

Experimenting with Soybean/Grass Combinations for Forage

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Rationale

- Possibilities of feed shortages exist.
 - 500,000 alfalfa acres winterkilled in Spring 2003
- Limited research on soybean mixtures.
- New forage oat and forage soybean varieties available.
- Limited pearl millet research in Central Wisconsin.

Previous Wisconsin Soybean Forage Research

- Evaluated maturity groups, row spacing, population, and harvest timing.
- Can produce similar yield and quality as alfalfa.
- Increased yield with narrow rows with no quality change.
- Greatest yield at R7 stage, but decreased quality.
- Increased yield when planting one maturity group greater than normally planted for grain.

Hintz, et al., 1992

‘Derry’ Forage Soybean

- Released by USDA in 1997; MG VI
- Tall variety with good lodging resistance.
- Superior forage producing ability.
- MN 1995- 3.6 tn dm/A; 1996- 4.5 tn dm/A
- However, quality lower due to high proportion of stems and leaves.
- MN 1996; Only matured to R3 Stage
CP- 15.2%; ADF- 41.3%; NDF- 48.6%

Scheaffer, et al., 2001

Forage dry matter yield of spring oat varieties harvested at late boot

Selected Varieties	Yield (tn/A)	CP (%)	RFV
	2 loc 2003-05	2003-04	2003-04
Forage Plus	3.06	9.5	100.8
Leonard	2.48	10.1	99.4
Vista	2.43	10.0	98.4
Belle	2.36	9.9	106.1
Moraine	1.99	11.1	106.2
LSD (0.05)	0.11	0.7	3.5

Borges, et al., 2005

Pearl Millet

- Tall, warm season annual grass.
- 1.5 million acres planted in the U.S.
- High drought tolerance.
- No prussic acid production.
- 1989 ND Yield- 4.2 tn dm/a; Quality- CP- 15%, ADF- 39%, NDF- 48%, TDN- 52%
- Can do well for silage, hay, and pasture.

Sedivec and Schatz, 1991

Experimental Design

- Locations
 - Marshfield Ag. Research Station
 - Longwood, Clark County (Dennis Rose Farm)
- 3 Years
- Randomized Complete Block Design
- 4 Replications, Small plots
- Previous Crop
 - Alfalfa preferred, simulate winterkill situation

Experimental Design (cont.)

- Planting: Early June
- Fertilization: Use N credits
- Weed Control: If necessary
- Harvest: Done at optimum stage for each crop
- Data collected: Yield, Dry matter, Height, Days to harvest, Quality
- Quality: Performed by Marshfield Soil and Forage Analysis Lab

Planting

- Dates
 - 2003: June 1-2
 - 2004: June 7
 - 2005: May 31, June 2
- Rates
 - Oats: solo- 3 bu; mix- 2 bu
 - PM, BMR: solo- 25 lb; mix- 16 lb
 - Soybeans: solo- 225 K; mix- 150 K

Crops

- Grasses
 - Vista Oat (Oat)
 - Forage Plus Oat (FO)
 - Honey Sweet BMR Sorghum Sudangrass (BMR)
 - Leafy 23 Hybrid Pearl Millet (PM)
- Soybeans
 - NK S08-R4 0.8 RM (1S)
 - Dairyland DSR 184RR 1.8 RM (2S)
 - Derry Forage Soybean (FS)

Vista Oat



Forage Oat



Pearl Millet



BMR Sorghum Sudangrass



Soybean



Yield Results- Solo

Mean of 6 expts. (tn dm/A)

Crop	Yield	Range	
Oat	1.64	0.86-2.89	• No dif. for 5 expt FO greater 1 expt
FO	1.56	1.03-2.47	
PM	2.80	1.58-4.82	• No dif. at 1 expt BMR greater 4 expt
BMR	3.02	1.71-5.31	
1S	1.84	1.51-2.11	• No dif. at 3 expt 1S lowest 3 expt 2S greatest 3 expt FS greatest 2 expt
2S	2.11	1.63-2.61	
FS	2.07	1.45-2.81	

Quality Results- Solo

Mean of 4 expts.

Crop	CP%	ADF%	NDF%	TDN%	RFQ
Oat	16.1	32.2	51.7	65.0	162
FO	16.7	29.3	47.9	69.4	188
PM	11.6	34.8	58.1	59.0	131
BMR	10.2	34.9	55.4	61.9	132
1S	16.3	29.9	41.5	63.7	157
2S	16.1	29.7	40.4	64.0	159
FS	14.8	30.9	39.9	62.5	158

Yield Results- Mixtures

Mean of 6 expts. (tn dm/A)

Crop	Yield	Range	
Oat/None	1.64	0.86-2.89	• No difference at any of 6 expts.
Oat/1S	1.56	0.80-2.99	
Oat/2S	1.55	0.75-2.93	
Oat/FS	1.51	0.74-2.85	• No difference at any of 6 expts.
FO/None	1.56	1.03-2.47	
FO/1S	1.59	0.94-2.97	
FO/2S	1.50	0.91-2.42	
FO/FS	1.49	0.90-2.46	

Quality Results- Mixtures

Mean of 4 expts.

Crop	CP%	ADF%	NDF%	TDN%	RFQ
Oat/None	16.1	32.2	51.7	65.9	162
Oat/1S	16.6	32.1	51.1	65.3	162
Oat/2S	17.1	32.3	50.7	65.0	160
Oat/FS	16.9	32.2	50.5	65.2	164
FO/None	16.7	29.3	47.9	69.4	188
FO/1S	17.5	29.4	46.2	68.5	191
FO/2S	17.2	29.6	46.5	68.5	187
FO/FS	17.3	29.2	45.9	68.7	190

Yield Results- Mixtures

Mean of 6 expts. (tn dm/A)

Crop	Yield	Range
PM/None	2.80	1.58-4.82
PM/1S	2.66	1.78-4.33
PM /2S	2.74	1.87-4.47
PM/FS	3.01	1.68-5.22
BMR/None	3.02	1.71-5.31
BMR/1S	3.04	2.27-4.33
BMR/2S	3.07	2.17-4.96
BMR/FS	3.17	2.12-5.18

- No dif. 2 expts. PM/FS greatest 4 expts, PM/N lowest 3 expts.
- No dif. 1 expts. Each greatest 2-3 expts, lowest 2-3 expt

Quality Results- Mixtures

Mean of 4 expts.

Crop	CP%	ADF%	NDF%	TDN%	RFQ
PM/None	11.6	34.8	58.1	59.0	131
PM/1S	12.5	33.9	52.9	60.5	133
PM /2S	13.1	33.7	51.0	60.9	135
PM/FS	11.9	33.5	50.2	60.9	138
BMR/None	10.2	34.9	55.4	61.9	132
BMR/1S	11.3	34.2	53.6	62.5	139
BMR/2S	11.3	33.5	52.3	62.6	138
BMR/FS	10.4	33.9	52.3	62.8	138

Conclusions

- Late oat planting is risky. It is a better option to plant early.
- Soybeans didn't change oat quality. Peas are a better choice to enhance yield and protein.
- Forage oats didn't improve yield over a conventional variety with late planting.
- Pearl millet and BMR sorghum sudangrass both had good yield potential, but pearl millet generally yielded less and was more dependent on good growing conditions.

Conclusions

- Soybeans may enhance quality in PM and BMR, but results were inconsistent.
- Group 1 soybeans generally yielded less than Group 2, which did not differ from Forage.
- Soybean quality did not differ and was similar to alfalfa, although protein was low.
- These are a few of many options producers could consider when short of forage. Corn silage still has a much greater yield potential.

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