

Aerial Surveillance Adds New Dimension To Soybean Drought Tolerance Research

FAYETTEVILLE, ARK.

Crop physiologist Larry Purcell is employing unmanned aerial reconnaissance to study 1,200 research plots for traits that may help the University of Arkansas System Division of Agriculture develop drought tolerant soybean varieties.

Purcell, holder of the Alzheimer Chair for Soybean Research, and Vaughn Skinner, director of the Arkansas Agricultural Research and Extension Center, are testing a remote control vehicle called the Oktokopter to determine its value as a research tool.

A strange-looking aircraft, the Oktokopter employs eight rotors on armatures surrounding a central body that contains the motor, control circuitry and a camera. Purcell said the Oktokopter can be preprogrammed with a computer controlled flight path as well as guided by a handheld remote control.

Purcell said the Oktokopter can carry an infrared camera that can measure temperatures as an indication of water availability of plants in research plots. It can also carry a digital camera to record and measure the shades of green in soybean plants that can be related to maturity of the plants.

"Some soybean genotypes may not wilt as quickly because they conserve water in the soil, providing a reserve during a drought," Purcell said. "Other plants use deeper rooting to draw water from deeper strata in the soil. Both traits allow a plant to continue active growth, which results in water evaporating from the leaves."

Purcell said the evaporation of water from leaves of slow-wilting varieties cools the leaves, and the infrared camera can detect the temperature differences.

Purcell has identified molecular markers for these genetic traits and has discovered that those same molecular markers are associated with higher yields.

The Oktokopter, which can operate at an altitude of 400 feet, the limit set by the Federal Aviation Administration, would considerably streamline data collection.

"We have 1,200 plots to rate each season," Purcell said. "Presently, we rate them by eye only on windless days and when they are dry."

He also tries to rate the plants when the sun is highest in the sky, and Purcell said that typically gives him a daily window of about 11 a.m. to 3 p.m. Sometimes the window is narrower because of cloud cover, which can affect plant response and the perception of color. He added that visual inspection is a subjective method that could make the results varied.

"Digital imaging," Purcell said, provides a more quantitative measure. And because the cameras in the Oktokopter can cover as many as 600 test plots at once, it can complete data collection rapidly.

Purcell proposes that the Oktokopter would allow him to make multiple measurements during the observation window so that he could monitor changes in plant response at different times of day. △



Crop physiologist Larry Purcell, left, and program manager Andy King prepare the oktokopter for a preprogrammed flight over soybean test plots at the Arkansas Agricultural Research and Extension Center in Fayetteville.



The Oktokopter flies a preprogrammed pattern over soybean test plots at the Arkansas Agricultural Research and Extension Center in Fayetteville.



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