

## COOPERATIVE PROJECT ATTEMPTING TO SOLVE THE AVOCADO ROOT ROT PROBLEM

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Among the diseases of avocado the root rot caused by the fungus *Phytophthora cinnamomi* is the most destructive and important. Under favorable conditions for the development of the pathogen, such as heavy and wet soils, the avocado trees can be killed in a few years.

It is considered that the ideal method to solve this problem would be to obtain a resistant rootstock. With such an objective the University of California at Riverside in 1952 (1) started to collect and test under greenhouse conditions the behavior of avocado seedlings to the attack of *P. cinnamomi*. Although some resistance has been found among the seedlings tested, the degree of resistance is not as high as desirable for practical purposes. Therefore the search has continued and in 1964 has been intensified by means of a cooperative project with the Mexican Research Institute for Agriculture (INIA). Recently, the Graduate College of the National School of Agriculture has also joined this project.

The importance of this cooperative project is not only the increase in the number of people searching for a resistant rootstock but to have a test center for resistance located in the area of the origin of avocado, as is Mexico. This facilitates collecting and testing material from the native cultivated and noncultivated avocados which represents a wide genetic variation. Therefore, now the chances to find a resistant root-stock have been increased and at a relatively low cost.

The general method for testing the resistance of avocado plants is the same as the one developed in Riverside in 1962 (2). It is as follows: a) Avocado seeds are germinated in flats containing steam sterilized sand; b) Seedlings are transplanted when 8 to 10 cm. tall into a water tank by using a rack so the root system is within the water; c) The seedlings are inoculated when they have new roots. This is done after 10 days by placing in the tank 8 small cheesecloth bags, each one containing 14 of a fungus colony developed in a Petri dish with potato dextrose agar medium. The inoculum is left in the tank for 10 days so the fungus produces many thousands of spores which after swimming in the water cause infection of the roots, d) The resistance of the root systems is then graded. The grading is done on the basis of percentage of infected roots. Plants with less than 90% of infected roots are the only ones selected for further observations under field conditions.

The first tank for the resistance tests was built in April of 1964 in a greenhouse of the

Institute's Chapingo Center (25 miles northeast of Mexico City). The construction materials were bricks and tiles. The aeration, circulation and constant temperature of the water were provided by means of a unit built especially for such purpose in the workshop of the School of Agriculture.

After the first test was completed satisfactorily, two more tanks were built in 1965. With these three tanks used at their maximum capacity it will be possible to test from 9,000 to 10,000 seedlings per year.

Since the project was initiated, several trips have been made to become acquainted with the avocado areas, to determine the disease situation, to look for wild avocado relatives and to collect seeds for the resistance tests.

As results of these trips the following points can be cited:

1. Avocado root rot is a widespread problem in Mexico, In some areas the disease has killed most of the trees. This sad situation, however, is offering today a unique opportunity to detect more easily any degree of resistance which could exist among the cultivated avocados. That is, with the wide spread of the disease a great number of seedling avocado trees are now under natural selection for resistance to the root rot fungus. Therefore the surviving trees in an infested area are likely to be resistant. The proof of this is underway. Seeds from a very healthy tree found in Michoacán of which neighbor trees have been killed by *P. cinnamomi* are germinating and very soon their resistance will be tested in the tank.

2. Of the eleven wild avocado species reported from Mexico (3), three have been found and fruit has been collected from them. These are a) *P. pachypoda* called "aguacatillo" in the States of San Luis Potosí and Mexico, b) *P. liebmanni* called "canelillo" in the State of Michoacan, and c) *P. schiedeana* called "chinini" in the States of Veracruz, Tabasco and Chiapas.

A possible genetical infiltration into the cultivated avocado is suspected, respectively, from *P. liebmanni* in the state of Michoacan and *P. schiedeana* in Tabasco.

Most of the material for the resistance tests has been collected in the groves and some from the markets. A systematic sampling of genetical material is being done in Tacambaro, Michoacan, thanks to the help of the Cupanda (avocado growers cooperative). Some other seed collections have been obtained from Guatemala through the cooperation of Dr. E. Schieber.

The number of seeds collected up to June 1966 is 9662 of which 6250 belong to cultivated avocados (*Persea americana*) and 3412 belong to wild avocados. The number of seeds planted is 4761 but only 3250 plants were obtained due mainly to insect pests which destroyed the embryos.

The resistance tests have been in charge of Ing. A. Salazar and the results of these tests are presented in Table 1.

TABLE 1. Results obtained in the resistance tests during the period June 1964 - June 1966.

	<i>P. americana</i>	<i>P. liebmanni</i>	<i>P. pachypoda</i>	<i>P. schiedeana</i>
Seeds collected	6250	1420	1890	102
Seeds planted	4392	90	235	44
Plants obtained and tested	3009	50	155	36
Plants selected	83	6	18	7
Per cent of resistance	2.75	12.0	11.6	19.4

The selected seedlings were planted in infested soil of the state of Mexico, for further testing under field conditions. Now this has been modified by keeping the selected plants for one year in the greenhouse and then transplanting them into the field.

As shown in Table 1 a higher percentage of resistance is found among the wild avocados than among the cultivated species; therefore the chances of finding an outstanding resistant plant are higher by testing these wild species than by testing the cultivated *P. americana*. These results indicate also the desirability of continuing with the search for more wild species.

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## REFERENCES

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