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1976 Grain Sorghum Performance Trials

Circular 216
January 1977



Plant Science Department
Agricultural Experiment Station
South Dakota State University
Brookings

1976 Grain Sorghum Performance Trials

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The relative performance of grain sorghum hybrids grown under similar environmental conditions is evaluated in this report for the 1976 season. Performance records of the hybrids harvested in 1976 and available two-, three-, four-, and five-year averages are presented. The trials were conducted under the Plant Science Department program in Crop Performance Testing, Agricultural Experiment Station, South Dakota State University.

Location of the 1976 Trials

For adequate performance evaluation, the various entries must be grown under similar environmental conditions. Crop adaptation areas in which the trials are conducted are based upon soil type, elevations, temperature, rainfall and other physical differences. A change in the Area B2 location was to be initiated in 1976 but the trial was never seeded. The farmer-cooperator near Harrold did not seed this crop because of the drouth and lack of surface and subsoil moisture. The exact location of the trials and dates of seeding and harvesting are included in Table 1. Data from soil samples taken at the various sites at seeding time and cultural practices are shown in Table 2.

Weather and Climatic Conditions

Climatic data (Table 3) for the 1976 grain sorghum year, May-September, are based upon U.S. Monthly Climatological Data. Weather information from the immediate Geddes and Letcher sites is not available. At Geddes it was hot and dry most of the summer and hail in early August caused damage to the crop. The Geddes and Kennebec trial yields were so variable that results are not valid and thus omitted from this report. The trial site near Letcher did not receive appreciable amounts of moisture and was in an area of the state with above normal temperatures most of the summer.

Rainfall during May was quite limited. Seeding was delayed at Kennebec, hoping for more rain, and because of the lack of spring moisture, germination was uneven at Brookings, Letcher and Redfield. Only at Centerville was the soil moisture adequate for nearly uniform germination.

Drouth prevented or delayed heading of late entries at most sites. Drouth plus the increased heat also hastened heading of early varieties at other locations. At Brookings and Centerville the temperatures actually averaged below normal in May and September. Despite the fact that nearly half the days in July and August

The assistance of the following individuals is acknowledged: G. W. Erion, A. O. Lunden and Q. S. Kingsley of the Plant Science Department; Station personnel Joe Giles, Burton Lawrensen, Herb Lund, Lucian Edler, Robert Morris and Mike Volek; and farmer-cooperators William Fijala, Harlan Halverson and Oscar Thompson.

Table 1. Location of Trials and Dates of Seeding and Harvesting of Grain Sorghum Performance Trials, South Dakota, 1976

County	Location and Post Office	Row Spacing	Date	
			Seeded	Harvested
Aurora	Oscar Thompson Farm, Letcher	36"	May 20	Sept. 23
Brookings	Plant Science Farm, Brookings	36"	May 25	Sept. 27
Charles Mix	William Fijala Farm, Geddes	40"	May 20	Sept. 30
Clay	Southeast Experiment Farm, Beresford	36"	May 21	Oct. 1
Lyman	Harlan Halvorson Farm, Kennebec	40"	June 2	Sept. 23
Spink	James Valley Research Farm, Redfield	36"	May 18	Sept. 29

reached 90° or higher the monthly departures from the long time averages of these two stations were not much above normal. Temperatures at Kennebec were above normal for the entire period, averaging over 5 degrees above normal for all months, May-September. The Kennebec site did not receive the rainfall recorded at the reporting station.

Drouth injury was increased because of long periods of high temperatures of 90° or more in June, July and August (Table 3). Some entries at Geddes, Kennebec and Letcher failed to head and in others heads emerged only to have pollination and seed set so poor that the variability was high within plots and between replications of the same entry. Hail damage at Geddes was most damaging to the early maturing varieties and actually knocked kernels loose from the heads.

The first frost did not occur over much of the grain sorghum production area of the state until late September or early October. A killing freeze did not occur until mid-October and allowed some filling of heads to continue. Lodging occurred in varying amounts at several locations. Some of the lodging occurred because the stalks dried up or were weakened by the drouth induced stresses. All of the research plots and most of the farm fields of grain sorghum were harvested before a killing freeze could weaken stalks late in the fall.

The stage of growth at the time the periods of hot, dry weather had varying effects on grain quality, test weights and varietal response.

Hybrid Entry Procedure

Grain sorghum offered for sale in South Dakota or being produced for distribution in 1977 were eligible for entry. A closed-pedigree hybrid was entered by the permanent

Table 2. Soil Classification and Laboratory Analysis of Soil Samples Taken Prior to Seeding, and Field Preparation for the Crop Year

County and crop adaptation area	Soil classification	Laboratory analysis				Field preparation			
		Org. mat. %	P	K	pH	Method	lb/A		
			lbs/A					N	P
Hughes, B2	Raber-Cavo SiL	2.5	22	840	6.5	Not seeded, too dry			
Lyman, B3	Pierre clay	3.1	16	1000+	7.4	Chisel plow, disc and harrow			
Aurora, C1	Hou.Prospers SiL	2.5	30	640	5.9	Field cult, disc and harrow			
Spink, C1-irr.	Beotia SiCl	3.0	61	720	7.1	Plowed, disced & harrow		100-40-0	
Charles Mix, C2	Highmore SiCl	3.3	140	1000	6.8	Manure, plowed and disced			
Brookings, D3	Lismore SiL	3.1	29	380	6.5	Disced and harrowed (soybeans)			
Clay, E	Egan SiCl	3.1	25	430	6.7	Plowed, disced & harrowed		60-30-0	

Table 3. Temperature and Precipitation Data for the 1976 Grain Sorghum Growing Season in South Dakota

Location and District	Month	Temperature, degrees F				Precipitation, inches			
		Mean Av.	Departure from normal	Av. departure	Days 90°+	Month total	Departure from normal	Total departure	
Brookings ^a 2 NE	May	54.2	- 2.0		--	0.43	- 2.77		
	June	67.8	2.1		2	2.68	- 1.90		
	July	73.1	2.0		11	1.51	- 1.33		
	D3	Aug.	71.4	1.8		11	2.02	- 0.84	
	Sept.	58.9	- 0.1	+ 0.8	3	<u>1.45</u>	- 1.23	- 8.07	
		First frost 27° - Sept. 23				<u>8.09</u>			
Centerville 6 SE	May	56.8	- 3.9		1	1.96	- 1.52		
	June	70.3	0.1		8	1.31	- 3.39		
	July	75.4	0.1		15	1.79	- 1.32		
	E	Aug.	73.6	- 0.3		17	1.05	- 1.99	
	Sept.	62.0	- 1.7	- 1.1	4	<u>1.14</u>	- 1.54	- 9.76	
		First frost 26° - Sept. 30				<u>7.25</u>			
Kennebec B3	May	59.9	1.8		--	1.13	- 1.56		
	June	75.0	7.5		18	0.17	- 3.36		
	July	80.9	6.0		24	3.84	+ 1.79		
	Aug.	80.4	6.5		24	0.17	- 2.17		
	Sept.	66.6	3.9	+ 5.1	12	<u>0.81</u>	- 0.71	- 6.01	
		First frost 27° - Sept. 28				<u>6.12</u>			
Redfield 6E	May	55.5	b		--	0.53	b		
	June	70.4			11	3.72			
	July	75.3			17	1.41			
	C1	Aug.	75.5			18	0.54		
	Sept.	61.2			5	<u>1.76</u>			
		First frost 26° - Sept. 23				<u>7.96</u>			

a - Based upon reports of Monthly Climatological Data, National Weather Service, Ashville, NC.

b - Departures are figured from 30 years data. This station has not been in operation for that long a period.

name and number under which it was sold by the parent company only. All entries maintained minimum laboratory germination of 80% as required by South Dakota Certification Standards. A nominal fee was charged for each entry in each area, except for grain sorghum entries developed by State and Federal Experiment Stations and entered by the South Dakota Agricultural Experiment Station.

Experimental Procedure

Each trial consisted of four or five replications. Plots of individual entries were randomly located within each replication. All trials were seeded two rows at a time, with 31-cell cone-planters mounted above flexi-planter units. A recommended herbicide for control of grassy weeds and an insecticide for greenbug control were banded over the row at time of seeding. The various row spacings used are indicated in Table 1. The plots were two rows wide; plot lengths were dependent upon the area available at the various locations.

The harvested grain was taken from two 10-foot sections of each row in each individual plot. The heads were bagged at harvest, tagged and tied, and returned to Brookings for drying and remained there for several weeks. Yields were calculated on the basis of pounds per acre (multiply by 1.121 for kg/ha). Depending upon location, either three or four replications were harvested for yield determination and one replication left for observational purposes.

Moisture determinations were made at time of normal date of killing frost are generally more reliable and informative than determinations made at harvest time. Generally, these figures and test weight of the harvested grain indicate more realistically the relative maturity of the grain. Moisture percentages given for 1976 vary widely since stress during the season delayed growth and maturity of some entries.

Moisture samples were taken from all available observation plots at all locations during the period of September 16 to 21. Ten to twelve heads, adequate for a 400-500 gram grain sample, were cut from each entry, placed in a polyethylene bag, tagged and sealed tightly. The samples were threshed and cleaned, and moisture percentages were determined with an electronic moisture meter. The upper limit of the meter is 35%. Material above this level is indicated as 35.+ in the tables and would normally indicate hybrids of late maturity for that area.

The extended periods of stress and hot weather either hastened or delayed maturity of some hybrids at all locations. Some trials did rather well in spite of higher temperatures and limited precipitation. The trials at Brookings received timely precipitation and together with some subsoil reserves produced satisfactory yields. In spite of a granular application at seeding for greenbug control, a large buildup occurred in early August and the plots were sprayed to control the insects at the Brookings site.

The Redfield trials were to be irrigated but received only one application of water. The river source became so low that all pumping was halted in mid-July because of prior domestic use water permits down the river. Total supplemental water was approximately 2 inches applied in early July.

Measurements of Performance

Variations in soil fertility, slope or stand may cause varieties of equal potential to yield differently. Mathematical determinations were made to determine if yield differences were caused by variations in environment or were true varietal differences. Small yield differences have no significance.

Yields for 1976 and other agronomic data are reported in Tables 4 through 7 for the Brookings, Centerville, Letcher and Redfield sites. Trials at Geddes and Kennebec are not reported. Yields were moderately good only at Brookings and Redfield but well below average at all other locations. Two to five-year averages are reported in Tables 5, 8 and 9.

Bird damage was not serious at any location in 1976. Plots were quite distant from trees and brush where possible or were included in larger fields to distribute the losses from picking over a much larger area.

Discussion of Results

Brookings yields were nearly average due to subsoil reserves from snow melt of the 1975-76 winter but the other dryland site yields ranged from no grain to well below average. The five-year averages at Brookings are not included because the 1975 yield results were voided by differential herbicide injury.

The subsoil reserve from past years irrigations, one irrigation in 1976 and timely rain showers were all contributors to the encouraging results found in the data from Redfield. The later maturing varieties were able to withstand the heat and produce the better yields. The earlier maturing varieties had good quality and low moisture but the yield potential was not available to exceed accepted genetic limits of certain maturity levels.

Many entries at Geddes and most entries at Kennebec failed to germinate and/or later failed to emerge from the boot so the yields ranged from no grain to only several hundred pounds per acre. Variability was widespread so these test plot results are not included.

CROP ADAPTATION AREAS

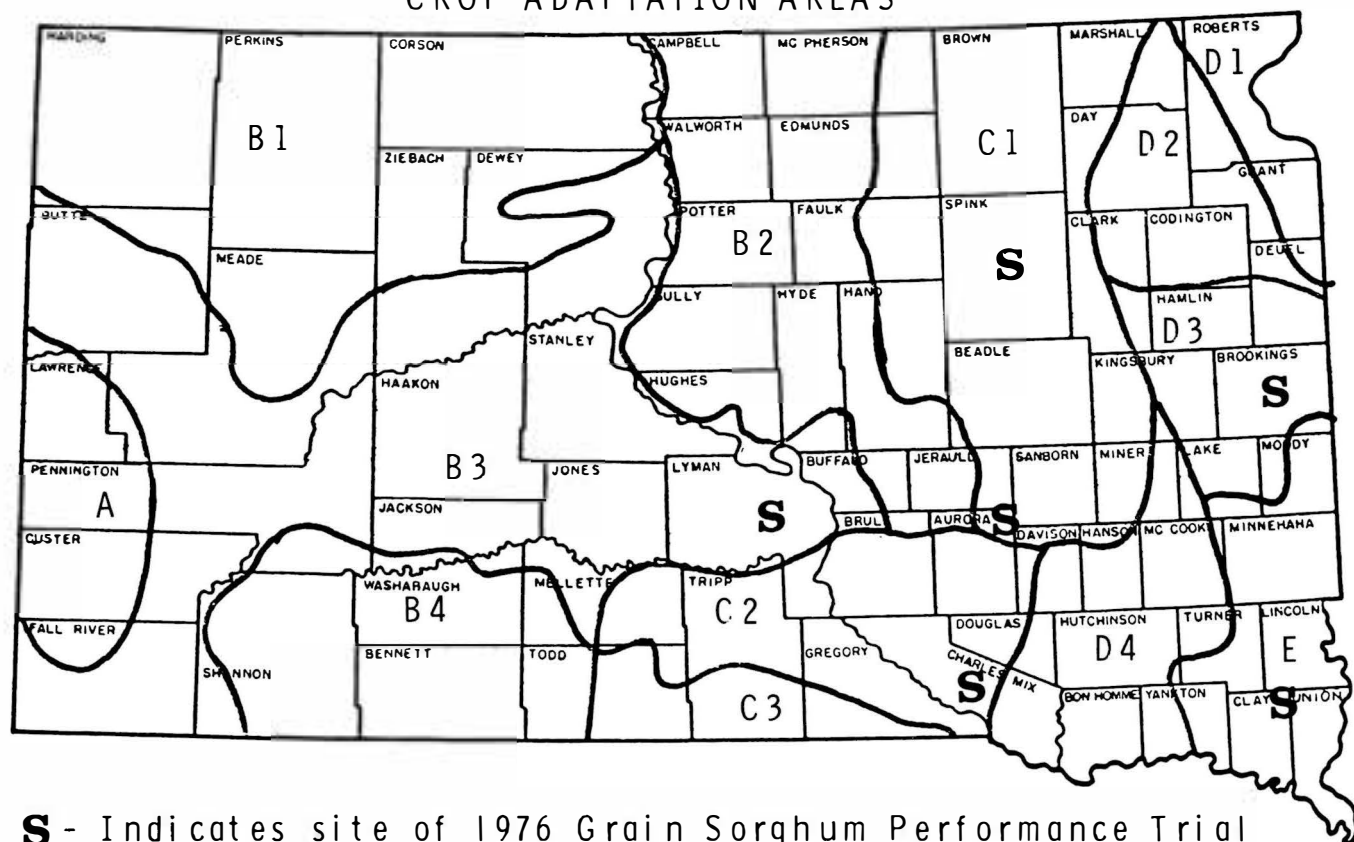


Table 4. 1976 Grain Sorghum Performance Trial, Area D3, Plant Science Farm, Brookings, Brookings County, SD

Brand & Variety	Yield, lb/A	Test Wt., lb/B	Height, inches	Stalk Lodging, percent	Percent Moisture, 9/21/76	Date Headed
Northrup-King NK 180	5605	58	41	10	19.1	7/28
Northrup-King X3171	4875	58	37	10	17.3	7/31
Funks G-404	4690	52	28	0	23.3	8/8
Northrup-King NK 129	4670	59	42	10	20.0	7/22
SDAES RS 610	4590	57	41	13	22.0	8/1
ACCO R1014	4515	55	34	27	21.8	8/3
Funks G-393	4490	58	36	0	15.7	7/30
SDAES RS 506	4480	57	44	33	18.5	7/25
SDAES RS 503	4470	58	45	10	23.3	7/26
Warner W-601	4430	58	37	10	17.3	7/30
Warner W-561	4400	55	36	10	24.5	8/4
P-A-G 354	4340	58	34	0	15.7	7/28
Trojan M56	4335	57	37	10	33.9	8/13
Trojan M55	4300	57	38	37	21.9	8/6
P-A-G 269	4255	58	39	0	13.9	7/23
Funks G-251	4220	59	33	0	16.2	7/23
Trojan M54	4175	59	35	10	19.6	8/2
Western WS 201	4175	58	36	10	12.6	7/23
Northrup-King NK 121	4160	57	37	0	13.7	7/22
SDAES SD 75001	4155	56	37	23	14.0	7/20
Funks G-520GBR	4130	57	40	17	31.6	8/5
Warner W-55	4110	56	33	0	17.4	8/1
ACCO R920	4025	56	36	13	13.9	7/22
Warner W-501	3965	56	39	0	14.1	7/21
P-A-G 4432	3755	57	34	15	21.5	8/6
SDAES SD 75002	3655	55	38	10	18.6	7/24
SDAES SD 75005	3485	56	38	20	14.5	7/20
SDAES SD 75004	3480	56	39	30	13.9	7/19
SDAES Expt1.	3425	55	40	20	14.4	7/22
SDAES SD 75006	3170	56	35	10	16.6	7/20
SDAES SD 106	3020	54	35	20	14.5	7/22
SDAES SD 75003	2740	56	35	27	14.9	7/19
Mean	4135					

LSD - .05 850

C.V. - 12.7%

Table 5. 1976 Grain Sorghum Performance Trial, Area C1, Oscar Thompson Farm, Letcher, Aurora County, SD

Brand & Variety	Height, inches	Stalk Lodging, percent	Percent Moisture, 9/20/76	Test Wt., lb/B	Yield, lb/A		
					1976	1974-76	1975-76
SDAES RS 610	32	0	19.7	53	1810	1685	2030
DeKalb B-35	33	0	20.4	56	1635		
Surgro YE-70	31	0	14.6	56	1605		
DeKalb B-38	32	0	16.4	57	1580		
Pride P 500A	34	23	15.6	54	1555	1695	2045
Pride P 570	31	5	15.9	56	1535	1740	1945
Surgro YE-80	31	0	17.9	56	1530		
DeKalb A-25a	27	0	15.9	55	1525		2200
Warner W-55	27	0	15.5	51	1520		
Trojan M54	34	0	15.9	56	1495		
ACCO R 1014	31	0	18.3	54	1480		2400
Warner W-601	32	0	16.2	55	1455		
SDAES RS 506	37	27	16.1	55	1440	1645	1900
Trojan M55	31	0	18.7	55	1400		
Trojan M51	32	0	16.0	56	1380		
SDAES SD 75003	35	10	15.4	54	1380		
SDAES Expt1.	35	0	15.4	54	1345		
Cenex 300	31	0	16.4	56	1335		
Funks G-251	33	0	15.1	56	1320	1265	1665
ACCO R 920	32	20	15.1	55	1300	1480	1725
Cenex 221	35	5	15.3	55	1295		
Funks G-393	32	0	15.4	56	1280	1540	1950
Northrup-King NK 121	33	0	14.5	56	1265		
Frontier Super 400A	30	0	17.4	53	1260		
Frontier 401-R	33	0	18.3	55	1235		
Western WS 201	34	5	14.9	55	1210		1660
Cenex 333	28	0	18.5	54	1195		
Northrup-King NK MM52	28	0	15.0	55	1165		
SDAES SD 75001	36	0	15.6	53	1145		
Warner W-501	34	10	15.6	55	1065		
Funks G-404	25	0	21.1	51	1050		
SDAES SD 106	32	0	15.8	51	980	1185	1310
Frontier 402-R	31	0	31.8	58	950		
SDAES SD 75006	32	0	15.6	53	930		
				Mean	1345		

C.V. - 27.1%

LSD - .05

N.S.

Table 6. 1976 Grain Sorghum Performance Trial, Area E, Southeast Experiment Farm, Centerville, Clay County, SD

Brand & Variety	Yield, lb/A	Test Wt., lb/B	Height, inches	Percent Moisture, 9/16/76	Date Headed
Funks G-404	4155	54	30	30.0	8/1
DeKalb B-35	3800	59	34	23.4	7/27
DeKalb C-42A+	3585	58	30	28.8	8/1
Trojan M55	3565	56	33	27.4	8/4
Warner W-561	3560	57	31	27.4	7/31
Northrup-King X3171	3505	59	29	19.5	7/27
Trojan M54	3450	59	34	24.5	7/29
ACCO R1019	3435	58	30	23.7	8/4
Funks G-520GBR	3295	59	31	30.9	8/3
SDAES RS 506	3255	58	38	18.3	7/21
Trojan M56	3155	58	29	35.+	8/12
Funks G-393	3135	59	31	22.3	7/28
Northrup-King NK 180	3060	58	32	21.1	7/27
ACCO R1029A	2955	58	29	28.1	8/4
SDAES RS 610	2920	57	29	26.9	7/31
Northrup-King NK 129	2850	59	30	18.7	7/24
Funks G-251	2785	59	29	18.1	7/21
Warner W-601	2770	59	30	18.8	7/29
ACCO R1014	2745	57	27	23.9	8/4
Warner W-55	2715	58	32	17.3	7/19
DeKalb B-38	2620	59	27	21.6	7/26
Warner W-501	2410	57	34	17.8	7/19
SDAES Expt1.	2320	56	34	18.5	7/19
SDAES SD 75005	2275	55	28	17.3	7/18
SDAES SD 75006	2255	55	30	18.4	7/18
SDAES SD 75002	2100	53	30	17.5	7/19
SDAES SD 75001	2040	53	33	16.5	7/16
SDAES SD 75003	1885	55	30	17.9	7/16
SDAES SD 75004	1715	53	33	17.6	7/16
SDAES SD 106	1420	50	27	17.7	7/16
Mean	2860				

LSD - .05 1045

C.V. - 22.5%

Table 7. 1976 Grain Sorghum Performance Trial, Area C1 (irrigated), James Valley Research and Extension Center, Redfield, Spink County, SD

Brand & Variety	Yield, lb/A	Test Wt., lb/B	Height, inches	Percent Moisture, 9/21/76	Date Headed
Northrup-King NK 180	6395	58	46	15.8	7/31
ACCO R1019	6145	56	42	26.1	8/6
Asgrow Dorado E	6135	59	44	22.4	7/30
SDAES RS 610	5825	55	48	24.0	8/3
Pride P570	5795	58	45	15.8	7/29
Northrup-King X3171	5765	58	43	19.9	7/30
Funks G-393	5650	57	44	18.7	7/31
Funks G-520GBR	5520	57	47	32.3	8/7
SDAES RS 506	5380	56	51	15.9	7/24
ACCO R1014	5380	55	42	23.7	8/2
Northrup-King NK 233A	5230	59	44	19.7	8/2
Funks G-404	5220	51	35	33.0	8/9
Northrup-King NK 129	5125	59	47	19.6	7/29
Asgrow H6944A	5025	55	39	24.6	8/3
Western WS 201	4965	55	43	14.7	7/21
ACCO R920	4655	55	44	20.7	7/22
Warner W-501	4545	54	47	14.2	7/17
Pride P500A	4540	55	48	16.9	7/24
SDAES SD 75003	4295	55	41	17.7	7/16
SDAES SD 75005	4295	54	42	16.4	7/18
P-A-G 269	4050	57	42	14.6	7/18
Funks G-251	3930	57	36	16.7	7/26
SDAES SD 75004	3840	55	43	16.6	7/15
SDAES Expt1.	3740	55	47	15.3	7/21
SDAES SD 106	3350	55	38	14.2	7/21
SDAES SD 75001	3035	55	41	20.5	7/16
Mean	4955				

LSD - .05 1010

C.V. - 12.5%

Table 8. Two-, Three-, Four-, and Five-Year Average Yields of Grain Sorghum Hybrids Entered at Centerville, SD, 1972-1976

Brand & Variety	Average yields, pounds per acre			
	1972-76	1973-76	1974-76	1975-76
ACCO R 1014		3545	3135	2495
ACCO R 1019	4905	4280	3890	3350
ACCO R 1029A				2995
DeKalb B-35			3615	3135
DeKalb C-42A+	5035	4540	3845	3485
Funks G-251			2895	2155
Funks G-393			4185	2610
Northrup-King NK 180	4730	4070	3610	3080
SDAES SD 106		2985	2375	1640
SDAES RS 506	4620	3895	3380	2650
SDAES RS 610	4580	3885	3360	2620
Warner W-55			3060	2465
Warner W-561			3660	3000
Warner W-601				2465

Table 9. Two-, Three-, Four-, and Five-Year Average Yields of Grain Sorghum Hybrids Entered at Redfield, SD, 1972-1976

Brand & Variety	Average yields, pounds per acre			
	1972-76	1973-76	1974-76	1975-76
ACCO R 920	4640	4470	5045	4455
ACCO R 1014		4745	5345	5250
ACCO R 1019	4915	4720	4095	5500
Funks G-251		4065	4595	3910
Funks G-393		4935	5475	5470
Northrup-King NK 129		5015	5560	5065
Northrup-King NK 180				5760
Northrup-King NK 233A	5650	5675	6010	5190
P-A-G 269				3665
Pride P 500A			5510	4520
Pride P 570				5585
SDAES SD 106		3505	3845	3445
SDAES RS 506	4990	4880	5505	5100
SDAES RS 610	4770	4990	5270	5250
Western WS-201				4645

Table 10. Entries Submitted for the 1976 Grain Sorghum Performance Trials and Tables Where Results Appear

Company & Brand	Variety	Tables	Company & Brand	Variety	Tables
ACCO Seed PO Box 1630 Plainview, TX 79070 "ACCO"	R 920 R 1014 R 1019 R 1029A	4,5,7,9 4,5,6,7,8,9 6,7,8,9 6,8	P-A-G Seeds 1200 Northstar Center Minneapolis, MN 55402 "P-A-G"	269 354 429 4432 X5216 X5323 X60101	4,7,9 4 not reported 4 not reported not reported not reported
Asgrow Seed Co. PO Box 2010 DesMoines, IA 50310 "Asgrow"	Bug Off Dorado E Super Red H 6944A	not reported 7 not reported 7	Pride Company, Inc. Glen Haven, WI 53810 "Pride"	P 500A P 570	5,7,9 5,7,9
Cenex Seeds Box 964 Sioux Falls, SD 57101 "Cenex"	221 300 333	5 5 5	R. C. Young Seed & Grain 624 27th Street Lubbock, TX 79404 "Surgro"	YE-70 YE-80	5 5
DeKalb AgResearch, Inc. Rt. 1, Box 225 Glenvil, NE 68941 "DeKalb"	A-25a B-35 B-38 B-39Y C-42A+	5 5,6,8 5,6 not reported 6,8	Trojan Seed Co. Box 115 Watertown, SD 57201 "Trojan"	M 51 M 54 M 55 M 56	5 4,5,6 4,5,6 4,6
Disco Seeds PO Box 640 Mitchell, SD 57301 "Frontier"	385A 389 Super 400A 401-R 402-R	not reported not reported 5 5 5	Geo. Warner Seed Co. Box 1448 Hereford, TX 79045 "Warner"	W-55 W-501 W-561 W-601	4,5,6,8 4,5,6,7 4,6,8 4,5,6,8
Funks Seeds, Int'l. 719 26th Street Lubbock, TX 79404 "Funks"	G-251 G-393 G-404 G-520GBR	4,5,6,7,8,9 4,5,6,7,8,9 4,5,6,7 4,6,7	Agricultural Experiment Station S. Dak. State Univ. Brookings, SD 57006 "SDAES"	SD 106 SD 503 RS 506 RS 610 SD 75001 SD 75002 SD 75003 SD 75004 SD 75005 SD 75006 Reg. Exptl.	4,5,6,7,8,9 4 4,5,6,7,8,9 4,5,6,7,8,9 4,5,6,7 4,5,6,7 4,6 4,5,6,7 4,6,7 4,6,7 4,5,6 4,5,6,7
Northrup, King & Co. 1500 Jackson St., NE Minneapolis, MN 55413 "NK"	NK 121 NK 129 NK 180 NK 233A NK MM52 NK X3171	4,5 4,6,7,9 4,6,7,8,9 7,9 5 4,6,7			
King's Western Seeds Huron, SD 57350 "Western"	WS-201	4,5,7,9			