EFFECT OF TRANSGENES FROM SORGHUM ON THE FITNESS OF SHATTERCANE × SORGHUM HYBRIDS. Lilyrani Sahoo, John L. Lindquist, Donald J. Lee, University of Nebraska, Lincoln, NE, Jeffrey F. Pedersen, USDA-ARS, Lincoln, NE 68583, Rajvinder Kaur, Joshua H. Wong, Bob B. Buchanan and Peggy G. Lemaux, Department of Plant and Microbial Biology, University of California at Berkley, Berkeley, CA 94720.

Grain sorghum (*Sorghum bicolor L. Moench*), the fifth most important cereal worldwide, is widely used as feed and as food in selected areas (primarily Africa, India and China) because of its ability to grow in a hot, dry climate. The nutritional quality of sorghum is limited by storage proteins (kafirins) with disulfide linkages that interfere with starch and protein degradation, causing digestibility problems in humans and livestock. Research has shown that adding NADPH and proteins of the NADP/thioredoxin system [NADP-thioredoxin reductase (NTR) and a thioredoxin (Trx)] to flour or seed preparation from a number of cereals results in change in the redox state due to reduction of S-S linkages of storage proteins and an accompanying increase in protein digestibility. Sorghum was, therefore, engineered to overexpress a Trx gene (barley *Trx h*) in protein bodies of the seed endosperm to improve nutritional quality for both human consumption and livestock feed. Shattercane (*Sorghum bicolor ssp. drummondii*) is a problem weed in U.S. row crops and freely cross-pollinates with cultivated sorghum. It is, therefore, essential to assess the effect of introducing *Trx h* into shattercane before considering deployment of the transgenic sorghum. Since overexpression of *Trx h* in barley was shown to affect seed germination and seedling development, our research will focus on assessing the fitness of shattercane x transgenic *Trx h* sorghum relative to their parents. Four *Trx h* transgenic 296B sorghum lines were obtained, and we confirmed one parent line as a fixed transgenic line (NTR+TRX-2H-3t) using PCR analysis. PCR results showed amplification in all plant tissues tested from this line. To confirm that the primers specifically targeted barley *Trx h*, amplified fragments were purified and submitted for DNA sequencing. Preliminary experiments were conducted to determine the effect of temperature on germination of non-transgenic 296B sorghum vs. shattercane in germination chambers using standard 2006 Association of Official Seed Analysts (AOSA) procedures. Seeds were germinated at four constant temperatures (20, 25, 30, and 35 ºC) as well as three variable temperatures: standard germination for sorghum (varying from 20-30 ºC over the course of a day), cold germination (prechill at 10 ºC for 5 d followed by standard germination), and accelerated aging germination (accelerated aging at 43 ºC for 3 d followed by standard germination). Optimal germination of 296B sorghum seeds was achieved at 25, 35, (20-30), and [10+(20-30)] ºC, whereas shattercane seeds were nearly 100% dormant at all constant temperatures below 30 ºC and were partially dormant at 30, 35 ºC and at the variable temperature treatments. The germination period was prolonged in shattercane compared to sorghum in the partially dormant treatments. Shattercane dormancy was nearly completely broken in the [43+(20-30)] ºC treatment, and rate of germination was similar to that of sorghum in the standard germination treatment. We are in the process of crossing A3 cytoplasmic male sterile shattercane with the *Trx h* transgenic sorghum in the greenhouse. Progeny and parents will be grown in the greenhouse and tissue samples harvested to determine the presence of the transgene using PCR analysis. Expression analysis will be conducted using western blots to assess the level of expression from the *Trx h* transgene in seeds of transgenic vs. null-segregant shattercane and sorghum. Germination potential of progeny seeds will be evaluated using the same treatments as described above and compared to parental lines. Similar tests will be conducted with the transgenic vs. null-segregant shattercane and sorghum lines to evaluate the effects of water potential and of burial depth, temperature, and the presence or absence of interplant competition on seedling emergence and early vigor.