

Azteca—A Bud-Perpetuated Rootstock Disorder of Some Texas-Grown Avocados

EDWARD O. OLSON¹, NORMAN MAXWELL², and W. C. COOPER¹
¹ *Agricultural Research Service, U. S. Department of Agriculture, Weslaco*
² *Texas Agricultural Experiment Station, Weslaco*

Many avocado selections from Mexico, Florida, and California have been introduced into the Rio Grande Valley during the past 12 years (Cooper and Maxwell, 1956). The object of these introductions was to find selections whose production, salt tolerance, cold tolerance and disease tolerance were superior to those of varieties already grown in the Valley. Scions of these selections were grafted on West Indian seedlings, since trees on this rootstock have greater salt tolerance than those on seedlings of the Mexican race (Cooper, 1951). The progeny were grown in test orchards at one or more locations to determine their performance in the Lower Rio Grande Valley. As the trees grew older, it became apparent that the trees of certain selections on West Indian rootstock were subject to a rootstock disorder, for convenience called azteca.

Symptoms and distribution of azteca

Azteca is characterized by deep grooves in the bark of the West Indian rootstock of young trees (2-6 years of age) when certain varieties are used as scions (figure 1). When other scions are used, the rootstock has bark as smooth as the top. In older trees, roughening of the root-stock bark may be due to natural causes.

Many of the trees with azteca are comparatively stunted in growth; others are not. No distinctive foliage symptoms such as those for sun-blotch-virus infections have been recognized on affected trees.

The disorder has been recognized in variety plantings near Weslaco, Harlingen, Rio Grande City and Monte Alto, Texas. G. D. Ruehle, in conversations in November, 1957, stated that approximately 25 to 100 Booth 8 trees on West Indian rootstock grown at Homestead, Florida, showed a similar rough bark condition on the rootstock; the affected trees were replaced. Since West Indian seedlings are not used in California, this disorder is apparently unknown there. The disorder has not been observed in Mexico, where most avocado trees are seedlings.

Relation of Azteca Symptoms to Scion Varieties

The grafted progeny of certain selections propagated on West Indian rootstock have shown azteca symptoms; others have not (table 1). The disorder is especially common in the budded progeny of seedlings from some areas of Mexico. Most of these seedlings were classed as hybrids of 2 races (West Indian x Mexican). Many of the trees examined for azteca were young and may subsequently develop symptoms of the

disorder.

Possible Causes of Azteca

(a) *Variability of rootstock seedlings.* This possibility is rejected because the disorder has been limited to the progeny of certain bud- source trees and has not been found in semi-commercial plantings with Lula tops on similar rootstocks.

(b) *Nutritional causes.* This possibility seems unlikely because the disorder has not developed in semi-commercial plantings of Lula and Pancho at Rio Grande City, while adjacent trees of Castro selections on the same West Indian rootstocks showed high proportions of azteca-affected trees. As shown in Table 2, dwarfed trees on Ardilla rootstock do not show azteca symptoms.

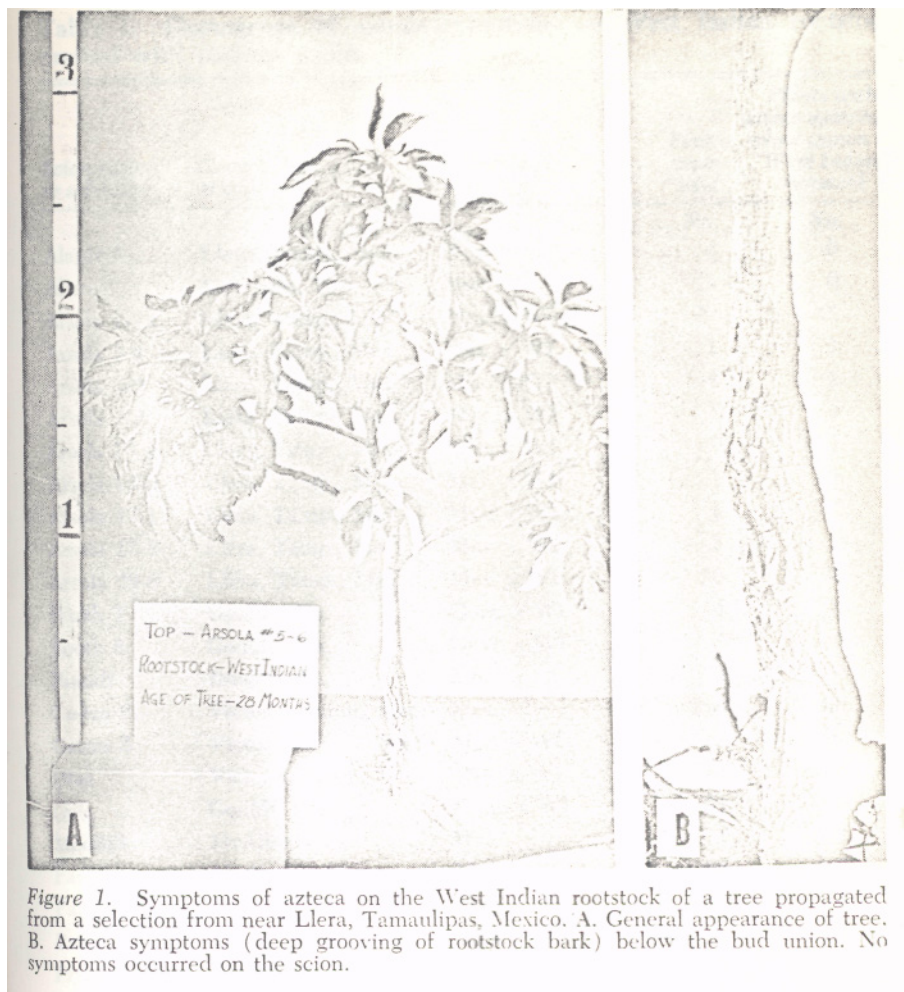


Table 1. Occurrence of azteca symptoms on West Indian rootstocks grafted with various scions.

Scion variety or selection	Geographic origin	Probable parentage ¹	Plants exam- ined	Plants with azteca symptoms when grown on West Indian rootstock
			No.	No.
Alaniz 3	Llera, Tamp., Mex.	Mex.	4	0
Allen	Mercedes, Tex.	Mex.	1	0
Arsola 1-18	Llera, Tamp., Mex.	Mex. x WI	29	18
Arsola 5-2	Llera, Tamp., Mex.	Mex. x WI	1	1
Arsola 5-6	Llera, Tamp., Mex.	Mex. x WI	2	2
Arsola 7-2	Llera, Tamp., Mex.	Mex. x WI	1	1
Arsola 10-2	Llera, Tamp., Mex.	Mex. x WI	1	1
Arsola 12-5	Llera, Tamp., Mex.	Mex. x WI	1	1
Arsola 17-1	Llera, Tamp., Mex.	Mex. x WI	1	1
Arsola 17-3	Llera, Tamp., Mex.	Mex. x WI	1	1
Arsola 29-9	Llera, Tamp., Mex.	Mex. x WI	26	23
Booth 7	Goulds, Fla.	Guat. x WI	4	0
Booth 8	Goulds, Fla.	Guat. x WI	3	0
Brandt	Brownsville, Tex.	Mex.	6	0
Castro 2	Victoria, Tamp., Mex.	Mex.	136	80
Castro 3	Victoria, Tamp., Mex.	Mex. x WI	2	2
Diaz	Victoria, Tamp., Mex.	Mex. x WI	13	6
Lula	Goulds, Fla.	Guat. x WI	84	0
MacRill	McAllen, Tex.	WI	1	1
Pancho	Harlingen, Tex.	Mex.	95	0
Paz 3	Llera, Tamp., Mex.	Mex. x WI	1	1
Paz 4	Llera, Tamp., Mex.	Mex. x WI	1	1
Pryor seedling	Harlingen, Tex.	Mex.	1	0
R-1	Raymondville, Tex.	Mex.	17	0
Rodilles 2	Atlixco, Pue., Mex.	Guat. x Mex.	1	1
W-1	San Juan, Tex.	Mex.	4	0
14366	Atlixco, Pue., Mex.	Guat. x Mex.	1	0
14369	Atlixco, Pue., Mex.	Guat. x Mex.	1	0
14375	Atlixco, Pue., Mex.	Guat. x Mex.	1	0
14382	Villa Guerrero, Mex.	Mex.	1	1
14383	Villa Guerrero, Mex.	Mex.	1	1
14384	Villa Guerrero, Mex.	Mex.	1	0

¹ "Mex." refers to Mexican race, "WI" to West Indian race, and "Guat." to Guatemalan race of avocados.

(c) *Uncongeniality of stock and scion.* The Pancho, II-1 and W-1 selections are genetically similar to many introductions from Mexico; yet use of these 3 varieties as scions does not cause azteca, whereas use of many of the others does. Uncongeniality might be expected to produce bud-union symptoms, but not symptoms extending from the bud union to the larger roots. Uncongeniality is a possible, but not a probable, cause of azteca.

(d) *Virus*. The only known virus disease affecting avocados is sun-blotch, which causes a yellow streaking of the foliage, green stems and branches and a yellow-to-red streak on the fruit. Some sunblotch-affected trees tend to have a decumbent willowy type of growth and may be stunted. Checking of the bark on mature branches and trunks is often associated, but it has not been definitely established that this is a symptom (Zentmyer, 1955). Gustafson (1956) also noted that rough and corky bark on the trunk and larger branches is sometimes, but not always, present on trees with sunblotch. With one exception, the trees observed in the various Texas plantings have shown no symptoms of sunblotch. The exception is described in Table 2. Sunblotch virus is seed-transmitted readily from some Mexican-race trees which are symptomless virus carriers (Wallace and Drake, 1953). However, Schroeder and Frolich (1958) indicate that several introductions from the Ciudad Victoria area of Mexico are sunblotch virus carriers, while other selections of Texas origin are not. There is a possibility that sunblotch virus is either associated with or perhaps is the causal agent of azteca. Support for this viewpoint is presented by the observation that the Diaz variety caused azteca on West Indian rootstock, whereas Lula tops on a Diaz seedling showed sunblotch symptoms (Table 2). However, in Ciudad Victoria, Tamaulipas, Mexico, Lula trees on West Indian rootstock showed sun-blotch symptoms on the Lula top, but no azteca symptoms on the rootstock. The occurrence of sunblotch in the Ciudad Victoria planting is evidence, however, that the causal virus is present in the area either naturally or introduced in budwood from the United States.

Table 2. Sunblotch and azteca symptoms on certain 3-year-old scion-rootstock combinations.

Scion	Rootstock	Appearance of			
		Tree growth	Foliage	Rootstock bark	Scion bark
Lula (Guat. x WI)	Diaz (Mexican)	dwarfed	sunblotch	normal	sunblotch
Lula (Guat. x WI)	West Indian	normal	normal	normal	normal
Diaz (Mexican)	West Indian	normal	normal	azteca	normal
Lula (Guat. x WI)	Ardilla ¹	dwarfed	normal	normal	normal

¹The ardilla is a wild avocado type of unknown species found in the mountains at Aguacatlan, S.L.P., Mexico.

If azteca is caused by a virus separate and distinct from sunblotch, then it is apparently common in Mexico. However, abnormal bark and foliage symptoms were not recognized in West Indian, Mexican x West Indian, and Mexican-race seedlings in the Ciudad Victoria area from which most of the Mexican introductions come. Thus, some original seedlings are apparently symptomless carriers of the causal agent of azteca.

In citrus, viruses may be symptomless in a scion variety but cause roughening of bark of certain rootstocks. It seems possible that the same phenomenon may occur in avocados. Therefore, further studies of this disorder are designed to test the hypothesis that a virus is the cause of azteca disorder.

Importance of the Azteca Disease Problems

Studies on this problem are necessary to determine the following:

(a) Whether budwood introductions from other areas are viruscarriers. Present indications are that some introductions carry sunblotch virus, which may or may not be the causal agent of *azteca*.

(b) Whether seed-transmitted diseases are being spread by Texas-grown seed of selections brought in from Mexico. Investigations on this point have been started.

(c) Whether the *Azteca* disorder is a limiting factor for avocados on West Indian rootstock. The semi-commercial varieties now being planted (Lula, R-1, and Pancho) on West Indian rootstock are those which do not cause the disorder.

Literature Cited

Cooper, W. C. 1951. Salt tolerance of avocados on various rootstocks. Yearbook Texas Avocado Society for 1951:24-28.

Cooper, William C. and Norman Maxwell. 1956. The search for avocado varieties adapted to the Rio Grande Valley. Journal of Rio Grande Valley Hort. Soc. 10:126-133.

Gustafson, C. D. 1956. How to identify avocado diseases and what to do about them. California Agricultural Experiment Station and Ext. Service Leaflet 61:8 pages.

Schroeder, C. A. and E. F. Frolich. 1958. Manuscript in preparation for publication in Journal of Rio Grande Valley Hort. Soc. 12:75

Wallace, J. M. and R. J. Drake. 1953. Seed transmission of the avocado sunblotch virus. Citrus Leaves 33:18-20.

Zentmyer, George A. 1955. Diseases of the avocado. California Avocado Society Yearbook 1955:44-58.