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## A new way to measure Very Early Water Stress

While water stress in C4 plants can be measured with Yield and ETR (J Cavender-Bares & Fakhri A. Bazzaz 2004 ) (Cerovic 1996), Previous attempts at detection and measurement of early water stress in C3 plants have met with difficulty.  $F_s$ , a component in “Yield”( also known as  $\Delta F/F_m'$  or  $F_m - F_s/F_m$ ), had been reported as the most sensitive test for moderate water stress (Flexas 1999) and (Flexas 2000). PI, or “Performance index” has shown to detect water stress after about seven days (Thach 2007) (Zivcak M., Brestic M, Olsovska K. Slamka P. 2008), and  $F_v/F_m$  has been found to be insensitive to water stress (Bukhov & Carpentier 2004).

Recently a paper using a new way to detect and measure very early water stress was published by John Burke of the USDA ARS in Lubbock Texas. The paper, **“Evaluation of Source Leaf Responses to Water-Deficit Stresses in Cotton Using a Novel Stress Bioassay”** was published in **Plant Physiology, Jan. 2007, Volume 143, pp108-121.**

He reports that water stress could be detected and measured *within twenty four hours of the cessation of irrigation. Dr. Burke informs that two to three hundred samples can be tested at one time.*

Excerpt:

“At sunrise, a leaf punch was harvested from a source leaf (in cotton this is the fifth main stem leaf from the top) using a number 6 cork borer and rubber stopper. This was repeated on five separate plants. The punches were transferred to a well in a Costar 3524 24-well cell culture cluster (Corning) that had been half filled with water. The lid was returned to the cell culture plate immediately following additional of the leaf punches. This process was repeated until samples from all treatments had been harvested. Upon returning to the lab, the punches were placed on moistened model 583 Gel Dryer Filter Paper (Bio-Rad Laboratories) in a Pyrex baking dish. The leaf punches and filter paper were covered with Glad Cling Wrap (CO<sub>2</sub> permeable; Glad Products Company) and pressed flat with a speedball roller for Microseal film (MJ Research) to remove air bubbles and ensure good contact between the tissue and filter paper. Initial  $F_v/F_m'$  (or  $\Delta F/F_m'$ ) (also known at the light adapted test “Yield”) levels were determined using an Opti-Science OS1-FL Modulated Fluorometer and then samples were placed in the dark in a VWR model 2005 incubator (Sheldon Manufacturing) set to 39\_C. The samples were evaluated every 30 min after being placed in the 39\_C incubator. The decline in  $F_v/F_m'$  (yield) over time was used as a relative measure of the stress level of the plant (a slow decline occurring in tissue from stressed plants, and a more rapid decline occurring in tissue from less stressed plants)”

The Opti-Sciences OS5p may also be used for this test. For a comprehensive Desk Top Stress Guide, please contact Opt-Sciences, [info@optisci.com](mailto:info@optisci.com) or cal 603 883-4400.

## References:

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