USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY15 Final Performance Report
Due date: July 15, 2016

Cover Page

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Fiscal Year:	2015
USDA-ARS Agreement ID:	59-0206-4-035
USDA-ARS Agreement Title:	Improved Malt Barley Production in the Northeast.
FY15 USDA-ARS Award Amount:	$ 14,577
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
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Project/Grant Reporting Period:	06/01/15-05/31/16
Reporting Period End Date:	05/31/16

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
MGMT	Enhancing the Capacity of Farmers to Produce Malting Barley in the Northeast.	$ 14,577
	FY15 Total ARS Award Amount	**$ 14,577**

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: *Enhancing the Capacity of Farmers to Produce Malting Barley in the Northeast.*

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 ingredients is quickly increasing. Until recently, local malt was not readily available to brewers or distillers. However, a rapid expansion of the fledgling malting industry will hopefully give farmers new markets and end-users hope of readily available malt. To date, the operating maltsters struggle to source enough local grain to match demand for their product. In addition to short supplies, the local malt barley that is available often does not meet the rigid quality standards for malting. 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. The major goal of this project is to enhance the production of barley in the northeast by providing growers with tools to manage FHB. The project objectives were:

1) Determine spring and winter barley varieties adapted to the Northeast.
2) Determine the efficacy of fungicides to control FHB infection in spring malting barley.
3) Determine the impact of seeding rate and interseeding on barley quality and yield.

2. What was accomplished under these goals?

1) Major Activities

Variety Trials

A variety trial with 34 winter barley cultitvars was established in September, 2014. In addition, a spring barley variety trial, consisting of 20 different varieties, was established in April, 2015. These varieties were evaluated for disease as well as yield and quality.

Fungicide Trials - In April of 2015 a spring barley fungicide trial was conducted to determine the efficacy and timing of fungicide application to reduce FHB infection on cultivars with varying degrees of disease susceptibility. These treatments included 5 organic and 1 conventional fungicide that were assessed for their ability to control FHB severity as well as their impact on yield and quality.

Interseeding x Seeding Rate Trial - In April of 2015 a spring malting barley seeding rate by interseeding trial was inconducted. Seeding rates were 70 and 125 lbs per acre and plots were interseeded with white clover.

2) Specific Objectives

Over the last year the following objectives were the focus on our work:

1 Evaluated spring and winter barley to identify those adapted to the Northeast.
2 Evaluated efficacy of fungicides to control FHB in malting barley.
3 Evaluated the impact of seeding rate and interseeding on barley yield and quality.

3) Significant Results

Variety Trials - The lack of snow cover and sub-zero temperatures in the winter of 2015 resulted in the winter kill of the winter barley variety trial. The 2015 growing season presented some challenging

weather conditions for grain production. The relatively dry conditions in April allowed for timely planting of spring grain mid-April. However, the cool temperatures and excessive rain in June delayed plant development and created ideal conditions for weed and fungal growth. In general, the weather conditions reduced overall grain yield and quality in 2015. However, we did identify six varieties (Scarlett, Colon, Harrington, Full Pint, Newdale, and Cerveza) that had DON levels below 1ppm.

Fungicide Trials - The cooler than average temperatures along with the higher than normal rainfall in June created the ideal conditions for FHB. This was evident in the high DON concentrations we found in both varieties. The only treatment that resulted in a DON level below 1ppm was Prosaro, a conventional fungicide, applied at anthesis to Conlon. Even though all but one of the treatments resulted in DON concentrations above 1 ppm, it's important to note that Conlon, a moderately resistant variety, had lowest incidence of FHB and DON levels, while Rasmussen, a susceptible variety, had DON levels three times greater (4.90 ppm) than Conlon (1.74 ppm). This indicates the importance of selecting resistant cultivars to manage FHB in our region.

Interseeding x Seeding Rate Trial - This first year of data suggested that a low seeding rate of 75 lbs ac^{-1} did not differ significantly in yield or quality from the higher seeding rate of 125 lbs ac^{-1}. In addition, we found that clover planted in the understory of barley had no significant impact on plant disease, yield and quality compared to the no clover control.

4) Key Outcomes or Other Achievements

No work has been done in this region on the optimum timing for a fungicide application to barley specifically to minimize DON. In addition, there are limited studies evaluating organic approved biofungicides for management of this disease. This study provided key insight as to how fungicides might perform under severe FHB pressure. A key outcome was understanding that winter barley will likely not perform well in the Northeast.

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

The project technician and project PI attended a barley quality testing professional development meeting held by Aaron MacLeod. Aaron MacLeod is the director at the Center for Craft Food and Beverage at Hartwick College in Oneonta, NY.

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. Stakeholders were able to view research and learn about results at field days.

- June 27, 2015- 3rd Annual Grain Research Tour, Alburgh, VT. Toured grain research plots, discussed 2014 and 2015 research trial results, malting barley experts from North Dakota State were on hand to talk answered questions from participants. There were 42 in attendance.
- July 23, 2015- Annual Crops & Soils Field Day, Alburgh, VT. Toured the research plots and discussed trials and answered questions from growers. There were 236 attendees.

- March 17, 2016- 12th Annual Grain Growers Conference, Essex, VT. Presented research results from the 2015 trials. There were 143 in attendance.

Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY15 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 FY15 award period?**

   If yes, how many? No

2. **Did any graduate students in your research program supported by funding from your USWBSI grant earn their Ph.D. degree during the FY15 award period?**

   If yes, how many? No

3. **Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant taken faculty positions with universities?**

   If yes, how many? No

4. **Have any post docs who worked for you during the FY15 award period and were supported by funding from your USWBSI grant gone on to take positions with private ag-related companies or federal agencies?**

   If yes, how many? No

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 FY15 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

Publications, Conference Papers, and Presentations
Refer to the FY15-FPR_Instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY15 grant. 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., E. Cummings, and L. Calderwood. 2016. 2015 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/2015GrainsPestScoutingReport.pdf (accessed 11 Jul. 2016).
Status: Published
Acknowledgement of Federal Support: Yes

Darby, H., E. Cummings, L. Calderwood, J. Cubins, A. Gupta, J. Post, and S. Ziegler. 2016. 2015 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/2015-Organic-Spring-Barley-Variety-Trial.pdf (accessed 11 Jul. 2016).
Status: Published
Acknowledgement of Federal Support: Yes

Darby, H., J. Cubins, L. Calderwood, E. Cummings, A. Gupta, J. Post, and S. Ziegler. 2016. 2015 Spring Barley Seeding Rate and Interseeding 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/2015-Spring-Barley-SR-and-Interseed-Trial.pdf (accessed 11 Jul. 2016).
Status: Published
Acknowledgement of Federal Support: Yes

Darby, H., E. Cummings, L. Calderwood, J. Cubins, A. Gupta, J. Post, and S. Ziegler. 2015. 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/2015-Spring-Barley-Fungicide.pdf (accessed 11 Jul. 2016).
Status: Published
Acknowledgement of Federal Support: Yes

Presentations

Darby, H. 2016. Building a Local Grain Economy. Hudson Valley Grain Meeting. 5 Feb. 2016. Leeds, NY.
Status: Published
Acknowledgement of Federal Support: Yes

Darby, H., E. Cummings, H. Emick and A. Gupta. 2016. 2015 Research Updates. Presented at: The 12th Annual Grain Growers Conference, Essex, VT. 17 Mar. 2016
Status: Published
Acknowledgement of Federal Support: Yes

Darby, H. 2015. Growing Grains for Local Markets. Growing Organic Pennsylvania Conference. 15, 16 Dec. 2015. Harrisburg, PA.
Status: Published
Acknowledgement of Federal Support: Yes

Darby, H. 2015. Value Added Grain Production. The 2nd Annual Ecological Farmers of Ontario Conference, 3-5 Dec. 2015. London, Ontario, Canada.
Status: Published
Acknowledgement of Federal Support: Yes