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CHINCH BUG RESISTANCE IN COMMERCIAL GRAIN AND FORAGE SORGHUM HYBRIDS

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Chinch bugs constitute a limiting factor to sorghum production in some areas. In recent years, growers in central and eastern Kansas, southeastern Nebraska, western Missouri, and parts of Oklahoma have lost millions of dollars from chinch bug damage. The majority of these losses have been due to severe early season stand reductions resulting from nymphal migration from maturing wheat fields to adjacent or nearby fields of young sorghum. In addition, mid-summer infestations from second generation chinch bug populations have caused damage and yield reduction.

From many interested growers we receive questions, some prompted by seed company advertisements, about chinch bug resistance in commercial grain and forage-sorghum hybrids. During the last 4 years we have tested a few commercial grain and forage-sorghum hybrids to determine if there are significant differences in chinch bug resistance among hybrids currently available. We designed these tests in two ways: (1) to compare yield and damage of hybrids in sprayed with those in nonsprayed field plots; and (2) to compare yield and/or damage in unsprayed field plots. In addition, chinch bug damage ratings were made on the Republic County Grain Sorghum Performance Tests in 1979 and 1980 and on Riley County Forage Performance Tests in 1978 and 1981.

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Two studies conducted in 1979 with a small number of grain sorghum hybrids suggested that they do differ in their response to chinch bugs. Yield loss in one test ranged from 6 to 43% (Table 1) and the damage rating ranged from 2.0 to 4.7 in the second (Table 2). Similar differences were noted in two 1981 grain sorghum tests in which the yield loss ranged from 8 to 79% in one test (Table 3) and the percentage of plant survival ranged from 16.4 to 80.7 in another (Table 4).

Our studies indicate that there are differences in chinch bug damage among different hybrids but that considerable variation is present; they also reveal some environmental effects on the expression of resistance. A hybrid may be low in damage in one test (but not significantly lower than damage on several other hybrids) and moderately high in damage in another test. We have found that hybrids with Kafir parents tend to have more resistance to chinch bugs than other hybrids do. Also, some hybrids are quite susceptible to chinch bugs and the risk of severe loss in yield is greater in the fields where those hybrids are planted if severe chinch bug pressure develops. The resistance that is present in hybrids currently grown extensively is useful primarily against mid-season infestations and is not high enough to prevent damage in small seedlings subject to heavy infestations. Therefore, a planting time or rescue insecticide treatment should be used to provide maximum protection to plants during their early stages of growth. Our tests do show that when treated with insecticides, lines with some chinch bug resistance withstand attack better than do more susceptible lines (Table 5).

We suggest that a grower use this information in combination with two or three years sorghum performance data (available from the Experiment Station or County Extension Office) that are most nearly applicable to one's own farm. This information should be carefully

studied to determine the following: (1) which hybrids show the least damage but yield best under the impact of chinch bug infestations; and (2) if chinch bugs failed to develop, which hybrids yield best under chinch bug-free conditions.

We are currently involved in a search for new and better sources of resistance and have identified some lines that may be useful in further reducing losses caused by chinch bugs.

Table 2. Stunt rating and grain yields in sorghum hybrid plots infested with chinch bugs, Manhattan, KS. 1979.

Company	Hybrid	Stunt Rating ^{a/b}	Grain wt. ^b lb/plot
Funk	HW 2124 Exp.	2.0 d	3.45 ab
Funk	G 642	2.0 d	3.48 ab
Prairie Valley	599	2.1 d	4.05 a
Pioneer	8324	2.2 d	3.43 ab
Pioneer	8585	2.8 cd	2.95 ab
Prairie Valley	708	3.0 cd	3.95 a
Prairie Valley	530	3.3 bc	2.95 ab
Funk	G 550	4.0 ab	2.12 ab
NC +	170	4.1 ab	1.68 b
Dekalb	DK 61	4.3 a	2.10 ab
Funk	G 404	4.6 a	2.12 ab
PAG	4488	4.7 a	1.63 b

^a 0—no plants stunted; 5 = 81-100% stunted.

^b Means with same letter in the vertical column are not significantly different at the 5% level.

Table 3. Grain yield, stunting, and plant survival in hybrid sorghum plots protected and unprotected from chinch bugs, Manhattan, KS 1981.

Company	Hybrid	% plant ^a survival	% stunted ^a plants	Bu/A at 12.5%		Yield loss%
				No chinch bugs	Chinch bugs present	
Funk	G 404	21.8 d	74.0 a	149	31	79*
NK	2778	50.8 c	41.8 b	146	68	53*
Funk	G 550	59.5 bc	39.5 b	145	87	40*
NC +	271	69.5 ab	13.5 c	141	99	30*
Funk	HW 2319 Exp.	80.5 a	10.0 c	131	109	17NS
Dekalb	DK 61	50.5 c	53.8 b	136	68	50*
PAG	4433	27.8 d	76.3 a	122	30	75*
Funk	G 642	78.3 a	7.5 c	118	109	8NS

^a Means followed by the same letter in the vertical column are not significantly different at the 5% level.

* Difference between no chinch bugs and chinch bugs present on the same hybrid significantly different at 5% level.

Table 1. Grain yields in sorghum hybrid plots protected and unprotected from chinch bugs, Manhattan, KS. 1979.

Company	Hybrid	Bu/A at 12.5% ^a		Yield loss%
		No chinch bugs	Chinch bugs present	
Pioneer	8324	161.7 a	125.4 bcde	24*
Funk	G 623	130.9 bcde	121.9 cdef	8 NS
Funk	G 522	134.0 bcde	105.1 f	22*
Funk	G 404	119.5 def	67.7 g	43*
Funk	2124 Exp.	135.4 bcd	127.4 bcde	6 NS
Dekalb	DK 61	136.0 bcd	115.3 ef	15*
Funk	G 550	141.6 b	122.1 bcdef	14*
NC +	170	140.9 bc	124.3 bcdef	12 NS

^a Means followed by the same letter in the vertical column are not significantly different at the 5% level.

* Difference between no chinch bugs and chinch bugs present on the same hybrid significantly different at 5% level.

Table 4. Stunt rating and percentage of plant survival in sorghum hybrid plots infested with chinch bugs. Manhattan, KS 1981.

Hybrid	% survival ^a	% stunted plants ^a
AG 4433	16.4 h	91.1 a
Funk HW 5227	29.0 gh	89.4 a
Golden Acres Dinero R	53.9 de	84.1 ab
O's Gold GS 712	52.6 de	82.9 abc
Funk G404	36.4 fg	80.7 abc
Grower's GSA 1310A	64.7 cde	71.7 bcd
NK 2778	62.7 cde	67.0 cde
Funk G550	67.7 abcde	59.4 def
Dekalb DK 61	62.6 de	59.3 def
Funk HW 5229	50.4 ef	58.9 def
Prairie Valley 734	65.0 cde	58.4 def
NC + 171	69.0 abcd	55.9 def
Fontanelle G 5537	66.7 bcde	52.6 ef
PAG 801094	70.7 abcd	47.3 fg
NC + 271	70.6 abcd	44.8 fgh
Prairie Valley 599	74.0 abc	44.1 fgh
Funk HW 2306	78.0 abc	42.8 fgh
Funk HW 2124	83.1 ab	35.8 gh
Funk HW 2318	85.6 a	34.0 gh
Funk G 642	80.7 abc	29.0 h

^a Means with the same letter in the vertical column are not significantly different at the 5% level.

Table 5. Plant stand of chinch bug resistant and susceptible sorghum lines treated with insecticide at planting.

Treatment	% plant survival
Resistant line + insecticide	81
Susceptible line + insecticide	21
Resistant line + No insecticide	20
Susceptible line + No insecticide	4

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