

## Vegetative and Reproductive Recovery of Avocado Trees from the January 1937 Freeze

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This report supplements a preliminary one issued in October, 1937.\*

\*Halma, F. F., and Courtney, A. Recovery of Avocado Trees from the January 1937 Freeze. Yearbook California Avocado Association 1937, pp. 94-97.

Shortly after the January 1937 freeze, thirteen trees in three orchards located in Orange and Los Angeles counties were selected for periodic observations. No temperature records were available but on the basis of degree of injury the minimum temperature was judged to have been 22-24 degrees P. The duration of the minimum temperatures probably varied from one to three hours. Varieties included were four Fuertes, two Nabals and one of each of Anaheim, Benik, Challenge, Dickinson, Itzamna, Puebla and Ryan. In the latest observations made in February 1939 only ten trees remained because one of the Fuertes and Itzamna had been topworked and Benik did not recover from the freeze. In this connection it may be mentioned that Ryan trees adjacent to Beniks made a rapid recovery.

The vegetative recovery of the ten trees is shown in figures 1 to 10 inclusive. In each case photograph A was taken in April, 1937; B in August, 1937; and C in February, 1939. A set of photographs was also taken in May, 1937, but is omitted to conserve space.

Puebla, Fuerte and Ryan shown in figures 1, 2 and 3 respectively are located in the same orchard and they are fairly close together. All three varieties showed about the same degree of cold injury.

The orchard in which one of the Fuerte (fig. 4) and Nabal (fig. 5) are located was probably the coldest of the three orchards. Here large Taft and Blakeman trees were severely injured. The exact degree of injury could not be determined because the trees were topworked to Fuerte shortly after the freeze. The progress of these grafts will be discussed later. Practically the entire top of the Nabal tree was killed and the tree shown in figure 5-C developed from a sprout about one foot above the graft union. The Fuerte is in another part of the orchard and since no temperature records are available no conclusions can be drawn as to the relative hardiness of the two varieties.

The trees in figures 6 to 10 are Fuerte, Anaheim, Dickinson, Nabal and Challenge. An Itzamna tree was observed until topworked to another variety about a year ago; its recovery was very rapid. With the exception of the Fuerte, which is several years older,

the trees were planted in 1931. It will be seen that all varieties recovered rapidly. The partly defoliated condition of the Anaheim in February (fig. 7-C) was caused by severe winds which occurred during the winter of 1938-1939.

Although these trees, as well as others which were exposed to similar conditions, regained their vegetative vigor within a year after the freeze, their reproductive power was in most cases still subnormal during the second year. This is indicated in table I. The fruit on each tree was counted in February, 1939, before any of the fruit was picked. The estimated normal crop given in the table is based on previous records and also on the crop borne by trees in the same orchard which by reason of a warmer location escaped serious injury.

### **COMPARATIVE TIME REQUIRED FOR RECOVERY**

The subnormal yield of all trees except the Challenge and possibly the Anaheim which was injured by wind, suggests that practically two years were required for complete recovery; that is one year for the restoration of vegetative vigor and another for the storing up of carbohydrates for a normal crop during the third year. The complete recovery of Challenge in one year is puzzling. It is close to the Nabal in orchard C and not far from the Dickinson, Anaheim, and Fuerte, and the degree of freeze injury and the rate of vegetative recovery was judged to be the same for all five varieties. It would be of interest to know whether our observations are in general agreement with those made by others.

The progress of large Taft and Blakeman trees which were topworked to Fuerte two months after the freeze may be of interest. These trees were on Mexican stock and were planted in 1916. The freeze injury was so severe that the owners decided to change to Fuerte. This was done two months after the freeze although a difference of opinion existed as to the advisability of doing this so soon. In some cases the Fuerte scion was inserted into the Mexican rootstock and in others into the crotch limbs close to the trunk. Figures 11 and 12 show both methods.

During the first year the grafts on the Mexican stock appeared to be doing much better than those on the Guatemalan part of the tree. However, during the second year there was no consistent difference in size or condition. Both types of trees set a few fruits this year and there should be a fair crop in 1940-41 or four years after the freeze. Nevertheless, an unnecessary risk was involved in using the Guatemalan because the extent of the freeze injury was not definitely known when the grafting was done. There is a further possible risk in case of future freeze by damage to the Guatemalan section of the trunk. It seems that under such conditions the safest procedure is to graft onto the hardy Mexican stock.

Table I. Actual and Per Cent of Normal Yield, February, 1939

Figures	Orchard Location	Variety	No. of Fruit	Per Cent Normal
1	A	Puebla	20	6
2	"	Fuerte	72	10
3	"	Ryan	17	10
4	B	Fuerte	7	1
5	"	Nabal	0	0
6	C	Fuerte	74	40
7	"	Anaheim	53	70
8	"	Dickinson	12	20
9	"	Nabal	8	5
10	"	Challenge	170	100

LEGENDS OF FIGURES

- |         |         |         |   |
|---------|---------|---------|---|
| Fig. 1. | Puebla  | Fig. 8. | Dickinson   |
| " 2.    | Fuerte  | " 9.    | Nabal   |
| " 3.    | Ryan    | " 10.   | Challenge   |
| " 4.    | Fuerte  | " 11.   | Guatemalan topworked to Fuerte scion inserted into Mexican Stock. |
| " 5.    | Nabal   | " 12.   | Same as Fig. 11 but scion inserted into Guatemalan trunk.         |
| " 6.    | Fuerte  |         |   |
| " 7.    | Anaheim |         |   |



Fig. 1 Puebla



Fig. 2 Fuerte

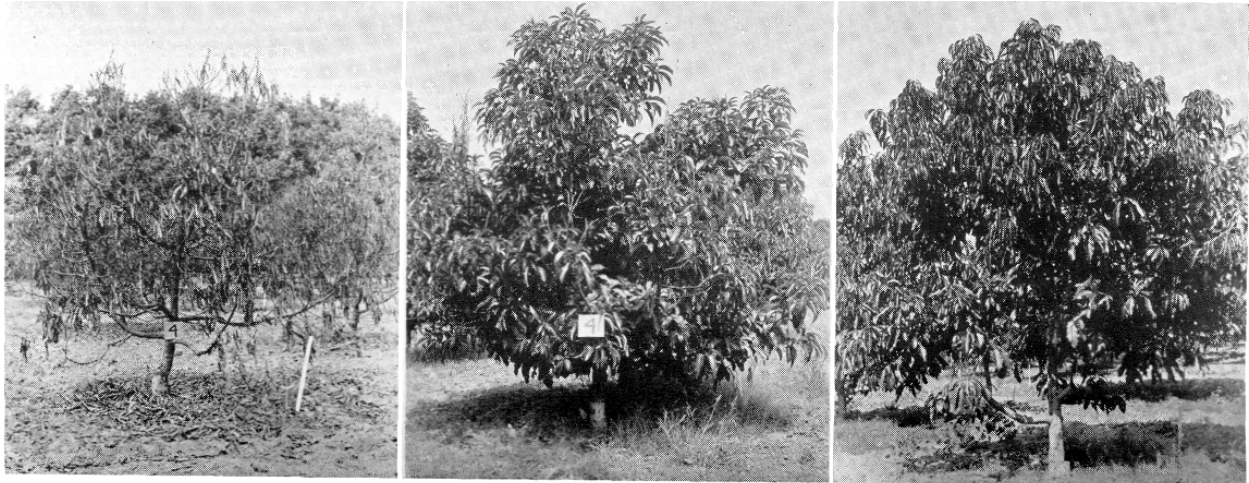


Fig. 3 Ryan



Fig. 4 Fuerte



Fig. 5 Nabal

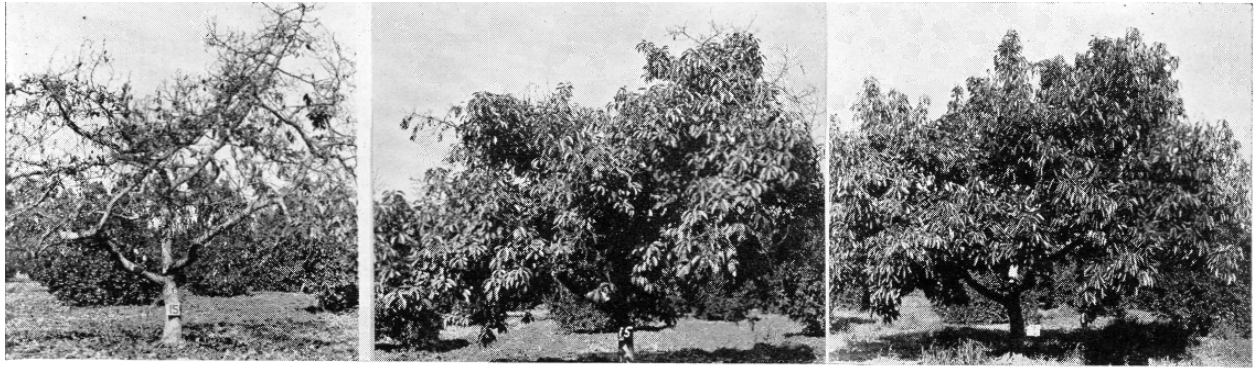


Fig. 6 Fuerte

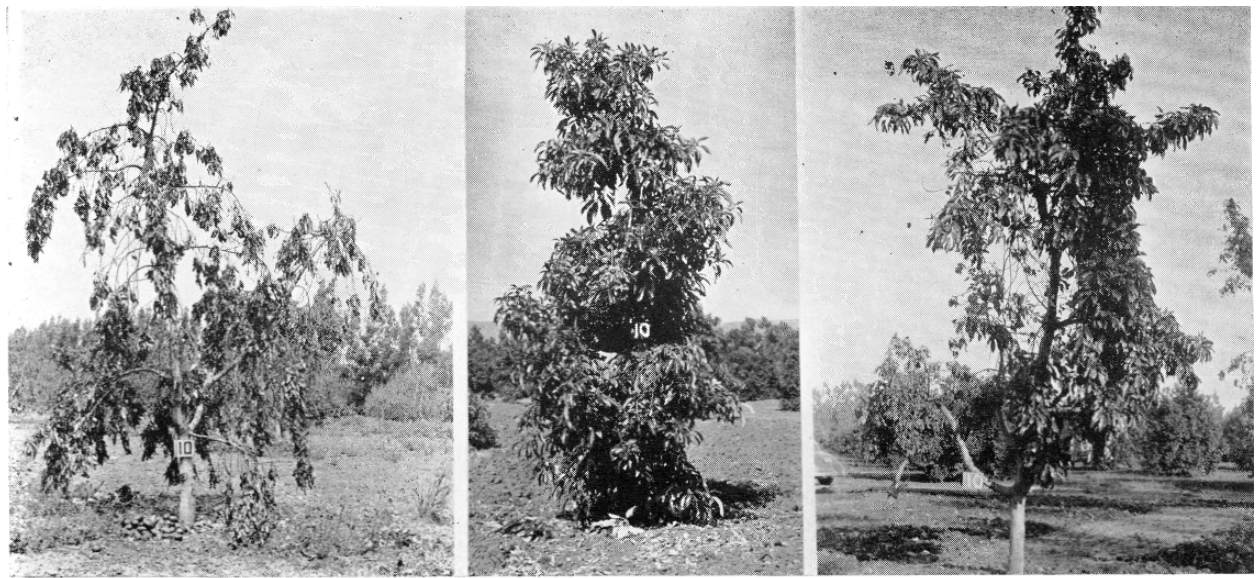


Fig. 7 Anheim



Fig. 8 Dickinson

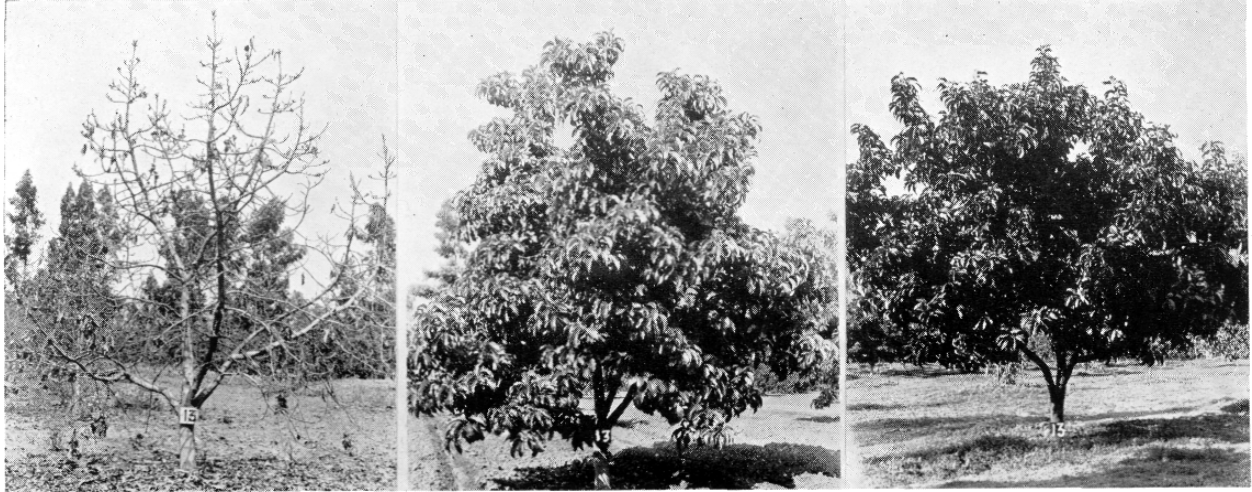


Fig. 9 Nabal

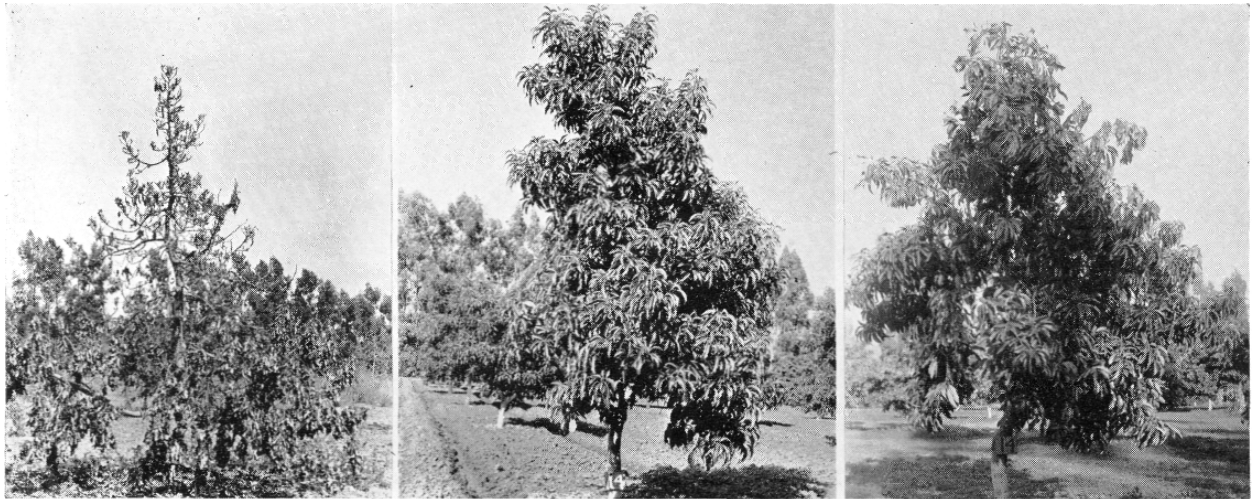


Fig. 10 Challenge



Fig. 11 Guatemalan top worked to Fuerte scion inserted into Mexican Stock.

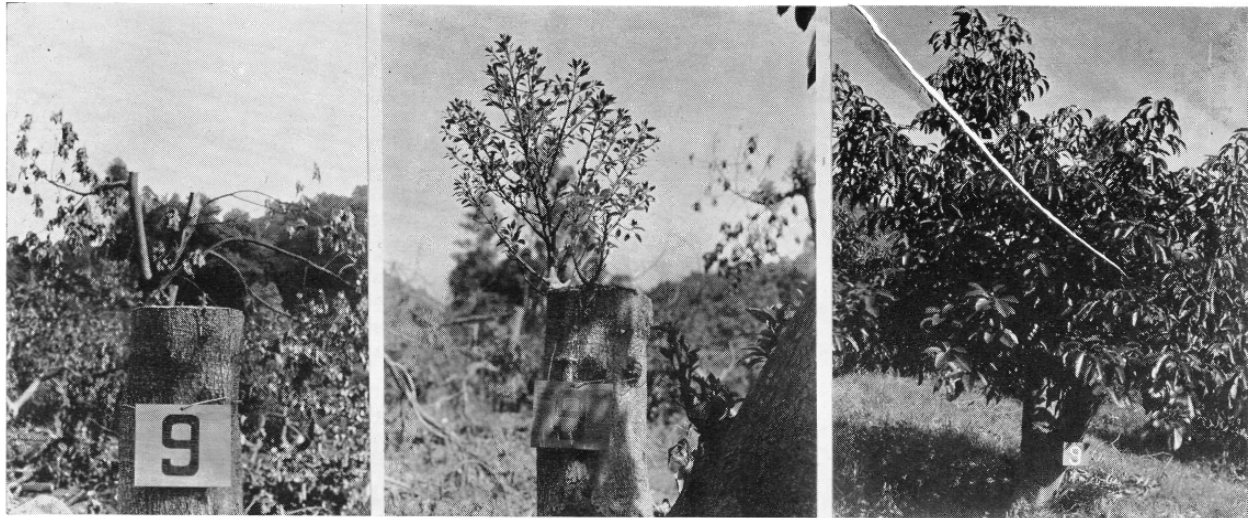


Fig. 12. Fuerte scions inserted in Guatemalan sandwich.