

A Study of Avocado Germplasm Resources, 1988 1990. V. The Evaluation of the Collected Avocado Germplasm Material for Horticultural Purposes

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Abstract. During earlier stages of the research, germplasm was collected in different countries and planted in Israel as a germplasm bank. About 50 representatives of this germplasm bank were propagated vegetatively in 1985 and planted in selected sites under stress conditions. The soils where the experimental orchards were planted have one or more of the following stress factors: salinity, lime, limited aeration, exchangeable sodium, high pH, low fertility and *Phytophthora* infestation. Vegetative development and health conditions of the trees were surveyed every year. Recently, most of the trees were grafted to a commercial cultivar. The findings collected from the experimental orchards show large differences among germplasm sources when planted as rooted trees.

Growing conditions for the avocado are worsening at an accelerated rate (salinity, exchangeable Na⁺, *Phytophthora cinnamomi* infection, etc.). Thus, there is a need to continuously search for stress-tolerant rootstocks (Soderholm, 1981).

This project is a part of an international study of avocado germplasm collected from different countries, mostly areas of origin of the avocado (Ben Ya'acov *et al.*, 1990). The germplasm collected is evaluated in Israel for horticultural purposes.

Materials and Methods

The 54 different rootstocks (Table 1) were propagated clonally and planted in 1985 in orchards at 6 sites in different commercial avocado areas of Israel. Six replicates were planted at each site. The sites are characterized by different stress conditions (Table 2). Two years after planting, the rootstocks were grafted to a commercial variety, usually Wurtz, a dwarf rootstock. Tree growth and development was investigated mainly by using aerial view photography. An annual survey of leaf burn, chlorosis and *Phytophthora cinnamomi* tolerance, gives us a large number of basic data on each rootstock.

Results

The information collected in the first 5 years includes one year with unusual heat (1988) and one year with severe frost (1989). During these years, four of our grafted clones are

growing well in *P. cinnamomi*-infested soil (Table 3). The outstanding clones 'Day', 'Antigua', 'Galvan', and '256' showed no leaf burn, no degeneration symptoms and have the best growth and development rates. Eight other clones from the germplasm bank were marked as moderate and will be studied more in the future.

In the alkaline soils, 'Mayo 133' has had outstanding resistance. 'VC 257' grew well in salinity and poor aerated soils. Under the severe desert conditions in Gilat, 'Stuart' showed no leaf burn symptoms due to salinity and lime, but exhibited chlorosis. 'Day', 'Antigua¹', 'Galvan¹' and '256' were outstanding clones under the various stress conditions.

Discussion

It is well known that clones differ in their behavior when planted in different ecological conditions. In our study, some of the rooted types are more universal in their adaptation, such as 'Day' and 'Orizaba 3', while others grew well only in one stress environment.

The wide behavioral range of our analyzed rootstocks enables us to select specific stocks for specific stress conditions and even more important than the study of the individual physiological behavior basis for specific resistance mechanisms. Ultimately, we hope to develop a bioassay for rapid screening for a specific resistance.

Literature Cited

- Ben-Ya'acov, A., G. Bufler, A. Barrientos, E. De La Cruz Torres, L. Lopez, H. Degani, and A. Solis Molina. 1990. A study of the avocado genetic resources. GIARA Project 1-15.
- Soderholm, P.K. 1981. Catalog of plant germplasm available from the Subtropical Horticulture Research Unit, Miami, Florida. Agric. Rev. and Manuals, ARM-S-19.

Table 1. Israeli avocado germplasm bank: First list of collections planted in the orchard for evaluation.

Name	Country of origin	State or region	Type/Race	Description
Amatenango	Mexico	Chiapas	Guatemalan	Primitive type
Amatlan	Mexico	Nayarit	West-Indian	Isolated tree
Antigua	Mexico	Vera Cruz	West-Indian	Dwarfing type
Apakia 1	Ecuador	Chota Valley	Hybrid	
Apakia 2	Ecuador	Chota Valley	Hybrid	
Aquilal	Mexico	Vera Cruz	Mexican	Very primitive
Aquila 2	Mexico	Vera Cruz	Mexican	Very primitive
Argui 1	Canary Isls.	G. Canary	West-Indian	
Argui 3	Canary Isls.	G. Canary	West-Indian	
Avocatoza 2	Mexico	Nayarit	West-Indian	Primitive, strong
Avocatoza 3	Mexico	Nayarit	West-Indian	Primitive, strong
Banios	Ecuador	Banios	Mexican	Big "Nacional"
Comitan 1	Mexico	Chiapas	Guatemalan	Primitive type
Cornitan 2	Mexico	Chiapas	Guatemalan	Primitive type
Comitan 3	Mexico	Chiapas	Guatemalan	Primitive Type
Cuevas	Mexico	Chiapas	Guatemalan	
Day	U.S.A.	Florida	West-Indian	
Guat.	Ecuador	Guayabamba	Not identified	
El Charco 1	Spain	Malaga	Not identified	Old introduction
El Charco 2	Spain	Malaga	Not identified	Old introduction
El Venado	Mexico	Nayarit	Hybrid?	Very strong tree
Gainesville	U.S.A.	Florida	Mexican	Frost Resistant
Guayabamba	Ecuador	Guayabamba	Mexican	"Nacional" type
Guzman	Mexico	Nayarit	West-Indian	Drought resistant
HAES 7315	U.S.A.	Hawaii	Hybrid	Root rot resistant
KM. 145	Mexico	Chiapas	Mexican	Primitive type
La Piscina	Spain	Malaga	Not identified	Old tree
Las Posas	Spain	Malaga	Not identified	Old tree
Leyad aro	Canary Isls	Tenerife	Not identified	Very strong tree
Maskaria 1	Ecuador	Chota Valley	Not identified	
No race	Mexico	Vera Cruz	Not identified	
Novillero	Mexico	Vera Cruz	West-Indian	Flooding resistant
Orizava 1	Mexico	Vera Cruz	West-Indian	
Orizaba 3	Mexico	Vera Cruz	West-Indian	
Orizaba 4	Mexico	Vera Cruz	West-Indian	
<i>P. americana</i> C2	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. americana</i> H. 1 .72	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. americana</i> PIS. 96 15	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. indica</i>	Canary Isls.			
<i>P. lingue</i>	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. longipes</i>	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. nubigena</i> I/7	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. nubigena</i> I/8	U.S.A.	California		S.C.F.S., U.C.R.
<i>P. schiedeana</i>	Mexico	Vera Cruz	Chinini	
San Cristobal	Mexico	Chiapas	Guatemalan	
San Javier I	Canary Isls.	La Gomera	West-Indian	
San Sabastian 10	Canary Isls.	La Gomera	West-Indian	
San Sabastian 11	Canary Isls.	La Gomera	West-Indian	
Sholola 1	Mexico	Chiapas	Guatemalan	
Tezuitlan	Mexico	Vera Cruz	Mexican	
Toro Blanco	Mexico	Vera Cruz	West-Indian	Flooding resistant

Table 2. Germplasm evaluation plots in Israel.

Location	Stress Conditions	Planted Clones (1985)
Givat-Haim	<i>P. cinnamomi</i>	52
Neve-Ya'ar	Salinity, lime	42
Emeq-Heffer	Salinity	30
Maoz-Haim	Exchangeable Na+	23
Bet-Dagan	Dune	28
Gilat	Salinity, lime	15

Table 3. The best developed trees from germplasm rooted clones in different orchards.

V.C. No.	Name	Orchard					
		Givat Haim	Neve Ya'ar	Maoz Haim	Emeq Hefer	Bet Degan	Gilat
202	Avocasta 2	-	.	x	x	+	-
204	Guzman	-	-	x	-	-	x
207	Day	+	+	+	+	+	+
209	Mayo 133	-	+	+	-	-	x
210	PIC 9615	-	+	-	-	-	+
213	<i>P. americana</i> C2	-	-	+	-	-	-
214	Dade	+	-	x	x	x	x
217	<i>P. americana</i> T2	-	-	+	-	x	-
218	Antigua	++	-	-	-	+	+
225	Galvan	++	-	x	+	+	-
226	Orizaba 1	-	-	+	x	x	-
227	Orizaba 4	+	+	x	-	+	x
231	Maskaria 1	-	+	-	-	-	-
232	Km 145	-	+	x	-	-	x
235	Orizaba 3	+	+	+	+	+	-
237	Sholola	-	-	-	-	+	x
239	Gainsville	+	-	x	x	x	x
240	Amatlan	-	+	x	x	x	x
241	<i>P. nubigena</i> 1/7	+	x	-	-	+	x
242	<i>P. nubigena</i> 1/8	-	x	-	-	+	x
245	<i>P. gigantea</i>	-	+	-	x	x	-
246	<i>P. floccosa</i>	-	+	x	x	x	x
247	Stuart	-	-	-	-	-	-
256	Not identified	++	x	x	x	x	x

Legend: (++) = very good, (+) = good, (-) = not good, (x) = not included in the plot.