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Effect of temperature and relative humidity in commercial warehouses on vigor of soybean seed stored for late plantings in Arkansas

*John Rupe**, Department of Plant Pathology, University of Arkansas, Arkansas, USA

Jung Ae Lee, Department of Agricultural Statistics, University of Arkansas, USA

Aaron Palmer, Arkansas Plant Board, Arkansas, USA

Robert Holland, Department of Plant Pathology, University of Arkansas, Arkansas, USA

Each year 25% of the Arkansas soybean crop is planted after June 1 requiring extended seed storage under high temperatures. To determine if extended commercial storage reduces seed germination and vigor, seed of two cultivars was stored in 23 kg paper seed bags at three sites within three commercial warehouses over three years. Warehouse managers selected sites within the warehouses representing good, bad, and on-farm seed storage environments. In two years, seed was also stored at the Arkansas Plant Board (APB) under controlled environmental conditions. From April through August, seed was sampled every two weeks and the standard germination (SG) and seed vigor (accelerated aging, AA) determined. Temperature and relative humidity (RH) was measured within the bags at each site. Average temperatures at all sites in the warehouses rose to over 30°C during the season. RH rose to approximately 70, 60, and 50% for the on-farm, good, and bad sites, respectively. The APB environment was constant: 20°C with 60% RH. There was little change in SG during the season, however, AA declined dramatically at the on-farm sites, followed by the good sites, with the least change at the bad sites. Relating temperature and RH to the decline in AA using the Kaplan-Meier curves with a 65% AA threshold and the Cox regression model, there was no change in AA for the first 70 days and then the decline in AA was associated with high RH, not temperature. Seed lots exposed to extended periods of temperatures between 27 and 33°C and RH above 57% had the greatest decline in AA. Few seed lots fell below 65% when temperatures were above 30°C, but RH was below 57% or if temperatures were 20°C. These results show significant declines in vigor of seed for late plantings when both temperature and RH were high.