

New avocado rootstocks are high-performing and disease-tolerant

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Greg Douhan, an assistant professor of plant pathology and microbiology at UC Riverside, examines an avocado plant in the greenhouse. Credit: UCR Strategic Communications

Avocado, a significant fruit crop grown in many tropical and subtropical parts of the world, is threatened by Phytophthora root rot (PRR), a disease that has already eliminated commercial avocado production in many areas in Latin America and crippled production in Australia and South Africa. Just in California the disease is estimated to cost avocado growers approximately \$30-40 million a year in production losses.

Research on developing PRR-tolerant rootstocks to manage the disease has been a major focus of avocado research at the University of California, Riverside since the 1950s. The latest research now comes from a team that has released three rootstocks, available for commercial

propagation by nurseries, that demonstrate superior tolerance to PRR.

The research, scheduled to appear soon in the journal [HortScience](#), describes the three avocado root-rot-tolerant varieties: Zentmyer, Steddom, and Uzi.

Zentmyer is an extremely vigorous and highly durable variety that is PRR-tolerant under most conditions. But it is not recommended for locations, such as some parts of California, where salt is a problem and often does not yield consistently under non-root-rot condition. Steddom has both a high PRR-tolerance and good [salt tolerance](#). Uzi is highly tolerant to PRR, and its yields are high and usually consistent.

The Zentmyer rootstock is named after George Zentmyer, a pioneer avocado pathologist at UC Riverside and a collector of avocado germplasm ([hereditary material](#)). Steddom is named after a former graduate student at UCR. Uzi is named after an Israeli scientist.



This photo shows a dying Hass avocado scion on a rootstock that is not tolerant to root rot. Credit: Douhan lab, UC Riverside

"With the release of these high-performing rootstocks, avocado growers worldwide will have more options in choosing PRR-tolerant rootstocks to determine which ones perform better under their own growing conditions," said Greg W. Douhan, an assistant professor of [plant pathology](#) and microbiology, who led the research.

A rootstock is the part of the plant that produces the [root system](#). For many fruit trees it is often genetically different than the scion — the top portion of the plant — that is grafted to the rootstock. The scion gives rise to leaves, stems, flowers, and fruit.

Commercial avocado trees are propagated by grafting scions of desirable cultivars onto various rootstocks with the most popular avocado cultivar being the Hass avocado. While avocados can be grown from seeds, their fruit quality and yield potential can vary dramatically. Therefore, it is more advantageous for avocado growers to have both a scion and rootstock that has the most desirable characteristics, enabling the best "plants" to be grown for profitability and consumption.

Prior to the development of specific avocado rootstocks, nurseries produced avocado trees, such as the Hass cultivar, on arbitrary avocado rootstocks, knowing almost nothing about the rootstocks' genetics. Because different rootstocks were used, it led often to orchards producing avocados of varying quality.



Brandon McKee, a staff research associate in plant pathology and microbiology, examines root rot symptoms in an avocado plant. Credit: Douhan lab, UC Riverside

The three new rootstocks were initially selected for PRR-tolerance based on approximately two years of screening under greenhouse conditions at UCR. Eventually, the three varieties were tested throughout several locations in California over many years to determine their viability for public release.

The UCR Office of Technology Commercialization is pursuing licensees for all three new avocado rootstocks for their successful commercialization, and will give preference to California avocado nurseries and growers.

The PRR-causing pathogen (*Phytophthora cinnamomi*) was first identified as causing PRR in avocado in Puerto Rico in 1928. It was eventually determined in 1942 to be responsible for a general decline of [avocado trees](#) reported in California since the late 1920s and 1930s. When PRR is controlled, avocado yields, growth, and fruit quality increase dramatically, resulting in increased profitability for growers.

"The ultimate long-term objective of the UCR avocado research program is to find a truly PRR-resistant rootstock for avocado," said Douhan, who joined UCR in 2005. "This objective has not yet been realized, but we have been making good progress and our germplasm foundation is continuing to broaden."

Douhan is confident that with the use of more modern molecular tools research will proceed faster in understanding many aspects of [avocado](#) genetics and the genomic diversity associated with PRR and other important agronomic traits.

Provided by University of California - Riverside

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