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The Flower Behavior of Avocados with Special Reference to Interplanting

A. B. Stout and E. M. Savage

With *a.* selection of varieties on the basis of their relative flower behavior, interplantings of avocados can be made which will greatly increase the chances for the proper pollinations necessary for fruit production. It is the purpose of this report to present records of the flower behavior of numerous varieties which indicate why interplanting is desirable and how the selection of varieties for the most successful interplanting is to be made.

With the exception of the variety Collinson, to be discussed later, all varieties and seedlings thus far studied by the writers have flowers that appear to be fully perfect. They shed pollen under favorable conditions of weather and they appear, with possibly a few exceptions among seedlings, fully able to function in the development of seed and fruit. But in avocados self-pollination of individual flowers is, for most varieties at least greatly restricted or even impossible. Each avocado flower has normally two distinct periods of being open. It is during the first period that the pistil of the flower is most ready for receiving pollen but it is during the second opening that the pollen is shed. The appearance of the flower during the two openings is indeed very different. At the climax of the first opening the pistil stands erect and alone and the stamens lie at right angles to its base.

During the second opening the stamens are decidedly larger, they stand more nearly erect and the valves of the anthers open bend upward and carry out the pollen and then insects may complete its distribution. The length of the interval between the closing after first-opening and the shedding of pollen in the second opening differs for varieties. When this interval is from 12 to 16 hours as in the Trapp, some pistils may remain in a condition suitable for fertilization by self pollination. . But for many varieties the climax of the maturity of the pistil of a flower, 24 or more hours before the pollen of that flower is shed, obviously makes self-fertilization of individual flowers impossible.

In a report concerning avocado crosspollination made in Florida during April 1916 for the U. S. Department of Agriculture mention was made of the opening of two sets of flowers each day, one in the morning and the other in the afternoon. Many points concerning avocado flowers and their behavior were recorded in this early report. Had individual flowers been tagged to better observe their behavior, the differences in them during the two open-periods of each flower, with the intervening closed period, would no doubt have been discovered at that time.

Close-pollination is also greatly restricted. The possibility of pollen being carried from a flower shedding pollen to a first-period flower of the same tree (inter-period close-pollination) is most decidedly limited. The rule of behavior is that only flowers of the

same period-opening occur together on a tree at one time.

Thus during the entire forenoon only first-period flowers will be found open on a tree of Taylor. About noon these flowers close fully and another set of flowers will open for the second time, and this is a set that opened for their first-period on the forenoon of the previous day. During the afternoon these flowers shed pollen. They are unable to self-pollinate properly for their pistils were most ready to receive pollen some 28 hours before. There are no first-period flowers open on the tree to which their pollen can be carried. This daily alternation in the character of the flowers occurs day after day with such precision that the chances for proper cross-pollination are indeed slight. The tree is really female in the forenoon and male in the afternoon!

A tree of Panchoy may be growing by the side of the Taylor tree. Observations of its flower behavior will reveal a daily periodicity or alternation of the sets that is exactly the reverse of that in the blooming of Taylor. During the forenoon only second-period flowers are open.

During the afternoon only first-period flowers are open. Thus the tree is male in the forenoon and female in the afternoon. *Its,* flowers are unable to self-fertilize or to close-fertilize.

Obviously the flower behavior of these two varieties affords opportunity for abundant cross-pollinations both ways between the two trees. In the forenoon pollen may be carried from Panchoy to Taylor and in the afternoon there is opportunity for pollen to be taken from Taylor to Panchoy. But if either tree stands entirely alone, with no other variety of avocado near or within insect range, there is very little chance that there will be pollination at the proper time.

A further point of special significance is that the growing of a solid block of trees of any variety of avocado tends to isolate the trees and to reduce the chances for proper pollination. The avocado is propagated vegetatively by budding or grafting. Thus all the many plants of any one variety are, in reality, merely branches of one original seedling plant. They all have the same flower behavior. When planted in solid blocks they all pass; through the same daily sequence in the opening of flowers for the two periods. Their flowers all shed pollen during the same hours and they all have first-period flowers open together during other hours. Reduction in the yields of fruit, in solid block plantings, is to be expected. It is the interplanting of trees of different varieties which have a reciprocating alternation (such as Panchoy and Taylor furnish) that provides the chances for the greatest number of proper fertilizations through cross-pollination.

In regard to flower behavior, all varieties and seedlings of avocados thus far studied by the authors in California and in Florida are to be grouped into two main classes.

In one class, which may be designated Class A, the first-period flowers normally open in the forenoon and close during midday to remain closed about 24 hours. Each afternoon another set of flowers opens to shed pollen. Taylor mentioned above is typical of this class.

In the other group of varieties, Class B, the second-period flowers are normally open during the forenoon and the first period flowers are open during the after-' noon. Panchoy is in this class.l

This natural grouping of varieties into two classes is readily revealed when one makes observations on the flowers of several varieties at frequent intervals during a single day of favorable weather. Tagging and numbering individual flowers greatly facilitates the observations for otherwise the shift of sets may not be discovered.

A chart of the records of flower behavior for one entire day of favorable weather clearly indicates several important facts, namely:—

1. That for each variety there are normally two different sets of flowers open during the day.

2. That the first-period flowers on a tree open together and for different hours than do the second-period flowers.

3. That the various varieties fall into two general classes with reference to the daily sequence of the two sets of flowers.

4. That the flower behavior of avocados is decidedly adapted to cross-pollination between varieties which shed pollen in the forenoon and those that have first period flowers open during the forenoon.

Cloudy and rainy periods of weather and particularly low temperatures greatly affect the opening and the closing of flowers. Such weather throws the sequence of blooming out of stride and the flowers of one or more sets of a variety may behave with marked irregularity. The first period of opening may be omitted by an entire set. Sets of second-period flowers may fail to shed pollen. A set that normally would open in the afternoon may be retarded until the following forenoon and the firsts of that forenoon may be retarded until afternoon, temporarily, giving a reversal for the normal daily sequence of the variety. Three distinct sets of flowers may be open during a single day.

Frequently during irregular and off stride blooming there is an overlapping of different sets and first-period flowers may be open at the time second-period flowers are shedding pollen. There is then an opportunity for close-pollination. When a set of flowers skips the first period and has. a single opening during which pollen is shed there would seem to be opportunity for self-fertilization of individual flowers provided the pistils have remained receptive to the pollen. There is, however, some question as to what extent off-stride flowers can function in fertilization and fruit setting. Certain varieties appear to be rather subject to overlapping and in some of those that open the first-period flowers in the forenoon this may be sufficient for some setting of fruit to close-pollination.

Class A. Varieties which normally have first-period flowers open in the forenoon and second-period flowers open in the afternoon.

G	Atlixco	W	Family	G	Sinaloa
W	Baker	EM	Gottfried	G	Solano
	Baldwin	EG	Grande	G	Spinks
G	Benik	W	Hawaii	G	Taft
G	Blakeman	LG	Kanan	G	Taylor
	Brooks	G	Kashlan	GWHy	Taylorson
W	Butler (SPI 26690)	MGHy	Lula	G	Ultimate
G	Cantel	G	Manik	G	Wagner
		G	Mayapan	W	Waldin
G	Challenge	E	Moanaloa	W	Wester
	Clower	G	Murrietta Green		SPI 18729
WGHy	Collason No. 1		Murrietta 2-lb.	M	SPI 19206
WGHy	Collason No. 2	G	Perfecto		SPI 26698
WGHy	Collason No. 3	W	Pinelli		SPI 26703
WGHy	Collinson 1 (No pollen)		Popenoe No. 3		SPI 29137 Trapp Sdl.
WGHy	Collinson No. 2	EM	Puebla		SPI 29379
G	Colorado	Hy	Reasoner		SPI 44626
G	Dickinson		Richardson	W	Seedling 1-2
G	Dickey	LG	Sharpless	W	Seedling 1-6
G	El Presidente	W	Simmonds	W	Seedling 4-5

Class B. Varieties which normally have first-period flowers open in the afternoon and second-period flowers open in the forenoon.

G	Akbal	W	Golden (Taft's)	W	Pollock
	Butternut		Hanson	G	Queen
G	Cabnal	W	Hardee	LG	Rey
	Cardinal (26699)	EG	Harmon	M	Rome (SPI 34831)
G	Champion	G	Ishim	EM	San Sebastian
G	Chisey (Pop. No. 11)	G	Ishkal	G	Schmidt
LG	Coban	G	Itzamna		Stephen's Choice
LG	Colla	LG	Knight	G	Surprise
Hy	Collason x Trapp (SPI 61740)	G	Lamat	G	Tertoh
		G	Linda	W	Trapp
Hy	Collason x Trapp (Broad-leaf)	G	Lyon	G	Tunim
			Mattair	G	Verde
LG	Collins	W	McClure	G	Walker
LG	Cook	LG	McDonald	W	Whitcomb
G	Dorothea	G	Meserve	G	Winslow
G	Eagle Rock	G	Montezuma	GWHy	Winslowson (Rolf's)
W	Earle's Late (26692)	G	Nabal	Hy	Winslowson x Trapp
LG	El Oro	G	Nimlioh	W	SPI 26689
W	Estelle	GWHy	Nimliohson		SPI 26700
G	Fuerte	EM	Northrup		SPI 32400 Seedless
	Fulford (26707)	G	Nutmeg		SPI 44856
M	Ganter	G	Panchoy	M	Seedling 12-7

A record for the month of February 1924 shows very much more off-stride blooming and overlapping of first and second period sets of flowers, with much more opportunity for both self and close pollinations on many varieties than was recorded during the spring of 1925. The cooler and more changeable temperature in 1924 were, no doubt, accountable for this difference in flower behavior. Certain varieties had much more opportunity to set fruit to their own pollen, but as a matter of fact, these certain varieties yielded one of their lightest crops.

A group of varieties of which Pollock, Trapp, Estelle and Taft's Golden are conspicuous examples, have the first-period opening late in the afternoon. They do this consistently day after day. This set may not open until after dark and it may frequently be skipped

even on days when numerous other varieties of the A and B groups complete the daily cycle of two sets with decided regularity. When these same flowers open on the following day to shed pollen their pistils are often still white. It seems highly probable that at least some of such flowers may be able to self-fertilize.

Thus the setting of fruit by isolated trees or by trees of a solid planting of one variety and particularly by trees abundantly worked by bees in tenting experiments may be expected. It is possible that a peculiar set of local weather conditions may sometimes favor setting of fruit year after year without cross-pollination. Some varieties such as the Trapp may have a flower behavior that enables them to be more self-fruitful than are other varieties. But even for such varieties there is no doubt that a proper interplanting will increase the chances of many more proper pollinations and to this extent insure the production of more uniform crops.

The varieties are here arranged alphabetically in two groups:. The upper group is made up of those which normally open their flowers for a first time during the forenoon and shed their pollen from another set of flowers open for a second time during the afternoon. The lower group is composed of varieties which have a reverse order of flower-opening behavior. These have flowers open for a first time in the afternoon and for a second time, shedding pollen, during the forenoon.

In the above list those varieties of Mexican origin have been marked with an "M." while "W" indicates West Indian, "G" Guatemalan and "Hy" Hybrids. "E" marks the varieties which start their blooming period early in the season and "L" those which are late in doing so. The early varieties are either all through with their blooming period, or are nearly through, before the late varieties start to open any flowers at all. Hence increased fruit production cannot be expected from an interplanting of an early blooming variety with a late one.

The varieties listed in these two groups are thus placed after careful observations on their flower behavior were made either in California in 1923 or in Florida in 1924 and 1925. A daily record continuing over many days was kept of most of the varieties and observations were made on a number of trees of each variety. A few varieties of lesser importance, however, are included where only one tree was available for study, or where observations were made on only one day. In some of these cases the identity of a tree may be in error as seems to be the case of a single tree called El Oro, which was studied in California in 1923.

The variety Collinson appears to be completely sterile as a pollen parent. The flowers have two periods of opening. The second-period flowers open in the afternoon but the anthers remain closed and no pollen is shed. Observations have been made of the flowers on the original tree of Collinson, on some of the first trees propagated from its buds and on about thirty others of blooming age in grove plantings. On some of these, observations were continued day after day over a period of more than two weeks. In two instances a single anther valve was found lifted but no pollen was found. An examination of the flowers closed after the second opening shows that the anthers had shed no pollen after the final closing. This variety appears to be completely impotent as a pollen parent. It sheds no pollen for any sort of pollination. Fruits maturing on it are the results of cross pollination.

A glance over the various charts shows a noticeable difference between the different varieties as to the hours of a single day when the two sets of flowers are open. Thus for the varieties studied on February 24th, there was a difference of two hours between the time when firsts opened on Perfecto and the time when the set of firsts started to open on Pinelli. A still greater difference is seen in the time when firsts started to open in the afternoon. There are also variations in the time when seconds were open and for the period when they shed pollen, but this is more nearly the same for the various; varieties of a group (A or B) than is the period of the opening of the firsts. These relative differences continue day after day. Atlixco and Perfecto open their first-period flowers early, Taft and Wagner late.

For the varieties in Group B, Meserve and Panchoy have firsts relatively early in the afternoon in comparison with Pollock, Trapp, Estelle and Taft's Golden. For the varieties opening firsts late in the afternoon there is, under normal conditions, a distinct period of one or more hours between the time when second-period flowers are fully closed and the time when the firsts begin to open. It is to be noted that none of these late-opening varieties of the B group were available for study in California so the records of flower behavior obtained there show less variation among varieties.

The observations both in California and Florida indicate that the varieties of the B class exhibit the greatest irregularity and off-stride behavior under unfavorable weather conditions. Weather which merely delays the opening of the two sets in varieties of the A group will often cause various varieties of the B group to continue a set of firsts open over night and into the next day; or to skip the set of firsts, or to have them open for a period during the night. The second opening of a set, or part of a set, may be delayed until the second day giving an interval of about thirty-six hours between the closing of firsts and the opening of seconds. For some varieties this interval of thirty-six hours seems to be almost a regular or normal behavior.

Under decided changes in temperature the blooming of all varieties is thrown off stride. The role which such irregularities play in fruit setting remains to be determined. Changes in weather which do not noticeably produce off-stride behavior of flowers will frequently produce differences from day to day of one or more hours in the time of opening. In such cases the relative behavior of different varieties remains quite the same. When this behavior is charted for a number of varieties it is as if the entire chart of one day is moved over to later or earlier hours.

As the season of blooming advances and there are more hours of sunlight with higher temperatures the periods of flower opening advance to earlier hours. Thus a day's record during the best weather of February may be two or more hours later than a day in March or April. This change to earlier hours as the season advances is also well shown when the records for a single variety for different days in the season are compiled in a single chart. While there are marked variations from day to day due to changes in weather there was a general trend to earlier hours as the season advanced. The record for Trapp, however, shows scarcely any tendency to such a shift to earlier hours.

COMMENTS ON INTERPLANTING

The aim in interplanting avocados is to provide for cross-pollinations which will increase the yield of fruit beyond that obtained or possible in solid block plantings of single varieties. On the basis of flower behavior, already discussed in this record, it seems certain that proper interplanting will provide the opportunity for cross-pollination and should increase production and make it more uniformly certain. It seems quite probable that without cross-pollination many varieties will be shy bearers or even non-fruitful. Apparently avocados have hither to been planted with little, if any, though of any necessity for cross-pollination. The results fully condemn this practice. Plantings of many varieties have often given scanty yields of fruit, particularly when there have been solid blocks of one sort, and when the general conditions of culture, weather, etc., were evidently highly favorable to the production of fruit. For the greatest success in avocado culture, the difficulties due to insufficient pollination should be reduced to a minimum. Other matters of importance bearing on fruit production, such as bud selection, methods of culture, nurture of (artificial fertilizers) etc., may then be determined with greater certainty.

The selection of varieties most desirable for culture involves many matters such as the habits of growth, adaptability to local conditions of soil, climate, fungus diseases and insect pests, and the quality of fruit and its season of maturity. These are matters which the grower must consider in deciding what varieties are most worthy of culture. When this selection is made the question of interplanting to be considered is how the varieties selected are to be arranged in the planting and if other varieties are needed as proper Pollenizers.

The one aim in interplanting avocados is to increase yields of fruit. Whether an interplanting will do this or not depends mainly on three conditions pertaining to pollination

1. The interplanting must provide opportunity for an increase in the number of proper pollinations that are possible.

2. Means for effecting these pollinations must be provided and must be working year after year.

3. The pollinations when made must be compatible for fertilization and hence result in the setting of fruit.

These three matters may be considered in the order stated.

1. What interplanting will increase the opportunity for a greater number of pollinations? Any interplanting of two or more varieties will do this if they supplement each other in the daily sequence of the opening of first-period and second period flowers, provided of course that they are in flower together or over a considerable span of calendar dates.

For example Taylor and Panchoy meet this requirement very well. They bloom together at least for a considerable period. Day after day in the forenoon many and even thousands of first-period flowers of a tree of Taylor are open and ready for proper pollination, during the hours when a tree of Panchoy is shedding pollen from second-period flowers. In the afternoon the conditions are reversed. When trees of these two varieties or of other similarly reciprocating pairs or combination of two or more pairs

stand side by side there are many more chances for proper pollination than can possibly exist when trees of any one of the varieties, stand alone or in solid blocks. *The chances are probably increased a thousand times:*

The first principle, of interplanting, is, therefore, that varieties which normally have first-period flowers in the forenoon should be planted with varieties which shed pollen in the forenoon.

A further selection may, however, be desirable. As amply shown and discussed above, there are varieties that are characteristically early or late in the daily periods. This suggests that some pairs selected from the A and B groups may be much more fully reciprocating than are other pairs.

2. An interplanting can only afford or supply the chances for cross-pollination. Means for effecting these cross-pollinations must then be operating. Insects are without a doubt the natural agents for the pollination of avocados. Wind plays, or seems to play no important role in the distribution of the pollen.

Fortunately honey bees are very fond of avocado nectar. They freely visit the flowers during both periods of their opening. In California they were frequently found in great numbers working avocado flowers. In Florida wherever bees were kept in groves or near by, they were found among the avocado flowers, but as a rule, during the past season the writers seldom saw many honey bees in the avocado trees. It is highly to be recommended that avocado growers keep bees. Insects other than bees, such as wild species of wasps, flies and thrips are frequently found working avocado flowers. Some of these may be important agents in pollination.

It must be noted that in effecting crosspollination insects must fly back and forth repeatedly between trees of reciprocating varieties. If individual bees or other insects confine their visits to the flowers of one tree or to trees of one variety the interplanting will be of no special advantage. Possibly the quality of the nectar produced by various varieties may influence the activities of bees. There may be such differences in the flavor and odor of nectar produced by certain varieties that individual bees may refuse to fly back and forth between them and collect nectar from both.

The whole matter of the behavior of bees and other insects in the pollination of avocados and especially in extended plantings of them deserves a very careful study. Insect behavior is without doubt one of the deciding factors as to the results obtained in interplanting.

3. When pollinations are made at the proper time and in the proper way fruit does not necessarily start to develop. In numerous fruit crops, apples, pears, plums, cherries, etc., certain pollinations are not compatible in fertilization and hence do not lead to the setting of fruit. Usually it is self-compatibility that is not effective and this limits or entirely restricts self and cross-pollinations as fully as does the flower behavior in avocados.

Sometimes cross-pollinations between varieties of the same fruit also fail and so differences in affinities of fertilization may exist between avocado varieties. Certain results in Florida have led some of the growers of avocados in the state to consider it possible that interplanting West Indian and Guatamalan varieties is especially productive of good yields. In California, many controlled cross-pollinations were made

between varieties in the hope of obtaining some evidence on this matter of affinities in fertilization. Most of these pollinations were made during the months when there was much irregular and off stride blooming and the percentages of "sets" were too low to be reliable in judging the matter.

In Florida, no fruit developed to either self or close-pollinations artificially made during 1924. From hundreds of flowers artificially self and close-pollinized during February and March 1925 only three close-pollinations were holding March 28, while eight fruits were holding from the cross-pollinations made prior to March 17. Between March 17 and 28, 562 flowers were cross-pollinized in 35 different ways, using 13 different varieties of flowers and 14 different kinds of pollen, from which some interesting data may be obtained.

Undoubtedly certain varieties will cross-fertilize more readily than others even when there are equally good chances for cross-pollination. It would be well worth while to determine this by appropriate experimental tests.

It is to be recognized that at the present time there is no rule of thumb for the interplanting of avocados which will guarantee unqualified success. In respect to the behavior of flowers alone, one can have no hesitancy in advising interplanting for every variety and of making the choice of various pairs of varieties which will provide the chances for greatly increased pollinations. Any interplanting on this basis is better than none at all!

It would undoubtedly be good business for avocado growers and nurserymen to perfect plans for determining as quickly and as exactly as may be possible the various combinations of interplantings most favorable to fruit setting. Without this it is up to the grower to inter plant the varieties which he wishes to grow on the basis of their relative flower behavior and to supply bees in abundance, placing them among the avocado trees during the blooming season.

The accumulated results of such plantings will no doubt in time reveal what varieties will work best together and also clear up many points regarding the way the interplanting should be arranged.

It may be noted that interplanting aims to correct fruitlessness that is due to faulty or inadequate pollination. The manifold cultural and environmental conditions which affect or determine the production of fruit must also be met. They exist quite apart from the problems of pollination and they may very frequently limit production of fruit when all the conditions for proper pollination are satisfied. There appear to be few legitimate objections to the interplanting of avocados. It seemingly entails no vital problem in culture. No very serious difficulties would be involved in the picking and grading of fruit. To grow two or three different varieties on one trunk will require the use of varieties which will grow together and make a well shaped tree, but this may not be necessary.

Finally it may be said that in making interplantings along the lines which now seem most promising the grower has nothing to lose and there is the chance that he will gain something worth while. He may not immediately hit upon the best combination which fills the bill in all three particular—i. e. (a) gives chance for proper pollination, (b) encourages and facilitates cross-visitations of bees and (c) involves strong affinities in

fertilization — but this much is certain, he will be no worse off than if he planted in solid blocks. He simply plays a game in which he has nothing to lose but stands a good chance to gain.

TENTING EXPERIMENTS

Experimental evidence as to what extent trees of different varieties of avocados are self-fruitful is one of special interest and of practical bearing on the planting of. varieties in solid blocks. Whether proper pollinations for fruit setting, either self or close, are possible and if so for what varieties and for what types of flower behavior are matters which should be determined.

During the past season some evidence bearing on these questions, was obtained by tenting experiments, conducted near Homestead, Florida, in the groves of Mr. W. J. Krome, who for years has been a leader in efforts to solve avocado problems. In these experiments a tree of each of the varieties Linda, Panchoy, Taft and Trapp was entirely covered with a tent in which a hive of bees was confined. It was the plan thus to supply abundant or even excessive means of pollination. Probably this was far beyond that possible in open orchard practice.

A frame of 2x4 timbers was erected on a base of 2x6 timbers and firmly braced. Furring strips were nailed to the sides and top, to which cheese cloth (Curity Absorbent, "1A") was overlapped and nailed under lath. The four tents were completed before there was any bloom, except that on the Trapp and Panchoy a very few flowers had opened and these were removed, the tents were all completed and the bees enclosed on or before February 28th.

The bees were furnished by Mr. E. P. Goldberg, who made frequent trips and observations regarding their welfare, feeding them with honey as seemed necessary. By the first of March the trees of Panchoy and Trapp were in fair bloom. On March 25 Panchoy and Trapp were in heavy bloom, Taft in good bloom and Linda in light bloom. Throughout the flowering of all the trees the bees in every tent worked the flowers hard. Good weather with sunny days prevailed and the bees continually worked flowers of both sets. On March 29th Dean Wilmon Newell of the Florida State Agricultural Experiment Station made observations on the conditions and remarked on the excellent and abundant visitations which the flowers were receiving from the bees.

The selection of the four varieties was made with special intent. Taft is, as the record of flower behavior shows, a variety typical of Class A in flower behavior with a long interval (24 hours) between the closing of the firsts and their opening for the second time. Besides it is a well known commercial variety that has a reputation of being a shy bearer.

The other three varieties, Linda, Panchoy and Trapp are all members of Class B with firsts normally opening in the afternoon. Linda and Panchoy are among the varieties of the B Class whose firsts complete their period regularly and comparatively early. Trapp is much later, frequently skips the first opening and is a widely cultivated variety and has the reputation of being a consistent and heavy bearer. It would seem that if any varieties can set fruit to selfing, it will be those that open firsts late as does the Trapp.

Mr. Barney: I would like to ask these gentlemen one question. In mixing up this planting, would it be in accordance with their investigation if each tree planted had one or two grafts of average varieties on the same tree?

Mr. Savage: The matter of grafts upon the same tree is one which will depend entirely upon the adequate growth of the tree, the strength which the two varieties will maintain in making a fine tree. That is something which can be experimented with.

W. J. Krome: I think I might partially answer Mr. Barney's inquiry about the propagation of two or more varieties on a single stock. I have tried that a good many times, generally just two and sometimes as he has done—three and four. I have never found that it was a wise thing to do. The stronger variety will almost every time dwarf the weaker variety, and you will wind up with only one variety on that stock; sometimes the weaker will persist for quite a length of time, but eventually you will come back and have only one avocado of good bearing value on that stock. The second variety during the time it persists might be worth while, simply as a pollinator for your other variety, but you could hardly expect it would be worth while as a producer of fruit.

Mr. Barney: The placing of more than one graft on a single tree was to act as a saver of space. I can put grafts on one tree and save a whole lot of space in the planting; it seems that two different kinds that blended harmoniously ought to be made to grow.

Mr. Krome: If you could get two, one of them in what Dr. Stout and Mr. Savage called Class A and the other in Class B, and have them growing on one stock or stem, and they were of equally vigorous strength, you might have a desirable combination. That has been suggested and is being applied to considerable extent in California, but I begun trying that ten years ago myself, and out of probably 75 or 80 instances of that kind I think I have only 2 or 3 trees remaining where they are still different varieties on the same stock, and even in those cases one of them bears practically no fruit.

**This report pertains particularly to studies made in Florida during February and March, 1925. in which Dr. A. B. Stout of the N. Y. Botanical Garden and Mr. E. M. Savage of the U. S. Department of Agriculture co-operated. The expenses of Dr. Stout were met by Dade County through its Farm Bureau. The County Agent, Mr. J. S. Rainey, various officers of the Florida Avocado Association and numerous growers of avocados co-operated very fully in the investigations. This report also draws freely of previous studies by the authors, those of Dr. Stout in California in the Spring of 1923, and those of Mr. Savage in Florida during the Spring of 1924. Certain portions of this report and especially the discussion of interplanting draws freely and to the point of exact quotation from articles previously published. The plan has been to assemble in this one article all the most important data now available on flower behavior of avocados with advice regarding interplanting.—The Authors*