

IN MEMORIAM, DR. GEORGE ZENTMYER

Hank Brokaw

It was about 1959 or '60 when I first saw him a tall, slim, young, almost boyish looking man. Yet, he was the world's foremost expert and perhaps our savior in what was then regarded as a mortal threat to California's developing avocado industry, avocado root rot. His task was to somehow enable us to live with, or defeat this menace. Dr. Zentmyer's job that day was to bring us up to date as to the status of knowledge of the threat, and the ongoing search for weapons to fend off the disease.

The focus of investigation at that time was to find surviving cultivars of avocado (or its relatives) that were native to areas where the causative fungus, *Phytophthora cinnamomi* (PC) was indigenous and rampant. The thought was that survivors in such areas were tolerant of, or resistant to the effects of the fungus. Also, tempering fungi or other microorganisms might ameliorate soil conditions here in California.

Dr. Zentmyer had, by that time, developed a method for finding cultivars that were particularly tolerant of PC. He designed a water bath that was continuously inoculated with PC spores and suspended scores, hundreds, and even thousands of seeds from candidate parents with blunted (bottom) ends in the infested bath. Generally, all the radicles (young roots) that emerged from the seeds rotted. Every now and then, though, a seed would show up with some healthy radicular tissue. This was evidence of individual tolerance and the grist for future research.

Cultivar tolerance was not the only avenue of research. Looking for chemical assistance Dr. Zentmyer first brought Terrazole to our attention. Later he introduced Ridomil and Aliette. Nutritional studies revealed the advantage of calcium, both in the soil and in plant tissues.

Plant resistance, however, was Dr. Zentmyer's chief target in those days. He made several trips to the Americas from Mexico southward, even to Chile and Argentina in the search for tolerant germplasm. Ironically, his greatest early success was found in one of the early California budlines, the Duke variety. Duke was commonly planted early in the state. While bearing a mediocre Mexican type fruit, the Duke fruit was nonetheless edible and the tree was hardy and more frost resistant than most. Therefore, it was quite suitable for planting in back yards of San Joaquín Valley homes.

While discovered PC tolerance in Duke, Huntalis, and a few other lines was encouraging, nursery practices until mid-to-late 1970's were not set up to take advantage of the discovery since tolerance within each line was variable and minor. For example, it was estimated at the time that only about 25% of Duke Seedlings demonstrated significant resistance to the effects of PC. The problem was that all nurseries at that time used seedling rootstocks, and these were all variable. Germplasm searches showed up with no scion-compatible cultivars that produced high percentages

of PC tolerant progeny.

Various efforts were made to solve this problem. Mr. Shepard of Carpinteria, for example, planted multiple Duke Seeds in planting sites in a prospective orchard with the intention of grafting each of them and selecting only the healthiest for permanent trees.

Dr. Zentmyer took a novel and aggressive approach to the nursery problem. He approached Ted Frolich, a young laboratory assistant at UCLA who had previously worked for Dr. Halma, a rootstock research man. In his efforts to impart control to his experiments Dr. Halma told Ted that he really needed clonal rootstocks. Subsequently, Ted had discovered a layering procedure using etiolated tissue, to produce rooted avocado clones. This was the answer to Dr. Zentmyer's problem, as Ted was able, subsequently, to furnish Dr. Zentmyer with hundreds, even a couple of thousand clones of his most promising survivor seedlings. It led to widespread planting of the Duke 7 line, and all the varieties which have supplemented and succeeded it.

This discovery of resistance to the deleterious effects of PC and the resulting impetus to produce commercial PC tolerant nursery stock is the crowning achievement of Dr. Zentmyer for the avocado industry. It is not, however, the only one.

Today, the avocado grower takes an integrated approach to PC management. This is an approach actively recommended by Dr. Zentmyer while doing all of the above. The introduction of mulching was his idea, starting with alfalfa meal experiments in the 1950's or before. Chemical control of PC was started by him. He began a program of bio-control using microbes from repressive soils, and experimented with nutrient concoctions.

Dr. Zentmyer, in his work collaborated extensively with assistants both at Riverside and abroad. He depended heavily on his chief laboratory technician, Fred Guillemet, Bob Platt and others of the Extension Service, and foreign workers such as Eugenio Schieber of Guatemala, who explored and furnished supplies of seeds and information.

Dr. Zentmyer's influence on nursery production was widespread and intense. The production of certified nursery stock is built on his ideas, which resulted in widespread soil sterilization techniques, fencing of growing grounds, hot water treatment of seeds, and locations out of the drainage zones of avocado plantings and plantings of other PC host plants. The use of virgin soils, harvesting of seed crops from on the tree (as contrasted with on-the-ground scavenging) were results of his research and recommendations. The growing of clonal rootstocks, of course, was a direct consequence of his work.

While probably most of Dr. Zentmyer's output was utilized by the avocado industry, his work went far beyond that. He became the world's foremost authority on various *Phytophthora* species. He became so professionally prominent that in 1979, he was elected a member of the American Academy of Sciences, an exclusive organization whose membership is limited and by invitation only.

Dr. Zentmyer worked in close collaboration with the California Avocado Society and received much of his support there. Indeed, the Society, in about 1960, furnished an infusion of cash in the initiation of an assault on avocado root rot and supported the maintenance of industry funding on a continuing basis. He had a mutual and fruitful

relationship with Society members, avocado growers in general, and with nurserymen in particular.

Any description of Dr. Zentmyer's accomplishments would be incomplete without a portrait of the man's personal character. Always the gentleman, George was accessible to all persons. His gentle and respectful mien included all of us, and encouraged each of us to do our best to promote and improve our industry. He and his wife and partner Dorothy, an equally gentle woman, were an elevating influence in every meeting we attended. A genuinely shy and unassuming man, he was respectful and gentlemanly to all whom he met, and he was both loved and respected by all.

No one in the past half-century, I believe, has had as salubrious effect on the world avocado industry as Dr. George Zentmyer. He treated us well. We miss him.