Wavin' Wheat

OSU Wheat Improvement team and producers benefit from professor's discoveries.

by ***Tosha Powell***

PHOTO BY MARY KATE SCOTT, TEXAS WHEAT BOARD AND ASSOCIATION

►OSU's Liuling Yan has isolated the genomic sequence responsible for the flowering process in winter wheat varieties.

After an Oklahoma State University (OSU) football team touchdown, the fans in the stadium cheer loud and clear as the marching band starts playing that familiar tune: The Waving Song. The crowd jumps to their feet and starts waving their hand in the air back-and-forth and, for a moment, the whole stadium looks like a field of Oklahoma's waving wheat.

Wheat serves a dual purpose to producers in the Sooner State: grain harvest and cattle production.

"Oklahoma is unique because it relies heavily on both uses," says David Porter, department head and professor in the OSU Department of Plant and Soil Sciences.

For many families in Oklahoma, this multi-purpose crop provides additional agricultural opportunities and profits. Winter wheat can be grazed for an extended period of time; however, the crop begins to suffer if cattle are allowed to graze it too long. On the other hand, farmers who are more concerned for their wheat crop often make the mistake of pulling cattle out of the field too early. Not giving cattle enough time to gain on wheat can cause a dollar decrease at the feedyard.

A forward-thinking OSU scientist from China, however, could soon have the power to manipulate Mother Nature's hold on Oklahoma's wheat crop.

After joining the OSU Wheat Improvement team two years ago, Liuling Yan, assistant professor in the OSU Department of Plant and Soil Sciences, has made a breakthrough discovery that has the potential to redefine the production of wheat in Oklahoma.

Yan has isolated the genomic sequence responsible for the flowering process in winter wheat varieties. By analyzing the genetic code, he is able to identify a vital piece of the biological switch between the vegetative and reproductive stages in this variety, explains Brett Carver, wheat genetics chair in agriculture and regent professor in the OSU Department of Plant and Soil Sciences.

Critical transitions

As wheat makes its way through the growth cycle, it must make critical transitions between growth stages. For plant health, the transition between vegetative and reproductive stages is one of the most critical, Carver says.

During the vegetative growth stage, the nonreproductive plant parts (leaf and stem) are exposed. The facade of the reproductive plant parts (flower and seed) transitions the plant into the reproductive growth stage.

Yan's research is focused on having a more accurate understanding and timeline of this process. Yan works specifically on certain varieties of wheat adapted to Oklahoma and the southern Great Plains — and that means a great deal to cattlemen in the state.

Yan's research could give producers the ability to predict the wheat flowering process more efficiently, meaning it could be possible to delay or stall the flowering process. That means more money in the bank for rural producers.

Ninnekah, Okla., native and stocker operator Ralph Morgan feeds his heifers strictly on wheat. Morgan purchases heifers at weaning and feeds them on wheat pasture until they reach 800-900 pounds (lb.) before selling them to a finishing feedyard. He looks forward to the development of Yan's research.

"I feed my cattle on my own wheat and that's it," Morgan says. "I normally sell off just before winter, so I won't have many inputs by keeping them any longer. With Yan's research I can better my grazing pattern and possibly keep my heifers for finishing."

Yan's laborious task of analyzing the complex genetic code could simplify the efforts of not only Oklahoma wheat producers but also those working to produce improved wheat varieties.

"Designing an Agricultural Genome Program," posted on the National Academic Press web site, compares the genetic makeup of a few major agricultural commodities. The wheat genome contains 16 billion base pairs, "oversized" compared to the 2.3 billion in corn and the 3 billion in the human genome, the web site reports.

"You are able to rely on DNA, rather than Mother Nature," Carver says. "There's so much more that I can't see. But you can nail it down in Yan's lab."

Predicting profit

This research has given other researchers an ability to increase profit on both avenues of wheat production with a more accurate understanding of the genetic building blocks of wheat.

The accuracy in predicting the flowering process would allow producers to have a more clear-cut timeframe as to when to remove their cattle from grazing, Carver says. This would eliminate the risk of any damage to the plant during flowering due to allowing cattle to graze too long.

►More days on wheat pasture can mean more revenue to Oklahoma producers.

PHOTO BY TOSHA POWELL

"The right timing must occur for the transition from vegetative to reproductive growth stages," Carver says. "This is crucial when grazing cattle."

Cattle can put a large amount of stress on wheat, causing canopy loss.

"We ask wheat to regrow after cattle graze it, with no drop in yield," Carver says. "That is a lot to ask."

On the other hand, with Yan predicting flowering more accurately, producers could gain extra days to extend their cattle's grazing period. Extending the grazing period by just a few days can allow cattle to gain an additional pound or two, resulting in higher-value cattle.

PHOTO BY MARY KATE SCOTT, TEXAS WHEAT BOARD AND ASSOCIATION

►The wheat genome contains 16 billion base pairs, "oversized" compared to the 2.3 billion in corn and the 3 billion in the human genome.

This additional income, Carver says, essentially goes back to rural America. He says the little things add up, and this could help renovate of the rural economy.

Julius Haralson, a Chickasha, Okla., native cow-calf producer, says Yan's research will solve many of a farmer's/rancher's grazing problems. "Growing wheat for dual-purpose has always been a tricky business," Haralson says. "Perhaps with Yan's research, it just won't be as hard to identify when to remove cattle from grazing."

Haralson strives to get his calves marketed as *Certified Angus Beef*® (CAB®). He says that with the ability to stall the flowering process he could keep his cattle on wheat a few days longer, with hopes to get their weight where they need to be before transferring them to a feedyard.

"You always like your cattle to bring good money," he says. "This way, I know I can get them a little fatter, and then I can get more out of them. I am excited to see a finished product from Dr. Yan's research."

Yan's research is made possible through support from the Oklahoma Center for the Advancement of Science and Technology, the Oklahoma Wheat Commission, the U.S. Department of Agriculture (USDA) Coordinated Agriculture Project and the National Research Initiative grant program.