

Breeding Spring Wheat for Disease Resistance

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Reporting period: July 1, 2012 – August 29, 2013

Total project period: (Continuous)

Report type: Annual progress report

Research Summary:

The general objective of this research program is to generate new hard red spring wheat germplasm with improved levels of resistance to regionally prominent diseases; primarily *Fusarium* head blight (FHB) and bacterial leaf streak (BLS). The germplasm is used specifically to increase the frequency of more resistant types for use as parents in the breeding program. Demonstration that the objective has been successfully accomplished with respect to FHB resistance can be illustrated by noting resistance levels of Uniform Regional Scab Nursery entries submitted in 2011, as an example. Among these five experimental lines (SD4313, SD4331, SD4337, SD4338, and SD4343), four fell within the top eight of the 24 test entries when average ranks of Disease Index, FDK, and DON values were considered (Table 1). Of particular interest was SD4343, which ranked as most resistant for all variables, except DON concentration (though the line with the lowest DON concentration was only tested at a single location). Additionally, increasing levels of resistance to BLS has been accomplished through the mapping of a resistance QTL in SD4205. Molecular mapping of a second resistance source (SD4148) is underway.

Introduction:

Specific objectives of this program are to 1). continuously create and evaluate hard red spring wheat germplasm populations for resistance to FHB and BLS, and 2). utilize line selections as parents to increase the frequency of resistant materials in the breeding program.

Description of Accomplishments:

During the 2013 reporting period, thousands of experimental breeding lines were evaluated for resistance to FHB and/or BLS. Roughly 3,000 lines were evaluated only for FHB and were derived from the breeding program, other cooperating breeding programs, or as evaluations of released cultivars included in the SD Crop Performance Testing program. Approximately 3,000 additional lines were tested for both diseases as part of graduate student research projects. This resulted in data being collected for 6,000 additional rows because both FHB and BLS resistance can not be evaluated on the same plants. Data analysis is presently underway. Preliminary examination suggest that severity of both diseases was at a level where differentiation among genotypes will be possible.

Projections:

Extraordinarily dry conditions prevailed in eastern SD during summer 2012.

Unfortunately, this prevented expression of disease symptoms at levels that could

successfully differentiate known resistant and susceptible germplasm. Consequently, no useful FHB or BLS resistance data was generated in the 2012 growing season. Data from 2013 is still being analyzed, though it seems that disease expression was much better than in 2012.

Data:

TABLE 1. 2011 UNIFORM REGIONAL SCAB NURSERY FOR SPRING WHEAT PARENTS. MEANS AND RANKS OVER LOCATIONS.

ENTRY	DISEASE INDEX		FDK		DON	
	%	Rank	%	RANK	ppm	RANK
No. of Locations	4	4	4	4	4	4
SD4343	22.1	1	5.9	1	2.2	2
ND2710	27.9	2	9.4	10	5.0	19
SD4313	32.4	3	13.2	18	3.0	4
SD4338	32.6	4	8.4	6	3.5	6
10EXP13-44	34.5	5	12.4	14	3.1	5
10EXP13-24	36.3	6	7.2	3	3.7	7
BW 928	37.9	7	9.0	7	4.6	15
SD4331	38.2	8	18.7	22	5.5	21
MN09092	38.6	9	7.6	4	3.8	8
SD4337	39.3	10	9.3	8	3.8	8
10 EXPSW13-28	39.5	11	15.4	20	2.9	3
10EXP13-87	40.0	12	10.2	11	4.5	14
X00009-16	40.8	13	10.4	12	4.7	17
10EXP13-16	41.0	14	12.7	15	5.0	19
MN09023	43.1	15	6.1	2	4.1	11
2375	47.3	16	14.4	19	4.9	18
Bacup	47.9	17	12.8	16	4.6	15
MN07167W-2-1	49.5	18	7.7	5	7.5	23
MN07057-6-4	49.5	18	9.3	8	3.8	8
10 EXPSW13-19	57.2	20	12.9	17	4.4	13
10 EXPSW13-9	58.5	21	11.3	13	8.6	24
BW429*	69.0	22	.	.	0.7	1
Wheaton	75.7	23	56.1	23	6.7	22
Oslo	77.5	24	18.3	21	4.3	12
Mean	44.8		13.0		4.4	

* = evaluated at a single location.