

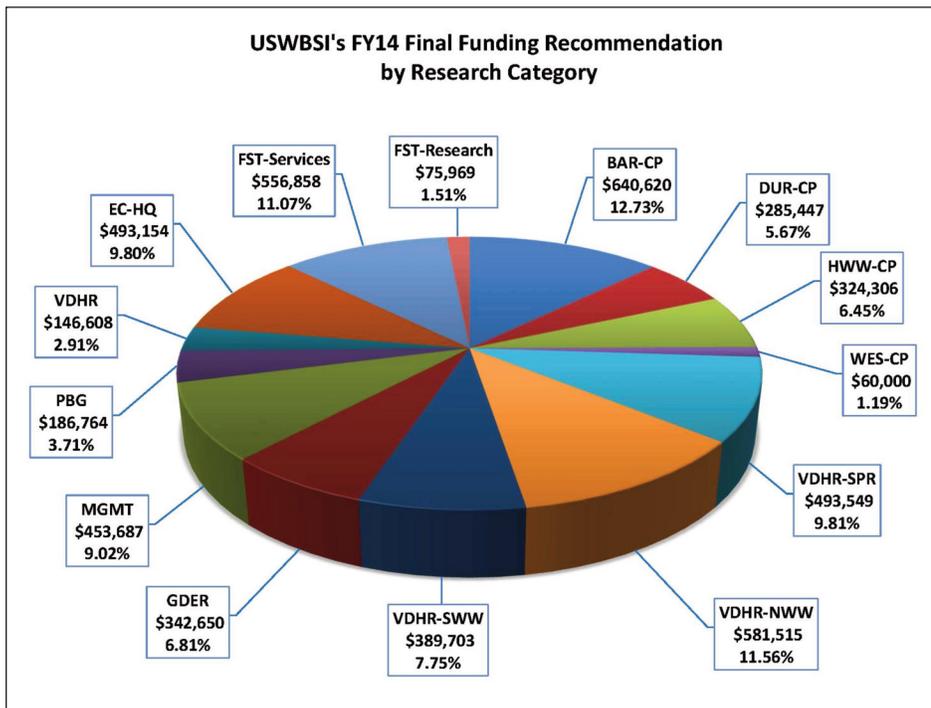


Fusarium Focus

Volume 14 Issue 2

Summer 2014

USWBSI Research Funding: FY14



The U.S. Wheat & Barley Scab Initiative (USWBSI) has submitted its fiscal year 2014 Research Plan and Budget to the USDA Agricultural Research Service, totaling \$5,030,830 in scab-related research projects. The total includes 129 projects in 26 states, including the District of Columbia, and encompasses 24 land grant universities plus USDA-ARS and USDA-NASS.

The above pie chart depicts the percentage of recommended funding broken down by research area, plus the actual amount for each area. The dollar level

recommendation and number of projects for each area are as follows:

- *Barley Coordinated Project* - \$640,620 / 10 research projects
- *Durum Coordinated Project* - \$285,557 / 7 projects
- *Hard Winter Wheat Coordinated Project* - \$324,306 / 11 projects
- *Western Coordinated Project* - \$60,000 / 3 projects
- *Variety Development & Host Resistance (VDHR) / Spring Wheat Region* - \$493,549 / 9 projects
- *VDHR / Northern Winter Wheat*

Region - \$581,515 / 23 projects

- *VDHR / Southern Winter Wheat*

Region - \$389,703 / 10 projects

- *Gene Discovery & Engineering*

Resistance - \$342,650 / 8 projects

- *FHB Management* - \$453,687 / 30 projects

- *Pathogen Biology & Genomics* -

\$186,764 / 4 projects

- *VDHR (Genotyping Centers)* -

\$146,608 / 4 projects (labs)

- *Executive Committee & USWBSI*

Headquarters - \$493,154* / 4 projects

- *Food Safety & Toxicology / DON*

Testing Labs - \$556,858 / 4 projects (labs)

- *Food Safety & Toxicology /*

Research - \$75,969 / 2 projects

* Includes partial funding for a survey conducted by USDA's National Agricultural Statistics Service (NASS). The survey of about 16,000 wheat and barley producers in 17 states was conducted to obtain information on their scab management practices and how/where they access information about scab risk, variety resistance, fungicide application and other topics relevant to reducing damage from scab. The goal is to better understand barriers to adoption of best scab management practices in order to better assist growers and their crop advisors. Survey results will be publicized shortly by USWBSI.

Each year, the U.S. Wheat & Barley Scab Initiative is charged with develop-



Plant Pathologists Help Thwart Vexing Grain Disease

By Blaine Friedlander

ing a comprehensive research plan and budget recommendation that is aimed at achieving the Initiative's primary mission - *i.e.*, that of developing, as quickly as possible, effective control measures that minimize the threat of *Fusarium* Head Blight (scab), including the reduction of mycotoxins, to the producers, processors and consumers of wheat and barley.

The process followed to develop this research plan and budget is the product of extensive deliberations overseen and approved by the USWBSI Steering Committee (SC), which is comprised of wheat and barley growers, farm organization representatives, food processors, public and private scientists and consumer groups. The USWBSI Networking and Facilitation Office coordinated this process in close consultation with the organization's Executive Committee (EC) and the chairs of each individual research area and coordinated project.

The Executive Committee's recommended plan and budget were presented to the Steering Committee at its meeting following the 2013 National *Fusarium* Head Blight Forum in Milwaukee last December. In its entirety, the recommendation encompassed 135 pre-proposals (including several multi-PI ones) from 83 PIs. The sum of all recommended award amounts was equal to the \$5,030,830 anticipated to be available to USDA-ARS for collaborative scab research for FY14.

Following a briefing and study of the plan, the Steering Committee passed it by a unanimous vote. So the plan then became the official USWBSI comprehensive research plan and budget for fiscal year 2014. Subsequently, the plan was translated into individual USDA-ARS grant applications, which now have been submitted en masse as the USWBSI's recommendation for how ARS could allocate the \$5,030,830 awarded it for scab research by Congress.

For more information about the U.S. Wheat & Barley Scab Initiative's funding application and approval process, go to its website - www.scabusa.org - and then click on the "About USWBSI" and

Editor's Note: *The following article appeared in the May 22 issue of Cornell Chronicle, a weekly newsletter of the Cornell University News Service.*

To protect wheat for bread and barley for beer, Cornell plant pathologists have been evaluating ways to battle fungal blight. Recently, the scientists found that a local fungal strain is no longer controlled by a key fungicide. Their findings provide warning to farmers, who can, however, surmount field problems with sound pest management practices.

Fusarium head blight distresses wheat and barley, destroys prospering green fields and contaminates grains with a fungal toxin known as vomitoxin. The disease has caused exceptionally high crop loss in the past few decades. Following a blight infestation about 14 years ago, U.S. producers suffered a \$2.7 billion loss.

Plant pathology professor Gary Bergstrom, Pierri Spolti, lead author and a visiting plant pathologist in Bergstrom's lab, and colleagues examined fungal sensitivity to the widely used fungicide tebuconazole. They found

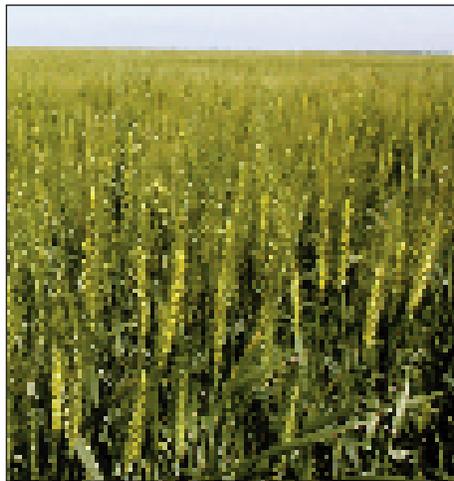
the first tebuconazole-resistant field isolate of *Fusarium graminearum* ever reported in North or South America.

Bergstrom explains that judiciously applying a family of fungicides called triazoles - of which tebuconazole is a member - when the crop flowers will continue as a successful crop management strategy. However, he cautions that multiple applications of the same fungicide at different crop stages and over wide geographic areas pose a risk for eventual resistance in fungal populations.

All agriculturists involved in North American cereal production should realize that decreased effectiveness of important head blight control fungicides could occur if these materials are not managed carefully to reduce the selection pressure on *Fusarium* head blight fungus populations," Bergstrom says. "We hope our findings will spur more routine screening of *Fusarium* populations. That way producers can put into place resistance-management strategies that prevent failures in the future."

The research, "Triazole Sensitivity in a Contemporary Population of *Fusarium graminearum* From New York Wheat and Competitiveness of a Tebuconazole-resistant Isolate," was co-authored by Emerson Del Ponte, Federal University of Vicosa, Brazil; Yanghong Dong, University of Minnesota; and Jaime Cummings, Cornell research support specialist.

The research was supported by funds from the U.S. Department of Agriculture, National Institute of Food and Agriculture to the Cornell Agricultural Experiment Station. The research was published in the May issue of the international journal *Plant Disease*, along with a question-and-answer supplement. ❖



How High DON & Low Scab Can Occur Simultaneously

By Don Hershman

Editor's Note: *In western Kentucky this summer, high levels of DON have been found at mills in delivered loads of wheat that appeared to be "disease-free." Adjacent areas of Tennessee have experienced similar situations. In the following commentary, written in late June, University of Kentucky extension plant pathologist Don Hershman addresses how this seeming contradiction can occur.*

Typically, the amount of *Fusarium* head blight (head scab) visible in a field, the level of visually scabby kernels evident in harvested grain, and the extent of contamination of grain by the fungal toxin, deoxynivalenol (DON; also called vomitoxin) are highly correlated. DON is produced by the head scab causal fungus, *Fusarium graminearum*, as part of the infection/disease development process. Thus, you would never expect to have significant head scab levels in a field and very low or no DON. It just doesn't happen, albeit DON levels may vary considerably. This said, we sometimes have situations where grain has moderate to high levels of DON, but minimal head scab symptom expression in the field. How could this happen?

Low head scab symptoms and moderate to high DON usually occurs when conditions during the onset of flowering (anthesis) - the most common susceptibility period for head scab in wheat - is not favorable for infection, but late infections are favored during late flowering and/or grain fill. When late infections occur, head scab symptoms may exist, but are not nearly as visible to the naked eye compared to earlier infections. Or, visual symptoms (in-field or in harvested grain) may barely develop at all.

Regardless, the fungus is still active, and this can translate into elevated DON and low (or apparently low) head scab symptom expression.

The above is not an extremely common scenario; but when it does occur, it is usually associated with cool, wet weather during grain fill. These are exactly the conditions experienced during much of the grain fill period for many fields throughout west Kentucky this spring.

I am also aware that some farmers who have experienced moderate to high head scab and DON this year feel betrayed because they "did everything right." To these folks I would say, "You probably did, but events were not working in your favor." For example, the wheat crop was extremely uneven this year. When that occurs, the period of head emergence is lengthened because the emergence of heads on secondary tillers is slow compared to primary tillers. This lengthened period of head emergence (thus crop flowering) may have exceeded the effective period for foliar fungicides to control head scab.

Another possibility is based on when fungicide applications were made. For example, if a fungicide application was made at the appropriate time for early tillers (*i.e.*, early anthesis), heads associated with secondary tillers may have been only partially emerged. Because current head scab fungicides have very limited mobility in leaf and head tissue following application, partially emerged heads would be only partially protected. Conversely, if applications were made at early anthesis for secondary tillers, older first-emerged heads on primary tillers would be unprotected when they were most susceptible to infection. So, if early conditions were somewhat favorable for

infection, the crop might show significant head scab on primary tillers and almost none on secondary tillers.

So as you can see, the uniformity of the crop can have a very significant impact on head scab (and DON), even if fungicides were applied. Also, I cannot stress enough that those fungicides currently labeled for use in managing head scab and DON are average compared to how those same fungicides perform against other fungal diseases, such as leaf rust and the various fungal blotch diseases. Efficacy of fungicides against head scab and DON can approach 75% control compared to a non-treated susceptible cultivar. However, control is much lower (40-55%) when fungicides are applied to cultivars that are susceptible to head scab (and DON).

Unfortunately, many, many acres last fall were planted to scab-susceptible cultivars because of availability issues for the best resistant cultivars or because farmers did not seek out resistant cultivars. Fields planted to a scab-susceptible cultivar were automatically compromised in terms of the potential for fungicides to suppress head scab and DON.

Lastly, I need to add that the weather conditions made it very difficult for some farmers to spray their wheat at the best time to achieve optimal scab/DON control. This is a very common conundrum: the very conditions that favor head scab and demand a fungicide application are the same conditions that make it difficult or even impossible to spray. Switching from ground to aerial application sometimes can fill the need; but at other times it is not even possible to spray aerially. In those cases, head scab and DON might still occur in spite of one's best efforts to do the "right thing."

As this commentary illustrates, head scab and DON management can be very complicated. Sometimes the head scab/DON results experienced for a field defy understanding. Usually, however, one can figure out where things went wrong. Fortunately, a great many acres of wheat in Kentucky yielded well and had low head scab and DON - though I realize this is no consolation for producers who are now dealing with moderate to high DON in their grain. ❖



National FHB Forum Scheduled For December 7-9 in St. Louis

The National Fusarium Head Blight Forum returns to St. Louis this year. The Hyatt Regency St. Louis at the Arch, site of the 2011 FHB Forum, once again is the venue for the 2014 event, which is scheduled for December 7-9. This will be the 17th FHB Forum.

Hosted by the U.S. Wheat & Barley Scab Initiative, the annual Forum is geared toward public and private scientists, millers, maltsters and brewers, additional food processors, wheat and barley growers, grower group representatives, consumers and others with interest in Fusarium Head Blight (scab) and its impact.

The 2014 FHB Forum begins at 1:00 p.m. on Sunday, December 7, and concludes at noon on Tuesday, the 9th. The program will consist of oral

and poster presentations, along with focus group discussions. A draft of the full program should be available by early September. For updates, visit www.scabusa.org. The USWBSI website also includes details on registration and making hotel reservations.

Here's a synopsis of key dates:

- Nov. 3 - Deadline for registration of posters/papers/abstracts.
- Nov. 7 - Deadline for submission of abstract and paper content for the Forum proceedings.
- Nov. 11 - Deadline for early registration; last day for full refund.
- Nov. 17 - Last day to reserve hotel room with guaranteed availability and rate.
- Nov. 21 - Last day to receive a partial refund.
- Dec. 1 - Online registration close.

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• Liu, S., Griffey, C.A., Hall, M.D., McKendry, A.L., Chen, J.L., Brooks, W.S., Brown-Guedira, G., Van Sanford, D., and Schmale, D.G. 2013. Molecular characterization of field resistance to Fusarium head blight in two US soft red winter wheat cultivars. *Theoretical and Applied Genetics*. Volume 126, Issue 10, pp 2485-2498. <http://link.springer.com/article/10.1007%2Fs00122-013-2149-y>

• Nelson BA, Ramaiya P, Lopez de Leon A, Kumar R, Crinklaw A, Jolkovsky E, Crane JM, Bergstrom GC, Rey MW. 2014. Complete genome sequence for the Fusarium head blight antagonist *Bacillus amyloliquefaciens* strain TrigoCor 1448. *Genome Announc*. 2(2):e00219-14. doi:10.1128/genomeA.00219-14.

• Prussin, A.J., Ross, S.D., and Schmale, D.G. 2014. Monitoring the long distance transport of Fusarium graminearum from field-scale sources of inoculum. *Plant Disease* 98(4): 504-511. <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-06-13-0664-RE>

• Prussin, A.J., Szanyi, N.A., Welling, P.I., Ross, S.D., and Schmale, D.G. 2014. Estimating the Production and Release of Ascospores from a Field-scale Source of Fusarium graminearum Inoculum. *Plant Disease* 98 (4): 497-503. <http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-04-13-0404-RE>

• Spolti, P., Del Ponte, E.M., Cummings, J.A., Dong, Y., and Bergstrom, G.C. 2014. Fitness attributes of Fusarium graminearum isolates from wheat in New York possessing a 3-ADON or 15-ADON trichothecene genotype. *Phytopathology* 104: 513-519.

• Spolti, P., Del Ponte, E.M., Dong, Y., Cummings, J.A., and Bergstrom, G.C. 2014. Assessment of triazole sensitivity in a contemporary population of Fusarium graminearum from New York wheat fields and competitiveness of a tebuconazole-resistant isolate. *Plant Disease* 98: 607-613. ❖

Listings of recent FHB-related publications by USWBSI-associated principal investigators are invited for submission to be listed in future issues. Listings can be sent to Don Lilleboe at dlilleboe@forumprinting.com.



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 Peer-Reviewed Scab-Related Publications

• Berger, G., Green, A., Khatibi, P.A., Brooks, W.S., Rosso, L., Liu, S., Chao, S., Griffey, C.A., and Schmale, D.G. 2014. Characterization of Fusarium head blight resistance and deoxynivalenol accumulation in hulled and hullless winter barley. *Plant Disease* 98 (5): 599-606.

<http://apsjournals.apsnet.org/doi/abs/10.1094/PDIS-05-13-0479-RE>

• Crane, J.M., Frodyma, M.E., and Bergstrom, G.C. 2014. Nutrient-induced spore germination of a *Bacillus* biocontrol agent on wheat spikes. *J. Applied Microbiology*. DOI 10.1111/jam.12480.

• Keller, M.D., G.C. Bergstrom, and E.J. Shields. 2013. The aerobiology of Fusarium graminearum. *Aerobiologia* DOI 10.1007/s10453-013-9321-3.

• Khatibi, P.A., McMaster, N., Musser, R., and Schmale, D.G. 2014. Survey of Mycotoxins in Corn Distillers' Dried Grains with Solubles from Seventy-Eight Ethanol Plants in Twelve States in the U.S. in 2011. *Toxins* 6(4): 1155-1168. <http://www.mdpi.com/2072-6651/6/4/1155>

• Khatibi, P.A., Wilson, J., Berger, G.,

