

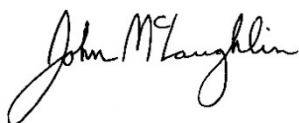
USDA-ARS
U.S. Wheat and Barley Scab Initiative
FY18 Performance Report
Due date: July 12, 2019

Cover Page

Principle Investigator (PI):	John McLaughlin
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Phone:	848-932-6359
Fiscal Year:	2018
USDA-ARS Agreement ID:	59-0206-8-213
USDA-ARS Agreement Title:	Suppression of FHB by Green Leaf Volatiles (GLVs).
FY18 USDA-ARS Award Amount:	\$ 38,760
Recipient Organization:	Rutgers, The State University of New Jersey Division of Grant and Contract Accounting ASB 111, 3 Rutgers Plaza New Brunswick, NJ 08901-8559
DUNS Number:	00-191-2864
EIN:	22-6001086
Recipient Identifying Number or Account Number:	824625 (Oracle # 124243)
Project/Grant Reporting Period:	7/1/18 - 6/30/19
Reporting Period End Date:	06/30/19

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
GDER	Suppression of FHB by Green Leaf Volatiles (GLVs).	\$ 38,760
	FY18 Total ARS Award Amount	\$ 38,760



Principal Investigator

7/9/19

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

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Project 1: *Suppression of FHB by Green Leaf Volatiles (GLVs).*

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

Previously we showed that the green leaf volatile (2-hexenal) has potent antifungal properties, including against *Fusarium graminearum*. The main objective of this study is to determine if VOCs affect susceptibility of wheat to FHB and whether production of these volatiles in wheat would enhance resistance.

Our specific objectives are:

- 1) Determine the effect of volatile treatment on susceptibility of wheat to *F. graminearum*.
- 2) Determine if the volatile treatment induces expression of the defense genes in wheat.
- 3) Determine if FHB resistance can be improved by increasing the production of volatiles in wheat.

2. What was accomplished under these goals? *Address items 1-4) below for each goal or objective.*

1) major activities

We have performed time course assays to determine the impact of four different concentrations of 2-hexenal on the induction of plant defense genes. We grew wheat plants in Sigma containers (1 liter, sealed) and sampled the material at 0, 1, 2, and 4 days after exposure.

We have also performed joint exposure assays to wheat growing in the Sigma containers. Using the optimum concentration of 2-hexenal identified in the plant defense gene assay, we also applied fungal spores to wounded leaves to determine if the VOC treatment impacted the growth of the fungus.

2) specific objectives

We collected RNA from time course studies to identify plant defense genes related to VOC treatment. Understanding the dynamics between VOC treatment and fungal growth on wheat leaf tissue is a key objective.

3) significant results

We have identified several plant defense genes differentially regulated upon exposure to GLVs. However, treatment of wheat to the GLV 2-hexenal results in significantly increased fungal growth on the plant relative to the mock control.

4) key outcomes or other achievements

Our laboratory, in collaboration with Professor Joan Bennett, has found that the retromer is a key factor for fungal tolerance to GLVs. Retromer genes will be tested from the RNA/cDNA libraries collected from both the fungal and plant samples (VOC treated vs mock treated) to investigate the role of this important gene family. Disruption of

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retromer function by VOC treatment is hypothesized to impact the plant response to the fungus.

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

The project has provided for the training for four undergraduate students (Maha Kahn, Noura AlDarwish (RISE Scholar), Waner Zheng (Douglas Scholar), and Jeffrey Garcia-Sanchez (McNair Scholar)) and one PhD student (Khadija Abdulhafid). The students have learned how to grow *Fusarium graminearum*, grow wheat/barley in the greenhouse, isolate *Fusarium* conidia and count the spores with a hemocytometer and flow cytometry, how to inoculate plants, how to perform protein isolations and analysis using SDS-PAGE/Western, how to isolate high quality plant DNA, and how to perform qPCR. The students give presentations during lab meetings and learn how to prepare and present posters.

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

This research has not been communicated to the public yet but we plan to present our findings at the 2019 USWBSI meeting.

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Training of Next Generation Scientists

Instructions: Please answer the following questions as it pertains to the FY18 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 FY18 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 FY18 award period?**

No.

If yes, how many?

- 3. Have any post docs who worked for you during the FY18 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 FY18 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 FY18 award period. All columns must be completed for each listed germplasm/cultivar. Use the key below the table for Grain Class abbreviations.

NOTE: 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 FY18-FPR_Instructions for detailed instructions for listing publications/presentations about your work that resulted from all of the projects included in the FY18 grant. Only include citations for publications submitted or presentations given during your award period (7/1/18 - 6/30/19). If you did not have any publications or presentations, state 'Nothing to Report' directly above the Journal publications section.

NOTE: Directly below each reference/citation, you must indicate the Status (i.e. published, submitted, etc.) and whether acknowledgement of Federal support was indicated in publication/presentation. See example below for a poster presentation with an abstract:

Conley, E.J., and J.A. Anderson. 2018. Accuracy of Genome-Wide Prediction for Fusarium Head Blight Associated Traits in a Spring Wheat Breeding Program. In: Proceedings of the XXIV International Plant & Animal Genome Conference, San Diego, CA.
Status: Abstract Published and Poster Presented
Acknowledgement of Federal Support: YES (poster), NO (abstract)

Nothing to report.

Journal publications.

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

Other publications, conference papers and presentations.