

An Evaluation of Commercial Grain Sorghum Hybrids
for Resistance to the Yuma Root Rot

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Summary

A field evaluation of 170 commercial hybrid grain sorghums from 14 companies was made at Yuma, Arizona in 1980 for resistance to the Yuma Root Rot. Ten entries, or about 6 percent of the 170 entries tested, possessed a high degree of resistance. The remaining 160 entries, or 94 percent, showed considerable or complete susceptibility.

A sorghum root rot problem of grain sorghums planted about midsummer (July) or later in the lower Colorado River area has been encountered by growers since about 1960. The symptoms are diseased roots which cease to support the growth of the plant in spite of adequate soil moisture and nutrients. Afflicted seedlings die at an early stage of growth. Older plants that are heading out will have little or no seed development due to deteriorating root support and even premature death of the plant. Severe or total lodging at the ground level may occur in plants that succumb with considerable above-ground growth. This disease apparently can attack susceptible sorghum genotypes at any stage of physiological development of the plant that may be occurring at the time environmental conditions are optimum for the disease to attack the plant roots. Considerable grain yield losses may be encountered when growing susceptible genotypes.

Previous research at the University of Arizona has shown that a hybrid produced from a completely resistant male or female parent and a completely susceptible male or female parent will eventually completely succumb to the disease. Both parents must be homozygous resistant in order to produce a totally resistant hybrid.

Very few, if any, of the commercial hybrid grain sorghums on the market are produced and tested specifically for resistance to this root rot. There is some genetic resistance in the germplasm used by plant breeders of most commercial companies. For these companies, resistance or susceptibility is usually on an unselected basis unless some of the breeding and testing work is done in the lower Colorado river area. Consequently many of the commercial hybrids are heterogeneous for resistance to this root rot.

One hundred seventy commercial hybrids from 14 companies were evaluated in 1980 for degree of resistance to this root rot. The test plots were planted at Yuma, Arizona in moisture on August 26 and 27 in two replications. The results are presented in the following table. There was considerable variation among hybrids as to the portion of plants within the test population that were resistant or susceptible. This variation came from the variable amounts of genetic resistance within breeding materials used to produce the different hybrids.

The phenotypic response of each of the commercial hybrids tested has been graded as an A, B, C or D. These responses are described as follows:

- A: All plants appeared to be resistant and exhibiting healthy growth. No diseased plants evident in the test population.
- B: Most all plants appeared to be resistant and exhibiting healthy growth but a few plants exhibited slight disease symptoms and somewhat reduced growth.
- C: Half to less than half of the plants were resistant with healthy growth. The remaining half or more ranged from slightly diseased to dead, having died in the late seedling stage.
- D: No resistant or healthy plants evident in test population. All plants were dead or dying.

A farmer could grow a commercial grain hybrid with an A or B response with no problem from this disease. Those entries with a C rating would likely give considerable loss of yield if the disease is prevalent during the growth of the crop. Those entries with a D rating would likely give a complete loss of yield if the disease is prevalent during the growth of the crop.

Five entries received an A rating, 5 a B rating, 105 a C rating, and 55 a D rating. Only about 6 percent (10 entries) of the entries tested possessed a high degree of resistance to this root rot. Ninety-four percent (160 entries) showed considerable susceptibility.

Table 1. Phenotypic Response Ratings of 170 Commercial Hybrid Grain Sorghums to The Yuma Root Rot.

Table No.	Commercial Hybrid	Phenotypic Response Rating	Table No.	Commercial Hybrid	Phenotypic Response Rating
1	Asgrow Bug Off	C	56	Frontier Super 412A	C
2	" Bug Off E	C	57	Funks 393	C
3	" Capitan	C	58	" 399	D
4	" Dorado	C	59	" 404	D
5	" Dorado E	C	60	" 499GBR	D
6	" Dorado M	C	61	" 520GBR	C
7	" Double TX	C	62	" 522DR	C
8	" Topaz	C	63	" 623GBR	C
9	DeKalb A25	D	64	" G251	D
10	" A25a	C	65	" G522	C
11	" A28+	C	66	" G701GBR	D
12	" B35	B	67	" G766W	D
13	" B38+	C	68	" HW3903	D
14	" B39y+	B	69	GSA 1180	C
15	" BR54	C	70	" 1210A	C
16	" BR54+	A	71	" 1310	C
17	" BR64	C	72	" 1320Y	C
18	" BR65+	C	73	" Little Joe A	C
19	" C42a	C	74	" L141	C
20	" C42y	C	75	" M125	C
21	" C42y+	C	76	" ML134	C
22	" C43y	C	77	" ML135	C
23	" C43y+	D	78	Northrup King 121	C
24	" C46	D	79	" " 125	C
25	" C46+	C	80	" " 129	D
26	" C48a	A	81	" " 180	C
27	" D42	C	82	" " 222	D
28	" D42a	C	83	" " 233	C
29	" D42y+	B	84	" " 265	D
30	" D54	D	85	" " 266	C
31	" D55	D	86	" " 279	C
32	" D58	A	87	" " 280	D
33	" D59+	C	88	" " 1580	C
34	" D60	B	89	" " 2778	D
35	" DD50+	D	90	" " 2779	C
36	" E57b+	D	91	" " 2884	C
37	" E59	C	92	" " MM52	D
38	" F61	D	93	" " SAVANNA 4	D
39	" F64	D	94	NC+ 54X	C
40	" F67	D	95	" 161	D
41	DeKalb F68	D	96	" 162	C
42	Excel 808	C	97	" 168	C
43	Ferry Morse (Advance) 14	C	98	" 169	C
44	" " " 19-22	D	99	" 170	C
45	" " " 53A	C	100	" 171	C
46	" " " 80	C	101	" 172	C
47	" " " 82	C	102	" 173	C
48	" " " 7403	D	103	P-A-G 3387	C
49	" " " AMAK R10	D	104	" 4432	D
50	" " " AMAK R12	D	105	" 4474	C
51	Frontier 385	C	106	" 4488	C
52	" 389	C	107	" 5504	D
53	" 399	D	108	" 5514	D
54	" Super 400A	D	109	" 6658	C
55	" Super 400C	D	110	" 6662	C

Table 1. Continued.

Table No.	Commercial Hybrid	Phenotypic Response Rating	Table No.	Commercial Hybrid	Phenotypic Response Rating
111	Paymaster GR 108	C	166	Taylor Evans Grainmaster A	D
112	" GR 1018	D	167	" " Grainmaster R	D
113	" GR 1019	C	168	" " Hondo	C
114	" GR 1028	C	169	" " Tops	C
115	" GR 1089	C	170	" " Total R	C
116	" R 109A	C			
117	" R 920	D			
118	" R 1014	D			
119	" R 1029A	C			
120	" R 1090	C			
121	Pioneer 820	C			
122	" 828	C			
123	" 866	D			
124	" 878	D			
125	" 883	D			
126	" 894	D			
127	" 8199	C			
128	" 8272	C			
129	" 8283	A			
130	" 8311	C			
131	" 8324	D			
132	" 8451	C			
133	" 8454	C			
134	" 8475	C			
135	" 8501	C			
136	" 8585	C			
137	" 8592	C			
138	" 8626	C			
139	" 8712	D			
140	" 8914	D			
141	" B815	A			
142	" B877	C			
143	Ring Around (Excel) 202	D			
144	" " " 230	C			
145	" " " 433	D			
146	" " " 733gb	B			
147	" " " 747	C			
148	" " " 808	C			
149	" " " 808gb	C			
150	" " " 811A	C			
151	" " " 811Agb	C			
152	" " " Bg68gb	C			
153	Taylor Evans 66	D			
154	" " 66B	D			
155	" " 77A	C			
156	" " 88A	C			
157	" " 111	C			
158	" " Y44R	D			
159	" " Y45	C			
160	" " Y101	C			
161	" " Y101D	C			
162	" " Y101R	C			
163	" " Bird A Boo II	D			
164	" " Champ	D			
165	" " Dinero	C			