



Fusarium Focus

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2015 FHB Forum Attracts 203

Just over 200 scientists, wheat and barley growers and industry representatives assembled in St. Louis in early December for the 2015 National Fusarium Head Blight Forum. The 18th FHB Forum took place at the Hyatt Regency St. Louis at the Arch.

The event featured stakeholder and scientific invited speaker presentations, plus focused group discussions and social events for attendee interaction.

Numerous research posters were on display as well, with primary authors present to discuss the research. Also, for the third year, several postdoctoral scientists and graduate students participated in “Flash & Dash” sessions in which they provided mini-oral presentations on posters they had at the Forum.

Organized/hosted by the U.S. Wheat & Barley Scab Initiative (USWBSI), the annual Forum provides a key venue for reports on the latest research findings on Fusarium Head Blight (scab) and deoxynivalenol (DON), the mycotoxin produced by scab infection in grains.

The 2016 National Head Blight Forum will be held at the same location: the Hyatt Regency St. Louis at the Arch. Dates for the event are December 4-6.

The following pages contain photos and talk summaries from several invited speaker presentations at the 2015 Forum. PDF copies of the following presentations are posted on the USWBSI's website — www.scabusa.org — as is a copy of the full Forum Proceedings:

• *Managing Mycotoxin Issues in Corn and Small Grains: Parallels and*

Contrasts / Gary Munkvold, Iowa State University, Ames

• *Utilizing Genomic Selection to Accelerate the Pace of Developing Resistant Varieties* / Antonio Cabrera, The Ohio State University, Wooster

• *Interaction Between 3-ADON and 15-ADON F. graminearum Isolates* / Gopal Subramaniam, Agriculture and Agri-Food Canada, Ottawa, Ontario

• *Crop Genome Editing and Precision Breeding with CRISPR-Cas9* / Yinong Yang, Pennsylvania State University, College Park

• *New FHB Predictions Models* / Erick DeWolf, Kansas State University, Manhattan

• *FHB/DON in the Soft Winter Wheat Region in 2015* / Carl Schwinke, Siemer Milling Co., Teutopolis, Ill. (Joint presentation with Don Mennel, Mennel Milling Co., Fostoria, Ohio)

• *20 years of Best Management Practices for FHB: Then and Now* / David Hooker, University of Guelph, Ridgetown, Ontario

• *Genomic Predictions to Advance Breeding for FHB Resistance in Barley* / Kevin Smith, University of Minnesota, St. Paul

• *National Survey of Wheat & Barley Producers* / Christina Cowger, USDA-ARS, Raleigh, N.C.

• *Past, Present, and Future of Fungicides for FHB* / Randy Myers, Bayer CropScience, Research Triangle Park, N.C.

• *Trichothecene Chemotypes of the FHB Fungus in the United States* / Corby Kistler, USDA-ARS, St. Paul

• *Exploration of Genomic Selection Strategies to Complement Wheat FHB Resistance Breeding* / Jim Anderson, University of Minnesota, St. Paul. ❖

Nominees Sought for USWBSI Stakeholder Co-Chair

The U.S. Wheat & Barley Scab Initiative is seeking nominations for the USWBSI stakeholder co-chair position currently held by Art Brandli, who is stepping down at the end of 2016. Nominations are being accepted until April 1.

The USWBSI co-chairs provide leadership to the consortium of wheat and barley research scientists, producers and industry representatives who together form the Initiative. They lead both the USWBSI Executive Committee and the Steering Committee. Along with that

governance role, the co-chairs also serve as the Initiative's principal spokespersons to U.S. wheat and barley growers, the milling, malting and brewing industries, and to members of Congress and their staffs and to the general public.

The USWBSI research co-chair is Dave Van Sanford, University of Kentucky wheat breeder.

A full description of the responsibilities and required qualifications of the USWBSI stakeholder co-chair position can be found on the Initiative's website, www.scabusa.org. ❖



— 2015 FHB Forum —

More than two years ago, the U.S. Wheat & Barley Scab Initiative (USWBSI) decided to sponsor a survey of nearly 16,000 farmers in 17 states. The purpose of the survey — which was performed by the USDA National Agricultural Statistics Service (NASS) under a contract with USWBSI — was to determine the extent to which farmers were adopting best management practices for the control of Fusarium Head Blight (FHB), *i.e.*, scab.

Formulation of the survey's questions was coordinated by an ad hoc committee convened by the USWBSI and led by **Christina Cowger**, North Carolina-based USDA Agricultural Research Service plant pathologist.

The underlying reasons for the survey were three-fold — all related to management. First, millers were reporting average DON levels no different than those of a decade earlier; why this lack of progress? Second, no mechanism existed in soft wheat states for tracking acreage by variety. And third, the general impression was that the adoption of best management practices for scab was spotty and inconsistent.

In conjunction with NASS, the USWBSI designed a four-page questionnaire focusing on three areas: (1) How important is scab to producers? (2) Which scab management tools are being used? (3) What hinders use of these tools? The survey was mailed and follow-up phone calls made in February-March of 2014. Of the 15,895 surveys sent out, about 32% (5,107) provided what were deemed “useable” responses. (That percentage



Christina Cowger

ranged from a high of 44% in Ohio to a low of 17% in Virginia.)

Respondents represented five market classes: hard red spring wheat, hard red winter wheat, soft red winter wheat, durum wheat and barley.

Here are several survey report highlights, as presented by Cowger to the 2015 National FHB Forum audience:

- Survey respondents were asked how serious a problem scab has been for them during the past five years, *i.e.*, did it result in economic levels of DON. Most of the responses (between 85% to 96%, depending on the state) indicated it was a serious issue in just one year or not at all. From 2% to 8% of useable responses said it was serious in two to three years out of the five. Finally, 0% to 3% said it was serious in four or five of those years.

- Respondents who reported DON being problematic two or more out of those five years also were asked whether they planted moderately resistant varieties to help reduce scab incidence and severity. The percentage of those who did so varied significantly by state, with North Dakota farmers ranking highest.

- As to percentage of moderately resistant varieties used by market class, the hard red spring wheat sector ranked highest with 47% of reported

acreage being planted to a variety moderately resistant (MR) to scab. Durum respondents' acreage was at 29% MR, followed by soft winter wheat (21%), soft red wheat (15%) hard red wheat (11%) and barley (8%). The percentages within market class varied significantly by state.

- Asked whether they had used the scab risk forecasting website — <http://www.wheatscab.psu.edu/riskTool.html> — 7% (337 respondents) replied affirmatively. The percentage ranged, by state, from a high of 18% in North Dakota to a low of 1% in Arkansas. Of those replying yes, more than four-fifths considered the risk tool easy to understand/use and useful.

- Survey recipients also were asked which fungicide(s) they applied the last time scab was the primary target. The highest percentage naming a specific scab-targeted product was in North Dakota (just under 50%); the lowest in Kansas (less than 10%).

The percentage of respondents naming one of the three most effective triazoles for scab management (Prosaro, Proline or Caramba) ranged from a high of 28% in North Dakota to a low of 0% in Arkansas. A fair number (7% across the states, and as high as 13% in Kentucky) used a strobilurin-containing fungicide for scab, which is not recommended.

- The surveyed farmers also were asked which barriers limited their adoption of scab best management practices. Across all soft wheat states, 18% said weather prevents timely fungicide treatments. Fields hard to spray for logistical reasons was a factor for 11%, and “flowering hard to identify” (for proper fungicide timing) for 10%. “Resistance information not available or timely” played a role for 9% of respondents, with 7% listing “scab risk information hard to obtain in time” and 6% reporting “scab-resistant seed hard to obtain.” For the hard wheat states as a group, the respective answers were 21% (weath-

**2015
National FHB Forum
Photo Credits:**

**Dave Hane
USDA-ARS, Albany, Calif.**



— 2015 FHB Forum —

er), 14% (hard-to-spray), 11% (flowering hard to ID), 7% (resistance info), 5% (scab risk info) and 5% (scab-resistant seed).

In summary, as to why economic damage from scab remains persistent, Cowger listed several key take-home messages gleaned from the producer survey, including:

- Most producers do not see scab as a serious problem.
- Scab-resistant varieties are widely used in hard red spring wheat, but not at present in barley or other wheat market classes.
- In the soft wheat regions, most higher-yielding varieties are either moderately susceptible or susceptible to scab.
- In the soft red and soft white wheat regions, many producers cannot name the varieties they are planting — and thus are not selecting scab-resistant varieties.
- Few producers directly monitor scab risk (although their crop consultants and/or county extension agents may do so).
- Overall, few producers name an effective scab-targeted fungicide. Cowger also suggested ways for USWBSI and the grain industry to increase the usage of scab best management practices, including:
 - Grain purchasers offering incentive programs for the planting of moderately resistant varieties.
 - USWBSI using metrics and goals to increase the percentage of released varieties (public and private) that are moderately resistant.
 - USWBSI studying districts where BMP adoption is high for a given market class to better understand what is working in those cases.
 - USWBSI increasing publicity/education to promote BMP to growers who do not attend field days or winter meetings.
 - University specialists addressing barriers to BMP adoption where adoption rates are particularly low. ❖



Gary Munkvold

Keynote speaker at the FHB Forum was **Gary Munkvold**, professor in the Department of Plant Pathology and Microbiology at Iowa State University. His presentation addressed “Managing Mycotoxin Issues in Corn and Small Grains: Parallels and Contrasts.”

Munkvold’s first comparison was between the major pathogens and mycotoxins impacting corn versus those affecting wheat and barley. For corn, the main mycotoxin families are aflatoxin (*e.g.*, *Aspergillus flavus*), deoxynivalenol, or DON (*Fusarium graminearum*), fumonisins and zearalenone. DON is the main one for wheat and barley, though zearalenone and other trichothecenes, as well as ochratoxin, are also in the mix. Geographic disease distribution differs between corn and small grains due to differences in their environmental requirements, Munkvold pointed out.

Unlike wheat and barley, corn is both a hybrid and a transgenic crop. Only 7% of 2014 planted U.S. corn acres were “non-biotech.” Of the other 93%, 76% carried stacked traits. About 39% ended up in the livestock feed/residual market; another 30.5% was used to make ethanol. Distiller’s Dried Grains (DDGs) constituted 7.6% of corn usage in 2014. Mycotoxins in DDGs are an issue for the corn industry as well.

Unlike wheat and barley, corn is not

routinely tested for mycotoxins at the initial point of sale, Munkvold noted. One exception would be in those locations where aflatoxin has been a common problem, or in aflatoxin outbreak years. In most states, the standard policy has been to reject grain with aflatoxin levels above 20 parts per billion.

In terms of mycotoxin management strategies, Munkvold ranked “breeding” as particularly important for both corn and small grains. Under that umbrella, “genetic engineering” to improve insect resistance and drought tolerance is especially significant for corn; for the small grains, genetic engineering holds great potential for the development of disease resistance traits, he noted.

Referencing other management strategies, Munkvold placed “insect management as very important in corn, while “fungicides” are a central component for small grains (less so for corn at present). The use of risk assessment models carries more weight for the small grains, he suggested, while certain cultural practices (*e.g.*, tillage) can be helpful — though not dramatically so — for both corn and small grains.

In summary, differing pathogens and disease cycles dictate the respective strategies and priorities in mycotoxin management for corn and small grains, Munkvold stated. Again, for corn it focuses mainly on insect management and drought tolerance (and, to a lesser degree, biocontrol); for wheat and barley, it’s more about fungicides and the use of risk assessment models. Genetic resistance is paramount for both.

Different use patterns also influence impacts, available management tools and post-harvest handling measures involving mycotoxins. With corn, for example, the huge amount of livestock feed usage impacts blending and feed additives. For corn exports, public health interventions in some developing countries also play a role. Munkvold said that food impacts, testing costs and quality management in food production are primary considerations for wheat. ❖



— 2015 FHB Forum —



Don Mennel

Don Mennel and Carl Schwinke provided stakeholder perspectives on the 2015 FHB/DON situation in the U.S. soft winter wheat region.

Mennel, who is board chairman of the Fostoria, Ohio-based Mennel Milling Company, recounted an “absolutely beautiful wheat crop” going into the harvest season. “And then the rains came.” Three weeks of steady rain prevented wheat growers from harvesting the crop and ultimately resulted in severe sprout damage. Total volume at Mennel Milling’s Indiana and Ohio

grain elevators was down 28% from 2014 — and only 50% of the volume they did handle was of milling quality.

“Vomitoxin was not the primary problem,” Mennel said. “Our Indiana elevator averaged 2.6 parts per million (ppm) ‘vom,’ and in Ohio our vom levels ranged from 0.9 ppm to 3.86 ppm. We could have survived with these vom levels had we not had the sprouting problems.” Having to reject dozens of wheat suppliers due to high vomitoxin and low falling numbers prompted the question: will those growers plant wheat in 2016?

Due to the lower volume of wheat in 2015 and the crop’s quality problems, Mennel said his company would originate at least 2.0 million bushels of milling quality wheat from the Eastern Shore into its Fostoria flour mill this crop year. “We have also originated wheat from Tennessee and northern Michigan,” he noted. The logistics of doing so “have been a nightmare due to not having freight rates established in advance and shipping into non-traditional shipping lanes.”

Mennel Milling also held, as of early December, 1.0 million bushels of wheat receipts on the Chicago Board of Trade



Carl Schwinke

as an insurance policy. “All these receipts are on the river system,” Mennel explained, “which means that if we take delivery of this wheat, we will have to barge the wheat to St. Louis or Cincinnati and then transload it to ship to our flour mills.”

“Last year’s crop was a game changer,” Mennel concluded. “It remains to be seen if wheat will remain a preferred crop in the rotation or will go the way of oats in the United States.”

Schwinke is vice president of grain supply for Siemer Milling Company. Based at Teutopolis, Ill., the company also operates facilities in Hopkinsville, Ky., and West Harrison, Ind., and buys wheat out of several states.

Schwinke noted that wheat yields and quality varied widely across Siemer’s trade region. Kentucky, for example, had a very good crop in 2015, while Missouri’s was “decimated” due to very wet weather during flowering. In parts of Missouri, (feed) wheat was selling for \$1.00 per bushel due to quality issues. Northern Indiana also had high levels of vomitoxin in wheat. USDA’s October estimate of 2015 soft wheat production was lowered by 30 million bushels from its previous projection.

Schwinke said fungicide applications remain “a tough call” for many of the region’s farmers. Resistance through plant breeding is still the best long-term answer to FHB he emphasized. ❖



Above: The poster sessions once again were a popular venue at the National FHB Forum, with most authors present for questions and discussion. Postdoctoral scientists and graduate students piqued interest in their posters by presenting mini-talks about their research at “Flash & Dash” sessions leading up to the poster sessions.



— 2015 FHB Forum —

David Hooker, field crop agronomist with the University of Guelph's Ridgetown Campus and also an Ontario farmer, provided an overview of 20 years of FHB best management practices evolution in the province.

Hooker recounted that 1996 was an epidemic year for FHB in Ontario, costing the province's farmers more than \$100 million in yield loss and DON discounts. Since then, significant strides have been made in FHB resistance levels in the cultivars grown by Ontario wheat producers. As of 1999, 40% of Ontario's wheat acreage was planted to cultivars highly susceptible to FHB — with another 30+% planted to susceptible ones. As of 2015, 20+% of acres were sown to moderately resistant varieties and another 35% to moderately susceptible. The susceptible percentage — about 43% — was actually up from 1999; however, the highly susceptible percentage was virtually non-existent as of 2015.

Another big change has come in the fungicide arena. As in the U.S., the



David Hooker

availability of the triazoles has been very beneficial to Ontario producers, Hooker noted. By way of illustration, he showed DON levels from 2013 research, comparing “untreated” versus “with fungicide.” Across highly susceptible and susceptible cultivars as a group, fungicide treatments reduced DON by about 60%. A similar effect occurred with

moderately susceptible cultivars. For the moderately resistant group, the addition of fungicide lowered DON levels by more than 40%.

But, Hooker emphasized, the effect of a moderately resistant cultivar *plus* fungicide is additive, and the combination is key to optimum FHB management.

What else has changed in Ontario FHB management since 1996? Hooker referred to several developments:

- Fungicide application technology, i.e., improved nozzle configurations, resulting in better coverage.
- DONcast, the Ontario web-based forecasting model that has been operational since 2000.
- The idea of spreading risk by altering heading dates, *e.g.*, planting earliest-heading cultivars first.
- Combine cleanout, *i.e.*, varying fan speed to better eliminate lighter scab-affected seeds.
- In-furrow placement of phosphorus to aid with uniformity of heading and fungicide application timing.
- The idea of harvesting early and incurring drying expense — with the premise that this approach will more than pay for itself with lower DON discounts.
- On-farm storage of contaminated grain, where feasible, with shipment to market during the off-season. ❖



Above: Dave Van Sanford (standing), University of Kentucky wheat breeder and co-chair of the U.S. Wheat & Barley Scab Initiative, addresses breeders and pathologists before breaking up into smaller, grain class-based groups. Following these breeder-pathologist breakouts were research area-based breakouts for FHB Management, Food Safety & Toxicology, Gene Discovery & Engineering Resistance, Pathogen Biology & Genetics, and Variety Development & Host Resistance.

Mark Your Calendar!

**2016 National
FHB Forum**

December 4-6

**Hyatt Regency
St. Louis at the Arch
St. Louis, Mo.**



— 2015 FHB Forum —

For many farmers, fungicides comprise a core component of their Fusarium Head Blight management program.

Randy Myers, product development manager for Bayer CropScience, provided the 2015 National FHB Forum audience with an overview of the “Past, Present and Future of Fungicides for FHB.”

Bayer has been heavily invested in FHB for decades. Bayer CropScience has supported the U.S. Wheat & Barley Scab Initiative since its inception and likewise has participated in every National FHB Forum. Bayer AG was the inventor of tebuconazole, the active ingredient in Folicur®, and Bayer also is the manufacturer and marketer of Prosaro® fungicide. Tebuconazole was identified in the mid-1990s as having activity on *Fusarium graminearum*, Myers recounted, but could be used for FHB suppression for 12 years only under “emergency exemptions” in select states. Folicur was first registered for cereals in 2008 — the same year that Prosaro and BASF’s Caramba® received their registrations.

Today, Prosaro and Caramba are considered to be the best-performing fungicide products available for protection against FHB. Multiple years of uniform trials, conducted with support from the U.S. Wheat & Barley Scab Initiative,



Randy Myers

have shown a 52% reduction in FHB and 42% reduction in DON with the use of Prosaro, while Caramba has provided 50% and 45% reduction, respectively. As is generally agreed, however, fungicides — while an important component in an FHB management program — are just that: one component.

Myers termed these current fungicide options as “pretty good;” but he simultaneously affirmed that any new products must be even better. A higher level of activity and a wider application window are two primary areas in which there’s

room for improvement, he stated.

Finding new crop protection compounds, developing them and moving them forward toward registration is a very complex and expensive process, Myers pointed out. Much like plant breeding, it includes intensive screening and selection. He outlined four basic steps:

- Initial (cell test)
- Primary (cell and plant test)
- Secondary & Profiling (monocot/dicot/seed treatment)
- Field Screening

Any candidates surviving that process must then be evaluated for “characterization testing,” *i.e.*, formulation development, rain fastness, effect of adjuvants and handling features. If a product “passes,” the next phase consists of in-depth assessments to support registration — examining things like human health dietary risk, aggregate risks (*e.g.*, drinking water, non-occupational), cumulative risks (common mechanism of toxicity), occupational exposure (mixers, loaders, applicators, crop scouts, etc.) and environmental exposure and risks.

“New tools will be coming for FHB,” Myers predicted. But, he emphasized, it’s a process that takes time, demands significant resources — and requires cooperation from numerous entities. ❖

Below: Phil Bregitzer, USDA-ARS, Aberdeen, Idaho (with back to camera), leads the Barley Coordinated Project breakout discussion. Other CP breakout sessions took place concurrently for Durum, Hard Winter Wheat and Variety Development & Host Resistance for three wheat regions: Spring Wheat, Northern Soft Winter Wheat and Southern Soft Red Winter Wheat.



Above: Bill Berzonsky (standing), wheat breeder with BayerCrop Science, leads discussion during the Hard Winter Wheat Coordinated Project breakout.



— 2015 FHB Forum —

An update on work to improve accuracy of FHB prediction models was given by **Erick DeWolf**, Kansas State University extension plant pathologist and a principal developer of the scab prediction model/FHB Risk Assessment Tool.

Recent research has focused on three main areas: (1) replacing the winter wheat model that had struggled under some environments; (2) simplifying the interpretation of predictions; and (3) being more representative of the breeding for FHB resistance in winter wheat. DeWolf and his team advanced four candidate models for a final round of testing and verification. The emerged new model considered the following variables: genetic resistance (very susceptible, susceptible, moderately susceptible and moderately resistant); wheat class (winter versus spring); and mean relative humidity 15 days prior to flowering.

They then developed case studies for



Erick DeWolf

final verification, evaluating model performance from the 2013 and 2014 growing seasons. They compared model predictions with cooperators' disease reports

and also verified with observations from the Integrated Management Cooperative Project. Ten case studies were considered (for 2013 and 2014). The analysis showed improved accuracy (most notably for winter wheat), as well as enhanced ability to explain DON contamination. The accuracy of the spring wheat model was maintained. The case studies also pointed to the potential to overestimate risk of disease in some environments.

Looking forward, the FHB prediction model improvement group continues to integrate new observations and message modeling priorities. Examples of the latter would be: (1) focusing on predictions to aid in management recommendations, and (2) rebuilding the weather database to consider more pre-anthesis weather conditions. The group also is looking at a time series of weather preceding anthesis and during the early stages of grain fill. ❖



Above: At 203, 2015 National FHB Forum attendance was slightly above that of recent years.

Left: Hallway conversation — always both enjoyable and useful.

Right: Art Brandli, USWBSI co-chair, delivers closing remarks before adjourning the 2015 National FHB Forum.



Virginia Tech Labs Visit Mennel Mill in Roanoke

By
Niki McMaster*

On January 11, 2016, 11 students and faculty in the Schmale and Griffey labs at Virginia Tech visited the Mennel Milling Company at Roanoke, Va. The visit was made possible by Don Mennel, current board chairman of Mennel Milling Company and a member of the U.S. Wheat & Barley Scab Initiative Executive Committee and Steering Committee.

The Schmale lab provides mycotoxin testing services for thousands of wheat and barley samples annually for the USWBSI. The visit to the flour mill was the perfect way to connect academ-

ic research and analysis with real world applications.

At the mill, the group was hosted by plant manager, James Elkin, Jr., along with Isha Chadha, quality assurance manager. The group discussed the impact that deoxynivalenol (DON) levels of incoming grain have on the company's operation. James described their challenges to continually balance acceptable DON levels of starting mate-

rial and what is available from his suppliers at given time.

The fully automated facility has innovative tools like a Megatex grain cleaner, which can often help significantly reduce DON levels. The company carefully monitors DON levels of grain and flour throughout the pipeline in its on-site lab, and is using cutting-edge processing methods to produce high-quality flour for its customers. ❖

Pictured below at the Mennel Mill in Roanoke are, from left to right: Nick Meier, Regina Hanlon, Nina Wilson, Ray David, Subas Malla, Niki McMaster, Christopher Anderson, Jordan Ullrich, Renee Pietch, Craig Powers and David Schmale.

* Niki McMaster is a research associate in David Schmale's lab at Virginia Tech.



Fusarium Focus

Fusarium Focus is an online newsletter published periodically by the U.S. Wheat & Barley Scab Initiative. The USWBSI is a national multi-disciplinary and multi-institutional research system whose goal is to develop as quickly as possible effective control measures that minimize the threat of Fusarium Head Blight (scab), including the production of mycotoxins, for producers, processors and consumers of wheat and barley. Contact information is as follows:

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Recent Scab-Related Peer-Reviewed Publications

• David, R.F., Bozorgmagham, A., Schmale, D.G., Ross, S.D., and Marr, L.C. 2016. Identification of meteorological predictors of *Fusarium graminearum* ascospore release using correlation and causality analyses. *European Journal of Plant Pathology*. Published online 17 December 2015. <http://link.springer.com/article/10.1007/s10658-015-0832-3>

• Prussin, A.J., Marr, L.C., Schmale, D.G., and Ross, S.D. 2015. Experimental validation of a long-distance transport model for plant pathogens: Application to *Fusarium graminearum*. *Agricultural and Forest Meteorology*

203:118-130. <http://www.sciencedirect.com/science/article/pii/S0168192314003190>

• Schmale, D.G., and Ross, S.D. 2015. Highways in the sky: Scales of atmospheric transport of plant pathogens. *Annual Review of Phytopathology* 53: 591-61. <http://www.annualreviews.org/eprint/MNUVFeRkXITPGshhwj4W/full/10.1146/annurev-phyto-080614-115942>

Listings of recent FHB-related publications by USWBSI-associated principal investigators are invited. Listings should be sent to Don Lilleboe at dlilleboe@forumprinting.com

