GRAZING ALFALFA WITH SHEEP: DOES IT EFFECT YIELD OR STAND LIFE?

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Abstract: Field trials in the Sacramento and southern San Joaquin Valley were conducted to investigate effects of winter grazing on stand life and forage yield. Results from the Sacramento Valley study using an intermediate dormant variety that included different grazing intensities showed no reduction in hay yields from selected cuttings compared to machine harvested controls. Two years of data from the San Joaquin Valley study using a non-winter dormant variety showed an average reduction in winter grazed and mowed plots of .4 ton per acre during the hay season compared to non-harvested controls; however, total forage (hay plus winter forage) was not reduced. In both studies no change in soil bulk densities from sheep grazing occurred. Reduction in stand density was not observed in either trial.

Keywords: alfalfa, grazing, sheep, soil compaction, winter harvest

INTRODUCTION

Alfalfa varieties grown in the Central Valley of California belong to dormancy groups which produce forage in late fall and winter under moderate temperature conditions. Several options are available to farmers for managing this winter growth when poor drying conditions prevent making hay. Standard practices in this area are greenchopping for dairy use or grazing by sheep. Another option is to leave alfalfa unharvested until the first spring cutting. With this last option, growers trying to produce optimum quality hay are concerned about the old over-wintered growth affecting first cutting hay quality.

Common questions concerning these management options relate to impact on yield in the following season, soil compaction and economic return. Trials have been conducted in the Sacramento and the southern San Joaquin Valley to investigate the impact of fall or winter sheep grazing on alfalfa stands and productivity. A report on sheep grazing in the Imperial Valley was presented at the 1987 California/Arizona Alfalfa Symposium.

UCD TRIAL - The grazing trial in the Sacramento Valley, which is reported in the 1988 September-October issue of CALIFORNIA AGRICULTURE, Pelton et al., was conducted at the University of California, Davis, on a Yolo loam soil. The alfalfa variety was an intermediate dormant type, typical of varieties planted in that area and grazing occurred in mid-September or October instead of a hay harvest. Grazing treatments consisted of two intensities: "severe," grazed by the equivalent of 340 head per acre for an average of 3 days; and "partial," 170 head for an average of 2.5 days. These were compared to machine harvested plots. Soil moisture content ranged from 20 to 22% just prior to grazing each year. During three years of the trial, yields from selected cuttings were obtained using a Carter forage plot harvester. Soil bulk densities, measured with a Troxler Double-Density Probe at depths from 2 to 8 inches, were taken before the initiation of grazing and then each spring before the first cutting.

Yield results (Table 1) did not show any differences among machine harvested, severely grazed, and partially grazed treatments for any of the cuttings taken. There were no significant differences in soil bulk density measurements between grazed and non-grazed treatments (Table 2).

SOUTHERN SAN JOAQUIN VALLEY TRIAL - This grazing trial was conducted in a commercial alfalfa field in Tulare County on a Traver fine sandy loam soil. Treatments included a control which was not harvested during late fall or winter, a treatment which was grazed when the commercial field was grazed, and a treatment that was mowed with a plot mower at the same time as grazing. This latter treatment was included to help separate the impact of removing forage from the effects of sheep grazing.

When the field was commercially grazed, nongrazed plots were fenced to keep sheep out. Grazing intensity and duration in grazed plots were the same as that used in the rest of the field, which was approximately 850 ewes plus lambs in 40 acre blocks for 7 to 8 days (approximately 23 grazing units per acre). In 1984, grazing occurred in the latter part of December; in 1985, sheep were present during the last week of November. Rainfall in the two

weeks prior to the first year of grazing totaled 1.3 inches with another .9 inches occurring while sheep were in the field. In 1985, 2.8 inches of rain fell in the 15 days preceding grazing with an additional .75 inches during the grazing period. Soil moisture content at the time sheep were introduced was 17 and 18.5%, respectively, for the two years.

Yields were determined during the season by mowing a strip through each plot with a plot harvester, measuring fresh weights, and taking moisture samples to calculate dry weights. Soil bulk density was measured with a Troxler Double-Density Probe. Measurements were made at depths of 2, 6 and 10 inches. Samples from the first cutting in 1985 were analyzed for total digestible nutrients (TDN) and percent protein.

In the first year of the trial, 1 ton of dry matter was harvested from the mowed treatment at the time of grazing and presumed to be the same amount of forage available for grazing (Table 3). Of the seven hay cuttings that year, there was only one (early June) in which yields differed between treatments. At this cutting the grazed treatment yielded lower than both the control and the winter mowed treatments. Totals for the seven hay cuttings that year showed that the grazed treatment yielded significantly less than the control but not less than the mowed treatment. When forage removed by mowing or grazing in December is added to hay season totals, grazed and mowed plots yielded similar to control plots. Quality samples collected from the first cutting indicated a slightly higher TDN value for grazed and mowed treatments compared to the unmowed control (Table 4). There were no differences, in percent protein among treatments.

In 1986, half a ton of dry matter was harvested from the treatment mowed in late November when grazing occurred. In this year, both grazed and mowed plots had reduced yields compared to the control at first cutting. In the next six cuttings no differences occurred. In the last cutting however, the mowed treatment produced significantly less than the control and the grazed treatments. Total hay production for that year did not differ significantly among treatments. When forage removed during the time of grazing is added to hay totals, mowed and grazed treatments produced as much as controls.

Analysis of combined data over the two years indicates both grazed and mowed plots yielded significantly less hay than controls but did not differ between each other (Table 5). Grazing or mowing reduced hay production by an average of .4 ton per acre. However, when the yield from the harvest taken at the time of grazing is added to hay totals, the grazed treatment produced as much as the control and the mowed treatment yielded significantly more than the control.

Soil bulk density measurements showed no difference between grazed and ungrazed plots (Table 6).

DISCUSSION

In both the Davis and southern San Joaquin Valley trials, grazing with sheep did not increase soil compaction as measured by bulk density. In both trials, yields from grazing treatments were equal to treatments mowed at the time of grazing. It is important to note that mowed treatments were not meant to simulate commercial greenchopping as small plot harvesters used in these trials do not have the same potential for crown damage and soil compaction that field-scale equipment would have.

The southern San Joaquin Valley trial demonstrated a reduction in hay season yields of .4 ton per acre when plots were either grazed or mowed in late fall/early winter compared to unharvested plots. Total dry matter produced for the year was not affected however.

Alfalfa hay producers should decide if income and other advantages from late fall/winter grazing or greenchopping are worth the approximately .4 ton/acre (dry weight) reduction in alfalfa produced during the "hay season."

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TABLE 1. YIELD RESULTS FROM ALFALFA SHEEP GRAZING TRIAL, U.C. DAVIS, 1985-1987[1]

	Yield[2]							
	4/4/85	5/16/85	4/17/86	6/30/86	10/15/86	4/16/87	7/24/87	10/9/87
Treatments	tons dry matter per acre							
Machine Harvest	1.4	1.4	1.0	1.5	.7	1.6	1.6	1.0
Severe Graze	1.4	1.5	1.0	1.6	.7	1.3	1.6	1.0
Partial Graze	1.4	1.6	1.0	1.4	.7	1.4	1.5	1.0

1 Grazing occurred during October in 1984 and 1985 and in mid-September in 1986

2 Differences among treatments were not significant (LSD .05)

TABLE 2. EFFECT OF GRAZING SHEEP ON SOIL BULK DENSITY, U.C. DAVIS TRIAL, 1985-87

	Soil Bulk Density			
Treatment and Depth	Pre-graze Fall 1984	Fall 1985*	Spring 1986*	Spring 1987*
Machine Harvest				
0-2	1.4	1.4	1.4	1.5
2-4	1.5	1.5	1.5	1.5
4-6	1.5	1.5	1.5	1.5
6-8	1.5	1.5	1.5	1.5
Severe Graze				
0-2	1.4	1.4	1.5	1.5
2-4	1.5	1.5	2.6	1.5
4-6	1.6	1.6	1.5	1.5
6-8	1.5	1.6	1.5	1 6
Partial Graze				
0-2	1.5	1.4	1.5	1.5
2-4	1.5	1.5	1.5	1.5
4-6	1.5	1.5	1.5	1.5
6-8	1.5	1.5	1.5	1.5

NOTE: Data not reported for spring of 1985 due to malfunction of density probe. The measurements were repeated again that year just before the fall grazing.

* Overall treatment for 1985, '86 and '87. Within each year, no statisticlly significant treatment effects were observed. Coefficient of variation on overall data: 5.52%.

TABLE 3 SUMMARY OF 1985 AND 1986 YIELDS FROM SOUTHERN SAN JOAQUIN VALLEY ALFALFA SHEEP GRAZING TRIAL

a) 1985	Winter Cut	4/4	5/3	6/4	6/28	7/29	8/30	10/2	Total For Hay Season	Total For Year
		Tons Dry Matter Per Acre								
Control		1.3	1.5	1.8a	1.6	1.4	1.0	1.0	9.8a	9.8 b
Mowed when grazed	1.0	1.3	1.5	1.8a	1.6	1.4	1.0	1.0	9.5ab	10.5a
Grazed	(1.0)[2]	1.3	1.5	1.6 b	1.5	1.4	1.0	1.0	9.2 b	(10.2)ab
LSD .05		NS	NS	.19	NS	NS	NS	NS	.3	.4
CV %		7.4	5.5	8.6	7.1	6.1	7.4	8.2	3.7	3.5

b) 1986	Winter Cut	4/4	5/5	6/3	6/30	7/28	8/28	10/8	11/13	Total Hay Season	Total For Year
Control		.8a	1.1	1.3	1.3	1.1	.8	.9	.6a	8.1	8.1
Mowed when grazed	.5	.6 b	1.1	1.3	1.3	1.1	.9	.9	.5 b	7.7	8.2
Grazed	5)[2]	.6 b	9	1.2	1.3	1.1	9	.9	.6a	7.6	8.1
LSD .05		.06	NS	NS	NS	NS	NS	NS	.07	NS	NS
CV %		14.8	15.2	5.1	6.7	10.3	10.3	9.1	11.4	5.9	5.6

[1] Values are means of 4 replications. Values within a column followed by the same letter do not differ significantly at the 5% level of probability.

[2] Value in parentheses assumed to be equivalent to the weight taken from the treatment mowed at the time of grazing.

TABLE 4. QUALITY ANALYSIS FROM APRIL 1985 HARVEST IN SAN JOAQUIN VALLEY ALFALFA SHEEP GRAZING TRIAL

Treatment	TDN	% PROTEIN
Control	47.0	21.0
Mowed When Grazed	47.5	21.1
Grazed	48.0	21.4

TABLE 5. COMBINED 1985 AND 1986 AVERAGE YIELDS FROM SOUTHERN SAN JOAQUIN VALLEY ALFALFA SHEEP GRAZING TRIAL

	Yield -- Tons Dry Matter Per Acre		
	Hay Season Yields	Fall/Winter Harvest	Total Dry Matter Production
Control	8.9	----	8.9 b
Mowed When Grazed	8.6	0.7	9.4a
Grazed	8.41	(0.7)[1]	(9.2)[2]
LSD .05	0.3		.3
CV %	7.4		7.2

Orthogonal comparison for hay season yields:
Control vs grazed and mowed when grazed (P = 0.01).

1 Assumed yield based on yield of plot harvested at the time of grazing.

2 No mean separation is given for this value because it is an assumed value based on the winter mowed treatment and was not included in the analysis.

TABLE 6. SOIL BULK DENSITY MEASUREMENTS FROM THE SOUTHERN SAN JOAQUIN VALLEY ALFALFA SHEEP GRAZING TRIAL

	DATE	
	2/15/85	3/4/86
Non-grazed		
2 inches	1.56	1.45
6 inches	1.57	1.57
10 inches	1.64	1.60
Grazed		
2 inches	1.59	1.57
6 inches	1.59	1.55
10 inches	1.59	1.60
	NS	NS

Measurements made with a Troxler Double-Density Probe