

PERSEA SCHIEDEANA, THE COYO, A POSSIBLE ROOTSTOCK FOR AVOCADO IN SOUTH AFRICA

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The use of botanical relatives of the avocado as rootstock for the several commercial varieties grown in California was considered by early investigators as a reasonable approach to the solution of such problems as physiological incompatibility, low temperature susceptibility, ultimate tree size, resistance to soil-borne or other diseases, and possibly to problems of fruit set and development. Anticipation of experimental work in this field has resulted in the collection of several species of *Persea* and closely related genera such as *Laurus*, *Umbellularia* and *Cinnamomum*, members of the family Lauraceae. These materials were established during the period 1925-45 at the University of California Agricultural Experiment Stations at Los Angeles and at Riverside from which several investigations on and testing of the genera and species eventually were forthcoming.

Persea Schiedeana was introduced into California with hope that it might prove resistant to the soil-borne fungus *Phytophthora cinnamomi*. While the testing techniques used by Zentmyer (11) indicated a slight resistance to and the field recovery of *Phytophthora cinnamomi* from *P. Schiedeana* in Guatemala (8,10) nevertheless the tentative conclusion by most investigators at the time was that problems of propagation and lack of demonstrated or marked disease resistance did not warrant continued consideration of the materials on hand as a rootstock source.

The coyo has been known in California for many years, but has never attained any degree of importance. Importation of coyo seed from several sources was made on several occasions (7,8,9,12) primarily in an attempt to ascertain their tolerance to the *Phytophthora cinnamomi* fungus and general grafting compatibility. Apparently these coyo forms exhibit no marked tolerance to the root-rot organism to judge from the limited number of seed sources tested. The budding affinity with commercial varieties of avocado was found to be satisfactory in the few trials attempted (3,5). Several scions were topworked onto older established Guatemalan and Mexican rootstock trees at Los Angeles and at Carpintería. There were a few fruits which resulted from the latter grafts but the fruit quality proved inferior, hence no further consideration has been given to this species either as a rootstock or fruit source in California.

A personal letter from Wilson Popenoe in 1953 regarding the use of coyo as a rootstock in Honduras indicated ". . . when we first propagated the avocado on this rootstock we found it to be congenial and their growth was rapid. Since then, however, our trees have failed to develop satisfactorily. . . . There is some lack of congeniality which we cannot explain. I am afraid we shall have to give up hope of using this rootstock, unless results elsewhere are better than ours have been to date."

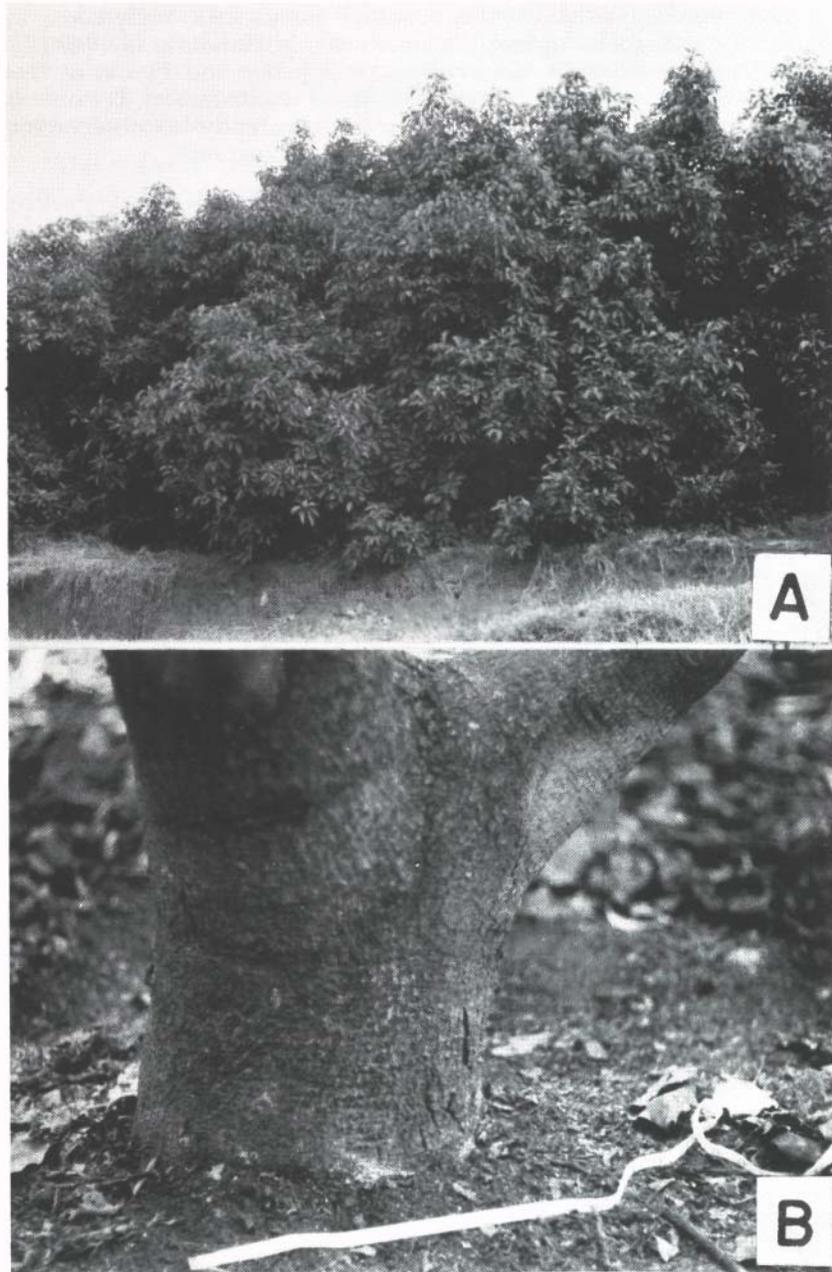


Figure 1A. Fuerte on *Persea Schiedeana* (coyo) rootstock. Tzaneen, Transvaal, South Africa. **B.** Bud union of Fuerte on coyo root.

The above observations were probably made in conjunction with the general experiments with coyo as rootstock for avocado undertaken by Don Fiester at Escuela Agrícola Panamericana in Honduras in 1949 (2). It would appear from the observations of Popenoe and Fiester at that time that the use of coyo as rootstock was not satisfactory because of problems of establishment of young trees. Apparently no

observations were made of older trees representing this combination.

The very satisfactory preliminary results of the coyo as a stock in South Africa warrant the suggestion for further consideration of the coyo for its possible and potential role in the avocado industry perhaps for use in some special areas and for specific purposes.

A general consideration of the coyo as a rootstock for avocado in South Africa has resulted from the apparent vigor which this species imparts to the scions grafted or budded on it. Fuerte budded on coyo stock produces a moderate to large size tree compared with Fuerte grown on Guatemalan stock. The tree is much larger than Fuerte on Mexican stock. The latter combination is not widely grown in South Africa because of the sun-blotch virus which is transmitted by "hidden carriers" in nearly all the Mexican seed sources in that area, hence the Mexican type rootstock is avoided by most growers and nurserymen. Guatemalan rootstocks and several selections of Duke seedlings of California origin currently are preferred for propagation of Fuerte and Edranol.

The apparent induction of vigor by the coyo rootstock, particularly when Edranol is utilized as the scion, results in a very strong tree of large proportions. Some growers have been concerned regarding the excessive height of such a tree which can extend up to forty or more feet within six to eight years from planting. Excessive tree height presents some problems of fruit harvest, particularly in hillside orchards. There are indications of desire by some growers for a lower growing or more dwarfed type tree for easier harvest procedures. The Fuerte on coyo is a desirable combination in this respect for it develops a vigorous but spreading tree of moderate, manageable height with good production.

The potentiality of *Persea Schiedeana* as a rootstock for avocado in South Africa was considered several years ago by Mr. Cookie Leon of Evenrond Estates near Tzaneen in the Eastern Transvaal. Mr. Leon is one of the pioneers in the South African avocado industry, who, following a notable career as wing commander in the RAF in World War II, returned to the land of his birth in 1946 to develop almost from native bush one of the finest and largest of modern avocado orchards of approximately 250 acres, in that part of the world. His interest in the avocado was stimulated by the presence of a few West Indian avocado trees which had been introduced and planted on the newly purchased land by the previous owner, Dr. Merensky, who discovered diamonds in South Africa. Extensive reading, planting and seeking of new materials to pursue his objective of growing avocado, a fruit relatively unknown in that area, led Mr. Leon to request some propagation materials of *Persea Schiedeana* in 1952 from the department of horticultural science then located at the University of California, Los Angeles. Two budsticks from a clone growing in the UCLA orchard and originally from Guatemala, were sent to South Africa. This original propagation resulted in ten trees, one of which remains in good condition in 1973. This original tree is about 42 feet tall with a trunk circumference of 49.5 inches (125 cm). Two other specimens of the original ten are in poor condition and the other seven have died, as the planting was in a comparatively neglected area on the estate.

The ten coyo trees produced hundreds of fruits to provide seed for a large nursery operation. These seedlings were eventually budded to Edranol and Fuerte.

Simultaneously Edranol and Fuerte were budded to comparable available seedlings of a Guatemalan type and on Mexicola rootstock. The budded trees were carried through the general nursery operations and planted in the orchard. The trees on the Mexicola stock soon failed because of a severe reaction to sun-blotch virus which apparently was transmitted through the unsuspected use of hidden carrier seed. Such trees were replaced in the orchard using Guatemalan root-stock. The final planting consisting of more than three hundred trees of Edranol and Fuerte on either Guatemalan seedling or *Persea Schiedeana* rootstock are now approximately six years in the orchard in 1973. The bud union in the case of Guatemalan stock under Edranol or Fuerte is normal with some roughness or corkiness on the surface of the root bark. In some cases the rootstock is slightly larger than the scion diameter but in most cases a relatively smooth union is evident. The bud union of *P. Schiedeana* under Edranol or Fuerte again is generally with no suggestion of overgrowth or physical incompatibility. The rootstock bark is markedly smooth on the surface and of lighter color compared with the Guatemalan bark. Confirmation of the identity of rootstock in the field made in one case through a rootsprout which exhibited the thick, vigorous shoot growth, pronounced pubescence and the large thick bud development characteristic of *P. Schiedeana*. The Edranol orchard on *P. Schiedeana* root consists of large trees of greater size than Fuerte on the same stock. The Fuerte trees appear to be vigorous and to develop a lateral and drooping branching habit rather than an upright habit as in the case of Edranol. Some of the Fuerte trees measured at the bud union attained 37.7 to 51.3 inches (96-116 cm) in circumference or approximately 12.1-16.3 inches (30.5-36.9 cm) in diameter. All of the trees on either stock appear to be in good vigor and health and are producing good crops.

Persea Schiedeana is a large tree in its native habitat, the tropical forests of southern Mexico and Central America. There it is known locally as "Coya" (Guatemala), "Chinini" or "Chinine" (Mexico), "Supte" (Honduras) or "Yas" (Costa Rica). Other local names are "Coyocte," "Kiyau," "Shuste," "Chucte" or "Chaucte" (4). Standley and Steyermark (6) described the species from Guatemala where it reaches a height of 20 to 50 meters. Fiestler (2) mentioned the failure of the early trials to establish the species in Florida. He also noted the apparent resistance of coyo to the heavy soils and persistent flooding in Honduras, hence concluded it might provide a potential rootstock for avocado in that area. It was observed at that time that attempts to bud avocado onto secondary branches of coyo were not successful. It also was noted that coyo in the nursery produced a strong, thick-stemmed plant with several major diverting roots rather than a long tap root.

Observations on the species made by Popenoe (4) indicate that the fruit resembles the avocado but is distinctively different. It is generally inferior in quality with a large seed and many coarse fibers. The fruit has a shorter period for maturity compared with most Guatemalan varieties. The fruits of most coyo trees are with a long slender neck, light green in color with a thick, pliable skin which peels readily from the flesh. The flesh varies from brownish white to pale brown in color and exudes a milky juice. The seed is more perishable than that of the ordinary avocado.

Persea Schiedeana (1,6) is a close botanical relative of the common avocado, *Persea americana* (Miller). The major difference found in *P. Schiedeana* is the pronounced

pubescence in nearly all the younger parts of the flowers and bud systems. The vegetative buds are larger in size and distinctly pubescent. The flower buds are generally terminal and of very large size. The stems are thick with short internodes. The leaf is variable in form and thickness but generally obovate in outline, coriaceous and usually more or less pubescent, especially in the younger stages of development.

These recent observations of the rather favorable response of several avocado varieties budded on *P. Schiedeana* in South Africa are recorded to indicate that reconsideration should be given this species as a possible rootstock particularly when increased vigor is an objective. While this one rather large trial planting is located in an area where *Phytophthora cinnamomi* has been found, the presence of the fungus in the trial area has not been verified though it is present in nearby orchards on the same property. Observations on the tolerance or resistance of the coyo to avocado root-rot organism in South Africa have not been made. Indeed this particular planting may provide some excellent information on this particular point.

The use of coyo as a rootstock to induce vigor in otherwise weak scions and its potential use where soil conditions may be limiting should be considered. While the exceptional vigor displayed by coyo rootstock in South Africa has been observed in one group of young trees less than ten years old, there is reason to believe that the bud unions with Fuerte and Edranol as scions at least are physiologically compatible and should withstand the test of time.

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