Water Management Strategy in Peanut for Improved Seed Physiological Quality

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Irrigation is critical to peanut seed production as drought episodes have become more frequent and intense in recent years in Georgia. Too much water applied during seed development delays acquisition of physiological components of seed quality such as germination and vigor. A comprehensive understanding of water management for the different growth stages of peanut plants is critical to achieve greatest yield potential and produce seeds with improved quality. The objective of this research is to determine more accurately the optimum irrigation trigger points in the different plant developmental stages of peanut to achieve greatest yields and physiological quality of seeds. The field experiment was carried out at the University of Georgia C.M. Stripling Irrigation Research Park in 2020 season under a variable rate lateral irrigation system capable of independently controlling water applications within eight-row wide by 40 ft long plots. Irrigation management included eight combinations of three soil water tensions (SWT) levels (20 kPa, 45 kPa, and 70 kPa) and a dryland using three replications of each treatment for a total of 27 plots. Peanut cultivar Georgia-06G was planted on May 6. SWT sensors were installed in the plots approximately 2 to 4 weeks after emergence and data were collected hourly and utilized to make decisions on irrigation scheduling triggers. Yield was determined at harvest. A pod subsample was taken to the laboratory, separated into six maturity classes (white, yellow 1, yellow 2, orange, brown, and black) according to the maturity profile board. Pods were shelled for evaluation of seed germination and vigor. No significant differences were observed among water treatments. However, irrigation water use efficiency (IWUE) was greatest for the water treatment 20/45/45 kPa and lowest for 70/20/45 kPa. Over-applying water during seed development did not reflect in greater yield or water use efficiency. In addition, seed germination in some of the maturity classes was impacted by water management. For the ‘brown’ class, the water treatment exposing plants to a moderate drought stress early season followed by optimum water supply during seed development (70/45/45 kPa) resulted in germination 37% higher than the dryland and 42% higher than the treatment over-irrigating the plants early season followed by a moderate drought during seed development (20/70/45 kPa). Seeds from ‘yellow 1’ followed a similar trend of ‘brown’, with greater germination for 70/45/45 kPa compared with 20/70/45 kPa and dryland. In conclusion, water can be managed more efficiently to improve IWUE and physiological quality of peanut seeds without negatively affecting yield.