

Report on the 2023-2024 Northern Uniform Winter Wheat Scab Nurseries (NUWWSN and PNUWWSN)

C. Sneller^{1*}, P. Paul², and N Arguello Blanco¹

Dept. of Horticulture and Crop Science¹, Dept. Plant Pathology², The Ohio State University, Wooster, Ohio 44691,.

*Corresponding author: PH:(330)749-8942, E-mail: sneller.5@osu.edu

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).

MATERIAL AND METHODS:

The locations that reported data and the traits assessed are listed in Tables 1, 2 and 3. 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). 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. The reported F09 values were multiplied by 10 to provide an IND value. All data from this test and previous tests are available from Dr. Clay Sneller (sneller.5@osu.edu)

Table 1. Fusarium Head Blight and other traits assessed in 2023-2024 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 $F09 * 10$
FHB(0-9)	FHB Index rated on a 0-9 scale	0= no disease, 9=very severe disease: 0-9 scores were multiplied by 10 to create values that were used in the IND analysis
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
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 2023-2024 P+NUWWSN.

ENV CODE	LOCATION	NUWWSN	PNUWWSN	COOPERATORS	INSTITUTE	CODE
ILCHA	Champaign, IL	yes	yes	Jana Murche	KWS	KWS
ILURB	Urbana, IL	yes	yes	Jessica Rutkoski	University of Illinois	UIL
INWLA	West Lafayette, IN	yes	yes	Mohsen Mohammadi, Tracey 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	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. Data collected for the 2023-2024 P+NUWWSN. “Yes” indicates a location where data was collected and used in this report.

NUWWSN												
	FHB(0-9)	INC	SEV	IND	FDK	ISK	DON	HGT	HD	LR	BYDV	PM
ILCHA	YES			YES				YES	YES	YES		
ILURB		YES	YES	YES	YES	YES	YES		YES			
KYLEX	YES			YES			yes		YES			
MIMAS		YES	YES	YES								
NELIN		YES	YES	YES	YES	YES	YES					
NYITH		YES	YES	YES	YES	YES						
OHWOO				YES	YES	YES	YES		YES			
VABLA	YES				YES	YES	YES			YES	YES	YES
INWLA					YES			YES	YES			
PNUWWSN												
	FHB(0-9)	INC	SEV	IND	FDK	ISK	DON	HGT	HD	LR	BYDV	PM
ILCHA	YES			YES	?	?	?	YES	YES	YES		
ILURB		YES	YES	YES	YES	YES	yes		YES			
KYLEX	YES			YES			yes		YES			
MIMAS		YES	YES	YES								
OHWOO				YES					YES			
VABLA	YES				YES	YES	yes			YES	YES	YES
INWLA					YES			YES	YES			

Table 4. Entries in the 2023-2024 NUWWSN.

ENTRY	NAME	PEDIGREE
1	TRUMAN	
2	FREEDOM	
3	ERNIE	
4	PIONEER2545	
5	KWS534	P25R25 / SYVIPER // VA09MAS1-12-8-4
6	KWS543	KWS095 / P25R25 // VA12W-101
7	KWS553	P25R40 / AR06146E-1-4
8	NYX11-0357-24-13-5	KY02C-3005-25//VA06W-558/BRANSON
9	NY12508-1-7-15-1536	NY05158-840(Va97w-375ws x NY87048W-7388) x 94052-6090B
10	NY15158-01-01-10-1873	SE00-10303-35 x MSU F2016
11	NY16058-01-06-1900	05152-825(NY87048W-7388 x Pio25r37) x 0762A1-2-8 (Jensen/Pio25w41 x NY04010-2-8-130)
12	TOWPATH	Frankenmuth/6432-10//6120-15 (Geneva sib)/65305-2) /3/Pio25W33
13	MI20R0096	KY09C-1024-96-1-3/0762A1-2-8
14	MI22R015	Hilliard/MSU19000088
15	MI22R239	X08C-1077-11-18-3/0527A1-9-14-4-3-3
16	MI22R034	KWS095/MSU19000211
17	MI22R134	MI16R0898/KWS095
18	OH20-96-116	OH12-133-74/0762A1-2-8
19	OH19-167-5	P0762A1-2-8 /OH07-175-11
20	OH19*102-76	0762A1-2-8 /KY04C-1128-38-1-5
21	OH19-161-70	VA05W-151 /KY02C-1121-75
22	OH20-96-99	OH12-133-74/0762A1-2-8
23	IL2020-5376	12-14179/P0762A1-2-8
24	IL2020-9945	10-19464/11-36131//P0762A1-2-8
25	IL16LCSDH-04-T-2659-20	IL14-28468/IL07-20728
26	IL16LCSDH-09-T-2664-23	IL07-20728/IL14-11848
27	IL16LCSDH-10-T-2665-41	IL07-20743/IL14-28462
28	22PU-1401	9017C1-1-2-X-4//92823A1-2-1-5/9218B4-4-1/3/P107_M4_LINE_BYDV_TRANSLOCATION/4/PATTERSON
29	21PU-0090-R1	0762A1-2-8/1042A1-1-23
30	21PU-0090-R3	0762A1-2-8/1042A1-1-23
31	21PU-0289-R2	0566A1-3-1-52/1042A1-1-23
32	21PU-0291-R2	0566A1-3-1-52/1042A1-1-23
33	X14-1009-84-4-3	KY03C-1237-32//SYNGENTA W1104/KY04C-1128-4-13-3
34	X14-1049-27-10-1	KY03C-1237-05//KY03C-1237-11/SHIRLEY
35	X11-0039-1-17-5	Pembroke//VA04W-90/KY97C-0508-01-01A-1
36	X16-1082-62-2-5-12	PEMBROKE 16 // KY06C-1166-14-1-5/VA11W-108
37	X15-3011-6-7-1	KY06C-2021-22-20-1/OH07-263-3****
38	18VTK6-3	13VTK429-3 / 13VTK59-148
39	18VTK10-110	KWS122 / 13VTK429-3
40	VA21W-60	UX1327-4 / Hilliard // MDC07026-F2-19-13-4
41	18VTK18-112	P05247A1-7-3-29 / Liberty 5658 (DH12SRW056-058)
42	15VTK-1-101-BS112	L11550 (VA11W-106) / USG 3118"S" (VA12W-54)
43	NE18435	TX07A001505/NE05496
44	NI17410	TX06A001281/NI04420
45	NE21503	NE10589/KS11HW39-5
46	NE21448	NE09521/NE13483V//NE12561
47	NEB-148-42	NW13493/LCH13NEDH-5-72

Table 5. Entries in the 2023-2024 PNUWWSN.

ENTRY	NAME	PEDIGREE
1	TRUMAN	
2	FREEDOM	
3	ERNIE	
4	PIONEER2545	
5	KWS571	KWS140 / P26R41
6	KWS586	P25R25 / Hilliard
7	KWS588	KWS152 / Hilliard // P25R25
8	KWS593	11-2327-3-1 / P25R25
9	KWS603	KWS152 / LES15-5593 // P25R25
10	MI22R031	KWS095/MSU19000088
11	MI22R033	KWS095/MSU19000148
12	MI22R197	MI17R0485/LCS3204
13	MI22W024	Jupiter/0527A1-9-14-4-3-3
14	MI22R021	IL13-20616/OH12-195-22
15	MI22R143	MI16R0898/MI16R0592
16	OH20*44-72	OH09-207-68/OH10-316-20
17	OH20-17-3	0762A1-2-8/OH10-316-20
18	OH20-17-66	0762A1-2-8/OH10-316-20
19	OH20-8-108	0762A1-2-8/MO130442
20	OH20-98-32	0762A1-2-8/OH13-16-25
21	IL2021-15134	07-20728/14-28462
22	IL2021-16726	14-11830/14-28462
23	IL2021-27466	13-1910/12-8512
24	IL2021-28801	14-9542/16-27570
25	IL2021-37737	07-4415/IL12-26004//10-21934
26	22PU-1412	PATTERSON/INW9853
27	22PU-0108	04620/08334A1-31
28	22PU-3290	0537A1-3-12-1-6-7/104RA
29	22PU-1176	0537A1-3-12-1-6-7/104RA
30	21PU-0006-R1	0762A1-2-8/0570A1-8-5-1
31	X14-1128-23-12-5	KY03C-1002-02//KY03C-1237-32/KY04C-1195-10-2-1
32	X14-1035-67-7-1	KY03C-1237-32//GERMPLASM 11-3-10/KY03C-1237-32
33	X16-3013-1-12-5	VA11W-106/MDC07026-F2-19-13-1
34	X14-1107-95-18-5	KY03C-1237-12//SHIRLEY/KY03C-1237-32
35	X16-1002-4-11-1-14	KY06C-1178-16-10-3 // MDC07026-F2-19-13-3/KY0901008-2-17-1
36	18VTK10-5	KWS122 / 13VTK429-3
37	VA22FHB-90	MDC07026-F2-19-13-4 / Yorktown // VA14FHB-14
38	19VDH-FHB-MAS03-29	VA13W-174 / Pioneer W050216N2 // 13VTK59-55
39	DH19SRW07-309	Featherstone 31 / Liberty 5658
40	DH19SRW07-321	Featherstone 31 / Liberty 5658

Table 6. Summary of all FHB traits from the 2023-2024 NUWWSN: * indicate a mean that is not significantly different from the lowest mean in that column. “Fhb1” indicates resistance at QTL *Fhb1*.

ENTRY	NAME	INC	SIG	SEV	SIG	IND	SIG	FHB(0-9)	SIG	FDK	SIG	ISK	SIG	DON	SIG	FHB1
1	TRUMAN	35.1		16.4	*	15.6	*	2.2	*	18.5	*	23.9	*	8.4	*	non-Fhb1
2	FREEDOM	31.1		22.5		25.7	*	3.8	*	21.5	*	30.9		9.8	*	non-Fhb1
3	ERNIE	41.1		21.2		21.4	*	2.5	*	29.4		32.9		10.8	*	non-Fhb1
4	PIONEER2545	47.7		19.3	*	31.1		5.7		34.8		39.3		12.9		non-Fhb1
5	KWS534	41.9		13.7	*	20.3	*	3.7	*	15.0	*	25.0	*	4.8	*	Fhb1
6	KWS543	27.7	*	11.5	*	21.1	*	4.0	*	21.9	*	28.6		7.7	*	Fhb1_het
7	KWS553	49.2		11.9	*	22.7	*	4.3	*	22.5	*	32.7		7.7	*	non-Fhb1
8	NYX11-0357-24-13-5	29.9		12.4	*	19.5	*	3.3	*	17.8	*	25.6	*	6.8	*	Fhb1
9	NY12508-1-7-15-1536	40.3		15.3	*	23.7	*	3.8	*	14.2	*	30.9		6.3	*	Fhb1
10	NY15158-01-01-10-1873	49.6		20.2		32.3		6.5		15.5	*	31.8		8.6	*	non-Fhb1
11	NY16058-01-06-1900	35.7		13.7	*	23.0	*	3.7	*	23.2	*	32.4		6.6	*	Fhb1
12	TOWPATH	5.5	*	7.8	*	12.7	*	2.7	*	22.4	*	14.9	*	15.0		non-Fhb1
13	MI20R0096	44.6		12.4	*	24.0	*	4.0	*	27.3		33.9		11.7	*	Fhb1
14	MI22R015	40.1		10.4	*	19.6	*	3.2	*	13.3	*	26.9	*	3.5	*	Fhb1
15	MI22R239	44.0		13.8	*	17.6	*	2.7	*	12.1	*	23.8	*	3.4	*	Fhb1
16	MI22R034	53.2		19.0	*	25.5	*	3.5	*	19.8	*	36.0		5.3	*	Fhb1
17	MI22R134	49.7		16.1	*	24.1	*	4.0	*	26.7		35.1		7.9	*	Fhb1
18	OH20-96-116	55.8		29.7		34.4		5.7		25.6	*	40.9		6.6	*	non-Fhb1
19	OH19-167-5	38.1		14.0	*	20.4	*	2.8	*	11.2	*	27.8	*	5.8	*	Fhb1
20	OH19*102-76	28.0	*	10.4	*	15.7	*	2.0	*	20.1	*	25.2	*	7.9	*	Fhb1
21	OH19-161-70	46.9		23.2		31.3		4.8		22.5	*	33.8		8.1	*	non-Fhb1
22	OH20-96-99	43.5		10.1	*	17.4	*	2.5	*	15.4	*	26.6	*	4.4	*	Fhb1
23	IL2020-5376	65.2		20.2		32.2		4.7		21.4	*	41.0		6.1	*	non-Fhb1
24	IL2020-9945	42.5		11.8	*	22.1	*	3.3	*	13.0	*	29.9		3.7	*	Fhb1
25	IL16LCSDH-04-T-2659-20	34.0		11.8	*	23.1	*	4.0	*	15.7	*	30.5		3.0	*	non-Fhb1
26	IL16LCSDH-09-T-2664-23	41.5		11.8	*	21.7	*	3.5	*	13.0	*	27.1	*	2.9	*	non-Fhb1
27	IL16LCSDH-10-T-2665-41	52.6		14.5	*	20.2	*	2.8	*	18.5	*	30.9		4.0	*	non-Fhb1
28	22PU-1401	65.2		28.0		41.4		5.8		32.5		48.7		9.9	*	non-Fhb1
29	21PU-0090-R1	38.8		13.3	*	19.4	*	2.8	*	19.3	*	27.4	*	7.6	*	non-Fhb1
30	21PU-0090-R3	44.8		21.1		25.7	*	3.5	*	18.6	*	31.3		9.0	*	non-Fhb1
31	21PU-0289-R2	49.3		15.9	*	30.1		5.3		30.0		39.6		14.4		non-Fhb1
32	21PU-0291-R2	42.2		17.0	*	26.7	*	5.0		24.7	*	35.5		10.0	*	non-Fhb1
33	X14-1009-84-4-3	41.7		21.2		26.5	*	4.3	*	29.9		33.6		13.6		Fhb1
34	X14-1049-27-10-1	45.2		21.4		25.0	*	3.8	*	31.0		35.2		13.8		non-Fhb1
35	X11-0039-1-17-5	60.6		20.1		31.7		4.7		23.7	*	41.1		9.5	*	non-Fhb1
36	X16-1082-62-2-5-12	53.8		19.5	*	27.3	*	4.7		26.3		35.0		8.5	*	Fhb1_het
37	X15-3011-6-7-1	35.1		16.6	*	22.7	*	4.2	*	21.1	*	31.3		8.2	*	non-Fhb1
38	18VTK6-3	45.4		25.2		33.3		4.2	*	23.3	*	39.3		8.9	*	non-Fhb1
39	18VTK10-110	40.1		18.4	*	23.1	*	3.2	*	19.0	*	29.2		9.5	*	non-Fhb1
40	VA21W-60	45.7		18.3	*	21.8	*	3.3	*	16.0	*	29.3		8.2	*	Fhb1
41	18VTK18-112	43.6		25.3		27.6	*	3.8	*	22.9	*	33.1		13.4		non-Fhb1
42	15VTK-1-101-BS112	39.3		16.8	*	21.9	*	2.8	*	30.7		35.8		15.0		
43	NE18435	61.5		29.2		40.4		7.0		40.8		49.9		19.2		non-Fhb1
44	NI17410	28.3	*	11.3	*	21.1	*	4.3	*	15.7	*	25.8	*	7.1	*	non-Fhb1
45	NE21503	40.4		22.8		26.1	*	4.3	*	31.9		36.1		23.4		non-Fhb1
46	NE21448	50.0		25.6		36.1		6.2		39.9		44.7		20.9		non-Fhb1
47	NEB-148-42	50.1		15.9	*	31.1		6.2		28.8		38.0		16.2		non-Fhb1
	NUMBER LOCATIONS	4		4		8		3		6		5		5		

Table 7. Summary of all FHB traits from the 2023-2024 PNUWWSN: * indicate a mean that is not significantly different from the lowest mean in that column. “Fhb1” indicates resistance at QTL *Fhb1*

ENTRY	NAME	INC	SIG	SEV	SIG	IND	SIG	FHB(0-9)	SIG	FDK	SIG	ISK	SIG	DON	SIG	FHB1
1	TRUMAN	56.0		13.2	*	20.0	*	2.8	*	21.8	*	40.9	*	9.8	*	Fhb1_het
2	FREEDOM	61.2		25.5		40.4	*	5.0		30.2		55.0		19.2		non-Fhb1
3	ERNIE	67.9		13.5	*	31.4	*	4.7		28.8		52.5		11.9	*	non-Fhb1
4	PIONEER2545	60.5		37.7		50.8		6.2		41.0		59.3		14.0		non-Fhb1
5	KWS571	50.3		10.7	*	19.6	*	3.0	*	29.4		44.5	*	13.2		non-Fhb1
6	KWS586	62.1		21.6		43.3		5.5		34.1		54.8		16.4		non-Fhb1
7	KWS588	62.6		18.5		35.0	*	5.3		33.3		50.1	*	13.4		non-Fhb1
8	KWS593	58.2		16.5		29.5	*	4.0	*	28.6		49.4	*	13.7		non-Fhb1
9	KWS603	56.1		17.4		32.1	*	3.8	*	28.4		45.4	*	9.1	*	Fhb1_het
10	MI22R031	49.4		11.4	*	28.0	*	3.8	*	23.9	*	48.9	*	7.0	*	Fhb1
11	MI22R033	53.2		11.8	*	42.9		5.0		23.8	*	50.2	*	11.2	*	Fhb1
12	MI22R197	60.5		14.4	*	32.8	*	5.0		23.3	*	48.6	*	8.2	*	non-Fhb1
13	MI22W024	49.3		10.8	*	36.2	*	4.5	*	21.7	*	50.5	*	7.7	*	Fhb1_het
14	MI22R021	48.8		7.7	*	43.2		5.2		25.5	*	48.5	*	8.4	*	non-Fhb1
15	MI22R143	53.6		19.5		36.7	*	4.7		34.7		56.6		13.7		Fhb1
16	OH20*44-72	51.2		10.9	*	23.4	*	3.8	*	26.1	*	48.5	*	8.6	*	non-Fhb1
17	OH20-17-3	60.4		15.2	*	31.0	*	4.3	*	29.4		46.7	*	10.4	*	Fhb1
18	OH20-17-66	54.2		19.2		34.3	*	4.3	*	44.0		60.7		12.4		non-Fhb1
19	OH20-8-108	46.1		10.4	*	25.3	*	4.2	*	23.9	*	47.7	*	7.9	*	Fhb1
20	OH20-98-32	31.6	*	9.4	*	26.4	*	3.5	*	23.6	*	39.6	*	10.9	*	Fhb1
21	IL2021-15134	54.3		9.8	*	40.4	*	5.0		24.4	*	50.4	*	6.7	*	non-Fhb1
22	IL2021-16726	44.0	*	6.9	*	33.1	*	3.5	*	15.2	*	44.1	*	3.4	*	Fhb1
23	IL2021-27466	52.6		11.0	*	38.6	*	4.8		26.2	*	48.2	*	11.7	*	non-Fhb1
24	IL2021-28801	64.3		27.4		52.0		6.7		29.0		57.2		7.4	*	non-Fhb1
25	IL2021-37737	49.6		6.0	*	38.9	*	4.3	*	25.8	*	49.1	*	4.3	*	Fhb1
26	22PU-1412	48.7		13.1	*	21.3	*	3.7	*	23.1	*	45.4	*	15.0		Fhb1_het
27	22PU-0108	58.4		11.0	*	33.8	*	4.7		26.4	*	49.1	*	10.3	*	non-Fhb1
28	22PU-3290	52.2		9.9	*	27.9	*	4.2	*	29.5		49.2	*	12.4		Fhb1
29	22PU-1176	52.6		11.4	*	23.8	*	3.2	*	22.7	*	43.4	*	10.6	*	non-Fhb1
30	21PU-0006-R1	49.2		10.4	*	33.0	*	4.3	*	19.8	*	44.7	*	9.6	*	non-Fhb1
31	X14-1128-23-12-5	53.2		14.0	*	31.4	*	4.5	*	23.9	*	51.0	*	9.7	*	Fhb1
32	X14-1035-67-7-1	53.9		15.6	*	28.0	*	4.3	*	28.7		53.5		8.6	*	Fhb1_het
33	X16-3013-1-12-5	57.2		21.8		32.2	*	4.8		23.6	*	47.0	*	10.7	*	Fhb1
34	X14-1107-95-18-5	56.9		22.0		30.7	*	4.7		34.6		55.7		12.4		Fhb1
35	X16-1002-4-11-1-14	61.9		24.3		37.2	*	4.0	*	29.6		51.7	*	6.7	*	Fhb1
36	18VTK10-5	50.8		25.9		30.1	*	3.7	*	31.4		48.0	*	16.8		non-Fhb1
37	VA22FHB-90	46.0		10.2	*	17.9	*	2.5	*	27.8		42.6	*	6.0	*	Fhb1
38	19VDH-FHB-MAS03-29	57.3		25.1		27.3	*	3.5	*	22.4	*	47.3	*	6.9	*	Fhb1
39	DH19SRW07-309	45.6		17.0		42.8		5.3		44.2		53.9		21.2		non-Fhb1
40	DH19SRW07-321	55.7		16.5		42.6		5.3		38.4		51.1	*	17.6		non-Fhb1
	NUMBER LOCATIONS	2		2		6		3		3		2		3		

Table 8. Summary of incidence (INC, %) from 2023-2024 NUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	MIMAS	NELIN	NYITH
1	TRUMAN	35.1		86.8	6.7	3.3	42.5
2	FREEDOM	31.1		101.3	16.0	16.7	26.3
3	ERNIE	41.1		100.7	23.3	10.0	43.8
4	PIONEER2545	47.7		100.1	20.0	0.0	58.8
5	KWS534	41.9		101.1	13.3	0.0	50.0
6	KWS543	27.7	*	98.1	15.0	6.7	23.8
7	KWS553	49.2		97.0	13.3	0.0	63.8
8	NYX11-0357-24-13-5	29.9		98.8	11.7	0.0	30.0
9	NY12508-1-7-15-1536	40.3		99.7	6.7	16.7	45.0
10	NY15158-01-01-10-1873	49.6		98.5	10.0	10.0	62.5
11	NY16058-01-06-1900	35.7		99.1	11.7	10.0	37.5
12	TOWPATH	5.5	*	14.7	6.7	3.3	8.8
13	MI20R0096	44.6		98.5	11.7	13.3	52.5
14	MI22R015	40.1		98.5	5.0	3.3	48.8
15	MI22R239	44.0		92.6	11.7	10.0	53.8
16	MI22R034	53.2		100.0	13.3	30.0	62.5
17	MI22R134	49.7		100.9	10.0	13.3	61.3
18	OH20-96-116	55.8		93.5	18.3	30.0	67.5
19	OH19-167-5	38.1		87.8	6.7	13.3	45.0
20	OH19*102-76	28.0	*	100.8	5.0	11.2	25.0
21	OH19-161-70	46.9		99.0	23.3	6.7	55.0
22	OH20-96-99	43.5		95.8	10.0	20.0	50.0
23	IL2020-5376	65.2		100.5	5.0	36.7	83.8
24	IL2020-9945	42.5		91.5	5.0	6.7	53.8
25	IL16LCSDH-04-T-2659-20	34.0		88.7	5.0	20.0	36.3
26	IL16LCSDH-09-T-2664-23	41.5		96.2	6.7	23.3	46.3
27	IL16LCSDH-10-T-2665-41	52.6		97.8	6.7	20.0	66.3
28	22PU-1401	65.2		99.4	20.0	23.3	83.8
29	21PU-0090-R1	38.8		100.9	10.0	26.7	38.8
30	21PU-0090-R3	44.8		101.3	8.3	20.0	51.3
31	21PU-0289-R2	49.3		100.8	13.3	16.7	58.8
32	21PU-0291-R2	42.2		100.1	13.3	13.3	47.5
33	X14-1009-84-4-3	41.7		99.6	5.0	3.3	51.3
34	X14-1049-27-10-1	45.2		102.2	18.3	16.7	50.0
35	X11-0039-1-17-5	60.6		100.4	25.0	50.0	67.5
36	X16-1082-62-2-5-12	53.8		101.0	18.3	13.3	66.3
37	X15-3011-6-7-1	35.1		99.9	5.0	16.7	36.3
38	18VTK6-3	45.4		100.4	21.7	6.7	52.5
39	18VTK10-110	40.1		100.2	6.7	10.0	46.3
40	VA21W-60	45.7		97.8	10.0	43.3	47.5
41	18VTK18-112	43.6		99.7	15.0	16.7	48.8
42	15VTK-1-101-BS112	39.3		84.3	5.0	26.7	45.0
43	NE18435	61.5		100.2	28.3	13.3	77.5
44	NI17410	28.3	*	87.3	8.3	3.3	30.0
45	NE21503	40.4		93.5	13.3	6.7	47.5
46	NE21448	50.0		99.4	23.3	23.3	56.3
47	NEB-148-42	50.1		100.2	11.7	10.0	62.5
	AVERAGE	43.3		95.9	12.3	14.8	50.3
	MINIMUM	5.5		14.7	5.0	0.0	8.8
	MAXIMUM	65.2		102.2	28.3	50.0	83.8

Table 9. Summary of severity (SEV, %) data from the 2023-2024 NUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	MIMAS	NELIN	NYITH
1	TRUMAN	16.4	*	18.0	25.0	13.3	10.5
2	FREEDOM	22.5		44.5	38.3	3.3	13.8
3	ERNIE	21.2		31.6	35.0	9.0	14.0
4	PIONEER2545	19.3	*	41.5	22.0	0.0	13.8
5	KWS534	13.7	*	19.7	26.7	0.0	8.3
6	KWS543	11.5	*	15.9	13.3	5.0	7.5
7	KWS553	11.9	*	15.2	18.3	0.0	8.3
8	NYX11-0357-24-13-5	12.4	*	18.4	16.7	0.0	8.8
9	NY12508-1-7-15-1536	15.3	*	17.7	6.7	25.0	10.3
10	NY15158-01-01-10-1873	20.2		25.2	29.3	11.0	14.8
11	NY16058-01-06-1900	13.7	*	19.2	13.3	7.7	9.8
12	TOWPATH	7.8	*	6.5	10.0	3.3	4.5
13	MI20R0096	12.4	*	22.5	5.0	6.7	9.0
14	MI22R015	10.4	*	13.2	6.7	3.3	8.3
15	MI22R239	13.8	*	8.6	8.3	15.0	12.0
16	MI22R034	19.0	*	15.4	13.3	31.0	14.3
17	MI22R134	16.1	*	20.0	16.7	22.3	9.3
18	OH20-96-116	29.7		25.3	21.7	30.0	28.5
19	OH19-167-5	14.0	*	7.9	5.0	26.7	10.5
20	OH19*102-76	10.4	*	17.5	6.7	6.0	6.5
21	OH19-161-70	23.2		40.0	30.0	15.0	15.3
22	OH20-96-99	10.1	*	11.0	8.3	6.7	7.0
23	IL2020-5376	20.2		15.5	5.0	25.3	19.8
24	IL2020-9945	11.8	*	10.5	6.7	11.7	9.3
25	IL16LCSDH-04-T-2659-20	11.8	*	6.1	10.0	20.0	7.5
26	IL16LCSDH-09-T-2664-23	11.8	*	19.1	13.3	6.7	6.8
27	IL16LCSDH-10-T-2665-41	14.5	*	9.6	13.3	12.7	12.3
28	22PU-1401	28.0		60.6	11.7	31.3	19.0
29	21PU-0090-R1	13.3	*	18.8	11.7	9.0	9.3
30	21PU-0090-R3	21.1		29.8	10.0	30.0	15.3
31	21PU-0289-R2	15.9	*	34.0	13.3	12.7	8.8
32	21PU-0291-R2	17.0	*	29.9	16.7	16.7	9.8
33	X14-1009-84-4-3	21.2		43.7	20.0	20.0	12.0
34	X14-1049-27-10-1	21.4		31.6	28.3	8.0	16.3
35	X11-0039-1-17-5	20.1		38.6	18.3	21.0	11.5
36	X16-1082-62-2-5-12	19.5	*	25.3	30.0	16.7	12.0
37	X15-3011-6-7-1	16.6	*	24.7	25.0	16.0	8.5
38	18VTK6-3	25.2		48.3	26.7	6.7	19.5
39	18VTK10-110	18.4	*	36.3	13.3	13.3	12.3
40	VA21W-60	18.3	*	20.7	26.7	17.0	11.8
41	18VTK18-112	25.3		42.8	30.0	27.7	15.0
42	15VTK-1-101-BS112	16.8	*	34.7	5.0	13.0	12.0
43	NE18435	29.2		38.6	53.3	36.7	14.8
44	NI17410	11.3	*	12.5	20.0	3.3	6.8
45	NE21503	22.8		44.3	20.0	6.7	18.0
46	NE21448	25.6		67.8	31.7	13.3	12.5
47	NEB-148-42	15.9	*	25.2	18.3	8.3	10.8
	AVERAGE	17.4		26.0	18.2	13.7	11.8
	MINIMUM	7.8		6.1	5.0	0.0	4.5
	MAXIMUM	29.7		67.8	53.3	36.7	28.5

Table 10. Summary of index (IND, %) data from the 2023-2024 NUWWSN.

ENTRY	NAME	ALL	SIG	ILCHA	ILURB	KYLEX	MIMAS	NELIN	NYITH	OHWOO	VABLA
1	TRUMAN	15.6	*	20.0	15.6	25.0	1.8	1.3	4.7	13.8	20.0
2	FREEDOM	25.7	*	55.0	45.1	20.0	6.4	1.7	3.6	44.8	40.0
3	ERNIE	21.4	*		31.8	15.0	8.9	2.7	6.4	24.6	30.0
4	PIONEER2545	31.1		80.0	41.5	35.0	7.0	0.0	8.3	35.4	55.0
5	KWS534	20.3	*	40.0	19.9	30.0	3.6	0.0	4.1	17.5	40.0
6	KWS543	21.1	*	25.0	15.6	40.0	1.8	1.0	1.8	31.2	55.0
7	KWS553	22.7	*	30.0	14.7	35.0	2.0	0.0	5.4	26.0	65.0
8	NYX11-0357-24-13-5	19.5	*	15.0	18.2	55.0	2.0	0.0	3.1	27.0	30.0
9	NY12508-1-7-15-1536	23.7	*	40.0	17.6	20.0	0.4	5.3	4.7	48.6	55.0
10	NY15158-01-01-10-1873	32.3		80.0	24.8	55.0	2.9	2.9	9.9	35.0	60.0
11	NY16058-01-06-1900	23.0	*	40.0	19.0	20.0	1.3	2.3	4.0	49.4	50.0
12	TOWPATH	12.7	*	10.0	1.0	55.0	0.8	0.3	0.5	0.0	15.0
13	MI20R0096	24.0	*	35.0	22.2	40.0	0.6	1.3	4.8	45.7	45.0
14	MI22R015	19.6	*	20.0	13.0	30.0	0.3	0.3	4.1	35.6	45.0
15	MI22R239	17.6	*	25.0	8.0	20.0	1.4	2.3	6.8	19.5	35.0
16	MI22R034	25.5	*	45.0	15.4	15.0	2.1	14.3	10.4	47.3	45.0
17	MI22R134	24.1	*	60.0	20.2	25.0	1.7	4.7	6.1	39.2	35.0
18	OH20-96-116	34.4		80.0	23.7	20.0	4.3	13.7	19.3	34.1	70.0
19	OH19-167-5	20.4	*	25.0	6.9	20.0	0.3	6.0	4.8	51.9	40.0
20	OH19*102-76	15.7	*	20.0	17.6	15.0	0.3	1.4	1.7	31.5	25.0
21	OH19-161-70	31.3		70.0	39.6	45.0	7.0	3.0	8.4	60.5	30.0
22	OH20-96-99	17.4	*	25.0	10.5	15.0	0.8	2.0	3.5	33.5	35.0
23	IL2020-5376	32.2		70.0	15.6	15.0	0.3	16.3	16.5	61.1	55.0
24	IL2020-9945	22.1	*	25.0	9.6	25.0	0.3	2.3	5.1	55.3	50.0
25	IL16LCSDH-04-T-2659-20	23.1	*	30.0	5.4	40.0	0.5	4.7	3.0	56.0	50.0
26	IL16LCSDH-09-T-2664-23	21.7	*	40.0	18.4	25.0	0.8	2.3	3.1	44.8	40.0
27	IL16LCSDH-10-T-2665-41	20.2	*	35.0	9.4	15.0	0.9	4.0	8.1	35.0	35.0
28	22PU-1401	41.4		90.0	60.2	30.0	3.3	13.7	16.2	83.3	55.0
29	21PU-0090-R1	19.4	*	40.0	19.0	25.0	1.2	3.3	3.6	35.6	20.0
30	21PU-0090-R3	25.7	*	45.0	30.2	30.0	0.9	8.7	9.3	45.5	30.0
31	21PU-0289-R2	30.1		50.0	34.3	50.0	1.9	3.0	5.4	55.3	60.0
32	21PU-0291-R2	26.7	*	35.0	29.9	50.0	1.9	2.3	5.5	31.9	65.0
33	X14-1009-84-4-3	26.5	*	45.0	43.5	35.0	1.0	2.0	6.9	32.0	50.0
34	X14-1049-27-10-1	25.0	*	55.0	32.3	25.0	5.2	4.0	8.2	29.9	35.0
35	X11-0039-1-17-5	31.7		50.0	38.8	45.0	4.0	16.7	8.0	61.8	45.0
36	X16-1082-62-2-5-12	27.3	*	60.0	25.6	45.0	5.7	4.3	8.1	37.2	35.0
37	X15-3011-6-7-1	22.7	*	60.0	24.7	25.0	1.3	5.3	3.8	23.1	40.0
38	18VTK6-3	33.3		30.0	48.5	50.0	5.3	1.3	10.4	89.2	45.0
39	18VTK10-110	23.1	*	25.0	36.4	45.0	0.8	2.3	5.8	41.6	25.0
40	VA21W-60	21.8	*	30.0	20.2	35.0	2.7	11.0	5.3	29.9	35.0
41	18VTK18-112	27.6	*	50.0	42.7	50.0	5.3	6.3	7.8	48.0	15.0
42	15VTK-1-101-BS112	21.9	*	30.0	29.3	30.0	0.3	6.3	6.1	40.1	25.0
43	NE18435	40.4		80.0	38.7	50.0	15.3	10.3	11.8	68.0	80.0
44	NI17410	21.1	*	45.0	10.9	30.0	1.9	0.3	2.1	25.0	55.0
45	NE21503	26.1	*	60.0	41.4	25.0	2.6	0.7	8.4	24.1	45.0
46	NE21448	36.1		90.0	67.4	50.0	7.5	4.3	7.4	47.6	45.0
47	NEB-148-42	31.1		70.0	25.3	55.0	1.9	1.3	7.1	45.5	60.0
	AVERAGE	25.1		45.2	25.5	33.0	2.8	4.3	6.6	40.4	42.9
	MINIMUM	12.7		10.0	1.0	15.0	0.3	0.0	0.5	0.0	15.0
	MAXIMUM	41.4		90.0	67.4	55.0	15.3	16.7	19.3	89.2	80.0

Table 11. Summary of Fusarium Damaged Kernel (FDK, %) data from the 2023-2024 NUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	INWLA	NELIN	NYITH	OHWO0	VABLA
1	TRUMAN	18.5	*	57.9	5.8	7.0	7.5	30.0	5.0
2	FREEDOM	21.5	*	70.9	9.9	3.0	12.5	25.0	7.5
3	ERNIE	29.4		53.4	10.0		17.5	82.5	7.5
4	PIONEER2545	34.8		69.1	31.8	1.0	25.0	57.5	25.0
5	KWS534	15.0	*	56.6	6.1	1.0	7.5	7.5	10.0
6	KWS543	21.9	*	56.5	10.4	0.0	7.5	40.0	22.5
7	KWS553	22.5	*	69.6	9.0	0.0	15.0	30.0	10.0
8	NYX11-0357-24-13-5	17.8	*	59.6	8.4	0.0	15.0	15.0	2.5
9	NY12508-1-7-15-1536	14.2	*	40.0	7.7	0.0	15.0	5.0	7.5
10	NY15158-01-01-10-1873	15.5	*	36.2	7.5	1.0	17.5	15.0	5.0
11	NY16058-01-06-1900	23.2	*	63.9	8.2	1.0	15.0	42.5	7.5
12	TOWPATH	22.4	*	43.8	5.2	1.0	7.5	35.0	47.5
13	MI20R0096	27.3		62.2	13.7	1.0	22.5	42.5	17.5
14	MI22R015	13.3	*	47.5	6.5	1.0	10.0	4.0	5.0
15	MI22R239	12.1	*	51.9	3.0	0.0	6.0	1.5	7.5
16	MI22R034	19.8	*	67.0	7.3	3.0	7.5	32.5	5.0
17	MI22R134	26.7		70.9	17.3	2.0	15.0	50.0	7.5
18	OH20-96-116	25.6	*	55.2	16.3	1.0	30.0	25.0	12.5
19	OH19-167-5	11.2	*	31.1	5.8	0.0	5.0	15.0	7.5
20	OH19*102-76	20.1	*	64.4	11.0	1.0	5.0	40.0	5.0
21	OH19-161-70	22.5	*	78.5	18.9	1.0	10.0	22.5	7.5
22	OH20-96-99	15.4	*	54.5	6.6	0.0	7.5	15.0	7.5
23	IL2020-5376	21.4	*	66.0	5.4	2.0	15.0	25.0	12.5
24	IL2020-9945	13.0	*	47.6	6.9	0.0	7.5	7.5	5.0
25	IL16LCSDH-04-T-2659-20	15.7	*	43.7	3.4	1.0	17.5	12.5	5.0
26	IL16LCSDH-09-T-2664-23	13.0	*	49.9	8.1	1.0	7.5	3.0	5.0
27	IL16LCSDH-10-T-2665-41	18.5	*	53.2	8.9	1.0	15.0	22.5	5.0
28	22PU-1401	32.5		79.1	23.1	1.0	30.0	42.5	12.5
29	21PU-0090-R1	19.3	*	53.9	16.1	1.0	7.5	32.5	7.5
30	21PU-0090-R3	18.6	*	60.2	13.6	2.0	7.5	25.0	5.0
31	21PU-0289-R2	30.0		69.7	16.7	2.0	17.5	60.0	17.5
32	21PU-0291-R2	24.7	*	68.7	22.3	0.0	10.0	45.0	7.5
33	X14-1009-84-4-3	29.9		76.2	30.2	1.0	12.5	55.0	12.5
34	X14-1049-27-10-1	31.0		78.1	27.5	2.0	15.0	57.5	12.5
35	X11-0039-1-17-5	23.7	*	62.9	11.9	2.0	10.0	45.0	15.0
36	X16-1082-62-2-5-12	26.3		57.5	17.3	0.0	17.5	50.0	15.0
37	X15-3011-6-7-1	21.1	*	64.4	6.6	0.0	15.0	30.0	7.5
38	18VTK6-3	23.3	*	69.6	15.6	1.0	7.5	35.0	17.5
39	18VTK10-110	19.0	*	54.5	9.6	0.0	10.0	32.5	7.5
40	VA21W-60	16.0	*	57.3	9.8	1.0	7.5	17.5	2.5
41	18VTK18-112	22.9	*	76.8	15.8	1.0	17.5	15.0	7.5
42	15VTK-1-101-BS112	30.7		90.6	10.0	3.0	15.0	55.0	17.5
43	NE18435	40.8		77.6		0.0	22.5	77.5	45.0
44	NI17410	15.7	*	44.1		0.0	10.0	25.0	5.0
45	NE21503	31.9		79.4	17.7	2.0	15.0	57.5	27.5
46	NE21448	39.9		86.7	40.3	6.0	22.5	67.5	25.0
47	NEB-148-42	28.8		67.4		1.0	15.0	50.0	20.0

Table 12. Summary of INC/SEV/FDK (ISK, %) data from the 2023-2024 NUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	NELIN	NYITH	OHWO0	VABLA
1	TRUMAN	23.9	*	54.6	8.0	19.5	20.3	14.0
2	FREEDOM	30.9		72.1	7.0	17.6	36.9	27.0
3	ERNIE	32.9		61.1		25.4	47.8	21.0
4	PIONEER2545	39.3		70.1	0.0	35.4	44.3	43.0
5	KWS534	25.0	*	58.9	0.0	21.0	13.5	28.0
6	KWS543	28.6		56.8	4.0	13.4	34.7	42.0
7	KWS553	32.7		61.5	0.0	28.2	27.6	43.0
8	NYX11-0357-24-13-5	25.6	*	59.0	0.0	23.0	22.2	19.0
9	NY12508-1-7-15-1536	30.9		51.2	13.0	23.4	31.1	36.0
10	NY15158-01-01-10-1873	31.8		51.6	7.0	30.0	27.0	38.0
11	NY16058-01-06-1900	32.4		61.1	6.0	20.0	46.7	33.0
12	TOWPATH	14.9	*	23.9	2.0	7.1	14.0	28.0
13	MI20R0096	33.9		61.2	6.0	25.1	44.4	34.0
14	MI22R015	26.9	*	52.5	2.0	23.8	23.0	29.0
15	MI22R239	23.8	*	51.1	8.0	20.0	12.3	24.0
16	MI22R034	36.0		61.4	20.0	28.5	41.4	29.0
17	MI22R134	35.1		64.6	11.0	30.2	43.5	24.0
18	OH20-96-116	40.9		57.7	18.0	42.3	30.5	47.0
19	OH19-167-5	27.8	*	41.2	12.0	21.1	37.1	27.0
20	OH19*102-76	25.2	*	61.3	6.0	12.2	34.9	17.0
21	OH19-161-70	33.8		73.1	7.0	24.6	45.3	21.0
22	OH20-96-99	26.6	*	53.8	8.0	20.3	26.1	24.0
23	IL2020-5376	41.0		61.2	19.0	36.8	46.6	38.0
24	IL2020-9945	29.9		49.6	6.0	24.0	36.2	32.0
25	IL16LCSDH-04-T-2659-20	30.5		45.9	12.0	23.7	38.6	32.0
26	IL16LCSDH-09-T-2664-23	27.1	*	54.6	9.0	18.6	28.1	26.0
27	IL16LCSDH-10-T-2665-41	30.9		53.5	10.0	30.8	30.0	23.0
28	22PU-1401	48.7		79.6	17.0	41.7	67.0	38.0
29	21PU-0090-R1	27.4	*	57.5	11.0	19.5	34.3	15.0
30	21PU-0090-R3	31.3		63.4	16.0	21.8	37.3	20.0
31	21PU-0289-R2	39.6		68.3	10.0	25.9	57.2	43.0
32	21PU-0291-R2	35.5		66.5	9.0	25.5	37.1	42.0
33	X14-1009-84-4-3	33.6		73.5	7.0	18.7	41.2	35.0
34	X14-1049-27-10-1	35.2		71.4	8.0	28.8	40.9	26.0
35	X11-0039-1-17-5	41.1		66.9	22.0	31.0	55.1	33.0
36	X16-1082-62-2-5-12	35.0		60.9	9.0	31.6	42.3	27.0
37	X15-3011-6-7-1	31.3		63.1	10.0	27.3	25.9	27.0
38	18VTK6-3	39.3		72.5	4.0	25.2	67.5	34.0
39	18VTK10-110	29.2		62.8	7.0	21.1	37.9	18.0
40	VA21W-60	29.3		58.5	18.0	22.5	24.9	22.0
41	18VTK18-112	33.1		73.5	14.0	28.5	34.8	12.0
42	15VTK-1-101-BS112	35.8		71.9	13.0	27.3	46.1	22.0
43	NE18435	49.9		72.7	15.0	33.3	71.8	66.0
44	NI17410	25.8	*	47.6	2.0	19.0	25.0	35.0
45	NE21503	36.1		73.1	5.0	27.8	37.5	38.0
46	NE21448	44.7		84.8	13.0	35.3	55.5	37.0
47	NEB-148-42	38.0		64.6	6.0	28.2	47.3	44.0

Table 13. Summary of deoxynivalenol (DON, ppm) data from the 2023-2024 NUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	KYLEX	NELIN	OHWOO	VABLA
1	TRUMAN	8.4	*	29.9	5.8	1.2	3.3	2.1
2	FREEDOM	9.8	*	32.1	8.8	0.7	3.0	4.5
3	ERNIE	10.8	*	25.1	6.5		16.8	3.1
4	PIONEER2545	12.9		41.9	10.4	0.5	5.9	5.7
5	KWS534	4.8	*	15.5	3.8	1.4	0.8	2.3
6	KWS543	7.7	*	18.4	12.2	0.2	2.8	5.1
7	KWS553	7.7	*	22.5	8.8	0.6	2.7	3.8
8	NYX11-0357-24-13-5	6.8	*	19.7	9.6	0.3	2.1	2.5
9	NY12508-1-7-15-1536	6.3	*	17.8	5.4	1.2	3.4	3.7
10	NY15158-01-01-10-1873	8.6	*	22.5	11.1	0.5	4.3	4.4
11	NY16058-01-06-1900	6.6	*	21.3	7.0	0.3	3.0	1.3
12	TOWPATH	15.0		13.2	39.9	0.5	7.7	13.8
13	MI20R0096	11.7	*	35.7	12.0	0.8	6.0	4.2
14	MI22R015	3.5	*	12.1	2.3	0.7	0.4	2.1
15	MI22R239	3.4	*	13.7	1.3	1.2	0.3	0.8
16	MI22R034	5.3	*	16.3	4.7	2.0	1.7	1.9
17	MI22R134	7.9	*	27.9	5.1	1.7	2.4	2.7
18	OH20-96-116	6.6	*	23.9	4.4	0.5	1.9	2.2
19	OH19-167-5	5.8	*	20.6	3.1	0.2	2.4	2.6
20	OH19*102-76	7.9	*	30.5	4.2		3.1	2.2
21	OH19-161-70	8.1	*	27.7	5.2	0.7	4.6	2.4
22	OH20-96-99	4.4	*	14.7	3.8	1.1	1.1	1.5
23	IL2020-5376	6.1	*	23.7	3.0	0.5	1.3	2.3
24	IL2020-9945	3.7	*	12.9	2.3	1.0	0.9	1.3
25	IL16LCSDH-04-T-2659-20	3.0	*	11.4	2.3	0.1	0.5	0.9
26	IL16LCSDH-09-T-2664-23	2.9	*	9.6	1.9	0.4	1.1	1.4
27	IL16LCSDH-10-T-2665-41	4.0	*	14.7	1.9	0.5	1.9	0.9
28	22PU-1401	9.9	*	29.1	9.7	2.0	4.2	4.4
29	21PU-0090-R1	7.6	*	28.5	2.8	0.8	3.7	2.0
30	21PU-0090-R3	9.0	*	33.2	6.1	0.5	2.6	2.5
31	21PU-0289-R2	14.4		42.6	11.9		5.2	6.2
32	21PU-0291-R2	10.0	*	36.2	7.4	0.3	3.0	3.3
33	X14-1009-84-4-3	13.6		46.1	10.0	0.6	4.8	6.5
34	X14-1049-27-10-1	13.8		42.2	12.3	1.1	6.9	6.4
35	X11-0039-1-17-5	9.5	*	27.1	9.1	1.6	5.4	4.1
36	X16-1082-62-2-5-12	8.5	*	25.6	8.8	0.3	3.2	4.5
37	X15-3011-6-7-1	8.2	*	22.2	11.2	0.5	3.2	3.9
38	18VTK6-3	8.9	*	27.4	3.2	0.4	3.9	9.6
39	18VTK10-110	9.5	*	29.8	7.9	0.1	5.5	4.5
40	VA21W-60	8.2	*	26.7	8.4	0.5	2.4	3.0
41	18VTK18-112	13.4		40.4	12.5	1.1	5.4	7.5
42	15VTK-1-101-BS112	15.0		43.2	14.1	0.9	12.0	4.8
43	NE18435	19.2		43.1	18.0	0.9	15.1	18.9
44	NI17410	7.1	*	22.1	5.6	0.5	2.6	4.9
45	NE21503	23.4		62.4	26.8	1.4	12.9	13.3
46	NE21448	20.9		63.2	13.9	2.1	14.9	10.7
47	NEB-148-42	16.2		36.5	17.5	1.1	15.3	10.6

Table 14. Summary of heading date (HD, Julian days) and height data from the 2023-2024 NUWWSN.

ENTRY	NAME	HEADING DATE							HEIGHT			
		ALL	SIG	ILCHA	ILURB	KYLEX	NYITH	OHWO0	ALL	SIG	ILCHA	INWLA
1	TRUMAN	129.0		133.5	126.9	119.5	142.0	126.3	38.8		36.5	41.0
2	FREEDOM	129.1		129.5	127.1	120.0	143.0	125.7	38.5		38.0	39.0
3	ERNIE	129.5			126.4	116.5	143.0	132.7	38.1			37.7
4	PIONEER2545	126.9		128.0	125.8	118.5	140.0	124.7	37.0		37.0	37.0
5	KWS534	127.8		127.0	126.9	118.0	142.0	124.0	35.2		37.0	33.3
6	KWS543	129.8		129.5	127.7	121.0	144.0	126.0	34.0		36.0	32.0
7	KWS553	127.3		127.5	126.3	118.0	141.0	124.7	33.7		35.0	32.3
8	NYX11-0357-24-13-5	130.6		131.5	128.6	123.5	144.0	127.3	32.5		33.0	32.0
9	NY12508-1-7-15-1536	128.4		129.0	127.9	119.5	142.0	125.0	33.0		34.0	32.0
10	NY15158-01-01-10-1873	127.8		127.0	124.4	117.0	143.0	123.7	33.6		34.5	32.7
11	NY16058-01-06-1900	129.2		128.0	127.0	119.5	144.0	125.3	32.5		34.0	31.0
12	TOWPATH	135.9		142.0	130.0	131.0	147.0	138.0	35.8		36.5	35.0
13	MI20R0096	129.1		129.0	126.0	118.0	144.0	126.0	33.4		34.5	32.3
14	MI22R015	127.0		126.0	123.5	117.5	142.0	122.7	36.0		37.0	35.0
15	MI22R239	124.8	*	125.0	122.9	114.0	139.0	122.7	33.4		33.5	33.3
16	MI22R034	126.4		127.0	122.9	116.5	141.0	122.7	36.9		38.0	35.7
17	MI22R134	127.3		128.0	125.0	119.5	141.0	124.0	36.3		36.5	36.0
18	OH20-96-116	128.2		128.0	124.3	116.0	144.0	123.3	33.2		33.0	33.3
19	OH19-167-5	128.0		128.0	123.7	117.0	143.0	125.0	33.9		34.0	33.7
20	OH19*102-76	127.4		131.0	125.7	115.5	141.0	124.7	35.6		34.5	36.7
21	OH19-161-70	130.0		131.0	128.7	120.0	144.0	126.3	32.5		32.0	33.0
22	OH20-96-99	126.7		127.5	124.5	116.0	141.0	123.3	33.3		32.5	34.0
23	IL2020-5376	124.2	*	124.0	121.7	116.0	138.0	122.0	34.1		34.5	33.7
24	IL2020-9945	126.5		127.0	124.0	116.5	141.0	122.3	31.4		32.0	30.7
25	IL16LCSDH-04-T-2659-20	127.4		126.5	124.3	119.0	142.0	123.0	34.7		35.0	34.3
26	IL16LCSDH-09-T-2664-23	126.6		127.0	126.8	117.0	140.0	124.0	34.5		34.0	35.0
27	IL16LCSDH-10-T-2665-41	125.5	*	125.0	122.8	118.0	139.0	123.7	32.0		32.0	32.0
28	22PU-1401	126.1	*	126.5	123.7	117.0	140.0	123.7	32.0		32.0	32.0
29	21PU-0090-R1	130.5		130.5	127.0	121.0	145.0	127.0	33.1		32.5	33.7
30	21PU-0090-R3	130.6		130.5	128.1	121.5	145.0	126.3	32.3		32.5	32.0
31	21PU-0289-R2	128.0		127.0	127.0	118.0	142.0	125.7	33.2		34.0	32.3
32	21PU-0291-R2	126.9		126.5	124.4	115.0	142.0	123.3	32.3		32.5	32.0
33	X14-1009-84-4-3	129.1		130.0	127.1	120.0	143.0	125.7	32.8		34.5	31.0
34	X14-1049-27-10-1	129.4		130.0	128.0	121.0	143.0	126.3	33.6		34.5	32.7
35	X11-0039-1-17-5	127.7		127.5	125.3	118.0	142.0	124.3	32.4		32.5	32.3
36	X16-1082-62-2-5-12	130.1		129.5	128.0	122.0	144.0	127.0	34.1		35.5	32.7
37	X15-3011-6-7-1	128.7		129.0	125.1	119.5	143.0	125.7	35.8		35.5	36.0
38	18VTK6-3	129.4		131.5	127.0	121.0	143.0	125.7	30.5		31.0	30.0
39	18VTK10-110	130.1		129.5	128.5	122.5	144.0	126.3	30.2		31.0	29.3
40	VA21W-60	129.3		130.5	127.8	121.5	143.0	124.7	26.4	*	26.0	26.7
41	18VTK18-112	130.0		133.5	127.5	119.5	144.0	125.0	28.4	*	27.5	29.3
42	15VTK-1-101-BS112	131.3		134.5	129.6	122.0	145.0	126.0	27.2	*	27.0	27.3
43	NE18435	128.7		129.0	126.9	122.5	142.0	125.0	34.0		36.0	32.0
44	NI17410	126.7		126.5	125.1	116.0	141.0	123.7	36.7		38.0	35.3
45	NE21503	128.2		132.5	126.7	121.5	140.0	126.7	38.5		39.0	38.0
46	NE21448	129.3		131.5	128.1	121.5	142.0	127.3	38.9		40.0	37.7
47	NEB-148-42	128.1		129.5	124.2	118.5	142.0	126.3	35.5		37.0	34.0
	AVERAGE	128.4		129.1	126.1	119.1	142.3	125.3				
	MINIMUM	124.2		124.0	121.7	114.0	138.0	122.0				
	MAXIMUM	135.9		142.0	130.0	131.0	147.0	138.0				

Table 15. Summary of other traits collected on the 2023-2024 NUWWSN. PM=Powdery Mildew, LR=Leaf Rust, BYDV=Barley Yellow Dwarf Virus.

		ILCHA	AVG	ILCHA	VABLA	VABLA	VABLA
		HGT	LR(0-9)	LR(0-9)	LR(0-9)	BYDV(0-9)	PM(0-9)
1	TRUMAN	36.5	7.8	7.5	8.0	1.0	1.0
2	FREEDOM	38.0	8.3	8.0	8.5	2.0	1.5
3	ERNIE		6.0		6.0	1.0	1.0
4	PIONEER2545	37.0	6.0	5.0	7.0	1.0	2.0
5	KWS534	37.0	8.5	8.0	9.0	1.0	3.0
6	KWS543	36.0	6.8	8.5	5.0	1.0	2.0
7	KWS553	35.0	7.8	8.0	7.5	1.0	1.0
8	NYX11-0357-24-13-5	33.0	1.5	2.0	1.0	1.0	4.0
9	NY12508-1-7-15-1536	34.0	8.3	7.5	9.0	1.0	1.0
10	NY15158-01-01-10-1873	34.5	6.0	4.5	7.5	1.0	7.0
11	NY16058-01-06-1900	34.0	7.5	7.5	7.5	1.0	2.0
12	TOWPATH	36.5	7.8	8.0	7.5	1.0	1.0
13	MI20R0096	34.5	8.5	8.0	9.0	1.0	1.0
14	MI22R015	37.0	6.3	7.0	5.5	1.0	2.5
15	MI22R239	33.5	8.5	8.5	8.5	1.0	1.0
16	MI22R034	38.0	8.0	7.0	9.0	1.0	1.0
17	MI22R134	36.5	8.5	8.0	9.0	1.0	2.0
18	OH20-96-116	33.0	3.3	3.5	3.0	1.0	2.0
19	OH19-167-5	34.0	6.5	6.0	7.0	1.0	1.0
20	OH19*102-76	34.5	6.5	7.5	5.5	1.5	1.5
21	OH19-161-70	32.0	6.5	7.5	5.5	1.5	1.0
22	OH20-96-99	32.5	7.0	7.5	6.5	1.0	1.0
23	IL2020-5376	34.5	5.8	5.5	6.0	1.0	3.5
24	IL2020-9945	32.0	5.5	6.5	4.5	1.0	1.0
25	IL16LCSDH-04-T-2659-20	35.0	4.8	4.5	5.0	1.0	1.0
26	IL16LCSDH-09-T-2664-23	34.0	1.5	2.0	1.0	1.0	3.0
27	IL16LCSDH-10-T-2665-41	32.0	6.8	6.0	7.5	1.0	1.0
28	22PU-1401	32.0	4.0	5.5	2.5	1.0	2.5
29	21PU-0090-R1	32.5	1.8	2.5	1.0	1.0	2.5
30	21PU-0090-R3	32.5	2.8	3.5	2.0	1.0	2.0
31	21PU-0289-R2	34.0	8.0	8.0	8.0	1.0	1.5
32	21PU-0291-R2	32.5	8.5	8.0	9.0	1.0	1.0
33	X14-1009-84-4-3	34.5	7.5	8.0	7.0	1.0	1.0
34	X14-1049-27-10-1	34.5	7.0	6.5	7.5	1.5	1.0
35	X11-0039-1-17-5	32.5	7.0	8.0	6.0	1.0	1.0
36	X16-1082-62-2-5-12	35.5	8.0	8.0	8.0	1.0	1.0
37	X15-3011-6-7-1	35.5	7.5	8.0	7.0	1.0	1.0
38	18VTK6-3	31.0	1.8	2.0	1.5	1.0	1.5
39	18VTK10-110	31.0	1.8	2.5	1.0	1.0	1.0
40	VA21W-60	26.0	2.3	3.5	1.0	3.5	1.0
41	18VTK18-112	27.5	3.5	4.5	2.5	1.0	1.0
42	15VTK-1-101-BS112	27.0	5.5	4.5	6.5	1.0	1.5
43	NE18435	36.0	4.8	4.0	5.5	1.0	3.0
44	NI17410	38.0	6.0	6.5	5.5	1.0	4.5
45	NE21503	39.0	3.3	3.5	3.0	1.0	3.0
46	NE21448	40.0	5.5	4.5	6.5	1.0	3.5
47	NEB-148-42	37.0	2.3	3.0	1.5	1.0	4.5
	AVERAGE	34.2	5.8	6.0	5.7	1.1	1.9
	MINIMUM	26.0	1.5	2.0	1.0	1.0	1.0
	MAXIMUM	40.0	8.5	8.5	9.0	3.5	7.0

Table 16. Summary of incidence (INC, %) from 2023-2024 PNUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	MIMAS
1	TRUMAN	56.0		92.1	20.0
2	FREEDOM	61.2		99.1	23.3
3	ERNIE	67.9		100.8	35.0
4	PIONEER2545	60.5		99.7	
5	KWS571	50.3		95.6	5.0
6	KWS586	62.1		97.5	26.7
7	KWS588	62.6		100.2	25.0
8	KWS593	58.2		96.5	20.0
9	KWS603	56.1		97.3	15.0
10	MI22R031	49.4		93.8	5.0
11	MI22R033	53.2		99.8	6.7
12	MI22R197	60.5		96.1	25.0
13	MI22W024	49.3		90.3	8.3
14	MI22R021	48.8		92.6	5.0
15	MI22R143	53.6		90.5	16.7
16	OH20*44-72	51.2		97.5	5.0
17	OH20-17-3	60.4		87.5	33.3
18	OH20-17-66	54.2		100.2	8.3
19	OH20-8-108	46.1		87.3	5.0
20	OH20-98-32	31.6	*	51.6	11.7
21	IL2021-15134	54.3		96.9	11.7
22	IL2021-16726	44.0	*	81.3	6.7
23	IL2021-27466	52.6		95.3	10.0
24	IL2021-28801	64.3		100.3	28.3
25	IL2021-37737	49.6		89.3	10.0
26	22PU-1412	48.7		89.1	8.3
27	22PU-0108	58.4		90.1	26.7
28	22PU-3290	52.2		89.4	15.0
29	22PU-1176	52.6		97.0	8.3
30	21PU-0006-R1	49.2		93.5	5.0
31	X14-1128-23-12-5	53.2		99.8	6.7
32	X14-1035-67-7-1	53.9		92.8	15.0
33	X16-3013-1-12-5	57.2		92.7	21.7
34	X14-1107-95-18-5	56.9		98.8	15.0
35	X16-1002-4-11-1-14	61.9		100.5	23.3
36	18VTK10-5	50.8		89.9	11.7
37	VA22FHB-90	46.0		87.0	5.0
38	19VDH-FHB-MAS03-29	57.3		99.6	15.0
39	DH19SRW07-309	45.6		86.3	5.0
40	DH19SRW07-321	55.7		89.8	21.7
	AVERAGE	54.0		93.1	14.6
	MINIMUM	31.6		51.6	5.0
	MAXIMUM	67.9		100.8	35.0

Table 17. Summary of severity (SEV, %) data from the 2023-2024 PNUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	MIMAS
1	TRUMAN	13.2	*	19.7	6.7
2	FREEDOM	25.5		44.3	6.7
3	ERNIE	13.5	*	17.0	10.0
4	PIONEER2545	37.7		43.7	
5	KWS571	10.7	*	14.7	6.7
6	KWS586	21.6		26.4	16.7
7	KWS588	18.5		20.2	16.7
8	KWS593	16.5		22.9	10.0
9	KWS603	17.4		24.8	10.0
10	MI22R031	11.4	*	16.1	6.7
11	MI22R033	11.8	*	17.9	5.7
12	MI22R197	14.4	*	20.4	8.3
13	MI22W024	10.8	*	17.3	4.3
14	MI22R021	7.7	*	10.4	5.0
15	MI22R143	19.5		25.6	13.3
16	OH20*44-72	10.9	*	13.4	8.3
17	OH20-17-3	15.2	*	25.4	5.0
18	OH20-17-66	19.2		30.1	8.3
19	OH20-8-108	10.4	*	15.8	5.0
20	OH20-98-32	9.4	*	8.9	10.0
21	IL2021-15134	9.8	*	9.7	10.0
22	IL2021-16726	6.9	*	7.1	6.7
23	IL2021-27466	11.0	*	15.2	6.7
24	IL2021-28801	27.4		31.5	23.3
25	IL2021-37737	6.0	*	7.0	5.0
26	22PU-1412	13.1	*	21.2	5.0
27	22PU-0108	11.0	*	13.8	8.3
28	22PU-3290	9.9	*	11.6	8.3
29	22PU-1176	11.4	*	12.9	10.0
30	21PU-0006-R1	10.4	*	15.9	5.0
31	X14-1128-23-12-5	14.0	*	21.3	6.7
32	X14-1035-67-7-1	15.6	*	22.8	8.3
33	X16-3013-1-12-5	21.8		30.4	13.3
34	X14-1107-95-18-5	22.0		32.3	11.7
35	X16-1002-4-11-1-14	24.3		31.9	16.7
36	18VTK10-5	25.9		45.1	6.7
37	VA22FHB-90	10.2	*	15.4	5.0
38	19VDH-FHB-MAS03-29	25.1		35.1	15.0
39	DH19SRW07-309	17.0		27.3	6.7
40	DH19SRW07-321	16.5		26.3	6.7
	AVERAGE	15.6		21.7	8.9
	MINIMUM	6.0		7.0	4.3
	MAXIMUM	37.7		45.1	23.3

Table 18. Summary of index (IND, %) data from the 2023-2024 PNUWWSN.

ENTRY	NAME	ALL	SIG	ILCHA	ILURB	KYLEX	MIMAS	OHWO0	VABLA
1	TRUMAN	20.0	*	25.0	18.1	20.0	1.2	15.8	40.0
2	FREEDOM	40.4	*	65.0	43.9	30.0	1.8	46.6	55.0
3	ERNIE	31.4	*		17.1	30.0	3.5	31.0	65.0
4	PIONEER2545	50.8		85.0	43.6	35.0		56.0	65.0
5	KWS571	19.6	*	20.0	14.1	30.0	0.3	13.3	40.0
6	KWS586	43.3		55.0	25.7	50.0	4.2	65.2	60.0
7	KWS588	35.0	*	70.0	20.2	35.0	4.0	25.8	55.0
8	KWS593	29.5	*	30.0	22.1	35.0	2.4	32.8	55.0
9	KWS603	32.1	*	35.0	24.1	40.0	1.5	52.0	40.0
10	MI22R031	28.0	*	35.0	15.1	15.0	0.3	37.6	65.0
11	MI22R033	42.9		55.0	17.9	30.0	0.4	89.1	65.0
12	MI22R197	32.8	*	70.0	19.6	15.0	2.3	25.0	65.0
13	MI22W024	36.2	*	50.0	15.6	10.0	0.4	66.4	75.0
14	MI22R021	43.2		55.0	9.6	35.0	0.3	94.4	65.0
15	MI22R143	36.7	*	35.0	23.2	35.0	2.0	55.0	70.0
16	OH20*44-72	23.4	*	35.0	13.1	20.0	0.4	11.8	60.0
17	OH20-17-3	31.0	*	45.0	22.2	35.0	1.7	32.0	50.0
18	OH20-17-66	34.3	*	50.0	30.2	20.0	0.8	44.6	60.0
19	OH20-8-108	25.3	*	35.0	13.8	25.0	0.3	12.7	65.0
20	OH20-98-32	26.4	*	30.0	4.6	15.0	1.5	47.3	60.0
21	IL2021-15134	40.4	*	55.0	9.4	25.0	1.8	81.1	70.0
22	IL2021-16726	33.1	*	15.0	5.8	15.0	0.5	87.1	75.0
23	IL2021-27466	38.6	*	65.0	14.5	20.0	0.6	71.4	60.0
24	IL2021-28801	52.0		80.0	31.6	45.0	7.3	72.9	75.0
25	IL2021-37737	38.9	*	20.0	6.3	35.0	0.5	96.6	75.0
26	22PU-1412	21.3	*	30.0	18.9	25.0	0.4	-1.6	55.0
27	22PU-0108	33.8	*	50.0	12.4	25.0	2.2	48.2	65.0
28	22PU-3290	27.9	*	20.0	10.4	40.0	1.9	30.0	65.0
29	22PU-1176	23.8	*	30.0	12.5	15.0	0.8	34.7	50.0
30	21PU-0006-R1	33.0	*	50.0	14.9	20.0	0.3	53.1	60.0
31	X14-1128-23-12-5	31.4	*	25.0	21.3	40.0	0.5	31.8	70.0
32	X14-1035-67-7-1	28.0	*	30.0	21.2	30.0	1.4	15.7	70.0
33	X16-3013-1-12-5	32.2	*	45.0	28.2	40.0	2.7	17.1	60.0
34	X14-1107-95-18-5	30.7	*	35.0	31.9	45.0	1.8	10.4	60.0
35	X16-1002-4-11-1-14	37.2	*	35.0	32.1	25.0	4.9	66.1	60.0
36	18VTK10-5	30.1	*	50.0	40.5	20.0	1.0	29.0	40.0
37	VA22FHB-90	17.9	*	20.0	13.4	15.0	0.3	18.6	40.0
38	19VDH-FHB-MAS03-29	27.3	*	45.0	35.0	10.0	3.3	20.4	50.0
39	DH19SRW07-309	42.8		65.0	23.6	40.0	0.3	73.1	55.0
40	DH19SRW07-321	42.6		65.0	23.6	40.0	1.7	70.2	55.0
	AVERAGE	33.1		43.8	20.5	28.3	1.6	44.5	59.6
	MINIMUM	17.9		15.0	4.6	10.0	0.3	-1.6	40.0
	MAXIMUM	52.0		85.0	43.9	50.0	7.3	96.6	75.0

Table 19. Summary of Fusarium Damaged Kernel (FDK, %) data from the 2023-2024 PNUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	INWLA	VABLA
1	TRUMAN	21.8	*	53.2	4.7	7.5
2	FREEDOM	30.2		79.7	5.8	5.0
3	ERNIE	28.8		69.0	9.8	7.5
4	PIONEER2545	41.0		81.2	31.7	10.0
5	KWS571	29.4		67.1	8.6	12.5
6	KWS586	34.1		71.0	11.4	20.0
7	KWS588	33.3		60.1	22.2	17.5
8	KWS593	28.6		69.5	11.1	5.3
9	KWS603	28.4		68.0	9.8	7.5
10	MI22R031	23.9	*	59.5	7.3	5.0
11	MI22R033	23.8	*	60.1	6.2	5.0
12	MI22R197	23.3	*	48.0	11.8	10.0
13	MI22W024	21.7	*	54.2	5.8	5.0
14	MI22R021	25.5	*	62.8	8.8	5.0
15	MI22R143	34.7		71.0	13.1	20.0
16	OH20*44-72	26.1	*	56.7	9.0	12.5
17	OH20-17-3	29.4		66.2	14.6	7.5
18	OH20-17-66	44.0		93.0	16.4	22.5
19	OH20-8-108	23.9	*	58.4	8.2	5.0
20	OH20-98-32	23.6	*	57.3	8.4	5.0
21	IL2021-15134	24.4	*	62.0	6.3	5.0
22	IL2021-16726	15.2	*	39.2	3.9	2.5
23	IL2021-27466	26.2	*	57.6	10.8	10.3
24	IL2021-28801	29.0		69.3	12.3	5.3
25	IL2021-37737	25.8	*	53.1	16.7	7.5
26	22PU-1412	23.1	*	46.5	7.5	15.3
27	22PU-0108	26.4	*	57.3	9.3	12.5
28	22PU-3290	29.5		50.1	16.0	22.5
29	22PU-1176	22.7	*	54.4	8.6	5.0
30	21PU-0006-R1	19.8	*	46.5	7.9	5.0
31	X14-1128-23-12-5	23.9	*	49.1	12.7	10.0
32	X14-1035-67-7-1	28.7		65.5	10.7	10.0
33	X16-3013-1-12-5	23.6	*	47.2	18.3	5.3
34	X14-1107-95-18-5	34.6		80.1	13.6	10.0
35	X16-1002-4-11-1-14	29.6		63.9	19.8	5.0
36	18VTK10-5	31.4		73.7	15.5	5.0
37	VA22FHB-90	27.8		71.1	7.3	5.0
38	19VDH-FHB-MAS03-29	22.4	*	55.3	6.9	5.0
39	DH19SRW07-309	44.2		81.5	31.2	20.0
40	DH19SRW07-321	38.4		65.9	29.4	20.0

Table 20. Summary of INC/SEV/FDK (ISK, %) data from the 2023-2024 PNUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	VABLA
1	TRUMAN	40.9	*	54.8	27.0
2	FREEDOM	55.0		74.9	35.0
3	ERNIE	52.5		62.9	42.0
4	PIONEER2545	59.3		75.5	43.0
5	KWS571	44.5	*	59.9	29.0
6	KWS586	54.8		65.6	44.0
7	KWS588	50.1	*	60.2	40.0
8	KWS593	49.4	*	63.6	35.1
9	KWS603	45.4	*	63.8	27.0
10	MI22R031	48.9	*	56.8	41.0
11	MI22R033	50.2	*	59.4	41.0
12	MI22R197	48.6	*	54.2	43.0
13	MI22W024	50.5	*	54.0	47.0
14	MI22R021	48.5	*	56.0	41.0
15	MI22R143	56.6		63.2	50.0
16	OH20*44-72	48.5	*	56.0	41.0
17	OH20-17-3	46.7	*	60.4	33.0
18	OH20-17-66	60.7		76.3	45.0
19	OH20-8-108	47.7	*	54.3	41.0
20	OH20-98-32	39.6	*	41.1	38.0
21	IL2021-15134	50.4	*	56.8	44.0
22	IL2021-16726	44.1	*	42.2	46.0
23	IL2021-27466	48.2	*	56.2	40.1
24	IL2021-28801	57.2		67.3	47.1
25	IL2021-37737	49.1	*	50.1	48.0
26	22PU-1412	45.4	*	51.7	39.1
27	22PU-0108	49.1	*	54.1	44.0
28	22PU-3290	49.2	*	50.3	48.0
29	22PU-1176	43.4	*	54.7	32.0
30	21PU-0006-R1	44.7	*	51.4	38.0
31	X14-1128-23-12-5	51.0	*	56.0	46.0
32	X14-1035-67-7-1	53.5		60.9	46.0
33	X16-3013-1-12-5	47.0	*	55.8	38.1
34	X14-1107-95-18-5	55.7		71.4	40.0
35	X16-1002-4-11-1-14	51.7	*	65.3	38.0
36	18VTK10-5	48.0	*	70.0	26.0
37	VA22FHB-90	42.6	*	59.2	26.0
38	19VDH-FHB-MAS03-29	47.3	*	62.5	32.0
39	DH19SRW07-309	53.9		66.7	41.0
40	DH19SRW07-321	51.1	*	61.2	41.0

Table 21. Summary of deoxynivalenol (DON, ppm) data from the 2023-2024 PNUWWSN.

ENTRY	NAME	ALL	SIG	ILURB	KYLEX	VABLA
1	TRUMAN	9.8	*	18.8	7.3	3.2
2	FREEDOM	19.2		48.7	3.8	5.1
3	ERNIE	11.9	*	27.9	2.9	4.9
4	PIONEER2545	14.0		28.2	7.8	6.1
5	KWS571	13.2		25.7	7.1	7.0
6	KWS586	16.4		26.5	12.5	10.1
7	KWS588	13.4		29.6	3.6	7.0
8	KWS593	13.7		20.9	9.8	10.4
9	KWS603	9.1	*	16.3	6.8	4.1
10	MI22R031	7.0	*	14.0	4.2	2.7
11	MI22R033	11.2	*	24.2	6.8	2.7
12	MI22R197	8.2	*	19.5	1.7	3.5
13	MI22W024	7.7	*	19.8	1.0	2.2
14	MI22R021	8.4	*	19.2	3.0	2.9
15	MI22R143	13.7		28.9	6.3	5.8
16	OH20*44-72	8.6	*	19.5	1.0	5.3
17	OH20-17-3	10.4	*	21.7	5.8	3.8
18	OH20-17-66	12.4		27.5	4.9	4.8
19	OH20-8-108	7.9	*	16.2	6.0	1.5
20	OH20-98-32	10.9	*	22.8	7.5	2.4
21	IL2021-15134	6.7	*	9.2	7.7	3.3
22	IL2021-16726	3.4	*	5.1	4.5	0.7
23	IL2021-27466	11.7	*	26.2	3.3	5.8
24	IL2021-28801	7.4	*	17.5	2.4	2.2
25	IL2021-37737	4.3	*	7.2	4.0	1.6
26	22PU-1412	15.0		29.6	3.9	11.6
27	22PU-0108	10.3	*	22.7	3.5	4.9
28	22PU-3290	12.4		25.8	4.9	6.6
29	22PU-1176	10.6	*	19.3	8.4	4.0
30	21PU-0006-R1	9.6	*	19.6	6.1	3.2
31	X14-1128-23-12-5	9.7	*	20.6	3.3	5.3
32	X14-1035-67-7-1	8.6	*	16.7	5.1	4.0
33	X16-3013-1-12-5	10.7	*	17.2	10.9	4.1
34	X14-1107-95-18-5	12.4		20.9	5.5	10.8
35	X16-1002-4-11-1-14	6.7	*	14.1	3.1	3.0
36	18VTK10-5	16.8		40.3	3.5	6.7
37	VA22FHB-90	6.0	*	7.0	9.6	1.6
38	19VDH-FHB-MAS03-29	6.9	*	15.6	2.6	2.7
39	DH19SRW07-309	21.2		41.5	6.8	15.3
40	DH19SRW07-321	17.6		31.4	5.2	16.2

Table 22. Summary of heading date (HD, Julian days) and height data from the 2023-2024 PNUWWN.

ENTRY	NAME	HEADING DATE						HEIGHT			
		ALL	SIG	ILCHA	ILURB	KYLEX	OHWO	ALL	SIG	ILCHA	INWLA
1	TRUMAN	126.6		133.0	127.3	120.0	126.0	38.9		39.0	38.7
2	FREEDOM	125.6		129.5	128.4	119.0	125.3	37.4		37.0	37.7
3	ERNIE	123.7			124.5	116.0	127.0	36.6			36.0
4	PIONEER2545	124.0		128.0	124.7	118.0	125.3	36.1		36.5	35.7
5	KWS571	126.1		130.0	127.1	120.5	126.7	35.1		37.5	32.7
6	KWS586	125.3		127.0	129.4	120.0	124.7	35.2		38.0	32.3
7	KWS588	124.1		127.0	125.9	119.0	124.3	34.9		36.5	33.3
8	KWS593	124.3		127.0	126.8	118.5	125.0	34.9		36.0	33.7
9	KWS603	124.7		127.0	127.7	118.5	125.7	35.0		37.0	33.0
10	MI22R031	123.1		126.5	124.8	117.0	124.0	36.4		36.5	36.3
11	MI22R033	121.2		125.5	122.5	115.5	121.3	36.7		38.0	35.3
12	MI22R197	122.7		125.5	125.1	116.5	123.7	36.4		37.0	35.7
13	MI22W024	122.1		125.0	124.5	117.5	121.3	36.2		36.0	36.3
14	MI22R021	119.7	*	124.0	121.9	112.0	120.7	35.7		36.0	35.3
15	MI22R143	124.5		128.0	125.3	119.5	125.0	35.5		37.0	34.0
16	OH20*44-72	123.0		126.5	124.4	116.5	124.7	34.6		34.5	34.7
17	OH20-17-3	125.6		129.5	126.8	120.5	125.7	34.7		34.0	35.3
18	OH20-17-66	123.5		128.0	124.9	116.5	124.7	32.9	*	34.5	31.3
19	OH20-8-108	123.3		129.5	123.9	116.0	123.7	33.5		32.0	35.0
20	OH20-98-32	121.5		125.5	122.6	114.5	123.3	33.9		35.0	32.7
21	IL2021-15134	120.5	*	125.0	122.0	113.0	122.0	34.4		35.0	33.7
22	IL2021-16726	121.5		125.0	123.5	115.0	122.3	34.7		35.0	34.3
23	IL2021-27466	122.2		126.0	123.6	116.5	122.7	33.8		34.5	33.0
24	IL2021-28801	119.8	*	123.0	119.9	113.0	123.3	32.9	*	32.5	33.3
25	IL2021-37737	119.1	*	124.0	121.3	110.5	120.7	32.9	*	33.0	32.7
26	22PU-1412	127.7		131.5	129.3	122.0	128.0	34.2		33.0	35.3
27	22PU-0108	124.8		128.0	125.8	120.0	125.3	34.4		34.5	34.3
28	22PU-3290	124.0		127.0	124.5	119.5	125.0	33.7		34.0	33.3
29	22PU-1176	126.0		129.0	128.1	121.0	126.0	37.5		37.0	38.0
30	21PU-0006-R1	124.6		128.5	126.0	118.0	125.7	34.1		34.5	33.7
31	X14-1128-23-12-5	123.5		126.5	125.8	117.0	124.7	32.3	*	33.5	31.0
32	X14-1035-67-7-1	123.7		126.0	124.5	119.5	124.7	33.8		34.5	33.0
33	X16-3013-1-12-5	124.6		127.5	127.0	118.5	125.3	32.8	*	33.5	32.0
34	X14-1107-95-18-5	124.9		127.0	124.6	121.0	127.0	33.8		35.5	32.0
35	X16-1002-4-11-1-14	123.0		127.5	124.4	116.5	123.7	33.3		35.5	31.0
36	18VTK10-5	126.4		129.5	129.1	120.5	126.3	32.8	*	34.5	31.0
37	VA22FHB-90	126.1		129.0	128.4	121.0	126.0	35.4		35.5	35.3
38	19VDH-FHB-MAS03-29	123.5		127.5	127.4	115.0	124.0	33.1		33.5	32.7
39	DH19SRW07-309	125.8		130.0	127.0	120.5	125.7	30.7	*	30.0	31.3
40	DH19SRW07-321	125.5		129.0	126.0	121.0	126.0	31.6	*	31.5	31.7

Table 23. Summary of other traits collected on the 2023-2024 PNUWWSN. PM=Powdery Mildew, LR=Leaf Rust.

		ILCHA	AVG	ILCHA	VABLA	VABLA	VABLA
		HGT	LR(0-9)	LR(0-9)	LR(0-9)	BYDV(0-9)	PM(0-9)
1	TRUMAN	39.0	7.3	7.0	7.5	1.0	1.0
2	FREEDOM	37.0	8.0	7.0	9.0	1.5	1.0
3	ERNIE		4.5		4.5	1.0	1.0
4	PIONEER2545	36.5	7.0	5.5	8.5	1.0	1.0
5	KWS571	37.5	5.5	4.0	7.0	1.0	1.5
6	KWS586	38.0	6.3	6.0	6.5	2.0	1.0
7	KWS588	36.5	8.5	8.0	9.0	1.5	1.0
8	KWS593	36.0	7.5	7.5	7.5	1.5	1.5
9	KWS603	37.0	7.0	6.0	8.0	1.0	2.0
10	MI22R031	36.5	8.5	8.0	9.0	1.5	1.0
11	MI22R033	38.0	8.0	8.0	8.0	1.5	3.0
12	MI22R197	37.0	7.8	7.5	8.0	1.5	1.0
13	MI22W024	36.0	7.5	7.0	8.0	1.0	2.0
14	MI22R021	36.0	3.3	4.0	2.5	2.5	1.0
15	MI22R143	37.0	6.5	7.0	6.0	1.0	1.0
16	OH20*44-72	34.5	7.0	5.5	8.5	1.0	1.0
17	OH20-17-3	34.0	4.5	4.0	5.0	1.0	1.5
18	OH20-17-66	34.5	7.0	6.0	8.0	1.0	1.0
19	OH20-8-108	32.0	8.3	7.5	9.0	1.0	1.0
20	OH20-98-32	35.0	6.3	6.0	6.5	1.0	4.5
21	IL2021-15134	35.0	2.3	3.5	1.0	0.5	2.5
22	IL2021-16726	35.0	4.0	4.0	4.0	1.0	2.5
23	IL2021-27466	34.5	7.5	7.5	7.5	1.0	5.0
24	IL2021-28801	32.5	3.3	4.0	2.5	1.0	1.5
25	IL2021-37737	33.0	6.8	5.0	8.5	1.0	1.0
26	22PU-1412	33.0	7.0	6.5	7.5	1.0	1.0
27	22PU-0108	34.5	3.5	4.5	2.5	0.5	1.5
28	22PU-3290	34.0	6.8	7.0	6.5	1.0	1.5
29	22PU-1176	37.0	8.5	8.0	9.0	1.0	1.0
30	21PU-0006-R1	34.5	1.8	2.0	1.5	1.0	2.0
31	X14-1128-23-12-5	33.5	8.3	8.0	8.5	1.0	1.0
32	X14-1035-67-7-1	34.5	7.8	7.0	8.5	1.0	1.0
33	X16-3013-1-12-5	33.5	1.5	2.5	0.5	1.0	1.0
34	X14-1107-95-18-5	35.5	7.0	6.0	8.0	1.0	1.0
35	X16-1002-4-11-1-14	35.5	7.8	6.5	9.0	1.0	1.5
36	18VTK10-5	34.5	2.8	3.0	2.5	1.0	1.0
37	VA22FHB-90	35.5	1.8	2.5	1.0	1.0	1.0
38	19VDH-FHB-MAS03-29	33.5	1.5	2.0	1.0	1.0	1.0
39	DH19SRW07-309	30.0	5.3	4.5	6.0	1.0	1.0
40	DH19SRW07-321	31.5	5.3	4.5	6.0	1.0	1.0
	AVERAGE	35.1	5.9	5.6	6.2	1.1	1.5
	MINIMUM	30.0	1.5	2.0	0.5	0.5	1.0
	MAXIMUM	39.0	8.5	8.0	9.0	2.5	5.0

Table 24. Summary of FHB traits for 129 limes from the University of Missouri and evaluated in Wooster Ohio in June 2024.

ENTRY	NAME	IND	FDK	DON	ENTRY	NAME	IND	FDK	DON
9003	PIONEER2545	73.6	50.0	5.6	80	MO182213	54.3		
9002	FREEDOM	53.3	32.5	3.9	51	MO181881	55.5		
9001	TRUMAN	40.6	35.0	4.7	12	MO181790	55.5		
65	MO181734	-2.9	10.0	1.0	38	MO181507	55.9		
26	MO181806	15.6	15.0	1.0	107	MO180749	56.3		
114	MO182186	16.3	6.5	0.7	28	MO181001	56.3		
109	MO181087	18.2	17.5	3.5	116	MO181096	56.4		
39	MO181887	18.9	6.5	1.1	128	MO181291	57.5		
2	MO150811	22.9	1.5	0.4	46	MO181659	57.5		
56	MO182242	24.9	6.5	0.7	130	MO182441	57.8		
68	MO182457	27.0	4.0	0.3	62	MO170501	57.8		
13	MO170386	28.0	22.5	2.4	79	MO180364	59.1		
36	MO180931	28.1	3.0	0.9	101	MO180247	59.6		
44	MO182069	28.2	5.0	0.7	76	MO181521	60.1		
108	MO181103	28.6	4.0	1.0	64	MO181263	60.2		
3	MO080104	30.0	3.0	0.2	29	MO181701	60.4		
121	MO180636	31.1	10.0	1.5	47	MO180748	60.9		
41	MO182550	32.5	7.5	0.5	40	MO182272	60.9		
15	MO181003	34.3	1.5	0.3	8	MO170659	60.9		
10	MO170382	34.5	7.5	2.9	127	MO180311	62.0		
31	MO181014	34.7	5.0	0.3	92	MO180783	62.4		
32	MO160959	35.0	30.0	3.6	19	MO182204	62.7		
54	MO181676	35.5	12.5	0.3	77	MO180816	63.7		
21	MO182010	35.7	12.5	0.3	133	MO180396	64.1		
52	MO180103	35.9	32.5	2.2	45	MO170270	64.7		
86	MO181843	36.4	4.0	2.6	72	MO180750	64.9		
43	MO181694	37.7	4.0	0.6	94	MO182438	65.1		
105	MO181713	37.8	11.5	1.0	11	MO180270	65.4		
5	MO170771	38.3	40.0	2.7	24	MO170475	66.3		
112	MO181109	38.6			124	MO180382	67.2		
22	MO182545	38.7			23	MO170186	68.4		
122	MO180337	40.0			58	MO110799	69.1		
20	MO180637	40.6			67	MO182236	69.2		
14	MO180212	40.9			115	MO182264	70.7		
131	MO180125	41.1			110	MO180885	70.7		
100	MO180249	41.3			59	MO180538	71.2		
74	MO182210	41.5			81	MO182275	71.4		
60	MO182214	41.5			49	MO180808	71.5		
7	MO170924	41.6			95	MO180962	72.5		
50	MO180432	42.0			6	MO170539	73.1		
53	MO182029	44.2			87	MO182168	73.2		
91	MO181882	45.2			73	MO180741	73.2		
1	MO151062	45.2			55	MO180759	73.7		
106	MO181693	45.4			119	MO181794	75.8		
34	MO182484	45.4			126	MO182148	75.9		
27	MO122017	46.1			85	MO182145	77.4		
125	MO180631	46.4			33	MO170555	80.1		
66	MO182456	46.5			69	MO181544	80.2		
17	MO160140	47.1			42	MO180156	80.7		
123	MO182508	47.7			63	MO181738	81.0		
129	MO181812	48.7			82	MO182415	81.6		
30	MO110201	49.1			117	MO181519	83.8		
103	MO182112	49.1			57	MO181916	83.8		
96	MO182020	49.3			113	MO170153	86.4		
83	MO182175	49.3			93	MO180475	86.4		
9	MO151082	50.1			111	MO181566	86.7		
88	MO181637	51.0			61	MO180537	88.7		
37	MO180856	51.9			99	MO180442	89.2		
48	MO181673	52.2			78	MO180222	90.9		
75	MO181012	52.8			98	MO180787	91.7		
89	MO180545	53.2			71	MO182416	93.7		
25	MO151156	53.7			104	MO181691	94.9		
80	MO182213	54.3							

