

VIABILITY, VIGOR, AND FIELD PERFORMANCE OF A LOW PHYTIC ACID, HIGH PHYTASE ACTIVITY SOYBEAN LINE, CAPP

April A. Bailey

Dr. Kristin D. Bilyeu, Advisor

Abstract

Plants store inorganic phosphate (P_i) in seeds as phytic acid (PA). Phytic acid chelates essential macro and micronutrients in developing seeds forming phytate, which is nutritionally unavailable to monogastric livestock. Composition changes to lower the PA content of seeds may affect seed viability and seedling performance. This project was conducted in 2006 and 2007 to test the viability, vigor, and field performance of a high phytase activity, transgenic soybean line, CAPP compared to its progenitor, Jack. CAPP seeds contain increased phytase activity, a >90% reduction in PA, and a concomitant increase in P_i . A seedling dry mass study measured dry mass gain for each entry from 8 days after planting (DAP) through 21 DAP. A yield component study measured the vegetative and reproductive dry mass gain for each entry from the R5-R8 stages. Laboratory vigor experiments involving standard germination, accelerated aging, cold test, electrical conductivity, and tetrazolium testing were conducted. Field emergence of all entries was low in 2006 and 2007. There was no significant difference in field emergence between CAPP and Jack in 2006, but in 2007 Jack field emergence was significantly higher than CAPP. There was no significant difference between CAPP and Jack in seedling dry mass 8-21 DAP. Jack vegetative dry mass was significantly greater than CAPP in 2006 and 2007, but CAPP seeds per plant, seed weight, and yield did not differ significantly

from Jack over the two study years. There was no significant difference between Jack and CAPPAs standard germination. Germination following accelerated aging was low but did not differ significantly between Jack and CAPPAs. Jack seed germination was low following cold testing, but was significantly higher than CAPPAs. Tetrazolium testing indicated no significant difference in viability between Jack and CAPPAs. Electrolyte leakage of both entries was high, but did not differ significantly. CAPPAs vigor appears to be lower than Jack, but due to high variability in the field environment over the study years, field emergence results are not conclusive. Further research is needed to indicate CAPPAs potential as a commercially released low PA soybean line. Emerged CAPPAs plants grew to be competitive, high yielding plants.