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Climatic Influence on Commercial Avocado Production

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Climate may be considered the greatest limiting factor in agriculture. The success or failure of the avocado industry, in California, will depend largely upon climatic influences. A study of California crops, in relation to climate, may present a good lead as to what we may expect in the growing of avocados.

The large lima bean thrives under coastal climatic influences from Santa Barbara to San Diego. It will not stand the heat and dryness of the interior districts. The lemon thrives best under coastal influences. The Washington Navel orange requires the hot weather of interior districts for proper development. The Valencia orange likes an intermediate climate for greatest perfection—it has poor quality near the coast. The highest quality and production of the English walnut is secured in the coastal districts, with the exception of a few heat resistant varieties.

Young as the avocado industry is, we all know that it owes its existence in California to climatic factors favoring its development. Just as with other crops in California, the avocado has been planted under a wide range of climatic conditions. Oranges are grown from San Diego County to Butte County. Although oranges are grown under a wide range of climatic conditions, not all climatic zones are equally favorable for their profitable production. We must expect that avocados will vary as much as the orange, and probably more so, since they seem to be more temperamental in their fruiting responses.

Until recent years, the production of avocados has been considered a "hobby" industry. There were very few commercial plantings. Hundreds of individuals planted a few trees, in yards and in family orchards. It was a novelty fruit. The wide climatic range in such plantings resulted in certain areas being recognized as desirable locations for the growing of avocados. These early avocado producers found a ready market for the limited supply of fruit, selling at high prices. The plantings expanded, and then growers began to study varieties. The California Avocado Association was organized during that early pioneer period. Varieties were recommended as superior or having certain qualities. They were widely planted in all avocado districts without much regard to such influences as varietal climatic adaptation.

The avocado industry has, therefore, been subjected to a succession of disappointments in the various varieties planted. Approximately seventy per cent of the entire acreage consists of one variety, the Fuerte. It is planted in every avocado district in California. If our fore-sight were as good as our hind-sight, we should have recognized that it would prove disappointing in some of the major avocado producing districts. Just as with the lemon, and our two principal varieties of oranges, we must recognize that the Fuerte variety has climatic factors favoring its production and others unfavorable to it. These climatic factors vary according to regions. We have finally come

to agree that the Fuerte will not thrive under coastal conditions.

The Fuerte variety has only been mentioned as a typical example. Other varieties have just as narrow limitations, some thriving under coastal conditions, or under intermediate or coastal influences. We should, therefore, in studying varieties pay more attention to climatic adaptation than we have in the past to avoid costly mistakes in planting varieties under conditions not suited to them.

There is another phase of the problem of climatic influences on commercial avocado production that should have an important bearing on future plantings-regional differences in the maturity of avocados, and duration of harvesting season. That was discussed by me at the annual meeting of the California Avocado Association in the spring of 1934, and was published in its Year Book for 1934. It should bear repetition at this time when considering climatic influences.

The manager of the Calavo Growers, Mr. George Hodgkin, let me have access to the records of fruit deliveries of avocados, using those for the years 1931-1932 and 1932-1933. Box deliveries were tabulated for different varieties according to districts. Symbols were made as to degree or amount of delivery, "O" representing light or very nominal delivery, and "X" representing heavy delivery. It was found that the results in both years were practically the same, so only those for the 1931-1932 crop are included in this discussion.

The following table shows the behavior of three avocado varieties, Fuerte, Pueblo, and Nabal, in different locations in the 1931-1932 crop year.

It is evident in examining the records for the Fuerte variety under "Total all districts" that the major period of harvest or maturity is during the four months December to March, inclusive. Although fruit was delivered in October, November, April, May and June, it was exceedingly light in amount. It is apparent, therefore, that the Fuerte variety with seventy percent of the total acreage actually supplies fruit in commercial quantities in an exceedingly brief period. This has developed a seasonal surplus. In future plantings we should take this into consideration, recognizing, however, that Florida and Cuba supply fruit in large amounts in the summer and fall months.

In studying the records by districts it is evident that climatic differences have influenced the season and period of maturity. If the Fuerte could be made to fruit satisfactorily in all these districts, it would be possible to greatly increase the period of marketing this variety by several months.

Records for Puebla and Nabal are given to illustrate how we might meet the problem of the short harvest season of the Fuerte by growing varieties which mature during other seasons. These are not suggested as the varieties to use, but merely the approach to the problem. Here again, it is evident that these varieties vary in maturity according to climatic influences.

In addition to the responses of avocado varieties under varying climatic conditions, as related above, it is well known that avocados are exceedingly sensitive to extremes in temperature. Resistance or susceptibility varies with varieties and race of avocados. That has an important bearing on profitable production. It was only this season that an avocado grower told me that he had finally pulled up his trees, because he recognized

that the climatic zone in which his orchard was located was unsuited to profitable production. Extremes in temperature were too great for the trees, which resulted in low production, poor quality, and in some years, injury to the trees. It would be better for the avocado industry, and for individual growers, if more growers would analyze their location from the standpoint of ever succeeding under the climatic conditions there.

BEHAVIOR OF THREE AVOCADO VARIETIES IN DIFFERENT LOCATIONS
Fuerte Box Deliveries, 1931-32, Calavo Growers

DISTRICT	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Total all districts	O	O	X	X	X	X	O	O	O	....	....	....
Monrovia to Riverside	O	O	X	X	O	O	....	....	....	....	....	....
North Whittier Heights	O	O	O	X	X	X	X	O	....	....	....	....
La Habra, Fullerton, Anaheim	O	O	X	X	X	O	O	O	O	....	....	....
Escondido, Fallbrook, Vista	O	O	O	X	X	X	X	O	O	....	....	....
Carlsbad, Encinitas	X	X	X	O	O	O	....	....	....	....	....	....
Ventura County	....	....	....	....	O	X	X	X	O	....	....	....
	(Puebla Oct. to Feb., 1931-32)						(Nabal Apr. to Sept., 1931-32)					
Total all districts	X	X	X	O	O	....	O	X	X	O	O	O
Monrovia to Riverside	X	X	O	O	....	....	....	....	X	X	....	....
North Whittier Heights	X	X	O	O	....	....	....	O	O	X	X	X
La Habra, Fullerton, Anaheim	X	X	O	O	....	....	....	X	X	....	....	....
Escondido, Fallbrook, Vista	O	X	X	O	O	....	O	X	X	O	....	....
Carlsbad, Encinitas	X	X	O	O	....	....	X	X	X	....	....	....
Ventura county	....	O	X	O	....	....	....	....	X	....	O	....

O—Light. X—Heavy.

Wind is one of the greatest climatic limiting factors in horticulture. A year ago I made a study of the effects of the prevailing west wind in Ventura County on the production of lemons and size of trees. I found differences in fruiting responses between tree wind-breaked orchards and unprotected for five hundred to seven hundred percent, as well as one-third to twice the size of trees. Wind is a deterrent to growth and production. I have observed that wind will also affect avocados similarly. Avocados will not stand wind, even what might be termed the mild westerly prevailing winds. The constancy of these winds plus their low temperatures reacts unfavorably to avocado growth and production.

Windbreaks have more than the influence of reducing the velocity of winds. They increase temperatures. Mr. Carl Newman, Manager of the Utt Development Company in Ventura County, and the San Joaquin Fruit Company in Orange County, has been keeping soil temperature records in the Utt Development Company orchards. He has found a difference of two degrees in the soil temperature in the areas protected by tree windbreaks, as compared with unprotected areas. Windbreaks should, therefore, have an influence in providing more favorable conditions for the setting of fruit in the coastal areas.

We Californians are noted for bragging about our climate. We have not only "climate," but we have "climates." There might not seem to be great apparent differences in these

"climates," but trees are able to find differences and react to them. Our job is to live with the trees, studying their behavior under varying conditions, and adapt our horticultural developments to those findings.