

**Project Title:** Establishing a pipeline for the evaluation of novel input and output traits in wheat derived from the tools of biotechnology

**Contractor**

**Principal Investigator:** University of Nebraska-Lincoln/Tom Clemente

**Reporting Period:** April 2009 through July 2009

**I. Statement of project Objectives**

- 1- Strengthen the capacity of UNL's Plant Biotechnology Field Facility to allow for handling of regulated wheat seed under strict identity preservation.
- 2- Evaluate transgenic wheat events expressing the bacterial *sacB* gene
- 3- Develop and characterize transgenic wheat events expressing the maize ramosa 1 (Ra 1) gene
- 4- Wheat transformation

**II. Statement of quantifiable progress towards objectives achieved this reporting period**

In 2008 a Hege 1000 series drill was obtained through Wintersteiger. We secured a second site as a dedicated area for release and testing of regulated transgenic plants in North Platte. In addition, UNL is participating APHIS sponsored pilot program entitled, Biotechnology Quality Management Systems (BQMS). BQMS certification requires demonstrate competency in movement and release of regulated transgenic plants and the ability to track and document training, inspection, and storage procedures involved in carrying out activities associated with movement and release of regulated seed.

**2- Evaluate transgenic wheat events expressing the bacterial *sacB* gene**

The *sacB* gene encodes for a bacterial enzyme levasucarsae, which synthesizes a fructan, levan. We designed a genetic element to allow production of this fructan to accumulate in the developing endosperm of wheat grain. We believe that this fructan may influence both dough quality and perhaps have a prebiotic effect on gut microflora.

Our 2009 field release of spring wheat transgenic events carrying the *sacB* gene was harvested in July 2009. We will begin characterization of the harvest within the next two weeks. Data will be gathered on level of the levan accumulated in the seed, proximate analysis.

**3- Develop and characterize transgenic wheat events expressing the maize ramosa 1 (Ra 1) gene**

We have assembled two genetic elements for wheat transformation to address this objective. The first is a vector designated pPTN974, which carries the Ra1 promoter from corn controlling expression of the visual marker gene GUS. Transgenic wheat plants with this RA-1::GUS element will allow to gain insight on the timing of the RA-1 promoter activity in wheat. The second vector assembled for wheat transformation is designated pPTN953. This harbors the Ra-1 promoter and the Ra-1 gene. Our hypothesis is that expression of the maize gene in wheat will impact head architecture, which may affect seed number per head.

We currently have transgenic events in the greenhouse carrying pPTN974, and we expect to begin establishing transgenic wheat plants with pPTN954 by October 2009.

#### **4- Wheat transformation**

We recently evaluated a Chinese spring wheat genotype for transformation, CP037. This genotype appears to be superior for transformation than the other two genotypes we have used in the past, namely Bobwhite and Xc-9.

### **III. Activities planned between now and the next reporting period**

Characterize transgenic wheat seed from our 2009 harvest for levan accumulation and proximate analysis.

Continue transformations with constructs pPTN974 and pPTN953. Our goal is to have a minimum of 10 independent events in the greenhouse by Nov 2009.

We have two additional potential anti-fungal constructs we have been working on in collaboration with researchers at the Donald Danforth Center in St. Louis. Transgenic events from these constructs are being established in the greenhouse and we hope to begin pathogen assays for scab in the spring of 2010.

In addition, we recently began to build a series of genetic constructs designed to improve nitrogen use efficiency (NEU). We will introduce these putative NEU genes in wheat beginning sometime in October 2009.

### **IV. Problems, obstacles, new developments for market/research changes that impact or may impact completion, data, cost or scope of the project.**

None

### **V. Message, questions, comments or requests**

None