INTERSEEDING ALFALFA INTO BERMUDAGRASS SODS: WHAT WE HAVE LEARNED

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INTRODUCTION

Bermudagrass (BGI is a mainstay of pasture-livestock systems in much of the Southeast, particularly on sandy coastal plains regions. It is widely used as a hay crop, as well. As a tropical warm-season grass, it suffers from modest, or lower, forage quality, being relatively high in fiber and low in digestibility. The quality problem is most severe in mid- to late summer. Herbage quality in forage swards has traditionally been enhanced by adding a legume. Winter annual legumes have proven useful in adding high quality forage in the off season. Legumes for the BG growing season have suffered from severe competition from the grass sod.

Perennial legumes have been explored to a very limited degree as companions for bermudagrass. White clover and red clover (Montgomery et al., 1983). birdsfoot trefoil (Jutras, 1967) and alfalfa (Burton, 1978) have received passing attention as to their ability to contribute to the composition of warm season grass swards, but the literature is very limited as to practicality and management information.

In preliminary research we found that alfalfa established readily into "Coastal" BG sods. Indeed, when alfalfa was interseeded in 8-inch row spacing, it competed strongly with the established BG sod. These preliminary results caused us to embark on a line of investigation with the objective of learning how to manage to maintain both species in the mixture.

MATERIALS AND METHODS

Sods of "Tifton 44" BG at Clemson and Blackville, SC were subdivided into plots and interseeded with "Cimarron" alfalfa in 8-, 16-, and 24-inch row spacings. Other plots were left as pure BG. Interseeding was done in early October, after mowing the BG sod to a 2-inch stubble. Alfalfa was seeded at the rate of 17, 8.5 and 5.6 lbs per acre for the 8, 16, and 24 inch row spacing treatments respectively. Each of these stand types was treated with 0. 100, 200. and 400 lbs of N per acre. These experiments were harvested for two years for yield and botanical composition determination. For the sake of brevity, on the second year's data at each location is presented in this paper. Another area of Tifton 44 was interseeded with Cimarron alfalfa at 16- and 24-inch row spacings. Each of these stand types was harvested at 21- 28- and 35-day intervals and yield and botanical composition were determined.

RESULTS AND DISCUSSION

Nitrogen fertilization of pure BG swards resulted in linear increases in yield at both sites, for an average yield increase of almost 110% at the 400 lb rate over the zero N check. Nitrogen fertilization of interseeded treatments gave inconsistent results. In 24-inch row spacings, N increased total yield, but in 16-inch rows there was no effect. At Blackville, N increased yields in 8-inch rows. The average increase from N fertilization in 24-inch row interseeded plots was only 20%. Increasing the row spacing had no significant effect on herbage yield. However there was small downward trend in yield as row spacing increased. The N by row spacing interaction was not significant.

In terms of botanical composition, N had much less effect than was expected. Grass percentage in the mixtures was not affected by N fertilization up to 400 lbs per acre, or in some cases was actually decreased slightly. Any yield increases in interseeded mixtures from N were not the result of increased BG contribution. Increasing row spacing resulted in small increases in percentage BG in the interseeded mixtures. Again, there was no significant N by row spacing interaction.

N fertilization had little impact on yields or composition of interseeded BG-alfalfa stands. Widening the row spacing did not influence yields, but did slightly increase the contribution of the BG component. The fact that BG, normally a very N-responsive species, did not respond to N

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Table 1. Total herbage yield of bermudagrass and alfalfa-bermudagrass mixtures (Blackville, 1988).

N rate	Stand type: Grass alone	Alfalfa row spacing, in: 8	16	24	N Rate Means
lbs/ac.$^{-1}$	----------	----------	Mg ha^{-1}	----------	----------
0	7.46	12.95	12.48	10.89	11.78
200	11.11	13.99	14.49	12.00	13.50
400	13.23	14.91	14.58	14.00	14.49
N effect	Lin.*	Lin.*	NS	Lin.*	Lin.*
Row Spacing Means	---	13.86	13.34	11.85	NS

* Significant at the 0.05 probability level. NS = not significant.

Table 2. Total herbage yield of bermudagrass and alfalfa-bermudagrass mixtures (Pendleton, 1989).

N rate	Stand tvoe: Grass alone	Alfalfa row soacina. in.: 8	16	24	N Rate
kg ha^{-1}	----------	----------	Mg ha^{-1}	----------	----------
0	8.45	17.29	15.81	14.58	15.88
100	13.35	17.20	15.45	14.60	15.76
200	16.47	15.09	15.96	16.05	15.70
400	20.45	17.50	16.38	16.80	16.90
N effect	Lin.*	Quad.'	NS	Lin.*	NS
Row Spacing Means	---	16.81	15.90	15.50	NS

* Significant at the 0.05 probability level. NS = not significant.

Table 3. Percentage bermudagrass in herbage of bermudagrass and alfalfa-bermudagrass mixtures (Blackville, 1988).

N rate	Stand type: Grass alone	Alfalfa row soacina. in.: 8	16	24	N Rate Means
kg ha^{-1}			% G		
0	45	5	17	16	13
100	51	4	16	23	14
200	54	3	12	20	12
400	69	2	9	16	9
N effect	Lin *	Quad'	NS	NS	NS
Row Spacing Means	...	4	14	18	Lin*

* Significant at the 0.05 probability level. NS = not significant.

Table 4. Percentage bermudagrass in herbage of bermudagrass and alfalfa-bermudagrass mixtures (Pendleton, 1989).

	Stand type				
		Alfalfa row spacing, in.			
N rate	Grass alone	8	16	25	N Rate Means
kg ha^{-1}		% grass			
0	81	3	8	20	10
100	81	2	8	18	9
200	85	2	7	16	8
400	86	2	7	16	8
N effect+	Lin.*, Cub.**	NS	NS	Lin.*	NS
Row Spacing Means	---	2	7	17	Lin.*

* Significant at the 0.05 probability level. NS = not significant.

Table 5. Herbage yield (Mg ha^{-1}) of alfalfa-bermudagrass mixtures as affected by row spacing and clipping frequency.

	Year							
	1990			1991			1992	
Cutting Frequency	16 in	24 in	Mean	16 in	24 in	Mean	16 in	24 in
3 weeks	4.3	3.1	3.7b	8.4	6.7	7.5	--	--
4 weeks	5.0	4.9	4.9a	8.9	8.9	8.9	--	--
5 weeks	6.1	4.8	5.4a	11.6	11.0	11.3	8.85	7.90
Mean	5.2a* Quad.	4.2b Quad		9.7 Quad.	8.8 Lin.	Lin.		

'Means within main effects with same letter are NSD. Interaction significant. 3- and 4-week treatments not harvested. No alfalfa.

Table 6. Percentage bermudagrass of alfalfa-bermudagrass mixtures as affected by row spacing and clipping frequency.

	Year							
	1990			1991			1992	
Cutting Frequency	16 in	24 in	Mean	16 in	24 in	Mean	16 in	24 in
3 weeks	38	49	43	58	61	60	---	---
4 weeks	31	38	34	47	54	50	---	---
5 weeks	26	33	30	21	36	28	7	21
Mean	42b	51a		42b	50a			

* Means within years followed by the same letter are not significantly different at the 0.05 probability level.

when interseeded with alfalfa suggests that another factor was controlling the fate of the BG. Ot is likely that the plant height advantage of alfalfa over BG was an important factor. The intolerance of BG for shade is well established (Burton et al., 1959). Under the cutting regime of this experiment (every 5 weeks), alfalfa towered over the companion BG at almost every harvest.

In a related experiment, we studied the effect of cutting frequency on yield and botanical composition. In the first harvest year, cutting more frequently than five weeks decreased total herbage yields (Table **1).** Yields were lower under the 24- than 16-inch row spacing. The effect of cutting frequency was similar under 16 and 24 inch row spacings. In the second harvest year, the cutting by row spacing interaction was significant. The decrease in yield from frequent cutting was smaller in 16- than **24-** inch rows. By the third cutting season, the **3-** and 4-week frequency plots were devoid of alfalfa. In terms of BG contribution, cutting more frequently increased the percentage BG in herbage. Increasing row spacing increased percentage BG. The yield effects of increased cutting frequency were related to the decreased occurrence of alfalfa in the mixtures. These findings suggest that defoliating more frequently than is normal for alfalfa hay production will aid in retaining the BG component in mixtures with alfalfa. row spacings of 24 inches or wider will also aid in BG persistence in competition with interseeded alfalfa.

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