Peptides Explained

By Rick Dantzler, CRDF chief operating officer

Encouraging news stories have appeared in recent months on the possible benefits of using peptides in the fight against HLB. The news is encouraging for good reason, and I believe peptides will be part of our solution.

Peptides are small groups of linked amino acids. They are like proteins in that they have defined amino acid structure and shape but are smaller in size.

Peptides have many functions, from signaling between different cells and species to having direct action on pathogens. Perhaps the most famous peptide is insulin, which binds to peptide-binding proteins — called receptors — to tell your body to pull sugar from your blood into your cells. Peptides have been growing in use because of the wide array of effects they can have and their ability to perform specific actions. They also have an excellent safety profile because, upon ingestion, they break down into amino acids, one of the safest and well-known chemistries.

In agriculture, peptides are categorized by their mode of action (how they work). Some bind to specific receptors on plant cells and cause specific plant responses, such as an immune response. A benefit of these peptides is they can be applied through foliar spraying.

A second category is antimicrobial peptides (AMPs), which bind to pathogens (like liberibacter). In the right concentration, AMPs poke holes in pathogens to kill them. To be effective, AMPs must get into the phloem, the thin part of the plant's vascular system just beneath the bark. This is difficult because the size of most peptides is too large for them to pierce the membrane of the phloem to get in. For that reason, technologies such as trunk injection, citrus tristeza virus transfer and laser etching are being developed.

A third category is peptides that block receptors, which stop plants from signaling. The fourth category is peptides that bind to insect receptors and act as insecticides. Here, the peptide is delivered into the gut of the psyllid where it attaches to bacteria, causing the death of the psyllid.

A homerun would be a peptide that could be applied by spraying, could stand up to the heat of a Florida summer, would induce HLB tolerance in the plant, would directly kill liberibacter and would not be toxic or allergenic to humans.

For any of these peptides, they would have to be constantly applied, which is why the development of a genetically modified tree would be the most durable way of using them. With this, the gene containing the peptide would be inserted into the genetic code of new citrus trees, resulting in the peptide being there for the life of the tree. With newly developing technologies, it is possible that such trees could be produced that would not be considered genetically modified organisms.

The Citrus Research and Development Foundation is pursuing all these leads.

Acknowledgements: *Brian Thompson of Elemental Enzymes and Bill Dawson, Citrus Research and Education Center emeritus professor, contributed content for this column.*

CRDF Grower Dollars at work for you

Column sponsored by the Citrus Research and Development Foundation