

REPORT FOR THE HWW-CP Planning Meeting
University of Nebraska
Lincoln, NE
4/20/15

Submitted: Bill Berzonsky, Chair HWW-CP

List of Meeting Participants:

<u>Name</u>	<u>Title</u>	<u>Organization</u>
Shaukat Ali	Small Grains Pathologist	South Dakota State Univ.
Guihua Bai	Research Mol. Geneticist	USDA
Bill Berzonsky	Winter Wheat Breeder	Bayer CropScience
Bill Bockus	Professor - Pathologist	Kansas State Univ.
Reid Christopherson	Executive Director	South Dakota Wheat Comm.
Floyd Dowell	Agric. Engineer	USDA
Bernd Friebe	Res. Professor	Kansas State Univ.
Pravin Gautam	Cereal Pathologist	Bayer CropScience
Frans Marais	Winter Wheat Breeder	North Dakota State Univ.
Joel Ransom	Extension Agronomist	North Dakota State Univ.
Sunish Sehgal	Winter Wheat Breeder	South Dakota State Univ.
Stephen Wegulo	Small Grains Pathologist	University of Nebraska
Yang Yen	Professor – Mol. Geneticist	South Dakota State Univ.

See HWW-CP Schedule and Agenda

Morning Items

PI Summaries

Guihua Bai

- Two cycles of backcrossing Fhb1 into Trego, Harding, and Wesley have been completed.
- Experienced some difficulty in getting necessary DH line production from HPI, but eventually received about 500 DH lines
- Mapping populations continue with Overley, Overland, and Lyman all at F₄ generation
- Genotyping Lab generally runs Fhb1 marker on NRPN and SRPN, and hopes to have a better marker by the end of the year
- Anticipates lab will be able to run accelerated MABC with markers in the future

Bill Bockus (Powerpoint presentation available)

History of Regional Uniform FHB Nursery:

- 2010 – Added industry entries – Limagrain, Monsanto (WestBred), and Syngenta have participated

- 2014 – Test-only MTA implemented for first time (MTA based on USDA's Regional Nursery MTA)

Other Items:

- Reporting of data to producers -- Kstate publications are annually provided to producers to disseminate info.
- Most resistant variety is giving 70 to 90% reduction in FHB index relative to rating
- Most resistant variety has less DON - relative to rating
- Two lines with same index can have much different DON levels
- About a 41% reduction of disease w/fungicide tmt, no matter the cultivar

Conclusions:

- Excellent progress has been made to reduce FHB Index with cultivars
- Reduction in DON not as high as index, but 73% reduction for Everest
- Proso reduces Index and DON, but not as high R cultivars
- Proso tends to work better on resistant vs susceptible

Floyd Dowell (Powerpoint presentation available)

Technologies applied to FHB Studies:

SKNIR
FT-NIR

Research Activities:

- Measuring single kernel DON levels to determine resistance type
- Not intended to replace a chemical test, but is rapid and non-destructive
- Measuring DON accumulation in varieties
- Asymptomatic kernels – Do have levels of DON
- Can look at DON in bran vs. non-bran fractions
- Future - improve calibration

Bernd Friebe (Powerpoint presentation available)

Research Activities:

- *Lemus* resistance - Fhb3 - chromosome 7 -proximal segment translocation
- *Elymus* resistance - Fhb6 - more exciting - chromosome 1A - recombinants and distal translocation
- Developed molecular markers for Fhb3 and Fhb6 lines
- Transferring Fhb6 into Everest, Lyman, and Overland - 3 BCs to Everest and just starting to Lyman and Overland
- Fhb7 from *Thinopyrum* just reported in the literature
- Spring types are available w/Fhb3 or Fhb6 - in C. Spring

Frans Marais

Research Activities:

- Much winterkill in ND - need winterhardiness background in addition to FHB resistance
- Started BCing Norstar into Fhb1 (using Wesley Fhb1 as well)
- Large DH numbers with marker and winter survival - extensively using in crossing blocks
- Using Frontana and (PI 277022) from Stephen Xu as new source of resistance
- GH screening being conducted for FHB resistance
- Future – would like to combine Fhb1, and 3A, and 5A
- Also simultaneously trying to move Sr and Lr genes (from Stephen Xu's sources) and getting resistance for BLS, tan spot, and S. nodorum

Joel Ransom (Powerpoint presentation available)

Research Activities:

- DON LSMean results presented
- Comparatively little response to fungicide compared with differences due to genotype
- Wesley BC is better than Wesley itself in reducing DON
- Fungicides gave some effect, but most of "punch" is due to genotype resistance
- Emerson (Canada) - even better than Lyman for resistance under ND conditions

Sunish Sehgal (Powerpoint presentation available)

Research Activities:

- Less than 10% FHB in western part of state – 2014 FHB levels
- Some fields as much as 80% in eastern part of state – 2014 levels
- V. poor start to ww in SD in 2015 – as much as 50% rated poor to v. poor
- Goals are to incorporate Fhb1 and Fhb6 into varieties for resistance
- SD08200 and SD09192 are potential future releases
- About 235 DH pops. with Wesley Fhb1 and Overland Fhb1 have been developed
- Fhb6 in Everest has been crossed to SD material along with TAM104
- Tetraploid and diploid core sets from WGRC are to be screened
- Sr and Lr resistance are also goals
- Norstar crosses for winterhardiness (trying to bring in rht1 and other dwarfing genes)

Stephen Wegulo (Powerpoint presentation available)

Research Activities:

- Quite a bit of winterkill in southwest NE for 2015
- Mainly screening Baenziger lines for resistance
- Scab situation in 2007 and 2008 very bad in NE, but various levels from 2009 to 2014
- Mead - spray inoculation screening - 2013 = 45 HWW-nursery; 1221 overall lines severity = 5-52%, index = 0.8-33.1%, DON = 1.6-10 ppm
- 2014 about the same, but lower ranges, starting with about 0 % or 0ppm
- Integrating fungicide and cultivar treatments
- Prosoya reduces the scab index quite significantly
- Harry is resistant phenotypically, but accumulates quite a bit of DON
- Fungicide more effective in resistant varieties vs susceptible

Yang Yen (Powerpoint presentation available)

- Hypothesis - Fhb1 is present in all wheats and just responds differently in resistant vs susceptible varieties
- Gene expression knocked out with VIGS - affected resistant and susceptible genotypes
- Sumai 3 lost resistance (R appears to only function in first 3 days)
- Regulator is produced by infection that suppresses Fhb1 to give susceptibility, but Fhb1-1 is methylated in R types to reduce infection by maintaining green tissue
- Xumn10 - actually seems located to outside of Anderson Lab area of chromosome
- Gene appears similar to PME1 gene or MYB79
- Suppression of gene by pathogen in susc. wheats
- It's the regulatory sequence that matters
- WFhb1-1 specific marker vs. Xumn10 is being developed

Future Objectives:

Understand how Wfhb1-1 is expressed in HWW lines --

- Screen current Fhb1-introgression lines with new marker (done)
- Look at expression pattern of Wfhb1-1 in winter wheat
- Must remember – there are 3 copies for Fhb1- 3A, 3B, and 2D – and they are polymorphic
- Methylation-specific PCR of the regulatory sequence
- Methylation causes plant not to respond to regulatory element, which causes susceptibility

Afternoon Items**Possible Revisions to the HWW-CP Goals and Metrics:**

- There were no suggested changes to the stated HWW-CP goals and metrics for success (membership advised to review these in more depth and return any suggestions to the HWW-CP chair at a later date)

ScabSmart – Review of Recommended Varieties:

Kansas – Bockus recommends possibly removing older varieties that are more rarely grown in the state – will visit with Eric DeWolf about final recommendations

Nebraska – No recommended changes, but Stephen Wegulo will visit with Stephen Baenziger about list

South Dakota – No recommended changes

North Dakota – Possibly remove Overland and add AC Emerson to the list

Uniform Regional FHB Nursery:

- Process for call for new nursery entries will start in mid-summer 2015 – Bill Bockus can coordinate the nursery, at least until his retirement in 2016
- Discussion and consensus was reached that an interim coordinator might be needed if Bill's KSU replacement is not in place and/or is wanting responsibility of coordinating 2016 nursery (will assess this as Bill's retirement approaches)
- Typical nursery checks = Everest (resistant), Karl92 (intermed.), and Overley (susceptible)
- Montana State University will need to sign off on test-only MTA if there is interest in participating in the nursery
- Results for public breeding lines are usually published annually in the *Plant Disease Management Rpts*

Genotyping Lab Discussion:

- Guihua pointed out that Fargo lab has received more funding outside of the initiative as part of USDA's most recent budget allocations
- Looking to combine Fhb1 and Fhb3 in many breeding lines
- Will check on status of BC to lines being produced – i.e. what BCs are being produced, and when seed is available to share with regional PIs

HWW-CP Resources, Future needs, and Collaborations:

- Membership will look to extend collaborations to include Montana State University
- DON testing needs seem to be adequate and testing requests are being met

- Database has been updated by N. Garst (Stephen B's UNL grad student) with Uniform Regional FHB Nursery data dating back to approx. 2006 – not sure of availability of funds to continually update with data from all PIs/programs
- Shared list of important FY16 proposal and proposal request dates with PIs and membership was advised to consider Out-of-CAP proposals for important research
- Membership advised to consider nomination of a new HWW-CP chair. Nominations and vote likely to be taken at FHB Forum in December, near end of current chair's final term

Action Items from Meeting:

- ❖ Membership to review HWW-CP goals and metrics for success and make suggested changes to the chair
- ❖ Genotyping Lab to provide list of Fhb1 BC lines and time when seed will be available to regional breeders
- ❖ ScabSmart recommendations to be revisited by PIs within their respective states, and necessary changes implemented
- ❖ Chair to check on funding and/or plan to continually update USWBSI database in future
- ❖ Retirement and replacement of Bockus position to be monitored, and interim regional coordinator may be selected by 2016 if necessary
- ❖ Membership will consider nominating and voting on new chair by 2015 December Forum