

Early-Season Temperature Conditions Effect on Physiology of Peanut Seedlings

C. PILON*, W. S. MONFORT, C. WEAVER, T. L. GREY, and V. TISHCHENKO,
Department of Crop and Soil Sciences, University of Georgia, Tifton, GA 31793.

Seed storage conditions with high fluctuations of temperature are likely to decrease seed germination and vigor. At planting, a 3-day soil temperature between 20 and 32 °C is generally optimum for germination. Additionally, optimum air temperature for seedling growth is 30 °C, but when above 35 °C or below 15 °C, growth inhibition can occur. However, the effect of seed storage and sub-optimal planting and growth temperature conditions on the photosynthetic thermotolerance of peanut seedlings has not been investigated. The objective of this study was to assess the photosynthetic thermotolerance of peanut seedlings grown under two temperature regimes. Georgia-06G seeds were maintained in four storage conditions (cold room, greenhouse, office, and wagon) for 72 days, when they were transferred to a cold room until planting. Seeds from each storage condition were planted in pots under two temperature regimes, 18 to 24 °C and 21 to 29 °C. Emergence was recorded daily from 5 to 18 days after planting. At 18 DAP, OJIP fluorescence was measured in the uppermost, fully-expanded, mainstem leaf. Leaf discs were also collected from the same leaves for pigment concentrations. Plants were harvested and separated into leaves and stems and oven dried at 60 °C for dry matter.

Higher emergence was observed in pots grown under 21-29 °C. Overall quantum efficiencies (ϕ_{P_0} and ϕ_{E_0}) and performance indices (PI_{ABS} and PI_{total}) were higher in plants grown under 21-29 °C compared to those grown under 18-24 °C. Density of PSII reaction centers was higher in plants grown under 18-24 °C compared to 21-29 °C. The plants grown under 21-29 °C also resulted in increased concentrations of chlorophyll b and carotenoids. Dry matter of leaves and stems was higher for the plants grown under 21-29 °C compared to 18-24 °C. Overall, plants grown at 21-29 °C had increased pigment concentrations and were more efficient at absorbing light, and trapping and conserving energy during the thylakoid reactions, which likely contributed to the enhanced growth and development of peanut seedlings. Seed storage did not influence peanut seedling growth. Further studies will be performed to support and validate these results.