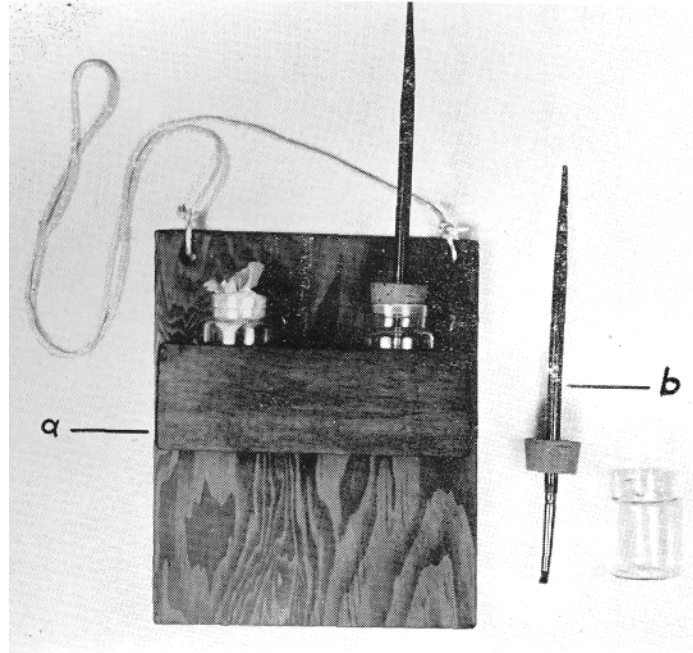


FIG. 2—POLLINATION KIT
 a. Holder with two vials of pollen.
 b. Soft, blunt, camel's hair brush used for transferring pollen.



FIG. 3.
 Transfer of pollen to cherimoya flower.

Results

The effects of pollination were evident within a week or 10 days when the pistil mass began to swell and the petals dropped. It was early noted that of many flowers pollinated at a given time some exhibited rapid fruit development while others developed much more slowly. There was some dropping of fruit in both hand and naturally pollinated groups accounting for the loss of many which, in these experiments,

were considered definitely to have passed the stage of fruit-set.

Fruit set—The results of the experiments in respect to fruit-set are shown in Table I.

TABLE I
FRUIT SETTING FROM HAND POLLINATION

Method	Number Flowers Pollinated	Per cent set	
		Hand Poll.	Control
Standard (brush)	1821	59.0	1.9
Sugar spray	22	4.5	0.0
Sugar suspension of pollen	152	3.3	1.3
Water suspension of pollen	106	21.7	1.9
Indole-3-acetic acid in lanolin paste	70	11.4	5.7
Stimulated with brush	25	4.0	0.0
Total (all methods)	2196	50.8	2.0

Considering first the results from hand pollination by the standard method, it is evident that fruit-set was greatly increased. On the average 59 per cent of the hand pollinated flowers set fruit whereas only 2 per cent of the controls reached the fruit-set stage. It is also evident that the standard method of hand pollination was considerably more effective than other methods tried. In this connection mention should also be made of the fact that fruits resulting from the standard method were markedly superior in quality.

Symmetry and Size of Fruit—One of the major complaints concerning cherimoya fruits has been that so large a part of the crop has consisted of misshapen and small fruits quite unsuitable for the markets. Considering the morphology of the flower and the resulting fruit it is evident that for the production of large and symmetrical fruits most or all of the pistils must be pollinated. Partial pollination is undoubtedly responsible for the misshapen and small fruits so commonly produced.

TABLE II
FRUIT SHAPE

	Number of Fruits	Fruit Shape (in per cent)		
		Perfect	Slightly Misshapen	Runts
Hand Pollinated	877	70.1	17.0	12.9
Naturally Pollinated	309	10.0	39.4	50.6

From the results in Table II it will be seen that hand pollination by the standard method resulted in a very great increase in the per cent of perfect and nearly perfect fruits and many fewer small fruits.

Seed Content—The belief has been expressed by some growers that hand pollination greatly increases the seed content of the cherimoya. To ascertain the facts samples of hand and naturally pollinated fruits were taken, their weights and seed contents determined, and the correlation between these characteristics determined. The results, given in Table III, indicate that a high correlation exists between fruit size and seed content and that the higher seed content of hand pollinated fruits is due, no doubt, to

their larger size.

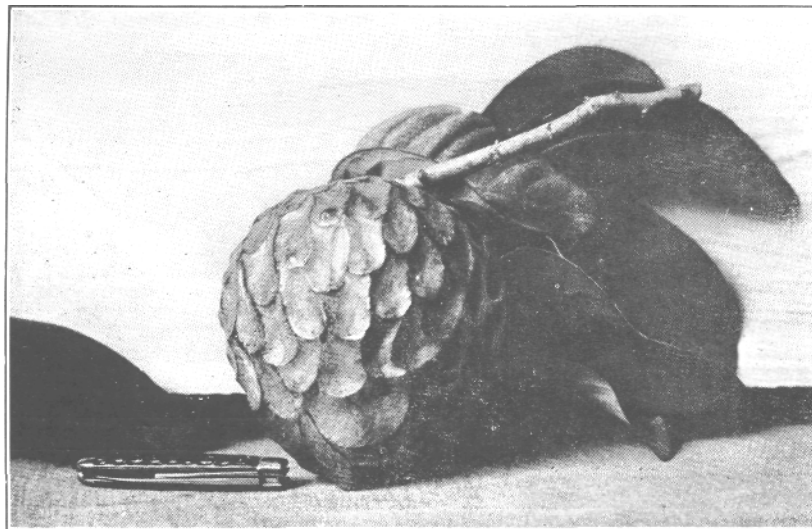
**TABLE III
SEED CONTENT**

	No. of Fruits	Ave. Weight Grams	Ave. Seed Number	Correlation Weight-seed number
Hand Pollinated	39	461.1	52.6	r = 0.861 ws
Naturally Pollinated	40	260.8	24.1	r = 0.861 ws

CONCLUSION

The data presented support the following conclusions, applicable to the coastal area of Southern California:

1. Hand pollination very greatly increases fruit-set in the cherimoya.
2. Hand pollination very markedly increases the per cent of perfect and near perfect fruits and reduces the number of misshapen and small fruits.
3. Hand pollination does not increase the inherent seediness of the fruit.



CHERIMOYA
Showing the delicately modeled surface.

LITERATURE CITED

1. Ahmed, M. S. 1936. Pollination and selection in *Annona squamosa* and *A. cherimola*. *Bul. Min. Agr. Egypt. Tech. Sci. Serv Hort. Sect.* 157: 1-29.
2. Clark, Orange I. 1925. *Cherimoya investigations*. Calif. Avocado Assoc. Ann. Rept. 1924-1925: pages 14-17.
3. Wester, P. J. 1910. Pollination experiments with *Annonas*. *Bul. Torrey Bot. Club* 37: 529-589.