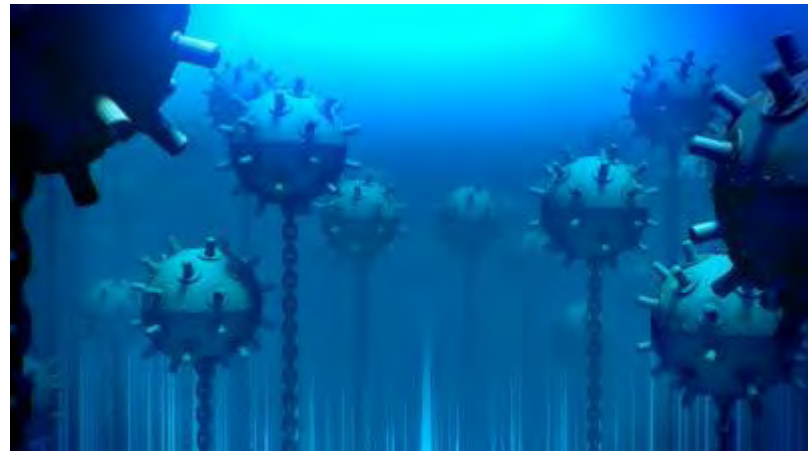


**Damn the torpedoes...four bells.....
full speed ahead**

David Glasgow Farragut; Battle of Mobile Bay
Dodging the torpedoes of the confederacy



Full speed ahead and damn the torpedoes

2017 BIC; Facultative/winter 2-row malting barley

1. The torpedoes of denial
2. The torpedoes of disaster
3. Four bells
4. A lifeboat for barley?

The torpedoes of denial

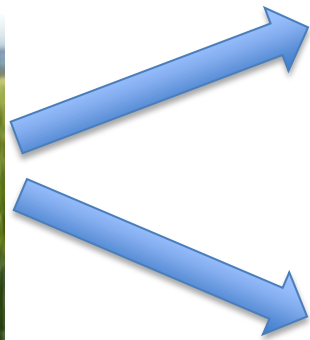
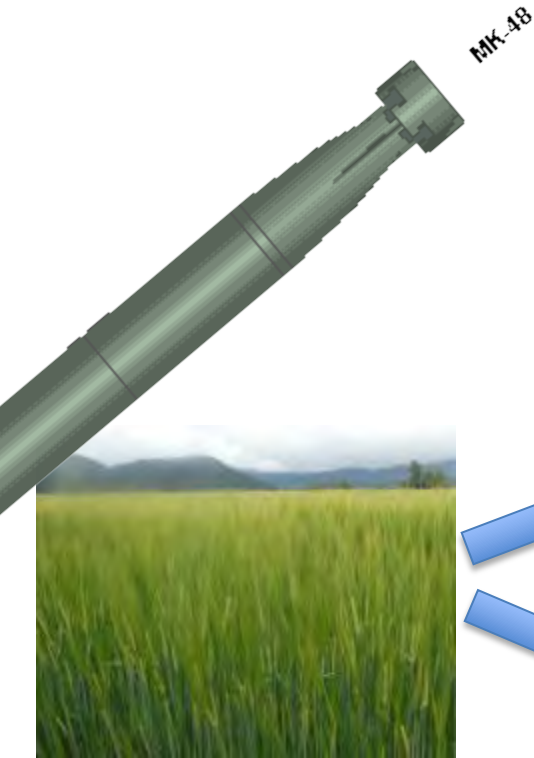
Climate
change



*Education, Energy,
Environment, Evolution....*



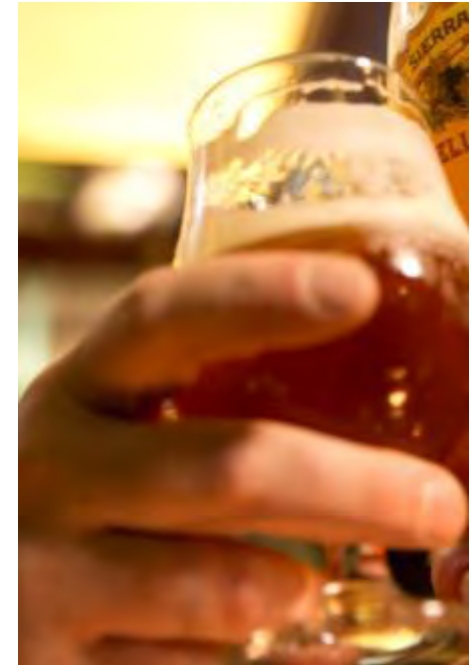
Climate change: Facultative growth habit



Fall planting
Cold tolerance
on demand



Spring planting
Cold tolerance
not needed



Facultative growth habit and winter hardiness: The data from the TCAP LTT panel

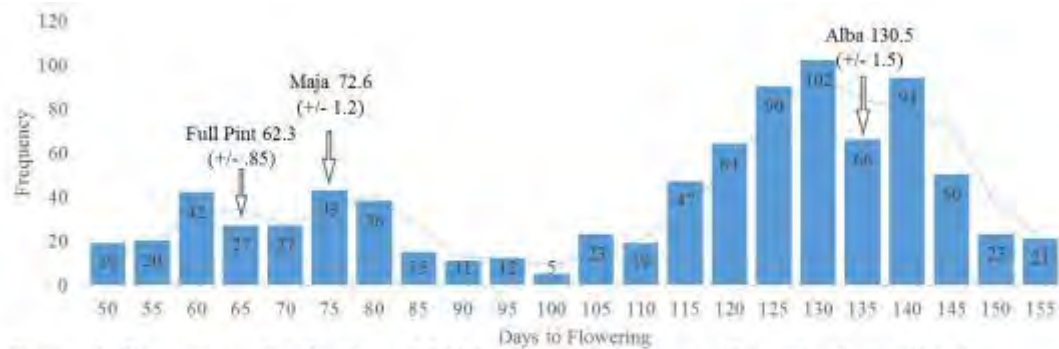


Figure 1. Frequency distribution of 2015 greenhouse days-to-flowering/vernalization sensitivity data of the LTT GWAS panel.

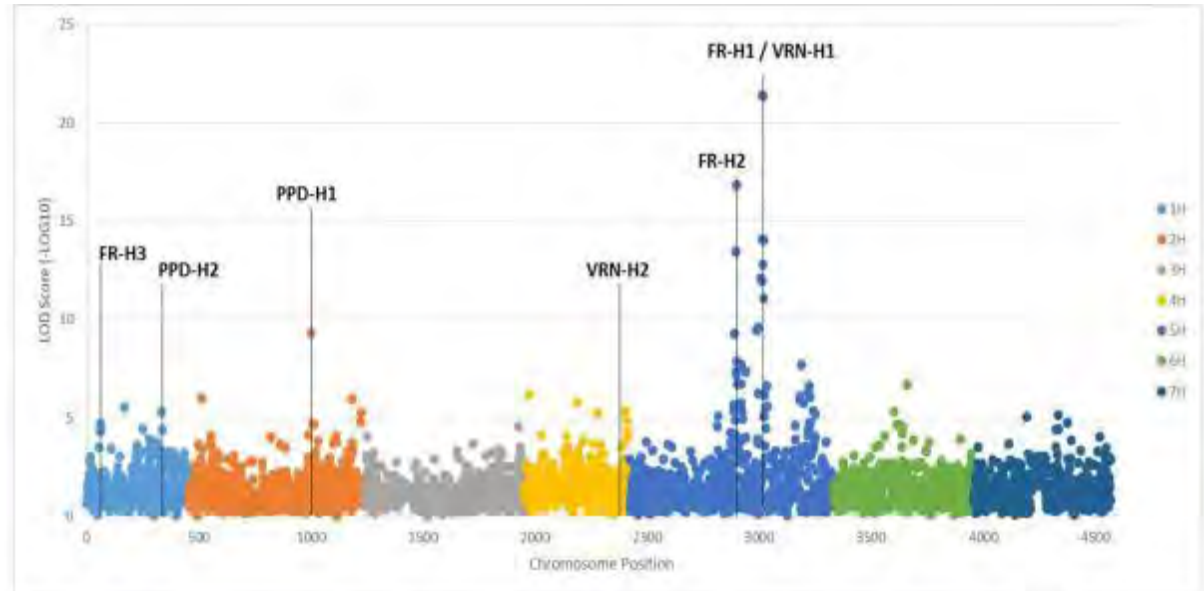


Figure 7. Manhattan plot of marker: trait associations from genome-wide mapping of combined 2014 and 2015 environments winter survival (%) of the LTT GWAS panel.

Facultative winter hardiness: The results
Ongoing doubled haploid breeding

AMBA Plant scale candidates

ORW1 and ORW2 (Wintmalt/Charles) = winters



**Facultative winter hardiness: *Ongoing
doubled haploid breeding***

Pilot candidates: all facultative, some semi-dwarf, winterhardiness, yield, disease resistance, quality

DH130718: TC6W261/3/LPZ276/Charles//Full Pint

DH120412: TC6W265//Herz 29494/2991

DH130004: TC6W265//Herz 29494/2991

DH120228: Wintmalt/Charles//Full Pint

DH130939: Full Pint/Violetta

Facultative winter hardiness: *Ongoing doubled haploid breeding*

Spring-planted yield and quality

Selection	Fall-planted yield (bu/acre)	Spring-planted yield (bu/acre)
DH130718	164	175
DH120412	150	161
DH130004	126	188
DH120228	142	171
DH130939	141	168

Facultative winter hardiness: *The ongoing collaborations*

Elite lines

Regional nurseries

FacWin2 malt collaborative



Facultative winter hardiness: *The ongoing collaborations*

FacWin2 Malt collaborative

- 9 crosses, 4 programs
- 480 2-row doubled haploids: genotype, phenotype, share, select, release

Facultative winter hardiness: *The potential collaborations*

The germplasm accelerator

- A. National collaborative resource for accelerated doubled haploid germplasm development and characterization
- B. Up-front, recurring support
- C. Collaborative germplasm design, testing, analysis, release

Thanks!!!

AMBA, BARI, GWM

(Sierra Nevada, TCAP)

Scott Fisk, Tanya Filichkin,
Laura Helgerson

Dustin Herb Ph.D. thesis



The torpedoes of disaster

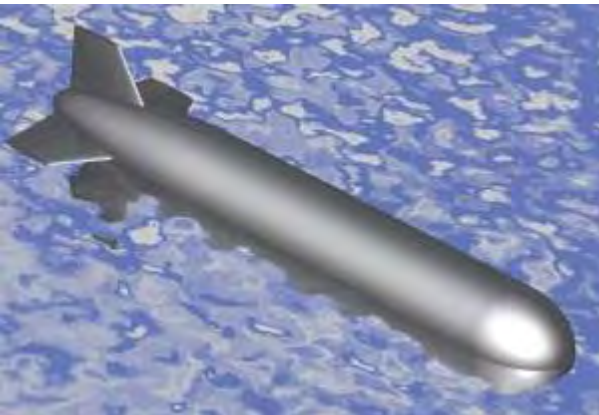


Disease susceptibility

Research funding



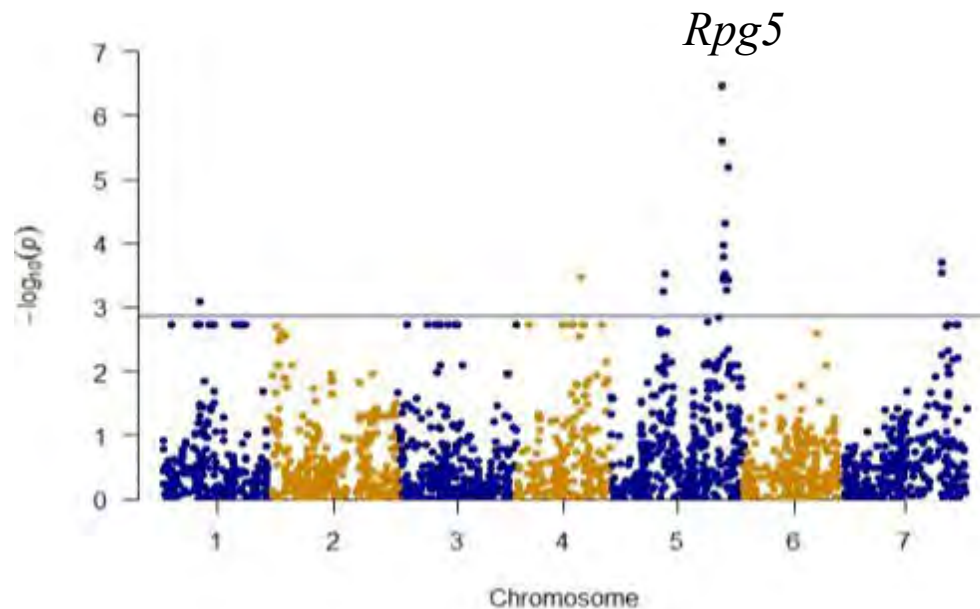
Disease susceptibility/resistance: Multi-rust (TTKSK, stripe, leaf) resistant germplasm



Disease resistance: *The results*

Cycle 1 doubled haploids (117 – all classes)

Cycle 2 doubled haploids (378 – all classes)



Disease resistance: *Upcoming*

Phenotyping and mapping of resistance to TTKSK, stripe rust and leaf rust in Cycle 1

Phenotyping, genotyping and mapping of resistance to TTKSK, stripe rust and leaf rust in Cycle 2

Disease resistance: *The future collaborations*

- All data
- All germplasm



Thanks!!!

USDA-ARS NACAS

Aberdeen (BSR), Corvallis (TTKSK)

Scott Fisk, Tanya Filichkin, Laura Helgerson

Javier Hernandez, Ph.D. thesis

Brian Steffenson and Austin Case (UMN)

Xianming Chen (USDA-ARS); Alicia del

Blanco, Jorge Dubcovsky, Lynn Gallagher

(UCD)

Research funding: find a new way, or....



Four bells: Barley Contributions to Beer Flavor



Barley contributes to beer flavor

It is there, if you want it.

Or to understand if you don't want it.

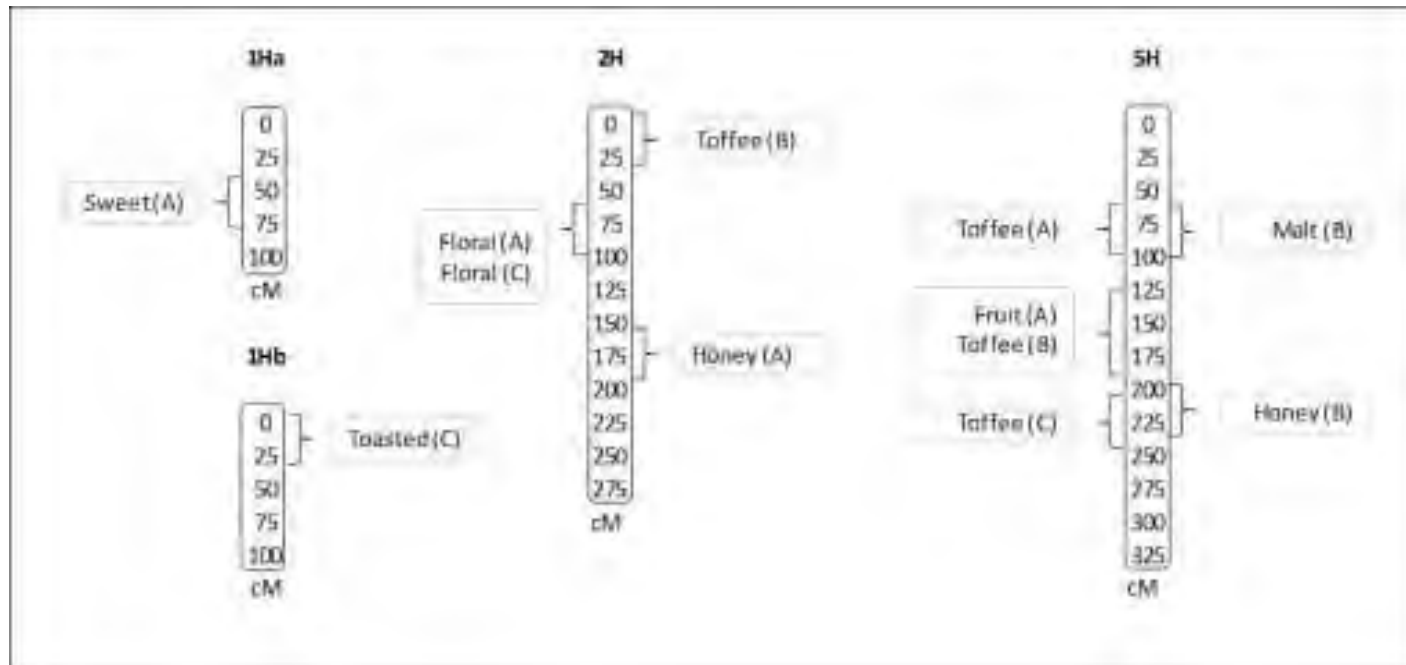


Golden Promise x Full Pint

200 doubled haploids

Flavor: *The results (a)*

- Significant differences between parents and progeny
- New combinations of flavors in progeny
- Mapped flavor QTLs



Flavor: *The results (b)*

The Barley World malt house

- ~ 200 lbs/run
- Available for research malting collaboratives
- Online CoAs



Flavor: *Upcoming*

- Thorough QTL mapping of flavor
- Exotic germplasm flavor
- Pilot brew and sensory of selected OreProms
- The romp of otters (Maris Otter derivatives)
- The bed of violets (Violetta derivatives)

DH130939:Full Pint/Violetta

DH130939

141

168



Flavor: *The potential collaborations*

OreProm selections + Fac2 malt collaborative

- ~ 14 entries
- Agronomics, malt/brew/sensory, joint release

All data

All germplasm



Thanks!!!

Brewers Association



Flavor-7: Bells, Deschutes, Firestone-Walker, New
Glarus Russian River, Sierra Nevada, Summit

Rahr Malting, Mecca Grade Estate Malting

Scott Fisk, Laura Helgerson, Tanya Filichkin

Dustin Herb Ph.D. thesis

Luis Cistue, Matt Moscou, Ignacio Romagoza, Bill
Thomas

A lifeboat for barley?



Hulls have served their purpose - but
is it time to go naked after 10,000 years?

Naked barley malts: *88% extract, choice of enzyme profiles, new flavors, and simplified marketing*

NIFA-OREI grant (OR, WA, MN, WI, NY) pending
End-products

- Malting and brewing
- Foods
- Feeds

Germplasm

- Regional trial
- Genomic selection
- K-12 education outreach

Thanks!

The Oregon Barley Project crew – past and present

Brought to you (currently) by

Your tax dollars, USDA-ARS, USDA-NIFA, American Malting Barley Association, AB-INBEV, Great Western Malting, The Flavor7-Pack, Mecca Grade Estate Malt, Oregon Wheat Commission

