

# Leaf Malady of Avocado Trees

leaves of trees of several varieties on various rootstocks seriously affected when placed under glasshouse conditions

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**Leaves** of seedling avocado trees grown under glasshouse conditions—in cultures of silica sand or soil—have occasionally shown certain symptoms of nutritional deficiency.

Seed of the Mexican variety, Topa Topa—from the same lots of seed used satisfactorily in other tests—were germinated in propagation beds and then planted in serpentine soil in three-gallon-capacity containers. This soil is deficient in many elements—such as molybdenum, calcium, copper—but contains considerable magnesium. Applications of Hoagland's complete nutrient solution containing as minor elements: boron, manganese, zinc, iron, aluminum, and copper,

but no molybdenum, were made to the cultures the leaves of which showed very numerous light colored, translucent circular spots with no raised or burned spots on either side of the leaves.

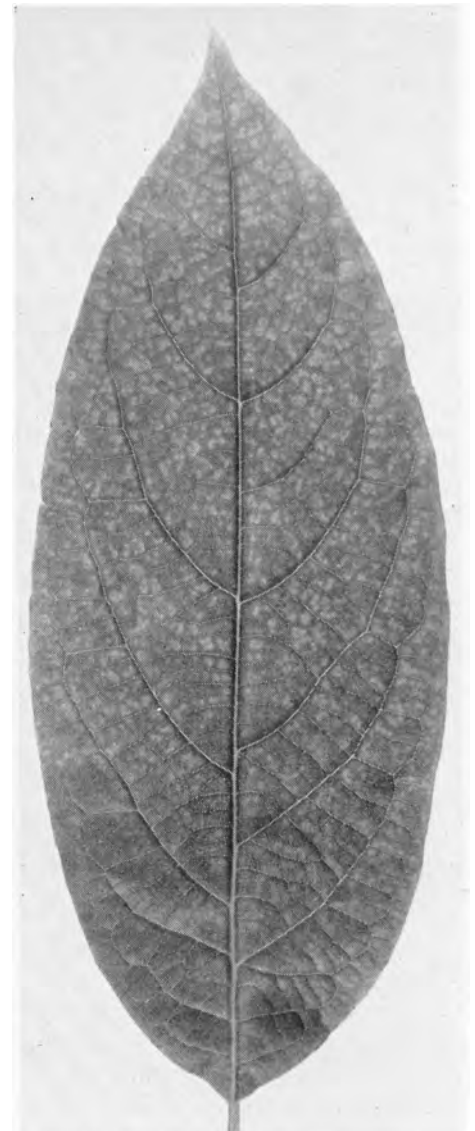
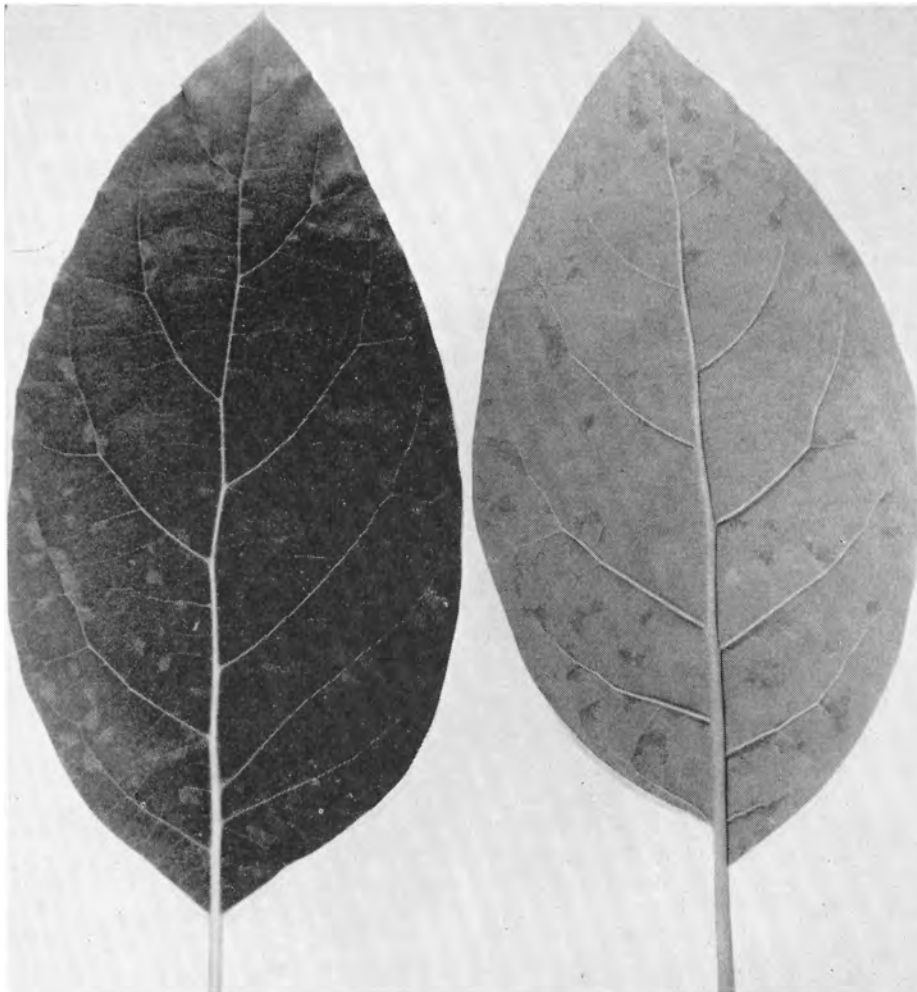
Leaf spots were also obtained in leaves of budded trees in the glasshouse. Large numbers of silica sand and soil cultures were set up in the glasshouse and outdoors. Seedlings of several varieties of avocado were used as rootstocks, all of which were budded with buds obtained from a healthy Fuerte-Carr-Hybrid avocado tree.

Regardless of the type of nutrient treatment or of the nature of the rootstock variety, it was clear that under

glasshouse conditions all Fuerte-Carr-Hybrid avocado trees possessed leaves which—as they approached maturity—showed translucent spots on the top side and corresponding raised spots on the underside that initially are light green in color and appear water-soaked. The spots on the underside of the leaves appear as clusters of small raised spots. As the leaves increase in maturity the upper leaf surface may show an extremely large

**Leaf of Topa Topa—Mex.—avocado seedlings grown in serpentine soil to which was applied Hoagland's nutrient solution with minor elements except molybdenum. Leaf spots are readily seen by use of a reading glass.**

**Under glasshouse conditions: left—upper side showing translucent spots in top view of Fuerte-Carr-Hybrid leaf; right—underside of leaf showing corresponding raised spots that appeared water-soaked.**



number of spots with corresponding raised spots—that turn reddish-brown—on the under surface. Evidently the loss of affected leaves is hastened by the appearance and increased number of the spots. Not until the new leaves are approximately of full size do the spots put in their appearance. This type of leaf spot occurred on leaves of seedlings in various soil cultures—as well as in silica sand—and on leaves of many varieties on various rootstocks. Such a leaf blem-

ish might conceivably affect the health of the tree because of the loss of green color and premature loss of leaves.

Outdoors in full sunlight or under partial shade no such leaf symptoms were found on Fuerte-Carr-Hybrid trees budded on various rootstock varieties in silica sand or soil cultures. Several of these outdoor cultures were brought into the glasshouse. The new leaves when of full size and some of the older leaves showed the symptoms as though the cul-

tures had always been grown in the glasshouse. No recovery of affected leaves occurred by the transfer of affected cultures from the glasshouse to the outdoors. However, the removal of affected cultures from the glasshouse to the outdoors permitted new leaves to develop to full size without the appearance of any of the symptoms, even though leaves severely affected and in poor condition while in the glasshouse were allowed to be in contact with the new growth produced while outdoors.

From the general occurrence of these avocado leaf symptoms in the glasshouse and in leaves of trees transferred to the glasshouse from outdoors and the failure of symptoms to appear in new leaves produced following the tree removal from the glasshouse to the outdoors, it would appear that possibly the increased humidity in the glasshouse under reduced light may be a factor in the initiation of this leaf malady.

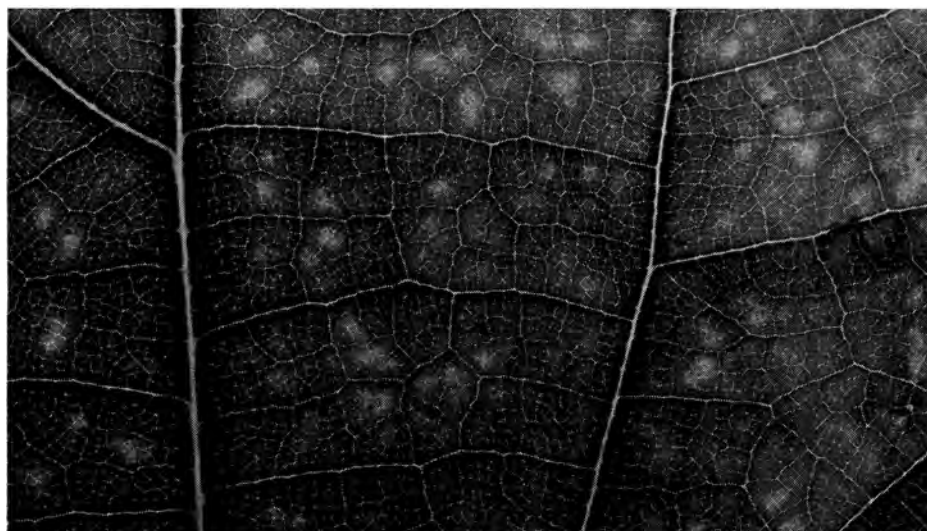
Whether a sprinkler system that contacts tree foliage would be sufficiently continuous as to affect leaves in this manner is not known.

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*The above progress report is based on Research Project No. 1087.*

**Appearance, when highly magnified, of leaf spots on underside of avocado seedling.**



## BRUSHING

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brushing, where several acres are protected. The short shields of the test did not seem to act as sufficient windbreaks to reduce the convective heat transfer. However, results from the test shields are indicative of reduction of nocturnal outward radiation as measured by heat flow from the soil. The heat loss was significantly less with brushing, although no material was significantly better than any other.

The second study was conducted in the Imperial Valley to evaluate the effect on plant growth and frost protection of the color of brushing paper. Four colors

were studied: brown kraft wrapping paper, black and red papers, and aluminum foil backed with brown kraft paper. An unshielded station was included for comparison.

All stations were replicated four times in a randomized block design. The shields were 3' high and sloped to the south 30° from the vertical. Each plot consisted of 15 hills of tomatoes 1' apart on the south side of a 5' wide raised tomato bed. The beds ran east-west. In each hill 10 Pearson tomato seeds were planted one half inch deep. Irrigation was started January 11, 1951. Data on per cent and rate of emergence in the

center 10 hills of each plot were used as a biological assay of soil temperature.

Daytime air temperatures as measured by mercury thermometers one half inch above the soil surface at the plant locations were approximately the same at all shielded stations and higher than at the unshielded station. Daytime soil temperatures were highest under the aluminum foil shield.

Percentage emergence was significantly greater under the aluminum foil shield than the other shields on January 20. Differences in per cent emergence under the various shields were not significant on January 25, but the difference between shielded and unshielded stations was highly significant. The data on rate and per cent emergence substantiate the temperature records observed under the various shields.

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**Air Temperature at Plant and Loss of Soil Heat Associated with Various Kinds of Protection**

Protection	Heat flow BTU/ft. <sup>2</sup> hr. from soil*	Air temperature at plant* °F
Unshielded .....	14.6	55.2
Kraft paper shield .....	13.3	55.5
Sisalation shield .....	13.3	55.3
Aluminum foil shield ..	13.5	55.4
Aluminum and kraft paper shield .....	13.3	55.7
L.S.D. 5% .....	0.55	not sig.
1% .....	0.74	

\*Average of 24 nights test, from 9 p.m. to 5 a.m.

**Soil and Air Temperatures Associated with Different Brushing Protection on a Typical Morning**

	7 a.m.	8 a.m.	10 a.m.	12 noon
Soil temperatures on Jan. 16 1/2" deep				
Unshielded ..	36	41	53	64
Brown .....	38	44	57	67
Red .....	37	44	56	68
Black .....	38	43	56	68
Aluminum ..	40	45	63	73
Air temperatures on Jan. 16 1/2" above soil surface				
Unshielded ..	33	40	59	62
Brown .....	34	42	60	64
Red .....	34	42	60	64
Black .....	34	42	60	64
Aluminum ..	34	42	61	66

**Effect of Color of Paper Shield Brushing on Rate and Per Cent Emergence**

Date	Paper color					L.S.D.* <sup>†</sup>	
	N <sup>*</sup>	Br <sup>*</sup>	Rd <sup>*</sup>	Bl <sup>*</sup>	Al <sup>*</sup>	5%	10%
1/16	0	0	0	0	0	..	..
1/20	0	35	29	32	47	6.95	9.76
1/25	18	73	68	62	78	19.8	27.8

\* N: none; Br: brown; Rd: red; Bl: black; Al: aluminum.

<sup>†</sup> Least significant difference.