

ENTRY	Control						MED		Culture filtrate						MED	
	REP1	REP2	REP3	REP4	REP5	MED			REP1	REP2	REP3	REP4	REP5	MED		
e4493	1	1	5	1	1	1	NS	4	2	3	6	6	4	TS		
K14-1717-1	1	1	4	6	4	4	S	6	2	6	6	6	6	TS		
K14-1717-5	6	6	6	5	6	6	S	6	6	6	6	6	6	TS		
K16-1066	1	2	1	1	1	1	NS	3	1	2	2	2	2	TR		
K16-1068	2	1	2	2	1	2	NS	2	2	2	2	1	2	TR		
K16-1071	1	1	3	2	1	1	NS	3	2	3	2	3	3	TS		
K16-1072*	4	4	4	3	6	4	S	4	4	3	3	3	3	TS		
K16-1072**	2	2	1	2	1	2	NS	1	1	1	1	2	1	TR		
K16-1081	1	1	1	1	1	1	NS	3	1	2	2	2	2	TR		
K16-1084	1	1	1	1	1	1	NS	2	2	2	2	3	2	TR		
K16-1091	2	2	3	2	1	2	NS	2	3	3	2	2	2	TR		
K16-1098	2	1	1	1	1	1	NS	2	3	1	2	2	2	TR		
K16-1099	3	2	2	2	2	2	NS	4	3	4	3	4	4	TS		
K16-1100	1	2	1	2	1	1	NS	2	2	2	2	2	2	TR		
K16-1106	1	3	2	2	2	2	NS	2	4	3	2	2	2	TR		
K16-1107	2	2	2	1	1	2	NS	2	2	2	2	2	2	TR		
K16-1114	1	1	1	1	1	1	NS	2	3	2	2	2	2	TR		
K16-1153	1	1	1	1	1	1	NS	2	2	2	1	2	2	TR		
K16-1154	2	3	1	3	1	2	NS	2	3	2	2	2	2	TR		
K16-1156	1	1	1	2	2	1	NS	2	3	2	2	2	2	TR		
K16-1158	1	3	2	2	3	2	NS	2	2	2	2	3	2	TR		

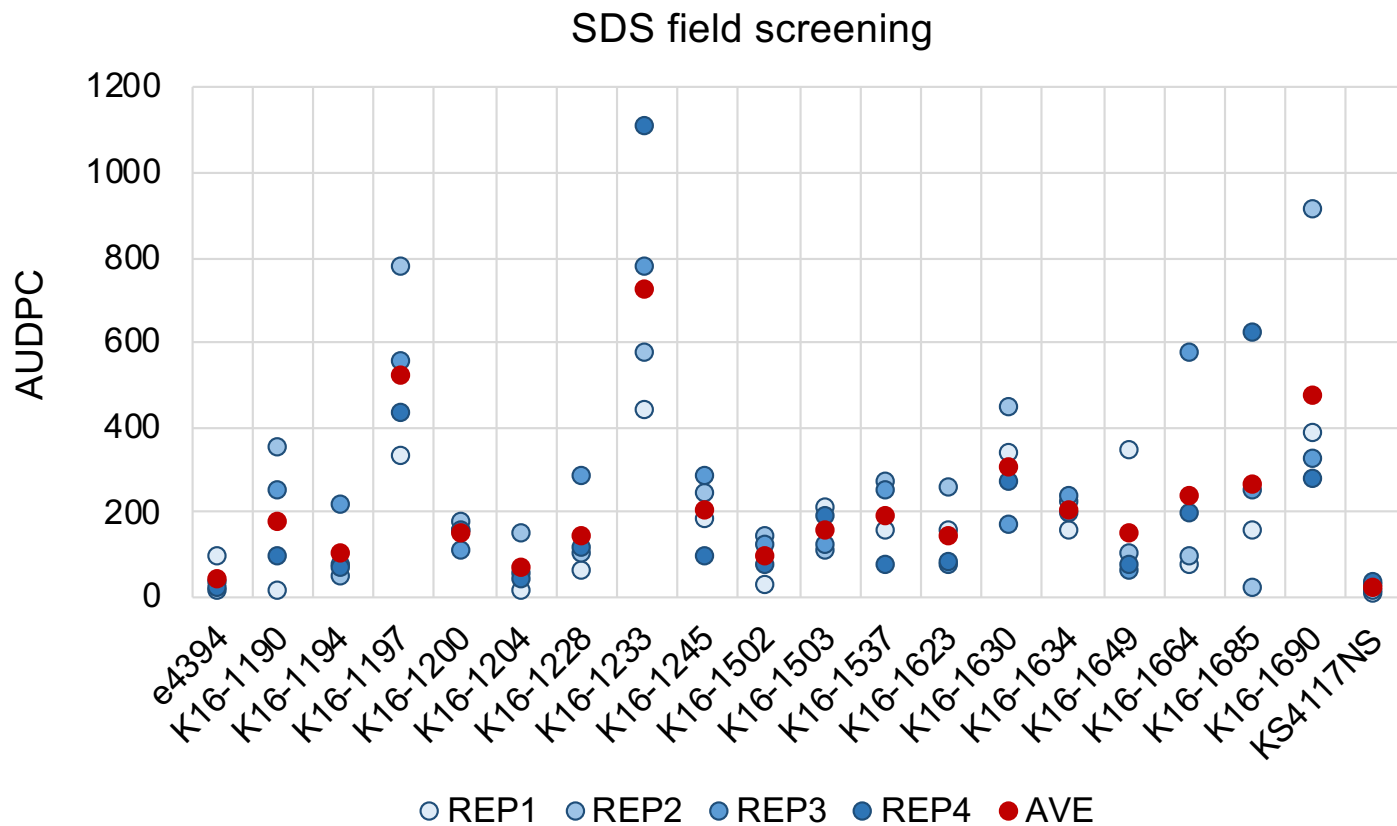
**Figure 1.** Example results from the *Fusarium virguliforme* toxin (culture-filtrate) assay screening experiment for Kansas soybean breeding lines. NS = non-senescent, S = senescent; TS = toxin-sensitive, TR = toxin resistant. MED = median value. \* and \*\* = KAE ABI 21 & 22, respectively.

COMMERCIAL	Control						Culture filtrate							
	REP1	REP2	REP3	REP4	REP5	MED	REP1	REP2	REP3	REP4	REP5	MED		
Asgrow AG 3432	6	6	2	6	3	6	S	6	6	5	6	6	6	TS
Asgrow AG 4232	6	1	2	1	6	2	NS	4	1	1	1	5	1	TR
Asgrow AG 5335	1	1	1	5	1	1	NS	6	2	6	3	2	3	TS
Credenz CZ 3548 LL	1	1	1	1	1	1	NS	1	1	2	1	1	1	TR
Credenz CZ 3601 LL	4	1	1	6	1	1	NS	6	2	4	1	4	4	TS
Credenz CZ 3738 LL	1	1	1	1	1	1	NS	1	2	1	1	4	1	TR
Credenz CZ 3841 LL	6	1	1	1	1	1	NS	3	2	2	3	2	2	TR
Credenz CZ 4105 LL	2	4	5	3	4	4	S	4	6	3	6	4	4	TS
Credenz CZ 4222 LL	1	1	1	5	1	1	NS	4	5	6	4	4	4	TS
Credenz CZ 4308 LL	1	1	6	1	1	1	NS	1	2	1	2	2	2	TR
Credenz CZ 4548 LL	4	1	6	6	1	4	S	6	2	2	5	5	5	TS
Credenz CZ 4748 LL	6	1	1	1	1	1	NS	4	2	6	6	1	4	TS
Credenz CZ 4918 LL	1	1	1	4	3	1	NS	1	1	1	1	1	1	TR
Credenz CZ 4938 LL	6	6	6	6	6	6	S	6	6	6	6	6	6	TS
Credenz HBK LL 4953	1	1	1	1	1	1	NS	1	1	1	1	1	1	TR
Dyna Gro S46xS87	2	1	1	1	1	1	NS	2	5	4	1	4	4	TS
Emerge Genetics e3796	1	4	1	5	6	4	S	6	6	6	6	6	6	TS
Emerge Genetics e4394	6	2	3	6	5	5	S	3	6	6	5	3	5	TS
Emerge Genetics e4892s	1	3	6	6	1	3	S	4	6	6	5	6	6	TS
Emerge Genetics e4993s	2	6	2	6	4	4	S	6	6	2	6	6	6	TS
Emerge Genetics e4996s	1	6	5	1	1	1	NS	5	5	5	5	5	5	TS

**Figure 2.** Example results from the *Fusarium virguliforme* toxin (culture-filtrate) assay screening experiment for commercial varieties. NS = non-senescent, S = senescent; TS = toxin-sensitive, TR = toxin resistant. MED = median value.

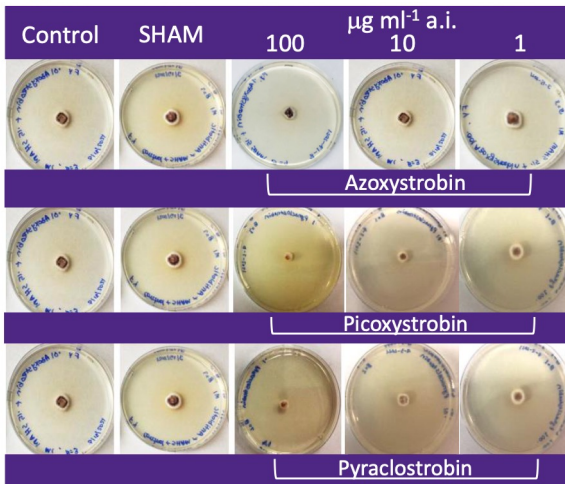
PUBLIC	Control						Culture filtrate							
	REP1	REP2	REP3	REP4	REP5	MED	REP1	REP2	REP3	REP4	REP5	MED		
Arkansas Osage	2	1	1	1	4	1	NS	3	4	6	2	2	3	TS
Arkansas R09-430	1	2	6	1	1	1	NS	3	1	4	4	2	3	TS
Arkansas R13-1019	1	1	1	1	4	1	NS	4	6	4	4	6	4	TS
Arkansas UA 5014 C	6	1	1	1	1	1	NS	2	4	2	5	4	4	TS
Arkansas UA 5414RR	2	1	2	3	4	2	NS	5	5	6	5	6	5	TS
Kansas AES KS4313 N	6	2	3	6	2	3	S	6	6	4	4	4	4	TS
Kansas AES K4313NRRT	1	6	1	2	1	1	NS	2	2	3	2	1	2	TR
Kansas AES KS3406RR	2	2	2	4	2	2	NS	6	6	4	5	6	6	TS
Kansas AES KS4117NS	3	3	4	1	1	3	S	4	6	5	6	3	5	TS
Kansas AES KS5004N	1	1	2	1	1	1	NS	4	5	5	5	5	5	TS
Kansas AES KS5502N	5	1	4	1	4	4	S	2	5	2	2	2	2	TR
Kansas AES KS5507NRR	1	1	1	1	1	1	NS	2	3	4	2	2	2	TR
Missouri S13-10590C	6	6	6	6	6	6	S	6	6	6	6	6	6	TS
Missouri S13-1955C	6	2	6	6	6	6	S	2	6	6	6	6	6	TS
Missouri S13-2743C	6	6	6	6	6	6	S	5	5	6	6	3	5	TS
Missouri S13-3851C	6	6	2	1	5	5	S	6	6	2	4	5	5	TS
Missouri S14-9051R	4	4	1	6	6	4	S	4	4	2	6	5	4	TS
Ripley	2	1	2	1	2	2	NS	2	3	4	4	5	4	TS
Morgan	1	6	3	3	6	3	S	6	6	6	5	6	6	TS
LD06-7862	1	6	1	1	1	1	NS	3	5	4	4	3	4	TS
Spencer	2	6	2	6	2	2	NS	3	5	5	3	5	5	TS

**Figure 3.** Example results from the *Fusarium virguliforme* toxin (culture-filtrate) assay screening experiment for public varieties. NS = non-senescent, S = senescent; TS = toxin-sensitive, TR = toxin resistant. MED = median value.



**Figure 4.** Example results of Kansas breeding materials from field screening for SDS severity. Data is reported as “area under the disease progress curve” (AUDPC).

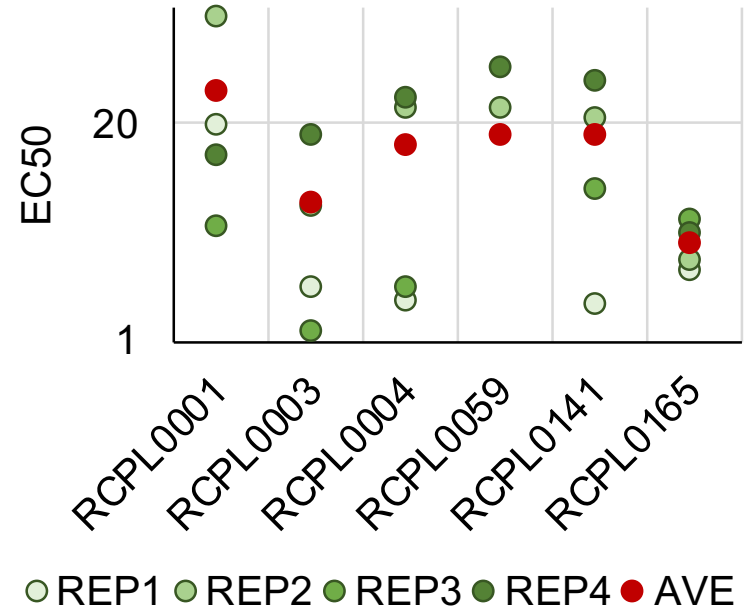
Example of colony growth assays for % inhibition and EC<sub>50</sub> determination.



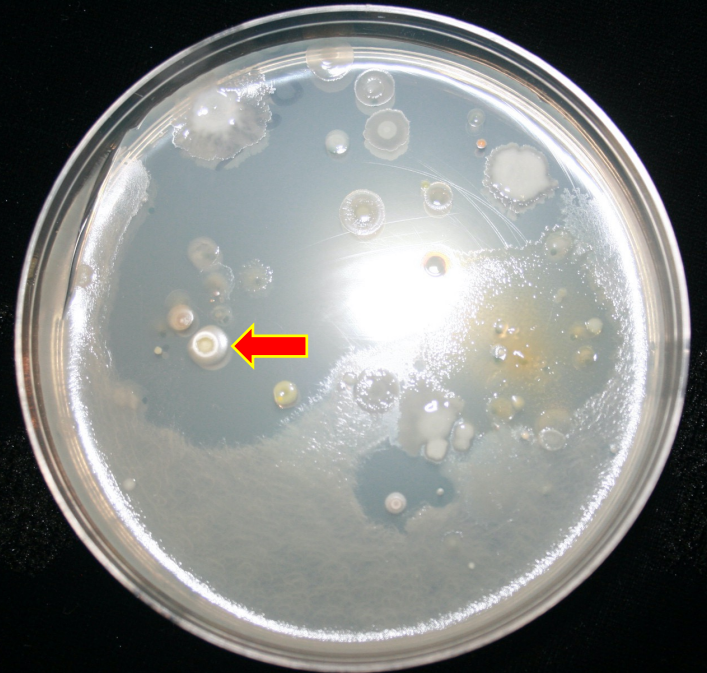
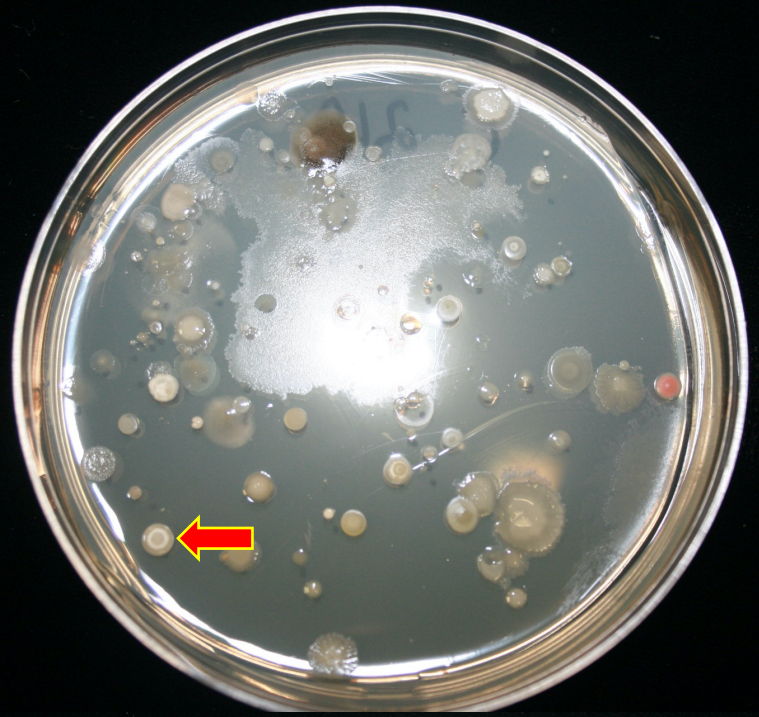
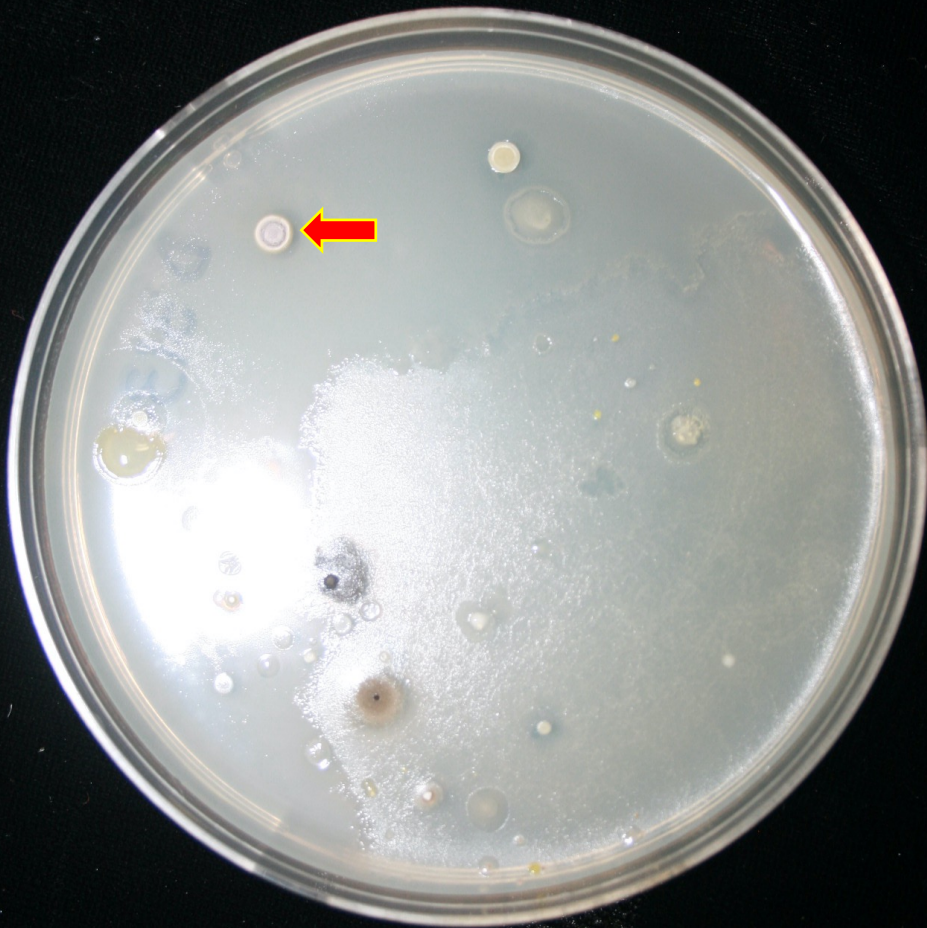
( $\mu\text{g ml}^{-1}$ )	Azoxystrobin	Picoxystrobin	Pyraclostrobin
Batch 1	20.91	--	12.75
Batch 2	30.96	6.123	13.71
Batch 3	25.330	9.707	6.59
Batch 4	19.064	10.446	7.08
AVE	<b>24.065 a</b>	<b>8.758 b</b>	<b>9.124 b</b>

Overall averages with different letters are significantly different according to Tukey's HSD test at  $P < 0.05$ .

Azoxystrobin EC<sub>50</sub> data for *F. proliferatum*



**Figure 5.** Examples of effective fungicide active ingredient concentrations to inhibit growth of *F. virguliforme* (*Mont-1* isolate; left) and soybean seedling isolates of *F. proliferatum* (right) by half (EC<sub>50</sub>).



**Figure 6.** Examples of candidate *F. virguliforme* colonies from Kansas soybean field soil isolations. Isolates must be purified, sequenced, and confirmed.

ENTRY	Disease Severity Index					
	Exp #1			Exp #2		
	CONT	INOC	t-test	CONT	INOC	t-test
e4394	1.57	1.83	0.17 ns	2.47	2.27	0.31 ns
K16-1190	1.42	1.75	0.022*	1.75	1.85	0.31 ns
K16-1194	1.33	1.62	0.066~	2.37	2.58	0.23 ns
K16-1197	1.55	1.88	0.074~	1.90	2.25	0.045*
K16-1200	1.39	1.61	0.13 ns	1.62	1.85	0.10 ns
K16-1204	1.42	1.52	0.43 ns	1.55	1.95	0.044*
K16-1228	1.31	1.41	0.62 ns	2.10	2.21	0.26 ns
K16-1233	1.25	1.90	< 0.0001***	2.19	2.26	0.59 ns
K16-1245	1.51	1.82	0.043*	2.18	2.16	0.86 ns
K16-1502	1.44	1.84	0.0073**	2.11	2.43	0.14 ns
K16-1503	1.29	1.41	0.095~	1.86	1.88	0.89 ns
K16-1537	1.10	1.60	0.034*	2.05	1.97	0.49 ns
K16-1623	1.13	1.70	0.0028**	2.17	2.26	0.59 ns
K16-1630	0.54	1.43	< 0.0001***	1.78	2.36	0.0098**
K16-1634	1.23	1.61	0.0019**	2.27	2.12	0.37 ns
K16-1649	1.14	1.45	0.090~	1.53	1.61	0.51 ns
K16-1664	1.26	1.88	0.037*	2.21	2.62	0.068~
K16-1685	1.07	1.63	0.0063**	2.02	2.32	0.013*
K16-1690	0.88	1.64	0.0002**	2.10	2.28	0.32 ns
KS4117NS	1.01	1.60	0.039*	2.32	2.02	0.012*

Significantly different from control treatment at  $P < 0.10$  (~),  $P < 0.05$  (\*),  $P < 0.01$  (\*\*), and  $P < 0.001$  (\*\*\*)

**Table 1.** Example of seedling disease severity after inoculation with *Fusarium virguliforme* using the “rolled-towel” assay. CONT = sterile-distilled water control; INOC =  $2 \times 10^5$  *F. virguliforme* conidia ml<sup>-1</sup>.

Layer-cake -- Disease Severity Ratings						
ENTRY	Exp #1			Exp #2		
	CONT	INOC	t-test	CONT	INOC	t-test
e4394	1.75	3.25	0.18 ns	1.72	5.58	0.0014**
K16-1190	1.08	2.94	0.011*	1.41	3.68	0.036*
K16-1194	1.18	2.50	0.031*	1.17	3.73	0.0025**
K16-1197	1.25	3.22	0.11 ns	1.75	4.60	0.0071**
K16-1200	2.16	3.54	0.28 ns	1.12	2.55	0.0076**
K16-1204	1.45	3.02	0.047*	1.30	3.20	0.0058**
K16-1228	2.04	2.64	0.54 ns	1.60	2.33	0.40 ns
K16-1233	2.31	3.27	0.51 ns	1.05	2.92	0.013*
K16-1245	2.40	2.94	0.68 ns	1.25	4.53	0.0003**
K16-1502	1.68	3.49	0.082~	2.02	3.40	0.19 ns
K16-1503	2.41	2.44	0.98 ns	1.16	4.30	0.0021**
K16-1537	1.61	3.29	0.022*	1.13	4.40	0.018*
K16-1623	1.41	4.05	0.0084**	.	.	
K16-1630	2.68	3.43	0.57 ns	1.57	4.53	0.0003**
K16-1634	1.85	4.14	0.084~	1.50	5.63	0.0038**
K16-1649	1.36	3.18	0.0065**	1.19	4.51	< 0.0001***
K16-1664	1.55	2.49	0.064~	2.64	4.10	0.17 ns
K16-1685	1.15	3.39	0.0011**	1.23	5.67	< 0.0001***
K16-1690	2.16	.		1.20	5.80	0.0002**
KS4117NS	2.89	2.41	0.66 ns	1.64	4.73	0.0083**

Significantly different from control treatment at  $P < 0.10$  (~),  $P < 0.05$  (\*),  $P < 0.01$  (\*\*), and  $P < 0.001$  (\*\*\*).

**Table 2.** Example of layer-cake assay disease severity ratings after inoculation with *Fusarium virguliforme*. CONT = uncolonized carrier layer; INOC = *F. virguliforme*-colonized carrier layer.