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The Impact of Seed Treatments on Peanut Germination and Viability Over Time During Storage in Controlled and Ambient Temperatures

Peanut seed quality and vigor remain persistent concerns for growers, particularly when stand establishment is inconsistent early in the season. While cultivar differences in yield and quality traits are largely genetic, seed vigor is strongly influenced by environmental conditions before and after harvest. Factors such as plant maturity at digging, post-harvest handling, and storage environment can significantly affect germination and early seedling growth. Recent research has shown that exposure of peanut seed to fluctuating temperatures and relative humidity during storage can reduce seedling vigor. These reductions in vigor often translate to uneven emergence, increased disease and weed pressure, delayed maturity, and in some cases, the need for replanting.

This study evaluates whether seed treatments can mitigate losses in seed vigor associated with storage-related stress. Treatments under evaluation include Trebuset®, Rancona® VPD, and a non-treated control. While many commercially available seed treatments are effective at managing seedling diseases such as *Pythium* and *Phytophthora*, newer formulations may also enhance tolerance to abiotic stressors, including temperature fluctuations and limited soil moisture at planting. Such benefits may be particularly important for early-season plantings in April and May, when soil temperatures are highly variable.

For this study, seed from a single lot of Georgia-06G were treated and stored under two storage regimes. Cold storage (10 °C in a controlled environment) and warm storage (an enclosed trailer with daily temperature fluctuations). Seed were stored in 6-lb paper bags to maintain consistent moisture and removed at scheduled intervals over an eight-month period, beginning in June 2025 and concluding at the end of this month. It was during the final week of each month that subsamples from each seed treatment and storage location were collected for germination testing.

Germination and seed vigor were evaluated using a thermogradient table, which allowed for simultaneous assessments across a wide temperature range (59–95 °F). Seed were arranged by treatment in three replications across a 216 cell grid and monitored daily for 10 days. Seeds were considered germinated once the radicle reached at least 5 mm in length. Germinated seeds were removed at each count to accurately quantify both the timing and rate of germination.

Differences in cumulative germination were driven primarily by seed treatment and storage temperature. Across treatments, final germination differed significantly between cold and warm storage conditions, while the rate of germination remained largely consistent. For the maximum amount of germination reached, seeds (both Trebuset® and Rancona® VPD treated seeds) stored in cold conditions consistently had higher maximums than those stored in warm conditions. Cold storage, Rancona® VPD treated seeds (RC) reached 72% germination, while

cold storage, Trebuset® treated seeds (TC) reached 65%, when combined across all germination temperatures on the thermal gradient table. Conversely, both warm storage, Rancona® VPD treated seeds (RW) and warm storage, Trebuset® treated seeds (TW) averaged <60% germination.

There were no differences in the amount of thermal energy (growing degree days (GDD)) required to reach 50% germination between RW & TW, RW & TC, or TC & TW. When compared to the nontreated controls, both warm and cold storage, all seed and storage treatments required more thermal energy to reach 50% germination. This can be partially attributed to the higher maximum germination rates reached by seeds that had either the Trebuset® or Rancona® VPD treatment. Overall, TW seeds required the same amount of thermal energy to reach 50% germination as RW seeds, while TC seeds required more energy than RC seeds. Overall, treatment effects were expressed through shifts in when germination occurred and the total extent of germination, rather than changes in the intrinsic rate of germination.