Grain Sorghum Research in Western Nebraska

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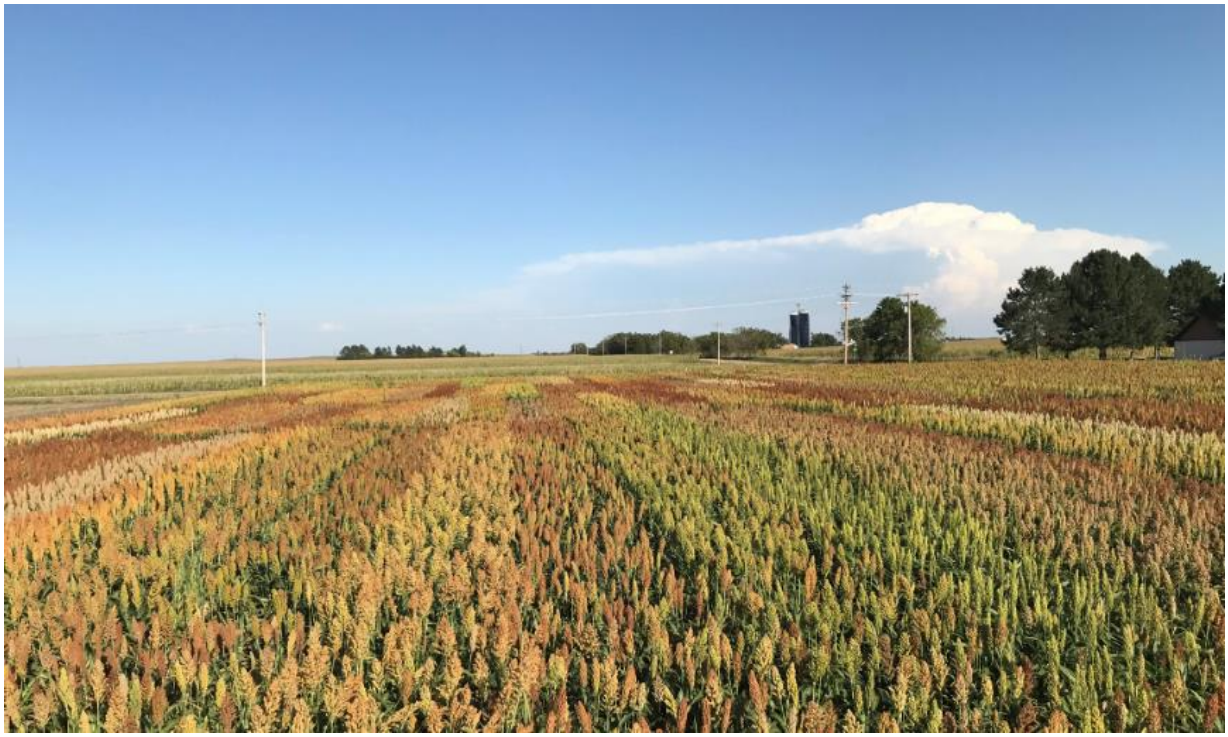

Figure 1. 2019 Grains sorghum variety trial at Henry J. Stumpf International Wheat Center near Grant, NE.

Grain sorghum is a warm-season grassy crop most known for its efficient water use and drought tolerance. It is primarily grown in the southern Great Plains, but recent genetic improvements have made it possible to grow it in cooler climates. Many Nebraska farmers have, therefore, implemented grain sorghum as a complementary part of their dryland crop rotation.

In semiarid western Nebraska, corn is the most prevalent crop in dryland crop rotations, taking up approximately 50% of the planted acres every year. However, research completed on grain sorghum in the central Great Plains region makes a compelling case for grain sorghum. It offers several advantages over corn under certain conditions:

- Better yield under drier or limited irrigation environment (Klocke et al., 2014)
- A 50% higher yield than corn in similar dryland crop rotations (Schlegel et al., 2019).
- Lower cost of production inputs (e.g. price of certified seed).
- Sorghum is a self-pollinated crop; thus, less affected by environmental stresses during pollination.

The disadvantages of grain sorghum compared to corn are mostly related to lower yield in higher rainfall environments, lower grain market price, and fewer marketing opportunities.

Variety testing initiated at Grant, NE

To help western Nebraska farmers identify the best-adapted genetics for grain sorghum in the region, we initiated variety testing at Henry J. Stumpf International Wheat Center near Grant. In addition, we wanted to evaluate the effects of row spacing on sorghum varieties. We evaluated the performance of 24 grain sorghum varieties planted in 15- and 30-inch rows.

Key Takeaways from the Study:

Overall, grain sorghum yielded better in narrow rows. When averaged across all varieties, yield in 15-inch rows was 115 bu/ac, which was 20 bu/ac greater than in 30-inch rows (Table 1). K-State researchers reported a yield benefit of 4 bu/ac with narrow (15-inch) rows as compared to wide (30-inch) rows, especially when yields were above 70 bu/ac (Ciampitti, 2019).

High yields can be achieved in both 15 and 30 inch rows, but 15 inch rows had better yield stability. Although the best performing varieties in both 15- and 30-inch rows achieved a 132 bu/ac yield, the lowest ranked variety in 15- and 30-inch rows yielded 46 bu/ac (86 bu/ac) and 110 bu/ac (22 bu/ac) less, respectively (Table 2).

Variety performance was changed with row spacing. Among 24 varieties evaluated, 16 varieties yielded 10-77 bu/ac better in narrow rows, six varieties had similar yield (± 10 bu/ac) regardless of the row spacing, and only two varieties had at least a 10 bu/ac yield increase in wide rows. In our study, narrow rows yielded better 75% of the time. However, in a similar study, K-State researchers reported that 71% of all the observations yielded better with wider rows.

Each seed company had at least one top performing variety, regardless of the row spacing. In western Nebraska where grain sorghum is not as widespread, increased competition can provide easier access to the good seed and agronomic services.

Avoid varieties with long maturity and lodging issues. Varieties evaluated in this study were early to medium in maturity and 51-67 days to mid-bloom (Table 1). Keep in mind that in our cooler environments, days to mid-bloom can be delayed by as much as 20 days when compared to what is reported by companies. The AS262 from Arrow Seed and two Hoegemeyer varieties (XP4720 and HPT 6064) seemed to be particularly late in their development, which affected their performance. Certain varieties had lodging issues when planted in 30-inch rows (Figure 2). For example, Dyna-Gro M57GB19 lodging was severe in 30-inch rows which caused it to be ranked 21st among 24 varieties evaluated. In 15-inch rows, the same variety was ranked second best.

Conclusion. Grain sorghum has a great potential to be a part of dryland crop rotations in western Nebraska. Although this study was a good start for developing grain sorghum resources for Nebraska growers, we remind growers always to consider multi-year and multi-location data when making important agronomic decisions.

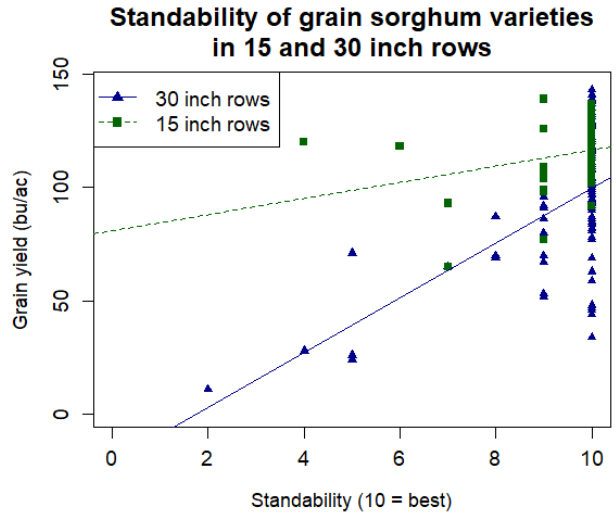

Figure 2. Relationship between yield and standability of grain sorghum varieites evaluated during 2019 growing season at Grant, NE.

Table 1. Yield (bu/ac), performance ranking and variety characteristics of 24 grain sorghum varieties grown in 15 and 30 inch rows at Grant, NE in 2019.

Company	Variety	15 inch rows		30 inch rows		Yield difference (15 vs 30 inch rows)	Variety characteristics				
		Yield (bu/ac)[1]	Rank	Yield (bu/ac)	Rank		Type/class[2]	Grain Color[3]	Plant Color[4]	Relative Maturity[5]	Days to mid-bloom
Arrow seed	AS212	114	13	125	2	-11	C	R	P	E	51
Arrow seed	AS248FG	113	18	95	14	+17	F	W	T	E/M	60
Arrow seed	AS262	86	24	58	22	+28	C	R	P	M	65
Dyna-Gro	M54GR24	123	7	97	12	+26	C	B	P	E	54
Dyna-Gro	M57GB19	128	2	63	21	+66	C	B	P	E	57
Dyna-Gro	M59GB57	118	9	132	1	-13	C	B	P	E	59
Dyna-Gro	M60GB31	117	10	84	19	+33	C	B	P	M	60
Dyna-Gro	M60GB88	113	17	89	16	+24	C	B	P	E/M	60
Dyna-Gro	M62GB77	109	19	94	15	+15	C	B	P	M	62
Golden Acres	2620C	107	20	95	13	+12	C	C	P	ME	58
Golden Acres	2730B	114	14	84	20	+31	C	B	P	ME	59
Golden Acres	2950B	132	1	122	4	+10	C	B	P	ME	58
Hoegemeyer	HPT 6020	124	5	124	3	0	C	R	.	E	62
Hoegemeyer	HPT 6064	99	23	22	24	+77	C	B	.	ME	66
Hoegemeyer	XP4720	106	21	57	23	+49	C	B	.	M	66
Pioneer	86P20	127	3	120	5	+8	C	R	P	E	64
Pioneer	87P10	113	16	85	18	+28	C	R	P	E	63
Pioneer	88P71	115	12	115	7	0	C	R	P	E	62
Sorghum Partners	SP 25C10	117	11	87	17	+30	C	C	P	E	51
Sorghum Partners	SP 31A15	104	22	107	9	-3	C	B	P	E	57
Sorghum Partners	KS310	124	4	105	10	+19	C	B	P	E	57
Sorghum Partners	SP 33S40	114	15	117	6	-3	F	C	T	ME	58
Sorghum Partners	SP 43M80	119	8	114	8	+5	C	B	P	ME	60
Sorghum Partners	SP 68M57	123	6	100	11	+23	C	B	P	ME	67
Average of all varieties		115		95		+20					
Difference at 5% level (LSD)		17		15							
Coefficient of variation (CV)		9		12							

[1] Yield at 56 lbs/bu adjusted to 14% grain moisture

[2] C = comercial hybrid, F= Food hybrid

[3] B=bronze, C=cream, R=red, Y=yellow, W=white, etc.; [4] P=purple, T=Tan

[5] E = early, E/M = early-medium, M = medium, M/L = medium-late, L = late

Table 2. Ranking of grain sorghum varieties by their performanc in 15 and 30 inch rows

Rank	15 inch rows			30 inch rows		
	Company	Variety	Yield (bu/ac)	Company	Variety	Yield (bu/ac)
1	Golden Acres	2950B	132	Dyna-Gro	M59GB57	132
2	Dyna-Gro	M57GB19	128	Arrow seed	AS212	125
3	Pioneer	86P20	127	Hoegemeyer	HPT 6020	124
4	Sorghum Partners	KS310	124	Golden Acres	2950B	122
5	Hoegemeyer	HPT 6020	124	Pioneer	86P20	120
6	Sorghum Partners	SP 68M57	123	Sorghum Partners	SP 33S40	117
7	Dyna-Gro	M54GR24	123	Pioneer	88P71	115
8	Sorghum Partners	SP 43M80	119	Sorghum Partners	SP 43M80	114
9	Dyna-Gro	M59GB57	118	Sorghum Partners	SP 31A15	107
10	Dyna-Gro	M60GB31	117	Sorghum Partners	KS310	105
11	Sorghum Partners	SP 25C10	117	Sorghum Partners	SP 68M57	100
12	Pioneer	88P71	115	Dyna-Gro	M54GR24	97
13	Arrow seed	AS212	114	Golden Acres	2620C	95
14	Golden Acres	2730B	114	Arrow seed	AS248FG	95
15	Sorghum Partners	SP 33S40	114	Dyna-Gro	M62GB77	94
16	Pioneer	87P10	113	Dyna-Gro	M60GB88	89
17	Dyna-Gro	M60GB88	113	Sorghum Partners	SP 25C10	87
18	Arrow seed	AS248FG	113	Pioneer	87P10	85
19	Dyna-Gro	M62GB77	109	Dyna-Gro	M60GB31	84
20	Golden Acres	2620C	107	Golden Acres	2730B	84
21	Hoegemeyer	XP4720	106	Dyna-Gro	M57GB19	63
22	Sorghum Partners	SP 31A15	104	Arrow seed	AS262	58
23	Hoegemeyer	HPT 6064	99	Hoegemeyer	XP4720	57
24	Arrow seed	AS262	86	Hoegemeyer	HPT 6064	22
Difference at 5% level (LSD)			17			15

Trial summary

Site description

- **Soil type:** Kuma silt loam
- **Previous crop:** Wheat (stripper header)
- **Tillage:** no-till
- **Irrigation:** none
- **Rainfall (May to Oct):** 16 inch

Agronomic practices

- **Planting date:** May 17, 2019
- **Harvest date**: Nov 3, 2019
- **Row spacing:** 15 and 30 inch rows
- **Seeding rate:** 65,000 seeds/ac
- **Final population:** ~45,000 plants/ac
- **Herbicide + Fertilizer (Apr 27):**
  - 32 oz Buccaneer 5 + AMS
  - 14 oz Verdict
  - 16 oz Atrazine 4L
  - 29 gal of 32-0-0 (100 lbs N/ac)

References

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