California Avocado Society 1958 Yearbook 42: 64-66

FUERTE FRUIT SET AS INFLUENCED BY CROSS-POLLINATION

Bob Bergh and Don Gustafson
Bob Bergh, Jr. Geneticist, Citrus Experiment Station, University of California at Riverside. Bob Bergh is a life member of the California Avocado Society.
Don Gustafson is University of California farm advisor in San Diego County.

Talk given at the annual meeting of the California Avocado Society at Fallbrook, June 7, 1958.

It is generally believed that cross-pollination is of little or no importance to avocado fruit set in California.

Probably the two most authoritative and comprehensive discussions of the California avocado industry are by Chandler (1) and by Hodgson (3). According to Chandler (1), p. 213, "Fuerte seems to fruit about as well in (large solid) blocks or as single isolated trees as in closely mixed plantings. If cross-pollination increases its crops, that increase is too small to be detected among the results of other influences . . ." Earlier, Hodgson (3), p. 65, had written in similar vein: ". . . no case has yet been brought to light in this state where the provision of cross-pollination has measurably improved either the regularity of bearing or the amount of yield of individual trees or solid plantings of single varieties . . ."

Neither the University of California Extension Avocado Committee (2) nor the Variety Committee of the California Avocado Society (4) make any mention of provision for cross pollination in their recommendations of varieties for planting.

On the other hand, Mr. Don Gustafson had come to question this assumption that cross-pollination has no appreciable effect on fruit set, from grower contacts and his own observations as Farm Advisor in Subtropical Horticulture for San Diego county. One grove, in which the owner felt that Fuerte trees nearer Topa Topa interplants set more fruits, was that of John M. Best, Pauma Valley. This grove is laid out in such a way that any real fruit set differences can readily be determined and the statistical significance checked.

Our procedure was simply to count the number of fruits on each Fuerte tree. The counts were made in October of 1957. The results are given in Table 1, which also shows the field setup. The Fuerte trees had been planted in February of 1950 with a spacing of 28 feet square. In February of 1951 seedling trees were planted between the Fuerte trees at ten row intervals; in September of 1951 these seedlings were top-worked to Topa Topa. These Topa interplant rows were designed simply for wind protection.

In Table 1 the vertical rows (which actually run north-south) are designated "columns" in order to distinguish them from the horizontal rows (east-west). Thus the Fuerte trees in

columns 1 and 2 adjoin the Topa Topa trees between them, and the same is true of columns 11 and 12 and also 21 and 22. The most obvious conclusion from Table 1 is that fruit set per tree was highly variable. This, of course, is typical of avocados. Thus, the Fuerte tree at column 2, row 12 adjoins a Topa and set 71 fruits, while in column 3 (not adjoining Topas) three different Fuerte trees had set over 200 fruits. Similarly, the adjoining Fuerte at column 21, row 6 set 23 fruits, while a tree in column 20 set 202. The Fuerte at column 7, row 3—as far removed from from the Topa interplants as the setup allows—had set 359 fruits.

However, when the column averages at the bottom of the table are examined, a definite pattern emerges. This pattern is made clearer when allowance is made for the fact that average yields gradually decrease as column number increases, toward the right of the table. With this qualification, the column averages of Table 1 become reasonably consistent: Fuerte trees which adjoin Topas set about two-and-one-half times as many fruits as Fuerte trees one row or more removed from Topa interplants. Averaged over all 22 vertical rows, Fuerte trees immediately adjoining Topas set 203.2 fruits per tree; the remaining Fuertes set an average of only 83.7 fruits per tree.

Table 1. Number of Fruits Set on Individual Fuerte Trees, Topa Topa Interplant Block (John M. Best grove, Pauma Valley)

Column	1		2	3	4	5	6	7	8	9	10	11		12	13	14	15	16	17	18	19	20	21		22
Row 3	311	Topa	431	226	133	33	191	359	147	116	138	153	Topa	183	51	127	50	58	28	46	16	11	17	Topa	140
4	176	"	257	27	201	239	167	81	96	69	73	167	"	373	155	226	123	21	86	67	31	19	56	"	47
5	396	"	273	27	44	91	123	83	101	31	113	79	"	95	36	7	121	93	68	21	19	33	99	"	69
6	207	"	374	145	143	62	2	201	121	53	34	191	"	321	134	122	149	128	52	38	12	89	23	"	54
7	253	"	338	77	186	115	134	81	12	54	56	221	"	165	178	42	53	78	4	33	42	78	99	"	130
8	230	"	308	234	130	80	105	147	27	94	62	172	"	263	131	18	65	59	19	10	51	118	55	"	289
9	167	"	247	100	116	89	86	47	116	123	66	286	"	338	232	38	128	44	3	23	78	36	164	"	137
10	279	"	277	173	35	92	198	118	86	152	92	530	"	154	72	11	170	136	25	22	7	101	355	"	117
11	198	"	383	263	118	96	47	47	27	14	106	228	"	239	245	230	4	138	174	49	194	202	360	"	112
12	196	"	71	37	73	41	46	39	79	72	26	232	"	119	13	5	32	10	5	21	95	29	281	"	193
13	224	"	100	22	17	52	36	56	21	150	85	167	"	69	11	77	10	5	61	133	53	76	78	"	86
Average:	239.7	"	278.1	121.0	108.7	90	103.2	114.5	75.7	84.4	77.4	220.5	"	210.8	114.4	82.1	82.3	70	47.7	42.1	54.4	72	145.2	"	124.9

In a second section of this same grove, Hass trees had been interplanted among some of the Fuerte rows. Three isolated Fuerte rows in this section had set an average of 99.3 fruits per tree, while four rows of Fuerte trees which have Hass interplants had set 157.6 fruits on the average.

Since Topa Topa and Fuerte usually overlap for much of their respective blooming periods, while Hass generally blooms later, it is not surprising that Topa ordinarily has a much greater cross-pollinating effect on Fuerte than does Hass.

What is the importance of this to California avocado growers? In the first place, it should be borne in mind that our data are for just one region, for just one fruiting variety, and

for just one year. With regard to the last-named limitation, the owners of the grove—John and Helen Best—state that they observed an increased set on neighboring Fuerte trees the first year that the Topas bloomed extensively (1954). They have noted the same differential yield each year thereafter, with the possible exception of 1956 when a severe summer heat wave resulted in the loss of most of the crop. With regard to the other two limitations, we as yet have not found another grove of avocados any place which even approaches the Best grove in suitability of layout for testing cross-pollination effects. In other words, effects this great could be present in other regions and with other varieties, without anyone being able to show with statistical certainty that any effect whatsoever was present.

For example, in Ventura County we learned of a grove in which the owner feels that he has beneficial effect on the set of his Edranols from cross-pollination by Mac-Arthur trees. We examined the grove. The Edranols indeed have set crops unusually heavy for that variety. But the MacArthurs and Edranols are completely interplanted—there are no Edranol trees by themselves for a comparison. Hence it is quite impossible to say why the Edranols here set heavy crops regularly. Cross-pollination is only a guess.

We would be most happy to hear from any grower who has a grove layout which may lend itself to a study of the relationship between cross-pollination and fruit set. Whether or not the grower has observed any relationship is immaterial, we are looking for all available evidence, negative or positive.

It seems reasonable to suppose that cross-pollinating effects will vary with variety, geographical region, season, and other factors. Varieties differ in flower behavior and probably in pollen vigor and longevity. Location would be expected to influence flower and pollen performance through climate. Climate varies from year to year.

Until much more evidence is in, we would suggest that action by interested growers be limited to the following. First, assistance with the accumulation of further evidence, as noted above. Secondly, growers who are bothered by usually low yields may benefit from top-working to scattered branches of a different variety. We will be glad to assist in the planning of such a topworking program, and within limits we may be able to assist in the actual topworking procedure, if this is desired. Finally, we will be glad also to assist in planning new plantings so that the grower can profit from any cross-pollination effect that may be present. This would be of greater interest to those wishing to plant such notoriously erratic bearers as the Fuerte variety.

LITERATURE CITED

1. Chandler, W. H. 1958. Evergreen Orchards. Philadelphia: Lea and Febiger.535 pp.
2. Extension Avocado Committee, University of California. 1952. Avocado Varieties for Your Farm. (Pamphlet)
3. Hodgson, R. W. 1947. The California Avocado Industry. California Agr. Ext. Ser. Circular No. 43. 93 pp.
4. Rounds, M. B. 1957. Report of the Variety Committee, California Avocado Society. Calif. Avocado Soc. 1957 Yearbook, pp. 15-16.