HWW-CP Planning Meeting Report
(Monday, 4 May 2009) –USDA-ARS GMPRC, Manhattan, KS

- **Summarized by Bill Berzonsky (notes recorded by Jeff Stein)**

I. Extent of the FHB Problem in the Region

The meeting followed an agenda and schedule as attached, and the meeting began with a discussion of the extent of the FHB problem in the HWW region over the last several years. Points relative to the extent of the FHB problem in the HWW region included:

- SD – Jeff Stein indicated that 2005 was the worst year within the past five, and estimated losses in that year at about $25 million.
- KS – Erick DeWolf indicated that significant losses were experienced in 2008.
    - Eastern third: 10-20% incidence, some fields up to 80% yield loss, estimated 17% yield loss. Wheat acreages down in eastern part of state.
    - Central third: lower incidence, 15.8% loss.
    - Statewide production losses of about 2% equate to ~$50 million in losses, mostly due to losses in east where there is less wheat. Most fields not treated specifically for FHB.
    - There are more questions coming to KSU Extension regarding the use of resistant varieties.
- NE – Stephen Baenziger and Stephen Wegulo indicated that NE has experienced severe losses to FHB in both 2007 and 2008 – Eastern and central NE worse.
    - Approximately 600,000 NE wheat acres were affected by FHB.
    - Estimated that approximately $1.10/bu dockage due to FHB.
    - Losses equate to ~$16 million each year, for a total of $32 million in losses
    - A large percentage of acreage was treated with fungicides, mostly at the flag leaf stage and often with strobilurins.

Total losses due to FHB in SD, KS, and NE (2005 to 2008) ~ $107 million

II. Summaries of Ongoing Projects

- Baenziger –
    - Nearly 200 crosses for FHB this year, many with *Fhb1* and nearly 50 with *Fhb3*, and some with native resistance.
    - Has two lines with *Fhb1* and Fhb3, sent to CIMMYT for doubled-haploid production.
    - Has 117 F_2s in field, 162 F_3s, 2,220 head rows and is willing to share germplasm.
    - *Fhb1* in Welsey, *Fhb3* in Overly and Jagger. Trying to determine if *Fhb1* provides sufficient level of resistance.
    - NIN has 15-60 lines with native resistance in them.
    - Relies heavily on G. Bai for support and some crosses.

- Bai –
    - Mapping of FHB-resistance QTLs – looking into novel Chinese Landraces, mostly in spring background. Also looking at native sources of resistance (Heyne and 2174). Trying to break any linkage with *Fhb1* using backcrossing.
    - Marker-assisted backcrossing –
        - Moved *Fhb1* into Wesley, Trego, Harding. Has ~300 lines of each background, which have been increased in NE.
        - Have BC_3 for Jagger, BC_2 in Overland, and Overley.

- Berzonsky –
    - New to the region. Most recent release, Lyman has very high levels of resistance as is indicated in several regional trials.
    - Student project (Subas Malla) – working on three projects:
        - ND2710 crossed with several HWWs – 3BS QTL was detected in a lower frequency in spring growth habit backgrounds whereas the 5A QTL was detected in a lower frequencey in winter growth habit backgrounds.
        - Diallel crosses were made to look at general combining ability. Found additive gene effects are important and that effective selection can be made for FHB resistance.
        - Native source (SD97060). Potentially new allele at 2BL.

- Bockus –
    - Tri-state (quad), breeders got 15 lines per breeding program (KS, NE, SD and now ND). Checks: Hondo, Karl92, Overley. Performed in 2006, 2007, and 2008.
    - Strong G by E effect; heading date, height, etc.

- Dowell –
    - Sorting technology to help support breeders – rough DON levels, FDK kernels, etc.
    - Screened about 1,000 samples to assess FDK, DON, and sort FHB damaged kernels.
    - Can potential use optical sorting to select for resistance in a population.

- Gill –
    - Alien chromosome engineering from wide grasses.
    - Identified *Fhb3* in Chinese Spring, transferred to Overley-background, working on Jagger. Now have homozygous line that is being tested in tri-state and elsewhere.
    - *Fhb3* on whole-arm translocation 7AL (*Leymus*), now have two recombinants with shorter segments.

- Wegulo (not funded by HWW-CP) –
    - Integrated management project: cultivar resistance and fungicides.
    - Differences in how the varieties react to fungicide applications, varieties with some tolerance sometimes have a greater response than the susceptible lines.

III. Refining the HWW-CP Definition of Success and Determining Future HWW-CP Research Needs

The initial discussion of the definition of a successful HWW-CP and related research focused on some comments made by Jay Romsa (General Mills). Jay commented that industry is pushing higher fiber and whole grain products, and this paradigm shift complicates reducing DON content to acceptable levels. The following points were made relative to industry needs and success in the reduction of DON:

- A target of 0.5 ppm in flour is needed to match European standards.
- Industry can deal with ~1.5 ppm for flour, but 1 ppm is really the limit for whole grain.
- Industry still supports hard white wheat expansion, but anticipates whole wheat issues.
- Industry language on GMO wheat has softened.

The group consensus was that a goal to release and foster adoption of the most FHB resistant HWW varieties by 2015 is still possible and will be achieved. Stephen Baenziger proposed and the group discussed the goal of having 90% of the wheat grown in the most FHB prone areas planted to resistant varieties. The following were discussed as priorities for future HWW-CP research:

- Wide deployment of FHB-resistant varieties (*Fhb1*, *Fhb3*, others, etc).
- A short-term goal for FHB control would be to encourage effective fungicide applications.
- A long-term goal for FHB control would be to reduce fungicide use in association with the use of more resistant varieties.
- There is a need and desire to produce doubled-haploid (DH) lines for purposes of hastening the development of FHB resistant varieties. Bill Berzonsky proposed the possibility of such lines being produced at SDSU since DH lines are likely to be produced as part of a potential effort to expand HWW acreage in the region. Bikram Gill noted a new facility at KSU will likely also be invovled in producing DHs.
- There is a regional need to conduct more genotype by fungicide trials to determine what if any synergistic effect there might be on control of FHB.
- The Quad-state Misted FHB Nursery should be expanded by:
    - Including at least one misted nursery in ND to be associated with the hiring of a new winter wheat breeder at NDSU.
    - Including the testing of industry developed lines and varieties (Westbred, AgriPro, etc).
    - Evaluating specific populations in the nurseries, e.g. Harry x Wesley pop.
- Breeding efforts should focus on:
    - Increasing targeted / directed marker-assisted backcrossing – Guihua Bai has backcrossed *Fhb1* to Wesley, Harding, Trego, Jagger, Overley, and Overland.
    - Native resistance and the need to develop more mapping populations.
- Pyramiding host plant resistance genes. This is already ongoing, and needs to be emphasized. We do not know if *Fhb1* alone will be durable long-term.

IV. Outreach

Participants discussed the layout of the Scab Smart website, and the request by Marcia McMullen to consider developing a list of HWW varieties with the highest levels of FHB resistance. Potential varieties for this list are e.g. Karl92, Overland, Endurance, and Art. Data are needed on the response of resistant and moderately resistant varieties to fungicide treatments. With more resistant varieties, will there still be a need to make two fungicide applications for adequate FHB control or could just one application be made to control both foliar diseases as well as FHB? HWW-CP members concluded that information on genotype x fungicide responses is needed for Scab Smart and for extension outreach activities. The following are outreach research needs:

- Scab Smart – Need to come up with a list of resistant varieties.
- Need to deploy demo plots for outreach efforts.
- Need better information on variety x fungicide responses.

V. Meeting Conclusion

HWW-CP members decided the Barley-CP model of developing Draft Letters of Intent would be an effective way to summarize the future needs of the HWW-CP and to best estimate the budgetary needs of the region. The HWW-CP Chair, Bill Berzonsky, promised to develop a call for DLOI and to solicit their submission to the HWW-CP Committee as soon as possible. The Chair also reminded members to submit their completed questionnaires as soon as possible. The HWW-CP Committee will utilize both

the DLOI and the questionnaires to develop a summary of the research needs of the region, which will be presented to at the USWBSI SC Meeting on May 28.

HWW-CP Planning Meeting – Participants (16)

Name	Affiliation
Bill Bockus	Kansas State University
Guihua Bai	USDA-ARS/Genotyping Lab
Bernd Friebe	Kansas State University
Joey Cainong	Kansas State University
Stephen Wegulo	University of Nebraska
Erick DeWolf	Kansas State University
Sid Perry	WestBred LLC
Jay Romsa	General Mills
Art Brandli	USWBSI Co-Chair and Grower Representative
Bob Bowden	USDA-ARS
Bikram Gill	Kansas State University
Floyd Dowell	USDA-ARS
P. Stephen Baenziger	University of Nebraska
Glen Weaver	Conagra Mills
Jeff Stein	South Dakota State University
Bill Berzonsky	South Dakota State University


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