**Flavor Report**

**March, 2017**

1. **Flavor has a date:** March 9, 3:00 PM (Oregon Time). Dustin’s thesis defense seminar. Stay tuned for high points at Barleyworld Facebook and Instagram….
2. **Flavor Paper II is attached.** You have all seen Flavor Paper I. That has gone through several rounds of review and is about ready for submission. It is all the better for having barrel aged a bit. Your critical reviews and comments appreciated. We are thinking of submitting Flavor Papers I and II as companions to JASBC….that would help eliminate some of the redundancy. The third chapter of Dustin’s thesis in on the genetics of low temperature tolerance and vernalization sensitivity. More on that whenever you are ready…
3. **The Flavor Fields Forever** seed entries were selected, packaged up, and shipped – thanks to Scott Fisk. Be sure to visit an experiment near you (OR, WA, MN, WI, MI, and/or NY). CA coming - you folks generally  plant spring barley in the fall, so we are bit out of synch there. We’ll get it right in the fall of 2017.
4. **Flavor Pack pilot beer sensory**:  We are working with Veronica Vega at Deschutes on finalizing the details.  Stay tuned….
5. **CBC chance to visit:** My presentation was shifted to April 12 in the 11:00 AM - 12:30 PM session. Maybe lunch and a beer afterward?
6. **Favorite topic:** I was asked to do a piece for a local magazine on a favorite topic – guess what topic I chose….? Here’s the text.

**Barley, malt, beer and barley flavor**

“Barley flavor?” you may rightfully ask, “What about hops, that signature of craft beer?” There’s no denying that hops provided the quantum leap forward that differentiated craft IPAs from mainstream lagers. And there is no apparent end in sight to the rainbow of hop flavors: our hops breeding colleagues continue expanding the edges of the sensory stratosphere with citrusy and tropical fruit flavors. To top that off, there are yeasts bringing flavors to beer that range from dry to clove to downright funky. Faced with hop and yeast competition, can barley dare raise its heads in the flavor arena?  Well, it has always made big flavor and color contributions due to the almost infinite permutations of moisture, temperature, and time during malting. The malting process gives colors ranging from pale to black and flavors from biscuit to chocolate.  But we are digging deeper, back to the variety itself and the ~ 30,000 genes that make barley a unique cereal grain.

To test the hypothesis that barley genotype can contribute to beer flavor, we leveraged Oregon Wheat Commission funding for our breeding program to set up a new line of research we call “The Flavor Project”. The flavor project is funded directly by the Brewers Association and a consortium of some of the nation’s most innovative and adventurous craft brewers: Deschutes, Firestone-Walker, Russian River, New Glarus, Sierra Nevada, and Summit.  Mecca Grade Estate Malting and Rahr Malting have both made essential in-kind contributions. Mecca Grade has provided field facilities for test plots at the Klann Farm and Rahr Malting developed and implemented a nano-brewing and beer sensory pipeline. Rahr also supported Dustin Herb, OSU Ph.D. student, while he conducted his research at their facilities in Shakopee, Minnesota.

Dustin’s work has been submitted for publication in a high caliber journal of brewing science. That could be a long, dry read so here’s a synopsis: (1) barley varieties can differ significantly in the flavors they impart to beer, (2) there is a genetic basis to flavor differences, and (3) where the barley is grown can make a difference to flavor.  To elaborate on these key findings just a bit, we’ll start with the barley varieties. We used two varieties reported to differ in their contributions to beer flavor as our starting point:  Golden Promise (released in Scotland in the 1960’s) and Full Pint (released by Oregon State University in 2014). In order to expand the scope of inference of our research and get at the genetic basis of flavor, we studied the parents *and* a sample of their progeny. There are 200 doubled haploid progeny in all from the cross of Golden Promise x Full Pint; for Dustin’ project, we used a subset of 34 progeny. Our “control” was CDC Copeland, one of the most widely grown malting varieties in North America. The parents, their 34 progeny (how’s that for family size?) and the CDC Copeland “chaperone” were grown in test plots at Corvallis, Lebanon and at the Klann Farm, near Madras.  The parents and progeny were also “DNA-fingerprinted” with molecular markers. The DNA fingerprinting is an essential piece of this research, as you’ll see in a moment. Grain from each location (250 grams) was micro-malted at Rahr, nano-beers were brewed from these malts, and 60 milliliters of each of beer was rated by a sensory panel based on a ballot of 17 flavor descriptors.  Considering the full set of experiments Dustin conducted at Rahr, over 300 beers were assessed!  The flavor descriptors include terms like “fruity, floral, malty, and toasty”.  As it turns out Golden Promise is strong on fruity and floral while Full Pint is notable for malty and toasty. Their progeny showed all possible combinations of fruity, floral, malty and toasty – plus other flavors.  Since we had the DNA fingerprint information, we were able to identify regions of barley chromosomes where genetic factors determine specific flavors. In companion experiments, sensory panels at the Canadian Malting Barley Technical Center, Deschutes Brewing, and New Glarus Brewing assessed a range of beers. In addition to the genetic component of flavor, Dustin identified an “environment” component.  The growing environment can affect flavor – a phenomenon known as *terroir* and a feature that Mecca Grade Estate Malting is capitalizing on. All of this work constitutes part of a PhD thesis for Dustin Herb, but it is only the beginning.

Next in line are experiments that will:  (1) connect genes, flavor descriptors, and metabolic compounds, (2) provide higher resolution mapping of flavor genes, (3) search for flavor genes in really wild and crazy barleys from the USDA barley museum (aka the National Small Grains Germplasm Collection), and (4) assess the effects of growing environment on barley contributions to beer flavor.   The “flavor fields forever (3F)” project involves the eight most flavorful Oregon Promise progeny, nine facultative 2-row malting selections from the OSU breeding program (facultative growth habit will be the topic of our 2018 Oregon Wheat Magazine article, so stay tuned) and three checks. The experiment will be grown at nine locations across America in 2017.  We look forward to seeing you at one of these test plots: there will be plenty of options, depending on your travel plans: three sites in Oregon, two in Washington, and one each in Minnesota, Wisconsin, Ohio, Michigan, and New York.  While we’re at it - let’s plan on a toast of barley-flavored beer in 2018!

Cheers!!!!

Pat and the Barley (Flavor) Team