

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