

ROOTSTOCK INFLUENCE ON THE COMPOSITION OF SCION AVOCADO LEAVES

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One of the large unknowns in the growing of avocado trees is the influence of the rootstock on the scion. Dr. F. F. Halma, of the University of California at Los Angeles, is making considerable progress in studies of the effect of various rootstocks on the growth of the scion and their converse relationship. At the University of California at Riverside, Mr. M. M. Winslow is supervising the avocado orchard in which emphasis is being placed on rootstocks of the Mexican race.

Mature leaves were collected at Riverside in the avocado orchard that was planted in 1943. Leaves from trees planted in November, 1946 in Dr. Halma's experiment at Carpinteria were collected by Dr. Halma and were brought in the fresh condition directly to me by Mr. J. C. Johnston, Extension Specialist in Citriculture at Riverside.

Mature leaves were washed by hand in running distilled water and after shaking free the excess moisture, were dried at 65° C. in heavy paper bags in a well-ventilated oven. After being finely ground in a Wiley mill, each sample was thoroughly mixed and then placed in a heavy folded envelope that was inserted into the original paper bag. The samples were kept in an oven at 50°-55° C. until the aliquots were weighed for analysis.

The analyses were run in duplicate and the results were averaged. As an example of the accuracy of the averaged determinations in Table I, the data are now given from which the values for Fuerte (Cole) in Table I were obtained: 1.203, 1.194; .433, .447; 1.545, 1.545; .028, .030; 1.341, 1.330; .368, .364; 1.657, 1.652; .034, .046; 1.194, 1.194; .338, .334; 1.459, 1.442; .041, .021; 1.480, 1.506; .408, .405; 1.634, 1.618; .006, .007. Calcium was determined by double precipitation of the oxalate followed by permanganate titration; magnesium by weight as the pyrophosphate; potassium by the chloroplatinate method and sodium by difference in the chloroplatinate method.

Table I gives the scion variety of the leaves analyzed. The Hass and Hellen varieties are Guatemalan; the Clifton is Mexican; whereas the other scion varieties are hybrids of the Guatemalan and Mexican varieties.

The average calcium percentages for all of the Fuerte scion varieties are: 1.06, Mexicola; 1.16, Topa Topa; 1.24, Ganter; and 1.49, Harmon, respectively. If we average the percentages for all of the scion varieties we find for calcium: 1.13, 1.23, 1.33, and 1.33 per cent respectively for the different Mexican rootstocks and the reverse order of the average percentages for potassium: 1.77, 1.73, 1.60, and 1.58 per cent respectively.

In Table II are given the average data of duplicate analytical determinations of the

composition of mature Fuerte avocado leaves from young trees on rootstocks of various Guatemalan or *Mexican* avocado varieties. If we take the Hass as the scion, the individual percentages for calcium etc. were; 3.657, 3.669; .738, .702; .416, .414; .044, .069; and for Blake as the scion: 2.380, 2.360; .497, .491; .526, .528, and .050, .048 respectively. Hence considerable confidence may be placed in the accuracy of the analytical determinations.

TABLE I

Effect of Various Mexican Avocado Rootstocks on the Composition (Per Cent in Dry matter) of the Mature Leaves of the Scion Variety at Riverside, July 7, 1949

Scion variety	Mexican rootstock variety															
	Mexicola				Topa Topa				Ganter				Harmon			
	Ca	Mg	K	Na	Ca	Mg	K	Na	Ca	Mg	K	Na	Ca	Mg	K	Na
Fuerte (Anthony)	1.12	.45	1.54	.03	1.09	.43	1.41	.02	1.43	.44	1.52	.03				
Fuerte (Cole)	1.20	.44	1.55	.03	1.34	.37	1.66	.04	1.19	.34	1.45	.03	1.49	.41	1.63	.01
Fuerte (Carr)	0.96	.38	1.49	.04	1.03	.40	1.88	.02	1.11	.42	1.78	.03				
Fuerte (Newman)	0.94	.47	2.10	.04	1.18	.38	1.86	.03					1.13	.33	1.34	.04
Hass	1.18	.40	1.97	.04	1.31	.46	1.96	.06	1.37	.48	1.39	.02				
Ryan	1.18	.43	2.04	.03					1.66	.44	2.00	.08	1.27	.47	1.98	.03
Regina	1.18	.44	1.92	.04					1.52	.51	1.68	.06				
Irving	1.29	.47	1.80	.02									1.44	.48	1.36	.02
Nowels	1.01	.33	1.68	.02	1.18	.38	1.77	.02								
Hellen	1.23	.45	1.61	.03	1.49	.41	1.54	.03								
Clifton									1.19	.38	1.46	.05				
Tantlinger									1.18	.40	1.49	.03				
Average percentages	1.13	.43	1.77	.03	1.23	.40	1.73	.03	1.33	.43	1.60	.04	1.33	.42	1.58	.03

The averaged or condensed data of Table II were so placed as to have a descending percentage (column 4) for the Calcium in the dry matter of the leaves. Examination of the list of scions reveals that the hybrid (cutting) is approximately midway in the list. Northrop, Topa Topa, Duke and Blake, all of which are Mexican varieties are relatively low in the list, whereas, with the exception of the Panchoy and MacArthur, all of the Guatemalan varieties are relatively high in the list.

In a large Fuerte avocado orchard at Santa Paula budded in 1940 and leaf sampled in 1946 all of the trees are on Mexican seedlings and the range of calcium percentages was 1.50 to 2.37 with an average of 1.91 per cent. The average magnesium percentage was .61, that of potassium .88, whereas, the average total phosphorus content was 1395 p.p.m. The importance of calcium in the nutrition of the avocado tree is again emphasized by this study of the rootstock influence on scion leaf composition.

TABLE II
Composition of Mature Fuerte Avocado Leaves Collected
June 12, 1950 from Young Trees on Various Rootstocks in
"B" Orchard at Carpinteria

Rootstock variety	Race of avocado	Row and tree number	Per cent in dry matter			
			Ca	Mg	K	Na
Hass	Guat.	9-3	3.66	0.72	0.42	0.06
Nabal	Guat.	8-4	3.55	0.67	0.51	0.03
Anaheim	Guat.	8-8	3.41	0.71	0.53	0.03
Itzamna	Guat.	9-5	3.31	0.74	0.56	0.05
Cutting	Hybrid	11-3	3.21	0.55	0.56	0.04
Taft	Guat.	7-1	3.16	0.86	0.54	0.05
Northrop	Mex.	4-1	3.02	0.92	0.53	0.06
Panchoy	Guat.	8-2	2.95	0.91	0.56	0.06
Topa Topa	Mex.	9-1	2.85	0.83	0.52	0.05
Duke	Mex.	5-2	2.85	0.66	0.61	0.05
MacArthur	Guat.	6-1	2.62	0.70	0.51	0.07
Blake	Mex.	8-5	2.37	0.49	0.53	0.05
Average percentage			3.08	0.73	0.53	0.05

SUMMARY

Studies were made of the composition of the mature leaves of various scion varieties grown on various Mexican seedling rootstock varieties at Riverside. Calcium appeared to be the principal element that varied when the same scions were grafted on seedlings of various Mexican rootstock varieties. The average calcium percentage for all of the Fuerte scion varieties were: 1.06 for Mexicola; 1.16 for Topa Topa; 1.24 for Ganter; and 1.49 for Harmon, respectively.

Determinations were made of the composition of mature leaves of young Fuerte avocado trees grown on rootstocks of various Mexican or Guatemalan avocado varieties. When the averaged percentages for calcium in the scion leaves were arranged in descending order, the Guatemalan rootstock varieties, in general, were high in the list as compared with the Mexican rootstock varieties which were low in the list.

The importance of calcium in the nutrition of the avocado tree is again emphasized by this study of the rootstock influence on scion leaf composition.