U.S. Wheat and Barley Scab Initiative
FY01 Final Performance Report (approx. May 01 – April 02)
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Cover Page

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Year:	**FY2001 (approx. May 01 – April 02)**
Grant Number:	**59-0790-9-037**
Grant Title:	**Fusarium Head Blight Research**
FY01 ARS Award Amount:	**$ 77,852**

Project

Program Area	Project Title	Requested Amount
Variety/Uniform	Fusarium head blight resistant wheat variety development for Ohio and uniform nursery maintenance	$ 79,974
	Total Amount Requested	**$ 79,974**

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Principal Investigator Date

(Form – FPR01)

Project 1: Fusarium head blight resistant wheat variety development for Ohio and uniform nursery maintenance

1. What major problem or issue is being resolved and how are you resolving it?

Host resistance is the most feasible method for minimizing losses from FHB. Unfortunately our current levels of resistance are inadequate to protect against severe infestations and breeding for improve resistance is difficult. The difficulty arises from the quantitative nature of resistance, error in screening methods, and the need to combine genes from different sources to obtain high levels of resistance. Our research attempts enhance host resistance to FHB by identifying adapted lines with strong resistance and improvinge selection efficiency. To do this we are screening many lines derived from adapted by adapted crosses for FHB resistance. Fortunately there is a moderate amount of resistance in the SRWW gene pool. We are also evaluating lines derived from multiple sources of resistance in an attempt to combine resistance genes from complementary sources of resistance. Hopefully, some of the gene combinations will prove stronger than our present levels of resistance. In addition, growers need resistance to multiple diseases so we are attempting to develop lines with resistance to FHB and *Stagonospora nodorum*, and common disease in Ohio.

Theoretically, selection for FHB resistance can be improved by using molecular markers to select lines with chromosome segments with resistance genes. Mapping studies have identified markers associated with FHB resistance, but the utility of these markers in different genetic backgrounds and environments must be assessed to determine if marker assisted selection is beneficial. We are developing germplasm and data to assess the value of these markers in SRWW.

Variability in environments can greatly impact selection for FHB resistance. Testing over multiple locations is required to be certain of having adequate data to make annual selections. Multi-site testing requires coordination to develop entry lists and synthesize a meaningful report. The OSU wheat breeding program provides such coordination.

2. What were the most significant accomplishments?

OSU field tested 147 lines derived from adapted x adapted crosses in 2001. Of these, 40% were at least as resistant as "Freedom" our moderately resistant check. Nearly 14% appeared to have greater resistance than Freedom. This data was combined with yield performance data to select lines that were advanced to the 2002 tests. We planted 522 similar breeding lines in the fall of 2001 for a 2002 evaluation.

Nearly 60 lines previously selected for high levels of resistance to FHB and Stagonospora leaf and glume blotch (SLGB) were field tests for FHB resistance in 2001. Forty four of these were selected for future yield testing based on their resistance. Greater resistance to FHB than SLGB was obtained in these selections. The FHB indes of the selected lines ranged from 0.1 to 15.9 (Freedom was 21 while the susceptible check was 48). Some of these lines also had moderate resistance to SGB or SLB.

Freedom appears to be a useful source of resistance for SRWW breeders. It is adapted to Ohio and has adequate quality characteristics. Marker analysis indicate that Freedom has a major resistance gene on chromosome 2AS. We completed greenhouse testing of 258 lines

derived from Freedom in FY01 and established a field nursery to screen these lines. The greenhouse assay did not work well as heading was spread over a six week period. This introduced considerable variation in the disease data. The data, while suspect, did suggest some line had good resistance, a finding we hope to confirm in the field trial. In addition, we obtained DNA from each line and will determine if resistance is associated with marker genotype at chromosome 2AS. We are also using this material to generate near isogenic lines (NIL) to further assess the utility of marker-assisted selection for the Freedom 2AS gene in improving FHB resistance.

We advanced many populations derived from crosses of adapted lines with Yugoslavian, Brazilian, and Japanese sources of resistance. We also initiated crossed of adapted material with CIMMYT germplasm whose resistance appears to be derived from *Triticum tauschii*.

We advanced population for developing NIL for major resistance genes from Ning 7840 (on 3BS) and Freedom (on 2AS). Theoretically, combining such strong resistance genes should provide stronger resistance than either gene on its own. Our preliminary data indicates that this did not occur as the combination of genes was no better than the strongest gene on its own. The NIL will be crucial to establishing the nature of any epistatic interaction among these genes. This will provide essential information to breeders attempting to combine genes for maximium resistance.

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Gupta, A., P. Lipps, K. Campbell, and C.H. Sneller. 2001. Molecular and pedigree analysis of wheat genotypes with resistance to Fusarium Head Blight. American Society of Agronomy, Charlotte, Oct. 21-25, 2001.

Gupta, A., P. Lipps, K. Campbell, and C.H. Sneller. 2001. QTL analysis of resistance to Fusarium Head Blight in the wheat lines Ning7840 and Freedom. American Society of Agronomy, Charlotte, Oct. 21-25, 2001.

Gupta, A., P. Lipps, K. Campbell, and C.H. Sneller. 2001. QTL analysis of resistance to Fusarium Head Blight in the wheat lines Ning7840 and Freedom. Canadian Fusarium Head Blight Forum, Ottawa, Nov. 4-5, 2001.

Sneller, C.H., and P. Lipps. 2001. Breeding for FHB resistance at the Ohio State University, US Fusarium Head Blight Forum, Cincinnati, Dec. 8-10, 2001.

Sneller, C.H., L. Herald, and P. Lipps. 2001. Report of the Northern Uniform Winter Wheat Scab Nursery for 2001. US Fusarium Head Blight Forum, Cincinnati, Dec. 8-10, 2001.

Gupta, A., P. Lipps, K. Campbell, and C.H. Sneller. 2001. Molecular and pedigree analysis of wheat genotypes with resistance to Fusarium Head Blight. US Fusarium Head Blight Forum, Cincinnati, Dec. 8-10, 2001.

Gupta, A., P. Lipps, K. Campbell, and C.H. Sneller. 2001. QTL analysis of resistance to Fusarium Head Blight in the wheat lines Ning7840 and Freedom. US Fusarium Head Blight Forum, Cincinnati, Dec. 8-10, 2001.

Sneller, C.H.. 2002. Breeding for scab resistance. Presentation to 49th Annual Soft Wheat Quality Lab Review, Wooster, OH, April 10th, 2002.

Sneller, C.H.. 2002. Breeding for scab resistance. Presentation to Eastern Wheat Worker Workshop. St Louis, MO, May 20th, 2002.