

First True Leaf Physiology of Peanut Plants under Different Field Conditions

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Poor stand establishment and low seedling vigor can be a major concern in peanuts (*Arachis hypogaea* L.). Factors such as genotype, field management, and environmental conditions generally influence seedling growth and vigor. In peanuts, the first pair of true leaves is the first aboveground photosynthetic tissue contributing to growth. The importance of rapid differentiation of the first true leaf on seedling growth and vigor has been indicated in other crops, but studies demonstrating the effect of the first true leaf on seedling growth in peanuts are limited. A field study was conducted to determine the physiology of the first true leaf and its relation to growth under different planting conditions. Three peanut cultivars (Georgia-06G, Georgia-14N, and TifNV High O/L) were planted on 04/01/2017 (mid-April), 05/10/2017 (early-May), and 06/05/2017 (early-June) to generate different field conditions, especially differences in temperature conditions. Stand counts were done at 5, 7, 8, 9, 11, 14, and 16 days after planting (DAP). First true leaves from a 2-m section within each plot were collected to measure first true leaf area (FTLA). Gas exchange and fluorescence parameters (net photosynthesis, dark respiration, electron transport rate (ETR), and quantum efficiency of PSII) and pigment concentrations (chlorophyll a, chlorophyll b, and carotenoids) of the first true leaf were assessed at 21 and 35 DAP. Initial data analysis showed the effect of cultivar and planting date on seedling growth parameters. For all three selected planting dates, seedling emergence was generally higher for GA-06G and TifNV compared to GA-14N. For the early-May planting, seedlings started emerging at 5 DAP, whereas for the other two planting dates, seedling emergence was observed only from 8 DAP. Overall, peanuts planted in early-June exhibited higher first true leaf area at 35 DAP as compared to the other two planting dates. Among cultivars, TifNV had the greatest first true leaf area, followed by GA-06G and GA-14N. The planting date effect was also observed in the pigment concentrations ($p < 0.0001$). At 21 and 35 DAP, plants sown in early-June had the lowest concentration of chlorophylls a and b, and carotenoids. No significant differences were observed in net photosynthesis and dark respiration for both cultivar and planting date effect. However, ETR and quantum efficiency of PSII were higher in plants sown in mid-April as compared to early-June ($p < 0.0001$). These preliminary results suggested that early-June was the planting date with most favorable temperature conditions for a more rapid development of first true leaves and overall seedling growth, mainly for GA-06G and TifNV. Further research is required to better understand the underlying processes and contribution of the first true leaf on peanut seedling growth.