Biotechnology Breakthroughs

By Rick Dantzler, CRDF chief operating officer

Jim Graham, a distinguished citrus researcher and University of Florida Institute of Food and Agricultural Sciences (UF/IFAS) professor emeritus, assists the Citrus Research and Development Foundation (CRDF) in numerous ways. He recently shared two publications from Brazil with me about how the country is attempting to deal with HLB. I read them from cover to cover. They were quite illuminating. I am citing material from one of the publications (Citricultor, www.fundecitrus.combr, Volume XV, Number 60, 1st Semester of 2024) for the first half of this column.

I found interviews with Leandro Pena, a scientist specializing in plant molecular biology, and Nelson Wulff, a researcher leading the Greening Resistance Project of Fundecitrus, particularly enlightening. A primary component of their recommended research strategy revolves around biotechnology, defined by Oxford as "the exploitation of biological processes for industrial and other purposes, especially the genetic manipulation of microorganisms for the production of antibiotics, hormones, etc." Examples cited of how this technology could be used were inserting a gene in a tree that repels the Asian citrus psyllid (ACP) or resists *C*Las. Repelling the HLB vector or making the plant resistant to the pathogen would have obvious benefits in controlling the disease and reducing dependence on pesticides.

Fundecitrus researchers have been successfully working on this. For example, they identified a volatile in guava trees that is repellant to psyllids, which they were able to get into a large planting of citrus trees in sufficient quantities to significantly repel the ACP. Furthermore, they planted orange jasmine and bergera (of the same species as the curry tree), known ACP attractants, along the edges of groves. This caused large numbers of psyllids that would otherwise be in the groves to congregate in the attractants where they were efficiently killed with pesticides. This repel, attract and kill strategy is an example of biotechnology in use.

Last month, I shared in my column the progress UF/IFAS is making in inserting a gene from *Bacillus thuringiensis*, a naturally occurring soil bacterium, into the tree to produce a protein which is toxic to newly born ACPs, wiping out what appears to be 100% of nymphs. If this can be combined with a tolerance gene, imagine how transformative that could be in dealing with HLB. This, too, is an example of biotechnology. CRDF has in hand a proposal to accelerate this research.

Manjul Dutt, UF/IFAS assistant professor, is making good progress in fully elucidating the mechanism that appears to create HLB tolerance in Parson Brown sweet oranges. Parson Brown trees have elevated levels of PR1, a gene believed to activate systemic acquired resistance (SAR), which creates more tolerance. NPR3 reduces SAR, creating less resistance. Upregulating NPR1, which results in the enhanced expression of PR1, coupled with downregulating NPR3, a possibility with biotechnology, could make a huge difference. Once completely understood, biotechnology could help transform all cultivars to become significantly more tolerant.

The list goes on. Biotechnology will lead the way.

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