Society Science

Using Small Unmanned Aircraft Systems for Early Detection of Turfgrass Drought Stress

Drones, known more formally as small unmanned aircraft systems (sUAS), have been thriving in applications across disciplines. Use of sUAS equipped with sensors may provide more accurate data collection and improve efficiency for turfgrass research and management compared with conventional methods. However, there has been little research on the ability of sUAS-based remote sensing technology to detect early drought stress in turfgrass.

New research published in Crop Science compared data collected via sUAS equipped with sensors with ground-based techniques in creeping bentgrass across a gradient of irrigation regimes from well-watered to severe water deficiency. Throughout the three-year study, the sUAS detected vegetation and reflectance indices indicating declines in soil moisture in deficit-irrigation treatments before symptoms appeared in turfgrass quality and green cover.

As such, using ultra-high-resolution remote sensing with sUAS allows drought stress to be detected efficiently and as well as (if not better than) a handheld device before it is visible to the human eye and may prove viable for irrigation management in turfgrass. Such an ability of sUAS-based imagery would allow more precise water application scheduling while maintaining plant health and conserving water.

Adapted from Hong, M., J. Bremer, and D. van der Merwe. 2019. Using small unmanned aircraft systems for early detection of drought stress in turfgrass. Crop Sci. 59. View the full article online at http://dx.doi.org/doi:10.2135/cropsci2019.04.0212

Provitamin A Maize Response to Environmental Stress Conditions

Many people in Africa suffer from vitamin A deficiency, which leads to blindness and other health problems in adults and children. The International Maize and Wheat Improvement Center (CIMMYT) in Mexico has developed orange maize inbred lines with high levels of β-carotene, the precursor to vitamin A. The problem is that many of these inbred lines are poorly adapted to the conditions experienced by small-scale producers in sub-Saharan Africa, such as heat, drought, and low soil fertility.

In a recently published Crop Science study, the orange inbred lines were crossed with drought-tolerant inbred lines, and the hybrids were evaluated for two seasons under four stressful conditions—drought, drought and heat, low nitrogen, and low phosphorus—and compared with corn grown in optimum conditions.

Sixteen hybrids performed better than the local checks under managed drought stress. One hybrid was among the top 10 hybrids in all the testing environments. Drought and low N stress reduced β-carotene by more than 60%, yet some hybrids retained a high percentage of β-carotene under stress conditions. This study identified hybrids that can be grown under adverse conditions while still retaining a good β-carotene content.


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Plot scene before sUAS takes off.

Orange maize after harvest. Photo courtesy of CIMMYT.