A Passion for Mint

Researcher Aims for Wilt Resistance in Mint

For Kelly Vining, nothing quite compares to mint research.

Vining, Assistant Professor, Horticulture Department, Oregon State University, has been fascinated with mint since she began working on it in 2002 while a graduate student at the University of New Hampshire.

She continued working on mint after moving to Corvallis seven years later when she took a position to study poplar trees in Oregon State University's College of Forestry, even working after hours to develop a reference genome of mint.

"I kept pursuing the mint work and trying to establish funding from the moment I landed here in 2009," she said. "I got some mint DNA sequence and started building the reference genome on my own."

Vining eventually approached the Oregon Mint Commission with a request for funding and, in 2013, the Commission began supporting her work.

Last year, the Mint Industry Research Council came on board, and today Vining, in collaboration with Purdue University and Washington State University researchers, is busy working to developing a mint plant with resistance to *Verticillium* wilt.

The work involves use of genomics, but without use of GMO, genetically modified organisms.

Vining, who has a doctorate in genetics, is working to enable what is known as "marker assisted selection" to hasten the development of a *Verticillium* wilt-resistant mint variety. The first step involves identifying candidate genes that show evidence that they might confer resistance to the wilt.

Asked how long before she and her follow mint researchers release a commercially viable mint variety with resistance to the wilt, she said, "We hope it won't be decades, but it will at least still be several years.

"We're just at the beginning of this," she said.

Vining said there are several pieces involved in the effort to apply the tools of modern genetics to mint breeding, starting with the mint reference genome. All gene-related information obtained will be compared to the reference, she said.

The second piece is previously-gathered information about wilt resistance from individual plants.

The third piece involves putting together the gene information and the wilt information. Small variations in genes among individual plants can be selected in a breeding program if they are found to be associated with wilt resistance. Mapping genes to the reference genome will help determine which genes are close together, and which are far away from each other, which helps to predict results of breeding and selection, she said.

Vining said she is unsure of just how many genes she will find that confer resistance to *Verticillium* wilt.

"I am expecting that there are going to be many of them, but I don't know exactly how many," she said.

Part of the research involves checking to see which genes are "turned on" in resistant and susceptible plants when they are inoculated with *Verticillium*.

"That is going to help me identify which genes and how many genes there are involved in resistance," she said.

Kelly Vining

"If we capture those genes that are being expressed and sequence them, then we can compare them to the reference genome and see where they are in the genome," she said. "This enables us to know what we are selecting for once we identify those genes."

To start with, Vining crossed a wilt-resistant variety with one that is highly susceptible to create what she called a "segregating population," a population that includes some that are resistant and some susceptible to the wilt.

Vining has about 100 plants in this population and has screened about 40 of them, she said.

"I know which are the most resistant and which are the most susceptible," she said.

Next she plans to select the resistant ones, self-pollinate them and breed resistant lines from there.

Her breeding material ultimately will be crossed with varieties developed by Brian Dilkes, an assistant professor of horticulture at Purdue University.

"That is the part that is probably going to take several years," she said. ✦