COTTON SEEDLING VIGOR AS AFFECTED BY FIRST TRUE LEAF PHYSIOLOGY UNDER DIFFERENT FIELD CONDITIONS

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Abstract

Rapid development of the first true leaf has been suggested as a reliable indicator of seedling vigor in cotton, yet studies demonstrating the effect of various first true leaf physiological processes on early season cotton seedling growth are limited. Total carbon assimilation to drive growth depends upon the amount of leaf area and the average photosynthetic efficiency. Thus both first true leaf area and photosynthetic rates may be important for early season growth. It was hypothesized that both first true leaf area (FTLA) and photosynthetic rates will be positively associated with cotton seedling vigor and various photosynthetic component processes will have different effects on net photosynthesis (A_n) of the first true leaf. To test the hypotheses, three different cotton cultivars (a large seeded Pima cultivar, one small and one large seeded Upland cultivar) were planted in 2017 and 2018 seasons on three selected dates in order to generate differences in seedling vigor and planting conditions. In both 2017 and 2018, a significant planting date and cultivar effect was observed for measured growth parameters. FTLA was also significantly affected by planting date and cotton cultivar with the largest seed mass cultivar and May planting date resulting in the highest FTLA and vigorous early season growth. The results indicated a stronger association of FTLA with seedling vigor compared to A_n, indicating FTLA is a major determinant of seedling vigor. We also concluded that variation in A_n of the first true leaf, whether induced by growth conditions or cultivar, was primarily governed by non-stomatal factors.