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Rainfall Distribution Under Fuerte Avocado Trees

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In a recent study[1] the rainfall distribution was investigated under young orange and lemon trees growing in the Citrus Experiment Station orchard. At the same time a young and an old Fuerte avocado tree were utilized in making additional tests. The young avocado tree (A in Table 1) had upright growth and the cans (9.5" in dia.) were placed under the tree and in the open as shown in Table 1. To the trunk was attached a U-shaped collar made of black building paper. Brushing or slight scraping of the bark together with "tree-seal," "tree-heal" or their equivalent made it possible to bind the collar and water-proof its attachment. A hole punched downward in the collar permitted the water to be carried through a tube (made of the same paper) through the side (near the top of the lid) of the can. Figure 1 illustrates how sealed collars with troughs were made to conduct water from trunks when the size or shape of the collar was not important.

In Table 1 the results are given for the young avocado tree (A) in which the branches slope at an upward angle as crudely sketched in Figure 2. To the left in figure 2 is the manner in which the "drip" of a tree is usually visualized. Some rain is assumed to penetrate the canopy whereas most of the rain is shed as at (D). Actually the data for an avocado tree such as (A), reveal that the situation is as shown to the right in Figure 2.

The results in Table 1 for tree (A) show that considerable water may flow down the trunk. In every case the water collected at the periphery of the tree ("drip") was less than that collected in the open. Gaps in the foliage canopy and also the wind were factors largely responsible for the variations in the amount of water collected on different sides of the trunk under the tree. Table 2 gives the rainfall record that may be of assistance in considering the data in Table 1.

The second trial was with a very old avocado tree (B) in which the trunk was without much foliage and was covered with heavy rough bark. Near its greatest height the trunk was forked, each of the two prongs turning sharply downward and bearing most of the foliage. This tree was used because its growth possibly might parallel that of younger trees growing in soils of limited favorable depth.

On Feb. 18, no water flowed down the trunk. With such light rain or with very light rain as on Mar. 3, no water was collected from the trunk. During light rainfall the can at the "drip" caught less water than that out in the open. However, during heavy rainfall (Dec. 5 and 6) the can placed under the "drip" collected slightly more water than that placed in the open. On Mar. 4 and Dec. 5 and 6 during the heavier of the rains, the cans under the "drip" caught more water than cans placed well inside the "drip." The trunk was very effective in conducting rainfall downward during the heavy rain of Dec. 4 and 6. The

rough thick bark of such old trees no doubt absorb considerable water and during very light rain scarcely any water if at all may reach the soil.

Summary

Rainfall distribution was studied in a young and upright-growing Fuerte avocado tree and in a very old Fuerte avocado tree in which the trunk was forked and the two large branches bearing most of the foliage were bent sharply downward. U-shaped collars of a given width and made of black building paper were sealed in a circle around the trunk and a puncture in the collar permitted the water to be carried inside a closed tube of the paper into the side of a covered container.

The data show that for an upright-growing tree a large amount of water moves in an almost imperceptible stream down the trunk, and that the water caught at the so-called "drip" of the tree was less than that collected in the open.

In the case of the old avocado tree, with light rainfall no water was collected from the trunk but during heavy rainfall considerable water was collected. With light rainfall the can located at the "drip" collected less water than that in the open. During heavy rainfall the can at the "drip" accumulated slightly more water than that placed in the open and considerably more than cans placed well inside the "drip."

When a considerable quantity of water moves as in a film down the trunk, it is possible that in certain soils the movement may continue down along the roots and may remove or displace oxygen and other nutritive constituents from close to the roots and may be followed by root-rot and tree decline. The "drip" of the tree needs qualification depending on the slope of the branches of the tree, the intensity of the rain, the foliage or canopy uniformity, and the wind velocity and direction. The manner or location in which fertilizers or amendments are added to soils may require some revision should the importance of the "drip" be found to have previously been exaggerated.

1. Haas, A. E. C. Rainfall Distribution in Orange and Lemon Orchards. (Ready for publication).

TABLE I

Volume (c.c.) of water collected at various times during and after rainfall on Fuerte avocado trees in orchard (field 17)

Time of water collection in 1947	Feb. 10	Feb. 18	Mar. 4	Mar. 21	Mar. 28	Dec. 5	Dec. 6
(A) An upright-growing young Fuerte avocado tree; T4 east of road; 17′ high; 15′ diameter-spread of top; trunk circumference 13.25″ at collar; trunk cross-sectional area of circle at trunk collar (trunk and collar) is 40.72 sq. in.; collar 1.5″ wide.							
Open cans (9.5″ dia.)* placed 2′ from trunk: West of trunk	165	105	405	310	75	961	165
East of trunk	170	110	415	350	88	998	179
South of trunk	150	20	125	130	7	361	38
Closed can attached to trunk collar	255	201	550	502	239	7462	1575
Open can (9.5″ dia.) at drip (periphery) of tree	120	110	220	230	80	748	156
Open can (9.5″ dia.) distant from tree (control)	200	175	360	284	142	1328	202
(B) Old Fuerte avocado tree with a tall trunk forked near the top into two pendulous or drooping halves; T1 east of road; 28′ high; 34′ diameter-spread of top; trunk circumference 44.5″ at collar; trunk collar 1.5″ wide; cross-sectional area of circle at trunk collar (trunk and collar) is 231.27 sq. in.							
Closed can attached to trunk collar	340	0	650	290	0	10,960	4500
Open can (9.5″ dia.) 6′ from trunk and well inside of drip	190	40	245	150	25	925	150
Open can (9.5″ dia.) at drip (periphery) of tree	160	30	260	130	15	1520	240
Open can (9.5″ dia.) distant from tree (control)	210	170	355	280	145	1319	203

*Area of circular opening: can 9.5″ dia. equals 70.88 sq. in.; 1″ of rainfall in 9.5″ dia. can equals 1250 c.c.

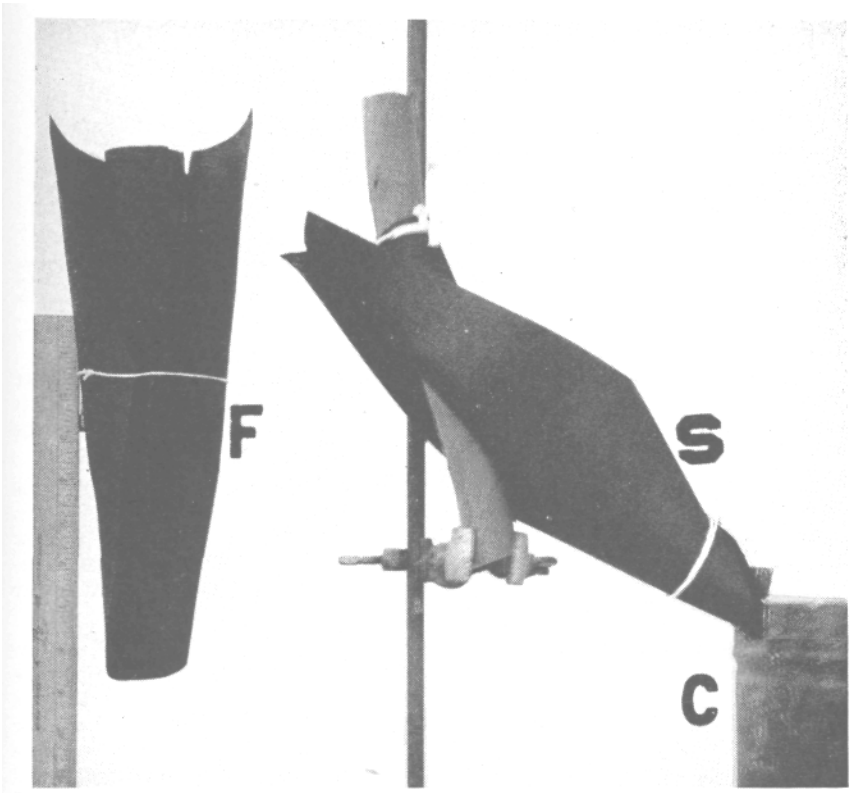

Fig. 1. Collars with trough to conduct the water-flow away from trunks. F, front view; S, side view showing attachment to trunk where a seal is made with cord and "tree-heal" or its equivalent; C, closed container for storing the diverted water.

TABLE II

Rainfall at the Citrus Experiment Station, Riverside, California

Month	Day	Inches during last 24 hours ending 8:30 A.M.	Storm total inches
1947			
February	10	.29	.29
"	17	.14	.14
"	27	.05	.05
March	1	.03	.03
"	4	.32	.32
"	21	.26	.26
"	28	.11	.11
December	2	.23	.23
"	4	.22	.22
"	5	.81	1.03
"	6	.28	1.31

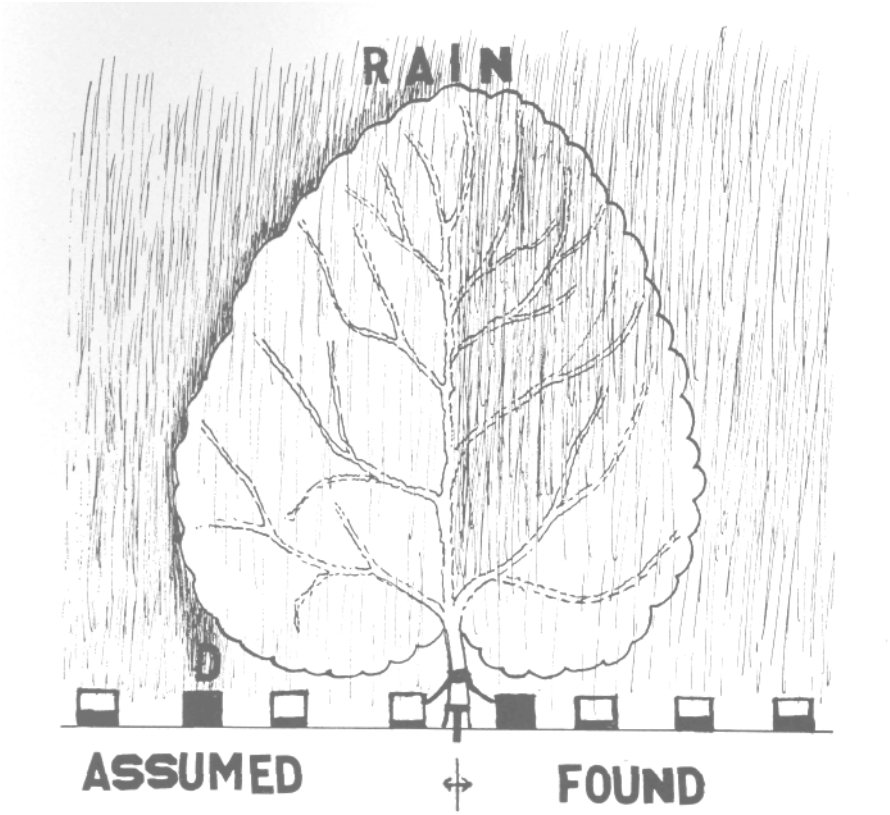

Fig. 2. Diagrammatic sketch shownig to the left, the generally assumed intersection of an avocado tree and the rainfall, and to the right, the situation as found in avocado tree (A). (D) is the assumed location of the "drip" whereas (T) is the trunk with collar and tube attachment for conducting the trunk-flow into a covered container.