CONTRIBUTIONS OF VARIOUS PHYSIOLOGICAL PARAMETERS TO EARLY SEASON WHOLE CROP VIGOR IN COTTON

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Abstract

Cotton is known to have poor seedling vigor as compared to other crops, which results in greater vulnerability to various types of early-season stresses. Various seed characteristics such as seed size and composition, and differences in planting date are known to influence seedling vigor in cotton. What has not been explored fully is the impact of the aforementioned factors on whole-crop growth and physiological responses under field conditions in the early season. It was hypothesized that large-seeded cotton would demonstrate greater early season crop growth through positive impacts on leaf area development or whole-canopy net assimilation rate. To test this hypothesis, a small (DP 1614; 72 mg seed^{-1}) and large seeded (DP 1612; 94 mg seed^{-1}) Upland cultivar and a large seeded Pima cultivar (DP 348; 138 mg seed^{-1}) were planted in 2017 and 2018 on three different dates to generate differences in early season crop growth. Early season crop growth rate (CGR) and leaf area index (LAI) were significantly higher ($p < .0001$) for larger seeded cultivars, whenever significant differences between cultivars were observed. For 2017, only planting date significantly affected NAR ($p = 0.0006$). For 2018, both main treatments resulted in significant differences in NAR, where higher NAR was observed for the largest seeded cultivar planted in June. When considered across both years, variability in early crop growth were strongly and positively associated with LAI ($r = 0.9844$), but only weakly associated with NAR ($r = 0.5649$). High early season LAI and CGR were also positively correlated with leaf area per plant but not leaf area ratio, specific leaf area, or leaf fraction. Thus, vigorous whole-crop growth in the early season is more dependent on leaf area development than specific leaf activity.