Project Title: Enhancing soybean germplasm through biotechnology

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Reporting Period: 2016 Final

Increasing photosynthesis capacity of soybean

In 2016 in this component of the program field trials were conducted with transgenic soybean events that carry transgenes designed to enhance carbon capture (photosynthesis). The data tabulated that significant improvement in photosynthesis was observed across three developmental stages, V5, R1 and R3. Moreover, the transgenic events carrying a two transgene stack, significant increases in biomass were measured at early reproduction stages, however, at harvest we observed no changes in plots weight or 100 seed weight. The take home message being, a more holistic approach is likely required to translate improvement in photosynthesis (carbon capture) and its impact on biomass accumulation to seed yield. Investigations into both sides of equation, carbon capture improvements along with carbon flux to seed, to better understand the "source/sink" relationship to yield will likely be required. To this end, with funds provided by USB, we are creating transgene stacks that combine these photosynthesis improving genes with transgenes designed to influence carbon flux to oil during seed development.

Improving biotic stress tolerance in soybean

Over the past year this component of the program focused on evaluation of transgenic soybean events that target resistance towards soybean cyst nematode (SCN). In collaboration with Loren Giesler's transgenic soybean events were tested to determine if the promoter selected to control expression of a cell death gene is activated upon SCN infection. While some activation of this promoter was detected in tissues not associated with SCN infection, there was an up-regulation of promoter activity about the infection site of the nematode. There are ongoing SCN challenge experiments in progress that are directly testing transgenic soybean events carrying this promoter fused to the cell death gene to determine if this strategy is effective to impart SCN resistance in soybean.

Soybean oil with end-use functionality in baking applications

During 2016 novel genetic designs were tested under field conditions, that were based off of transgene stacks created during 2014/2015 that led to the synthesis of a soybean oil, elevated in oleic acid (>50%) and high in saturated fatty acids (>25%). A soybean oil with such a fatty acid profile is a semisolid at 23°C, with high oxidative stability. A patent application has been filed on this genetic approach for a soybean oil suitable for baking applications.