# UTILIZING WHOLE PLANT AND IN VITRO CULTURE TECHNIQUES TO SCREEN FOR WATER STRESS TOLERANCE IN SWITCHGRASS

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**Abstract**

*Water stress is a major problem threatens agriculture worldwide. Switchgrass can benefit from enhanced water stress tolerance as it will be grown in marginal areas. The objectives of this study are to (1) evaluate growth and physiological parameters and identify switchgrass traits that can contribute to water stress adaption, (2) investigate the ability of switchgrass cultivars for callus formation and water stress adaptation at cellular level, and (3) compare regenerated plants with plants produced from seed. Under objective 1, 13 genotypes were screened using control (well watered - WW), 60%WW and 20%WW treatments, and physiological parameters, total biomass, and biomass components were measured. Under objective 2, 12 genotypes were used in vitro culture procedure to investigate callus formation. For objective 3, two switchgrass cultivars were used for callus formation and induce in vitro variation under water stress using MS media + Poly Ethylene Glycol. Results showed that genotypes vary in tolerance to water stress treatments. Photosynthesis decreased with increase in water stress and genotypes Carthage (lowland) and Forestburg (upland) had the least decrease in photosynthesis at both 60%WW and 20%WW conditions. Total biomass was severely reduced by water stress at 20% WW and significant interaction was observed on most lowland and upland cultivars. However, Forestburg showed increase in total biomass. Detailed analysis of partitioning parameters also showed the same results. These genotypes had increase in dry weight of leaf, stem and root. Results from second and third objectives revealed that Alamo, Blackwell, and Dacotah produced best callus. Both Alamo and Forestburg callus survived the levels of stress applied and developed callus but organogenesis in both of them was affected by the stress. Alamo cultivar produced more callus and longer shoots than Forestburg whereas Forestburg produced larger number of shoots than Alamo.*