

Project FY22-NW-007: Use of Traditional and Molecular Breeding to Develop FHB Resistant SRWW for Ohio

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

Goal 1. Breed for resistance to FHB, high yield, test weight, and other traits required for new cultivars

Goal 2. Coordinate and participate in the NWW-CP uniform FHB nursery

Goal 3. Assess SRWW germplasm for resistance to toxin accumulation

2. What was accomplished under these goals or objectives? (For each major goal/objective, address these three items below.)

What were the major activities?

Goal 1: Over 800 OSU breeding lines were planted in the 2022-2023 FHB nursery. Unfortunately, we did not get enough visual symptoms to assess FHB Index. We did collect grain samples for FDK and DON assessments. 77 new crosses involving parents with FHB resistance were made: 52 of 77 were made between parents that were both homozygous for resistance at Fhb1. Additional populations were advanced. 800 OSU lines were planted in the Fall of 2023 for assessing their FHB resistance in June of 2024

Goal 2: The 2022-2023 P+NUWWSN consisted of 86 lines that were tested for FHB resistance at locations in NE, IL, IN, MI, KY, OH, NY, and VA. OSU assessed this trial in Wooster Ohio. OSU compiled the data from the trial and prepared a report. OSU also coordinated the entry list and seed distribution of the 2023-2024 P+NUWWSN trials. We also had 87 entries from the Ohio Wheat Performance Trial in the 2022-2023 nursery, though we were not able to collect and useful data due to low disease pressure.

Goal 3: Data from three locations, three years and 234 SRWW breeding lines were collected on Index, FDK, DON, and fungal biomass (FB). The data was used to estimate Resistance to Toxin Accumulation (RTA) and to assess the associate among all traits.

What were the significant results?

Goal 1: We had low visual symptoms in the 2023 FHB nursery but FDK and DON values were high. Over 60% of all OSU had lower DON than Truman (Table 1) and >40% had less FDK than Truman.

Table 1. Percentage of OSU breeding lines in the 2023 OSU trials with less FDK or DON than the resistance check Truman.

	% < Truman		% OSU Lines Homozygous for res at FHB1
	DON	FDK	
Stage-2	91%		
Stage-3	66%	40%	81%
Stage-4	76%	57%	50%

81% of lines in the OSU stage-3 lines and 50% of stage-4 lines are homozygous for resistance at Fhb1 (Table 1).

Goal 2: A report was prepared, and the 2023-2024 trials were established

Goal 3: We determined the association of all traits with DON. We found that FDK was a key predictor of DON along with FB. We noted significant genetic effects and heritability for RTA.

List key outcomes or other achievements.

Goal 1: We released 4 new cultivars in 2023-2024. OH18-65-54 had significantly less DON and FDK than Truman (Table 2).

Table 2. FHB assessments of four new OSU releases and three FHB checks

Name	Release	DON (ppm)	FDK (%)	INDEX (%)
TRUMAN "Res"		7.7	23.3	12.8
FREEDOM "MR"		15.4	37.6	22.5
PIONEER2545 "Sus"		21.1	53.2	29.8
OH18-65-54	Public	3.1	14.3	12.2
OH18*104-99	Licensed	8.4	22.9	25.2
OH18*105-13	Licensed	2.6	17.2	16.4
OH18-65-13	Licensed	15.1	34.1	18.8

Goal 2: A report on the 2022-2023 P+NUWWSN trials was prepared and distributed to all participants. The report can be found on the USWBSI website.

Goal 3: We determined that some lines repeatedly accumulated low DON despite high FDK or FB. The presence of resistance at FHB1 caused a significant decrease ob Index, FDK, DON, FB, and increased RTA.

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

OSU had two post-docs and four graduate students work on the FHB project. Another PhD student did his dissertation on the RTA project. In addition, OSU hosted two visiting scholars

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

The three new cultivars are being licensed and the fourth is a public release. Seed is being disseminated to growers. The P+NUWWSN report was sent to all collaborators and is on the USWBSI website.

5. What do you plan to do during the next reporting period to accomplish the goals and objectives?

Goals 1 and 2: We will continue the same activities on the 2023-2024 trials. We will reduce the number of samples for FDK and DON due to the budget cut. In addition, we will likely reduce the size of some of our trial in the FHB nursery to save labor costs.

Goal 3: we will publish the results of the RTA work