

Ashley Yow Defies the Odds, Working to Create Disease-Resistant Cultivars

BY CYNTHIA ADAMS

Blueberries!

Love 'em or not, blueberries surely love us. From the first time a plucky someone popped a blueberry into their mouth, it was clear that the tiny berry possessed very big flavor.

Beyond toothsome flavor, blueberry benefits keep unfolding.

Research indicates that the antioxidant-rich berry not only supports visual health, but also helps maintain brain function.

More than a decade ago, neuroscientist James Joseph first called the blueberries a “brain berry.” Joseph said that nothing topped the blueberry for protection of the brain. Current studies indicate blueberries may reduce the risk of Alzheimer’s or even reverse it. Animal trials demonstrate an astonishing brain-boosting ability. “It will be important to see what comes out of human trials,” says Ashley Yow, a graduate student in Hamid Ashrafi’s lab at NC State, who just completed her masters.

Ashley Yow is fascinated by the little blueberry, an important commodity with a projected 25 percent increase in production over the next four years. She placed second at the 2017 Graduate Student Research Symposium for RNA sequencing that identifies genes resistant to mummy berry disease in blueberries.

Blueberries are vulnerable to both biotic, or living, and abiotic stress factors such as sunlight, water, and temperature. Mummy berry disease is a fungal disease that causes the berry to be shriveled and pale. It is among the most widespread and damaging diseases affecting blueberries. Through genetic mapping studies and analytics, Yow is working with a team of NC State researchers in horticultural science, bioinformatics, and plant pathology in order to one day breed more resistant blueberry cultivars. According to Yow, “My work helps provide breeders with genomic information about this trait that they can use in order to be able to breed them to be more resistant.”



Mummy berry is a common plight. “Resistant cultivars can save growers thousands of dollars each year, keep costs down for consumers, and reduce the environmental impact of farming,” says Yow. In order to identify genes that are differentially expressed in response to the disease, she performed a gene expression analysis, “comparing infected and uninfected tissues of a susceptible blueberry cultivar, ‘Arlen.’”

The blueberry researchers working on the RNA-sequencing include Marc Cubeta, Kathleen Burchardt, and Ashrafi. More recently, Jeff Rollins of the University of Florida began working closely with the mummy berry disease project.

“The validated genes will be used as candidate genes for further genetic mapping studies,” says Yow.

Proving that researchers have a winning sense of humor, Yow says the two most common questions she fielded about her research at the symposium tickled her funny bone.

“People asked if mummy berries are okay to eat,” she laughs good-naturedly. “And people asked me if I dyed my hair blue because of blue berries.”

(For the record, Yow’s hair is no longer Willy Wonka/Veronica blue, eliminating that question. “I got tired of dyeing it,” she says.) Now her hair is light brown.

BIOINFORMATICS AND THE “BRAIN BERRY”

In 2014, Yow completed her undergraduate degree in plant biology at NC State. She accepted a job at the USDA/NC State soybean



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improvement unit, joining Hamid’s research team in 2015 after learning that Ashrafi was seeking a graduate student. A coworker introduced her to Ashrafi for an interview and things clicked.

“He seemed like a very nice person, and I was interested in blueberries. Who doesn’t like blueberries?” she asks. Soybeans weren’t as rewarding. “They aren’t very tasty,” she jokes.

“I love blueberries. But I was interested in biotechnology. That’s what I did for plant biology. And Hamid told me I would basically be doing Linux scripting—we use a Linux server to do a lot of our analyses. I would basically be learning bioinformatics but working with blueberries.”

Bioinformatics used in the context of plant pathology became the basis of her graduate work.

“It was a match made in heaven! I was super excited to get into grad school, and my professor was excited to get his first graduate student,” she says. “He explained what I could learn,

what he could teach me, and what the job prospects were. I started in January of 2016 and now I’m writing my thesis.”

ONE DETERMINED GRANDFATHER AND A DEVOTED GRANDDAUGHTER: “YOU’RE GETTING AN EDUCATION!”

Yow did not come from a long line of scientists—in fact, she is the first in her family to get a degree. She grew up in the suburbs of Durham and loved to be outdoors and play with bugs. Her mother worked in insurance, and her father owned a construction business.

Her college years were fraught with illness. Yow’s father fell ill with lung cancer in 2011 while she was a teenager, and her mother battled a terminal illness a few years later. Yow helped care for her father, and moved out at 20 years old after her father’s passing. Her younger sister, Erica, helped care for their mother.

Yow watched television crime programs, fantasizing about becoming a forensic scientist. “Or maybe a forensic pathologist.” But as her father died, Yow had little time left for dreams.

When her high school biology teacher went out on maternity leave, Yow recalls how the unattended class played cards or slept to pass the time. Her biology grade suffered. “I barely made a C,” she says. “We didn’t even have a substitute teacher. We didn’t learn anything. Kids were losing out on their education.” Her grades were lackluster.

Yet one person wasn’t relenting: Yow’s grandfather insisted that she enter college.

“He said I was smart; he believed I was a smart person,” Yow recalls. He enrolled his granddaughter online at Durham Technical Community College and sent her the confirmation paperwork.

“My grandpa worked for IBM for nearly 50 years—and he enrolled me in Durham Tech after I graduated high school—after I nearly failed high school biology! My high school, Southern Durham High School, was very underfunded. I thought I hated biology when I was 18. He took me to take the placement test at Durham Tech, because I never took the SAT.”

Yow revered her grandfather and listened. “He told me, ‘I know you’re smart, and you’re getting an education.’”

As a community college student, she began taking science classes and worked to catch up. “Between my Grandpa pushing me and my teacher, Dr. Gretel Guest, I did well.” While Yow was enrolled in Guest’s biology II class, her mother died, landing another blow. But there was no more failing—Yow persisted. “I was on the road to *being* a biologist.”

Yow had not only her grandparents, but a professor who believed in her.

She transferred successfully to NC State two years later, graduated and entered the plant biology program. She sent Guest an email of thanks for having helped her. Guest responded, saying she understood that Yow had faced unusual stresses and that it was inspiring to know she was doing well.

“My father would have been so proud,” Yow said. “I know my grandfather was super proud, for me to be here, and go on and get my master’s. He was tickled pink.”

Her grandmother died in 2010. Yow lost her father in 2011 and her mother in 2015. She lost her grandfather this year. “It’s just me and my sister and my uncle now,” Yow says. “That’s the whole family.”

She keeps her grandparents’ picture as a talisman in the lab

where she works. “That’s my Nana and Papa right there. He worked so hard. He did everything for me, to give us a better life than he had.”

Yow lives in her grandparents’ house with her younger sister, Erica, who is interested in eventually pursuing psychology or criminology. “Staying in Nana and Papa’s house, taking care of the yard, and having neighbors are different than living in my apartment where everybody was anonymous,” says Yow. Surrounded by memories of her family, the sisters are making the house their own.

MISTRUSTS OF GMOS MAY BE MISPLACED

Yow doesn’t have an abundance of free time, but keeps a greenhouse and intends to do more indoor and outdoor gardening. Her love of horticulture and plant pathology is deepening.

She discusses all the exhilarations, challenges and frustrations of her profession. Breeding is slow and difficult as a process, but genetically modified organisms face problems of public misperception. “I know there are documentaries about GMOs, and people assume it is true. It might be a documentary by a single person, and may not be true.” Yow worries about assaults on science. Despite years of trials by established researchers — verifying findings decades in the making—distrust persists.

Also, genetic engineering remains expensive for specialty crops like blueberries. Yow’s research steps into that gap. “There are no companies currently genetically engineering blueberries that I am aware of,” she explains. “But, I think the perfect option is to find the gene responsible for a trait and reengineer the plant.”

As for her personal future, Yow begins a new project in pineapple research next year under NC State’s Massimo Iorizzo. She will continue working with gene expression analysis for her doctorate, working with Iorizzo in the plant genetics and nutritional genomics lab.

In, say, another five years, she has a new fantasy. “I’d like to be at a biotech company and managing a lab,” Yow says. “I like being a group leader. ■

Ashley Yow won top honors this spring among her fellow graduate researchers for her analytical research of blueberries. She is now beginning doctoral studies.



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