

Impacts of Melatonin Application on the Drought Tolerance of Turfgrass Erik Infante, 2026

Recently, scientists have been able to use satellites to measure solar-induced chlorophyll fluorescence (SIF) at a large scale, which was claimed to correlate with CO₂ assimilation. The problem with this assumption is that the measurement is too large of a scale and there isn't a one-to-one correlation between fluorescence and CO₂ assimilation. The National Institute of Standards of Technology (NIST), the Barry Logan lab seeks to disprove the assumption that fluorescence can be correlated with CO₂ assimilation. This was done by turning off the plant, turf grass, and photosynthetic mechanism through drought while measuring the photosynthetic capabilities and the greenness of the turf grass. In addition, melatonin was added to the plants because recent studies have shown that adding melatonin has helped increase a plant's resistance to drought (Cui et al.). The measurements and information our lab has gathered will then be sent to our collaborators at NIST so they can make the SIF measurements and apply them to the data we collected. Leaf-level CO₂ assimilation through photosynthesis and Pam Chlorophyll fluorescence will be assessed utilizing an instrument that measures photosynthesis as CO₂ removal from air passed over a leaf. Measurements will be conducted on fully sun-acclimated lawn grass leaves within the designated study area. The watering regimen will vary, mimicking conditions of either drought stress typical of lawns or optimal hydration akin to healthy urban lawn environments. This turfgrass was seeded in lined plastic pallets and pallets. In addition, 2/3 of the turf grass pallets received a 50 μM solution with 1/3 receiving melatonin through a spray and the other 1/3 through their regular watering. A picture of the turf grass was taken and run through a programming system named ImageJ that can measure how green the green is through the pixels of the picture. At the end of the experiment, it was found that melatonin did not make a significant difference throughout the drought of the experiment, which goes against the literature used for this experiment. In addition, the drought seemed to decrease CO₂ assimilation throughout the experiment as the severity of the drought increased. Similarly, the maximum potential quantum efficiency of Photosystem II decreased as the severity of the drought increased.

Graphs/images/figures

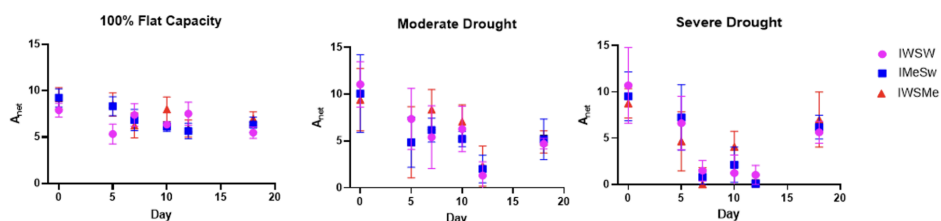


Figure 1-3, CO₂ assimilation of Turf grass under different drought conditions. Pink circles represent the control for the melatonin treatment. Blue squares represent melatonin added through irrigation. The red triangle represents melatonin added through the use of a spray bottle.

Faculty Mentor: Barry Logan

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References: Cui, G., Zhao, X., Liu, S., Sun, F., Zhang, C., & Xi, Y. (2017). Beneficial effects of melatonin in overcoming drought stress in wheat seedlings. *Plant Physiology and Biochemistry*, 118, 138–149.

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