

Grant funds UC-Berkeley research into wheat gene-editing

By **MATTHEW WEAVER**
Capital Press

A grant to the University of California-Berkeley will pay for research into advanced gene editing aimed at developing wheat that is resistant to pathogens.

The grant comes from the Foundation for Food and Agriculture Research in Washington, D.C. The 2Blades Foundation and Innovative Genomics Institute provided matching funds, for a total \$3.2 million investment.

FFAR builds public-private partnerships to support agricultural research.

If successful, the three-year project could help growers reduce fungicide use by developing crops with improved resistance, Jeff Rosichan, director of the Crops of the Future collaborative for the foundation,



Jeff Rosichan

told the Capital Press.

“This methodology allows scientists to put the newest and best disease resistance genes in the best germplasm that’s currently available,” he said.

Currently, scientists use traditional crop breeding to introduce, or stack, multiple resistance genes, but this is a time-consuming approach, according to FFAR.

As pathogens mutate, plant breeders or chemical producers must constantly work to keep one step ahead, Rosichan said.

It typically takes eight to 10 years to stack genes through conventional breeding. Gene editing accelerates the process, getting a

variety to growers in possibly half the time, he said.

“It’s really not a matter of being more resistant, it’s a matter of trying to stack and create more hurdles for the pathogen to overcome,” he said.

The UC-Berkeley research team, led by Brian Staskawicz and Ksenia Krasileva, uses gene editing technology to stack resistance genes in the wheat that recognize the pathogen’s proteins. By recognizing the proteins, the plant can fight the pathogen, even if it mutates.

The resulting wheat varieties will have greater yields and require fewer chemical inputs, according to FFAR.

Gene editing is not considered genetic modification, or GMOs, Rosichan said.

Many key overseas wheat-buying countries will not purchase GMO wheat.

Gene editing is more precise than genetic engineering, Rosichan said.

The USDA Animal and Plant Health Inspection Service oversees regulated genetically engineered wheat field trials, but agencies agree gene editing poses no risks, since it makes minor changes to the plant without incorporating any foreign DNA or genetic material, Rosichan said.

There is no GMO wheat for sale or in commercial production in the U.S. at this time.

“From a scientific point of view ... there probably isn’t really a scientific downside to this research,” Rosichan said. “It’s really more about consumer acceptance of new technology.”

Some European customers have expressed concerns, but researchers have petitioned the European

Union to adopt a scientifically based assessment of risk instead of non-scientific based perceived risk, he said.

“Growers really like to have the best tools out there to deal with their problems,” he said. “This at least offers them a cost-effective, potentially successful way to stay ahead of the disease issue for longer.”

Wheat varieties developed using gene editing could possibly enter the marketplace in six years, Rosichan said. Other gene-editing projects are being developed globally, as the technology gains more public acceptance.

According to FFAR, the grant includes computational and synthetic biology approaches to develop novel resistance genes, through the 2Blades Foundation’s wheat rusts consortium, for rust-resistant wheat.



Richard Roseberg, left, and Gordon Jones at the Oregon State University Southern Oregon Research and Extension Center in Central Point examine hemp plants for their maturity near harvest as part of a nationwide trial.

OSU researchers spearheading nationwide hemp trials

Projects made possible by \$2.5 million federal appropriation

By **GEORGE PAVEN**
Capital Press

CORVALLIS, Ore. — Researchers at Oregon State University and the USDA Agricultural Research Service are teaming up for a first-of-its-kind nationwide hemp study to find out how different growing environments may influence the newly legalized crop.

Hemp was criminalized under the Controlled Substances Act of 1970, but Congress removed it from the list of Schedule I drugs as part of the 2018 Farm Bill, opening the door for widespread cultivation.

Jeff Steiner, associate director of the OSU Global Hemp Innovation Center, said the crop was “essentially put in a time capsule” during the years it was illegal. While farming practices and technology for other commodities progressed, hemp was left behind.

Producers and academics alike are now rushing to catch up. The center was established in 2019, combining more than 40 OSU faculty members working to incorporate hemp into American agriculture.

“Now that hemp is out of the time capsule, doing (this) research starts to bring it up



Jeff Steiner

to speed with other crops so that farmers and other agriculture business people, and even the processors of hemp, can make science-based decisions on whether they should grow it, how they should grow it and where they should grow it,” Steiner said.

Earlier this year, lawmakers provided another leg-up for hemp by appropriating \$2.5 million for joint research between OSU and the USDA-ARS.

One project, Steiner said, involves planting six varieties of hemp at 16 locations across the country, measuring how the differences in soil, temperature and amount of sunlight affect the plants’ timing, yield and levels of chemical compounds like cannabidiol, or CBD.

Project partners include universities in Alabama, New York, Vermont, Kentucky, Wisconsin and Montana, among others. Genetics include both full-season and auto-flowering varieties — the latter of which is not dependent on length of daytime to enter its flowering stage.

Steiner said the focus is on hemp grown for cannabinoids like CBD, used in oils, lotions, tinctures and other products. Scientists are also paying close attention to whether environmental factors have any effect on levels of tetrahydrocannabinol, or THC, in the plants.

By law, hemp cannot have more than 0.3% THC, the component in cannabis that gets users high. If hemp exceeds the 0.3% benchmark, it is considered illegal marijuana under federal law and must be destroyed.

“This is the first nationwide trial of this sort,” Steiner said. “Right now, much of this market the last couple of years has revolved around CBD production and cannabinoids. But we don’t really know where is the best place to produce, optimally and economically, essential hemp varieties.”

That’s not the only project underway at the Center.

Steiner said the center is also working with the University of California-Davis on irrigation trials to determine how much water hemp needs to grow in drier climates. Testing began this year in Ontario, Hermiston and Klamath Falls in Oregon and Fresno and Yolo counties in California.

WSU ventures into hemp field trials

By **DON JENKINS**
Capital Press

Washington State University has joined the search for hemp varieties that can fulfill the hopes of growers and promises of advocates.

David Gang, professor at WSU’s Institute of Biological Chemistry, will collect information this summer from seven test plots across the state. The university has not participated in hemp research at this scale before.



David Gang

Gang said he expects researchers to learn a lot over the next five years about hemp’s chemistry and which varieties will thrive in different regions of Washington.

“I don’t think there’s going to be one hemp variety. The answer I think is that we’ll have a battery of hemp varieties,” he said.

WSU faculty members obtained hemp licenses from the Washington State Department of Agriculture after the 2014 Farm Bill allowed state-supervised hemp cultivation and research.

Hemp, however, remained a federally controlled substance. Hemp and marijuana are the same plant, cannabis, but distinguished by hemp’s low level of THC, the psychoactive chemical in marijuana.

Hemp research projects bogged down, requiring the same federal scrutiny as research involving marijuana. “It was a nightmare. It just became too hard,” Gang said.

The 2018 Farm Bill legalized live plants and viable seeds. Farmers still need a state license and must have their plants tested for THC. If sample plants have too much TCH, the crop must be destroyed.

With hemp no longer a controlled substance, WSU



La Center, Wash., hemp grower Lyn Larson-McCann, left, and Industrial Hemp Association of Washington director Bonnie Jo Peterson look over a hemp test plot July 12. Washington State University is participating in field trials across the state.

has an opportunity, and perhaps an obligation, to help develop it as a profitable agricultural crop, Gang said.

Washington has 170 licensed hemp farmers, far fewer than leading hemp states such as Oregon, Colorado and Kentucky.

“We know we’re behind the curve compared to a number of states,” Gang said. “We’re trying to play catch-up right now.”

WSU has collaborated with the Industrial Hemp Association of Washington and farmers on field trials in Spokane, Kennewick, Chelan, Mabton, Mattawa, Prosser and La Center.

About 19 acres are involved, and 17 varieties are being grown, the hemp association’s director, Bonnie Jo Peterson, said.

She estimated the trials will cost more than \$300,000, with more than \$200,000 coming from in-kind contributions of farmers. Peterson said she’s still raising the rest from the hemp industry.

Trials have a long list of goals, including finding a variety that can be planted in June and harvested in September, fitting into short growing seasons in Western Washington, Peterson said.

“We’re relying on the scientists and the farmers to fig-

ure this out rather than people who like hemp and think that it will save the world,” she said. “We’re still building an industry, and we have a long way to go.”

Lyn Larson-McCann planted a dozen varieties on a little less than 2 acres near La Center, the only field trial west of the Cascades. She’s growing the hemp organically, and pulling a lot of weeds by hand.

She said she started planting hemp last year, interested in it as a medicinal plant.

“We’re so new at being allowed to do this. Like any new business, it’s going to take years,” she said.

“But I know this isn’t going to go away, so now we’re down to the meat-and-potatoes to see how it grows and who it can benefit.”

Hemp advocates tout the plant’s versatility and its ability to yield seeds to eat and fiber to make clothing, building materials, biofuel and other products.

So far, however, the plant’s chemistry has attracted the most consumer interest. The most popular product is cannabidiol, or CBD.

CBD and THC are just two of more than 80 naturally occurring chemicals in hemp, according to the Food and Drug Administration.

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