

U of I Research on Grain Stalks Aims to Reduce Crop Loss, Increase Revenues

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University of Idaho researchers are working with counterparts at the University of Kentucky and Clemson University to breed stronger plants as part of a four-year quest to increase grain yields and reduce crop loss.

Stalk lodging, when a grain stem snaps prior to harvest, is a serious problem in most grain crops and results in annual yield losses of approximately 20 percent. The problem arises as a result of factors ranging from high nitrogen levels to storm damage to disease and seed type.

Faced with a growing global population, plant scientists, engineers and mathematicians from the three universities will spend the next four years examining ways to overcome this barrier in improving grain yields.

Researchers including U of I mechanical engineer [Daniel Robertson](#) from the [College of Engineering](#) and renewable materials chemist [Armando McDonald](#) from the [College of Natural Resources](#) will study stalk lodging in corn and sorghum with the intent of breeding stronger plants. The project is funded through a \$6 million grant from the National Science Foundation Established Program to Stimulate Competitive Research (EPSCoR).

Through the unique combination of measuring stalk strength and mathematical modeling, the team will investigate the microstructure of large plant populations to predict the underlying features that cause — and also may be used to overcome — stalk lodging.

“Corn, wheat and rice account for two-thirds of human caloric intake and all three crops suffer from crop lodging,” Robertson said. “If you reduce corn lodging by just 1 percent, you’d produce another \$2 billion of corn each year.”

Lead researcher [Seth DeBolt](#), horticulture professor at the University of Kentucky, said the team will tackle the problem from a biomechanical standpoint.

“We will analyze the corn stalks just like we do an aircraft carrier or a car. We are going to figure out where and why they break,” Robertson said. “It will be one of the first times that mechanical engineers are directly involved in solving this mechanical problem.”

McDonald will study the cellular mechanics and chemistry of the stalk cells, investigating how changing the chemistry of the plants’ cell walls affect stalk strength and how the stalk deforms. Robertson is producing several portable biomechanical devices to rapidly measure stalk strength in corn and sorghum fields.

“We’ll use those devices to determine the lodging resistance of multiple corn and sorghum varieties, and then using engineering techniques, mathematics and statistics, we should be able to predict why particular varieties are stronger or weaker,” DeBolt said. “In particular, we are hoping to determine both genetic and environmental factors that influence stalk strength.”

Corn geneticist Rajan Sekhon and statistician Chris McMahan at Clemson University are also involved with the grant. Robertson hopes the expertise and knowledge gained through the team’s work will make Idaho more competitive for future federal funding.

This project was funded under the National Science Foundation grant No. 1826715. The total amount of federal funds for the project is anticipated to be \$6,000,000, which amounts to 100 percent of the total cost of the project; \$2,999,998 of which has been awarded to date.

Media Contacts:

Daniel Robertson

Assistant Professor, Department of Mechanical Engineering

University of Idaho

208-885-7889

danieljr@uidaho.edu

Armando McDonald

Professor, Department of Forest, Rangeland and Fire Sciences

University of Idaho

208-885-9454

armandm@uidaho.edu

Leigh Cooper

Science and Content Writer

University of Idaho

208-885-1048

leighc@uidaho.edu

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