

Ontario Corn Hybrid DON Screening Trials 2023 Report

Introduction. Gibberella ear rot concerns the industry because of DON concentrations. It is well known that DON concentrations are highly dependent on interactions among hybrids, pathogens, and the environment. Starting in 2019, the Ontario Corn Committee (OCC) refined protocols for testing hybrid sensitivity to DON accumulation with confidence based on an assessed risk. This inaugural report provides a risk assessment of hybrids entered in the 2023 trials, along with a multi-year assessment on the same hybrids if data were available. The current testing method was designed to identify the hybrid-specific relative resistance of hybrids across multiple environments produced at 2 locations and 3 planting dates at each location per year. The variability inherent in this work was sufficiently constrained to support statistical differences among hybrid entries. **It needs to be emphasized that this is a relative risk assessment of hybrids and that additional data sources (e.g., seed company information, field trial results, etc.) should be used for better hybrid decisions based on DON risk. Currently, there are no DON-resistant hybrids.**

Notes on inoculation trials. Briefly, the hybrids were voluntarily submitted by seed companies for testing from 2019 to 2023. Hybrids were tested in misted, inoculated disease nurseries at the Ridgetown Campus from 2019 through 2023, at the Huron Research Station (Exeter) from 2021 to 2023, and at AAFC-Ottawa in 2019. After 2019, it was determined that the Ottawa location was too far removed from the maturity zone of most hybrids, so trials were conducted at Ridgetown and Exeter in subsequent years. The hybrid entries varied each year depending on seed company decisions and hybrid turnover in the marketplace. Some seed companies chose not to participate in this study, while others entered only a few hybrids. Each hybrid entry was planted on three dates to expose various hybrid maturities to different weather conditions around silking and during grain-fill: relatively early (early to mid-May), mid (late May), and relatively late (early to mid-June), with three replications per planting date. Thus, each hybrid entry was exposed to six “environments” (two locations × three planting dates) with three replications for a total of 18 DON measurements per hybrid per year in most years. In 2023, the late-planted block at the Huron Research Station was not inoculated and was subsequently discarded because of late silking.

In all years, corn was planted in 30” rows to achieve a final stand of 34,400 plants per acre (see Appendix Figure 1). Each hybrid was planted in a single row of approximately 25 plants. Ten plants were inoculated in each row by hand at the optimal time for infection (from full silk to the first sign of silk browning). The trials were mist-irrigated on timers every day for approximately four weeks after inoculation (see Appendix Figure 2). At harvest, corn was hand-harvested, dried, shelled, and analyzed for DON.

Data were analyzed using PROC GLIMMIX with a lognormal distribution. Indices were calculated and compared based on the log means relative to the same (highly DON susceptible) check hybrid. In 2023, hybrids that were statistically different from the check hybrid were identified within each planting date. In the multi-year combined analysis, data were combined across all environments. Each combination of year, location, and planting date was treated as an “environment” in the analysis as a random effect.

Results. The data were analyzed over multiple years (Table 1) if data were available. The 1-year column is identical to the last column in Table 2 (i.e., 2023 data). Note that the hybrids were sorted according to the CHU rating. In general, hybrids with multi-year data ranked similarly across years using only 2 years of data, with only a few exceptions. Of the 45 hybrids entered in 2023, the DON in 16 hybrids was similar to the DON in the susceptible check (note “nd” or “not different” statistically in the last column to the right). Two hybrids were statistically higher than the susceptible check (note “+” in the last column).

A relative risk assessment of hybrid susceptibility to DON is presented as indices by environment in 2023 (see Table 2). The environments are based on location and planting dates. As expected, there was some variability across the five environments; however, there was sufficient consistency or evidence to identify statistical differences in hybrid sensitivity to DON accumulation.

Table 1. Relative DON risk assessment indices by hybrid relative to susceptible check from 2020-2023. Hybrids are sorted by CHU rating. Always use one-year data with caution. The colour scheme highlights hybrid effects within column. An index=100 means DON equal to the susceptible check.

Hybrid	Hybrid CHU	4-year	3-year	2-year	1-year	Interpretation
DKC36-48RIB	2600		28 *	26 *	30 *	For example, this hybrid produced 28% of DON compared to the susceptible check hybrid across 17 environments (over 3 years). Hybrids with an asterisk (*) are statistically lower in DON compared to the susceptible check hybrid.
A5424G2 RIB	2625				44 *	
A5959G2 RIB	2725		27 *	26 *	37 *	
DKC39-55RIB	2725		59 *	59 *	59 *	
P9316Q	2750				34 *	
P9466AML	2800				45 *	
DKC42-05RIB	2800	34 *	32 *	26 *	48 *	
P9535AM	2825		62 *	55 *	56 *	
P9624Q	2850				22 *	
B96H83AM	2850		27 *	19 *	24 *	
DKC44-80RIB	2850	30 *	34 *	24 *	32 *	
A6566G8RIB	2850				43 *	
NK9535-V	2850				76 nd	
A6572G2 RIB	2850		60 *	81 nd	102 nd	
NK9601-AA	2875				36 *	
NK9653-DV	2875		34 *	37 *	48 *	
DKC45-74RIB	2875				91 nd	
*company removed	2875				209 +	
DKC46-40RIB	2900		52 *	43 *	45 *	
P97299AM	2900				86 nd	
EXP9723-DV	2900				106 nd	
P9823Q	2925		28 *	23 *	31 *	
*experimental	2925				275 +	
P9845PCE	2950				116 nd	
DKC49-09RIB	2975	54 *	53 *	44 *	98 nd	
B00R96AM	3000	42 *	37 *	26 *	22 *	
P0035AM	3000		46 *	43 *	33 *	
P0075AM	3000		55 *	44 *	35 *	
NK9991-5122	3000		69 *	77 nd	73 nd	
NK0007-AA	3000				166 nd	
A7199G9 RIB	3025				84 nd	
NK0243-D	3075		39 *	31 *	30 *	
*experimental	3100				125 nd	
B04S21AM	3125	62 *	61 *	56 *	33 *	
B04D72Q	3125		62 *	61 *	57 *	
P04922Q	3125				87 nd	
P0404AM	3125		99 nd	136 nd	113 nd	
P04511AM	3125				164 nd	
P0529Q	3150				24 *	
MZ 4577SMX	3150	66 *	66 *	57 *	41 *	
SUSCEPTIBLE CHECK	3175	100	100	100	100	Susceptible check hybrid
MZ 4608SMX	3200		16 *	15 *	17 *	
B07M64AM	3200		85 nd	95 nd	37 *	
MZ 4799SMX	3250				14 *	
P0806AM	3250				36 *	
P0859AM	3250				89 nd	
Hybrid diff (P-value)		<0.0001	<0.0001	<0.0001	<0.0001	Low statistical p-values indicate strong evidence that hybrid differences exist considering variability.
Average DON in Check (ppm)		13.9	8.8	3.4	16.0	
No. environments tested		23	17	11	5	
No. observations per hybrid		69	51	33	15	

Table 2. Relative DON risk assessment indices by hybrid and environments in 2023. Hybrids are sorted by CHU rating. Always interpret one-year data with caution. The colour scheme highlights relative hybrid effects within column.

Hybrid	Hybrid CHU	Exeter environments		Ridgetown environments			Overall mean	Interpretation
		1	2	3	4	5		
DKC36-48RIB	2600	7	50	15	38	118	30	*
A5424G2 RIB	2625	10	91	36	36	132	44	*
A5959G2 RIB	2725	25	106	23	23	50	37	*
DKC39-55RIB	2725	30	108	33	18	379	59	*
P9316Q	2750	7	61	42	24	98	34	*
P9466AML	2800	14	69	69	18	139	45	*
DKC42-05RIB	2800	17	108	52	24	106	48	*
P9535AM	2825	47	75	23	32	198	56	*
P9624Q	2850	12	13	17	23	80	22	*
B96H83AM	2850	11	43	13	24	53	24	*
DKC44-80RIB	2850	12	54	16	52	56	32	*
A6566G8 RIB	2850	13	138	12	70	94	43	*
NK9535-V	2850	20	182	54	194	64	76	nd
A6572G2 RIB	2850	27	137	83	78	442	102	nd
NK9601-AA	2875	4	20	102	96	72	36	*
NK9653-DV	2875	5	47	88	100	110	48	*
DKC45-74RIB	2875	30	35	90	90	731	91	nd
*Company removed	2875	66	266	138	204	778	209	+
DKC46-40RIB	2900	35	174	32	21	30	45	*
P97299AM	2900	36	87	76	51	381	86	nd
*Experimental	2900	29	130	62	140	382	106	nd
P9823Q	2925	31	60	21	35	21	31	*
*Experimental	2925	107	445	124	247	1317	275	+
P9845PCE	2950	48	105	52	160	483	116	nd
DKC49-09RIB	2975	41	179	55	100	214	98	nd
B00R96AM	3000	8	6	66	40	33	22	*
P0035AM	3000	37	12	23	33	112	33	*
P0075AM	3000	22	21	12	42	206	35	*
NK9991-5122	3000	45	18	118	213	112	73	nd
NK0007-AA	3000	132	529	75	120	285	166	nd
A7199G9 RIB	3025	64	68	76	22	659	84	nd
NK0243-D	3075	23	11	45	46	41	30	*
*Experimental	3100	86	120	112	159	162	125	nd
B04S21AM	3125	18	7	35	60	154	33	*
B04D72Q	3125	24	10	101	63	384	57	*
P04922Q	3125	44	41	152	111	157	87	nd
P0404AM	3125	39	97	70	129	465	113	nd
P04511AM	3125	58	84	186	266	465	164	nd
P0529Q	3150	15	6	34	24	105	24	*
MZ 4577SMX	3150	30	39	49	33	57	41	*
SUSCEPTIBLE CHECK	3175	100	100	100	100	100	100	
MZ 4608SMX	3200	5	5	29	25	58	17	*
B07M64AM	3200	25	37	68	16	52	37	*
MZ 4799SMX	3250	4	5	17	48	33	14	*
P0806AM	3250	20	45	71	14	71	36	*
P0859AM	3250	23	182	39	135	246	89	nd
Hybrid difference (P-value)		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Average DON in Check (ppm)		68.9	13.2	30.0	9.8	4.0	16.0	
No. observations per hybrid		3	3	3	3	3	15	

For example, this hybrid produced 30% of DON compared to the susceptible check hybrid across environments. hybrids with an asterisk (*) are statistically lower in DON compared to the susceptible check hybrid.

Hybrids with "nd" are not different statistically compared to the susceptible check hybrid.

Hybrids with "+" have statistically higher DON compared to the susceptible check hybrid. In this hybrid, DON was 2.75x higher than the susceptible check hybrid.

An example of variability across environments

Susceptible check hybrid

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Sponsors:

Brand or identification, participating seed companies (2019-2023)	
Brevant, Corteva Agriscience	NK Brand, Syngenta Seeds Inc.
Country Farm, Country Farm Seeds Ltd.	Pioneer, Pioneer Hi-Bred Canada
CROPLAN, Winfield United	PRIDE Seeds, AgReliant Genetics Inc.
DEKALB, Bayer CropScience Inc.	Saatbau, Saatbau Linz
Maizex, Maizex Seeds Inc.	



ONTARIO PORK



Appendix



Figure 1. Precision planting the OCC DON experiment at Ridgetown.



Figure 2. Overview of the OCC DON trial showing the overhead misting lines at Ridgetown.