PROJECT TITLE: Developing Malting Barley for California

STATUS: Continuing

PRINCIPAL INVESTIGATORS: Isabel A. del Blanco and Jorge Dubcovsky

LEVEL OF 2016-2017 FUNDING: $30,000 ($10,000 went to barley breeder L.W. Gallagher)

OBJECTIVES AND EXPERIMENTS CONDUCTED BY LOCATION TO ACCOMPLISH OBJECTIVES:

The objectives of the malting barley program at UC Davis are to develop two-rowed spring varieties adapted to different California environments, with resistance to the most important diseases (i.e. the yellow dwarf virus: CYDV & BYDV, stripe rust, powdery mildew, etc.), excellent malting quality and enhanced grain yield. A secondary objective is to select short-cycle genotypes to fit in different rotations. To accomplish these objectives, every year we create new crosses, select families and individual plants in different generations, and evaluate advanced lines in replicated trials. We aim to interact and cooperate closely with the malt houses developing in our State. This interaction will help us to prioritize the traits that are most desirable for the malting and brewing industry, and target them for improvement.

SUMMARY OF 2016-2017 RESEARCH (Major Accomplishments) BY OBJECTIVE:

The major accomplishment of 2016/17 was the release and PVP of UC Tahoe, the first (to our knowledge) two-rowed, spring, malting barley from California. UC Tahoe originated in a recombinant inbred population (RIL) created to map resistance/tolerance to Cereal Yellow Dwarf Virus (CYDV) (del Blanco et al., 2014). UC Tahoe (formerly UC1409 and MP103) was one of the few RIL carrying all the genes for resistance/tolerance from both parents, Madre Selva and Butta 12. UC Tahoe was further selected, among the most resistant RIL, for its excellent malting quality scores. Complementary to the release of UC Tahoe, other major accomplishments are the production and sale of its Foundation Seed (2016), and the availability of Certified Seed (Adam Grains Co.) this summer. The interaction with our partners at Grizzly Malt continuous, and they already have produced the first batches of malt, and beer, using our new released variety UC Tahoe.
For the first time we sent four UCD malting barley advanced lines to the AMBA Western Pilot Malting to be evaluated at multiple locations. We also planted The AMBA Western Pilot Malting at UC Davis. We evaluated our elite lines statewide in the Smallgrains Regionals, directed by M. Lundy. To assess Malting Quality we sent samples for micro malting to the USDA Malting Lab. at the Cereal Crops Research Unit, USDA-ARS, located in Madison, WI.

We made new crosses according to the objectives of improving disease resistance and malting quality in our breeding program.

Fig. 1. Malting Barley Crossing Block in Greenhouse

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We selected families and individual spikes in all generations (F2 to F6).

**PUBLICATION AND REPORTS 2016:**


**Presentations 2016:**


I prepared and filled all forms and paperwork required for the release and PVP of UC Tahoe.
I wrote all the required reports for the California Crop Improvement Association (CCIA) and for the Cooperative Agreement on Stripe Rust in Barley.

**GRANTS 2016:**
- CCIA (2016) 30,000 for Barley Breeding
- CCIA (2016) 12,000 for Oat Breeding
- USDA ARS (Specific Cooperative Agreement, Disease Nurseries, 2016) 16,700
- Ug99 NACA SCA (2016) 30,000

**SERVICES PROVIDED 2016**
1- Participation as Field Day Judge (UC Davis, March 5, 2016)
2- Participation as Picnic Day Volunteer (UC Davis, April 16, 2016)
3- Presentation about the Breeding Program at Field Day (UC Davis, 2016)
4- Attended American Malting Barley Association Conference (2016)

**REFERENCES:**


**CONCISE GENERAL SUMMARY OF CURRENT YEAR'S RESULTS:**

During this funding period, we released and PVP the first two-row, spring, malting barley for California: **UC Tahoe**. Foundation seed of UC Tahoe was produced and sold during 2016, and certified seed is now planted and it will be available this summer (2017).

We made crosses of UCD elite lines to new sources of resistance to African stem rust (Ug99) in adapted germplasm: A two-row malting barley (Conlon) carrying rpg4/Rpg5. The previous crosses we made to SH98076 from the University of Saskatchewan Crop Development Centre; and to TR02272, developed at the Agriculture and Agri-Food Canada program, are in F3 generation, growing in the field. Hundreds of rows of barley lines, from different breeding programs, are evaluated every year in our field at UCD for disease reactions, and the best entries are incorporated into our crossing block. We also started the crosses of our elite lines to ‘Karl’, with the objective to incorporate the low grain protein content (GPC) allele from Karl (GPC-H1) into our UC germplasm.