

GRAFT COMPATIBILITY IN THE GENUS PERSEA

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Avocado root rot caused by **Phytophthora cinnamomi** Rands has become a serious threat to the industry in California and is widespread in other areas. The discovery or development of an immune or highly resistant rootstock could provide a possible solution to the problem.

Investigations on compatibility between the commercial varieties of avocado and botanical relatives were begun at the University, Los Angeles, as early as 1936, when attempts were made to graft **P. americana** on the common laurel, **Laurus nobilis**, the California bay, **Umbellularia californica**, and the camphor tree, **Cinnamomum camphora** (3). Two unidentified species of Nectandra and one of Ocotea were also tried later. All of these attempts were unsuccessful. As new materials were made available, additional trials were undertaken with such species as **Persea borbonia**, the Swamp-bay of southeastern United States, **P. indica**, an ornamental form from the Canary Islands, **P. nubigena** and **P. schiedeana** from Central America.

When the seriousness of the onslaught of the root rot disease in the California industry was fully realized, a concerted and definite program was undertaken by the University to locate and import new rootstock materials and to test them for Phytophthora resistance and grafting affinity. A series of exploration trips to Central America was begun in 1947 in cooperation with and with the support of the California Avocado Society. These exploration trips have resulted in the location and importation of several species and forms closely related to the avocado which have been under horticultural investigation (1, 4).

The present report is a summary of the investigations to date concerning the results of grafting experiments among the several species and forms. A previous report (3) indicated that the avocado could be easily established on some closely related rootstocks and species but that all attempts to graft on certain other species resulted in failure.

Testing for compatibility was done by splice grafting scions onto seedling root-stocks grown in quart or gallon size containers in the glasshouse. Materials were tested as they became available over a period of approximately ten years. Species to be tested were grafted as scions on both **P. borbonia** and **P. americana**. In cases where sufficient numbers of seedlings of the species being tested were available, reciprocal combinations were also tried using the species as a stock plant. Reciprocal combinations invariably gave the same results in establishment of the graft when the species was utilized either as stock or as scion.

Table 1 shows the results of the interspecific grafting trials made on seedlings in the glasshouse. The criteria for the compatible condition was that of healthy appearing initial growth of the graft. Among those listed as incompatible, a few made as much as six inches of spindly small-leaved shoot growth but none of the grafts survived much beyond one year. The longevity of combinations listed as compatible is not known, though they appear to be growing well. In some cases there is overgrowth of the scion, but the shoot growth still appears healthy.

TABLE 1

	americana	aguacate de mico	floccosa	gigantea	longipes	nubigena	Schiedeana	borbonia	caerulea	chrysophylla	Donnell-Smithii	durifolia	indica	lingue	portoricensis	Skutchii	M-2
americana	X	X	X	X	X	X	X	O	O	O	O	O	O	O	O	O	O
aguacate de mico	X	X	—	—	—	—	—	O	O	O	O	O	O	O	O	O	O
floccosa	X	—	X	—	—	—	—	O	—	—	O	—	—	—	—	O	O
gigantea	X	—	—	X	—	—	—	O	—	—	O	—	—	—	—	O	O
longipes	X	—	—	—	X	—	—	O	—	—	O	—	—	—	—	O	O
nubigena	X	—	—	—	—	X	—	O	—	—	O	—	—	—	—	O	O
Schiedeana	X	—	—	—	—	—	X	O	—	—	O	—	—	—	—	O	O
borbonia	O	O	O	O	O	O	O	X	X	X	X	X	X	X	X	X	X
caerulea	O	—	—	—	—	—	—	X	X	—	—	X	—	—	—	—	—
chrysophylla	O	—	—	—	—	—	—	X	—	X	—	X	—	—	—	—	—
Donnell-Smithii	O	O	O	O	O	O	O	X	X	—	X	—	X	—	—	X	X
durifolia	O	—	—	—	—	—	—	X	X	X	X	X	—	—	—	—	X
indica	O	O	—	—	—	—	—	X	—	—	X	—	X	—	—	—	—
lingue	O	—	—	—	—	—	—	X	—	—	—	—	—	X	—	—	—
portoricensis	O	—	O	—	—	—	—	X	—	—	—	—	—	—	X	—	—
Skutchii	O	O	O	O	O	O	O	X	—	—	—	X	—	—	—	X	—
M-2	O	O	O	O	O	O	O	X	—	—	X	X	—	—	—	—	X

X = compatible
 O = incompatible
 — = not tested

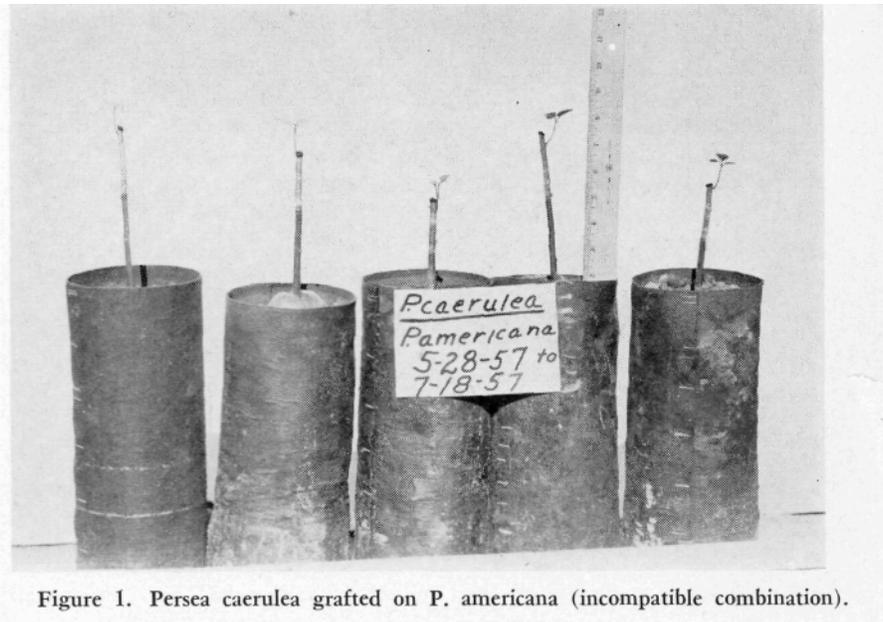


Figure 1. *Persea caerulea* grafted on *P. americana* (incompatible combination).



Figure 2. *Persea caerulea* grafted on *P. borbonia* (compatible combination). Grafted same day as plants in Figure 1.

The materials available for testing and their sources were as follows:

Species or form	Source
<i>P. americana</i>	local varieties
<i>P. borbonia</i>	Louisiana
<i>P. caerulea</i>	Caracas, Venezuela (Zentmyer)
<i>P. chrysophylla</i>	Colombia (Hoffman)
<i>P. Donnell-Smithii</i>	Coban, Guatemala (Zentmyer)
<i>P. durifolia</i>	Macchu Picchu, Peru (Zentmyer)
<i>P. floccosa</i>	Veracruz, Mexico (Schroeder)
<i>P. gigantea</i>	Honduras (Popenoe)
<i>P. indica</i>	Canary Islands (California seedlings)
<i>P. lingue</i>	Chile (California seedlings)
<i>P. longipes</i>	Veracruz, Mexico (Schroeder)
<i>P. nubigena</i>	Guatemala (Popenoe)
<i>P. portoricensis</i>	Puerto Rico (Pennock)
<i>P. Schiedeana</i>	Guatemala (Popenoe)
<i>P. Skutchii</i>	Costa Rica (Zentmyer)
<i>P. spp. (M-2)</i>	Mazatlan, Mexico (Schroeder)
Aguacate de Mico	Guatemala (Popenoe)

It can be seen from Table 1 that the first seven species listed from the top down and left to right comprise the **P. americana**-compatible group. The remainder comprise the **P. borbonia**-compatible group. Not all possible combinations were tested because of lack of sufficient materials. All available species, however, have been tested on both **P. americana** and **P. borbonia**. It is apparent that no species is compatible with both **P. americana** and **P. borbonia**. In those cases where grafts were made between others than **P. americana** and **P. borbonia**, no materials in the **americana**-compatible group could be grafted on materials in the **borbonia**-compatible group. Furthermore, of those tested no incompatibilities have been apparent between species grafted within each group. In addition to the tests made in the glasshouse, the species **floccosa**, **gigantea**, **longipes**, **nubigena**, **Schiedeana**, and the **aguacate de mico** were bark grafted onto ten-to twenty-year-old americana trees in the field. Growth of all of these has been satisfactory, the youngest of the combinations being eight years old.

P. americana has been grafted on both **floccosa** and **Schiedeana**. In the latter combination the original graft take was satisfactory but growth during the first two years has been markedly poorer than the reciprocal of **P. Schiedeana** on **P. americana**. This observation is in agreement with reports of similar trials in Honduras.

With the *Persea* species used it was not possible to correct an incompatibility between **P. americana** and **P. borbonia** by use of an interstem. None of the materials available proved to be compatible with both components.

The results of the studies reported here strongly suggest that there are two distinct groups in the genus **Persea** as regards graft compatibility. In one group we have those compatible with **P. americana**, in the other group those compatible with **P. borbonia**.

It is of interest to note that the species **borbonia**, **caerulea**, **chrysophylla**, **durifolia**, **Donnell-Smithii**, **Skutchii**, and **P. spp. (M-2)** have immunity or resistance to

Phytophthora cinnamomi (7).

Continued search is being made to locate and import new species and materials in an attempt to find some form which may prove useful as a disease resistant root-stock compatible with **P. americana** directly, or one which may be compatible with both **P. americana** and a disease resistant species, hence could be used as an intermediate stem piece.

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