Physiological seed quality: Impact of drought at flowering and fruiting

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Rational and Significance of Research. Peanut is an extremely important crop in Georgia and the ongoing efforts to improve yield and seed quality are an indication of the impact this crop has on the U.S. economy. Growing peanuts is expensive and one of the major production costs is the seed. The quality of a seed lot is represented by a combination of genetic, physical, physiological, and sanitary factors. Environmental stresses during seed development can be detrimental to seed quality. Drought stress during seed development generally reduces growth and yield. Previous results indicated that drought accelerates the germination acquisition during seed development. However, information is lacking on the time, duration, and severity in which plants can undergo without water during seed development in order to improve seed quality without compromising yield. The knowledge on the impact of dry periods at different timings during flowering and pod development on physiological quality of peanut seeds can greatly assist in the efforts to adjust water management in peanut production for greatest seed quality and yield. **Objective.** The objective is to determine the impact of drought stress at different timings during flowering and pod development on physiological quality of peanut seeds. **Procedures.** Peanut cultivars Georgia-06G, TifNV-High O/L, and AU-NPL 17 were planted on June 2, 2023 under field conditions at UGA, Tifton Campus. Four water regimes were used, an untreated control, drought stress (DS) from 30 to 50 days after planting (DAP), DS from 51 to 70 DAP, and DS from 71 to 90 DAP. The untreated control received irrigation as needed throughout the season. For the DS treatments, when plants reached the desired developmental stage, water was withheld for 20 days. A rainout shelter was used to cover the stressed plots and prevent rain/irrigation on the plants from these treatments. Other field management practices followed UGA Extension recommendations. At the end of each stress period, number of flowers, pegs, and pods were counted in 10 plants to follow fruit development. Plants were also collected for aboveground biomass and seed physiological quality assessment. Physiological quality was assessed in seeds from each pod maturity class. **Results.** Aboveground biomass production was highly correlated with peg and pod production for all cultivars. Overall, early season and mid-season drought stresses were the treatments that resulted in lowest pod production for all cultivars. Late season stress promoted harvest index similar to the control. Cultivars varied in seed germination in response to the different drought stresses. For AU-NPL, differences in germination started from orange class, with drought stress from 71 to 90 DAP resulting in the lowest germination of all water treatments. For GA-06G, drought stresses from 30 to 50 DAP and 51 to 70 DAP decreased germination compared with the control and late stress. For TifNV, brown and black classes were the most impacted by the water treatments, with drought from 51-70 DAP indicating the lowest germination of all treatments. In summary, for AU-NPL, late season drought maintained fruit production, but decreased germination of seeds. For GA-06G and TifNV, mid-season drought impaired growth and seed quality the most. Late season drought contributed to accelerate the germination potential in GA-06G, with seeds reaching over 70% in immature classes (i.e. yellow 1). Other seed physiological quality parameters are being analyzed.