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 potentially 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 still 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, 2022 under field conditions at the University of Georgia, Tifton Campus. Four water regimes were used, an untreated control, drought stress (DS) from 30 to 50 days after planting (DAP), drought stress from 51 to 70 DAP, and drought stress 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. Number of pods per plant, fresh pod weight, and maturity profile were evaluated. Physiological quality was assessed in seeds from each maturity class. **Results.** When drought stress occurred early season (30-50 DAP), number of open flowers, pegs, and pods was substantially decreased compared with the irrigated control, indicating that drought at this period is detrimental to the onset of the reproductive stage. Mid-season drought promoted different responses among the cultivars. TifNV-High O/L formed less flowers, but continued producing pegs and pods. Georgia-06G tended to increase flower and peg production under stress. AU-NPL 17 allocated assimilates to flower and peg growth, thus decreasing pod production. For the late-season drought, overall number of flowers was low. Georgia-06G and TifNV-High O/L continued the production of pegs and pods under stress, whereas AU-NPL 17 produced great number of pods at the expense of peg production. Aboveground biomass and seed physiology data are being analyzed.