Peanut Immaturity Could be a Stress Event on Seedling Vigor Throughout Generations

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Current research is now elucidating that optimal seed maturity is critical for agronomic production because immature seed often lacks vigor characteristics that are essential for successful stand establishment. Despite these new revelations, the effects of seed maturity on vigor and quality of seeds across subsequent generations are under-investigated. We hypothesize that mature seeds will produce more vigorous seed, which can perform better physiologically and lead to optimal maturity of their offspring. To investigate this hypothesis, research was conducted over three generations (G1, G2, and G3) of seed varying in maturity from two cultivars (FloRun™ '107' and TUFRunner™ '727'). Determination of the maturity of source seed was accomplished through separation based on mesocarp color, with yellow hull mesocarp seed considered as immature, while black or brown hull mesocarp seed considered as mature. Starting with the G2 pods, seed was separated according to both parental (G1) and current (G2) pod maturity; when G3 pods were harvested, effects of grandparental (G1), parental (G2) and current (G3) pod maturity could be evaluated. These effects were evaluated using both seedling vigor bioassays and a field experiment.

A grandparental (G1 by G3) and a parental (G2 by G3) "maturity memory" were observed in G3 bioassays. A parental (G1 by G2) memory was found in both G2 and G3 bioassays, but this effect was dependent on variety. No effect of maturity memory was found in the G2 field experiment. All the patterns indicated that the current generation mature seeds with a mature generational history performed better than the mature seeds under an immature generational history. However, the vigor of seeds with a mature generational history was more negatively affected by immaturity compared to the seeds with an immature generational history. These results implied that when the seeds experienced a generational history of immaturity, a "compensating effect" may be occurring in the immature offspring. This compensation related to maturity memory may have similar responses as exposure to an abiotic stress event. Thus, these results indicate that the biochemical and biophysical modifications of immature seed could be considered as a generational "stress" event affecting the early vigor. These results also confirm that maturity memories are impacted by cultivar, such that some cultivars are more "susceptible" to immaturity.