

Nominate the grain sorghum line 13sorg 23 for release to be used for wildlife feed and habit plots, cover crops plantings and for livestock feed and forage.

The development of 13sorg23

Line 13sorg23 is the result of a long term open pollination selection process initiated in 1986 at the CARC. Two "Iowa" bulk populations of sorghum were used in the initial seeding (MSU Dr. Dave Sands was source of the first seed planted). The populations were numbered, but the seed bags were marked 1 and 2. Early on, the amount of seed planted and harvested were similar quantities. It was noted in 1989, and later in 1991 & 1992, seed was produced only on the south facing portion of the head. In excess of 50 phenotypes were observed early on.

Over the years, an effort was made to retain as much variability in head types, glume and seed color, and structure in the population (lines) as possible. Taller plants were eliminated. The earliest heading plants of the various phenotypes were flagged each year and its seed planted the next year. When there was a high potential for a hard frost prior seed dry down, the flagged plants were dug and brought inside to dry down. When the first fall frost was delayed beyond the average date of September 12, the sorghum was harvested at higher moisture to keep selection pressure on for early maturing types. Assumed the immature seed would not be less viable.

In the early 1990s, Arrowhead Mills of Texas, learned of the CARC sorghum effort and sent some of their earliest lines to be evaluated alongside of the Moccasin selections. Over four years of evaluation, no fertile seed was produced by the Arrowhead lines. Freezing temperatures, prior to seed dry down, can result in seed death which frequently happened. 2002 Seed died due to fall freezing. The fall of 2003, seed viability between pre-frost harvested seed and post frost harvested seed was compared. Pre-frost harvest seed had germination levels 84% to 98% and the post frost harvested seed germination ranged from 8% to 70% with a mean of 51%.

By the early 2000s, it became apparent there was an interest, from pheasant hunters and others, in getting a better sorghum for pheasant food plots in Montana. An effort was made to get Winifred FFA to take the sorghum populations on and develop market for wildlife food plots. That four year effort did not pan out. Hail and elk were a factor, plus it was too dry for continuous cropping. Concurrent to Vo-Ag effort, yields were taken at the Moccasin location and some lines were found to produce over 500 lbs per acre at 4300 ft. elevation. Few notations were made on the sorghum plantings in the 2005 to 2010 period. In 2009 and 2010, excess seed was bulked and given to the Montana Fish, Wildlife and Parks to see how it worked in their food plots. In 2010, in cooperation with a Pompeys Pillar farmer, an effort was made to get sufficient seed for wider testing and possibly breeder's seed, for a potential release. When the canal water was shut off, the neighbor's cows came up the canal and ate all of the sorghum. Collections were made from the FWP food plot near Pompeys Pillar and remnant seed from 2004 and 2005 were used to re-establish the selection process. In 2013, the sorghum lines were seeded at NARC-Havre along with an early maturing commercial line, DKS 28, for a check.

The DKS 28 yielded in excess of 4000 lbs of seed per acre at the NARC location along with some of the Moccasin selections and 13Sorg23 produced 3932 lbs of seed per acre. At CARC, DKS 28 produced 11 lbs/a acre of shriveled seed while 13sorg23 produced 389 lbs/a. DKS 28 was not included in the 2014 NARC test. DKS 28 has been planted at the Moccasin as a heading date check since 2005, and typically heads 10 to 18 days later than the Moccasin lines.

Most years, DKS28 does not produce any seed(see photos: 1 & 2). NARC 2014 sorghum yields were down some from the 2013 level and the 13Sorg23 produced 2854 lbs of seed per acre (Table 1). We are confident in that 13Sorg23 will continue to perform well in the future, based on the long development process. While this line is not specifically identified in the Table 2, the 2005 data presented supports the concept that that 13sorg23 will produce modest levels of grain in environments similar to the CARC environment and much higher yields in higher heat unit accumulating areas, such as Hill County.

As a result of the NARC results interest in sorghum is currently high amongst Hill county growers for both grain production and for wildlife food plots. Releasing 13Sorg23 now will enable us to feed this growing interest in grain sorghum. To retain the short season adaptation in 13Sorg23, foundation should be produced at 3800 ft. elevation or higher.

A brief narrative is at the end of this nomination.



Photo: 1



Photo: 2

**Table 1 2013 and 2014 Grain sorghum yield performance at CARC and NARC.
Exp144407,02 Central and Northern Reseach Centers. Moccasin and Havre, Montana**

		2014		2013	Single Ob (48 entries total)			
		CARC	NARC	CARC	2013 NARC	2013 Testwt	2013 Headdate	2013 Plant Ht
		lbs/a	lbs/a	lb/a	lbs/a	lbs/bu	Julian	inches
DKS 28 -05	check	29	n/a	11	4495	55.4	220	41
13SORG12		249		165	2615	57.1	204	45
13SORG13		337		244	4715	57.0	206	52
13SORG19		332		225	3249	56.7	206	40
13SORG22		81	3104	262	2058	57.8	203	47
13SORG23		354	2854	389	3932	57.5	204	37
SRG25		277	2661		4419	57.2	209	37
SRG29		296			4153	56.8	206	35
SRG33		555	2402		3071	58.4	203	42
SRG34		533			2770	57.2	207	37
SRG37		140			1982	56.6	210	55
SRG38		394			3094	57.2	209	51
SRG45		195			1991	59.7	205	46
13SORG01				266	2813	55.7	211	38
13SORG02				292	2650	58.3	202	43
13SORG03				260	2826	56.8	203	37
13SORG04				217	3167	51.6	204	39
13SORG05				242	2920	55.8	201	37
13SORG06				153	2388	55.7	199	38
13SORG07				200	3387	56.9	207	36
13SORG08				198	2526	57.0	204	46
13SORG09				265	1408	56.0	208	41
13SORG10				208	416	52.8	211	30
13SORG11				398	3610	56.7	203	40
13SORG14				224	3369	56.8	202	51
13SORG15				317	2760	54.8	206	52
13SORG16				257	2013	55.2	208	42
13SORG17				254	3331	56.2	211	43
13SORG18				131	1110	56.3	206	43
13SORG20				202	3249	57.2	209	37
13SORG21				147	586	56.4	209	58
Mean		311.8	2755	294.2	2649.9	56.1	206.5	41.3
df		21	3	44				
F ratio		4.046	0.901	1.446	High 4715		early 199	short 30
P value		0.00	0.56	0.14	Low 416		late 211	tall 58
STD DEV (S)		116.3	442.9	94.88				
CV 1		37.3	16.1	40.3				
LSD(0.05by t)		197.4	1408	156.2				

Table 2		2005 Grain Sorghum Yields		
Field SE11 A		On continuous crop following barley.		
Plot	Trial code	Description	Plot wt	Grain Yield
			grams/plot	lbs per ac
101	4475	SorghumSE11	222.1	388
102	4475	SorghumSE11	160.8	281
103	4475	SorghumSE11	9.4	16
104	4475	SorghumSE11	110.8	193
105	4475	SorghumSE11	243.2	425
106	4475	SorghumSE11	21.7	38
107	4475	SorghumSE11	91.5	160
108	4475	SorghumSE11	48.7	85
111	4475	SorghumSE11	121.5	212
112	4475	SorghumSE11	179.9	314
113	4475	SorghumSE11	146.3	255
114	4475	SorghumSE11	282.2	493
115	4475	SorghumSE11	290.6	507
116	4475	SorghumSE11	250.9	438
117	4475	SorghumSE11	370.0	646
118	4475	SorghumSE11	283.9	496
119	4475	SorghumSE11	335.9	586
121	4475	SorghumSE11	543.2	948
122	4475	SorghumSE11	23.0	40
123	4475	SorghumSE11	508.3	887
124	4475	SorghumSE11	401.0	700
125	4475	SorghumSE11	211.4	369
126	4475	SorghumSE11	328.7	574
127	4475	SorghumSE11	201.2	351
128	4475	SorghumSE11	285.3	498
129	4475	SorghumSE11	308.0	538
130	4475	SorghumSE11	246.7	431
131	4475	SorghumSE11	208.8	365
132	4475	SorghumSE11	112.7	197
133	4475	SorghumSE11	184.0	321
134	4475	SorghumSE11	145.5	254
135	4475	SorghumSE11	183.6	321
136	4475	SorghumSE11	218.1	381
137	4475	SorghumSE11	89.4	156
138	4475	SorghumSE11	169.7	296
139	4475	SorghumSE11	290.7	508
140	4475	SorghumSE11	290.6	507
141	4475	SorghumSE11	384.5	671
142	4475	SorghumSE11	282.5	493
143	4475	SorghumSE11	267.3	467
144	4475	SorghumSE11	139.0	243
145	4475	SorghumSE11	136.9	239
146	4475	SorghumSE11	96.9	169
147	4475	SorghumSE11	141.3	247
148	4475	SorghumSE11	129.6	226
149	4475	SorghumSE11	141.7	247
150	4475	SorghumSE11	357.9	625

Moccasin Grain Sorghum grain sample	
Component	Drywt
Crude Protein	14.8
ADF %	4.96
NDF %	9.26
TDN %	84.6
RFV	854



Photo: 3

Narrative

Grain sorghum (milo) is a warm season crop adapted hot arid regions of the United States. It is grown in the plains states where it is too hot and dry for corn. In the USA, it is grown on more acres than barley and oats. Efforts are being made in

developing sorghum lines, and in processing methods to make it more suitable for human consumption for the gluten intolerant market.

Cattle and sheep are pastured on the sorghum stubble and fallen heads following grain harvest. The grain is highly palatable to livestock. It is recommended that the grain be cracked or rolled when feeding to livestock to enhance digestion.

Most of the grain sorghum presently grown in Montana is upland game bird habitat. Many Montana sorghum growers are frustrated by the lack grain production by the grain sorghum varieties available. However, they are pleased with shelter provided by the leafy crop and its height is compatible with hunters for ease of passing through crop and good visibility.

For some Montana producers, grain sorghum has the potential to be a dual purpose crop. It can be utilized through the growing season by birds and wildlife and then cattle or sheep could be turned on the crop to graze in the fall and winter. Birds and wildlife would continue to utilize the stand alongside the livestock. Because the rumen does not completely digest the whole grain sorghum, it may be pheasants and partridge would find additional feed in the manure. Most grain sorghum lines stand well in the fall and winter weather providing shelter for the birds and access to seed and sprouts on the soil surface. Also, the grain sorghum lines appear to retain leaves into the fall and winter, in spite of the bench land area winds.