Report on the 2016-2017 Northern Uniform Winter Wheat Scab Nurseries (NUWWSN and PNUWWSN)

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INTRODUCTION

The objective of the Northern Uniform Winter Wheat Scab Nursery (NUWWSN) and the Preliminary Northern Uniform Winter Wheat Scab Nursery (PNUWWSN) is to screen winter wheat genotypes adapted to the northern portion of the eastern US for scab resistance. Breeders submit entries each also conducts the trial in inoculated and misted FHB nurseries within their programs. Data is then sent to the coordinator for summation and distribution. Public and private breeders submit lines using their own criteria for inclusion though all must be adapted. Entries vary in the degree of pretesting and selection and their purpose (germplasm, cultivars). Most of the entries have only native resistance though some have undergone MAS for *Fhb1* and other QTL.

MATERIAL AND METHODS

The locations that reported data and the traits assessed are listed in Tables 1, 2 and 3. The NUWWSN had 60 entries (56 lines & four checks, Table 4) from 11 programs and we obtained phenotypic data on seven FHB-related traits from 11 locations. The PNUWWSN had 43 entries (39 lines & four checks, Table 5) from 8 programs and we obtained phenotypic data from 8 locations. Cooperators collect replicated data and submit means to the coordinator. The means from individual locations are used in an analysis over locations. The genotype x environment interaction (GEI) term is the error and is used to calculate an LSD (0.05). The LSD value is used to determine if a particular entry mean is statistically equal to the lowest entry mean (such values are designated with an "l") or the highest entry mean (such values are designated with an "h") for each trait. Variance components were estimated using PROC MIXED from SAS considering entries and locations to be random.

RESULTS

The mean for each entry over all environments for all FHB traits are shown in tables 10 and 11. The entry mean heritability was moderate for all FHB traits though the ratio of genetic variance to error variance was < 0.50 for most traits (Table 7). We observed good levels of FHB resistance in the 2016 uniform tests, though perhaps not as quite as good as in the 2015 and 2014 tests.

- Only 31.6% of the entries in the PNUWWSN and the NUWWSN had an FHB index < that of Freedom, considerably lower than in the past four years (this was 58.7% in 2016, 68% in 2015, 69% in 2014, and 90% in2013)
- Only 3.2% of the PNUWWSN and the NUWWSN entries had an FHB index < that of Truman, similar to values found in the past four years (vs 2.2% in 2016, 23% in 2015, 4% in 2015 and 24% in 2013)
- 86.3% of the PNUWWSN and NUWWSN entries had less DON than Freedom, a value that was considerably higher than in 2016, but similar to 2015-2013 (vs 40.2% in 2016, 83% in 2015, 90 % in 2014, and 65% in 2014)
- 13.7% of the PNUWWSN and the NUWWSN entries had less DON than Truman, down some from past years (vs 19.6% in 2016, 63% and 35% in 2015 and 2014)

- In the NUWWSN, 6 of 56 entries (10.7%) were not significantly different than the most resistant entry for all six FHB traits with an LSD while 13 of 39 entries (33.3%) in the PNUWWSN were not different than the most resistant entry for all six FHB traits (Tables 10 & 11).

While the percentage of line < Freedom of Truman were somewhat lower than in recent years, there were very few entries placed in the "worst" category in either test (Tables 8 and 9) ("worst" is defined as being not significantly different from worst entry for five or more of the six FHB traits where an LSD was calculated).

Most of the entries have only native resistance (e.g. not from Asia, or South America) though the frequency of the resistant alleles at *Fhb1* was 0.147 (versus 0.208 in 2016) among all 95 breeding lines in the P+NUWWSN tests (Tables 30 and 31).

Most of FHB traits were positively correlated in the NUWWSN and PNUWWSN where the correlations among INC, SEV, IND, FDK, ISK, and DON all exceeded 0.30 in the NUWWSN and 0.57 in the PNUWWSN: GHSEV was only significantly correlated to DON in the NUWWSN. Of the 30 possible correlations among INC, SEV, IND, FDK, ISK, and DON, 24 exceeded 0.56 (Tables 6a and b). This is reflected in the PC analysis of the data FHB traits (INC, SEV, IND, FDK, ISK, DON, GH) where the first PC accounted for > 61% of the variation in both tests (Figs. 1 & 2). Heading date and height were negatively correlated to INC, SEV, and IND in the NUWWSN but neither was significantly correlated to any FHB trait in the PNUWWSN.

The tables in this report are created from excel files that are available from Clay Sneller (sneller.5@osu.edu).

Table 1. Fusarium Head Blight and other traits assessed in 2016-17 P+NUWWSN

Code	Trait	Description
INC	Disease incidence	% of heads with at least one infected spikelets
SEV	Disease severity from field tests	% of infected spikelets in an infected head.
IND	Disease index	IND = (SEVxINC)/100
FDK	Fusarium damaged kernels	Either a visual assessment of the percent infected kernels, or a percent of scabby seed by weight
ISK	Composite of head and kernel traits	ISK Index = .3 (Severity) + .3 (Incidence)+.4 (FDK)
DON	DON (vomitoxin)	PPM of vomitoxin in grain
GH	Greenhouse severity	Same as SEV except from greenhouse
HD	Heading Date	Julian date when 50% of spikes have emerged from the boot
HGT	Plant Height	Height in inches from soil to top of spike of a typical plant

Table 2. Cooperators in the 2016-2017 P+NUWWSN

ENV CODE	LOCATION	NUWWSN	PNUWWSN	COOPERATORS	INSTITUTE	CODE
ILCHA	Champaign, IL	yes	yes	Jana Murche	KWS Cereals	KWS
INWLA	W. Lafayette, IN	yes	yes	Mohsen Mohammadi	Purdue University	PUR
KYLEX	Lexington, KY	yes	yes	David Van Sanford	Unversity of Kentucky	UKY
MIELA	East Lansing, MI	yes	yes	Eric Olson, Lee Siler	Michigan State University	MSU
MOCOL	Columbia, MO	yes	yes	Anne McKendry,	University of Missouri	UMO
NEMEA	Mead, NE	yes	no	Stephen Baenziger, S Wegulo	University of Nebraska	UNE
NYITH	Ithaca, NY	yes	no	Mark Sorrells, Gary Bergstrom	Cornell University	COR
OHNAP	Napoleon, OH	yes	no	Don Obert	Limagrain	LIM
OHWOO	Wooster, Ohio	yes	yes	Clay Sneller, Pierce Paul	The Ohio State University	OSU
VAMTH	Mt Hope, VA	yes	yes	Carl Griffey	Virginia Tech	VAT
VAWAR	Warsaw, VA	yes	yes	Carl Griffey	Virginia Tech	VAT

Table 3. Means for each trait and each location for the 2016-2017 P+NUWWSN. PM=powdery mildew, LR = leaf rust, YR = yellow rust

NUWWSN	INC	SEV	IND	FDK	ISK	DON	GHSEV	HD	HGT	Yield	Test Wgt	PM	LR	YR	Foliar Rating
	%	%	%	%	%	ppm	%	days	inches	bu/ac	lbs/bu	0-9	0-9	0-9	0-9
ILCHA	7.3	15.7	2.2					126.5	38.0				4.3	4.1	
INWLA	8.8														
KYLEX	13.7	35.1	5.0	34.7	28.5	14.5		114.1	37.4						
MIELA	44.7	42.3	20.4												
MOCOL	65.4	10.0	7.2	10.4	26.8	0.3	10.8	127.0							
NEMEA	88.1	30.6	28.7	1.1	36.1										
NYITH	27.1	10.9	3.2	41.6	28.0			145.4							
OHNAP								136.1	31.7	81.7	58.2				
OHWOO			20.1	25.2	22.1	11.3		133.0							4.4
VAMTH	64.2	23.0	15.7	29.5	38.0	1.8			33.7						
VAWAR										70.1	58.8	1.9	4.2	0.4	

PNUWWSN	INC	SEV	IND	FDK	ISK	DON	GHSEV	HD	HGT	Yield	Test Wgt	PM	LR	YR	Foliar Rating
	%	%	%	%	%	ppm	%	days	inches	bu/ac	lbs/bu	0-9	0-9	0-9	0-9
ILCHA	11.5	18.3	3.8					127.3	38.2				4.2	5.0	
INWLA	8.4														
KYLEX	13.5	34.9	5.0	34.6	28.4	15.8		112.8	36.3						
MIELA	41.6	41.7	18.3												
MOCOL	69.9	12.8	9.8	13.6	30.2	0.5	10.6	128.0							
OHWOO			20.8	29.8	24.4	10.2		133.2							4.6
VAMTH	66.9	25.7	17.9	23.4	37.1	2.0			32.4	73.4	58.9	1.5	4.0		

Table 4. Entries in the 2016-2017 NUWWSN

ENTRY	NAME	PEDIGREE
1	TRUMAN	
2	ERNIE	
3	FREEDOM	
4	PIONEER2545	
5	VA11W-108PA	PIONEER25R47/JAMESTOWN
6	VA09MAS1-12-5-1	GA991371-6E13/USG3555//OAKES
7	VA14FHB-29	RecurrentSelectionPop3
8	VA09MAS8-34-5-2	SHIRLEY/USG3120"S"(GA991209-6E32)//P992231A1-2-1
9	VA09MAS3-34-2-1	VA05W-139(PION26R24/McCORMICK)/'5205'(VA01W-205)//GA031238-DH7-7A28
10	KY09C-0052-26-12-3	USG3350//IL02-19463/VA01-476
11	X08C-1070-74-20-1	KY97C-0519-04-07/P.03630A1-18
12	KY09C-1245-100-1-3	LA01-425/VA06W-558
13	KY09C-0267-45-16-3	KY97C-0519-04-07//KY97C-0232-2-2/VA01W-476
14	X08C-1090-51-12-5	KY97C-0519-04-07/P.981129A1--17
15	OH12-195-22	SHIRLEY/992178A3-1-1
16	OH11-118-18	P.99840C4-8-3-6/(5x690=TRUMAN/IL00-8061)
17	OH12-133-74	OH02-12686/6x136,F2-A=PIO25R47/IL01-16170,F2
18	OH12-194-24	SHIRLEY/992178A3-1-1
19	OH13-16-25	BRANSON/7x096=COYOTE/OH02-13567
20	NE14538	SD98W175-1/NW03666//Freeman
21	NE14606	KS04HW101-3/NW03670//NW06655
22	NE14696	NE05537/Overland
23	NI12702W	N03Y2014/NW03681//NuHills10005
24	NE15545	NE07569/NE04424
25	KWS095	IL04-8445/Sunburst
26	KWS103	G59326/B030543
27	KWS122	P99840C4-8-4/21525c1*
28	KWS127	LA01*425/M04-4802
29	KWS141	Shirley/IL00-8061//MO080104
30	IL09-3264-T2	B990081/IL00-8109
31	IL12-21235	IL97-1828/IL02-18228//IL06-13878
32	IL12-26004	IL01-34159/IL00-8061//IL06-7550
33	IL13-451	Bromfield/IL00-8530
34	IL13-20616	IL01-34159/IL00-8530//IL04-8445/IL00-8530
35	NY99056-161	NY85020-395/Pio25W33
36	NYWhatford/7388-39-693	Whatford/NY87048W-7388
37	NY09087-15-69-1124	Pio25w41/Truman//05068-2-127-3///Truman
38	NY01016-AN	CaledoniaxD8006
39	NY09125-16-1034	(Pio25w41/Truman//(NY7388/Pinb-a//NY73886///NY7388-3////NY7388-5/////NY7388-2)-127)-1-21
40	MO140304	MO050101/MO030291
41	MO151323	MO110243SP
42	MO151031	MO110799SP
43	MO151826	P981517A1-1-5-2/MO030291
44	MO150133	Truman/CO2WO-3
45	0566A1-3-1-1-63	INW0412/6/9017C1//92823A1/9218B4/3/P107/4/PATT/5/ACC3130/PATT/7/992060G1-1
46	04620A1-1-7-4-10	TRUMAN/9017C1//92823A1/9218B4/3/P107/4/PATT/5/INW9811/GLD//96204A1
47	0527A1-9-14-4-3-3	99751D8-2-3/96169RE2-3-6-1-4/3/7D(E)//97462A1-21-1-5-1-15/INW0412
48	0762A1-2-8	981129A1-45-3/99793RE2-3//INW0301/92145E8-7-7-3-57/3/981477A1/981312A1//INW0316
49	07419A1-16-1-1-16-1-1	981128A1-5-3-1/981477A1-10-2-1//VA98W-593/3/ChineseSprph1b/KS242-2(275-4)//ChineseSpr/4/99751D8-2-1-1/5/981128A1-5-3-1/981477A1-10-2-1//92145E8-7-7-1-9/6/MSUE1007-W
50	LES15-5199	97397J1-4-1-4-7/30-530//Branson
51	LES15-7011	Patton/M03-3616-C
52	LES15-5540	B980582/G39029(BW452TW)
53	LES15-5605	T814/L900819//McCormick
54	LES15-7004	BW6150/Branson
55	U6714-B-041	KS05HW14*3/TA1662
56	MI14R0008	Unknown
57	MI14R0009	Unknown
58	MI14R0421	D8006/P25R37
59	MI14R0267	Oasis/D8006W
60	OH09-207-68	

Table 5. Entries in the 2016-2017 PNUWWSN

ENTRY	NAME	PEDIGREE
1	TRUMAN	
2	ERNIE	
3	FREEDOM	
4	PIONEER2545	
5	VA09MAS1-12-8-4	GA991371-6E13/USG3555//OAKES
6	VA14W-28	VA05W-139(PIONEER26R24/McCORMICK)/'5205'(VA01W-205)
7	VA09MAS6-122-7-1-1	SHIRLEY/GA991371-6E13//'5205'(VA01W-205)
8	VA09MAS6-122-7-1-4	SHIRLEY/GA991371-6E13//'5205'(VA01W-205)
9	DH11SRW069-70	SOISSONS/SHIRLEY
10	X09-0187-112-3-3	KY97C-0519-04-07//KY97C-0508-01-01A-1/M03-3616
11	KY09C-0053-28-9-3	SSMPV-57//IL02-19463/VA01W-476
12	KY09C-1245-99-8-5	LA01-425/VA06W-558
13	KY07C-1317-116-4-1	KY97C-0277-01-06/KY96C-0770-3//KY97C-0540-01-03
14	KY09C-1245-99-15-1	LA01-425/VA06W-558
15	OH12-317-55	SHIRLEY//PIO25R47/IL99-15867
16	OH12-196-24	SHIRLEY/992178A3-1-1
17	OH12-104-72	IL01-11934/7x831-1=MALABAR*4/TAM110,SELECTEDB
18	OH13-16-69	BRANSON/7x096=COYOTE/OH02-13567
19	OH12-133-66	OH02-12686/6x136,F2-A=PIO25R47/IL01-16170,F2
20	KWS114	Shirley/IL99-26442
21	KWS126	LA01*425/W06-202B
22	KWS133	Trevor/INW0412
23	KWS140	G59326/M03-3616//VA05W-168
24	KWS145	Arena/INW803
25	KWS147	W07-999/W06703
26	IL13-1658	MO050101/IL01-6262
27	IL13-8063	IL04-9942/IL02-18228
28	IL13-10403	IL06-8223/IL04-10741
29	IL13-18570	IL01-6262/IL00-8530//IL06-7034
30	MO151526	MO030291SP/MO010996
31	MO151425	MO081652SP
32	MO151424	MO081652SP
33	MO130689	MO080680SP(030291RS))
34	MO151835	APBranson/MO030921
35	0527A1-7-7-3-1	99751D8-2-3/96169RE2-3-6-1-4/3/7D(E)//97462A1-21-1-5-1-15/INW0412
36	05247A1-7-7-3-1	99840C4/5/INW0315/3/INW0301MADSEN//INW0315/4/97395B1/6/99840C4//99794RA1
37	0566A1-3-1-63-3	INW0412/6/9017C1//92823A1/9218B4/3/P107/4/PATT/5/ACC3130/PATT/7/992060G1-1
38	02444A1-23-1-3-4	981129A1-45-3/99793RE2-3//INW0301/92145E8-7-7-3-57
39	0762A1-2-8	981129A1-45-3/99793RE2-3//INW0301/92145E8-7-7-3-57/3/981477A1/981312A1//INW0316
40	U6714-A-004	KS05HW14*3/TA1662
41	U6715-020	KS05HW14*3/TA1662
42	MI14R0330	D8006W//FHB12/P25R47
43	MI14R0213	Jupiter//MO050699/Truman

Tables 6a and b. Correlation of traits in the 2016-2017 P+NUWWSN. Grey values are significant at p <0.05. Bold values are > 0.59.

a. NUWWSN

	INC	SEV	IND	FDK	ISK	DON	GHSEV	HD	HGT
INC		**0.79**	**0.85**	0.40	**0.75**	0.36	0.19	-0.57	-0.55
SEV	**0.79**		**0.95**	0.44	**0.77**	0.31	0.18	-0.57	-0.53
IND	**0.85**	**0.95**		0.40	**0.75**	0.30	0.18	**-0.61**	-0.55
FDK	0.40	0.44	0.40		**0.87**	**0.74**	0.26	0.11	-0.07
ISK	**0.75**	**0.77**	**0.75**	**0.87**		**0.67**	0.28	-0.21	-0.32
DON	0.36	0.31	0.30	**0.74**	**0.67**		0.47	0.26	0.14
GHSEV	0.19	0.18	0.18	0.26	0.28	0.47		0.14	0.16
HD	**-0.57**	**-0.57**	**-0.61**	0.11	-0.21	0.26	0.14		0.77
HGT	-0.55	-0.53	-0.55	-0.07	-0.32	0.14	0.16	0.77	

b. PNUWWSN

	INC	SEV	IND	FDK	ISK	DON	GHSEV	HD	HGT
INC		**0.90**	**0.90**	**0.62**	**0.82**	**0.73**	0.23	0.02	-0.16
SEV	**0.90**		**0.92**	**0.57**	**0.80**	**0.65**	0.26	-0.02	-0.04
IND	**0.90**	**0.92**		**0.64**	**0.88**	**0.68**	0.28	-0.03	-0.11
FDK	**0.62**	**0.57**	**0.64**		**0.89**	**0.80**	0.10	0.08	0.05
ISK	**0.82**	**0.80**	**0.88**	**0.89**		**0.79**	0.23	-0.02	-0.09
DON	**0.73**	**0.65**	**0.68**	**0.80**	**0.79**		0.16	0.30	0.06
GHSEV	0.23	0.26	0.28	0.10	0.23	0.16		0.04	-0.02
HD	0.02	-0.02	-0.03	0.08	-0.02	0.30	0.04		0.51
HGT	-0.16	-0.04	-0.11	0.05	-0.09	0.06	-0.02	0.51	

Table 7. Summary of variance components and their ratios from the 2016-2017 P+NUWWSN. Entry mean h^2 was calculated as $V_g/(V_g+(V_{error}/e))$ where e is the number of environments.

NUWWSN	INC	SEV	IND	FDK	ISK	DON	HD	HGT
Environment	922.4	155	94.6	230.2	34.9	48.1	129	8.5
Genotype	18.71	20.8	10.1	44.5	21.1	8.7	5.6	1.2
Error	88.1	89.4	49.2	158.2	49.8	18.9	5.8	6.1
# Envs	7	8	8	6	6	4	5	3
Vg/(Vg+Verror)	0.18	0.19	0.17	0.22	0.30	0.32	0.49	0.16
Vg/Verror	0.21	0.23	0.21	0.28	0.42	0.46	0.97	0.20
"h2"	0.60	0.65	0.62	0.63	0.72	0.65	0.83	0.37

PNUWWSN	INC	SEV	IND	FDK	ISK	DON	HD	HGT
Environment	797.4	136.4	53.2	79.2	27.3	50.9	76.5	8.5
Genotype	16.8	22.6	20.3	72.2	41	9.7	0.75	1.16
Error	79.3	104.6	48.3	126.1	45	14.6	4.48	6.1
# Envs	5	6	6	4	4	4	4	3
Vg/(Vg+Verror)	0.17	0.18	0.30	0.36	0.48	0.40	0.14	0.16
Vg/Verror	0.21	0.22	0.42	0.57	0.91	0.66	0.17	0.19
"h2"	0.51	0.56	0.72	0.70	0.78	0.73	0.40	0.36

Table 8. Best (top) and worst (bottom) entries in the 2016-2017 NUWWSN. Summary statistics are over all entries.

ENTRY	NAME	INC		SEV		IND		FDK		ISK		DON		GHSEV	PC1	Fhb1	#l	#h
37	NY09087-15-69-1124	25.8	l	11.3	l	6.1	l	10.7	l	19.1	l	2.1	l	6.6	-4.7	Fhb1	6	0
16	OH11-118-18	27.4	l	14.0	l	5.5	l	13.3	l	18.7	l	2.3	l	5.1	-4.4	Fhb1	6	0
1	TRUMAN	31.3	l	13.7	l	5.8	l	12.7	l	21.2	l	3.4	l	5.4	-3.8	no	6	0
43	MO151826	29.7	l	16.4	l	6.5	l	12.6	l	18.4	l	4.0	l	7.1	-3.8	no	6	0
36	NYWhatford/7388-39-693	30.7	l	12.6	l	5.5	l	20.1	l	23.8	l	5.5	l	5.6	-3.2	no	6	0
13	KY09C-0267-45-16-3	32.0	l	16.0	l	6.7	l	17.6	l	23.1	l	5.4	l	14.5	-2.6	Fhb1	6	0
41	MO151323	36.1		19.8	l	9.2	l	10.8	l	22.1	l	2.9	l	10.3	-2.6	no	5	0
48	0762A1-2-8	33.8	l	18.4	l	9.7	l	22.8	l	27.0		3.4	l	4.7	-2.0	Fhb1	5	0
44	MO150133	40.9		20.9	l	11.1	l	11.7	l	24.9	l	2.3	l	5.0	-1.9	no	5	0
40	MO140304	39.9		19.3	l	8.2	l	14.6	l	25.8	l	5.9	l	5.7	-1.8	no	5	0
6	VA09MAS1-12-5-1	37.5		20.7	l	11.2	l	14.9	l	26.3	l	7.7	l	13.9	-1.1	no	5	0
27	KWS122	40.0		21.2	l	12.3	l	15.2	l	27.0		4.4	l	17.5	-1.2	no	4	0
20	NE14538	31.4	l	17.0	l	7.4	l	29.8	h	28.2		7.5	l	24.8	-1.0	no	4	1
11	X08C-1070-74-20-1	42.7		21.3	l	11.2	l	16.4	l	26.9		3.4	l	14.6	-0.9	Fhb1	4	0
59	MI14R0267	39.9		20.6	l	10.9	l	17.9	l	27.3		6.9	l	11.5	-0.9	no	4	0
42	MO151031	38.5		23.3		11.5	l	18.8	l	26.2	l	6.8	l	16.4	-0.6	no	4	0
52	LES15-5540	43.6	h	28.6	h	16.7	h	29.3	h	35.1		7.9	l	7.0	1.7	no	1	4
18	OH12-194-24	47.2	h	31.4	h	19.1	h	31.0	h	37.1		9.9		20.4	3.3	no	0	4
49	07419A1-16-1-1-16-1-1	52.4	h	32.4	h	18.3	h	41.8	h	43.5	h	10.1		7.6	4.3	no	0	5
55	U6714-B-041	50.3	h	29.8	h	17.8	h	39.1	h	40.0	h	21.0	h	23.3	4.9	no	0	6
4	PIONEER2545	53.0	h	35.9	h	23.3	h	42.2	h	45.4	h	18.5	h	23.2	6.5	no	0	6
100	AVERAGE	39.9		24.0		12.8		23.7		29.9		7.0		11.9				
101	MINUMUM	25.8		11.3		5.5		10.5		18.4		2.1						
102	MAXIMUM	53.0		36.8		23.3		42.2		45.4		21.0						
103	LSD(0.05)	9.4		10.1		7.0		14.5		8.1		6.1						
	# ENVIRONMENTS	8		7		8		6		6		4		1				

Table 9. Best and worst entries in the 2016-2017 PNUWWSN. Summary statistics are over all entries.

ENTRY	NAME	INC		SEV		IND		FDK		ISK		DON		GHSEV	PC1	Fhb1	#l	#h
1	TRUMAN	25.1	l	16.0	l	5.4	l	13.4	l	20.5	l	3.4	l	5.1	-3.5	no	6	0
30	MO151526	28.3	l	17.0	l	4.8	l	8.8	l	18.1	l	2.3	l	18.6	-3.4	no	6	0
39	0762A1-2-8	27.9	l	16.7	l	5.4	l	14.8	l	21.6	l	2.7	l	4.8	-3.2	Fhb1	6	0
28	IL13-10403	25.8	l	18.1	l	6.9	l	15.9	l	22.5	l	5.2	l	5.3	-2.8	no	6	0
31	MO151425	31.4	l	19.9	l	6.5	l	11.6	l	21.2	l	2.8	l	4.6	-2.8	no	6	0
32	MO151424	32.8	l	17.4	l	6.5	l	13.9	l	21.6	l	2.8	l	5.1	-2.7	no	6	0
29	IL13-18570	31.8	l	21.7	l	8.9	l	12.5	l	19.9	l	2.7	l	16.9	-2.3	Fhb1?	6	0
17	OH12-104-72	30.9	l	20.1	l	8.8	l	15.6	l	21.7	l	5.0	l	6.5	-2.2	no	6	0
33	MO130689	31.7	l	20.7	l	6.9	l	14.6	l	22.2	l	3.6	l	19.7	-2.1	no	6	0
27	IL13-8063	29.2	l	19.3	l	6.7	l	18.6	l	22.7	l	4.6	l	25.3	-2.1	no	6	0
34	MO151835	32.0	l	24.5	l	9.6	l	18.5	l	22.6	l	4.8	l	5.5	-1.6	no	6	0
38	02444A1-23-1-3-4	34.6	l	22.0	l	9.5	l	18.6	l	27.3	l	2.1	l	5.0	-1.6	Fhb1	6	0
26	IL13-1658	31.9	l	23.3	l	10.9	l	16.0	l	22.9	l	5.7	l	4.8	-1.6	no	6	0
35	0527A1-7-7-3-1	30.0	l	19.3	l	7.3	l	28.4		26.8	l	6.4	l	5.1	-1.5	no	5	0
42	MI14R0330	29.7	l	21.0	l	7.4	l	28.8		27.0	l	7.1	l	7.5	-1.3	Fhb1	5	0
23	KWS140	32.8	l	26.9	l	9.8	l	22.5	l	28.1		6.9	l	4.6	-0.7	no	5	0
13	KY07C-1317-116-4-1	30.8	l	28.5	l	11.0	l	20.8	l	25.4	l	8.0		7.8	-0.7	no	5	0
12	KY09C-1245-99-8-5	31.9	l	27.4	l	13.0		18.6	l	29.1		5.3	l	10.1	-0.7	no	4	0
41	U6715-020	42.4	h	31.0	h	15.0		41.2	h	36.5	h	12.9	h	20.2	2.7	no	0	5
40	U6714-A-004	44.3	h	36.2	h	20.5		43.0	h	41.4	h	17.8	h	9.9	4.3	no	0	5
6	VA14W-28	41.6	h	37.4	h	23.3	h	35.8	h	43.8	h	9.0		35.0	3.8	no	0	5
5	VA09MAS1-12-8-4	49.2	h	42.0	h	29.7	h	32.3	h	44.0	h	9.8		6.8	4.7	no	0	5
4	PIONEER2545	50.5	h	42.0	h	24.4	h	40.4	h	43.1	h	16.7	h	21.2	5.5	no	0	6
100	AVERAGE	35.3		26.7		12.6		25.4		30.0		7.1		11.1				
101	MINUMUM	25.1		16.0		4.8		8.8		18.1		2.1						
102	MAXIMUM	50.5		42.0		29.7		46.5		44.0		17.8						
103	LSD(0.05)	10.3		12.9		8.0		15.9		9.5		5.4						
		6		5		6		4		4		4		1				

Figure 1. Graph of first two PC from the analysis of the seven FHB traits from the NUWWSN. Entry numbers are shown.

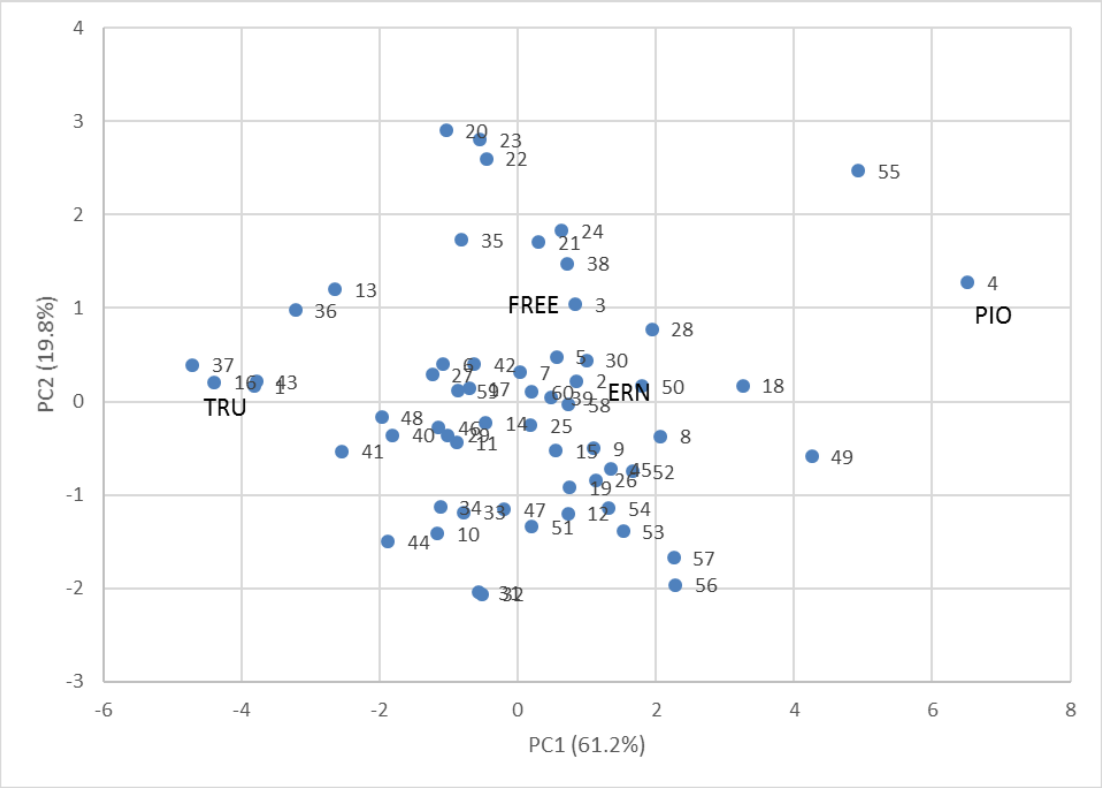

Figure 2. Graph of first two PC from the analysis of the seven FHB traits from the PNUWWSN. Entry numbers are shown

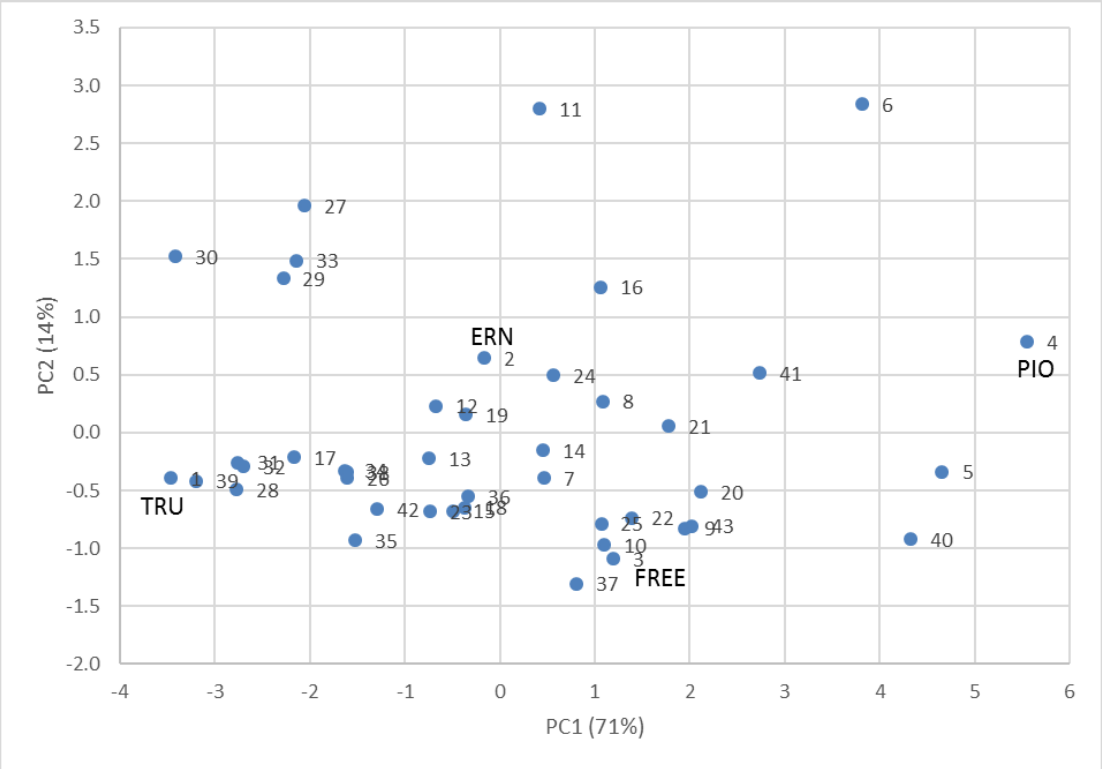

Table 10. Summary of all FHB traits from the 2016-2017 NUWWSN: " h" and "l" indicate means that are not significantly different from the highest (h) or lowest (l) mean in that column. Lower PC1 scores indicate more resistance.

ENTRY	NAME	INC	SEV	IND	FDK	ISK	DON	GHSEV	PC1 Score	Fhb-1	#l	#h
1	TRUMAN	31.3 l	13.7 l	5.8 l	12.7 l	21.2 l	3.4 l	5.4	-3.82	no	6	0
2	ERNIE	39.8	28.7 h	13.7	25.2	31.2	7.9 l	15.4	0.85	no	1	1
3	FREEDOM	39.8	23.4	10.4 l	35.0 h	34.7	10.7	7.2	0.83	no	1	1
4	PIONEER2545	53.0 h	35.9 h	23.3 h	42.2 h	45.4 h	18.5 h	23.2	6.51	no	0	6
5	VA11W-108PA	38.7	24.1	12.9	30.8 h	32.3	8.6	9.2	0.56	no	0	1
6	VA09MAS1-12-5-1	37.5	20.7 l	11.2 l	14.9 l	26.3 l	7.7 l	13.9	-1.09	no	5	0
7	VA14FHB-29	39.8	23.4	10.8 l	25.8	31.2	8.9	7.4	0.03	no	1	0
8	VA09MAS8-34-5-2	45.5 h	28.5 h	15.7	35.4 h	35.8	8.3	7.5	2.06	no	0	3
9	VA09MAS3-34-2-1	42.4	27.3 h	16.7 h	24.1 l	31.5	8.0 l	11.2	1.10	no	2	2
10	KY09C-0052-26-12-3	42.8	22.9	13.1	11.4 l	24.7 l	3.3 l	9.5	-1.17	Fhb1het	3	0
11	X08C-1070-74-20-1	42.7	21.3 l	11.2 l	16.4 l	26.9	3.4 l	14.6	-0.89	Fhb1	4	0
12	KY09C-1245-100-1-3	44.9 h	26.5	16.2	20.3 l	31.6	4.9 l	10.8	0.72	no	2	1
13	KY09C-0267-45-16-3	32.0 l	16.0 l	6.7 l	17.6 l	23.1 l	5.4 l	14.5	-2.64	Fhb1	6	0
14	X08C-1090-51-12-5	40.8	24.2	12.4 l	16.4 l	26.6	7.2 l	12.5	-0.47	no	3	0
15	OH12-195-22	42.1	27.1 h	13.2	25.3	31.2	7.6 l	6.8	0.55	no	1	1
16	OH11-118-18	27.4 l	14.0 l	5.5 l	13.3 l	18.7 l	2.3 l	5.1	-4.40	Fhb1	6	0
17	OH12-133-74	36.1	22.1	10.5 l	29.1 h	30.0	5.1 l	6.5	-0.71	no	2	1
18	OH12-194-24	47.2 h	31.4 h	19.1 h	31.0 h	37.1	9.9	20.4	3.26	no	0	4
19	OH13-16-25	39.4	27.6 h	17.7 h	23.6 l	31.2	6.9 l	7.8	0.75	no	2	2
20	NE14538	31.4 l	17.0 l	7.4 l	29.8 h	28.2	7.5 l	24.8	-1.04	no	4	1
21	NE14606	38.7	20.5 l	11.1 l	27.6	31.1	9.9	18.8	0.30	no	2	0
22	NE14696	32.5 l	17.4 l	7.4 l	36.0 h	31.9	10.5	13.3	-0.46	no	3	1
23	NI12702W	32.8 l	16.4 l	7.7 l	34.2 h	29.8	12.8	12.9	-0.55	no	3	1
24	NE15545	37.1	21.0 l	11.2 l	35.0 h	32.6	11.8	12.2	0.63	no	2	1
25	KWS095	40.9	24.2	12.9	26.5	31.7	4.6 l	11.2	0.19	Fhb1	1	0
26	KWS103	40.6	28.4 h	16.7 h	28.8 h	33.5	6.3 l	6.9	1.12	no	1	3
27	KWS122	40.0	21.2 l	12.3 l	15.2 l	27.0	4.4 l	17.5	-1.24	no	4	0
28	KWS127	43.0	30.2 h	15.5	34.9 h	35.2	11.3	11.8	1.94	no	0	2
29	KWS141	39.8	24.8	11.5 l	19.8 l	28.2	6.4 l	5.3	-1.02	no	3	0
30	IL09-3264-T2	43.1	26.4	14.9	22.4 l	30.9	4.2 l	27.7	0.99	no	2	0
31	IL12-21235	44.3 h	25.4	15.8	10.5 l	25.7 l	4.3 l	6.4	-0.57	no	3	1
32	IL12-26004	46.6 h	24.4	15.2	13.0 l	25.7 l	2.8 l	7.7	-0.51	Fhb1het	3	1
33	IL13-451	42.8	22.4	13.3	16.4 l	26.7	4.3 l	7.3	-0.78	no	2	0
34	IL13-20616	40.5	21.9	13.2	15.8 l	26.0 l	3.9 l	7.2	-1.12	Fhb1	3	0
35	NY99056-161	37.3	19.4 l	8.7 l	19.9 l	26.7	10.0	19.2	-0.82	no	3	0
36	NYWhatford/7388-39-693	30.7 l	12.6 l	5.5 l	20.1 l	23.8 l	5.5 l	5.6	-3.22	no	6	0
37	NY09087-15-69-1124	25.8 l	11.3 l	6.1 l	10.7 l	19.1 l	2.1 l	6.6	-4.71	Fhb1	6	0
38	NY01016-AN	39.0	23.6	12.2 l	25.3	30.4	14.6	12.9	0.72	no	1	0
39	NY09125-16-1034	40.9	24.4	13.2	27.8 h	31.2	8.4	8.1	0.48	Fhb1	0	1
40	MO140304	39.9	19.3 l	8.2 l	14.6 l	25.8 l	5.9 l	5.7	-1.81	no	5	0
41	MO151323	36.1	19.8 l	9.2 l	10.8 l	22.1 l	2.9 l	10.3	-2.55	no	5	0
42	MO151031	38.5	23.3	11.5 l	18.8 l	26.2 l	6.8 l	16.4	-0.63	no	4	0
43	MO151826	29.7 l	16.4 l	6.5 l	12.6 l	18.4 l	4.0 l	7.1	-3.79	no	6	0
44	MO150133	40.9	20.9 l	11.1 l	11.7 l	24.9 l	2.3 l	5.0	-1.88	no	5	0
45	0566A1-3-1-1-63	45.1 h	26.1	15.1	30.8 h	35.2	5.8 l	7.6	1.34	no	1	2
46	04620A1-1-7-4-10	37.7	22.0	10.7 l	19.2 l	27.2	6.1 l	6.9	-1.15		3	0
47	0527A1-9-14-4-3-3	42.2	24.7	12.7	24.8 l	30.6	2.9 l	5.7	-0.20	Fhb1	2	0
48	0762A1-2-8	33.8 l	18.4 l	9.7 l	22.8 l	27.0	3.4 l	4.7	-1.97	Fhb1	5	0
49	07419A1-16-1-1-16-1-1	52.4 h	32.4 h	18.3 h	41.8 h	43.5 h	10.1	7.6	4.25	no	0	5
50	LES15-5199	43.7 h	25.8	14.1	37.7 h	37.1	8.3	7.5	1.79	no	0	2
51	LES15-7011	40.3	27.7 h	16.8 h	20.8 l	28.4	5.7 l	6.4	0.21	no	2	2
52	LES15-5540	43.6 h	28.6 h	16.7 h	29.3 h	35.1	7.9 l	7.0	1.67	no	1	4
53	LES15-5605	38.4	36.0 h	18.6 h	24.3 l	33.4	5.4 l	10.5	1.53	no	2	2
54	LES15-7004	42.2	31.5 h	16.6 h	24.3 l	33.1	6.7 l	8.3	1.31	no	2	2
55	U6714-B-041	50.3 h	29.8 h	17.8 h	39.1 h	40.0 h	21.0 h	23.3	4.93	no	0	6
56	MI14R0008	44.0 h	36.6 h	20.2 h	24.3 l	35.3	5.3 l	9.5	2.29	no	2	3
57	MI14R0009	45.0 h	36.8 h	19.6 h	21.3 l	34.0	5.7 l	14.2	2.25	no	2	3
58	MI14R0421	43.2	21.5	13.5	30.5 h	34.3	7.3 l	7.0	0.73	no	1	1
59	MI14R0267	39.9	20.6 l	10.9 l	17.9 l	27.3	6.9 l	11.5	-0.87	no	4	0
60	OH09-207-68	37.7	27.5 h	12.6	26.4	30.0	5.5 l	14.1	0.20	no	1	1
100	AVERAGE	39.9	24.0	12.8	23.7	29.9	7.0	10.8				
101	MINUMUM	25.8	11.3	5.5	10.5	18.4	2.1					
102	MAXIMUM	53.0	36.8	23.3	42.2	45.4	21.0					
103	LSD(0.05)	9.4	10.1	7.0	14.5	8.1	6.1					
	# ENVIRONMENTS	8	7	8	6	6	4	1				

Table 11. Summary of all FHB traits from the 2016-2017 PNUWWSN: " h" and "l" indicate means that are not significantly different from the highest (h) or lowest (l) mean in that column. Lower PC1 scores indicate more resistance.

ENTRY	NAME	INC		SEV		IND		FDK		ISK		DON		GHSEV	PC1	Fhb1	#l	#h
1	TRUMAN	25.1	l	16.0	l	5.4	l	13.4	l	20.5	l	3.4	l	5.1	-3.47	no	6	0
2	ERNIE	34.1	l	29.9	h	13.4		21.8	l	28.9		5.2	l	13.6	-0.16	no	3	1
3	FREEDOM	36.3		29.1	h	11.8	l	38.9	h	35.3	h	9.8		6.3	1.19	no	1	3
4	PIONEER2545	50.5	h	42.0	h	24.4	h	40.4	h	43.1	h	16.7	h	21.2	5.54	no	0	6
5	VA09MAS1-12-8-4	49.2	h	42.0	h	29.7	h	32.3	h	44.0	h	9.8		6.8	4.66	no	0	5
6	VA14W-28	41.6	h	37.4	h	23.3	h	35.8	h	43.8	h	9.0		35.0	3.81	no	0	5
7	VA09MAS6-122-7-1-1	37.4		25.8	l	15.0		26.3		32.3		7.6		7.7	0.47	no	1	0
8	VA09MAS6-122-7-1-4	39.3		34.4	h	16.0		22.6	l	34.0		6.1	l	10.4	1.08	no	2	1
9	DH11SRW069-70	38.2		27.2	l	17.0		35.3	h	39.8	h	11.3		8.1	1.95	no	1	2
10	X09-0187-112-3-3	36.2		29.4	h	13.4		35.6	h	35.9	h	8.5		5.8	1.10	no	0	3
11	KY09C-0053-28-9-3	36.0		30.3	h	15.3		18.4	l	31.1		5.0	l	30.0	0.42	no	2	1
12	KY09C-1245-99-8-5	31.9	l	27.4	l	13.0		18.6	l	29.1		5.3	l	10.1	-0.68	no	4	0
13	KY07C-1317-116-4-1	30.8	l	28.5	l	11.0	l	20.8	l	25.4	l	8.0		7.8	-0.75	no	5	0
14	KY09C-1245-99-15-1	37.3		31.9	h	16.2		22.3	l	31.2		5.3	l	6.7	0.46	no	2	1
15	OH12-317-55	34.2	l	21.0	l	11.6	l	26.3		30.0		7.7		6.5	-0.49	no	3	0
16	OH12-196-24	39.4		30.4	h	16.2		23.1	l	30.8		8.1		19.5	1.06	no	1	1
17	OH12-104-72	30.9	l	20.1	l	8.8	l	15.6	l	21.7	l	5.0	l	6.5	-2.17	no	6	0
18	OH13-16-69	34.7	l	24.3	l	13.5		25.3		28.7		6.4	l	5.1	-0.37	no	3	0
19	OH12-133-66	37.4		33.0	h	13.8		15.1	l	26.1	l	3.9	l	6.6	-0.36	no	3	1
20	KWS114	37.7		33.6	h	16.9		39.3	h	39.1	h	8.5		9.5	2.12	no	0	3
21	KWS126	33.4	l	27.6	l	16.0		46.5	h	40.5	h	11.4		19.1	1.77	no	2	2
22	KWS133	38.6		29.6	h	14.6		36.9	h	37.6	h	7.0	l	7.2	1.39	no	1	3
23	KWS140	32.8	l	26.9	l	9.8	l	22.5	l	28.1		6.9	l	4.6	-0.74	no	5	0
24	KWS145	39.3		28.8	l	12.2	l	21.3	l	28.7		10.2		14.3	0.56	no	3	0
25	KWS147	38.8		26.2	l	13.4		28.5		32.6		12.4		7.1	1.07	no	1	0
26	IL13-1658	31.9	l	23.3	l	10.9	l	16.0	l	22.9	l	5.7	l	4.8	-1.61	no	6	0
27	IL13-8063	29.2	l	19.3	l	6.7	l	18.6	l	22.7	l	4.6	l	25.3	-2.06	no	6	0
28	IL13-10403	25.8	l	18.1	l	6.9	l	15.9	l	22.5	l	5.2	l	5.3	-2.77	no	6	0
29	IL13-18570	31.8	l	21.7	l	8.9	l	12.5	l	19.9	l	2.7	l	16.9	-2.28	Fhb1?	6	0
30	MO151526	28.3	l	17.0	l	4.8	l	8.8	l	18.1	l	2.3	l	18.6	-3.41	no	6	0
31	MO151425	31.4	l	19.9	l	6.5	l	11.6	l	21.2	l	2.8	l	4.6	-2.76	no	6	0
32	MO151424	32.8	l	17.4	l	6.5	l	13.9	l	21.6	l	2.8	l	5.1	-2.70	no	6	0
33	MO130689	31.7	l	20.7	l	6.9	l	14.6	l	22.2	l	3.6	l	19.7	-2.15	no	6	0
34	MO151835	32.0	l	24.5	l	9.6	l	18.5	l	22.6	l	4.8	l	5.5	-1.63	no	6	0
35	0527A1-7-7-3-1	30.0	l	19.3	l	7.3	l	28.4		26.8	l	6.4	l	5.1	-1.53	no	5	0
36	05247A1-7-7-3-1	36.0		27.5	l	10.2	l	25.6		28.9		6.0	l	5.8	-0.34	Fhb1	3	0
37	0566A1-3-1-63-3	35.8		24.9	l	12.8		43.6	h	36.1	h	6.4	l	4.8	0.81	no	2	2
38	02444A1-23-1-3-4	34.6	l	22.0	l	9.5	l	18.6	l	27.3	l	2.1	l	5.0	-1.61	Fhb1	6	0
39	0762A1-2-8	27.9	l	16.7	l	5.4	l	14.8	l	21.6	l	2.7	l	4.8	-3.20	Fhb1	6	0
40	U6714-A-004	44.3	h	36.2	h	20.5		43.0	h	41.4	h	17.8	h	9.9	4.33	no	0	5
41	U6715-020	42.4	h	31.0	h	15.0		41.2	h	36.5	h	12.9	h	20.2	2.73	no	0	5
42	MI14R0330	29.7	l	21.0	l	7.4	l	28.8		27.0	l	7.1	l	7.5	-1.29	Fhb1	5	0
43	MI14R0213	41.1	h	33.7	h	15.1		33.4	h	34.1		11.7		6.6	2.02	no	0	3
100	AVERAGE	35.3		26.7		12.6		25.4		30.0		7.1		10.6				
101	MINUMUM	25.1		16.0		4.8		8.8		18.1		2.1						
102	MAXIMUM	50.5		42.0		29.7		46.5		44.0		17.8						
103	LSD(0.05)	10.3		12.9		8.0		15.9		9.5		5.4						
		6		5		6		4		4		4		1				

Table 12. Summary of incidence (INC, %) from 2016-2017 NUWWSN.

ENTRY	NAME	AVG		ILCHA	INWLA	KYLEX	MIELA	MOCOL	NEMEA	NYITH	VAMTH
1	TRUMAN	31.3	l	1.0	7.5	13.5	17.5	67.5	90.0	13.0	40.0
2	ERNIE	39.8		6.0	7.5	16.5	49.1	72.5	80.0	24.0	62.5
3	FREEDOM	39.8		5.0	4.5	12.5	36.1	90.0	80.0	25.0	65.0
4	PIONEER2545	53.0	h	25.0	20.0	17.5	58.4	77.5	93.3	52.0	80.0
5	VA11W-108PA	38.7		3.5	15.0	10.0	40.4	47.5	93.3	30.0	70.0
6	VA09MAS1-12-5-1	37.5		3.5	7.5	11.0	32.1	57.5	86.7	25.0	76.3
7	VA14FHB-29	39.8		7.5	7.5	18.5	43.9	55.0	93.3	23.0	70.0
8	VA09MAS8-34-5-2	45.5	h	20.0	10.0	10.0	51.6	70.0	80.0	36.0	86.3
9	VA09MAS3-34-2-1	42.4		6.0	12.5	10.0	50.3	70.0	96.7	17.0	76.3
10	KY09C-0052-26-12-3	42.8		2.0	12.5	13.0	58.0	87.5	86.7	18.0	64.7
11	X08C-1070-74-20-1	42.7		5.0	15.0	12.0	43.7	77.5	93.3	19.0	76.3
12	KY09C-1245-100-1-3	44.9	h	6.0	15.0	10.0	52.3	72.5	100.0	37.0	66.3
13	KY09C-0267-45-16-3	32.0	l	2.0	7.5	8.0	28.7	32.5	83.3	33.0	61.3
14	X08C-1090-51-12-5	40.8		7.5	7.5	14.0	56.4	55.0	93.3	20.0	72.5
15	OH12-195-22	42.1		15.0	12.5	13.5	47.3	65.0	63.3	43.0	77.5
16	OH11-118-18	27.4	l	1.0	7.5	9.0	31.1	62.5	70.0	2.0	36.3
17	OH12-133-74	36.1		6.0	7.5	18.5	48.1	47.5	73.3	24.0	63.8
18	OH12-194-24	47.2	h	35.0	10.0	19.0	52.1	57.5	86.7	45.0	72.5
19	OH13-16-25	39.4		7.5	10.0	18.0	50.3	52.5	73.3	26.0	77.5
20	NE14538	31.4	l	3.5	10.0	13.0	23.6	67.5	70.0	12.0	51.3
21	NE14606	38.7		13.5	20.0	13.0	29.6	55.0	95.0	30.0	53.8
22	NE14696	32.5	l	1.0	12.5	14.5	31.6	57.5	63.3	37.0	42.5
23	NI12702W	32.8	l	10.0	10.0	13.0	34.0	67.5	63.3	18.0	46.3
24	NE15545	37.1		3.5	7.5	12.0	46.9	60.0	86.7	30.0	50.0
25	KWS095	40.9		11.0	7.5	11.0	49.0	60.0	80.0	27.0	81.3
26	KWS103	40.6		7.5	5.0	10.0	56.6	52.5	86.7	23.0	83.8
27	KWS122	40.0		1.0	12.5	14.0		60.0	80.0	35.0	72.5
28	KWS127	43.0		32.5	7.5	11.5		57.5	96.7	24.0	66.3
29	KWS141	39.8		5.0	5.0	12.5		80.0	86.7	17.0	67.5
30	IL09-3264-T2	43.1		5.0	15.0	16.0	56.7	55.0	96.7	29.0	71.3
31	IL12-21235	44.3	h	0.0	5.0	15.0	65.4	70.0	93.3	33.0	72.5
32	IL12-26004	46.6	h	0.0	10.0	16.0	76.1	75.0	93.3	35.0	67.5
33	IL13-451	42.8		1.0	12.5	13.0	66.7	80.0	90.0	19.0	60.0
34	IL13-20616	40.5		0.0	7.5	15.5	63.2	62.5	93.3	37.0	45.0
35	NY99056-161	37.3		20.0	15.0	16.0	17.0	70.0	80.0	10.0	70.0
36	NYWhatford/7388-39-693	30.7	l	7.5	5.0	11.0	18.3	57.5	80.0	14.0	
37	NY09087-15-69-1124	25.8	l	0.0	5.0	11.5	1.0	40.0	96.7	12.0	40.0
38	NY01016-AN	39.0		12.5	5.0	5.5	39.7	60.0	93.3	21.0	75.0
39	NY09125-16-1034	40.9		8.5	5.0	14.0	56.1	52.5	93.3	18.0	80.0
40	MO140304	39.9		6.0	5.0	15.5	28.2	72.5	96.7	39.0	56.3
41	MO151323	36.1		2.0	7.5	14.5	41.3	75.0	93.3	8.0	47.5
42	MO151031	38.5		2.0	5.0	18.0	54.8	55.0	90.0	22.0	61.3
43	MO151826	29.7	l	2.0	5.0	13.0	42.9	47.5	66.7	7.0	53.8
44	MO150133	40.9		1.0	12.5	13.0	43.6	85.0	90.0	17.0	65.0
45	0566A1-3-1-1-63	45.1	h	5.0	7.5	10.5	45.0	60.0	100.0	59.0	73.8
46	04620A1-1-7-4-10	37.7		2.5	5.0	15.5	45.5	67.5	86.7	16.0	62.5
47	0527A1-9-14-4-3-3	42.2		3.5	5.0	8.5	60.9	85.0	80.0	31.0	63.8
48	0762A1-2-8	33.8	l	2.5	5.0	12.5	25.8	72.5	96.7	12.0	43.8
49	07419A1-16-1-1-16-1-1	52.4	h	22.5	5.0	17.5	53.0	90.0	96.7	68.0	66.3
50	LES15-5199	43.7	h	5.0	10.0	17.5	50.9	75.0	96.7	33.0	61.3
51	LES15-7011	40.3		5.0	5.0	17.9	65.8	52.5	93.3	19.0	63.8
52	LES15-5540	43.6	h	2.0	7.5	15.0	54.3	52.5	100.0	50.0	67.5
53	LES15-5605	38.4		1.0	5.0	8.0	41.0	77.5	90.0	23.0	61.3
54	LES15-7004	42.2		5.0	7.5	18.0	44.3	75.0	100.0	24.0	63.8
55	U6714-B-041	50.3	h	12.5	5.0	13.0	56.1	95.0	100.0	56.0	65.0
56	MI14R0008	44.0	h	12.5	5.0	14.0	45.7	72.5	100.0	36.0	66.3
57	MI14R0009	45.0	h	12.5	5.0	17.5	51.5	67.5	100.0	37.0	68.8
58	MI14R0421	43.2		7.5	5.0	18.0	49.0	75.0	93.3	25.0	72.5
59	MI14R0267	39.9		5.0	10.0	20.0	37.3	60.0	93.3	25.0	68.8
60	OH09-207-68	37.7		15.0	20.0	13.5	32.8	52.5	90.0	24.0	53.8
100	AVERAGE	39.9		7.3	8.8	13.7	45.8	66.5	85.0	29.2	63.9
101	MINUMUM	25.8		0.0	4.5	5.5	1.0	32.5	17.0	2.0	36.3
102	MAXIMUM	53.0		35.0	20.0	20.0	80.0	96.7	100.0	72.5	86.3
103	LSD(0.05)	9.4		.	.	.	.	.	.	.	.

Table 13. Summary of severity (SEV, %) data from the 2016-2017 NUWWSN

ENTRY	NAME	AVG		ILCHA	KYLEX	MIELA	MOCOL	NEMEA	NYITH	VAMTH
1	TRUMAN	13.7	l	2.5	32.0	19.6	7.9	17.4	6.4	10.0
2	ERNIE	28.7	h	25.0	49.7	51.0	9.9	37.9	10.2	17.1
3	FREEDOM	23.4		20.0	42.2	35.1	20.0	13.9	10.0	22.5
4	PIONEER2545	35.9	h	50.0	43.7	52.1	14.3	32.6	19.0	39.9
5	VA11W-108PA	24.1		10.0	25.8	43.3	4.8	37.8	13.4	33.7
6	VA09MAS1-12-5-1	20.7	l	12.5	26.0	25.2	8.8	20.1	14.6	37.6
7	VA14FHB-29	23.4		25.0	45.3	28.3	7.6	13.2	15.8	28.8
8	VA09MAS8-34-5-2	28.5	h	45.0	17.8	53.6	12.7	22.1	12.0	36.2
9	VA09MAS3-34-2-1	27.3	h	12.5	21.9	54.4	12.5	43.4	11.4	35.0
10	KY09C-0052-26-12-3	22.9		5.0	26.0	52.0	13.8	36.1	9.6	17.7
11	X08C-1070-74-20-1	21.3	l	7.5	31.8	46.0	10.8	25.8	8.8	18.7
12	KY09C-1245-100-1-3	26.5		7.5	36.4	42.5	11.3	45.3	10.6	31.7
13	KY09C-0267-45-16-3	16.0	l	5.0	35.9	24.7	3.2	24.9	6.8	11.7
14	X08C-1090-51-12-5	24.2		15.0	43.8	48.7	3.7	16.7	7.8	33.8
15	OH12-195-22	27.1	h	40.0	35.8	44.8	10.2	23.4	11.0	24.4
16	OH11-118-18	14.0	l	2.5	35.9	26.6	12.4	10.7	1.2	8.6
17	OH12-133-74	22.1		25.0	35.4	28.6	5.4	19.5	11.0	29.6
18	OH12-194-24	31.4	h	40.0	38.8	50.9	7.5	29.9	20.8	31.8
19	OH13-16-25	27.6	h	12.5	23.1	58.8	7.5	36.0	10.0	45.4
20	NE14538	17.0	l	22.5	25.7	26.7	9.5	14.2	10.0	10.6
21	NE14606	20.5	l	17.5	35.5	32.0	8.4	27.2	11.4	11.6
22	NE14696	17.4	l	2.5	52.8	27.8	10.4	7.4	11.4	9.5
23	NI12702W	16.4	l	15.0	26.8	32.4	9.6	10.7	6.4	13.9
24	NE15545	21.0	l	12.5	28.2	60.5	6.8	12.2	8.0	18.7
25	KWS095	24.2		22.5	39.2	38.3	7.6	21.3	14.2	26.2
26	KWS103	28.4	h	15.0	30.5	59.6	7.3	27.9	20.6	37.8
27	KWS122	21.2	l	5.0	36.7		12.5	18.8	13.6	22.4
28	KWS127	30.2	h	42.5	40.5		7.6	28.6	10.6	33.0
29	KWS141	24.8		15.0	45.5		12.8	33.1	8.0	15.8
30	IL09-3264-T2	26.4		5.0	47.5	54.5	7.7	26.6	9.2	34.2
31	IL12-21235	25.4		0.0	29.2	53.7	7.5	57.4	11.2	19.0
32	IL12-26004	24.4		0.0	36.1	68.9	10.4	36.9	11.4	7.4
33	IL13-451	22.4		2.5	33.8	43.8	14.0	38.7	7.8	16.0
34	IL13-20616	21.9		0.0	36.4	46.1	8.9	44.0	9.0	9.2
35	NY99056-161	19.4	l	22.5	32.7	22.9	7.4	18.8	13.4	18.3
36	NYWhatford/7388-39-	12.6	l	6.0	29.2	15.5	8.2	11.9	7.0	10.3
37	NY09087-15-69-1124	11.3	l	0.0	21.2	14.2	6.1	22.8	6.4	8.5
38	NY01016-AN	23.6		20.0	25.3	43.7	8.9	22.7	17.0	27.3
39	NY09125-16-1034	24.4		12.5	41.2	52.8	6.2	34.6	8.0	15.4
40	MO140304	19.3	l	15.0	40.9	26.6	9.6	22.1	11.2	10.0
41	MO151323	19.8	l	5.0	44.7	32.0	10.0	34.3	4.8	7.6
42	MO151031	23.3		12.5	35.4	53.1	6.9	24.7	13.0	17.5
43	MO151826	16.4	l	3.5	29.0	41.9	4.9	17.7	5.8	11.7
44	MO150133	20.9	l	2.5	35.1	32.2	13.4	41.7	7.6	13.8
45	0566A1-3-1-1-63	26.1		7.5	28.7	53.2	9.3	44.7	12.0	27.5
46	04620A1-1-7-4-10	22.0		2.5	49.3	36.7	10.4	30.3	8.2	16.9
47	0527A1-9-14-4-3-3	24.7		12.5	39.0	41.0	18.0	36.1	10.8	15.8
48	0762A1-2-8	18.4	l	2.5	31.6	21.6	8.8	51.6	6.0	6.8
49	07419A1-16-1-1-16-1-	32.4	h	32.5	48.4	43.8	16.7	35.3	16.0	34.4
50	LES15-5199	25.8		10.0	37.4	45.2	13.5	35.8	10.2	28.5
51	LES15-7011	27.7	h	5.0	26.7	57.1	8.5	62.2	7.2	26.9
52	LES15-5540	28.6	h	10.0	47.6	50.0	6.7	51.2	10.4	24.4
53	LES15-5605	36.0	h	20.0	35.8	61.2	11.5	66.5	15.8	41.4
54	LES15-7004	31.5	h	20.0	48.2	64.5	13.2	43.3	13.4	17.8
55	U6714-B-041	29.8	h	35.0	24.7	60.2	22.3	39.8	11.4	15.4
56	MI14R0008	36.6	h	45.0	33.8	51.3	13.1	48.2	13.6	51.0
57	MI14R0009	36.8	h	50.0	33.9	44.2	10.9	35.2	20.8	62.7
58	MI14R0421	21.5		5.0	35.1	41.9	13.3	20.8	10.6	24.1
59	MI14R0267	20.6	l	20.0	24.9	31.8	9.0	25.9	11.8	21.1
60	OH09-207-68	27.5	h	25.0	37.4	40.2	7.7	44.9	10.6	27.0
100	AVERAGE	24.0		15.7	35.1	40.7	10.8	29.8	11.6	23.0
101	MINUMUM	11.3		0.0	17.8	7.6	3.2	7.4	1.2	6.8
102	MAXIMUM	36.8		50.0	52.8	68.9	33.1	66.5	33.0	62.7
103	LSD(0.05)	10.1		.	.	.	.	.	.	.

Table 14. Summary of index (IND, %) data from the 2016-2017 NUWWSN.

ENTRY	NAME	AVG		ILCHA	KYLEX	MIELA	MOCOL	NEMEA	NYITH	OHWOO	VAMTH
1	TRUMAN	5.8	l	0.1	4.4	3.4	5.5	16.3	0.8	12.2	3.9
2	ERNIE	13.7		1.7	8.2	25.1	7.2	33.2	2.4	21.1	10.8
3	FREEDOM	10.4	l	1.0	5.8	12.7	18.8	11.3	2.5	16.7	14.7
4	PIONEER2545	23.3	h	14.0	7.6	30.4	11.1	31.0	9.9	50.6	32.0
5	VA11W-108PA	12.9		0.4	2.7	17.5	2.3	35.7	4.0	17.2	23.5
6	VA09MAS1-12-5-1	11.2	l	0.6	3.6	8.1	5.7	18.0	3.7	21.7	28.5
7	VA14FHB-29	10.8	l	2.3	8.3	12.4	4.1	12.3	3.6	22.8	20.6
8	VA09MAS8-34-5-2	15.7		9.0	1.8	27.7	8.8	17.7	4.3	24.4	31.5
9	VA09MAS3-34-2-1	16.7	h	1.1	2.2	27.4	8.9	42.3	1.9	22.2	27.3
10	KY09C-0052-26-12-3	13.1		0.1	3.5	30.2	12.1	32.0	1.7	14.4	11.1
11	X08C-1070-74-20-1	11.2	l	0.4	3.8	20.1	8.8	24.2	1.7	16.7	14.2
12	KY09C-1245-100-1-3	16.2		0.6	3.6	22.3	8.9	45.3	3.9	23.9	20.8
13	KY09C-0267-45-16-3	6.7	l	0.1	2.9	7.1	1.2	22.5	2.2	10.0	7.2
14	X08C-1090-51-12-5	12.4	l	1.3	6.0	27.5	2.1	16.2	1.6	20.0	24.3
15	OH12-195-22	13.2		6.0	4.8	21.2	6.7	16.2	4.7	27.2	18.9
16	OH11-118-18	5.5	l	0.1	3.4	8.3	9.9	9.7	0.0	9.4	3.1
17	OH12-133-74	10.5	l	1.7	6.5	13.8	2.6	17.5	2.6	20.0	19.2
18	OH12-194-24	19.1	h	13.5	7.3	26.5	4.8	26.5	9.4	42.2	22.9
19	OH13-16-25	17.7	h	1.1	4.1	29.6	3.9	32.7	2.6	32.8	35.1
20	NE14538	7.4	l	1.1	3.8	6.3	6.8	13.1	1.2	21.1	5.5
21	NE14606	11.1	l	3.8	4.8	9.5	4.6	26.0	3.4	30.0	6.3
22	NE14696	7.4	l	0.1	7.9	8.8	6.7	5.5	4.2	21.7	4.3
23	NI12702W	7.7	l	1.5	3.2	11.0	6.4	8.8	1.2	23.3	6.2
24	NE15545	11.2	l	0.6	3.8	28.4	4.1	11.0	2.4	30.0	9.3
25	KWS095	12.9		4.1	4.3	18.8	4.8	18.8	3.8	26.7	21.5
26	KWS103	16.7	h	1.0	2.9	33.7	4.4	25.5	4.7	29.4	31.7
27	KWS122	12.3	l	0.1	5.3		7.3	17.8	4.8	26.7	16.4
28	KWS127	15.5		15.1	4.8		4.4	28.3	2.5	23.9	22.0
29	KWS141	11.5	l	1.5	6.1		10.0	29.3	1.4	13.3	11.0
30	IL09-3264-T2	14.9		0.3	7.6	30.9	4.9	26.0	2.7	22.2	24.6
31	IL12-21235	15.8		0.0	4.0	35.1	5.2	53.7	3.7	11.1	13.8
32	IL12-26004	15.2		0.0	5.8	52.5	8.2	36.2	4.0	10.0	5.0
33	IL13-451	13.3		0.1	4.4	29.3	11.2	34.8	1.5	15.6	9.4
34	IL13-20616	13.2		0.0	5.8	29.1	6.1	41.5	3.3	15.6	4.2
35	NY99056-161	8.7	l	4.8	5.2	3.9	6.1	16.2	1.3	19.4	12.8
36	NYWhatford/7388-39-693	5.5	l	0.4	3.1	2.8	4.7	10.0	1.0	16.7	5.5
37	NY09087-15-69-1124	6.1	l	0.0	2.9	0.1	2.5	22.5	0.8	16.1	3.5
38	NY01016-AN	12.2	l	2.5	1.4	17.4	5.3	21.2	3.6	25.0	21.0
39	NY09125-16-1034	13.2		1.6	5.8	29.6	3.2	32.5	1.4	18.9	12.3
40	MO140304	8.2	l	0.7	6.7	7.5	6.9	21.7	4.4	12.2	5.7
41	MO151323	9.2	l	0.1	7.3	13.2	7.8	33.7	0.4	7.8	3.6
42	MO151031	11.5	l	0.3	6.4	29.1	3.8	23.5	2.9	15.0	11.1
43	MO151826	6.5	l	0.1	3.8	18.0	2.6	15.7	0.4	5.4	6.3
44	MO150133	11.1	l	0.1	4.6	14.0	11.4	36.7	1.3	11.1	9.5
45	0566A1-3-1-1-63	15.1		0.4	3.0	23.9	5.9	44.7	7.1	15.6	20.4
46	04620A1-1-7-4-10	10.7	l	0.1	7.8	16.7	7.5	28.2	1.3	13.3	10.5
47	0527A1-9-14-4-3-3	12.7		0.3	3.1	24.9	15.9	31.2	3.3	12.2	10.6
48	0762A1-2-8	9.7	l	0.1	4.0	5.6	7.2	50.5	0.7	6.7	2.9
49	07419A1-16-1-1-16-1-1	18.3	h	7.5	8.5	23.2	15.0	35.0	10.9	23.3	23.3
50	LES15-5199	14.1		0.5	6.9	23.0	10.2	35.0	3.4	15.6	18.2
51	LES15-7011	16.8	h	0.5	2.1	37.6	4.5	59.2	1.4	11.7	17.2
52	LES15-5540	16.7	h	0.2	8.0	27.1	3.5	51.2	5.2	21.7	16.5
53	LES15-5605	18.6	h	0.4	2.9	25.1	9.2	59.8	3.6	21.7	25.8
54	LES15-7004	16.6	h	2.0	8.7	28.6	9.9	43.3	3.2	26.1	11.0
55	U6714-B-041	17.8	h	5.5	2.9	33.8	21.2	39.8	6.4	22.8	9.9
56	MI14R0008	20.2	h	5.8	4.3	23.4	10.7	48.2	4.9	31.1	33.4
57	MI14R0009	19.6	h	6.3	6.0	22.8	8.1	35.2	7.7	27.8	42.6
58	MI14R0421	13.5		0.4	6.3	20.5	11.7	20.3	2.7	27.8	18.0
59	MI14R0267	10.9	l	1.0	5.0	11.9	5.8	24.7	3.0	21.1	14.9
60	OH09-207-68	12.6		4.5	5.6	13.2	4.3	42.7	2.5	13.3	14.6
100	AVERAGE	12.8		2.2	5.0	19.7	8.1	27.5	4.1	19.9	15.7
101	MINUMUM	5.5		0.0	1.4	0.1	1.2	1.4	0.0	5.4	2.9
102	MAXIMUM	23.3		15.1	8.7	52.5	29.3	59.8	26.7	50.6	42.6
103	LSD(0.05)	7.0		.	.	.	.	.	.	.	.

Table 15. Summary of Fusarium Damaged Kernel (FDK, %) data from the 2016-2017 NUWWSN.

ENTRY	NAME	AVG		KYLEX	MOCOL	NEMEA	NYITH	OHWOO	VAMTH
1	TRUMAN	12.7	l	10.0	7.5	0.0	15.0	12.0	31.5
2	ERNIE	25.2		42.5	12.5	1.0	50.0	24.0	21.0
3	FREEDOM	35.0	h	65.0	7.5	2.0	60.0	37.0	38.5
4	PIONEER2545	42.2	h	65.0	7.5	0.0	90.0	56.0	34.5
5	VA11W-108PA	30.8	h	60.0	15.0	0.0	55.0	16.0	38.5
6	VA09MAS1-12-5-1	14.9	l	20.0	7.5	0.0	30.0	15.0	17.0
7	VA14FHB-29	25.8		52.5	10.0	1.0	50.0	15.0	26.5
8	VA09MAS8-34-5-2	35.4	h	47.5	20.0	2.0	90.0	16.0	37.0
9	VA09MAS3-34-2-1	24.1	l	45.0	17.5	0.0	40.0	21.0	21.0
10	KY09C-0052-26-12-3	11.4	l	17.5	12.5	0.0	10.0	11.0	17.5
11	X08C-1070-74-20-1	16.4	l	12.5	7.5	1.0	45.0	10.0	22.5
12	KY09C-1245-100-1-3	20.3	l	40.0	10.0	3.0	40.0	12.0	17.0
13	KY09C-0267-45-16-3	17.6	l	27.5	20.0	1.0	30.0	9.0	18.0
14	X08C-1090-51-12-5	16.4	l	30.0	5.0	0.0	25.0	12.0	26.5
15	OH12-195-22	25.3		37.5	5.0	1.0	75.0	17.0	16.5
16	OH11-118-18	13.3	l	7.5	10.0	0.0	10.0	8.0	44.5
17	OH12-133-74	29.1	h	30.0	15.0	0.0	65.0	17.0	47.5
18	OH12-194-24	31.0	h	47.5	15.0	0.0	80.0	17.0	26.5
19	OH13-16-25	23.6	l	37.5	7.5	0.0	55.0	15.0	26.5
20	NE14538	29.8	h	55.0	10.0	1.0	55.0	17.0	41.0
21	NE14606	27.6		37.5	5.0	0.0	40.0	26.0	57.0
22	NE14696	36.0	h	32.5	10.0	0.0	45.0	87.0	41.5
23	NI12702W	34.2	h	45.0	10.0	0.0	25.0	72.0	53.0
24	NE15545	35.0	h	42.5	10.0	1.0	40.0	73.0	43.5
25	KWS095	26.5		35.0	20.0	1.0	45.0	26.0	32.0
26	KWS103	28.8	h	57.5	5.0	4.0	45.0	34.0	27.5
27	KWS122	15.2	l	20.0	7.5	0.0	20.0	17.0	26.5
28	KWS127	34.9	h	65.0	17.5	2.0	55.0	47.0	23.0
29	KWS141	19.8	l	42.5	5.0	0.0	30.0	14.0	27.5
30	IL09-3264-T2	22.4	l	32.5	12.5	3.0	30.0	24.0	32.5
31	IL12-21235	10.5	l	12.5	5.0	0.0	10.0	11.0	24.5
32	IL12-26004	13.0	l	7.5	10.0	0.0	35.0	6.0	19.5
33	IL13-451	16.4	l	40.0	5.0	1.0	15.0	18.0	19.5
34	IL13-20616	15.8	l	25.0	10.0	2.0	20.0	11.0	27.0
35	NY99056-161	19.9	l	17.5	5.0	1.0	25.0	18.0	53.0
36	NYWhatford/7388-39-693	20.1	l	7.5	5.0	0.0	35.0	22.0	51.0
37	NY09087-15-69-1124	10.7	l	12.5	7.5	0.0	10.0	9.0	25.0
38	NY01016-AN	25.3		37.5	5.0	1.0	60.0	17.0	31.5
39	NY09125-16-1034	27.8	h	37.5	15.0	5.0	50.0	13.0	46.0
40	MO140304	14.6	l	22.5	12.5	0.0	25.0	13.0	14.5
41	MO151323	10.8	l	12.5	7.5	1.0	10.0	12.0	21.5
42	MO151031	18.8	l	42.5	5.0	1.0	25.0	19.0	20.0
43	MO151826	12.6	l	12.5	7.5	4.0	20.0	11.0	20.5
44	MO150133	11.7	l	12.5	12.5	5.0	10.0	10.0	20.0
45	0566A1-3-1-1-63	30.8	h	32.5	20.0	0.0	90.0	22.0	20.0
46	04620A1-1-7-4-10	19.2	l	37.5	5.0	0.0	20.0	25.0	27.5
47	0527A1-9-14-4-3-3	24.8	l	42.5	10.0	8.0	55.0	15.0	18.5
48	0762A1-2-8	22.8	l	20.0	22.5	3.0	50.0	19.0	22.5
49	07419A1-16-1-1-16-1-1	41.8	h	57.5	15.0	0.0	80.0	70.0	28.5
50	LES15-5199	37.7	h	65.0	20.0	1.0	55.0	46.0	39.0
51	LES15-7011	20.8	l	32.5	10.0	0.0	30.0	26.0	26.5
52	LES15-5540	29.3	h	37.5	15.0	1.0	25.0	57.0	40.0
53	LES15-5605	24.3	l	40.0	10.0	3.0	35.0	32.0	25.5
54	LES15-7004	24.3	l	37.5	7.5	0.0	50.0	37.0	13.5
55	U6714-B-041	39.1	h	77.5	5.0	1.0	65.0	42.0	44.0
56	MI14R0008	24.3	l	25.0	7.5	1.0	60.0	26.0	26.0
57	MI14R0009	21.3	l	17.5	10.0	0.0	60.0	17.0	23.5
58	MI14R0421	30.5	h	47.5	12.5	1.0	40.0	47.0	35.0
59	MI14R0267	17.9	l	15.0	5.0	0.0	35.0	32.0	20.5
60	OH09-207-68	26.4		35.0	10.0	2.0	50.0	29.0	32.5
100	AVERAGE	23.7		34.7	10.4	1.1	41.6	25.2	29.5
101	MINUMUM	10.5		7.5	5.0	0.0	10.0	6.0	13.5
102	MAXIMUM	42.2		77.5	22.5	8.0	90.0	87.0	57.0
103	LSD(0.05)	14.5		.	.	.	.	.	.

Table 16. Summary of INC/SEV/FDK (ISK, %) data from the 2016-2017 NUWWSN

ENTRY	NAME	AVG		KYLEX	MOCOL	NEMEA	NYITH	OHWOO	VAMTH
1	TRUMAN	21.2	l	17.6	25.6	32.2	11.8	12.1	27.6
2	ERNIE	31.2		36.9	29.7	35.8	30.3	22.1	32.3
3	FREEDOM	34.7		42.4	36.0	29.0	34.5	24.7	41.6
4	PIONEER2545	45.4	h	44.4	30.5	37.8	57.3	52.8	49.8
5	VA11W-108PA	32.3		34.7	21.7	39.4	35.0	16.6	46.5
6	VA09MAS1-12-5-1	26.3	l	19.1	22.9	32.0	23.9	18.9	41.0
7	VA14FHB-29	31.2		40.2	22.8	32.4	31.6	19.8	40.2
8	VA09MAS8-34-5-2	35.8		27.4	32.8	31.4	50.4	21.0	51.5
9	VA09MAS3-34-2-1	31.5		27.6	31.7	42.0	24.5	21.6	41.8
10	KY09C-0052-26-12-3	24.7	l	18.7	35.4	36.8	12.3	13.2	31.7
11	X08C-1070-74-20-1	26.9		18.1	29.5	36.1	26.3	13.9	37.5
12	KY09C-1245-100-1-3	31.6		29.9	29.1	44.8	30.3	19.1	36.2
13	KY09C-0267-45-16-3	23.1	l	24.2	18.7	32.9	23.9	9.6	29.1
14	X08C-1090-51-12-5	26.6		29.4	19.6	33.0	18.3	16.8	42.5
15	OH12-195-22	31.2		29.8	24.6	26.4	46.2	23.0	37.2
16	OH11-118-18	18.7	l	16.5	26.5	24.2	5.0	9.0	31.2
17	OH12-133-74	30.0		28.2	21.9	27.9	36.5	18.7	47.0
18	OH12-194-24	37.1		36.3	25.5	35.0	51.7	32.1	41.9
19	OH13-16-25	31.2		27.3	21.0	32.8	32.8	25.7	47.5
20	NE14538	28.2		33.6	27.1	25.7	28.6	19.3	34.9
21	NE14606	31.1		29.5	21.0	36.7	28.4	28.4	42.4
22	NE14696	31.9		33.2	24.4	21.2	32.5	47.8	32.2
23	NI12702W	29.8		30.0	27.1	22.2	17.3	42.8	39.2
24	NE15545	32.6		29.1	24.0	30.1	27.4	47.1	38.0
25	KWS095	31.7		29.1	28.3	30.8	30.4	26.6	45.0
26	KWS103	33.5		35.1	19.9	36.0	31.1	31.2	47.5
27	KWS122	27.0		23.2	24.7	29.6	22.6	23.0	39.1
28	KWS127	35.2		41.6	26.5	38.4	32.4	33.0	39.0
29	KWS141	28.2		34.4	29.8	35.9	19.5	13.4	36.0
30	IL09-3264-T2	30.9		32.1	23.8	38.2	23.5	23.1	44.6
31	IL12-21235	25.7	l	18.2	25.2	45.2	17.3	10.9	37.2
32	IL12-26004	25.7	l	18.6	29.6	39.1	27.9	8.5	30.3
33	IL13-451	26.7		30.0	30.2	39.0	14.0	16.6	30.6
34	IL13-20616	26.0	l	25.6	25.4	42.0	21.8	13.9	27.1
35	NY99056-161	26.7		21.6	25.2	30.0	17.0	18.8	47.7
36	NYWhatford/7388-39-693	23.8	l	15.0	21.7	27.6	20.3	18.8	39.2
37	NY09087-15-69-1124	19.1	l	14.8	16.8	35.8	9.5	13.1	24.6
38	NY01016-AN	30.4		24.2	22.7	35.2	35.4	21.7	43.3
39	NY09125-16-1034	31.2		31.5	23.6	40.4	27.8	16.7	47.0
40	MO140304	25.8	l	25.9	29.6	35.6	25.1	12.7	25.7
41	MO151323	22.1	l	22.8	28.5	38.7	7.8	9.5	25.1
42	MO151031	26.2	l	33.0	20.6	34.8	20.5	16.5	31.6
43	MO151826	18.4	l	17.6	18.7	26.9	11.8	7.8	27.8
44	MO150133	24.9	l	19.4	34.5	41.5	11.4	10.7	31.6
45	0566A1-3-1-1-63	35.2		24.8	28.8	43.4	57.3	18.3	38.4
46	04620A1-1-7-4-10	27.2		34.5	25.4	35.1	15.3	18.0	34.8
47	0527A1-9-14-4-3-3	30.6		31.2	34.9	38.0	34.5	13.5	31.3
48	0762A1-2-8	27.0		21.2	33.4	45.7	25.4	11.8	24.2
49	07419A1-16-1-1-16-1-1	43.5	h	42.8	38.0	39.6	57.2	42.0	41.6
50	LES15-5199	37.1		42.5	34.5	40.1	35.0	27.8	42.5
51	LES15-7011	28.4		26.4	22.3	46.7	19.9	17.3	37.8
52	LES15-5540	35.1		33.8	23.8	45.8	28.1	35.7	43.6
53	LES15-5605	33.4		29.1	30.7	48.1	25.6	25.8	41.0
54	LES15-7004	33.1		34.9	29.5	43.0	31.2	30.3	29.9
55	U6714-B-041	40.0	h	42.3	37.2	42.4	46.2	30.3	41.7
56	MI14R0008	35.3		24.4	28.7	44.9	38.9	29.2	45.6
57	MI14R0009	34.0		22.4	27.5	40.6	41.3	23.3	48.8
58	MI14R0421	34.3		34.9	31.5	34.6	26.7	35.3	43.0
59	MI14R0267	27.3		19.5	22.7	35.8	25.0	25.6	35.1
60	OH09-207-68	30.0		29.3	22.1	41.3	30.4	19.7	37.2
100	AVERAGE	29.9		28.5	26.8	36.1	28.0	22.1	38.0
101	MINUMUM	18.4		14.8	16.8	21.2	5.0	7.8	24.2
102	MAXIMUM	45.4		44.4	38.0	48.1	57.3	52.8	51.5
103	LSD(0.05)	8.1		.	.	.	.	.	.

Table 17. Summary of deoxynivalenol (DON, ppm) data from the 2016-2017 NUWWSN.

ENTRY	NAME	AVG		KYLEX	MOCOL	OHWOO	VAMTH
1	TRUMAN	3.4	l	5.5	0.1	7.3	0.8
2	ERNIE	7.9	l	15.5	0.2	14.4	1.4
3	FREEDOM	10.7		23.1	0.3	18.0	1.4
4	PIONEER2545	18.5	h	26.9	1.2	39.9	5.9
5	VA11W-108PA	8.6		21.3	0.5	10.7	2.1
6	VA09MAS1-12-5-1	7.7	l	15.1	0.5	13.7	1.6
7	VA14FHB-29	8.9		21.8	0.3	12.8	0.9
8	VA09MAS8-34-5-2	8.3		17.3	0.3	12.3	3.2
9	VA09MAS3-34-2-1	8.0	l	20.1	0.6	9.7	1.7
10	KY09C-0052-26-12-3	3.3	l	9.5	0.3	2.4	1.0
11	X08C-1070-74-20-1	3.4	l	7.2	0.2	5.3	0.9
12	KY09C-1245-100-1-3	4.9	l	11.3	0.5	7.0	1.0
13	KY09C-0267-45-16-3	5.4	l	14.1	0.2	5.8	1.4
14	X08C-1090-51-12-5	7.2	l	13.0	0.4	14.3	1.4
15	OH12-195-22	7.6	l	15.6	0.3	13.1	1.5
16	OH11-118-18	2.3	l	3.4	0.6	4.3	1.0
17	OH12-133-74	5.1	l	9.8	0.2	8.9	1.7
18	OH12-194-24	9.9		22.3	0.6	14.8	1.7
19	OH13-16-25	6.9	l	15.3	0.4	10.3	1.8
20	NE14538	7.5	l	16.6	0.1	11.7	1.5
21	NE14606	9.9		12.7	0.3	21.6	4.9
22	NE14696	10.5		17.7	0.5	21.3	2.6
23	NI12702W	12.8		15.9	0.2	31.1	4.0
24	NE15545	11.8		20.2	0.1	23.3	3.7
25	KWS095	4.6	l	8.8	0.3	7.9	1.5
26	KWS103	6.3	l	12.8	0.2	10.1	2.2
27	KWS122	4.4	l	10.4	0.3	6.1	0.6
28	KWS127	11.3		25.2	1.1	15.9	3.0
29	KWS141	6.4	l	20.1	0.4	3.7	1.3
30	IL09-3264-T2	4.2	l	9.4	0.2	6.0	1.1
31	IL12-21235	4.3	l	12.0	0.3	4.1	1.0
32	IL12-26004	2.8	l	7.3	0.2	3.0	0.6
33	IL13-451	4.3	l	10.3	0.2	6.5	0.2
34	IL13-20616	3.9	l	9.5	0.3	5.1	0.6
35	NY99056-161	10.0		14.2	0.3	20.0	5.5
36	NYWhatford/7388-39-693	5.5	l	6.1	0.2	13.7	2.2
37	NY09087-15-69-1124	2.1	l	4.2	0.6	3.0	0.6
38	NY01016-AN	14.6		24.2	0.3	29.8	4.2
39	NY09125-16-1034	8.4		19.5	0.3	12.1	1.9
40	MO140304	5.9	l	14.6	0.2	7.5	1.3
41	MO151323	2.9	l	7.4	0.2	3.2	0.8
42	MO151031	6.8	l	14.8	0.1	11.4	0.9
43	MO151826	4.0	l	11.0	0.1	4.4	0.7
44	MO150133	2.3	l	5.7	0.1	3.2	0.3
45	0566A1-3-1-1-63	5.8	l	14.0	0.4	6.8	1.9
46	04620A1-1-7-4-10	6.1	l	14.4	0.3	7.9	1.7
47	0527A1-9-14-4-3-3	2.9	l	7.7	0.3	2.9	0.6
48	0762A1-2-8	3.4	l	9.6	0.3	3.2	0.4
49	07419A1-16-1-1-16-1-1	10.1		18.3	0.5	19.3	2.4
50	LES15-5199	8.3		20.4	0.4	10.3	2.3
51	LES15-7011	5.7	l	16.9	0.7	4.3	1.1
52	LES15-5540	7.9	l	14.4	0.5	15.1	1.6
53	LES15-5605	5.4	l	11.5	0.5	8.4	1.1
54	LES15-7004	6.7	l	16.3	0.3	9.6	0.9
55	U6714-B-041	21.0	h	47.1	0.2	28.9	7.7
56	MI14R0008	5.3	l	11.4	0.5	7.2	2.4
57	MI14R0009	5.7	l	9.4	0.7	9.7	2.9
58	MI14R0421	7.3	l	12.9	0.1	15.0	1.2
59	MI14R0267	6.9	l	15.3	0.4	9.6	2.3
60	OH09-207-68	5.5	l	13.9	0.3	6.8	1.3
100	AVERAGE	7.0		14.5	0.3	11.3	1.8
101	MINUMUM	2.1		3.4	0.1	2.4	0.2
102	MAXIMUM	21.0		47.1	1.2	39.9	7.7
103	LSD(0.05)	6.1		.	.	.	.

Table 18. Summary of greenhouse severity (GHSEV, %) data from the 2016-2017 NUWWSN.

	NAME	GHSEV
1	TRUMAN	5.4
2	ERNIE	15.4
3	FREEDOM	7.2
4	PIONEER2545	23.2
5	VA11W-108PA	9.2
6	VA09MAS1-12-5-1	13.9
7	VA14FHB-29	7.4
8	VA09MAS8-34-5-2	7.5
9	VA09MAS3-34-2-1	11.2
10	KY09C-0052-26-12-3	9.5
11	X08C-1070-74-20-1	14.6
12	KY09C-1245-100-1-3	10.8
13	KY09C-0267-45-16-3	14.5
14	X08C-1090-51-12-5	12.5
15	OH12-195-22	6.8
16	OH11-118-18	5.1
17	OH12-133-74	6.5
18	OH12-194-24	20.4
19	OH13-16-25	7.8
20	NE14538	24.8
21	NE14606	18.8
22	NE14696	13.3
23	NI12702W	12.9
24	NE15545	12.2
25	KWS095	11.2
26	KWS103	6.9
27	KWS122	17.5
28	KWS127	11.8
29	KWS141	5.3
30	IL09-3264-T2	27.7
31	IL12-21235	6.4
32	IL12-26004	7.7
33	IL13-451	7.3
34	IL13-20616	7.2
35	NY99056-161	19.2
36	NYWhatford/7388-39-693	5.6
37	NY09087-15-69-1124	6.6
38	NY01016-AN	12.9
39	NY09125-16-1034	8.1
40	MO140304	5.7
41	MO151323	10.3
42	MO151031	16.4
43	MO151826	7.1
44	MO150133	5.0
45	0566A1-3-1-1-63	7.6
46	04620A1-1-7-4-10	6.9
47	0527A1-9-14-4-3-3	5.7
48	0762A1-2-8	4.7
49	07419A1-16-1-1-16-1-1	7.6
50	LES15-5199	7.5
51	LES15-7011	6.4
52	LES15-5540	7.0
53	LES15-5605	10.5
54	LES15-7004	8.3
55	U6714-B-041	23.3
56	MI14R0008	9.5
57	MI14R0009	14.2
58	MI14R0421	7.0
59	MI14R0267	11.5
60	OH09-207-68	14.1
100	MEAN	10.8

Table 19. Summary of heading date (HD, Julian days) height (HGT, inches), and lodging (LDG) data from the 2016-2017 NUWWSN

		Heading Date (Juian Days)							Height (inches)					LODGING (0-9)
ENTRY	NAME	AVG		ILCHA	KYLEX	MOCOL	NYITH	OHWOO	AVG		ILCHA	KYLEX	VAMTH	VA
1	TRUMAN	135.5	h	133	121	134	151	139	42.0	h	44.0	45.0	37	1
2	ERNIE	129.4		128	117	127	144	132	35.5		37.0	39.5	30	1
3	FREEDOM	130.9		130	114	129	147	135	38.7	h	38.0	39.0	39	3
4	PIONEER2545	130.1		129	117	128	145	132	37.3		39.0	37.0	36	3
5	VA11W-108PA	128.1		124	111	128	147	131	36.8		39.5	37.0	34	0
6	VA09MAS1-12-5-1	130.4		128	115	131	146	132	35.5		37.0	36.5	33	0
7	VA14FHB-29	131.2		130	116	128	147	135	36.2		37.5	39.0	32	3
8	VA09MAS8-34-5-2	129.7		129	113	131	144	132	36.0		36.0	39.0	33	1
9	VA09MAS3-34-2-1	129.4		130	109	128	147	133	33.0	l	34.5	35.5	29	1
10	KY09C-0052-26-12-3	125.4	l	120	113	124	142	129	36.0		36.0	39.0	33	3
11	X08C-1070-74-20-1	129.3		129	113	125	146	134	35.5		33.5	39.0	34	0
12	KY09C-1245-100-1-3	125.2	l	120	111	124	143	129	35.0		37.5	35.5	32	8
13	KY09C-0267-45-16-3	128.5		126	111	128	146	132	34.0	l	35.0	34.0	33	1
14	X08C-1090-51-12-5	128.8		126	118	124	145	132	35.8		38.0	38.5	31	3
15	OH12-195-22	127.8		122	117	125	143	132	35.7		37.0	36.0	34	1
16	OH11-118-18	133.7	h	133	118	133	147	138	38.3	h	40.0	39.0	36	1
17	OH12-133-74	129.2		130	115	127	143	132	36.8		39.0	35.5	36	1
18	OH12-194-24	128.1		125	115	125	143	133	35.8		37.5	36.0	34	1
19	OH13-16-25	125.8	l	119	115	122	144	129	37.3		37.0	39.0	36	3
20	NE14538	132.2		131	112	134	147	137	39.0	h	41.5	39.5	36	0
21	NE14606	132.5	h	132	114	131	148	138	40.0	h	42.0	43.0	35	0
22	NE14696	132.8	h	132	110	131	151	140	41.2	h	47.0	36.5	40	0
23	NI12702W	135.3	h	133	121	134	150	139	39.8	h	43.5	42.0	34	0
24	NE15545	133.0	h	132	111	134	150	138	38.2	h	44.5	36.0	34	0
25	KWS095	129.5		126	118	127	145	132	36.2		38.5	36.0	34	2
26	KWS103	126.8	l	122	112	128	142	130	34.7	l	37.5	35.5	31	2
27	KWS122	130.3		129	112	129	148	134	37.7		38.0	39.0	36	3
28	KWS127	129.6		130	112	127	146	134	37.5		40.0	34.5	38	0
29	KWS141	127.7	l	125	112	125	145	132	33.3	l	37.5	29.5	33	0
30	IL09-3264-T2	127.3	l	123	113	125	144	132	34.5	l	34.5	39.0	30	1
31	IL12-21235	124.7	l	120	112	122	141	129	35.7		38.0	37.0	32	4
32	IL12-26004	125.8	l	117	121	124	140	128	34.8	l	36.0	37.5	31	5
33	IL13-451	126.0	l	119	118	124	141	129	35.0		35.5	39.5	30	4
34	IL13-20616	126.2	l	121	115	122	142	131	34.3	l	35.0	39.0	29	5
35	NY99056-161	130.7		132	114	122	151	135	38.7	h	43.5	34.5	38	1
36	NYWhatford/7388-39-	134.9	h	134	118	134	148	141	41.5	h	41.0	42.5	41	0
37	NY09087-15-69-1124	134.3	h	134	121	128	150	139	41.5	h	45.0	43.5	36	1
38	NY01016-AN	131.1		130	114	131	146	135	39.2	h	40.5	39.0	38	0
39	NY09125-16-1034	129.7		130	113	128	145	133	37.0		37.5	38.5	35	2
40	MO140304	130.9		130	113	129	148	135	38.0	h	39.0	36.0	39	0
41	MO151323	126.7	l	122	112	124	144	132	35.5		36.5	39.0	31	1
42	MO151031	130.7		130	115	129	147	133	38.3	h	41.0	40.0	34	2
43	MO151826	130.9		130	118	129	145	133	37.5		39.0	39.5	34	1
44	MO150133	128.1		122	117	126	145	131	37.0		36.5	41.5	33	0
45	0566A1-3-1-1-63	127.2	l	124	111	127	143	132	33.5	l	34.0	35.5	31	1
46	04620A1-1-7-4-10	127.9		123	112	129	144	132	34.3	l	36.5	33.5	33	1
47	0527A1-9-14-4-3-3	127.0	l	123	110	126	145	132	33.5	l	34.0	36.5	30	3
48	0762A1-2-8	127.7	l	124	112	125	147	131	33.3	l	32.5	35.5	32	2
49	07419A1-16-1-1-16-1-	127.2	l	122	115	122	146	131	30.7	l	30.0	36.0	26	0
50	LES15-5199	126.8	l	120	115	127	143	130	33.3	l	36.5	33.5	30	0
51	LES15-7011	125.5	l	117	118	122	142	129	31.2	l	40.0	22.5	31	3
52	LES15-5540	130.6		130	112	128	148	135	34.2	l	36.0	35.5	31	3
53	LES15-5605	126.3	l	122	112	125	142	131	34.5	l	35.5	38.0	30	3
54	LES15-7004	127.6	l	122	116	125	144	131	35.2		34.5	39.0	32	2
55	U6714-B-041	129.5		128	113	129	143	135	35.7		37.0	38.0	32	5
56	MI14R0008	127.8		126	113	127	143	131	36.0		36.0	39.0	33	5
57	MI14R0009	128.0		125	115	124	145	132	35.5		36.0	37.5	33	4
58	MI14R0421	129.9		130	115	126	146	133	36.7		37.0	36.0	37	1
59	MI14R0267	129.9		129	114	128	146	133	38.2	h	39.0	37.5	38	0
60	OH09-207-68	127.9		125	114	125	145	131	38.7	h	42.0	36.0	38	0
100	AVERAGE	129.2		127	114	127	145	133	36.4		38.0	37.4	33.7	
101	MINUMUM	124.7		117	109	122	140	128	30.7		30.0	22.5	26	
102	MAXIMUM	135.5		134	121	134	151	141	42.0		47.0	45.0	41	
103	LSD(0.05)	3.0		.	.	.	.	.	4.2		.	.	.	

Table 20. Summary of other traits collected on the 2016-2017 NUWWSN including powdery mildew (PM), leaf rust (LR), yellow rust (YR) and foliar rating of general foliage health.

		YIELD		TEST WEIGHT		HGT (inches)	HD (Julian Days)	POWDERY MILDEW (0-9)	YELLOW RUST (0-9)		LEAF RUST (0-9)		LEAF RUST - REACTION TYPE: 0-3 (TFRTG)	LEAF RUST - REACTION TYPE: 0-3 (TNRJ)	Foilar Rating (0-9)
		VA	OHNAP	VA	OHNAP	OHNAP	OHNAP	VA	VA	ILCHA	VA	ILCHA	VA	VA	OHWOO
1	TRUMAN	66.9		58.2				3	0	4.0	4	5.0	3	3	4.7
2	ERNIE	69.3		56.8				2	0	4.5	6	6.5	3	3Tr0;	4.7
3	FREEDOM	72.8		58.1				1	3	5.0	6	6.5	23;	1;	4.3
4	PIONEER2545	53		56.4				0	0	6.0	8	6.0	3	3Tr0;	5.3
5	VA11W-108PA	78.7	76.2	59.4	58.8	31.5	136.0	1	0	2.5	3	3.0	3/12;	12;	3.7
6	VA09MAS1-12-5-1	84.9	87.6	61.2	60.7	31.5	136.0	1	0	2.5	1	1.5	21;Tr3	1;	4.0
7	VA14FHB-29	83.3	76.8	60.9	57.2	33	138.5	1	0	2.0	1	1.5	0;12	3	4.7
8	VA09MAS8-34-5-2	91.9	82.2	58.6	56.1	31.5	137.5	0	0	3.0	2	2.0	12-;	;1=	4.0
9	VA09MAS3-34-2-1	77.5	79.5	58.4	58.7	30	138.5	1	0	2.5	3	2.5	3-;	1;	4.7
10	KY09C-0052-26-12-3	61.3		58.8				0	0	4.5	9	8.0	3	3	5.0
11	X08C-1070-74-20-1	71.6		59.4				0	0	4.5	7	5.0	3	3	4.3
12	KY09C-1245-100-1-3	63.5		57.7				0	0	5.0	7	6.5	3/1;	3/1;	5.0
13	KY09C-0267-45-16-3	77.8		60				1	0	6.5	7	4.5	3	3	4.3
14	X08C-1090-51-12-5	65.1		57.9				0	0	3.0	8	3.5	3	3	5.7
15	OH12-195-22	72	65.3	57.5	55.2	29.5	137.5	0	5	6.0	1	3.0	1;	0;Tr3	3.3
16	OH11-118-18	67.5	82.7	59.6	59.9	36	139.0	0	0	4.5	6	2.5	12;Tr3	0;Tr3	3.7
17	OH12-133-74	79.9	86.6	57.7	57.1	33.5	137.5	0	0	3.0	2	3.0	3	32;	3.7
18	OH12-194-24	71.5	67.7	57.4	55.2	30	137.0	0	0	3.0	1	3.5	1;Tr3	;1=	3.7
19	OH13-16-25	66.9	78.9	57.8	56.5	31	135.0	4	0	4.5	7	4.5	3	3	5.0
20	NE14538	73.6		61.1				4	0	3.5	1	2.0	21;3;	12;	4.3
21	NE14606	54.7		59.8				6	0	4.0	1	3.0	1;23;	;1-/23;	4.3
22	NE14696	74		59.8				5	0	2.5	1	2.0	;1=	;1=	3.7
23	NI12702W	53		59.6				6	0	4.0	1	3.5	23-;	12;/3	4.0
24	NE15545	45.2		56.8				6	0	4.0	3	3.5	3	3	5.0
25	KWS095	72.3		58.4				5	0	3.5	7	7.0	3	3	4.7
26	KWS103	88		58.3				2	0	3.0	1	3.0	3	3	4.0
27	KWS122	81.7		59.9				4	0	2.0	1	2.5	3	3	4.7
28	KWS127	76.8		56.9				0	0	3.5	6	5.5	12-;	3	4.0
29	KWS141	67.9		59.9				4	0	4.0	5	5.0	3	3	6.0
30	IL09-3264-T2	77.6	75.5	59.8	58.5	28	136.5	3	0	4.0	2	4.5	32	23;	4.0
31	IL12-21235	75.6	81.4	61.2	60.4	32.5	133.0	5	0	6.5	3	3.5	3	3	4.3
32	IL12-26004	66.5	70.1	58.8	57.6	30	132.0	4	0	6.5	2	4.0	3	3	4.3
33	IL13-451	67.1	91.0	60.5	60.0	34.5	132.0	4	0	4.0	3	3.5	3	3	3.7
34	IL13-20616	66.3	75.4	60.6	60.8	32.5	134.0	1	0	4.0	1	3.0	3	3	5.3
35	NY99056-161	47.3		55.5				0	0	3.0	7	5.5	3	3	5.3
36	NYWhatford/7388-39	48.7		58.2				0	0	6.5	6	3.5	3	3	4.7
37	NY09087-15-69-1124	44.8		55.7				1	0	7.0	7	6.5	3	3	5.0
38	NY01016-AN	76.9		59.9				1	0	5.0	4	5.5	3-;	3	4.7
39	NY09125-16-1034	52.5		54.1				2	0	5.5	8	6.0	3	3	5.7
40	MO140304	78.9		62.1				1	0	2.5	5	4.0	3-	3	4.3
41	MO151323	66.5		60.1				3	0	3.0	6	4.0	3	3	4.0
42	MO151031	73.7		60.2				1	0	2.5	4	3.5	3	3/Tr0;	4.7
43	MO151826	75		61.8				0	0	3.0	4	3.5	3-	3	4.3
44	MO150133	79.1		61.2				2	0	2.5	5	4.5	3	23	4.0
45	0566A1-3-1-1-63	85.7		58.4				1	0	6.0	1	4.5	1-;	;1=	3.0
46	04620A1-1-7-4-10	82		58.5				0	0	5.5	3	4.0	23;/12;	;1-	4.3
47	0527A1-9-14-4-3-3	60.1		54.6				5	0	6.0	8	4.0	12;	1-;	4.0
48	0762A1-2-8	79		56.2				3	0	4.0	6	3.0	21;	;1	4.0
49	07419A1-16-1-1-16-1	76.7		60.1				0	0	3.5	1	4.5	12;	;1-	3.7
50	LES15-5199	80.4	89.2	55.9	57.3	29	136.0	1	0	3.0	3	4.5	3	23;	5.0
51	LES15-7011	54.9	83.6	56.9	58.9	33	132.5	0	0	6.0	4	5.5	3	3	6.0
52	LES15-5540	69.5	84.6	59.9	59.3	31	138.0	2	0	3.0	7	5.5	3	3	4.3
53	LES15-5605	77.3	86.6	59	59.8	31.5	134.5	2	0	2.5	5	4.5	23	3	4.0
54	LES15-7004	77.3	79.3	58.5	58.0	32.5	135.0	1	0	3.0	1	4.0	3	3;	5.7
55	U6714-B-041	61		57.8				0	0	4.0	1	4.0	0;	;1=	4.7
56	MI14R0008	58.2		59				6	8	6.0	8	7.5	3;	3	4.0
57	MI14R0009	55.8		59.4				7	6	6.0	7	7.0	23	3-	4.0
58	MI14R0421	76.4		60.7				0	0	4.0	3	4.5	23;	;1=Tr3	5.0
59	MI14R0267	79.5		59.9				0	0	4.5	4	4.5	3	3	4.0
60	OH09-207-68	71	89.7	58.3	58.5	36	137.0	0	0	3.0	5	5.5	3	3	4.3
	SR7353		87.8		56.4	30	135.5								
	AM444		88.2		57.6	33	138.0								
	Hilliard		83.1		59.5	32.5	135.5								
	JM1011		84.5		57.4	34	136.5								
	2141		72.5		58.6	30.5	137.5								
	Croplan9415		89.6		57.8	30.5	136.5								
	Becks125		88.0		58.1	33.5	136.5								
	P26R41		82.5		57.6	29.5	137.0								
	Average	70.1	81.7	58.8	58.2	31.7	136.1	1.9	0.4	4.1	4.2	4.3			4.4
			19.2		1.4	2.6	1.4								
			11.8		1.2	4.1	0.5								

Table 21. Summary of incidence (INC, %) from 2016-2017 PNUWWSN.

ENTRY	NAME	AVG		ILCHA	INWLA	KYLEX	MIELA	MOCOL	VAMTH
1	TRUMAN	25.1	l	2.0	5.0	17.5	20.0	60.0	46.3
2	ERNIE	34.1	l	7.5	7.5	17.0	51.0	60.0	61.3
3	FREEDOM	36.3		25.0	7.5	10.0	35.1	72.5	67.5
4	PIONEER2545	50.5	h	45.0	20.0	15.5	58.4	80.0	83.8
5	VA09MAS1-12-8-4	49.2	h	30.0	22.5	19.0	55.0	82.5	86.3
6	VA14W-28	41.6	h	30.0	7.5	17.0	26.5	82.5	86.3
7	VA09MAS6-122-7-1-1	37.4		10.0	15.0	9.5	49.9	90.0	50.0
8	VA09MAS6-122-7-1-4	39.3		5.0	7.5	18.0	53.0	92.5	60.0
9	DH11SRW069-70	38.2		6.0	5.0	17.0	48.9	82.5	70.0
10	X09-0187-112-3-3	36.2		15.0	15.0	11.5	34.7	67.5	73.8
11	KY09C-0053-28-9-3	36.0		10.0	10.0	15.0	29.7	80.0	71.3
12	KY09C-1245-99-8-5	31.9	l	3.5	10.0	16.0	28.0	62.5	71.3
13	KY07C-1317-116-4-1	30.8	l	22.5	7.5	18.0	37.9	50.0	48.8
14	KY09C-1245-99-15-1	37.3		5.0	5.0	20.0	54.9	75.0	63.8
15	OH12-317-55	34.2	l	5.0	12.5	10.0	32.7	77.5	67.5
16	OH12-196-24	39.4		16.0	7.5	18.0	52.4	67.5	75.0
17	OH12-104-72	30.9	l	3.5	7.5	8.5	45.9	55.0	65.0
18	OH13-16-69	34.7	l	5.0	7.5	5.0	53.1	70.0	67.5
19	OH12-133-66	37.4		7.5	5.0	12.0	61.3	77.5	61.3
20	KWS114	37.7		30.0	7.5	8.0	33.2	75.0	72.5
21	KWS126	33.4	l	5.0	12.5	4.5		72.5	66.3
22	KWS133	38.6		20.0	5.0	11.0	35.8	77.5	82.5
23	KWS140	32.8	l	10.0	7.5	12.5	34.5	62.5	70.0
24	KWS145	39.3		12.5	10.0	16.5	54.4	72.5	70.0
25	KWS147	38.8		10.0	5.0	16.0	52.8	77.5	71.3
26	IL13-1658	31.9	l	0.0	7.5	19.0	53.4	52.5	58.8
27	IL13-8063	29.2	l	0.0	5.0	14.5	38.4	52.5	65.0
28	IL13-10403	25.8	l	2.5	5.0	13.0	17.1	50.0	67.5
29	IL13-18570	31.8	l	0.0	5.0	12.0	56.5	52.5	65.0
30	MO151526	28.3	l	2.5	5.0	13.5	29.0	60.0	60.0
31	MO151425	31.4	l	2.5	5.0	18.0	36.7	67.5	58.8
32	MO151424	32.8	l	7.5	5.0	20.0	26.8	72.5	65.0
33	MO130689	31.7	l	3.5	7.5	12.5	36.6	60.0	70.0
34	MO151835	32.0	l	5.0	15.0	11.0	47.5	47.5	66.3
35	0527A1-7-7-3-1	30.0	l	3.5	10.0	16.0	32.8	57.5	60.0
36	05247A1-7-7-3-1	36.0		12.5	7.5	7.5	39.5	90.0	58.8
37	0566A1-3-1-63-3	35.8		15.0	5.0	10.0	42.6	67.5	75.0
38	02444A1-23-1-3-4	34.6	l	3.5	5.0	9.0	25.0	95.0	70.0
39	0762A1-2-8	27.9	l	1.0	5.0	8.5	21.6	77.5	53.8
40	U6714-A-004	44.3	h	17.5	7.5	9.5	64.0	92.5	75.0
41	U6715-020	42.4	h	30.0	7.5	14.5	54.7	85.0	62.5
42	MI14R0330	29.7	l	3.5	7.5	13.5	41.0	45.0	67.5
43	MI14R0213	41.1	h	45.0	15.0	16.0	44.3	60.0	66.3
100	AVERAGE	35.3		11.5	8.4	13.5	42.3	69.8	66.9
101	MINUMUM	25.1		0.0	5.0	4.5	17.1	45.0	46.3
102	MAXIMUM	50.5		45.0	22.5	20.0	72.5	95.0	86.3
103	LSD(0.05)	10.3		.	.	.	.	.	.

Table 22. Summary of severity (SEV, %) data from the 2016-2017 PNUWWSN

ENTRY	NAME	AVG		ILCHA	KYLEX	MIELA	MOCOL	VAMTH
1	TRUMAN	16.0	l	7.5	30.8	20.0	9.9	12.0
2	ERNIE	29.9	h	20.0	43.1	51.0	10.6	25.0
3	FREEDOM	29.1	h	32.5	37.7	35.1	14.7	25.5
4	PIONEER2545	42.0	h	55.0	47.4	52.1	19.7	35.7
5	VA09MAS1-12-8-4	42.0	h	40.0	30.3	55.0	19.4	65.3
6	VA14W-28	37.4	h	50.0	40.2	26.5	18.8	51.6
7	VA09MAS6-122-7-1-1	25.8	l	7.5	23.6	49.9	22.8	25.3
8	VA09MAS6-122-7-1-4	34.4	h	7.5	69.6	53.0	21.6	20.5
9	DH11SRW069-70	27.2	l	5.0	43.2	48.9	12.6	26.1
10	X09-0187-112-3-3	29.4	h	35.0	33.3	34.7	10.4	33.4
11	KY09C-0053-28-9-3	30.3	h	30.0	28.1	29.7	16.5	47.2
12	KY09C-1245-99-8-5	27.4	l	12.5	43.5	28.0	13.3	39.6
13	KY07C-1317-116-4-1	28.5	l	40.0	37.9	37.9	6.8	20.1
14	KY09C-1245-99-15-1	31.9	h	10.0	41.4	54.9	12.7	40.4
15	OH12-317-55	21.0	l	7.5	19.6	32.7	16.6	28.6
16	OH12-196-24	30.4	h	22.5	29.6	52.4	12.4	35.0
17	OH12-104-72	20.1	l	7.5	26.0	45.9	8.3	12.7
18	OH13-16-69	24.3	l	7.5	17.4	53.1	10.8	32.8
19	OH12-133-66	33.0	h	20.0	40.1	61.3	13.7	30.0
20	KWS114	33.6	h	40.0	34.8	33.2	13.5	46.3
21	KWS126	27.6	l	7.5	27.5		13.6	46.8
22	KWS133	29.6	h	25.0	37.5	35.8	13.8	36.0
23	KWS140	26.9	l	35.0	38.7	34.5	11.7	14.8
24	KWS145	28.8	l	20.0	42.2	54.4	8.2	19.3
25	KWS147	26.2	l	12.5	34.7	52.8	11.5	19.5
26	IL13-1658	23.3	l	0.0	42.5	53.4	5.0	15.5
27	IL13-8063	19.3	l	0.0	36.2	38.4	7.9	13.8
28	IL13-10403	18.1	l	10.0	31.7	17.1	7.1	24.8
29	IL13-18570	21.7	l	0.0	30.3	56.5	9.2	12.4
30	MO151526	17.0	l	5.0	33.7	29.0	6.4	11.0
31	MO151425	19.9	l	2.5	39.2	36.7	9.1	12.1
32	MO151424	17.4	l	15.0	22.8	26.8	13.1	9.5
33	MO130689	20.7	l	7.5	35.7	36.6	9.4	14.5
34	MO151835	24.5	l	7.5	30.2	57.3	9.1	18.6
35	0527A1-7-7-3-1	19.3	l	12.5	26.1	32.8	8.5	16.4
36	05247A1-7-7-3-1	27.5	l	35.0	23.4	39.5	16.2	23.5
37	0566A1-3-1-63-3	24.9	l	15.0	21.8	42.6	20.2	24.7
38	02444A1-23-1-3-4	22.0	l	12.5	33.0	25.0	24.4	15.3
39	0762A1-2-8	16.7	l	5.0	32.0	21.6	12.3	12.6
40	U6714-A-004	36.2	h	25.0	40.2	64.0	19.8	32.0
41	U6715-020	31.0	h	30.0	37.0	54.7	15.0	18.4
42	MI14R0330	21.0	l	5.0	37.3	41.0	6.5	15.2
43	MI14R0213	33.7	h	40.0	49.1	44.3	8.9	26.4
100	AVERAGE	26.7		18.3	34.9	41.0	13.6	25.2
101	MINUMUM	16.0		0.0	17.4	13.6	5.0	9.5
102	MAXIMUM	42.0		55.0	69.6	64.0	46.8	65.3
103	LSD(0.05)	12.9		.	.	.	.	.

Table 23. Summary of index (IND, %) data from the 2016-2017 PNUWWSN.

ENTRY	NAME	AVG		ILCHA	KYLEX	MIELA	MOCOL	OHWOO	VAMTH
1	TRUMAN	5.4	l	0.2	5.6	3.0	5.9	12.8	5.2
2	ERNIE	13.4		1.5	7.1	25.1	6.4	26.1	14.3
3	FREEDOM	11.8	l	8.1	3.9	12.7	11.3	17.8	17.3
4	PIONEER2545	24.4	h	24.5	7.3	30.4	16.0	38.3	29.9
5	VA09MAS1-12-8-4	29.7	h	14.0	5.8	29.3	16.7	56.1	56.4
6	VA14W-28	23.3	h	15.0	6.6	9.3	16.0	48.3	44.5
7	VA09MAS6-122-7-1-1	15.0		0.8	2.2	19.1	20.5	34.4	12.8
8	VA09MAS6-122-7-1-4	16.0		0.4	12.5	25.7	20.0	25.0	12.3
9	DH11SRW069-70	17.0		0.3	7.1	20.0	10.5	45.6	18.7
10	X09-0187-112-3-3	13.4		5.5	4.0	9.7	7.2	29.4	24.7
11	KY09C-0053-28-9-3	15.3		3.0	4.2	8.6	13.2	29.4	33.4
12	KY09C-1245-99-8-5	13.0		0.6	6.9	12.7	8.6	21.1	28.1
13	KY07C-1317-116-4-1	11.0	l	9.0	6.8	13.7	3.4	23.3	9.8
14	KY09C-1245-99-15-1	16.2		0.5	8.3	29.8	10.1	22.2	26.1
15	OH12-317-55	11.6	l	0.4	1.9	15.0	12.9	20.0	19.2
16	OH12-196-24	16.2		6.1	5.0	26.7	8.3	25.0	26.4
17	OH12-104-72	8.8	l	0.2	2.2	22.0	4.6	15.6	8.3
18	OH13-16-69	13.5		0.4	0.9	27.3	8.0	22.2	22.2
19	OH12-133-66	13.8		1.5	5.7	29.4	10.6	16.7	18.8
20	KWS114	16.9		13.0	3.7	10.7	10.3	30.6	33.4
21	KWS126	16.0		0.4	1.3		10.4	31.1	31.3
22	KWS133	14.6		5.0	4.1	15.2	10.8	22.8	29.5
23	KWS140	9.8	l	3.8	6.0	9.6	7.4	21.7	10.1
24	KWS145	12.2	l	2.8	6.7	23.7	6.2	20.0	13.6
25	KWS147	13.4		1.6	5.5	19.8	8.9	30.6	14.3
26	IL13-1658	10.9	l	0.0	8.1	33.1	2.6	12.8	8.9
27	IL13-8063	6.7	l	0.0	6.1	14.0	4.2	6.7	9.1
28	IL13-10403	6.9	l	0.5	4.7	4.3	4.0	10.6	17.1
29	IL13-18570	8.9	l	0.0	3.9	27.5	4.8	8.9	8.1
30	MO151526	4.8	l	0.3	5.1	7.4	4.4	5.0	6.6
31	MO151425	6.5	l	0.1	7.0	11.0	6.1	7.8	7.1
32	MO151424	6.5	l	1.0	4.6	11.0	10.5	5.6	6.3
33	MO130689	6.9	l	0.3	4.7	12.5	5.6	7.8	10.3
34	MO151835	9.6	l	0.4	3.3	27.2	4.7	9.4	12.3
35	0527A1-7-7-3-1	7.3	l	0.6	3.9	13.1	5.1	10.6	10.7
36	05247A1-7-7-3-1	10.2	l	4.0	1.8	12.7	14.6	14.4	13.8
37	0566A1-3-1-63-3	12.8		2.0	2.2	21.3	17.8	15.0	18.8
38	02444A1-23-1-3-4	9.5	l	0.3	3.9	9.7	23.2	8.9	10.7
39	0762A1-2-8	5.4	l	0.1	3.1	5.6	10.0	6.1	7.3
40	U6714-A-004	20.5		5.0	4.2	44.1	18.4	26.7	24.4
41	U6715-020	15.0		11.0	5.5	31.8	12.9	17.2	11.3
42	MI14R0330	7.4	l	0.2	5.3	15.2	3.0	10.6	10.2
43	MI14R0213	15.1		18.0	7.4	17.0	5.3	25.0	17.9
100	AVERAGE	12.6		3.8	5.0	18.1	10.3	20.8	17.6
101	MINUMUM	4.8		0.0	0.9	3.0	2.6	5.0	5.2
102	MAXIMUM	29.7		24.5	12.5	44.1	31.1	56.1	56.4
103	LSD(0.05)	8.0		.	.	.	.	.	.

Table 24. Summary of Fusarium Damaged Kernel (FDK, %) data from the 2016-2017 PNUWWSN.

ENTRY	NAME	AVG		KYLEX	MOCOL	OHWOO	VAMTH
1	TRUMAN	13.4	l	12.5	5.0	11.0	25.0
2	ERNIE	21.8	l	35.0	10.0	18.0	24.0
3	FREEDOM	38.9	h	57.5	17.5	35.0	45.5
4	PIONEER2545	40.4	h	47.5	25.0	63.0	26.0
5	VA09MAS1-12-8-4	32.3	h	30.0	12.5	62.0	24.5
6	VA14W-28	35.8	h	50.0	5.0	65.0	23.0
7	VA09MAS6-122-7-1-1	26.3		32.5	25.0	19.0	28.5
8	VA09MAS6-122-7-1-4	22.6	l	17.5	25.0	25.0	23.0
9	DH11SRW069-70	35.3	h	45.0	22.5	55.0	18.5
10	X09-0187-112-3-3	35.6	h	42.5	20.0	46.0	34.0
11	KY09C-0053-28-9-3	18.4	l	25.0	12.5	14.0	22.0
12	KY09C-1245-99-8-5	18.6	l	25.0	15.0	11.0	23.5
13	KY07C-1317-116-4-1	20.8	l	40.0	12.5	15.0	15.5
14	KY09C-1245-99-15-1	22.3	l	30.0	17.5	13.0	28.5
15	OH12-317-55	26.3		30.0	25.0	37.0	13.0
16	OH12-196-24	23.1	l	25.0	12.5	29.0	26.0
17	OH12-104-72	15.6	l	17.5	5.0	21.0	19.0
18	OH13-16-69	25.3		50.0	10.0	18.0	23.0
19	OH12-133-66	15.1	l	5.0	20.0	13.0	22.5
20	KWS114	39.3	h	57.5	10.0	66.0	23.5
21	KWS126	46.5	h	72.5	22.5	72.0	19.0
22	KWS133	36.9	h	45.0	25.0	51.0	26.5
23	KWS140	22.5	l	35.0	5.0	32.0	18.0
24	KWS145	21.3	l	20.0	20.0	26.0	19.0
25	KWS147	28.5		50.0	10.0	22.0	32.0
26	IL13-1658	16.0	l	32.5	5.0	11.0	15.5
27	IL13-8063	18.6	l	40.0	5.0	11.0	18.5
28	IL13-10403	15.9	l	22.5	12.5	12.0	16.5
29	IL13-18570	12.5	l	17.5	5.0	9.0	18.5
30	MO151526	8.8	l	10.0	5.0	9.0	11.0
31	MO151425	11.6	l	12.5	7.5	13.0	13.5
32	MO151424	13.9	l	15.0	10.0	14.0	16.5
33	MO130689	14.6	l	20.0	10.0	13.0	15.5
34	MO151835	18.5	l	32.5	10.0	16.0	15.5
35	0527A1-7-7-3-1	28.4		42.5	12.5	32.0	26.5
36	05247A1-7-7-3-1	25.6		35.0	5.0	38.0	24.5
37	0566A1-3-1-63-3	43.6	h	60.0	35.0	52.0	27.5
38	02444A1-23-1-3-4	18.6	l	12.5	25.0	11.0	26.0
39	0762A1-2-8	14.8	l	12.5	12.5	13.0	21.0
40	U6714-A-004	43.0	h	65.0	10.0	53.0	44.0
41	U6715-020	41.2	h	65.0	5.0	57.0	38.0
42	MI14R0330	28.8		45.0	7.5	25.0	37.5
43	MI14R0213	33.4	h	50.0	12.5	52.0	19.0
100	AVERAGE	25.4		34.6	13.6	29.8	23.4
101	MINUMUM	8.8		5.0	5.0	9.0	11.0
102	MAXIMUM	46.5		72.5	35.0	72.0	45.5
103	LSD(0.05)	15.9		.	.	.	.

Table 25. Summary of INC/SEV/FDK (ISK, %) data from the 2016-2017 PNUWWSN

ENTRY	NAME	AVG		KYLEX	MOCOL	OHWOO	VAMTH
1	TRUMAN	20.5	l	19.5	23.1	11.9	27.5
2	ERNIE	28.9		32.0	25.2	23.0	35.5
3	FREEDOM	35.3	h	37.3	33.2	24.7	46.1
4	PIONEER2545	43.1	h	37.9	39.9	48.3	46.2
5	VA09MAS1-12-8-4	44.0	h	26.8	35.6	58.3	55.3
6	VA14W-28	43.8	h	37.2	32.4	55.0	50.6
7	VA09MAS6-122-7-1-1	32.3		22.9	43.8	28.4	34.0
8	VA09MAS6-122-7-1-4	34.0		33.3	44.2	25.1	33.4
9	DH11SRW069-70	39.8	h	36.1	37.5	49.4	36.2
10	X09-0187-112-3-3	35.9	h	30.4	31.4	36.2	45.7
11	KY09C-0053-28-9-3	31.1		22.9	33.9	23.2	44.3
12	KY09C-1245-99-8-5	29.1		27.9	28.7	16.9	42.7
13	KY07C-1317-116-4-1	25.4	l	32.8	22.1	19.8	26.9
14	KY09C-1245-99-15-1	31.2		30.4	33.3	18.4	42.6
15	OH12-317-55	30.0		20.9	38.2	26.7	34.0
16	OH12-196-24	30.8		24.3	29.0	26.5	43.4
17	OH12-104-72	21.7	l	17.4	21.0	17.6	30.9
18	OH13-16-69	28.7		26.7	28.2	20.5	39.3
19	OH12-133-66	26.1	l	17.6	35.4	15.1	36.4
20	KWS114	39.1	h	35.8	30.6	44.8	45.0
21	KWS126	40.5	h	38.6	34.7	47.3	41.5
22	KWS133	37.6	h	32.6	37.4	34.1	46.1
23	KWS140	28.1		29.3	24.3	26.0	32.6
24	KWS145	28.7		25.6	32.2	22.4	34.4
25	KWS147	32.6		35.2	28.3	27.0	40.0
26	IL13-1658	22.9	l	31.5	19.2	12.2	28.5
27	IL13-8063	22.7	l	31.2	20.1	8.3	31.0
28	IL13-10403	22.5	l	22.4	22.1	11.3	34.3
29	IL13-18570	19.9	l	19.7	20.5	8.8	30.6
30	MO151526	18.1	l	18.1	21.9	6.7	25.7
31	MO151425	21.2	l	22.2	26.0	9.9	26.6
32	MO151424	21.6	l	18.8	29.7	9.0	29.0
33	MO130689	22.2	l	22.5	24.8	9.9	31.5
34	MO151835	22.6	l	25.4	21.2	12.0	31.7
35	0527A1-7-7-3-1	26.8	l	29.6	24.8	19.3	33.5
36	05247A1-7-7-3-1	28.9		23.3	33.8	24.0	34.5
37	0566A1-3-1-63-3	36.1	h	33.5	40.3	29.7	40.9
38	02444A1-23-1-3-4	27.3	l	17.6	45.8	9.9	36.0
39	0762A1-2-8	21.6	l	17.2	31.9	8.9	28.3
40	U6714-A-004	41.4	h	40.9	37.7	37.4	49.7
41	U6715-020	36.5	h	41.4	32.0	33.0	39.5
42	MI14R0330	27.0	l	33.2	18.5	16.4	39.8
43	MI14R0213	34.1		39.5	25.7	35.7	35.4
100	AVERAGE	30.0		28.4	30.2	24.4	37.1
101	MINUMUM	18.1		17.2	18.5	6.7	25.7
102	MAXIMUM	44.0		41.4	45.8	58.3	55.3
103	LSD(0.05)	9.5					

Table 26. Summary of deoxynivalenol (DON, ppm) data from the 2016-2017 PNUWWSN.

ENTRY	NAME	AVG		KYLEX	MOCOL	OHWOO	VAMTH
1	TRUMAN	3.4	l	5.4	0.1	6.2	2.1
2	ERNIE	5.2	l	11.4	0.5	7.8	1.2
3	FREEDOM	9.8		23.2	0.5	12.8	2.9
4	PIONEER2545	16.7	h	26.6	1.5	32.9	5.9
5	VA09MAS1-12-8-4	9.8		15.6	1.0	20.0	2.7
6	VA14W-28	9.0		19.1	0.7	13.7	2.4
7	VA09MAS6-122-7-1-1	7.6		16.8	1.2	11.6	1.0
8	VA09MAS6-122-7-1-4	6.1	l	12.6	1.2	8.9	1.6
9	DH11SRW069-70	11.3		21.9	1.0	19.0	3.4
10	X09-0187-112-3-3	8.5		14.6	0.8	15.5	3.3
11	KY09C-0053-28-9-3	5.0	l	13.3	0.4	5.0	1.3
12	KY09C-1245-99-8-5	5.3	l	13.7	0.5	5.1	1.9
13	KY07C-1317-116-4-1	8.0		18.8	0.6	11.5	1.1
14	KY09C-1245-99-15-1	5.3	l	12.2	0.5	7.0	1.5
15	OH12-317-55	7.7		17.3	0.6	10.9	2.0
16	OH12-196-24	8.1		16.3	1.0	12.7	2.3
17	OH12-104-72	5.0	l	10.9	0.1	7.3	1.8
18	OH13-16-69	6.4	l	15.7	0.3	7.9	1.5
19	OH12-133-66	3.9	l	9.1	0.3	4.8	1.2
20	KWS114	8.5		18.5	0.3	12.5	2.5
21	KWS126	11.4		22.9	0.9	19.8	2.0
22	KWS133	7.0	l	14.9	1.1	9.4	2.7
23	KWS140	6.9	l	15.8	0.3	10.6	0.8
24	KWS145	10.2		22.4	0.7	14.0	3.7
25	KWS147	12.4		27.7	0.2	16.4	5.2
26	IL13-1658	5.7	l	16.2	0.3	5.3	1.2
27	IL13-8063	4.6	l	13.5	0.1	4.3	0.6
28	IL13-10403	5.2	l	14.8	0.6	4.5	0.8
29	IL13-18570	2.7	l	6.6	0.2	3.6	0.4
30	MO151526	2.3	l	6.1	0.2	2.3	0.5
31	MO151425	2.8	l	7.3	0.1	3.2	0.7
32	MO151424	2.8	l	7.5	0.2	2.8	0.7
33	MO130689	3.6	l	9.7	0.3	4.0	0.6
34	MO151835	4.8	l	13.5	0.2	5.0	0.7
35	0527A1-7-7-3-1	6.4	l	14.0	0.5	9.0	1.9
36	05247A1-7-7-3-1	6.0	l	13.2	0.5	8.2	2.2
37	0566A1-3-1-63-3	6.4	l	13.9	0.3	9.3	2.1
38	02444A1-23-1-3-4	2.1	l	5.5	0.3	2.2	0.5
39	0762A1-2-8	2.7	l	6.1	0.3	3.7	0.5
40	U6714-A-004	17.8	h	40.3	0.4	23.2	7.5
41	U6715-020	12.9	h	27.3	0.4	18.9	5.1
42	MI14R0330	7.1	l	19.8	0.4	7.0	1.1
43	MI14R0213	11.7		26.5	0.6	18.0	1.6
100	AVERAGE	7.1		15.8	0.5	10.2	2.0
101	MINUMUM	2.1		5.4	0.1	2.2	0.4
102	MAXIMUM	17.8		40.3	1.5	32.9	7.5
103	LSD(0.05)	5.4		.	.	.	.

Table 27. Summary of greenhouse severity (GHSEV, %) data from the 2016-2017 PNUWWSN.

		GHSEV
1	TRUMAN	5.1
2	ERNIE	13.6
3	FREEDOM	6.3
4	PIONEER2545	21.2
5	VA09MAS1-12-8-4	6.8
6	VA14W-28	35.0
7	VA09MAS6-122-7-1-1	7.7
8	VA09MAS6-122-7-1-4	10.4
9	DH11SRW069-70	8.1
10	X09-0187-112-3-3	5.8
11	KY09C-0053-28-9-3	30.0
12	KY09C-1245-99-8-5	10.1
13	KY07C-1317-116-4-1	7.8
14	KY09C-1245-99-15-1	6.7
15	OH12-317-55	6.5
16	OH12-196-24	19.5
17	OH12-104-72	6.5
18	OH13-16-69	5.1
19	OH12-133-66	6.6
20	KWS114	9.5
21	KWS126	19.1
22	KWS133	7.2
23	KWS140	4.6
24	KWS145	14.3
25	KWS147	7.1
26	IL13-1658	4.8
27	IL13-8063	25.3
28	IL13-10403	5.3
29	IL13-18570	16.9
30	MO151526	18.6
31	MO151425	4.6
32	MO151424	5.1
33	MO130689	19.7
34	MO151835	5.5
35	0527A1-7-7-3-1	5.1
36	05247A1-7-7-3-1	5.8
37	0566A1-3-1-63-3	4.8
38	02444A1-23-1-3-4	5.0
39	0762A1-2-8	4.8
40	U6714-A-004	9.9
41	U6715-020	20.2
42	MI14R0330	7.5
43	MI14R0213	6.6
100	MEAN	10.6
101	CV	
102	LSD	

Table 28. Summary of heading date (HD, Julian days) height (HGT, inches), and lodging (LDG) data from the 2016-2017 PNUWWN

		Heading Date (Julian Days)						Height (inches)					LODGING (0-9)
ENTRY	NAME	AVG		ILCHA	KYLEX	MOCOL	OHWOO	AVG		ILCHA	KYLEX	VAMTH	VA
1	TRUMAN	129.0	h	133	112	131	140	39.7	h	44	37	38	3
2	ERNIE	124.8	l	128	113	126	132	38.0	h	39	39	36	5
3	FREEDOM	125.8		130	111	128	134	37.7	h	40	37	36	2
4	PIONEER2545	126.1	h	128	116	128	133	36.7	h	39	35	36	3
5	VA09MAS1-12-8-4	125.4		126	116	128	132	35.3		36	37	33	1
6	VA14W-28	125.5		130	111	128	133	34.5		36	37	31	1
7	VA09MAS6-122-7-1-1	123.0	l	120	114	128	130	32.5	l	33	40	25	0
8	VA09MAS6-122-7-1-4	122.6	l	120	116	125	130	31.0	l	32	36	25	0
9	DH11SRW069-70	127.3	h	131	113	130	136	35.7	h	37	39	31	0
10	X09-0187-112-3-3	125.8		130	111	128	134	37.7	h	42	37	34	2
11	KY09C-0053-28-9-3	126.0		130	112	128	134	34.5		35	36	33	1
12	KY09C-1245-99-8-5	124.1	l	123	114	128	132	35.0		38	35	32	0
13	KY07C-1317-116-4-1	125.3		125	117	128	131	35.8	h	39	38	31	2
14	KY09C-1245-99-15-1	124.5	l	123	115	128	132	35.3		38	35	33	0
15	OH12-317-55	125.1	l	126	113	129	133	37.2	h	39	38	35	1
16	OH12-196-24	124.9	l	125	118	125	132	35.8	h	37	40	31	1
17	OH12-104-72	127.3	h	131	112	130	137	37.8	h	43	35	36	4
18	OH13-16-69	124.0	l	124	111	128	133	35.8	h	37	38	33	3
19	OH12-133-66	124.9	l	127	114	128	131	37.2	h	40	38	34	1
20	KWS114	125.3		127	112	129	134	36.3	h	40	36	33	3
21	KWS126	123.5	l	123	111	128	132	35.3		39	39	28	0
22	KWS133	122.3	l	119	111	128	131	36.2	h	38	38	33	0
23	KWS140	126.1	h	130	112	129	134	37.7	h	40	39	34	6
24	KWS145	126.3	h	130	112	128	135	35.7	h	39	36	32	0
25	KWS147	127.3	h	131	114	129	136	34.5		37	36	31	0
26	IL13-1658	126.0		129	114	128	133	35.2		40	36	30	1
27	IL13-8063	125.6		130	113	128	132	35.5		40	35	32	5
28	IL13-10403	125.4		126	114	128	134	35.5		40	35	32	2
29	IL13-18570	124.9	l	126	115	128	131	36.2	h	38	38	33	2
30	MO151526	125.6		126	115	128	134	37.7	h	38	38	37	3
31	MO151425	124.9	l	127	113	128	132	35.3		37	35	34	2
32	MO151424	124.9	l	127	112	128	133	30.2	l	37	21	33	1
33	MO130689	124.5	l	125	113	128	132	35.7	h	38	34	35	1
34	MO151835	125.5		126	116	128	132	37.0	h	37	39	35	3
35	0527A1-7-7-3-1	125.9		131	112	128	133	36.7	h	40	38	32	4
36	05247A1-7-7-3-1	126.3	h	132	111	129	134	35.2		39	36	31	0
37	0566A1-3-1-63-3	125.8		128	114	129	133	35.0		35	39	31	0
38	02444A1-23-1-3-4	123.6	l	124	112	128	131	33.8	l	36	35	31	1
39	0762A1-2-8	122.6	l	126	105	128	132	32.7	l	34	34	30	2
40	U6714-A-004	126.5	h	130	111	129	136	34.8		40	36	29	4
41	U6715-020	127.5	h	131	114	129	136	36.5	h	40	38	32	4
42	MI14R0330	126.4	h	130	114	127	135	36.5	h	40	38	32	3
43	MI14R0213	125.6		129	113	128	133	35.2		37	37	32	2
100	AVERAGE	125.3		127	113	128	133	35.7		38	36	32	
101	MINUMUM	122.3		119	105	125	130	30.2		32	21	25	
102	MAXIMUM	129.0		133	118	131	140	39.7		44	40	38	
103	LSD(0.05)	3.0		.	.	.	.	4.0		.	.	.	

Table 29. Summary of other traits collected on the 2016-2017 PNUWWSN including yield (YLD, bu/ac), test weight (TW, lbs/bu), powdery mildew (PM), leaf rust (LR), yellow rust (YR) and foliar rating (FR) of general foliage health.

		FHB (0-9)	YLD	TW	POWDERY MILDEW (0-9)	LEAF RUST (0-9)		LEAF RUST - REACTION TYPE: 0-3 (TFRTG)	LEAF RUST - REACTION TYPE: 0-3 (TNRJ)	YELLOW RUST (0-9)	Foilar Rating (0-9)
		KYLEX	VA	VA	VA	VA	ILCHA	VA	VA	ILCHA	OHWOO
1	TRUMAN	4.5	53.3	55.9	1	6.0	6	3	3	4.0	5.0
2	ERNIE	2.0	64.8	57.9	4	4.5	6	3	3/Tr;1	5.5	5.0
3	FREEDOM	5.0	67.4	57.2	0	5.0	7	23-;	1;	6.0	4.7
4	PIONEER2545	4.6	48.7	55.7	0	5.0	8	3	3	7.0	5.7
5	VA09MAS1-12-8-4	3.5	84.8	60.8	3	2.5	1	;1-	3/;1	2.0	5.0
6	VA14W-28	3.5	80.7	61.1	0	2.5	4	23;	;1	2.5	8.0
7	VA09MAS6-122-7-1-1	2.5	86.7	60.1	1	2.5	0	23	1;	3.5	5.7
8	VA09MAS6-122-7-1-4	6.5	83.9	59.4	0	2.0	0	32	1;	3.0	5.3
9	DH11SRW069-70	5.0	85.5	58.5	0	2.5	5	23;	;1-	5.5	5.0
10	X09-0187-112-3-3	6.5	80.5	58.9	0	5.5	6	3	3	5.5	4.3
11	KY09C-0053-28-9-3	4.0	67.8	61.7	5	3.5	5	12-;	;1-	6.5	3.7
12	KY09C-1245-99-8-5	6.0	82	59.8	3	4.5	4	21;	12-;Tr3	4.0	3.7
13	KY07C-1317-116-4-1	6.0	72.5	60.8	1	2.5	1	;1Tr3	23;	6.0	4.7
14	KY09C-1245-99-15-1	4.5	73.9	59.5	2	4.0	3	21;	1;	6.0	4.3
15	OH12-317-55	2.0	92.8	58.4	1	4.0	4	2;	2;	5.0	3.7
16	OH12-196-24	3.5	82.3	57.3	0	3.5	1	1;	0;	5.0	3.3
17	OH12-104-72	2.5	65.5	59.7	0	5.0	6	3	3	5.0	5.3
18	OH13-16-69	2.0	66.6	58.4	3	7.0	8	3	3	6.5	5.3
19	OH12-133-66	3.0	74.5	60.3	1	5.5	5	3	3	7.5	4.3
20	KWS114	2.5	89.6	59.9	0	3.5	1	3-	1;/3	2.5	4.0
21	KWS126	2.5	68.5	57.1	3	5.0	6	23;	23;	4.0	5.3
22	KWS133	5.0	92.3	58.8	0	3.5	1	12-;	;1-	4.0	4.3
23	KWS140	5.0	52.2	56.5	4	4.0	8	3	3	4.0	5.3
24	KWS145	5.0	84.7	60	0	2.5	1	3-	3/;1-	2.0	4.0
25	KWS147	5.0	84.5	60.4	1	2.5	1	23;	;1/Tr3	2.5	5.3
26	IL13-1658	4.5	58.9	58.1	4	6.0	8	3	3	6.5	4.7
27	IL13-8063	4.0	75.9	60.9	1	5.0	6	3	3	6.5	3.7
28	IL13-10403	4.0	71.4	59.6	3	5.0	5	3	3	7.5	3.7
29	IL13-18570	5.0	67.3	60.9	5	3.5	2	3	3	5.5	4.3
30	MO151526	4.5	77.3	60.6	1	5.5	6	3	3	5.0	4.3
31	MO151425	5.0	71.6	60.8	3	5.5	6	3	3	3.0	4.3
32	MO151424	2.5	67.3	60.3	4	7.0	5	3	3-	3.5	4.7
33	MO130689	2.0	74.1	60.5	1	6.0	6	3	3	3.5	5.0
34	MO151835	3.6	71.9	59.5	3	3.5	7	3-	3	2.5	5.0
35	0527A1-7-7-3-1	3.5	90	61.2	0	2.5	1	23;	0;Tr3	5.0	2.3
36	05247A1-7-7-3-1	4.0	79.8	61	0	3.0	1	23;	;1-	6.0	2.7
37	0566A1-3-1-63-3	3.5	84.1	58.3	0	3.0	1	;1=	;1=	6.0	3.3
38	02444A1-23-1-3-4	4.0	59.6	54	3	4.5	8	21;	1;	7.0	4.3
39	0762A1-2-8	4.0	71.1	55.2	1	2.5	1	12-;	1;	5.5	3.7
40	U6714-A-004	5.0	64.7	58.4	0	3.5	1	0;	;1=	7.5	5.0
41	U6715-020	4.0	57.3	57.3	0	4.0	4	0;Tr3	0;	7.0	6.0
42	MI14R0330	5.0	54.6	54	0	7.0	8	3	3	6.5	5.3
43	MI14R0213	4.0	72.5	57.4	1	8.0	8	3;	3	4.5	5.0
100	MEAN	4.1	73.4	58.9	1.5	4	4.2			5.0	4.6
101	CV	39.2									
102	LSD	3.2									

Table 30. Presence or absence of FHB QTL in the 2016-2017 NUWWSN entries. Entries were also genotyped for Rht, Ppd, Vrn,rust, PM, Hessian Fly, BYDV, rye translocation, and quality genes. That data is available in an excel file from sneller.5@osu.edu. Data is from the USDA Eastern Regional Small Grains Genotyping Lab , Raleigh NC. The % or resistant alleles is calculated only for the 56 entries (no checks).

Entry	Fhb1	Fhb_3B Massey	Fhb_5A Ernie	Fhb_5A Ning7840	Fhb_2DL Wuhan1/W14	Fhb_1A Neuse	Fhb_2B Bess	Fhb_3B Bess	Fhb_4A Neuse	Fhb_6A Neuse	Fhb_1B Jamestown
TRUMAN	no	no	no	no	no	**Fhb1A**	**Fhb2B**	**Fhb3B**	no	no	**Fhb1B**
ERNIE	no	**Fhb3Bhet**	**Fhb5Ahet**	no	no	**Fhb1Ahet**	no	**Fhb3Bhet**	**Fhb4Ahet**	**Fhb6A**	no
FREEDOM	no	**Fhb3B**	no	no	no	**Fhb1A**	no	no	no	no	no
PIONEER2545	no	no	no	no	no	**Fhb1Ahet**	no	no	**Fhb4Ahet**	no	no
VA11W-108PA	no	no	no	no	no	no	no	no	no	no	**Fhb1B**
VA09MAS1-12-5-1	no	no	no	no	no	no	no	no	no	**Fhb6Ahet**	no
VA14FHB-29	no	no	no	no	no	no	no	no	**Fhb4A**	no	no
VA09MAS8-34-5-2	no	no	**Fhb5Ahet**	no	no	**Fhb1Ahet**	no	no	no	no	no
VA09MAS3-34-2-1	no	no	no	no	no	no	no	no	**Fhb4A**	no	no
KY09C-0052-26-12-3	**Fhb1het**	no	no	no	no	**Fhb1A**	no	no	no	no	**Fhb1B**
X08C-1070-74-20-1	**Fhb1**	no	no	no	ND	no	no	no	no	no	no
KY09C-1245-100-1-3	no	**Fhb3B**	**Fhb5A**	no	no	**Fhb1A**	no	no	no	**Fhb6A**	no
KY09C-0267-45-16-3	**Fhb1**	no	no	no	no	no	no	no	no	**Fhb6Ahet**	no
X08C-1090-51-12-5	no	no	no	no	no	no	no	no	no	no	no
OH12-195-22	no	no	no	no	no	no	no	no	**Fhb4A**	no	no
OH11-118-18	**Fhb1**	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	**Fhb6A**	no
OH12-133-74	no	no	no	no	no	**Fhb1A**	no	no	no	no	**Fhb1B**
OH12-194-24	no	no	no	no	no	no	no	no	**Fhb4A**	**Fhb6Ahet**	no
OH13-16-25	no	**Fhb3Bhet**	**Fhb5A**	no	no	**Fhb1A**	no	no	**Fhb4A**	no	no
NE14538	no	no	no	no	**Fhb2DLhet**	**Fhb1A**	no	no	**Fhb4A**	no	no
NE14606	no	no	no	no	no	no	no	no	**Fhb4A**	no	no
NE14696	no	no	no	no	no	no	no	no	no	no	no
NI12702W	no	no	no	no	no	no	no	no	**Fhb4A**	no	no
NE15545	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	no
KWS095	**Fhb1**	no	no	no	no	no	no	no	no	no	no
KWS103	no	**Fhb3B**	no	no	no	**Fhb1A**	no	no	**Fhb4A**	**Fhb6A**	no
KWS122	no	no	no	no	no	**Fhb1A**	no	**Fhb3Bhet**	no	**Fhb6A**	no
KWS127	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	no
KWS141	no	**Fhb3B**	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**
IL09-3264-T2	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**
IL12-21235	no	no	no	no	no	**Fhb1A**	no	no	no	no	no
IL12-26004	**Fhb1het**	no	no	no	no	**Fhb1A**	no	no	**Fhb4Ahet**	**Fhb6Ahet?**	**Fhb1B**
IL13-451	no	no	**Fhb5A**	no	no	no	no	no	no	no	no
IL13-20616	**Fhb1**	no	**Fhb5A**	no	no	**Fhb1A**	**Fhb2B**	no	no	no	no
NY99056-161	no	no	**Fhb5A**	no	no	no	no	no	**Fhb4A**	no	no
NYWhatford/7388-39-693	no	no	no	no	no	no	no	no	no	**Fhb6Ahet**	no
NY09087-15-69-1124	**Fhb1**	**Fhb3Bhet**	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1Bhet**
NY01016-AN	no	no	no	no	ND	**Fhb1A?**	no	no	no	no	ND
NY09125-16-1034	**Fhb1**	no	no	no	no	no	no	no	**Fhb4A**	no	no
MO140304	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**
MO151323	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	**Fhb6Ahet?**	**Fhb1B**
MO151031	no	no	no	no	no	no	**Fhb2B**	**Fhb3B**	no	**Fhb6A**	**Fhb1B**
MO151826	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	**Fhb6A**	**Fhb1B**
MO150133	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4Ahet**	no	**Fhb1B**
0566A1-3-1-1-63	no	no	no	no	no	**Fhb1A**	no	no	no	no	no
04620A1-1-7-4-10	ND	ND	no	no	no	**Fhb1A**	no	no	no	**Fhb6Ahet**	no
0527A1-9-14-4-3-3	**Fhb1**	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	no
0762A1-2-8	**Fhb1**	no	no	no	no	**Fhb1A**	no	no	no	no	no
07419A1-16-1-1-16-1-1	no	no	no	no	no	**Fhb1A**	no	no	no	**Fhb6A**	no
LES15-5199	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	no
LES15-7011	no	no	no	no	no	no	no	no	no	no	**Fhb1B**
LES15-5540	no	no	no	no	no	**Fhb1A**	no	no	no	**Fhb6A**	**Fhb1B**
LES15-5605	no	no	no	no	no	**Fhb1A**	no	no	no	no	**Fhb1Bhet**
LES15-7004	no	no	no	no	no	**Fhb1A**	**Fhb2B**	no	**Fhb4A**	**Fhb6A**	**Fhb1B**
U6714-B-041	no	no	no	no	no	no	no	no	**Fhb4Ahet**	no	no
MI14R0008	no	no	no	no	no	no	no	no	no	no	no
MI14R0009	no	no	no	no	no	no	no	no	**Fhb4Ahet**	no	no
MI14R0421	no	no	no	no	no	**Fhb1A**	no	no	no	no	no
MI14R0267	no	**Fhb3B**	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**
OH09-207-68	no	no	no	no	no	**Fhb1A**	no	no	no	**Fhb6Ahet**	no
Number Homozygotes	9	4	5	0	0	31	3	1	24	9	15
Number of Heterozygotes	2	2	1	0	1	1	0	1	4	6	2
% of resistant alleles	17.9	8.9	9.8	0.0	0.9	56.3	5.4	2.7	46.4	21.4	28.6

Table 31. Presence or absence of FHB QTL in the 2016-2017 PNUWWSN entries. Entries were also genotyped for Rht, Ppd, Vrn,rust, PM, Hessian Fly, BYDV, rye translocation, and quality genes. That data is available in an excel file from sneller.5@osu.edu. Data is from the USDA Eastern Regional Small Grains Genotyping Lab, Raleigh NC. The % or resistant alleles is calculated only for the 39 entries (no checks).

Entry	Fhb1	Fhb_3B Massey	Fhb_5A Ernie	Fhb_5A Ning7840	Fhb_2DL Wuhan1/W14	Fhb_1A Neuse	Fhb_2B Bess	Fhb_3B Bess	Fhb_4A Neuse	Fhb_6A Neuse	Fhb_1B Jamestown	Fhb_6A Jamestown
TRUMAN	no	no	no	no	no	**Fhb1A**	no	**Fhb3B**	no	no	**Fhb1B**	no
ERNIE	no	**Fhb3Bhet**	**Fhb5Ahet**	no	no	**Fhb1A**	no	no	**Fhb4Ahet**	**Fhb6Ahet**	no	no
FREEDOM	no	**Fhb3B**	no	no	no	**Fhb1A**	no	no	no	no	no	no
PIONEER2545	no	no	no	no	no	no	no	no	**Fhb4A**	no	no	no
VA09MAS1-12-8-4	no	no	no	no	no	**Fhb1A**	no	no	no	no	no	no
VA14W-28	no	no	no	no	no	no	no	no	**Fhb4A**	no	no	no
VA09MAS6-122-7-1-1	no	no	no	no	no	no	no	no	**Fhb4A**	no	no	no
VA09MAS6-122-7-1-4	no	no	no	no	no	no	no	no	**Fhb4A**	no	no	no
DH11SRW069-70	no	no	no	no	no	no	no	no	no	no	no	no
X09-0187-112-3-3	no	no	no	no	no	no	no	no	**Fhb4Ahet**	no	no	no
KY09C-0053-28-9-3	no	no	no	no	no	no	**Fhb2B**	no	no	no	**Fhb1B**	no
KY09C-1245-99-8-5	no	**Fhb3B**	**Fhb5A**	no	no	**Fhb1A**	no	no	no	no	no	no
KY07C-1317-116-4-1	no	no	no	no	no	**Fhb1Ahet**	no	no	**Fhb4A**	**Fhb6Ahet**	**Fhb1Bhet**	no
KY09C-1245-99-15-1	no	**Fhb3B**	**Fhb5A**	no	no	**Fhb1A**	no	no	no	no	no	no
OH12-317-55	no	no	no	no	no	no	no	no	no	no	no	no
OH12-196-24	no	no	no	no	no	no	no	no	**Fhb4A**	**Fhb6Ahet**	no	no
OH12-104-72	no	no	**Fhb5A**	no	no	no	no	no	**Fhb4A**	**Fhb6A**	**Fhb1B**	no
OH13-16-69	no	**Fhb3Bhet**	**Fhb5Ahet**	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**	no
OH12-133-66	no	no	no	no	no	**Fhb1A**	**hb2Bhetorn**	no	no	no	no	no
KWS114	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	**Fhb6A**	no	no
KWS126	no	no	no	no	no	no	no	no	no	no	no	no
KWS133	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	**Fhb6A**	no	no
KWS140	no	no	no	no	no	**Fhb1A**	no	no	no	no	**Fhb1B**	no
KWS145	no	no	no	no	no	**Fhb1A**	no	no	no	ND	no	no
KWS147	no	no	no	no	no	**Fhb1A**	no	no	no	no	no	no
IL13-1658	no	no	no	no	no	no	**Fhb2B**	**Fhb3B**	no	no	**Fhb1B**	no
IL13-8063	no	no	no	no	no	no	no	no	no	no	**Fhb1B**	no
IL13-10403	no	no	no	no	no	**Fhb1A**	no	no	no	no	**Fhb1B**	no
IL13-18570	**Fhb1?**	no	no	no	no	**Fhb1A**	no	no	no	**Fhb6A**	**Fhb1B**	no
MO151526	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**	no
MO151425	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4Ahet**	**Fhb6Ahet**	**Fhb1B**	**Fhb6Ahet**
MO151424	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**	no
MO130689	no	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**	no
MO151835	no	**Fhb3B**	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	**Fhb1B**	no
0527A1-7-7-3-1	no	**Fhb3Bhet**	**Fhb5A**	no	no	**Fhb1Ahet**	no	no	**Fhb4A**	**Fhb6Ahet**	no	no
05247A1-7-7-3-1	**Fhb1**	no	**Fhb5A**	no	no	no	no	no	**Fhb4A**	**Fhb6Ahet**	no	no
0566A1-3-1-63-3	no	no	no	no	no	**Fhb1A**	no	no	no	no	no	no
02444A1-23-1-3-4	**Fhb1**	no	no	no	no	**Fhb1A**	no	no	**Fhb4A**	no	no	no
0762A1-2-8	**Fhb1**	no	**Fhb5Ahet**	no	no	**Fhb1A**	no	no	no	no	no	no
U6714-A-004	no	no	no	no	no	no	no	no	no	ND	no	no
U6715-020	no	no	no	no	no	no	no	no	no	no	no	no
MI14R0330	**Fhb1**	no	no	no	no	**Fhb1A**	**Fhb2Bhet**	no	no	no	no	no
MI14R0213	no	no	no	no	no	no	no	no	**Fhb4A**	no	**Fhb1B**	no
Number Homozygotes	4	3	5	0	0	21	2	1	17	4	14	0
Number of Heterozygotes	0	2	2	0	0	2	1	0	2	5	1	1
% of resistant alleles	10.3	10.3	15.4	0.0	0.0	56.4	6.4	2.6	46.2	16.7	37.2	1.3

Table 32. Quality parameters for the 2016-2017 NUWWSN. Data is from the USDA Soft Wheat Quality Lab. Additional analytical data is available in an excel file from sneller.5@osu.edu.

Entry	Test Weight (LB/BU)	NIR Kernel Protein (at 12%)	SKCS Kernel Hardness	SKCS Kernel Diameter (mm)	SKCS Kernel Weight (mg)	Adjusted Flour Yield (%)	Adjusted Flour Yield % Grade	Softness Equivalent (%)	Flour Protein (at 14%)	Lactic Acid SRC (%)	Sodium Carbonate SRC (%)
TRUMAN	58.7	10.2	19.1	2.5	29.7	67.1	D	55.6	8.4	97.9	70.6
ERNIE	59.0	11.2	9.1	2.8	34.9	66.2	F	54.3	8.9	119.3	73.9
FREEDOM	58.1	10.5	25.7	2.6	32.5	66.1	F	51.4	8.2	103.7	74.3
PIONEER2545	57.6	10.5	23.5	2.6	31.1	65.3	F	55.4	8.9	98.0	76.5
VA11W-108PA	60.3	11.1	15.3	2.6	33.1	65.9	F	56.7	8.7	120.0	77.2
VA09MAS1-12-5-1	62.0	10.5	21.5	2.8	35.1	69.8	B	51.7	8.4	110.3	70.0
VA14FHB-29	61.6	10.5	27.9	2.7	36.2	67.9	D	53.3	8.2	116.7	74.8
VA09MAS8-34-5-2	59.4	10.7	23.0	2.8	37.9	69.3	C	50.3	8.5	107.3	72.9
VA09MAS3-34-2-1	59.0	10.9	13.1	2.7	35.4	68.4	C	54.8	8.9	126.7	73.2
KY09C-0052-26-12-3	59.4	9.9	18.0	2.5	28.3	70.9	A	61.9	8.1	117.1	72.3
X08C-1070-74-20-1	60.1	11.5	39.1	2.8	34.0	66.5	F	46.5	9.3	143.5	78.3
KY09C-1245-100-1-3	57.9	11.4	31.8	2.5	27.9	63.8	F	52.7	8.7	130.5	85.7
KY09C-0267-45-16-3	60.2	10.8	23.8	2.6	31.0	66.0	F	55.8	8.7	120.5	77.6
X08C-1090-51-12-5	58.9	10.9	20.7	2.7	34.9	65.4	F	55.9	9.0	126.0	77.2
HILLIARD	59.5	10.7	15.2	2.7	33.9	65.6	F	57.8	8.4	117.1	80.7
SHIRLEY	57.0	10.8	8.2	2.6	33.1	67.6	D	56.1	8.4	97.2	76.8
OH12-195-22	58.1	10.5	12.7	2.8	35.1	66.0	F	54.6	8.4	96.9	78.7
OH11-118-18	60.6	11.2	41.3	2.5	27.5	64.7	F	54.0	8.9	118.2	74.1
OH12-133-74	58.5	11.0	34.9	2.7	34.8	65.9	F	50.5	8.8	116.1	73.9
OH12-194-24	58.3	10.6	12.5	2.7	33.6	66.1	F	54.1	8.4	98.6	75.4
OH13-16-25	57.9	10.5	8.4	2.5	31.5	65.6	F	54.8	8.3	118.2	77.2
NE14538	61.4	11.6	65.0	2.8	32.9	67.0	D	45.0	9.2	159.9	91.9
NE14606	59.6	11.6	69.3	2.8	32.2	67.7	D	40.0	9.7	141.1	83.6
NE14696	60.4	12.1	75.2	2.7	32.8	67.2	D	40.1	10.1	146.1	87.9
NI12702W	61.2	13.6	86.2	2.8	34.3	63.2	F	32.5	11.9	152.8	99.8
NE15545	58.9	11.7	80.1	2.6	30.4	64.4	F	39.2	9.8	148.0	94.6
PIONEER 26R10	58.5	10.1	12.7	2.6	34.3	68.4	C	64.2	8.3	113.8	80.8
KWS095	58.8	9.2	21.4	2.6	32.5	70.7	B	60.0	7.8	114.4	73.4
KWS103	58.7	10.4	10.4	2.7	36.4	68.9	C	56.3	8.2	122.0	74.7
KWS122	60.4	10.5	22.6	2.8	36.4	66.5	F	51.6	8.4	121.2	74.8
KWS127	57.6	9.9	15.8	2.6	34.6	68.7	C	59.0	8.1	138.1	79.5
KWS141	60.7	10.7	16.2	2.6	30.2	66.2	F	57.7	8.4	139.4	77.7
IL09-3264-T2	60.3	11.2	10.8	2.6	32.8	69.1	C	54.4	8.8	148.4	74.0
IL12-21235	61.8	10.6	14.2	2.7	33.1	68.6	C	54.3	8.8	138.2	73.8
IL12-26004	58.7	10.8	4.3	2.7	33.8	69.6	C	58.9	8.5	148.7	74.3
IL13-451	60.9	11.3	12.4	2.6	32.0	67.8	D	55.5	8.8	117.8	72.5
IL13-20616	60.6	11.7	9.4	2.6	32.1	63.7	F	51.6	9.2	145.5	78.0
HILLIARD	60.2	10.3	14.2	2.7	33.5	66.6	F	59.4	8.1	120.2	78.6
SHIRLEY	58.8	10.7	10.7	2.7	35.5	68.0	D	54.5	8.1	97.0	75.8
NY99056-161	56.7	10.1	31.6	2.5	28.7	67.8	D	57.5	8.5	106.0	74.3
NYWhatford/7388-39-693	59.6	11.6	28.0	2.6	28.9	64.8	F	57.9	8.8	80.6	71.6
NY09087-15-69-1124	57.1	10.5	27.6	2.4	28.0	65.5	F	58.7	8.2	84.2	71.5
NY01016-AN	60.2	10.5	16.2	2.9	39.5	68.5	C	56.1	8.3	122.5	72.9
NY09125-16-1034	55.6	10.7	16.2	2.6	26.7	65.4	F	61.7	8.4	82.4	73.2
MO140304	62.5	10.6	32.4	2.7	33.5	64.1	F	47.9	8.3	94.6	74.1
MO151323	60.7	9.9	23.8	2.7	32.1	65.5	F	56.6	7.8	121.9	80.4
MO151031	60.1	10.5	16.7	2.5	31.6	67.9	D	57.5	8.2	102.5	74.5
MO151826	62.5	11.6	33.3	2.7	32.4	65.3	F	52.9	8.8	142.7	76.3
MO150133	61.7	10.5	25.7	2.7	33.0	65.7	F	54.6	8.2	128.6	78.5
TRIBUTE	62.2	10.4	26.6	2.7	32.9	66.8	D	50.9	8.3	131.0	77.0
0566A1-3-1-1-63	59.1	11.0	13.1	2.9	35.3	66.8	D	55.7	8.5	120.5	74.7
04620A1-1-7-4-10	58.7	11.2	21.6	2.9	36.9	66.5	F	49.1	8.9	111.3	73.6
0527A1-9-14-4-3-3	55.2	10.7	8.5	2.6	31.2	64.3	F	55.8	8.9	130.1	88.3
0762A1-2-8	56.6	9.9	12.6	2.8	34.0	65.7	F	55.0	8.3	110.9	78.4
07419A1-16-1-1-16-1-1	60.8	12.1	33.1	2.7	31.5	63.0	F	50.0	9.5	107.8	87.4
LES15-5199	56.4	10.5	18.6	2.5	27.9	68.0	D	57.8	8.7	103.2	72.9
LES15-7011	57.5	11.1	15.2	2.6	29.0	66.9	D	61.3	8.8	135.7	76.4
LES15-5540	59.8	10.3	14.5	2.7	31.6	66.6	F	57.4	8.5	123.5	77.5
LES15-5605	59.8	10.3	8.7	2.6	32.7	68.6	C	59.3	8.1	124.5	77.0
LES15-7004	58.8	9.7	5.2	2.7	34.7	68.3	C	61.8	7.6	112.4	76.6
HILLIARD	59.5	10.5	17.6	2.6	33.0	65.9	F	58.6	8.1	116.3	80.1
SHIRLEY	58.7	11.2	8.9	2.7	35.0	67.8	D	53.5	8.5	98.6	75.5
U6714-B-041	58.6	13.2	28.6	2.7	31.6	66.8	D	53.0	10.5	161.5	79.0
MI14R0008	59.6	10.2	25.4	2.5	29.4	66.8	D	52.6	8.2	122.6	74.2
MI14R0009	60.0	10.5	27.5	2.6	30.0	66.2	F	51.3	8.1	117.9	72.6
MI14R0421	61.0	11.0	21.7	2.7	37.3	64.4	F	55.5	8.3	109.6	83.1
MI14R0267	60.0	10.9	15.8	2.9	38.7	70.0	B	51.1	8.5	122.9	70.7
OH09-207-68	58.7	11.2	13.6	2.5	30.0	67.7	D	57.7	8.9	121.3	78.0
Average	59.4	10.8	23.3	2.7	32.8	66.8		54.1	8.6	120.0	77.3
Standard Deviation	1.6	0.7	17.0	0.1	2.8	1.8		5.5	0.7	18.0	5.6

Notes:

= check used for this evaluation

= favorable quality trait value

= marginal quality trait value

Table 33. Quality parameters for the 2016-2017 PNUWWSN. Data is from the USDA Soft Wheat Quality Lab. Additional analytical data is available in an excel file from sneller.5@osu.edu.

Entry	Test Weight (LB/BU)	NIR Kernel Protein (at 12%)	SKCS Kernel Hardness	SKCS Kernel Diameter (mm)	SKCS Kernel Weight (mg)	Adjusted Flour Yield (%)	Adjusted Flour Yield % Grade	Softness Equivalent (%)	Flour Protein (at 14%)	Lactic Acid SRC (%)	Sodium Carbonate SRC (%)
TRUMAN	57.5	11.1	19.3	2.4	28.9	67.1	D	55.4	8.9	99.4	71.3
ERNIE	58.7	11.3	9.1	2.8	33.9	66.3	F	54.9	8.9	119.2	75.9
FREEDOM	58.0	10.5	24.9	2.6	32.0	66.4	F	52.4	8.4	104.6	75.2
PIONEER2545	57.2	10.6	21.8	2.6	31.1	66.1	F	56.6	9.0	95.7	77.3
VA09MAS1-12-8-4	61.6	10.3	29.8	2.7	34.3	68.8	C	50.7	8.5	108.6	72.1
VA14W-28	60.8	11.3	23.0	2.7	35.7	67.7	D	50.9	8.9	119.7	72.5
VA09MAS6-122-7-1-1	60.2	10.9	5.1	2.8	37.0	70.0	B	56.2	8.6	116.0	68.5
VA09MAS6-122-7-1-4	59.4	11.1	6.8	2.8	36.0	69.0	C	56.8	9.1	116.1	69.9
DH11SRW069-70	58.5	10.6	7.8	2.7	36.7	65.5	F	59.5	8.3	109.8	82.4
X09-0187-112-3-3	59.7	10.3	12.7	2.7	35.6	66.4	F	54.3	8.3	129.5	77.3
KY09C-0053-28-9-3	61.9	11.4	27.6	2.8	32.3	66.0	F	49.5	9.2	122.1	73.8
KY09C-1245-99-8-5	59.8	10.4	23.8	2.6	30.4	64.8	F	53.9	8.5	116.2	79.5
KY07C-1317-116-4-1	61.5	11.1	27.8	2.7	36.4	66.1	F	48.4	9.1	121.4	73.4
KY09C-1245-99-15-1	59.6	10.8	23.3	2.6	29.2	64.6	F	52.1	8.9	117.0	78.1
PIONEER 26R10	57.8	9.9	10.8	2.6	34.8	68.2	C	63.7	8.2	110.7	78.0
OH12-317-55	58.9	10.1	3.9	2.7	36.0	69.7	B	54.0	8.1	85.0	69.6
OH12-196-24	58.7	10.9	13.1	2.8	36.5	65.1	F	52.0	8.6	96.5	77.7
OH12-104-72	60.5	10.7	49.4	2.7	32.2	66.9	D	43.9	8.6	116.0	80.6
OH13-16-69	58.5	10.6	19.7	2.6	30.4	66.6	F	55.1	8.5	132.4	76.8
OH12-133-66	60.9	11.1	27.6	2.6	34.5	66.6	F	52.3	8.7	130.0	75.9
KWS114	59.8	11.4	15.8	2.8	35.9	68.0	D	49.9	9.1	98.3	70.5
KWS126	57.9	9.6	6.0	2.6	34.0	69.2	C	61.0	7.9	111.7	76.0
KWS133	58.7	11.1	10.9	2.8	39.2	65.2	F	56.2	8.8	128.5	80.8
KWS140	57.8	9.1	13.8	2.5	30.4	65.2	F	59.7	7.7	125.6	80.9
KWS145	60.0	11.3	20.8	2.8	41.9	65.6	F	51.6	8.7	107.2	78.3
KWS147	61.0	11.3	24.7	2.7	39.9	67.0	D	50.1	8.8	102.9	76.5
HILLIARD	59.6	10.6	16.8	2.7	34.5	66.1	F	58.7	8.7	119.7	81.2
SHIRLEY	58.9	10.9	12.0	2.6	34.8	68.2	C	53.9	8.6	98.3	76.8
IL13-1658	58.5	10.7	11.6	2.5	29.9	67.7	D	57.8	8.6	106.6	77.3
IL13-8063	61.1	11.0	38.0	2.6	28.2	68.7	C	50.1	8.9	128.3	73.0
IL13-10403	60.0	10.2	12.4	2.6	31.9	69.7	B	56.7	8.3	127.2	73.0
IL13-18570	61.7	11.0	13.9	2.7	33.8	68.8	C	54.6	8.6	129.7	72.2
MO151526	60.7	11.0	28.0	2.7	31.9	65.4	F	53.6	8.7	144.0	84.9
MO151425	61.0	10.3	24.4	2.7	32.8	65.8	F	55.1	8.1	130.3	82.1
MO151424	60.6	10.7	25.7	2.7	32.2	64.7	F	54.6	8.4	132.5	80.8
MO130689	60.9	10.7	24.1	2.7	33.1	66.5	F	55.0	8.3	130.9	81.0
MO151835	60.0	10.8	21.2	2.7	31.7	68.5	C	54.0	8.7	131.1	73.6
TRIBUTE	61.7	11.0	29.5	2.7	33.7	66.6	F	50.6	8.6	132.6	78.9
0527A1-7-7-3-1	61.4	10.9	28.5	2.8	36.0	66.6	F	51.4	8.9	100.4	77.6
05247A1-7-7-3-1	61.3	11.8	27.8	2.7	35.3	66.4	F	50.2	9.4	99.6	77.1
0566A1-3-1-63-3	59.0	10.9	13.1	2.9	35.4	66.6	F	55.5	8.7	121.0	74.4
02444A1-23-1-3-4	55.3	9.9	8.9	2.6	32.1	65.5	F	54.7	8.4	129.1	86.4
0762A1-2-8	56.1	9.9	12.0	2.8	33.1	65.7	F	56.3	8.3	112.2	79.9
U6714-A-004	59.3	11.8	31.2	2.8	32.4	67.7	D	52.7	9.7	148.4	79.5
U6715-020	58.1	11.2	62.5	2.8	34.1	68.8	C	41.6	10.0	160.7	93.0
MI14R0330	54.8	9.7	6.4	2.6	30.4	67.5	D	62.5	8.0	102.6	78.6
MI14R0213	57.4	10.6	9.8	2.7	34.4	68.5	C	56.5	8.6	77.1	71.8
JAMESTOWN	60.1	11.5	17.6	2.8	31.7	64.2	F	54.7	8.8	122.1	80.0
Average	59.4	10.8	19.9	2.7	33.7	66.9		54.0	8.7	117.2	77.1
Standard Deviation	1.7	0.6	11.3	0.1	2.8	1.5		4.1	0.4	16.1	4.7