

## HOW TO MAKE THE AVOCADO TREE BEAR

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In many if not most varieties of avocados the setting of fruit is decidedly irregular. A tree may grow splendidly and bloom freely (having flowers supposed to be perfect) but set very few or even no fruits year after year, while trees of the same variety elsewhere may bear fruit. When several varieties are grown together in the same orchard, there is usually also much irregularity in the yield. Such behavior suggests most clearly that proper pollination is frequently lacking and that proper cross-pollination is necessary for the setting of fruit by many varieties.

That this is the case has already been suggested by the studies which Nirody has made in Florida, an account of which is published in the Annual Report of the California Avocado Association for the year 1921-1922. According to the observation of Nirody there is a decided difference in the time when the pollen is shed and the time when the pistil is receptive to pollen and this is so synchronous for all the flowers of a variety that there is slight chance for the pollination of a pistil either by pollen from the same flower or from a different flower on the tree or on another tree of the same variety. It is also reported that there are marked and very uniform differences among varieties in regard to the hour of the relative development of pistils and stamens which greatly limit and often prohibit cross-pollination between varieties. If these observations are correct many and perhaps most varieties are decidedly fruitless when grown alone and also the interplanting of such varieties will not result in the increased setting of fruit unless it happens that the pollen of one is shed at the exact hour when the pistils of the other are receptive, and also that the means for the proper transfer of pollen *is* operating. *Failure to set fruit* is considered by Nirody to be due to the *failure of any pollination*,

It takes but little observation of avocado flowers to reveal that there is more or less protogyny (development of pistil before pollen is shed from the stamens of the same flower). But it may also readily be observed that in some of the self-fruitless varieties the pollen is shed while the stigma of the same flower is apparently still receptive, or at least it is not brown and withered. There appears to be quite frequently an opportunity for self-pollination at the proper time. This suggests that in certain self- and cross-pollinations the pistils and the pollen may not function or work together in the processes of fertilization. This type of sterility which we may call *physiological incompatibility* is frequent in many species of plants. Among cultivated plants it is seen in many varieties of apples, cherries, almonds and pears. To obtain the setting of fruit in such cases it is not only necessary that good pollen be supplied to the stigma at the proper time but that there also be compatible relations between the pollen and the pistil. The conditions in many varieties of avocados certainly suggest that this type of sterility may be operating here.

At any rate definite knowledge of the kind of pollination necessary for the best yield of fruits by each of the varieties of avocado is highly to be desired. In general the grower needs to know the following:

1. What is the behavior of any variety when grown in isolation with no opportunity for cross-pollination? In other words which varieties, if any, are highly self-fruitful, which are feebly self-fruitful and which are self-fruitless?
2. What particular interplanting leads to the best setting of fruit, and especially for each one of any wholly or partially self-fruitless varieties?
3. Is there any internal change with increasing age in the ability of a plant to set fruit after it once comes into blooming age either in regard to self- or cross-pollination?
4. Can the sterility of any variety be modified by environment, by cultural conditions or by treatment of any kind? For example, what is the effect of *ringing* on the production of; flowers, on the setting of fruit to self or to cross-pollination, and on the ability of the plant to mature fruit?

Without doubt in the course of time experience alone would hit upon the varieties which are the most fully self-fruitful and would also discover the best combination for interplanting of self-fruitless varieties. But such knowledge is greatly to be desired *now*. It would do much to assure a more certain and immediate success in the growing of avocados. Fortunately the practical experiences of growers may be supplemented by certain observational and experimental studies. At the present time the principal items of such studies which the writer would suggest may be summarized as follows:

1. The observational study of the fruit-forming habits of varieties to determine if the setting of fruit is related to position of flowers or to a particular part of the period of bloom. There are always many more flowers than fruit which set. What flowers are most likely to set fruit?
2. A strictly botanical study of the flower parts (pistils and stamens) as to possible variation in degree of perfection. Are some flowers more perfect than others and do varieties differ in this respect?
3. A study of the maturity of pistils and stamens as to the length of time the flowers remain open, of the movements of the two sets of stamens, of the period when pollen is shed, and of the time and period when pistils are receptive.
4. A microscopic study of the pollen with tests for germination to determine if pollen varies in quantity and quality and to learn how long it remains viable.
5. A study of means for the distribution of pollen with particular reference to the activities of insects. It may be desirable to extend such a study to the original home of the avocados!
6. Experimental studies by controlled pollinations to determine the type of sterility present and to learn what, if any, varieties are self-fertile and what varieties are most able to cross when interplanted. Special effort should be made to determine if it is possible readily to obtain fruit on trees that bloom but do not set fruit.
7. Appropriate studies to determine if there is bud-variation in any of the aspects of

fruit production.

During the coming season of bloom the writer hopes to attempt some of the studies suggested above, giving special attention to one or two of the best bearers (Spinks?) and some that are decidedly irregular in yields (Taft?).

The practical experience of the many growers should now yield much valuable data which will greatly assist and direct such studies. By combining the results of both, a very definite understanding may be gained of the kinds of pollination necessary for setting of fruits by avocados.

It is fully to be recognized that there is always some irregularity in the yield of any fruit plant even when varieties are most highly self-fruitful. Environmental influences and cultural methods (influence of stock, pruning, etc., etc.) always operate to affect vegetative vigor and yield of fruits. Many questions of hardiness, season of maturity of fruit, quality of fruit, etc., are also to be considered. But when marked sterilities exist, as they do in many fruit crops, the vicissitudes of pollination very frequently decide whether there is any fruit or not.

In such cases it is not enough to see a tree loaded with fruit when selecting varieties to plant. One needs to know what kind of pollination led to this setting of the fruit. It has always been good business to look at the teeth when buying or trading horses! It is equally good business to know what the flowers of any variety of avocado will do.