

**AGRICULTURAL RESEARCH FOUNDATION  
INTERIM REPORT  
FUNDING CYCLE 2014 – 2016**

**TITLE:** Characterization of the Oregon Promise: a unique barley resource

**RESEARCH LEADER:** Dr. Patrick Hayes; originally submitted by Dr. Alfonso Cuesta-Marcos, who is now employed by Seminis Seeds.

**COOPERATORS:** Brigid Meints (currently PhD student; WSU); Dustin Herb (currently PhD student OSU); Chris Martens (USDA/ARS Cereal Crops Research Unit); Rebecca Jennings (Rahr Malting; Shakopee, MN); Dan Carey (New Glarus Brewing; New Glarus, WI); Mathew Moscou (Sainsbury Laboratory, John Innes Institute, UK).

**SUMMARY:** The goal of this project is to use a doubled haploid population of barley, derived from the cross of two iconic malting varieties for the craft brewing industry - Golden Promise and Full Pint - to stimulate Oregon's economic development and contribute to the fundamental body of knowledge on the genetics of disease resistance, agronomic performance, and malting/brewing quality.

**OBJECTIVES:**

1. Phenotype the Oregon Promise population for malting and brewing quality traits; disease resistance traits; and morphology/phenology.
2. Genotype the Oregon Promise using high throughput techniques.
3. Linkage mapping and quantitative trait locus (QTL) analysis to discover the location of genes controlling target traits in the barley genome.
4. Annotate the QTLs/genes discovered in realizing Objective 3.

**PROCEDURES:**

1. Disease resistance and agronomic traits were rated on the full population in 2013 – 2015 and disease resistance will be assessed again in 2016. Malting quality was assessed on the full population (2013 harvest) and on an agronomically promising subset (2014 harvest). Nano-brews from the agronomically promising subset, and a set of random lines, from the 2014 Corvallis harvest were made by New Glarus and used for sensory assessment. The agronomically promising subset (and random lines) were grown at three locations in Oregon in 2015 (Corvallis, Lebanon, and Madras). Micro-malts, nano-brews, nano-brew sensory assessments, and nano-brew GC-MS analyses were conducted by Dustin Herb at Rahr Malting in 2015. The full population (2014 harvest) is currently being micro-malted by the USDA/ARS/CCRU. These malts will be used for nano-brewing and sensory assessment at OSU in 2016.
2. Genotyping by sequencing was completed in 2015 in collaboration with the USDA/ARS facility at Pullman, WA. KASP genotyping was completed by the Sainsbury Laboratory in the UK.
3. Mapping will be finalized at WSU in 2016.
4. Annotation of QTLs/genes will be based on results of mapping (procedure 3). Meints will use the disease resistance, morphology, and phenology data for a chapter in her PhD. thesis. Herb will use the malting quality and nano-brew data for a chapter in his PhD. thesis.
5. Selected lines will be grown at three locations in Oregon in 2016 (Corvallis, Lebanon, and Madras). The two most promising (in terms of beer flavor contributions and agronomic

performance) will be increased in 2016, malted at Mecca Grade Estate Malting and the resulting malt used for pilot brewing and sensory assessment by members of the Barley Contributions to Beer Flavor Brewing Collaborative.

**SIGNIFICANT ACCOMPLISHMENTS:**

The project is on schedule. All objectives are realized or in the process of being realized.

Meints and Herb are expected to each generate at least one peer reviewed publication in 2016.

We have leveraged the ARF grant to stimulate international and national collaboration and to explore the frontiers of barley contributions to beer flavor.

**BENEFITS & IMPACT:**

There is a high probability that one or more lines in this population will merit variety release. These varieties will have positive economic impacts via expanding agricultural production, malting, and brewing.

The population will, as anticipated, allow us to make contributions to the fundamental body of knowledge on the genetic basis of disease resistance, morphology, phenology, malting and brewing quality, and barley contributions to beer flavor.

**ADDITIONAL FUNDING RECEIVED:** The Barley Contributions to Beer Flavor Brewing Collaborative generates \$35,000 per year in funding via the OSU Foundation. Collaborations with the Sainsbury Laboratory, New Glarus Brewing, and Rahr Malting have been leveraged via this ARF grant. The estimated value of these leveraged projects is \$150,000.

**FUTURE FUNDING:** Excellent prospects.