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Selecting Sorghum Hybrids for the Wheat-Sorghum-Fallow System in Southwest Kansas

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The wheat-sorghum-fallow system consists of growing wheat and grain sorghum in rotation, with an eleven-month fallow period between crops. Wheat is harvested in late June or early July, sorghum is planted the following June, harvested in October, and wheat is planted the following September. The wheat-sorghum-fallow system is routinely practiced in north central Kansas, but has been slow to move into the dryland wheat area of western Kansas. Wheat farmers have been reluctant to accept the system largely because they feel that there may not be enough soil moisture to grow sorghum after only an eleven-month fallow period. While research thus far at Garden City has shown soil moisture not to be a severely limiting factor, the possibility of yield reductions do exist, in the event of a very dry fallow period followed by inadequate rainfall during the growing season.

With this in mind, an experiment was begun in 1979 using hybrids differing in time to maturity, and

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thus in the amount of water required. The hybrids are also compared in the sorghum-fallow and continuous sorghum systems, in addition to the wheat-sorghum-fallow system. The experiment is scheduled to continue for several more years, and the data presented here are from the first three years of the study. Supplemental data are included from a separate experiment conducted from 1978 to 1980 comparing hybrids in continuous sorghum culture.

Results

Yield data collected from 1979-1981 (GCES #1) are presented in Table 1. Four hybrids were used, ranging in days to half bloom (averaged over the three years) from 57 to 68 days. There was not much difference between the yields of the three latest maturing hybrids in either the wheat-sorghum-fallow or sorghum-fallow systems. All three hybrids out-yielded the earliest hybrid in these two systems. This happened primarily because the combination of subsoil moisture and growing season precipitation was favorable for the longer season hybrids in each year.

Only one year of data is available for continuous sorghum from the GCES #1 experiment. The test area had a severe sandbur problem prior to 1979, so it was fallowed in 1979 and planted in 1980 and 1981. Thus 1981 was the first year for continuous sorghum. Subsoil moisture was extremely limited, with only about 18 inches of the subsoil wet at planting time. The earliest hybrid, Pioneer 8790, yielded more than the latest hybrid, Dekalb E-57+. There were no significant differences between Pioneer 8790 and the remaining two hybrids in the continuous sorghum plots. While the earlier hybrids did not show a yield advantage in the wheat-sorghum-fallow system, perhaps the data from the continuous sorghum system in 1981 can be extrapolated to show what might occur due to extremely dry conditions in wheat-sorghum-fallow.

Further comparisons are made in the GCES #2 experiment, the results of which are presented in Table 2. There were no significant differences between hybrids in two of three years. The results of the remaining year are similar to the GCES #1 experiment, namely the latest maturing hybrid yielded more than the earliest maturing hybrid. An explanation for these results may be seen in Table 3, which gives the amount of water used until bloom for each hybrid. In general, water use increased as the days to bloom increased.

Table 1. Yield of sorghum as affected by hybrid and cropping system 1979-1981 (GCES #1)

		Wheat Sorghum Fallow				Sorghum Fallow				Continuous Sorghum
Hybrid	Days to half bloom	1979	1980	1981	Avg.	1979	1980	1981	Avg.	1981
						-Bu/A-				
Pioneer 8790	57[1]	43	45	53	47	48	43	78	56	48
Dekalb C-42a +	61	56	58	59	58	69	61	87	72	44
Golden Acres TE-Y-101-R	67	55	59	68	61	71	66	84	74	43
Dekalb E-57 +	68	56	61	68	62	67	67	87	74	39
						1979	1980	1981		
		LSD .10	Cropping			NS	NS	8		
			System	Hybrid		3	3	6		

[1] Average over 3 years.

Table 2. Yield of continuous dryland grain sorghum as affected by hybrids differing in time to maturity 1978-1980 (GCES #2).

Hybrid	Days to half bloom	Year 1978	1979	1980	Avg.
			-Bu/A-		
Northrup King MM52	44[1]	47	36	40	41
Pioneer 894	51	52	36	43	44
NC + 55X	53	54	41	43	46
Dekalb C-42a +	58	48	37	43	43
Dekalb E-57 +	65	48	21	41	37
LSD .05		NS	2	NS	

[1] Average over 3 years.

Table 3. Water use of continuous dryland grain sorghum as affected by hybrids differing in time to maturity (GCES #2).

Hybrid	Days to half bloom	Year 1978	1979	1980	Avg.
			-Inches Water Used-[1]		
Northrup King MM52	44[2]	5.21	6.87	4.95	5.68
Pioneer 894	51	7.17	7.55	5.18	6.63
NC + 55X	53	8.57	7.40	6.44	7.47
Dekalb C-42a +	58	9.43	8.07	6.25	7.92
Dekalb E-57 +	65	10.40	7.86	9.27	9.18

[1] Soil moisture plus rainfall used until half bloom.

[2] Average over 3 years.

Conclusions

The results of this study indicate that the same sorghum hybrids can be grown in the sorghum-fallow and wheat-sorghum-fallow systems. However, in the wheat-sorghum-fallow system, following a dry fallow period, it may be advantageous to select a hybrid that matures somewhat earlier. The study will be continued, and this report will be updated if necessary.

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