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Early season monitoring of drought induced physiological changes of flowering dogwoods in container production system

Abstract

Flowering dogwoods (*Cornus florida* L.) are an important ornamental crop sensitive to drought stress. Drought impacts major physiological processes in plants to decrease production and increase pest and pathogen infestation. Thus, monitoring of early stage of drought stress is essential to ensure healthy crop production in the nurseries. An outdoor study was set up in a randomized complete block design to monitor early-stage physiological changes of flowering dogwood trees. Three different irrigation rates were used as control, moderate, and severe drought (125%, 25%, and 10% of daily water usage), respectively. Normalized Difference Vegetative Index (NDVI) was recorded every week using hand-held NDVI meter and Unmanned Aerial Vehicle (UAV) mounted NDVI sensor. Data on mid-day leaf moisture potential (ψ) was collected every week whereas plant growth data was recorded at the beginning and end of the study. No significant differences were observed among the treatments for plant total fresh weight and fresh root weight; however, plant height increase and average plant width were greater for control. NDVI measured from the hand-held NDVI meter was significantly higher for control in 7th, 14th, 21st and 27th day compared to the other treatments. A high correlation of 91%, 93%, 84%, and 88% was observed between the hand-held NDVI meter and UAV mounted NDVI sensor in 7th, 14th, 21st and 28th day, respectively. No significant difference was observed on 7th day for ψ but was significantly higher for control on 14th, 21st, and 27th day. This study will provide useful information in the application of UAVs and imaging sensors to monitor early season abiotic stress along with the understanding of physiological changes occurring in woody plants during stress conditions.

Keywords: nursery production, drought, Normalized Difference Vegetative Index (NDVI), dogwood

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