

**USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY16 Final Performance Report
Due date: July 28, 2017**

Cover Page

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Fiscal Year:	2016
USDA-ARS Agreement ID:	59-0206-4-035
USDA-ARS Agreement Title:	Improved Malt Barley Production in the Northeast.
FY16 USDA-ARS Award Amount:	\$ 17,205
Recipient Organization:	University of Vermont and State Agricultural College Sponsored Project Administration 217 Waterman Building 85 South Prospect St. Burlington VT 05405
DUNS Number:	66811191
EIN:	03-0179440
Recipient Identifying Number or Account Number:	000028951
Project/Grant Reporting Period:	6/1/16 - 5/31/17
Reporting Period End Date:	05/31/17

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Integrated Management of FHB and DON in Barley in New England.	\$ 17,205
	FY16 Total ARS Award Amount	\$ 17,205


7/24/17

 Principal Investigator /Date

* MGMT – FHB Management
 FST – Food Safety & Toxicology
 GDER – Gene Discovery & Engineering Resistance
 PBG – Pathogen Biology & Genetics
 EC-HQ – Executive Committee-Headquarters
 BAR-CP – Barley Coordinated Project
 DUR-CP – Durum Coordinated Project
 HWW-CP – Hard Winter Wheat Coordinated Project
 VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
 SPR – Spring Wheat Region
 NWW – Northern Soft Winter Wheat Region
 SWW – Southern Soft Red Winter Wheat Region

Project 1: *Integrated Management of FHB and DON in Barley in New England.*

1. What are the major goals and objectives of the project?

Public interest in sourcing local foods has extended into beverages, and the current demand for local brewing and distilling ingredients is quickly increasing. One new market that has generated interest of both farmers and end-users is malting barley. Until recently, local malt was not readily available to brewers or distillers. However, a rapid expansion of the fledgling malting industry will give farmers new markets and end-users hope of readily available malt. One major obstacle for growers is *Fusarium* head blight (FHB) infection of grain. This disease is currently the most important disease facing organic and conventional grain growers in the Northeast, resulting in loss of yield, shriveled grain, and most importantly, mycotoxin contamination. The project objectives were to:

1. Evaluate spring and winter barley varieties in order to identify those that are suitable for malting and adapted to the Northeast.
2. Determine the efficacy of using fungicides to control FHB infection of spring malting barley.
3. Determine the efficacy of using fungicides to control FHB infection of spring wheat.

2. What was accomplished under these goals?

Objective 1. Continue to evaluate spring and winter barley varieties in order to identify those that are suitable for malting and adapted to the Northeast.

Variety trials were implemented to identify varieties suitable for malting and adapted to the Northeast. Twenty-four winter barley cultivars were established in September 2015. In addition, a spring barley variety trial, consisting of twenty-five different varieties, was established in April 2016. These varieties were evaluated for disease resistance/tolerance as well as yield and quality.

Many of the varieties in the winter barley trial were developed in environments much different from New England. Hence, it is important to evaluate the varieties for tolerance to our climate. The winter survival of the malting barley plots were assessed on April 21, 2016. There was severe winterkill in all of the plots and therefore the trial was terminated.

Overall, the 2016 growing season was ideal for growing spring barley. The warmer than average temperatures along with below normal rainfall throughout much of the growing season resulted in higher yields and quality. The average yield was 3,213 lbs ac⁻¹, 1,635lbs ac⁻¹ higher than the 2015 average yield. Test weight, a measure of grain plumpness, also an indicator used to determine malt quality, was the only quality parameter that was low, all varieties were below the ideal malting test weight of 48 lbs per bushel. However, kernel plumpness did not appear to be impacted, all varieties were above 90% for plumpness. The average percent protein this year was 10.4%, 2.88% higher than the trial mean in 2015. Twenty-three of the 25 spring barley varieties had protein levels that met industry standards. All varieties were below the 1ppm FDA recommend limit for DON concentration. The average DON level in 2016 was 0.23 ppm, 1.18 ppm lower than the average DON level in 2015. Outcomes showed that in an excellent growing season the Northeast could produce significant yield and high quality barley.

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Objective 2. Determine the efficacy of using fungicides to control Fusarium head blight infection of spring malting barley.

Fungicide applications have proven to be relatively effective at controlling FHB in other barley growing regions. No work has been done in this region on the optimum timing for a fungicide application to barley specifically to minimize DON levels. In addition, there are limited studies evaluating organic approved biofungicides, biochemicals, or biostimulants for management of this disease. In April of 2016 we initiated the third year of a spring barley fungicide trial to determine the efficacy and timing of fungicide application to reduce FHB infection on cultivars with varying degrees of disease susceptibility. These treatments were assessed for FHB severity as well as yield and quality.

The warmer than average temperatures along with below normal rainfall throughout much of the growing season resulted in minimal fungal growth. This is evident in the low DON concentrations in both varieties. All of the treatments, including the untreated control and the Fusarium only plots, had DON concentrations below the 1 ppm threshold. The application of a conventional fungicide (Prosaro) at heading and 4-days after heading had the lowest DON concentrations and the highest yields. It is interesting, given the ideal growing conditions, that none of the treatments attained the industry standard for test weight. Drought conditions might have contributed to overall low test weights. Future research across years is needed to evaluate fungicides.

Objective 3. Determine the efficacy of using fungicides to control FHB infection of spring wheat.

Limited work has been done in this region on fungicide application to spring wheat specifically to minimize FHB and ultimately reduce DON mycotoxin production. In April of 2016, we established a spring wheat fungicide trial to determine the efficacy of a conventional fungicide application to reduce FHB infection on cultivars with varying degrees of disease susceptibility.

Similar results were recorded in the spring wheat fungicide trial. All of the treatments had DON concentrations below the 1 ppm threshold. Prosaro applied at flowering had lowest DON concentrations. By variety, Glenn had the lowest harvest moisture and DON concentrations.

3. What opportunities for training and professional development has the project provided?

Through this project 387 stakeholders received training at 1 conference and 5 field days.

4. How have the results been disseminated to communities of interest?

Research reports were written for each of the trials and disseminated via our website, www.uvm.edu/extension/cropsoil and hard copies were distributed at our conferences, workshops and field days to 387 stakeholders.

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Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY16 award period. The term “support” below includes any level of benefit to the student, ranging from full stipend plus tuition to the situation where the student’s stipend was paid from other funds, but who learned how to rate scab in a misted nursery paid for by the USWBSI, and anything in between.

1. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their MS degree during the FY16 award period?**
No
If yes, how many?

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY16 award period?**
No
If yes, how many?

3. **Have any post docs who worked for you during the FY16 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**
No
If yes, how many?

4. **Have any post docs who worked for you during the FY16 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**
No
If yes, how many?

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Release of Germplasm/Cultivars

Instructions: In the table below, list all germplasm and/or cultivars released with full or partial support through the USWBSI during the FY16 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations. *Leave blank if you have nothing to report or if your grant did NOT include any VDHR-related projects.*

Name of Germplasm/Cultivar	Grain Class	FHB Resistance (S, MS, MR, R, where R represents your most resistant check)	FHB Rating (0-9)	Year Released

Add rows if needed.

NOTE: List the associated release notice or publication under the appropriate sub-section in the ‘Publications’ section of the FPR.

Abbreviations for Grain Classes

- Barley - BAR
- Durum - DUR
- Hard Red Winter - HRW
- Hard White Winter - HWW
- Hard Red Spring - HRS
- Soft Red Winter - SRW
- Soft White Winter - SWW

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Publications, Conference Papers, and Presentations

Instructions: Refer to the FY16-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY16 grant. Only include citations for publications submitted or presentations given during your award period (6/1/16 - 5/31/17). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

Journal publications.

Books or other non-periodical, one-time publications.

Other publications, conference papers and presentations.

Darby, H., A. Hazelrigg, E. Cummings, and G. Maia. 2016. 2016 Small Grain Disease and Insect Pest Scouting Report. University of Vermont Extension Northwest Crops and Soils Program, St. Albans, VT. Available online at: <http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2016-Grains-Pest-Scouting-Report.pdf> (accessed 10 Jul. 2017).

Status: Published

Acknowledgement of Federal Support: Yes

Darby, H., E. Cummings, and H. Emick. 2017. 2016 Organic Spring Barley Variety Trial. University of Vermont Extension Northwest Crops and Soils Program, St. Albans, VT. Available online at: <http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2016-Organic-Spring-Barley-VT.pdf> (accessed 10 Jul. 2017).

Status: Published

Acknowledgement of Federal Support: Yes

Darby, H., E. Cummings and J. Post. 2017. The Efficacy of Spraying Fungicides to Control Fusarium Head Blight Infection in Spring Malting Barley. University of Vermont Extension Northwest Crops and Soils Program, St. Albans, VT. Available online at: <http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2016-Spring-Barley-Fungicide.pdf> (accessed 10 Jul. 2017).

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Darby, H., E. Cummings and J. Post. 2017. The Efficacy of a Fungicide Application to Control Fusarium Head Blight Infection in Spring Wheat. University of Vermont Extension Northwest Crops and Soils Program, St. Albans, VT. Available online at: <http://www.uvm.edu/extension/cropsoil/wp-content/uploads/2016-Spring-Wheat-Prosaro.pdf> (accessed 10 Jul. 2017).

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Darby, H., A. Hazelrigg, E. Cummings, and G. Maia. 2016 Small Grain Scouting Report. 'Fungi, Bacteria, and Insects, Oh My!' Presented March 23, 2017, at the Annual Grain Growers Conference, Essex, VT.

Status: Published

Acknowledgement of Federal Support: Yes