Seeding and Nitrogen Rate Effect on Forage Yield, Lodging, and Nutrient Composition of Two Brown Midrib Forage Sorghums

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PROGRESS REPORT

Summary:
Nitrogen and seeding rate had no effect on the lodging of BMR 106 which did not significantly lodge in any of the treatments. However, percent lodging of BMR 100 greatly increased with high nitrogen and seeding rates. Yield and digestibility of both varieties were unaffected by nitrogen or seeding rate.

Introduction:
Brown midrib forage sorghums are growing in popularity because of their increased digestibility over conventional forage sorghums. However, some brown midrib forage sorghum varieties have been found to have significant lodging in the field. If the brown midrib forage sorghum varieties are to become wide spread, agronomic practices that decrease the potential for lodging while maintaining acceptable yield and digestibility must be implemented. Management strategies are needed to minimize the lodging potential of these hybrids. Nitrogen and seeding rates are two management inputs that have been identified that may affect lodging.

Objective:
Examine the effect of seeding and nitrogen rates on lodging, yield, and nutrient composition of brown midrib forage sorghum.

Work Plan:
The study consisted of two brown midrib hybrids BMR 100 and BMR 106, two nitrogen fertility levels, and three seeding rates. Based on previous experience we knew that BMR 100 had a high lodging potential whereas BMR 106 had a low lodging potential. The two nitrogen levels were accomplished by applying 50 and 100 lb/acre of nitrogen to specific plots prior to planting. Approximately 75 lbs of residual nitrogen was present in all plots prior to nitrogen application. Fifty lbs of phosphorus was applied in May prior to planting. Varieties were planted on June10, 2003. The seeding rates chosen were 30,000, 60,000 and 120,000 seed/acre. The study was planted on level borders with each plot measuring 30 by 30 ft and each treatment replicated three times. All plots were received identical irrigation with a pre-irrigation followed by four in-season flood irrigations. A total of 20 inches of irrigation water was applied. Rainfall from planting through September totaled 4.65 inches. Data collected at time of harvest were lodging ratings, yield, nutrient composition, plant height measurements, and stand counts. Yield data was collected by hand harvesting plants from 10 ft of row in the middle of each plot. All yields were reported at 65% moisture. Samples were immediately weighed, and random plants chopped with a limb chopper. Subsamples were collected for obtaining percent moisture at harvest and nutrient analysis. All nutrient analysis was completed by Dairy One Lab in Itheca, NY.

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Results:

There was very little lodging of BMR 106 regardless of nitrogen or seeding rate (Figure 1). However, lodging of BMR 100 was greatly influenced by both nitrogen and seeding rate. Lodging of BMR 100 increased from 36.1% in the 50 lb/acre nitrogen treatment, to 61.1% when 100 lb/acre nitrogen was applied. Seeding rate dramatically increased lodging of BMR 100 going from 16.7% to 73.3% when seeding rate was increased from 30,000 to 20,000 seed/acre. Yield of the two varieties were not affected by nitrogen or seeding rate with both varieties yielding approximately 18.2 ton/acre (Figure 2). This was somewhat of a surprise but may be due to the unusually hot, dry summer. Yields were somewhat lower than what was observed with the two varieties in previous years. Digestibility as indicated by % IVTD was also unaffected by nitrogen or seeding rate (Figure 3, Table 1). Similar results were observed for % Crude protein (Table 1).

Figure 1. Nitrogen & Seeding Rate Effect on Lodging of BMR 100 and BMR 106 Forage Sorghum Varieties.
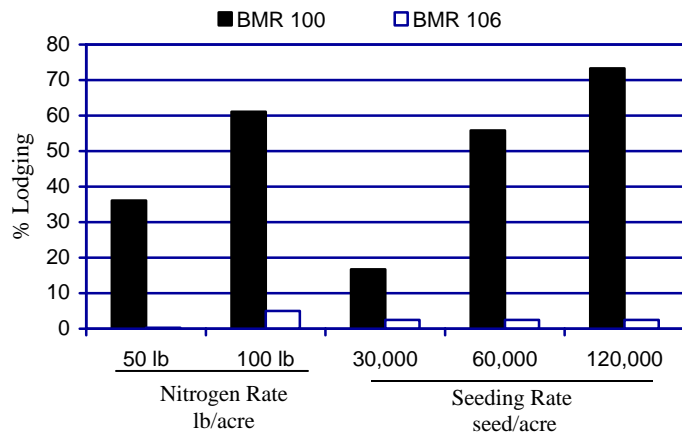
Figure 2. Nitrogen & Seeding Rate Effect on Yield of BMR 100 and BMR 106 Forage Sorghum Varieties.
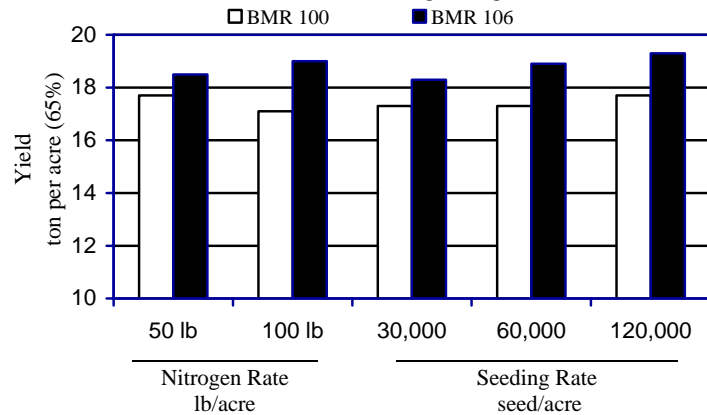
Figure 3. Nitrogen & Seeding Rate Effect on % IVTD of BMR 100 and BMR 106 Forage Sorghum Varieties

Table 1. Factorial/Pooled Error AOV.

Entry	Treatment	Height, Ft	% Lodging	% Moisture	Yield, Ton/ac	% C. Protein	% ADF	% IVTD	% Lignin	Head/plt, Ratio
1	BMR 106	6.25	2.50	65.23	18.8	9.06	24.38	88.06	2.97	0.36
2	BMR 100	8.03	48.61	72.59	17.5	8.31	29.12	82.11	3.88	.
TABLE OF A MEANS (p=0.05)		**0.13**	**2.14**	**ns**	**ns**	**0.42**	**1.75**	**1.23**	**0.36**	**na**
1	50 lb	7.14	18.06	68.61	18.2	8.55	25.77	84.83	3.46	0.39
2	100 lb	7.14	33.06	69.21	18.1	8.82	27.73	85.33	3.39	0.32
TABLE OF B MEANS (p=0.05)		**ns**	**2.14**	**ns**	**ns**	**ns**	**1.75**	**ns**	**ns**	**0.03**
1	30,000	7.33	9.58	70.15	17.8	8.96	26.26	85.17	3.46	0.42
2	60,000	7.21	29.17	67.97	18.1	8.77	25.61	85.75	3.09	0.35
3	120,000	6.88	37.92	68.61	18.5	8.32	28.38	84.33	3.72	0.31
TABLE OF C MEANS (p=0.05)		**0.15**	**2.62**	**ns**	**ns**	**0.51**	**2.14**	**ns**	**0.44**	**0.03**
1	BMR 106	6.22	0.00	65.43	18.5	9.08	23.91	87.56	2.91	0.39
1	50 lb									
2	BMR 100	8.06	36.11	71.78	17.8	8.02	27.63	82.11	4	.
1	50 lb									
1	BMR 106	6.28	5.00	65.02	19.1	9.04	24.84	88.56	3.03	0.32
2	100 lb									
2	BMR 100	8.00	61.11	73.41	17.2	8.59	30.61	82.11	3.76	.
2	100 lb									
TABLE OF AB MEANS (p=0.05)		**ns**	**3.03**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**0.04**
1	BMR 106	6.58	2.50	66.11	18.3	9.43	23.43	88.17	2.9	0.42
1	30,000									
2	BMR 100	8.08	16.67	74.19	17.3	8.48	29.08	82.17	4.02	.
1	30,000									
1	BMR 106	6.42	2.50	64.41	18.9	9.18	23.7	89	2.77	0.35
2	60,000									
2	BMR 100	8.00	55.83	71.53	17.3	8.37	27.52	82.5	3.42	.
2	60,000									
1	BMR 106	5.75	2.50	65.15	19.3	8.57	26	87	3.25	0.31
3	120,000									
2	BMR 100	8.00	73.33	72.06	17.8	8.07	30.77	81.67	4.2	.
3	120,000									
TABLE OF AC MEANS (p=0.05)		**0.22**	**3.71**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**0.05**
1	50 lb	7.42	7.50	70.18	17.1	8.73	25.95	84.33	3.52	0.44
1	30,000									
2	100 lb	7.25	11.67	70.12	18.5	9.18	26.57	86	3.4	0.4
1	30,000									
1	50 lb	7.17	18.33	67.36	18.8	8.75	24.5	85.83	3.15	0.42
2	60,000									
2	100 lb	7.25	40.00	68.58	17.4	8.8	26.72	85.67	3.03	0.28
2	60,000									
1	50 lb	6.83	28.33	68.28	18.6	8.17	26.87	84.33	3.7	0.32
3	120,000									

2	100 lb	6.92	47.50	68.94	18.5	8.47	29.9	84.33	3.75	0.29
3	120,000									
TABLE OF BC MEANS (p=0.05)		**ns**	**3.71**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**
1	BMR 106	6.67	0.00	66.32	17.6	9.2	23.23	86.67	2.8	0.44
1	50 lb									
1	30,000									
2	BMR 100	8.17	15.00	74.05	16.5	8.27	28.67	82	4.23	.
1	50 lb									
1	30,000									
1	BMR 106	6.50	5.00	65.91	18.9	9.67	23.63	89.67	3	0.4
2	100 lb									
1	30,000									
2	BMR 100	8.00	18.33	74.34	18.1	8.7	29.5	82.33	3.8	.
2	100 lb									
1	30,000									
1	BMR 106	6.33	0.00	63.93	18.8	9.37	22.97	89.33	2.77	0.42
1	50 lb									
2	60,000									
2	BMR 100	8.00	36.67	70.79	18.8	8.13	26.03	82.33	3.53	.
1	50 lb									
2	60,000									
1	BMR 106	6.50	5.00	64.89	19	9	24.43	88.67	2.77	0.28
2	100 lb									
2	60,000									
2	BMR 100	8.00	75.00	72.27	15.9	8.6	29	82.67	3.3	.
2	100 lb									
2	60,000									
1	BMR 106	5.67	0.00	66.05	19.2	8.67	25.53	86.67	3.17	0.32
1	50 lb									
3	120,000									
2	BMR 100	8.00	56.67	70.51	18	7.67	28.2	82	4.23	.
1	50 lb									
3	120,000									
1	BMR 106	5.83	5.00	64.26	19.4	8.47	26.47	87.33	3.33	0.29
2	100 lb									
3	120,000									
2	BMR 100	8.00	90.00	73.62	17.5	8.47	33.33	81.33	4.17	.
2	100 lb									
3	120,000									
TABLE OF ABC MEANS (p=0.05)		**ns**	**5.25**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**