

Report on the 2021-2022 Northern Uniform Winter Wheat Scab Nurseries (NUWWSN and PNUWWSN)

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We wish to acknowledge the support of the USDA Soft Wheat Quality Lab, Wooster OH, and the USDA Eastern Regional Small Grains Genotyping Lab, Raleigh NC.

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 49 entries (45 lines & four checks, Table 4) from 10 programs, and we obtained phenotypic data on seven FHB-related traits from nine locations. The PNUWWSN had 41 entries (37 lines & four checks, Table 5) from 7 programs, and we obtained phenotypic data from seven locations. Cooperators collect replicated data and submit either plot level data or 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.

Several cooperators scored FHB Index using a 0-9 scale (0=no disease, 9=severe disease). This creates issues with combining IND data over locations. Data for IND is report in two ways: 0-9 (referred to as “F09” trait) and as a %, referred to as IND. The reported F09 values were multiplied by 10 to provide an IND value.

Table 1. Fusarium Head Blight and other traits assessed in 2021-2022 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	$IND = (SEV*INC)/100$ or $F09*10$
F09	FHB Index rated on a 0-9 scale	0= no disease, 9-very severe disease
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	$ISK \text{ Index} = 0.3 (\text{Severity}) + 0.3 (\text{Incidence}) + 0.4 (\text{FDK})$
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 2021-2022 P+NUWWSN

ENV CODE	LOCATION	NUWWSN	PNUWWSN	COOPERATORS	INSTITUTE	CODE
ILCHA	Champaign, IL	Yes	yes	Jana Murche	KWS Cereals	KWS
ILURB	Urbana, IL	yes	yes	Jessica Rutkoski	University of Illinois	UIL
INWLA	W. Lafayette, IN	yes	yes	Mohsen Mohammadi, Tracy Richards	Purdue University	PUR
KYLEX	Lexington, KY	yes	yes	David Van Sanford	University of Kentucky	UKY
MIMAS	Mason, MI	yes	yes	Eric Olson, Amanda Noble	Michigan State University	MSU
NEMEA	Mead, NE	yes	no	Katherine Frels, S Wegulo	University of Nebraska	UNE
NYITH	Ithaca, NY	yes	no	Mark Sorrells, Gary Bergstrom	Cornell University	COR
OHWOO	Wooster, Ohio	yes	yes	Clay Sneller, Pierce Paul	The Ohio State University	OSU
VAWAR	Warsaw, VA	yes	yes	Nicholas Santantonio	Virginia Tech	VAT

Table 3. Entries in the 2021-2022 NUWWSN

TEST	ENTRY	NAME	PEDIGREE
NUWWSN	1	TRUMAN	
NUWWSN	2	ERNIE	
NUWWSN	3	FREEDOM	
NUWWSN	4	PIONEER2545	
NUWWSN	5	OH18-65-54	OH10-194-16/P0762A1-2-8
NUWWSN	6	OH17-193-77	IL07-20728/x11-MAS1-024(=CokerW1377
NUWWSN	7	OH17-206-71	MD08-26-H2-7-12-9[SS8641//McCormick*2/Ning7840]/Jamestown(VA02W-370)//
NUWWSN	8	OH17-206-73	MD08-26-H2-7-12-9[SS8641//McCormick*2/Ning7840]/Jamestown(VA02W-370)//
NUWWSN	9	MI20R0134	OH07-263-3/MI14W0190
NUWWSN	10	MI20R0003	10512RA1-8/VA11W-182
NUWWSN	11	MI20R0008	IL10-21934/VA12FHB-55
NUWWSN	12	MI20R0135	OH08-180-48/MI14W0190
NUWWSN	13	MI20R0153	KY09C-1024-96-1-3/U6714-B-041//IL10-21934
NUWWSN	14	IL17-17739	07-24841/02-18228//07-4415
NUWWSN	15	US16-IL-064-160	12-14179/10-21934
NUWWSN	16	IL17-31541	02-18228/08-12174//07-24841
NUWWSN	17	US16-IL-061-029	12-7918/07-4415
NUWWSN	18	IL17-9320	07-19334/07-20743
NUWWSN	19	KWS369	LCS19229 / VA12FHB-8
NUWWSN	20	KWS382	Starburst / KWS051
NUWWSN	21	KWS384	MO110767 / KWS054
NUWWSN	22	KWS400	KWS077 / VA11W-106
NUWWSN	23	KWS405	IL07-19334 / LCS19228 // KWS054
NUWWSN	24	X11-0039-1-17-5	Pembroke//VA04W-90/KY97C-0508-01-01A-1
NUWWSN	25	X11-0120-12-4-3	Syngenta W1104//VA06W-558/SS MPV-57
NUWWSN	26	X12-3010-4-4-1	KY03C-1237-39/SHIRLEY
NUWWSN	27	X12-3051-53-17-3	0762A1-2-8/KY03C-1237-32
NUWWSN	28	X11-0170-52-3-3	Excel 234//IL04-7942/SS MPV-57
NUWWSN	29	NE16562	HV9W02-942R/CAMELOT
NUWWSN	30	NE17441	Hitch/NE07409
NUWWSN	31	FHB BC2F2-1	NE14696/OVERLAND_FHB10/2/NE14696/3/NE14696
NUWWSN	32	FHB BC2F2-2	NE14421/OVERLAND_FHB10/2/NE14421/3/NE14421
NUWWSN	33	NE16424	NI06737/HV9W03-696R-1//BC01007-7
NUWWSN	34	NY12512-1-6-05	05158-864 x 94052-6090B = Va97w-375ws/NY7388/Pio2737w/Harus
NUWWSN	35	NY12302-2-14-08-1442	09067-2-4 x 09067-2-48R = Erie86/Cal-Res-L/03179-10
NUWWSN	36	NY12302-2-14-01-1441	09067-2-4 x 09067-2-48R = Erie86/Cal-Res-L/03179-10
NUWWSN	37	NYDD1543-06R-1652	VA10W-21//GERMPLASM 11-3-10/SYNGENTA W1104
NUWWSN	38	NY12007-2-4-13-1381	Pio25R39 x 03180-10(NY7387/Caledonia//Caledonia-2///Caledonia 9 BC2 S1)
NUWWSN	39	17VDH-SRW01-077	MDC07026-F2-19-13-1 (SS8641//McCormick*2 / Ning7840) / HILLIARD"S" (Dyna-Gro 9811, VA11W-108PA)
NUWWSN	40	VA19FHB-22	GA04570-10E46 [00440/3/PIO2684/3*AGS 2000 // AGS2000*2/GA84202] / MD03W61-10-2 [Pioneer 25R42/ Chesapeake] // Jamestown, F9
NUWWSN	41	16VDH-FHB-MAS60-7-03	NC8248-14 (Bess / Neuse: FHB-RES. DH) / MDC07026-F2-19-13-4 (SS8641//McCormick*2 / Ning7840) // VA09MAS6-122-7-1 [SHIRLEY / GA991371-6E13 // SS5205 (VA01W-205)]
NUWWSN	42	17VTK4-29	SY Viper / MDC07026-F2-19-13-1 (SS8641// McCormick*2 / Ning7840)
NUWWSN	43	17VTK19-15	VA09MAS1-12-5-1-3 [GA991371-6E13 / USG 3555 (VA02W-555) // OAKES] / HILLIARD
NUWWSN	44	P2104	
NUWWSN	45	P2105	
NUWWSN	46	P2106	
NUWWSN	47	P2130	
NUWWSN	48	P2135	
NUWWSN	49	P2143	

Table 4. Entries in the 2021-2022 PNUWWSN

TEST	ENTRY	NAME	PEDIGREE
PNUWWSN	1	TRUMAN	
PNUWWSN	2	ERNIE	
PNUWWSN	3	FREEDOM	
PNUWWSN	4	PIONEER2545	
PNUWWSN	5	OH18-78-33	OH09-207-68/P0762A1-2-8
PNUWWSN	6	OH18*76-27	OH09-207-68/P05247A1-7-3-121
PNUWWSN	7	OH18*105-13	P0762A1-2-8/OH09-207-68
PNUWWSN	8	OH18*104-99	P0762A1-2-8/OH09-207-68
PNUWWSN	9	OH16-184-77	OH08-180-48/0762A1-2-8
PNUWWSN	10	MI20R0174	0762A1-2-8/MI14R0009//MDC07026-F2-19-13-4
PNUWWSN	11	MI20R0049	F2028R/Jamestown//IL10-19464/3/VA11W-182
PNUWWSN	12	MI20R0161	IL10-21934//Branson/U6714-B-041
PNUWWSN	13	MI20R0076	0762A1-2-8/IL11-6543
PNUWWSN	14	MI20W0085	E2041/MI14W0190
PNUWWSN	15	MI20W0125	MI14W0190/NY05158-833
PNUWWSN	16	US17-IL-111-005	11-662/10-21934
PNUWWSN	17	18MSFRS-60	
PNUWWSN	18	IL18-5270	07-4415/12 - 30879
PNUWWSN	19	US17-IL-109-046	12-26448/13-1960
PNUWWSN	20	US17-IL-108-070	10-21934/13-1910
PNUWWSN	21	KWS347	Pembroke2014 / LCS19228
PNUWWSN	22	KWS386	MO110799 / VA12FHB-4
PNUWWSN	23	KWS396	VA10W-21 / LCS08850-2
PNUWWSN	24	KWS397	KWS023 / P0762A1-2-8
PNUWWSN	25	KWS407	KWS074 / GL1032-38-2
PNUWWSN	26	X12-3114-65-7-1	KY03C-1237-32/USG 3251
PNUWWSN	27	X12-3014-46-7-3	SHIRLEY/KY03C-1195-10-2-5
PNUWWSN	28	X12-3072-55-13-5	MD03W61-10-2/KY03C-1237-07
PNUWWSN	29	X12-3048-52-18-3	0762A1-2-8/Pembroke
PNUWWSN	30	X11-0414-116-11-3	KY03C-1237-32//KY02C-3006-46/BRANSON
PNUWWSN	31	18VDH-FHB-MAS07-164	TXGA06343-17-3-5-EL2 (011638-G1-G1/ 981592-8-8-1// 991336-47-5W-1W) / MDC07026-F2-19-13-1 (SS8641// McCormick*2/ Ning7840) // USG 3118 (VA11W-279)
PNUWWSN	32	DH17SRW136-066	VA12FHB-8 [IL99-27048 (IL90-6364/Pioneer 2571)/ VA04W-486 {ERNIE//INW 9824 (P92823A1-1-4-4-5) /McCormick}} // SHIRLEY] / DH11SRW070-14 [GA00067-8E35 (GA921204/AGS2000) /Shirley]
PNUWWSN	33	DH17SRW136-038	VA12FHB-8 [IL99-27048 (IL90-6364/Pioneer 2571)/ VA04W-486 {ERNIE//INW 9824 (P92823A1-1-4-4-5) /McCormick}} // SHIRLEY] / DH11SRW070-14 [GA00067-8E35 (GA921204/AGS2000) /Shirley]
PNUWWSN	34	VA20FHB-20	'111301W' (Pioneer W000273A1) / 12V51 (VA05W-251) // Hilliard (VA11W-108), F8
PNUWWSN	35	18VDH-FHB-MAS07-173	TXGA06343-17-3-5-EL2 (011638-G1-G1/ 981592-8-8-1// 991336-47-5W-1W) / MDC07026-F2-19-13-1 (SS8641// McCormick*2/ Ning7840) // USG 3118 (VA11W-279)
PNUWWSN	36	17VTK6-17	MDC07026-F2-19-13-1 (SS8641// McCormick*2 / Ning7840) / GAJT 141-14E45 (Jamestown/AGS2026)
PNUWWSN	37	21PU-0121	
PNUWWSN	38	21PU-0192	
PNUWWSN	39	21PU-0348	
PNUWWSN	40	21PU-0597	
PNUWWSN	41	21PU-0598	

Table 5. Summary of all FHB traits from the 2021-2022 NUWWSN: “h” and “l” indicate means that are not significantly different from the highest (h) or lowest (l) mean in that column. “Fhb1” indicates the presence of the resistance allele at QTL *Fhb1*.

ENTRY	NAME	INC AVG	SEV AVG	IND AVG	FHB(0-9) AVG	FDK AVG	ISK AVG	DON AVG	FHB1
1	TRUMAN	26.3 l	21.8 l	16.3 l	3.0 l	16.3 l	24.4 l	6.2 l	no
2	ERNIE	43.8 h	33.8 h		4.2	24.8	35.9	7.1 l	no
3	FREEDOM	44.7 h	34.1 h	30.9	3.7 l	38.9 h	38.0	15.6	no
4	PIONEER2545	53.7 h	35.5 h	40.0	5.3	49.2 h	51.1 h	22.8 h	no
5	OH18-65-54	26.1 l	19.8 l	12.5 l	2.0 l	14.1 l	17.3 l	2.4 l	Fhb1
6	OH17-193-77	53.2 h	32.7 h	27.9	3.0 l	26.8	34.0	7.9 l	no
7	OH17-206-71	48.3 h	27.7 l	21.2	3.7 l	11.6 l	27.0 l	5.6 l	Fhb1
8	OH17-206-73	50.6 h	31.7 h	29.7	3.7 l	16.2 l	36.4	7.0 l	Fhb1
9	MI20R0134	31.7 l	20.5 l	13.3 l	3.3 l	9.1 l	23.5 l	2.0 l	Fhb1
10	MI20R0003	46.0 h	19.3 l	24.5	6.0 h	18.9 l	37.3	5.2 l	Fhb1
11	MI20R0008	35.5 l	29.4 l	17.9 l	2.5 l	6.8 l	17.2 l	3.1 l	no
12	MI20R0135	36.4 l	28.1 l		4.5	20.7 l	29.8 l	3.8 l	Fhb1
13	MI20R0153	41.2 h	26.4 l	25.6	4.5	21.6 l	32.2 l	5.7 l	no
14	IL17-17739	26.1 l	20.9 l	12.6 l	2.3 l	5.7 l	19.6 l	3.8 l	no
15	US16-IL-064-160	33.8 l	20.6 l	13.1 l	2.5 l	14.8 l	18.3 l	3.1 l	no
16	IL17-31541	32.3 l	26.3 l		4.3	11.6 l	25.8 l	2.0 l	no
17	US16-IL-061-029	27.3 l	17.8 l	16.7 l	4.0	9.3 l	22.5 l	1.6 l	Fhb1
18	IL17-9320	22.8 l	22.3 l	13.5 l	2.5 l	4.9 l	16.3 l	1.2 l	no
19	KWS369	44.6 h	31.0 l	23.8	3.3 l	32.3	33.9 l	9.3 l	no
20	KWS382	48.6 h	34.7 h	34.8	6.0 h	36.8	48.1 h	11.6	no
21	KWS384	41.7 h	31.4 hl	21.4	2.8 l	14.9 l	32.8 l	7.1 l	no
22	KWS400	47.9 h	29.8 l	24.1	3.0 l	18.8 l	26.2 l	10.4	no
23	KWS405	37.5 l	34.2 h	20.5	2.7 l	16.3 l	29.8 l	5.7 l	no
24	X11-0039-1-17-5	59.6 h	33.3 h	34.8	5.0	30.3	41.2	14.4	no
25	X11-0120-12-4-3	41.9 h	29.0 l	22.4	2.8 l	28.2	31.4 l	10.6	no
26	X12-3010-4-4-1	55.7 h	38.7 h	34.8	4.0	34.4	42.6 h	13.2	no
27	X12-3051-53-17-3	55.1 h	27.7 l	28.1	3.8 l	34.4	38.3	9.4 l	no
28	X11-0170-52-3-3	41.8 h	32.3 h	34.0	5.0	28.7	37.9	11.8	no
29	NE16562	52.7 h	40.0 h	45.4 h	8.0 h	50.4 h	61.7 h	16.1	no
30	NE17441	34.3 l	30.1 l	31.8	5.8 h	28.8	42.3	6.3 l	no
31	FHB BC2F2-1	34.5 l	22.7 l	19.2	2.8 l	27.3	25.4 l	10.3	no
32	FHB BC2F2-2	62.0 h	40.3 h	41.6	4.3	51.3 h	49.6 h	27.1 h	Fhb1
33	NE16424	61.9 h	47.5 h	52.7 h	6.0 h	56.4 h	58.4 h	20.7 h	no
34	NY12512-1-6-05	45.8 h	34.6 h	26.2	2.5 l	27.6	33.3 l	26.6 h	Fhb1
35	NY12302-2-14-08-1442	19.9 l	15.4 l	8.2 l	1.3 l	31.6	21.6 l	9.0 l	Fhb1
36	NY12302-2-14-01-1441	30.1 l	17.3 l	12.1 l	1.8 l	46.8 h	26.7 l	15.0	Fhb1
37	NYDD1543-06R-1652	20.3 l	18.0 l	13.6 l	2.0 l	18.7 l	14.8 l	3.0 l	Fhb1
38	NY12007-2-4-13-1381	31.8 l	28.9 l	22.9	3.3 l	34.7	38.0	10.3	Fhb1
39	17VDH-SRW01-077	59.9 h	36.4 h	36.0	4.5	28.6	43.0 h	10.9	Fhb1
40	VA19FHB-22	55.9 h	37.2 h	40.2	5.5 h	34.4	47.4 h	15.7	Fhb1_het
41	16VDH-FHB-MAS60-7-03	54.0 h	37.7 h	29.2	3.0 l	22.6 l	31.8 l	8.6 l	Fhb1
42	17VTK4-29	62.4 h	38.2 h	31.6	3.3 l	19.7 l	33.2 l	12.0	Fhb1
43	17VTK19-15	48.9 h	39.7 h	34.8	5.0	31.8	49.7 h	14.0	no
44	P2104	27.0 l	27.5 l	14.4 l	1.5 l	24.1	19.0 l	8.6 l	no
45	P2105	40.8 l	25.3 l	18.9 l	2.7 l	21.4 l	26.4 l	10.5	no
46	P2106	29.1 l	19.1 l	12.2 l	1.3 l	17.3 l	16.5 l	6.7 l	Fhb1
47	P2130	55.6 h	33.0 h	33.2	5.0	28.3	42.3	6.1 l	no
48	P2135	40.1 l	16.4 l	20.9	2.8 l	23.7 l	25.1 l	8.9 l	Fhb1_het
49	P2143	47.0 h	22.7 l	21.2	4.7	42.4 h	45.1 h	11.2	Fhb1
1001	MEAN	42.2	29.0	25.2	3.7	25.8	33.1	9.5	
1002	MAXIMUM	62.4	47.5	52.7	8.0	56.4	61.7	27.1	
1003	MINIMUM	19.9	15.4	8.2	1.3	4.9	14.8	1.2	
1005	MSE	594.9	350.9	259.8	3.2	258.3	222.9	51.9	
1006	LSD	21.2	16.3	10.9	2.6	18.9	19.2	8.5	
	# Environments	4	4	8	2	4	3	4	

Table 6. Summary of all FHB traits from the 2021-2022 PNUWWSN: “h” and “l” indicate means that are not significantly different from the highest (h) or lowest (l) mean in that column. “FHB1” indicates the presence of the resistance allele at QTL *Fhb1*.

ENTRY	NAME	INC	SEV	IND	FO-9	FDK	ISK	DON
1	TRUMAN	29.2 l	28.0	19.9 l	3.3	16.4 l	23.8 l	4.9 l
2	ERNIE	44.2	48.3	34.9	3.8	25.0 l	35.4	8.2 l
3	FREEDOM	55.8	41.7	31.6	3.0	37.2 h	35.8	13.7 h
4	PIONEER2545	75.8 h	65.8 h	50.9 h	4.8	45.9 h	52.2 h	19.6 h
5	OH18-78-33	57.5	34.3	26.6	3.3	25.0 l	28.1	8.5 l
6	OH18*76-27	16.1 l	16.6 l	13.9 l	2.0	20.4 l	14.8 l	2.4 l
7	OH18*105-13	23.9 l	10.0 l	11.1 l	1.8	11.8 l	15.4 l	2.4 l
8	OH18*104-99	30.4 l	29.7	21.0	3.3	11.4 l	20.1 l	3.6 l
9	OH16-184-77	27.9 l	26.4	15.0 l	2.0	23.3 l	19.1 l	3.7 l
10	MI20R0174	30.4 l	27.9	13.5 l	2.0	14.4 l	16.0 l	3.7 l
11	MI20R0049	42.5	28.8	24.5	3.3	21.9 l	30.0	5.5 l
12	MI20R0161	28.3 l	29.2	18.2 l	2.5	11.8 l	14.5 l	2.3 l
13	MI20R0076	48.3	38.7	1	2.5	26.7 l	30.0	5.8 l
14	MI20W0085	17.5 l	30.4	16.2 l	2.5	16.7 l	20.1 l	10.2
15	MI20W0125	43.8	33.0	20.1	2.3	17.5 l	23.0 l	6.2 l
16	US17-IL-111-005	18.3 l	29.2	11.6 l	1.5 l	8.3 l	10.0 l	2.0 l
17	18MSFRS-60	32.5	24.7	15.7 l	2.5	8.9 l	19.5 l	2.4 l
18	IL18-5270	16.7 l	35.2	15.1 l	2.3	8.8 l	13.2 l	1.8 l
19	US17-IL-109-046	25.8 l	30.7	16.7 l	2.5	10.8 l	16.2 l	2.5 l
20	US17-IL-108-070	34.6	34.2	15.6 l	1.8	8.9 l	16.8 l	2.6 l
21	KWS347	51.8	37.5	22.9	3.0	25.3 l	31.7	7.0 l
22	KWS386	32.9	26.0	14.6 l	1.3 l	16.3 l	12.8 l	6.5 l
23	KWS396	57.5	56.7 h	1	2.3	25.5 l	30.1	7.1 l
24	KWS397	37.9	26.0	19.2 l	2.8	17.5 l	22.5 l	5.9 l
25	KWS407	42.5	38.3	21.5	2.3	20.2 l	24.4 l	8.4 l
26	X12-3114-65-7-1	80.4 h	48.7	49.7 h	6.0 h	47.3 h	53.7 h	14.2 h
27	X12-3014-46-7-3	37.1	30.4	23.6	3.3	19.8 l	22.5 l	5.6 l
28	X12-3072-55-13-5	45.4	35.0	23.0	3.3	13.3 l	23.5 l	5.1 l
29	X12-3048-52-18-3	66.7 h	56.2 h	39.2	4.3	34.9 h	46.5 h	11.6
30	X11-0414-116-11-3	65.0	55.0 h	38.5	3.3	38.8 h	44.4 h	13.6 h
31	18VDH-FHB-MAS07-164-08	78.3 h	59.7 h	53.3 h	6.0 h	27.4	54.1 h	11.9
32	DH17SRW136-066	62.5	48.7	31.0	2.8	31.7 h	33.8	7.4 l
33	DH17SRW136-038	65.8	50.0	43.4	4.5	37.7 h	47.9 h	17.6 h
34	VA20FHB-20	47.1	39.6	28.8	4.2	20.9 l	35.5	7.2 l
35	18VDH-FHB-MAS07-173-03	50.8	30.0	23.2	2.8	20.2 l	24.4 l	12.6 h
36	17VTK6-17	69.2 h	57.1 h	42.4	3.5	23.3 l	38.5 h	10.7
37	21PU-0121	33.3	28.5	23.6	2.5	16.2 l	18.3 l	2.3 l
38	21PU-0192	63.7	33.7	33.0	3.8	23.0 l	32.0	11.1
39	21PU-0348	31.2	23.0 l	18.6 l	1.8	20.4 l	16.6 l	9.1
40	21PU-0597	39.2	45.8	22.8	1.0 l	29.4 h	23.5 l	7.3 l
41	21PU-0598	50.0	50.0	30.1	2.3	30.7 h	32.0	10.5
1001	MEAN	44.1	37.1	25.5	6.0	22.2	27.4	7.4
1002	MAXI	80.4	65.8	53.3	1.0	47.3	54.1	19.6
1003	MINI	16.1	10.0	11.1	15.6	8.3	10.0	1.8
1005	MSE	399.2	367.9	134.3	0.7	252.4	164.3	37.9
1006	LSD	14.4	13.8	8.8		18.6	16.5	7.2

Table 7. Summary of incidence (INC, %) from 2021-2022 NUWWSN.

ENTRY	NAME	AVG	ILURB	MIELA	NELIN	NYITH
1	TRUMAN	26.3 l	37.5	28.3	4.3	35.0
2	ERNIE	43.8 h	65.0	51.7	3.3	55.0
3	FREEDOM	44.7 h	77.5	41.7	3.3	56.3
4	PIONEER2545	53.7 h	92.5	58.3	1.7	62.5
5	OH18-65-54	26.1 l	35.0	21.7	1.7	46.3
6	OH17-193-77	53.2 h	85.0	48.3	3.3	76.3
7	OH17-206-71	48.3 h	70.0	38.3	13.7	71.3
8	OH17-206-73	50.6 h	92.5	41.7	14.3	53.8
9	MI20R0134	31.7 l	45.0	16.7	5.0	60.0
10	MI20R0003	46.0 h	80.0	35.0	1.7	67.5
11	MI20R0008	35.5 l	27.5	40.0	18.3	56.3
12	MI20R0135	36.4 l	42.5	25.0	26.7	51.3
13	MI20R0153	41.2 h	70.0	43.3	21.7	30.0
14	IL17-17739	26.1 l	42.5	26.7	1.7	33.8
15	US16-IL-064-160	33.8 l	42.5	35.0	19.0	38.8
16	IL17-31541	32.3 l	40.0	33.3	33.3	22.5
17	US16-IL-061-029	27.3 l	35.0	31.7	0.0	42.5
18	IL17-9320	22.8 l	17.5	23.3	9.0	41.3
19	KWS369	44.6 h	70.0	26.7	9.3	72.5
20	KWS382	48.6 h	67.5	36.7	30.3	60.0
21	KWS384	41.7 h	67.5	38.3	3.3	57.5
22	KWS400	47.9 h	67.5	46.7	7.3	70.0
23	KWS405	37.5 l	62.5	35.0	12.7	40.0
24	X11-0039-1-17-5	59.6 h	92.5	43.3	22.7	80.0
25	X11-0120-12-4-3	41.9 h	67.5	33.3	11.7	55.0
26	X12-3010-4-4-1	55.7 h	85.0	36.7	11.0	90.0
27	X12-3051-53-17-3	55.1 h	90.0	40.0	6.7	83.8
28	X11-0170-52-3-3	41.8 h	67.5	50.0	6.0	43.8
29	NE16562	52.7 h	87.5	53.3	20.0	50.0
30	NE17441	34.3 l	62.5	35.0	7.3	32.5
31	FHB BC2F2-1	34.5 l	30.0	23.3	8.3	76.3
32	FHB BC2F2-2	62.0 h	92.5	55.0	9.3	91.3
33	NE16424	61.9 h	95.0	61.7	7.3	83.8
34	NY12512-1-6-05	45.8 h	95.0	28.3	8.7	51.3
35	NY12302-2-14-08-1442	19.9 l	7.5	20.0	18.3	33.8
36	NY12302-2-14-01-1441	30.1 l	45.0	26.7	7.7	41.3
37	NYDD1543-06R-1652	20.3 l	5.0	26.7	8.3	41.3
38	NY12007-2-4-13-1381	31.8 l	40.0	30.0	17.3	40.0
39	17VDH-SRW01-077	59.9 h	97.5	50.0	5.7	86.3
40	VA19FHB-22	55.9 h	77.5	53.3	9.0	83.8
41	16VDH-FHB-MAS60-7-03	54.0 h	92.5	46.7	10.7	66.3
42	17VTk4-29	62.4 h	92.5	53.3	12.3	91.3
43	17VTk19-15	48.9 h	92.5	38.3	3.3	61.3
44	P2104	27.0 l	12.5	35.0	13.0	47.5
45	P2105	40.8 l	40.0	36.7	9.0	77.5
46	P2106	29.1 l	30.0	30.0	12.7	43.8
47	P2130	55.6 h	82.5	55.0	5.0	80.0
48	P2135	40.1 l	75.0	33.3	18.3	33.8
49	P2143	47.0 h	87.5	20.0	9.3	71.2
1001	MEAN	42.2	62.8	37.5	10.7	57.9
1002	MAXIMUM	62.4	97.5	61.7	33.3	91.3
1003	MINIMUM	19.9	5.0	16.7	0.0	22.5
1004	NOBS	10.9	2.0	2.0	3.0	3.9
1005	MSE	594.9	157.1	0.0	196.4	303.5
1006	LSD	21.2	25.5	0.0	23.3	25.1

Table 8. Summary of severity (SEV, %) data from the 2021-2022 NUWWSN

ENTRY	NAME	AVG	ILURB	MIELA	NELIN	NYITH
1	TRUMAN	21.8 l	22.5	25.0	23.3	16.5
2	ERNIE	33.8 h	45.0	61.7	10.0	18.5
3	FREEDOM	34.1 h	55.0	46.7	13.3	21.3
4	PIONEER2545	35.5 h	60.0	50.0	13.3	18.8
5	OH18-65-54	19.8 l	13.5	50.0	3.3	12.3
6	OH17-193-77	32.7 h	35.0	61.7	13.3	20.8
7	OH17-206-71	27.7 l	25.0	40.0	26.7	19.0
8	OH17-206-73	31.7 h	55.0	41.7	16.7	13.5
9	MI2OR0134	20.5 l	5.0	55.0	10.0	12.0
10	MI2OR0003	19.3 l	12.0	50.0	3.3	11.8
11	MI2OR0008	29.4 l	25.0	55.0	26.7	11.0
12	MI2OR0135	28.1 l	12.0	60.0	30.0	10.2
13	MI2OR0153	26.4 l	20.0	63.3	13.3	9.0
14	IL17-17739	20.9 l	9.5	61.7	3.3	9.3
15	US16-IL-064-160	20.6 l	12.0	45.0	13.3	12.0
16	IL17-31541	26.3 l	30.0	60.0	6.7	8.5
17	US16-IL-061-029	17.8 l	7.5	53.3	0.0	10.5
18	IL17-9320	22.3 l	3.0	56.7	20.0	9.5
19	KWS369	31.0 l	30.0	33.3	36.7	24.0
20	KWS382	34.7 h	47.5	43.3	30.0	18.0
21	KWS384	31.4 hl	45.0	61.7	3.3	15.5
22	KWS400	29.8 l	27.5	55.0	16.7	20.0
23	KWS405	34.2 h	55.0	51.7	20.0	10.2
24	X11-0039-1-17-5	33.3 h	25.0	50.0	33.3	24.8
25	X11-0120-12-4-3	29.0 l	42.5	45.0	10.0	18.5
26	X12-3010-4-4-1	38.7 h	47.5	48.3	33.3	25.5
27	X12-3051-53-17-3	27.7 l	32.5	46.7	10.0	21.5
28	X11-0170-52-3-3	32.3 h	35.0	66.7	16.7	11.0
29	NE16562	40.0 h	67.5	58.3	20.0	14.3
30	NE17441	30.1 l	40.0	50.0	20.0	10.5
31	FHB BC2F2-1	22.7 l	12.0	36.7	16.7	25.5
32	FHB BC2F2-2	40.3 h	60.0	58.3	13.3	29.5
33	NE16424	47.5 h	75.0	65.0	20.0	30.0
34	NY12512-1-6-05	34.6 h	37.5	36.7	50.0	14.3
35	NY12302-2-14-08-1442	15.4 l	33.5	11.7	6.7	9.8
36	NY12302-2-14-01-1441	17.3 l	12.0	23.3	20.0	13.8
37	NYDD1543-06R-1652	18.0 l	3.0	41.7	16.7	10.5
38	NY12007-2-4-13-1381	28.9 l	55.0	20.0	23.3	17.3
39	17VDH-SRW01-077	36.4 h	50.0	50.0	20.0	25.5
40	VA19FHB-22	37.2 h	50.0	46.7	26.7	25.5
41	16VDH-FHB-MAS60-7-03	37.7 h	35.0	65.0	33.3	17.5
42	17VTK4-29	38.2 h	35.0	58.3	33.3	26.0
43	17VTK19-15	39.7 h	75.0	60.0	6.7	17.0
44	P2104	27.5 l	16.0	46.7	30.0	17.5
45	P2105	25.3 l	16.0	33.3	23.3	28.5
46	P2106	19.1 l	16.0	31.7	16.7	12.3
47	P2130	33.0 h	30.0	65.0	16.7	20.3
48	P2135	16.4 l	16.0	33.3	6.7	9.8
49	P2143	22.7 l	21.0	36.7	16.7	16.5
1001	MEAN	29.0	32.4	48.3	18.2	16.8
1002	MAXIMUM	47.5	75.0	66.7	50.0	30.0
1003	MINIMUM	15.4	3.0	11.7	0.0	8.5
1004	NOBS	10.9	2.0	2.0	3.0	3.9
1005	MSE	350.9	85.9	0.0	293.0	24.0
1006	LSD	16.3	18.9	0.0	28.5	7.1

Table 9. Summary of index (IND, %) data from the 2021-2022 NUWWSN.

ENTRY	NAME	AVG	ILCHA	ILURB	KYLEX	MIELA	NELIN	NYITH	OHWO0	VABLA
1	TRUMAN	16.3 |	14.5	8.1	15.0	7.1	1.7	5.3	33.3	45.0
2	ERNIE	.	22.2	30.0	50.0	31.9	0.7	10.4		35.0
3	FREEDOM	30.9	34.8	42.8	45.0	19.4	1.0	13.0	61.1	30.0
4	PIONEER2545	40.0	47.4	55.5	60.0	29.2	0.7	11.9	70.0	45.0
5	OH18-65-54	12.5 |	7.0	5.7	15.0	10.8	0.3	5.3	31.1	25.0
6	OH17-193-77	27.9	22.1	29.5	35.0	29.8	1.3	17.2	62.9	25.0
7	OH17-206-71	21.2	19.1	18.0	55.0	15.3	2.7	13.6	26.2	20.0
8	OH17-206-73	29.7	21.1	51.0	50.0	17.4	2.7	7.1	63.6	25.0
9	MI20R0134	13.3 |	5.7	2.2	30.0	9.2	1.0	7.0	16.2	35.0
10	MI20R0003	24.5	5.3	9.6	50.0	17.5	0.3	8.2	35.3	70.0
11	MI20R0008	17.9 |	8.4	6.9	15.0	22.0	9.7	6.4	39.5	35.0
12	MI20R0135	.	4.6	5.1	30.0	15.0	20.7	5.3		60.0
13	MI20R0153	25.6	14.4	14.0	55.0	27.4	4.3	2.8	52.2	35.0
14	IL17-17739	12.6 |	10.3	4.2	35.0	16.4	0.3	3.6	21.1	10.0
15	US16-IL-064-160	13.1 |	5.3	5.1	25.0	15.8	5.0	4.4	19.5	25.0
16	IL17-31541	.	7.0	12.0	35.0	20.0	6.7	2.0		50.0
17	US16-IL-061-029	16.7 |	5.8	3.3	50.0	16.9	0.0	4.6	22.9	30.0
18	IL17-9320	13.5 |	5.2	0.5	20.0	13.2	2.3	3.9	32.9	30.0
19	KWS369	23.8	27.7	22.0	45.0	8.9	3.7	18.3	44.4	20.0
20	KWS382	34.8	25.2	31.9	65.0	15.9	9.3	11.9	64.4	55.0
21	KWS384	21.4	17.8	30.8	35.0	23.6	0.3	9.3	34.4	20.0
22	KWS400	24.1	15.5	18.8	40.0	25.7	1.3	14.9	56.7	20.0
23	KWS405	20.5	18.1	35.0	25.0	18.1	4.7	3.9	29.5	30.0
24	X11-0039-1-17-5	34.8	32.3	23.3	60.0	21.7	8.7	21.0	71.1	40.0
25	X11-0120-12-4-3	22.4	26.8	28.9	35.0	15.0	1.3	10.0	42.2	20.0
26	X12-3010-4-4-1	34.8	46.3	41.0	45.0	17.7	5.7	23.1	64.4	35.0
27	X12-3051-53-17-3	28.1	25.9	29.3	50.0	18.7	1.0	19.0	56.1	25.0
28	X11-0170-52-3-3	34.0	33.2	23.3	65.0	33.3	1.3	4.9	76.1	35.0
29	NE16562	45.4 h	35.6	58.9	80.0	31.1	5.0	7.2	65.3	80.0
30	NE17441	31.8	28.2	25.0	45.0	17.5	1.7	3.9	62.9	70.0
31	FHB BC2F2-1	19.2	20.9	3.6	25.0	8.6	1.7	19.5	44.4	30.0
32	FHB BC2F2-2	41.6	53.7	55.5	50.0	32.1	1.7	27.1	77.8	35.0
33	NE16424	52.7 h	81.6	71.2	50.0	40.1	1.7	25.1	82.2	70.0
34	NY12512-1-6-05	26.2	44.6	35.6	40.0	10.4	4.3	7.8	56.7	10.0
35	NY12302-2-14-08-1442	8.2 |	10.2	1.9	15.0	2.3	3.7	3.3	19.4	10.0
36	NY12302-2-14-01-1441	12.1 |	10.7	5.4	25.0	6.2	2.7	4.5	32.2	10.0
37	NYDD1543-06R-1652	13.6 |	6.5	0.2	30.0	11.1	3.0	4.6	43.6	10.0
38	NY12007-2-4-13-1381	22.9	35.5	23.5	35.0	6.0	8.0	8.4	36.7	30.0
39	17VDH-SRW01-077	36.0	35.4	48.7	55.0	25.0	3.3	22.0	63.3	35.0
40	VA19FHB-22	40.2	45.3	38.9	55.0	24.9	3.7	21.1	77.8	55.0
41	16VDH-FHB-MAS60-7-03	29.2	32.8	32.7	45.0	30.3	6.0	12.7	58.9	15.0
42	17VTK4-29	31.6	34.7	32.2	35.0	31.1	7.0	23.7	58.6	30.0
43	17VTK19-15	34.8	41.9	69.2	70.0	23.0	0.7	10.4	32.9	30.0
44	P2104	14.4 |	14.1	2.1	20.0	16.3	8.3	8.5	35.6	10.0
45	P2105	18.9 |	18.8	5.6	45.0	12.2	4.0	22.5	32.8	10.0
46	P2106	12.2 |	13.5	4.8	15.0	9.5	4.7	5.5	34.5	10.0
47	P2130	33.2	20.8	24.8	50.0	35.8	1.7	16.7	66.2	50.0
48	P2135	20.9	15.5	12.0	25.0	11.1	3.7	3.5	66.2	30.0
49	P2143	21.2	2.8	19.1	40.0	7.3	2.3	12.1	31.1	55.0
1001	MEAN	25.2	23.1	23.6	40.5	18.9	3.6	11.0	48.0	32.0
1002	MAXIMUM	52.7	81.6	71.2	80.0	40.1	20.7	27.1	82.2	80.0
1003	MINIMUM	8.2	2.8	0.2	15.0	2.3	0.0	2.0	16.2	10.0
1004	NOBS	17.9	1.0	2.0	2.0	2.0	3.0	3.9	2.1	2.0
1005	MSE	259.8	.	51.0	164.1	0.0	40.8	28.2	69.8	137.7
1006	LSD	10.9	.	14.5	26.1	0.0	10.6	7.7	16.5	23.9

Table 10. Summary of Fusarium Damaged Kernel (FDK, %) data from the 2021-2022 NUWWSN.

ENTRY	NAME	AVG	ILURB	KYLEX	OHWOO	VABLA
1	TRUMAN	16.3 l	22.5	5.7	10.0	27.0
2	ERNIE	24.8	22.5	8.2	25.0	43.5
3	FREEDOM	38.9 h	57.5	13.2	60.0	25.0
4	PIONEER2545	49.2 h	65.0	10.7	85.0	36.0
5	OH18-65-54	14.1 l	15.0	3.2	15.0	23.0
6	OH17-193-77	26.8	22.5	13.2	40.0	31.5
7	OH17-206-71	11.6 l	27.5	8.2	5.0	5.5
8	OH17-206-73	16.2 l	35.0	3.2	15.0	11.5
9	MI20R0134	9.1 l	5.0	3.2	10.0	18.0
10	MI20R0003	18.9 l	20.0	3.2	15.0	37.5
11	MI20R0008	6.8 l	12.5	3.2	5.0	6.5
12	MI20R0135	20.7 l	5.0	3.2	35.0	39.5
13	MI20R0153	21.6 l	20.0	3.2	25.0	38.0
14	IL17-17739	5.7 l	7.5	3.2	5.0	7.0
15	US16-IL-064-160	14.8 l	5.0	10.7	15.0	28.5
16	IL17-31541	11.6 l	12.5	3.2	10.0	20.5
17	US16-IL-061-029	9.3 l	7.5	3.2	5.0	21.5
18	IL17-9320	4.9 l	3.0	3.2	3.0	10.5
19	KWS369	32.3	42.5	25.7	40.0	21.0
20	KWS382	36.8	37.5	23.2	45.0	41.5
21	KWS384	14.9 l	25.0	3.2	3.0	28.5
22	KWS400	18.8 l	22.5	10.7	25.0	17.0
23	KWS405	16.3 l	35.0	5.7	5.0	19.5
24	X11-0039-1-17-5	30.3	32.5	15.7	50.0	23.0
25	X11-0120-12-4-3	28.2	52.5	3.2	35.0	22.0
26	X12-3010-4-4-1	34.4	47.5	10.7	45.0	34.5
27	X12-3051-53-17-3	34.4	37.5	15.7	55.0	29.5
28	X11-0170-52-3-3	28.7	35.0	5.7	65.0	9.0
29	NE16562	50.4 h	62.5	43.2	80.0	16.0
30	NE17441	28.8	32.5	25.7	40.0	17.0
31	FHB BC2F2-1	27.3	32.5	5.7	55.0	16.0
32	FHB BC2F2-2	51.3 h	57.5	15.7	90.0	42.0
33	NE16424	56.4 h	80.0	25.7	80.0	40.0
34	NY12512-1-6-05	27.6	47.5	3.2	35.0	24.5
35	NY12302-2-14-08-1442	31.6	45.0	15.7	40.0	25.5
36	NY12302-2-14-01-1441	46.8 h	82.5	10.7	75.0	19.0
37	NYDD1543-06R-1652	18.7 l	17.5	13.2	30.0	14.0
38	NY12007-2-4-13-1381	34.7	47.5	8.2	30.0	53.0
39	17VDH-SRW01-077	28.6	30.0	38.2	45.0	1.1
40	VA19FHB-22	34.4	47.5	10.7	50.0	29.5
41	16VDH-FHB-MAS60-7-03	22.6 l	22.5	13.2	45.0	9.5
42	17VTK4-29	19.7 l	25.0	10.7	30.0	13.0
43	17VTK19-15	31.8	40.0	23.2	45.0	19.0
44	P2104	24.1	17.5	20.7	35.0	23.0
45	P2105	21.4 l	22.5	15.7	20.0	27.5
46	P2106	17.3 l	20.0	10.7	25.0	13.5
47	P2130	28.3	22.5	23.2	30.0	37.5
48	P2135	23.7 l	30.0	18.2	35.0	11.5
49	P2143	42.4 h	22.5	58.2	40.0	49.0
1001	MEAN	25.8	30.0	12.4	33.2	23.4
1002	MAXI	56.4	82.5	58.2	90.0	53.0
1003	MINI	4.9	3.0	3.2	3.0	1.1

Table 11. Summary of INC/SEV/FDK (ISK, %) data from the 2021-2022 NUWWSN

ENTRY	NAME	AVG	ILURB	KYLEX	VABLA
1	TRUMAN	24.4 l	27.0	8.3	37.8
2	ERNIE	35.9	42.0	27.3	38.4
3	FREEDOM	38.0	62.8	23.3	28.0
4	PIONEER2545	51.1 h	71.8	40.3	41.4
5	OH18-65-54	17.3 l	20.6	7.3	24.2
6	OH17-193-77	34.0	45.0	29.3	27.6
7	OH17-206-71	27.0 l	39.5	27.3	14.2
8	OH17-206-73	36.4	58.3	31.3	19.6
9	MI20R0134	23.5 l	17.0	25.3	28.2
10	MI20R0003	37.3	35.6	19.3	57.0
11	MI20R0008	17.2 l	20.8	7.3	23.6
12	MI20R0135	29.8 l	18.4	19.3	51.8
13	MI20R0153	32.2 l	35.0	25.3	36.2
14	IL17-17739	19.6 l	18.6	31.3	8.8
15	US16-IL-064-160	18.3 l	18.4	10.3	26.4
16	IL17-31541	25.8 l	26.0	13.3	38.2
17	US16-IL-061-029	22.5 l	15.8	25.3	26.6
18	IL17-9320	16.3 l	7.4	19.3	22.2
19	KWS369	33.9 l	47.0	34.3	20.4
20	KWS382	48.1 h	49.5	45.3	49.6
21	KWS384	32.8 l	43.8	31.3	23.4
22	KWS400	26.2 l	37.5	22.3	18.8
23	KWS405	29.8 l	49.3	14.3	25.8
24	X11-0039-1-17-5	41.2	48.3	42.3	33.2
25	X11-0120-12-4-3	31.4 l	54.0	19.3	20.8
26	X12-3010-4-4-1	42.6 h	58.8	34.3	34.8
27	X12-3051-53-17-3	38.3	51.8	36.3	26.8
28	X11-0170-52-3-3	37.9	44.8	44.3	24.6
29	NE16562	61.7 h	71.5	59.3	54.4
30	NE17441	42.3	43.8	34.3	48.8
31	FHB BC2F2-1	25.4 l	25.6	26.3	24.4
32	FHB BC2F2-2	49.6 h	68.7	42.3	37.8
33	NE16424	58.4 h	83.0	34.3	58.0
34	NY12512-1-6-05	33.3 l	58.8	25.3	15.8
35	NY12302-2-14-08-1442	21.6 l	30.3	18.3	16.2
36	NY12302-2-14-01-1441	26.7 l	50.1	16.3	13.6
37	NYDD1543-06R-1652	14.8 l	9.4	23.3	11.6
38	NY12007-2-4-13-1381	38.0	47.5	27.3	39.2
39	17VDH-SRW01-077	43.0 h	56.3	51.3	21.6
40	VA19FHB-22	47.4 h	57.3	40.3	44.8
41	16VDH-FHB-MAS60-7-03	31.8 l	47.2	35.3	12.8
42	17VTK4-29	33.2 l	48.3	28.3	23.2
43	17VTK19-15	49.7 h	66.3	57.3	25.6
44	P2104	19.0 l	15.6	26.3	15.2
45	P2105	26.4 l	25.8	36.3	17.0
46	P2106	16.5 l	21.8	16.3	11.4
47	P2130	42.3	42.7	39.3	45.0
48	P2135	25.1 l	39.3	13.3	22.6
49	P2143	45.1 h	41.5	41.3	52.6
1001	MEAN	33.1	39.7	28.3	29.0
1002	MAXI	61.7	83.0	59.3	58.0
1003	MINI	14.8	7.4	7.3	8.8
1005	MSE	222.9	60.1	.	77.7
1006	LSD	19.2	15.8	.	17.9

Table 12. Summary of deoxynivalenol (DON, ppm) data from the 2021-2022 NUWWSN.

ENTRY	NAME	AVG	ILURB	KYLEX	OHWO0	VABLA
1	TRUMAN	6.2 |	4.3	1.8	14.7	4.0
2	ERNIE	7.1 |	10.2	2.1	13.7	2.5
3	FREEDOM	15.6	16.0	2.8	38.7	4.9
4	PIONEER2545	22.8 h	30.9	4.0	49.5	7.0
5	OH18-65-54	2.4 |	1.5	0.8	6.4	0.9
6	OH17-193-77	7.9 |	6.7	1.4	19.0	4.7
7	OH17-206-71	5.6 |	9.8	1.6	9.6	1.4
8	OH17-206-73	7.0 |	12.8	2.0	11.2	2.0
9	MI20R0134	2.0 |	1.4	1.4	4.0	1.1
10	MI20R0003	5.2 |	4.7	1.8	12.4	2.0
11	MI20R0008	3.1 |	5.2	1.2	5.2	0.6
12	MI20R0135	3.8 |	2.3	1.4	9.2	2.4
13	MI20R0153	5.7 |	7.0	1.8	11.6	2.6
14	IL17-17739	3.8 |	3.3	1.7	9.3	0.7
15	US16-IL-064-160	3.1 |	2.4	1.6	4.5	4.1
16	IL17-31541	2.0 |	1.9	0.9	4.3	0.8
17	US16-IL-061-029	1.6 |	1.9	0.7	3.0	0.7
18	IL17-9320	1.2 |	0.8	0.8	2.7	0.7
19	KWS369	9.3 |	12.0	3.1	19.4	2.7
20	KWS382	11.6	16.9	3.0	22.0	4.4
21	KWS384	7.1 |	9.0	2.1	14.9	2.5
22	KWS400	10.4	12.5	2.5	20.7	5.7
23	KWS405	5.7 |	7.7	1.8	11.7	1.5
24	X11-0039-1-17-5	14.4	14.9	4.9	34.2	3.5
25	X11-0120-12-4-3	10.6	14.1	1.6	23.5	3.3
26	X12-3010-4-4-1	13.2	15.4	2.6	31.3	3.4
27	X12-3051-53-17-3	9.4 |	12.7	3.3	16.5	5.1
28	X11-0170-52-3-3	11.8	8.5	2.7	32.9	3.3
29	NE16562	16.1	31.7	5.2	17.9	9.7
30	NE17441	6.3 |	9.0	1.9	10.4	4.1
31	FHB BC2F2-1	10.3	5.2	2.2	28.3	5.7
32	FHB BC2F2-2	27.1 h	34.7	4.8	55.0	13.9
33	NE16424	20.7 h	25.5	5.1	43.7	8.5
34	NY12512-1-6-05	26.6 h	32.1	3.8	60.1	10.5
35	NY12302-2-14-08-1442	9.0 |	7.1	1.7	21.4	5.7
36	NY12302-2-14-01-1441	15.0	8.3	2.9	43.8	4.9
37	NYDD1543-06R-1652	3.0 |	3.1	1.6	5.1	2.1
38	NY12007-2-4-13-1381	10.3	8.4	2.8	22.7	7.3
39	17VDH-SRW01-077	10.9	14.2	3.5	21.8	4.1
40	VA19FHB-22	15.7	20.0	2.0	34.8	5.9
41	16VDH-FHB-MAS60-7-03	8.6 |	13.8	2.0	14.8	3.7
42	17VTK4-29	12.0	22.5	2.0	20.3	3.1
43	17VTK19-15	14.0	21.7	1.7	25.9	6.8
44	P2104	8.6 |	4.4	2.2	22.2	5.5
45	P2105	10.5	5.5	4.5	23.8	8.3
46	P2106	6.7 |	4.2	2.5	15.8	4.4
47	P2130	6.1 |	10.0	1.3	11.4	1.5
48	P2135	8.9 |	6.6	1.8	25.4	1.7
49	P2143	11.2	14.1	2.6	23.4	4.5
1001	MEAN	9.5	10.7	2.3	19.6	3.9
1002	MAXI	27.1	34.7	5.2	60.1	13.9
1003	MINI	1.2	0.8	0.7	2.7	0.6
1005	MSE	51.9	15.2	.	.	2.7
1006	LSD	8.5	7.9	.	.	3.4

Table 13. Summary of heading date (HD, Julian days) and height (HGT, inches) data from the 2021-2022 NUWWSN

ENTRY	NAME	HEADING DATE (JULIAN DAYS)							HEIGHT (INCHES)		
		AVG	ILCHA	ILURB	KYLEX	MIELA	NYITH	OHWO0	AVG	ILCHA	KYLEX
1	TRUMAN	140	141	137	128	155	142	139	36	37	36
2	ERNIE	139	138	136	126	152	144	137	38 h	40	36
3	FREEDOM	141	140	139	128	156	145	139	37	38	36
4	PIONEER2545	140	138	138	131	153	144	137	36	38	34
5	OH18-65-54	138 l	135	136	125	153	143	136	34	36	31
6	OH17-193-77	140	138	137	129	153	145	138	33	33	33
7	OH17-206-71	139	137	137	126	155	144	137	29 l	30	29
8	OH17-206-73	139	138	137	126	155	144	137	30 l	30	29
9	MI20R0134	138	136	135	127	152	144	136	34	35	32
10	MI20R0003	138 l	137	135	126	152	143	137	33	34	32
11	MI20R0008	138 l	136	135	125	153	142	135	35	39	32
12	MI20R0135	139	137	137	128	154	143	137	32	34	31
13	MI20R0153	139	138	137	126	154	144	138	34	36	32
14	IL17-17739	139	138	136	128	152	142	138	36	38	34
15	US16-IL-064-160	140	137	136	128	155	145	136	36	38	33
16	IL17-31541	138 l	138	136	126	152	142	136	35	38	32
17	US16-IL-061-029	137 l	135	134	126	151	141	136	35	37	34
18	IL17-9320	137 l	136	135	125	151	143	136	36	38	34
19	KWS369	142	140	139	130	158	145	138	31 l	34	28
20	KWS382	140	138	137	129	155	144	138	32 l	32	31
21	KWS384	140	138	137	131	153	144	138	33	34	31
22	KWS400	140	138	137	129	154	145	137	33	35	31
23	KWS405	140	138	137	129	154	144	138	32 l	34	29
24	X11-0039-1-17-5	140	139	137	127	155	144	137	32	34	31
25	X11-0120-12-4-3	142	141	138	131	156	146	139	32 l	31	33
26	X12-3010-4-4-1	142	140	138	132	157	147	139	33	35	31
27	X12-3051-53-17-3	142	141	139	130	157	146	139	29 l	32	27
28	X11-0170-52-3-3	140	138	137	129	153	144	137	34	36	31
29	NE16562	139	137	135	126	154	143	137	33	37	30
30	NE17441	139	138	137	127	153	144	137	36	40	31
31	FHB BC2F2-1	143	142	140	132	158	146	140	40 h	43	38
32	FHB BC2F2-2	142	140	138	132	156	145	139	37	39	35
33	NE16424	139	138	136	125	154	145	137	34	36	32
34	NY12512-1-6-05	144	142	141	134	158	147	141	36	36	35
35	NY12302-2-14-08-1442	147 h	146	144	135	161	150	144	35	36	33
36	NY12302-2-14-01-1441	146 h	145	144	137	160	148	144	35	37	33
37	NYDD1543-06R-1652	139	136	136	126	154	144	136	31 l	35	27
38	NY12007-2-4-13-1381	143	142	139	133	159	147	141	34	36	32
39	17VDH-SRW01-077	138	136	135	126	153	144	137	33	36	30
40	VA19FHB-22	141	138	138	129	157	145	137	33	33	32
41	16VDH-FHB-MAS60-7-03	139	137	136	127	153	143	138	31 l	32	29
42	17VTK4-29	139	136	136	124	155	145	137	31 l	33	30
43	17VTK19-15	140	138	138	129	154	145	138	35	37	32
44	P2104	144	143	141	134	157	145	141	33	33	32
45	P2105	145	144	143	136	159	146	143	35	36	34
46	P2106	143	142	139	133	157	146	139	36	37	35
47	P2130	138 l	136	135	126	152	142	137	32	33	32
48	P2135	139	137	136	125	155	143	137	34	35	33
49	P2143	138 l	136	134	124	155	142	137	35	38	33
1001	MEAN	140	139	137	128	155	144	138	34	36	32
1002	MAXIMUM	147	146	144	137	161	150	144	40	43	38
1003	MINIMUM	137	135	134	124	151	141	135	29	30	27
1004	NOBS	14	1	2	2	2	3.9	3	3	1	2
1005	MSE	3	.	0.7	1.6	0	0	0.4	3	.	1.9
1006	LSD	1	.	1.7	2.6	0	0	1	2.9	.	2.8

Table 14. Summary of other traits collected on the 2021-2022 NUWWSN.

ENTRY	DESIGNATION	KWS ILCH		
		WINTER KILL	SEPTORIA TRITICI	LEAF RUST
1	TRUMAN	1.1	5.4	5.5
2	ERNIE	1.1	6.4	5.1
3	FREEDOM	1.1	5.9	6.7
4	PIONEER2545	1.1	7.3	6.4
5	OH18-65-54	1.1	4.3	4.1
6	OH17-193-77	0.8	5.2	1.8
7	OH17-206-71	1.4	4.2	0.9
8	OH17-206-73	1.4	4.2	1.0
9	MI20R0134	0.9	4.3	2.6
10	MI20R0003	1.5	6.3	5.2
11	MI20R0008	1.0	6.3	2.8
12	MI20R0135	1.0	3.8	5.9
13	MI20R0153	1.1	6.9	3.4
14	IL17-17739	1.1	4.4	5.0
15	US16-IL-064-160	1.1	6.4	2.0
16	IL17-31541	1.1	7.0	8.6
17	US16-IL-061-029	1.1	8.0	2.6
18	IL17-9320	1.1	6.6	5.1
19	KWS369	1.1	6.0	2.5
20	KWS382	1.1	5.6	3.8
21	KWS384	1.1	3.1	2.7
22	KWS400	1.1	6.7	4.0
23	KWS405	1.1	3.7	3.9
24	X11-0039-1-17-5	1.2	8.8	5.8
25	X11-0120-12-4-3	1.2	6.2	4.0
26	X12-3010-4-4-1	1.2	6.2	2.1
27	X12-3051-53-17-3	1.2	3.7	1.3
28	X11-0170-52-3-3	1.2	8.1	3.4
29	NE16562	1.1	3.1	1.9
30	NE17441	1.1	4.1	2.4
31	FHB BC2F2-1	1.1	3.6	1.3
32	FHB BC2F2-2	1.1	3.1	1.2
33	NE16424	1.1	4.0	4.0
34	NY12512-1-6-05	1.0	5.5	6.3
35	NY12302-2-14-08-1442	0.9	3.0	6.2
36	NY12302-2-14-01-1441	0.9	3.0	6.5
37	NYDD1543-06R-1652	0.7	3.6	0.9
38	NY12007-2-4-13-1381	2.1	3.5	5.0
39	17VDH-SRW01-077	0.6	4.4	1.0
40	VA19FHB-22	3.5	7.3	1.1
41	16VDH-FHB-MAS60-7-03	1.4	8.3	2.8
42	17VTK4-29	0.9	4.7	2.5
43	17VTK19-15	0.9	4.2	2.0
44	P2104	1.0	4.2	2.5
45	P2105	1.5	4.3	2.5
46	P2106	2.0	3.8	4.5
47	P2130	1.1	5.8	2.0
48	P2135	1.1	4.9	6.9
49	P2143	1.1	4.4	2.9

Table 15. Summary of incidence (INC, %) from 2021-2022 PNUWWSN.

ENTRY	NAME	AVG	ILURB	MIELA
1	TRUMAN	29.2 l	32.5	26.0
2	ERNIE	44.2	55.0	33.3
3	FREEDOM	55.8	70.0	41.7
4	PIONEER2545	75.8 h	95.0	56.7
5	OH18-78-33	57.5	75.0	40.0
6	OH18*76-27	16.1 l	15.0	17.2
7	OH18*105-13	23.9 l	37.5	10.3
8	OH18*104-99	30.4 l	37.5	23.3
9	OH16-184-77	27.9 l	27.5	28.3
10	MI20R0174	30.4 l	42.5	18.3
11	MI20R0049	42.5	50.0	35.0
12	MI20R0161	28.3 l	25.0	31.7
13	MI20R0076	48.3	70.0	26.7
14	MI20W0085	17.5 l	22.5	12.5
15	MI20W0125	43.8	47.5	40.0
16	US17-IL-111-005	18.3 l	15.0	21.7
17	18MSFRS-60	32.5	45.0	20.0
18	IL18-5270	16.7 l	10.0	23.3
19	US17-IL-109-046	25.8 l	15.0	36.7
20	US17-IL-108-070	34.6	27.5	41.7
21	KWS347	51.8	62.5	41.1
22	KWS386	32.9	27.5	38.3
23	KWS396	57.5	70.0	45.0
24	KWS397	37.9	27.5	48.3
25	KWS407	42.5	50.0	35.0
26	X12-3114-65-7-1	80.4 h	92.5	68.3
27	X12-3014-46-7-3	37.1	27.5	46.7
28	X12-3072-55-13-5	45.4	37.5	53.3
29	X12-3048-52-18-3	66.7 h	85.0	48.3
30	X11-0414-116-11-3	65.0	75.0	55.0
31	18VDH-FHB-MAS07-164-08	78.3 h	95.0	61.6
32	DH17SRW136-066	62.5	75.0	50.0
33	DH17SRW136-038	65.8	90.0	41.7
34	VA20FHB-20	47.1	62.5	31.7
35	18VDH-FHB-MAS07-173-03	50.8	70.0	31.7
36	17VTK6-17	69.2 h	80.0	58.3
37	21PU-0121	33.3	35.0	31.7
38	21PU-0192	63.7	87.5	40.0
39	21PU-0348	31.2	27.5	35.0
40	21PU-0597	39.2	40.0	38.3
41	21PU-0598	50.0	60.0	40.0
1001	MEAN	44.1	.	.
1002	MAXI	80.4	.	.
1003	MINI	16.1	.	.
1004	NOBS	15.7	2.0	2.0
1005	MSE	399.2	188.0	0.0
1006	LSD	14.4	27.9	0.0

Table 16. Summary of severity (SEV, %) data from the 2021-2022 PNUWWSN

ENTRY	NAME	AVG	ILURB	MIELA
1	TRUMAN	28.0	27.5	28.5
2	ERNIE	48.3	45.0	51.7
3	FREEDOM	41.7	40.0	43.3
4	PIONEER2545	65.8 h	75.0	56.7
5	OH18-78-33	34.3	12.0	56.7
6	OH18*76-27	16.6 l	7.5	25.7
7	OH18*105-13	10.0 l	7.0	13.0
8	OH18*104-99	29.7	9.5	50.0
9	OH16-184-77	26.4	9.5	43.3
10	MI20R0174	27.9	7.5	48.3
11	MI20R0049	28.8	16.0	41.7
12	MI20R0161	29.2	13.5	45.0
13	MI20R0076	38.7	27.5	50.0
14	MI20W0085	30.4	36.0	24.8
15	MI20W0125	33.0	16.0	50.0
16	US17-IL-111-005	29.2	5.0	53.3
17	18MSFRS-60	24.7	9.5	40.0
18	IL18-5270	35.2	12.0	58.3
19	US17-IL-109-046	30.7	3.0	58.3
20	US17-IL-108-070	34.2	20.0	48.3
21	KWS347	37.5	32.5	42.5
22	KWS386	26.0	7.0	45.0
23	KWS396	56.7 h	55.0	58.3
24	KWS397	26.0	7.0	45.0
25	KWS407	38.3	30.0	46.7
26	X12-3114-65-7-1	48.7	32.5	65.0
27	X12-3014-46-7-3	30.4	22.5	38.3
28	X12-3072-55-13-5	35.0	20.0	50.0
29	X12-3048-52-18-3	56.2 h	57.5	55.0
30	X11-0414-116-11-3	55.0 h	55.0	55.0
31	18VDH-FHB-MAS07-164-08	59.7 h	70.0	49.3
32	DH17SRW136-066	48.7	37.5	60.0
33	DH17SRW136-038	50.0	55.0	45.0
34	VA20FHB-20	39.6	37.5	41.7
35	18VDH-FHB-MAS07-173-03	30.0	20.0	40.0
36	17VTK6-17	57.1 h	57.5	56.7
37	21PU-0121	28.5	12.0	45.0
38	21PU-0192	33.7	22.5	45.0
39	21PU-0348	23.0 l	16.0	30.0
40	21PU-0597	45.8	45.0	46.7
41	21PU-0598	50.0	50.0	50.0
1001	MEAN	37.1	.	.
1002	MAXI	65.8	.	.
1003	MINI	10.0	.	.
1004	NOBS	15.7	2.0	2.0
1005	MSE	367.9	99.5	0.0
1006	LSD	13.8	20.3	0.0

Table 17. Summary of index (IND, %) data from the 2021-2022 PNUWWSN.

ENTRY	NAME	AVG	ILCHA	ILURB	KYLEX	MIELA	OHWOO	VABLK
1	TRUMAN	19.9 l	11.8	8.4	40.0	7.4	26.7	25.0
2	ERNIE	34.9	25.0	24.5	45.0	17.2	67.7	30.0
3	FREEDOM	31.6	35.8	28.0	35.0	18.1	47.8	25.0
4	PIONEER2545	50.9 h	46.8	71.3	55.0	32.1	60.0	40.0
5	OH18-78-33	26.6	23.0	9.0	35.0	22.7	40.0	30.0
6	OH18*76-27	13.9 l	9.9	1.3	25.0	4.4	28.0	15.0
7	OH18*105-13	11.1 l	6.4	2.6	25.0	1.3	21.3	10.0
8	OH18*104-99	21.0	10.9	3.9	45.0	11.7	34.7	20.0
9	OH16-184-77	15.0 l	7.3	2.9	25.0	12.3	27.8	15.0
10	MI20R0174	13.5 l	11.6	4.7	30.0	8.9	16.1	10.0
11	MI20R0049	24.5	16.4	6.6	30.0	14.6	44.7	35.0
12	MI20R0161	18.2 l	9.3	4.4	35.0	14.3	31.3	15.0
13	MI20R0076	.	15.1	19.0	40.0	13.3	10.0	.
14	MI20W0085	16.2 l	19.5	3.9	40.0	3.1	20.9	10.0
15	MI20W0125	20.1	16.4	7.9	25.0	20.0	31.1	20.0
16	US17-IL-111-005	11.6 l	5.8	0.9	20.0	11.6	21.1	10.0
17	18MSFRS-60	15.7 l	3.7	4.9	30.0	8.0	27.8	20.0
18	IL18-5270	15.1 l	4.7	1.2	30.0	13.6	26.1	15.0
19	US17-IL-109-046	16.7 l	4.2	0.5	30.0	21.4	24.2	20.0
20	US17-IL-108-070	15.6 l	8.8	5.5	25.0	20.1	24.2	10.0
21	KWS347	22.9	13.5	21.9	30.0	17.5	24.4	30.0
22	KWS386	14.6 l	3.3	1.9	15.0	17.3	40.0	10.0
23	KWS396	.	20.7	38.5	25.0	26.3	20.0	.
24	KWS397	19.2 l	0.1	1.9	40.0	21.8	36.2	15.0
25	KWS407	21.5	15.0	15.0	30.0	16.3	37.8	15.0
26	X12-3114-65-7-1	49.7 h	37.0	29.9	70.0	44.4	66.7	50.0
27	X12-3014-46-7-3	23.6	21.7	6.1	50.0	17.9	31.1	15.0
28	X12-3072-55-13-5	23.0	14.2	7.5	45.0	26.7	24.5	20.0
29	X12-3048-52-18-3	39.2	27.6	48.1	50.0	26.6	47.8	35.0
30	X11-0414-116-11-3	38.5	37.6	41.7	35.0	30.3	56.1	30.0
31	18VDH-FHB-MAS07-164-08	53.3 h	45.4	66.5	75.0	30.4	57.8	45.0
32	DH17SRW136-066	31.0	28.5	28.1	30.0	30.0	44.4	25.0
33	DH17SRW136-038	43.4	44.3	49.5	50.0	18.8	57.8	40.0
34	VA20FHB-20	28.8	12.9	25.6	50.0	13.2	36.1	35.0
35	18VDH-FHB-MAS07-173-03	23.2	14.2	14.0	35.0	12.7	43.3	20.0
36	17VTK6-17	42.4	43.0	46.0	45.0	33.1	62.2	25.0
37	21PU-0121	23.6	12.0	4.2	25.0	14.3	61.3	25.0
38	21PU-0192	33.0	16.0	19.4	45.0	18.0	69.5	30.0
39	21PU-0348	18.6 l	13.5	4.5	25.0	10.5	48.0	10.0
40	21PU-0597	22.8	36.5	18.0	10.0	17.9	44.7	10.0
41	21PU-0598	30.1	33.1	30.0	25.0	20.0	52.8	20.0
1001	MEAN	25.5	.	.	.	.	.	.
1002	MAXI	53.3	.	.	.	.	.	.
1003	MINI	11.1	.	.	.	.	.	.
1004	NOBS	14.3	1.0	2.0	2.0	2.0	1.9	2.0
1005	MSE	134.3	.	36.5	136.4	0.0	84.3	44.9
1006	LSD	8.8	.	12.3	23.9	0.0	18.9	13.7

Table 18. Summary of Fusarium Damaged Kernel (FDK, %) data from the 2021-2022 PNUWWSN.

ENTRY	NAME	AVG	ILURB	KYLEX	OHWOO	VABLK
1	TRUMAN	16.4 l	12.5	5.1	30	18
2	ERNIE	25 l	27.5	5.1	30	37.5
3	FREEDOM	37.2 h	60	5.1	60	23.5
4	PIONEER2545	45.9 h	75	15.1	70	23.5
5	OH18-78-33	25 l	30	5.1	45	20
6	OH18*76-27	20.4 l	15	5.1	40	21.5
7	OH18*105-13	11.8 l	20	7.6	10	9.5
8	OH18*104-99	11.4 l	22.5	5.1	5	13
9	OH16-184-77	23.3 l	27.5	5.1	30	30.5
10	MI20R0174	14.4 l	7.5	5.1	35	10
11	MI20R0049	21.9 l	30	7.6	40	10
12	MI20R0161	11.8 l	10	5.1	20	12
13	MI20R0076	26.7 l	25	5.1	30	46.5
14	MI20W0085	16.7 l	10	5.1	35	16.5
15	MI20W0125	17.5 l	20	5.1	5	40
16	US17-IL-111-005	8.3 l	5	5.1	3	20
17	18MSFRS-60	8.9 l	5	7.6	5	18
18	IL18-5270	8.8 l	5	5.1	5	20
19	US17-IL-109-046	10.8 l	10	5.1	10	18
20	US17-IL-108-070	8.9 l	15	5.1	5	10.5
21	KWS347	25.3 l	35	10.1	25	31
22	KWS386	16.3 l	25	5	25	10
23	KWS396	25.5 l	40	7.6	45	9.5
24	KWS397	17.5 l	27.5	7.6	10	25
25	KWS407	20.2 l	25	10.1	25	20.5
26	X12-3114-65-7-1	47.3 h	70	10.1	60	49
27	X12-3014-46-7-3	19.8 l	25	5	30	19
28	X12-3072-55-13-5	13.3 l	27.5	7.6	10	8
29	X12-3048-52-18-3	34.9 h	57.5	7.6	40	34.5
30	X11-0414-116-11-3	38.8 h	82.5	10.1	40	22.5
31	18VDH-FHB-MAS07-164-08	27.4	57.5	10.1	30	12
32	DH17SRW136-066	31.7 h	50	5.1	40	31.5
33	DH17SRW136-038	37.7 h	72.5	7.6	50	20.5
34	VA20FHB-20	20.9 l	45	7.6	20	11
35	18VDH-FHB-MAS07-173-03	20.2 l	27.5	5.1	40	8
36	17VTK6-17	23.3 l	30	5.1	35	23
37	21PU-0121	16.2 l	12.5	5.1	30	17
38	21PU-0192	23 l	35	7.6	25	24.5
39	21PU-0348	20.4 l	22.5	10.1	35	14
40	21PU-0597	29.4 h	75	5.1	20	17.5
41	21PU-0598	30.7 h	70	5.1	25	22.5
1001	MEAN	22.2	32.8	6.7	28.6	20.7
1002	MAXI	47.3	82.5	15.1	70	49
1003	MINI	8.3	5	5	3	8
1004	NOBS	6	2	1	1	2
1005	MSE	252.4	68.4	.	.	65.7
1006	LSD	18.6	16.8	.	.	16.5

Table 19. Summary of INC/SEV/FDK (ISK, %) data from the 2021-2022 PNUWWSN

ENTRY	NAME	AVG	ILURB	KYLEX	VABLK
1	TRUMAN	23.8 l	23.0	26.1	22.2
2	ERNIE	35.4	41.0	32.1	33.0
3	FREEDOM	35.8	57.0	26.1	24.4
4	PIONEER2545	52.2 h	81.0	42.1	33.4
5	OH18-78-33	28.1	38.1	20.1	26.0
6	OH18*76-27	14.8 l	12.8	14.1	17.6
7	OH18*105-13	15.4 l	21.4	15.1	9.8
8	OH18*104-99	20.1 l	23.1	20.1	17.2
9	OH16-184-77	19.1 l	22.1	14.1	21.2
10	MI20R0174	16.0 l	18.0	20.1	10.0
11	MI20R0049	30.0	31.8	33.1	25.0
12	MI20R0161	14.5 l	15.6	14.1	13.8
13	MI20R0076	30.0	39.3	26.1	24.6
14	MI20W0085	20.1 l	21.6	26.1	12.6
15	MI20W0125	23.0 l	27.1	14.1	28.0
16	US17-IL-111-005	10.0 l	8.0	8.1	14.0
17	18MSFRS-60	19.5 l	18.4	21.1	19.2
18	IL18-5270	13.2 l	8.6	14.1	17.0
19	US17-IL-109-046	16.2 l	9.4	20.1	19.2
20	US17-IL-108-070	16.8 l	20.3	20.1	10.2
21	KWS347	31.7	42.5	22.1	30.4
22	KWS386	12.8 l	20.4	8.0	10.0
23	KWS396	30.1	53.5	21.1	15.8
24	KWS397	22.5 l	21.4	27.1	19.0
25	KWS407	24.4 l	34.0	22.1	17.2
26	X12-3114-65-7-1	53.7 h	65.5	46.1	49.6
27	X12-3014-46-7-3	22.5 l	25.0	26.0	16.6
28	X12-3072-55-13-5	23.5 l	28.3	27.1	15.2
29	X12-3048-52-18-3	46.5 h	65.8	39.1	34.8
30	X11-0414-116-11-3	44.4 h	72.0	34.1	27.0
31	18VDH-FHB-MAS07-164-08	54.1 h	72.5	58.1	31.8
32	DH17SRW136-066	33.8	53.8	20.1	27.6
33	DH17SRW136-038	47.9 h	72.5	39.1	32.2
34	VA20FHB-20	35.5	48.0	33.1	25.4
35	18VDH-FHB-MAS07-173-03	24.4 l	38.0	20.1	15.2
36	17VTK6-17	38.5 h	53.3	38.1	24.2
37	21PU-0121	18.3 l	19.1	14.1	21.8
38	21PU-0192	32.0	47.0	21.1	27.8
39	21PU-0348	16.6 l	22.1	16.1	11.6
40	21PU-0597	23.5 l	55.5	2.1	13.0
41	21PU-0598	32.0	61.0	14.1	21.0
1001	MEAN	27.4	36.8	23.8	21.6
1002	MAXI	54.1	81.0	58.1	49.6
1003	MINI	10.0	8.0	2.1	9.8
1004	NOBS	5.0	2.0	1.0	2.0
1005	MSE	164.3	49.2	.	27.6
1006	LSD	16.5	14.3	.	10.7

Table 20. Summary of deoxynivalenol (DON, ppm) data from the 2021-2022 PNUWWSN.

ENTRY	NAME	AVG	ILURB	KYLEX	OHWOO	VABLK
1	TRUMAN	4.9 l	3.5	1.4	12.4	2.1
2	ERNIE	8.2 l	8.0	0.7	21.3	2.7
3	FREEDOM	13.7 h	13.7	1.1	37.0	3.2
4	PIONEER2545	19.6 h	33.0	6.3	32.4	6.5
5	OH18-78-33	8.5 l	8.7	1.4	19.4	4.6
6	OH18*76-27	2.4 l	2.0	0.1	6.8	0.7
7	OH18*105-13	2.4 l	2.7	0.2	6.4	0.3
8	OH18*104-99	3.6 l	4.1	3.3	5.4	1.5
9	OH16-184-77	3.7 l	2.2	0.9	11.3	0.3
10	MI20R0174	3.7 l	2.8	0.5	10.8	0.9
11	MI20R0049	5.5 l	6.4	1.6	12.1	1.8
12	MI20R0161	2.3 l	2.4	1.0	5.1	0.8
13	MI20R0076	5.8 l	8.7	0.9	12.3	1.5
14	MI20W0085	10.2	7.7	3.6	25.0	4.6
15	MI20W0125	6.2 l	5.3	2.0	15.1	2.4
16	US17-IL-111-005	2.0 l	1.6	1.5	4.5	0.3
17	18MSFRS-60	2.4 l	2.4	1.2	5.3	0.5
18	IL18-5270	1.8 l	1.2	0.3	5.0	0.7
19	US17-IL-109-046	2.5 l	1.4	0.5	7.1	0.8
20	US17-IL-108-070	2.6 l	4.3	1.2	4.3	0.4
21	KWS347	7.0 l	9.6	2.0	13.5	3.0
22	KWS386	6.5 l	5.6	1.0	17.7	1.6
23	KWS396	7.1 l	14.0	0.6	12.2	1.4
24	KWS397	5.9 l	5.8	1.4	14.6	1.8
25	KWS407	8.4 l	8.0	2.8	20.7	2.0
26	X12-3114-65-7-1	14.2 h	19.8	2.9	29.9	4.1
27	X12-3014-46-7-3	5.6 l	4.6	2.1	13.7	1.9
28	X12-3072-55-13-5	5.1 l	6.5	1.8	10.2	2.0
29	X12-3048-52-18-3	11.6	24.2	1.9	17.3	2.9
30	X11-0414-116-11-3	13.6 h	29.1	1.6	19.8	3.9
31	18VDH-FHB-MAS07-164-08	11.9	25.1	2.3	16.6	3.5
32	DH17SRW136-066	7.4 l	9.6	1.3	16.6	2.2
33	DH17SRW136-038	17.6 h	36.0	2.2	26.9	5.2
34	VA20FHB-20	7.2 l	12.1	3.2	11.3	2.1
35	18VDH-FHB-MAS07-173-03	12.6 h	12.2	1.3	33.2	3.8
36	17VTK6-17	10.7	18.4	0.6	20.7	2.9
37	21PU-0121	2.3 l	2.2	0.6	5.8	0.6
38	21PU-0192	11.1	10.8	2.2	29.4	2.2
39	21PU-0348	9.1	7.9	2.1	24.7	1.7
40	21PU-0597	7.3 l	12.2	1.1	13.6	2.2
41	21PU-0598	10.5	18.3	1.9	17.7	4.0
1001	MEAN	7.4	10.1	1.6	15.7	2.2
1002	MAXI	19.6	36.0	6.3	37.0	6.5
1003	MINI	1.8	1.2	0.1	4.3	0.3
1004	NOBS	6.0	2.0	1.0	1.0	2.0
1005	MSE	37.9	5.7	.	.	0.9
1006	LSD	7.2	4.9	.	.	1.9

Table 21. Summary of heading date (HD, Julian days) and height (HGT, inches) data from the 2021-2022 PNUWWN

ENTRY	NAME	HEADING DATE						HEIGHT		
		AVG	ILCHA	ILURB	KYLEX	MIELA	OHWO0	AVG	ILCHA	KYLEX
1	TRUMAN	140	141	138	129	155	138	37 h	38	36
2	ERNIE	138	138	136	126	152	138	36	38	34
3	FREEDOM	141	141	139	130	156	140	38 h	37	38
4	PIONEER2545	139	139	137	128	153	139	35	35	35
5	OH18-78-33	139	138	137	128	153	138	35	37	32
6	OH18*76-27	138	138	137	127	152	137	35	35	36
7	OH18*105-13	138	138	137	126	152	137	34	35	32
8	OH18*104-99	137 l	136	135	124	152	136	35	38	32
9	OH16-184-77	140	140	138	129	154	138	30 l	30	30
10	MI20R0174	137 l	136	135	126	151	137	31	32	31
11	MI20R0049	137	137	136	124	154	136	33	33	33
12	MI20R0161	136 l	136	134	124	152	136	35	38	33
13	MI20R0076	138	137	136	129	152	137	33	35	32
14	MI20W0085	140	139	139	128	156	140	36 h	39	34
15	MI20W0125	140	140	138	130	155	139	34	34	34
16	US17-IL-111-005	136 l	136	134	124	151	137	33	35	31
17	18MSFRS-60	139	138	136	129	152	138	33	34	32
18	IL18-5270	137 l	136	135	127	151	137	33	36	30
19	US17-IL-109-046	138	137	135	127	152	137	34	36	31
20	US17-IL-108-070	138	137	136	128	152	137	34	37	31
21	KWS347	139	138	138	128	152	138	33	36	30
22	KWS386	141	140	139	129	156	140	31	33	30
23	KWS396	140	139	138	130	153	138	32	35	29
24	KWS397	139	139	138	128	153	138	33	35	31
25	KWS407	140	140	138	131	154	138	33	36	31
26	X12-3114-65-7-1	138	138	137	127	152	138	32	34	30
27	X12-3014-46-7-3	140	142	140	127	154	138	32	35	30
28	X12-3072-55-13-5	140	141	141	126	154	138	31	33	30
29	X12-3048-52-18-3	140	139	139	130	154	138	32	34	30
30	X11-0414-116-11-3	139	139	138	127	154	137	35	36	33
31	18VDH-FHB-MAS07-164-08	137 l	135	134	126	153	136	32	35	29
32	DH17SRW136-066	139	139	138	129	152	138	32	34	30
33	DH17SRW136-038	139	138	137	129	154	137	31 l	32	29
34	VA20FHB-20	138	137	137	128	152	138	35	38	32
35	18VDH-FHB-MAS07-173-03	139	137	137	129	155	138	34	36	32
36	17VTK6-17	139	139	137	129	154	138	31 l	32	30
37	21PU-0121	138	138	137	128	152	136	33	35	31
38	21PU-0192	139	138	137	129	152	137	34	36	33
39	21PU-0348	143 h	142	141	132	158	141	32	33	32
40	21PU-0597	140	141	139	128	155	140	36	37	35
41	21PU-0598	140	141	138	128	154	138	34	34	33
1001	MEAN	139	.	.	.	.	.	38	.	.
1002	MAXI	143	.	.	.	.	.	30	.	.
1003	MINI	136	.	.	.	.	.	12	1	2
1004	NOBS	16	1	2	2	2	3	3	.	2
1005	MSE	2	.	0	5	0	0	2	.	3
1006	LSD	1	.	1	5	0	1			

Table 22. Summary of other traits collected on the 2021-2022 PNUWWSN.

		KWS, ILCHA		
		SPRING FREEZE KILL	SEPTORIA 90-9)	LEAF RUST (0-9)
1	TRUMAN	1.3	4.2	4.0
2	ERNIE	1.4	5.2	3.7
3	FREEDOM	1.4	5.3	4.1
4	PIONEER2545	1.3	7.3	3.6
5	OH18-78-33	1.3	5.9	4.3
6	OH18*76-27	1.3	4.9	2.8
7	OH18*105-13	1.3	4.5	3.3
8	OH18*104-99	1.4	4.0	4.2
9	OH16-184-77	1.3	2.6	2.0
10	MI20R0174	1.3	2.2	2.7
11	MI20R0049	1.3	8.1	2.7
12	MI20R0161	1.2	6.0	2.5
13	MI20R0076	1.2	5.0	2.8
14	MI20W0085	1.7	7.4	5.7
15	MI20W0125	1.2	4.9	3.9
16	US17-IL-111-005	1.2	4.3	2.3
17	18MSFRS-60	1.2	6.3	2.7
18	IL18-5270	1.2	5.8	3.1
19	US17-IL-109-046	1.2	8.3	3.5
20	US17-IL-108-070	1.3	3.8	3.5
21	KWS347	1.2	6.3	4.1
22	KWS386	1.2	3.4	5.0
23	KWS396	1.1	6.5	2.6
24	KWS397	1.4	3.9	4.3
25	KWS407	1.2	4.0	2.1
26	X12-3114-65-7-1	1.0	8.0	4.4
27	X12-3014-46-7-3	1.7	3.6	2.5
28	X12-3072-55-13-5	1.4	3.7	2.5
29	X12-3048-52-18-3	1.7	5.6	3.5
30	X11-0414-116-11-3	1.4	6.5	4.5
31	18VDH-FHB-MAS07-164	1.1	7.5	1.9
32	DH17SRW136-066	1.2	6.5	3.8
33	DH17SRW136-038	1.3	8.4	4.3
34	VA20FHB-20	1.3	6.4	3.8
35	18VDH-FHB-MAS07-173	1.8	7.9	1.8
36	17VTK6-17	1.2	3.4	1.6
37	21PU-0121	1.2	6.9	5.2
38	21PU-0192	2.2	2.4	3.2
39	21PU-0348	1.2	4.4	3.7
40	21PU-0597	1.7	3.9	4.3
41	21PU-0598	1.3	4.0	2.5

