

# Accelerated breeding for disease and insect pest resistance in winter wheat

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**Total Project Period:** (Continuous)

**Report type:** Annual progress report

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## Research Summary:

Wheat is one of the most important cereal crops in the state of South Dakota. Maintaining and increasing winter wheat yields and profitability are the primary goals of the SDSU winter wheat breeding program. The general objective of this research project is to enhance the disease and insect pest resistance in South Dakota winter wheat germplasm for development of winter wheat varieties with better resistance to Fusarium head blight (FHB or scab), stripe rust, leaf rust, Wheat streak mosaic virus (WSMV), bacterial leaf streak (BLS) and wheat sawfly. In the 2016 HWW Uniform Regional Scab Nursery, where 75 hard winter wheat experimental lines from five states were tested, three of the top 15 entries were from SDSU winter wheat breeding program. The new released variety 'Oahe', SD9227, SD10W089-3-5 and SD8200 showed better resistance as compared to Everest, the moderately resistant check. Oahe and SD10W089-3-5 also showed good resistance in HWW Uniform Regional Scab Nursery in Kansas. Samples for DON content analysis will be submitted soon. Nearly 299 released winter wheat varieties were screened for resistance to BLS and 10 moderately resistant varieties have been identified including Tandom and Hume from SDSU program. These varieties will be used as parents in breeding BLS resistant winter wheat varieties.

## Introduction:

Specific objectives of the program are to 1) continuously develop and evaluate hard red and hard white winter wheat germplasm and populations for resistance to FHB, stripe rust, leaf rust, WSMV and BLS and thus lead to increased frequency of resistant materials in the breeding program.

## Description of Accomplishments:

All advanced experimental lines were evaluated for resistance to FHB, stripe rust, leaf rust, stem rust, and WSMV either in green house or in field nurseries. During 2016 reporting period, more than 2,200 lines were evaluated only for FHB, that were derived from SDSU breeding program and cooperating breeding programs. These included released cultivars included in CPT, experimental in NRPN, SRPN, RGON, PYT, AYT and a few entries from private industry. The evaluation data helped in selection of parents in the breeding program and is also used for release of new cultivars. More than 200 segregating populations were also planted in Castroville, TX and 50- 60 heads were selected from leaf rust resistant populations. Several hundred crosses were made for mobilizing resistance to FHB, leaf rust, stripe rust, stem rust, WSMV, BLS, and wheat sawfly in to South Dakota germplasm.

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Table 1. 2016 HWW Uniform Regional FHB Nursery

Entry	Disease Index (%)	Rank	Entry	Disease Index (%)	Rank
KS-11	8.7	1	MT-6	16.5	40
16NDSU-5	11.1	2	NI12702W	16.7	41
KS-7	11.2	3	KS-14	16.8	42
16NDSU-14	11.4	4	16NDSU-3	16.8	43
KS-15	11.5	5	NE14569	16.8	44
16NDSU-15	12.0	6	MT-8	16.9	45
KS-8	12.4	7	NE14557	16.9	46
MT-5	12.6	8	MT-9	16.9	47
<b>SD09227</b>	<b>12.9</b>	<b>9</b>	SDSU9	17.0	48
<b>SD10257-2</b>	<b>12.9</b>	<b>10</b>	NE13515	17.0	49
KS-6	13.4	11	SDSU15	17.0	50
KS-3	13.7	12	LCH13NEDH-11-24	17.2	51
16NDSU-13	13.7	13	NE14494	17.4	52
MT-14	13.7	14	SDSU12	17.6	53
<b>SD10W089-3-5</b>	<b>13.7</b>	<b>15</b>	NE13604	17.7	54
MT-3	14.1	16	NE14696	17.9	55
SD08200	14.1	17	KS-9	17.9	56
MT-10	14.1	18	NE10478-1	18.3	57
KS-13	14.3	19	MT-12	18.5	58
NE12589	14.7	20	SDSU13	18.7	59
NE13625	14.9	21	Karl 92	18.9	60
16NDSU-4	15.0	22	MT-1	18.9	61
KS-5	15.1	23	KS-4	19.3	62
16NDSU-1	15.2	24	SDSU10	19.3	63
16NDSU-6	15.3	25	MT-4	19.4	64
NE05548	15.3	26	SDSU5	19.7	65
16NDSU-2	15.4	27	16NDSU-11	19.9	66
KS-12	15.4	28	SDSU6	20.0	67
KS-2	15.5	29	16NDSU-7	20.4	68
<b>Everest</b>	<b>15.6</b>	<b>30</b>	SDSU8	20.8	69
16NDSU-12	16.0	31	16NDSU-9	20.9	70
SD09113	16.1	32	MT-7	21.1	71
KS-1	16.1	33	16NDSU-8	21.3	72
16NDSU-10	16.2	34	MT-11	21.4	73
KS-10	16.3	35	NW13570	22.1	74
NE14538	16.3	36	MT-13	23.7	75
MT-2	16.3	37	MT-15	24.5	76
SD10W153	16.4	38	SDSU11	26.3	77
NE10478	16.5	39	Overley	33.2	78
<b>Mean</b>				<b>16.8</b>	