WEIGHT GAIN AND NUTRIENT INTAKE OF HOLSTEIN HEIFERS FED 25- OR 35-DAY REGROWTH ALFALFA PASTURE, OR ALFALFA HAY

by

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B.S., Kansas State University, 1976

A MASTER'S THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Animal Nutrition
Department of Animal Sciences and Industry

KANSAS STATE UNIVERSITY
Manhattan, Kansas

1977

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ACKNOWLEDGMENTS

The author wishes to thank the members of his committee, Drs. E. E. Bartley, B. E. Brent, C. L. Norton and G. M. Ward for their time and effort. Special appreciation is accorded to Dr. Ward for guidance during the course of this investigation, and to Dr. Bartley for his assistance in preparation of this paper.

Sincere thanks are expressed to Dr. R. M. Bechtle for his assistance in the laboratory and with calculations of the data, to Dr. A. D. Dayton for his guidance in analyzing the data and to H. J. Muncrief for the acid detergent fiber analyses.

The author also wishes to thank Smith Kline Corporation for their financial support on this project.

The author gratefully acknowledges the sincere support of his parents, Mr. and Mrs. P. J. Stroupe.

INTRODUCTION

Alfalfa grazing is an attractive alternative for cattle. Alfalfa fixes nitrogen thus decreasing fertilizer costs. Because it is a perennial herbage, field preparation costs are spread over 4 to 5 years. Legume bloat is often associated with alfalfa grazing, but this can be overcome by using poloxalene (Bloat Guard®). With adequate rainfall and/or irrigation alfalfa is productive for an entire summer and under the proper circumstances some of the alfalfa may be harvested and stored.

This study compares alfalfa pastured at two stages of maturity with drylot-fed alfalfa hay for growing Holstein heifers.

LITERATURE REVIEW

Alfalfa protein and metabolizable energy (ME) decrease with maturity, with protein decreasing faster. National Academy of Sciences (1976) values for alfalfa ME are (Mcal/kg): late vegetative stage, 2.13; early bloom, 2.06; midbloom, 1.99; full bloom, 1.92; and mature, 1.81. The crude protein contents (%) for the respective growth stages are 19.4, 18.4, 17.1, 15.9, and 13.6. National Academy of Sciences (1976) values for grazed alfalfa are 2.06 Mcal/kg (ME) and 19.3% protein. Hardison et al. (1954) implied that the protein content of alfalfa actually grazed is often higher than harvested samples because cattle select shorter, more immature and leafier herbage over taller, more mature herbage. Animals tend to eat the more tender tops of rotationally grazed forage.

Stiles et al. (1968) showed that dairy cows on alfalfa pasture produced significantly more milk than those on brome-grass pasture or those fed alfalfa hay in drylot, The alfalfa pastured animals also had the highest income per cow. Porter and Skaggs (1958) showed that alfalfa pasture was more economical for producing milk than alfalfa silage or greenchop. Stiles et al. (1971) found that alfalfa pasture yielded more income per cow ($160.92) than alfalfa hay ($147.47) or greenchop ($152.06).

While a few trials have shown higher gains on pastured crops other than alfalfa (Ross, 1977; Heinemann and Rogers, 1973), alfalfa requires less fertilization. Acord (1970) reported that daily gains of beef cattle on alfalfa pasture plus .45 kg grain/day equalled those of cattle fed alfalfa-grass pasture and 1.82 kg grain/day. Other comparisons in that paper indicate that the feeding value of alfalfa may compare favorably with grain.

Consumption figures for alfalfa vary, but tend to be between 1.5 and 3.5 kg dry matter (DM) per 100 kg body weight (Foley et al., 1973). Sell and Sisk (1971) reported DM intakes of 2.7 to 3.2 kg/100 kg body weight on temporary winter pasture with Guernsey heifers. Stiles et al. (1970) found that Holstein heifers (216 to 302 kg) ate 3.2 kg of alfalfa dry matter per 100 kg body weight while on pasture. Lactating cows ate 4.6 kg (Stiles et al., 1968) and 2.5 kg alfalfa DM (Stiles et al., 1971) per 100 kg body weight when fed 5.9 kg grain per day in each instance. This difference was thought to be due to a poorer quality alfalfa in the second study.

Our experiment was designed to relieve the relative paucity of information on average daily gain and intake for varying maturities of alfalfa pasture, specifically 25- and 35-days after cutting.

EXPERIMENTAL PROCEDURE

The trial was conducted from May to September 1976. Performance of Holstein heifers grazing 25-day (bud to midbloom), or 35-day (midbloom to full-bloom) regrowth alfalfa (Medicago sativa) was compared with that of cattle fed alfalfa hay, 22.7% crude fiber and 21.8% crude protein, in drylot. They grazed a plot for 5 days and were then transferred to another plot containing alfalfa at the same stage of regrowth. The grazing area was 7.2 ha subdivided into 14 .4-ha plots (30.5 m by 132.8 m) and two .8-ha plots (61 m by 132.8 m). Poor quality and quantity of alfalfa were the reasons for 4 .4-ha plots being combined into the 2 larger .8 ha plots. The 4 year old alfalfa stand was fertilized yearly with 22.7 kg of phosphorus per hectare. Soil pH ranged from 8.0 to 8.1. The plots were irrigated as required. Cattle were watered in tanks, and no shade was available. Salt and dicalcium phosphate were available free choice. Plots were randomly selected for the initial order of use and regrowth length, then matched in an alternating 25- and 35-day regrowth pattern. A single wire electric fence separated the plots. On completion of a period the cattle were moved to the next scheduled plot and the grazed plot was clipped to 8 cm with a sickle mower. The clipped residue was left on the ground.

Twenty-four Holstein heifers were divided into three groups; group A grazed 25-day regrowth alfalfa, group B grazed 35-day regrowth alfalfa and group C was fed alfalfa hay in drylot (control). Although there was considerable variability in weights and ages of animals (9 months, 223 kg to 21 months, 528 kg), the groups were equalized for average weight and age. Five heifers in each group were pregnant (2 to 5 months at the start of the trial). Two rumen fistulated animals were added to each grazing group for sampling the herbage ingested. Group A had a Holstein and a Jersey, while group B had a Holstein and an Ayrshire. Each animal received 16 g of poloxalene (Bloat Guard®) daily mixed in .9 kg ground sorghum grain. Group C received the same grain mixture as the grazing animals and baled late bud stage alfalfa hay (3.3 kg/100 kg body weight per day). One animal in group C died of traumatic gastritis.

The cattle were weighed four times. Groups A and B grazed 90 days and group C was fed 105 days in drylot. A one-month interval separated the weighings with a two-month interval occurring with group C after the initial weighing. The cattle were weighed after the first and second days that the cattle were on the plot for the first and final weights. Weighings occurred on the second and third days for the two intermediate weights.

Three samples were taken on the morning the animals entered and the morning they left a plot. Herbage samples were taken by randomly cutting .46 m by 1.83 m areas with a hedge clipper (Anonymous, 1952). Three postgrazed samples from each plot

were dried in a forced air oven at 100 C in paper bags, and the dry matter per plot calculated. Two pregraze samples were handled similarly. Dry matter consumption per period was assumed to be the difference between the total pre- and postgraze dry matters. A third pregrazed sample was frozen in a plastic freezer bag for later analysis. "Grazed" samples were taken via rumen fistulae from the rumen cardial region in the morning shortly after eating on the first, third and fifth complete day that the cattle were on each plot. Those samples were frozen and stored in plastic freezer bags. Portions of the frozen alfalfa and rumen samples from the Holstein rumen-fistulated animals were dried at 55 C (to prevent artifact lignification), ground (Christy and Norris laboratory mill) and subjected to acid detergent fiber (ADF) analysis.

The rumen samples contained mucin which had to be removed before ADF determination (Muncrief, 1977). Approximately 1 g of dry sample was placed in a 50 ml centrifuge tube and mixed with 15 ml of distilled water. After washing the sides with 5 ml distilled water, the tubes were covered with Parafilm and refrigerated overnight to inhibit microbial activity. The next morning the samples were centrifuged 10 min at 1500 x g with the Parafilm still in place, filtered through Whatman no. 41 filter paper and the filtrate discarded. The precipitate and the residue on the filter were washed into Berzelius beakers. After the sides of the beaker were washed down and the volume made up to 100 ml with acid detergent solution, the analysis was completed according to Goering and Van Soest (1970).

For nonprotein nitrogen (NPN) and protein fractionation (Bartley et al., 1975; Bechtle, 1977; and Wooding et al., 1970), about 20 g of the frozen sample was placed in a 230 ml jar and blended to a homogenous state. A two gram sample of that material was digested for total crude protein analysis (Association of Official Analytical Chemists, 1975). Duplicate dry matter and ash determinations were made on approximately 2 g of the homogenous material (Association of Official Analytical Chemists, 1975). Nitrogen fractions were partitioned using 5 g of the homogenized sample in a plastic 230 ml homogenizer jar with 100 ml of deionized water. That sample was blended twice at high speed for 15 sec intervals and refrigerated overnight. The mixture was again blended for 15 sec before filtering by suction through a Reeve Angel 11 cm glass fiber filter. Crude protein in the residue was considered insoluble protein. The filtrate was diluted to 200 ml, and nitrogen was determined on 20 ml of the diluted filtrate and designated "soluble protein plus nonprotein nitrogen". Soluble protein was separated from nonprotein nitrogen by acidifying 80 ml of the diluted filtrate to pH 4.5, heating 15 min in boiling water bath, refrigerating overnight and centrifuging at 10,300 x g for 15 min. Nitrogen determinations on the filtrate and precipitate measured the nonprotein nitrogen and soluble protein fraction, respectively. Analytic accountability was measured by summing the NPN, soluble and insoluble protein and comparing with total crude protein.

The consumption and dry matter availability values were tested by the paired t-test (Snedecor and Cochran, 1974). The

variances of the average daily gain and the chemical analyses were analyzed (Snedecor and Cochran, 1974). Linear regressions were calculated as described by Barr et al. (1976).

RESULTS AND DISCUSSION

The average daily gains of the three groups were not significantly different. Average daily gains were: grazing 25-day alfalfa, 1.06 ± .07 kg; grazing 35-day alfalfa, 1.03 ± .05 kg; and drylot-fed alfalfa hay, .95 ± .03 kg. Those gains are slightly higher than those of Stiles et al. (1970) for Holstein heifers on similar feeds.

The average 5-day dry matter consumption per plot was 369 ± 37 kg for the 25-day regrowth alfalfa and 476 ± 43 kg for the 35-day regrowth alfalfa ($P<.05$). That is equivalent to daily roughage dry matter intakes of 1.6 kg/100 kg body weight for 25-day alfalfa and 2.1 kg/100 kg body weight for 35-day alfalfa, in addition to the .8 kg sorghum grain dry matter per animal daily. Those values fall within the range of roughage intake cited by Foley et al. (1973), but are lower than those of Stiles et al. (1970). However, Stiles et al. used cage measurements, which may have accounted for the apparent larger intakes (Cowlishaw, 1951). The difference in intake probably is due to a difference in the amount of forage available to the animals on the two plots. Group A averaged 891 ± 51 kg dry matter and group B averaged 1189 ± 75 kg available at the start of the periods ($P<.01$). No bloat was observed.

The total crude protein and insoluble protein contents of the alfalfa forage were greater ($P<.05$) in the 25-day than the 35-day forage (Table 1). The decrease in soluble protein was due to decreasing proportion of leaves with increasing maturity. Leaves contain 63.38 and 68.19% of the protein of prebud and bud stage alfalfa, respectively (Woodman and Evans, 1935). Lee and Smith (1972) also showed that alfalfa leaves have two to three times as much protein as the stems. Chloroplasts contain 75% of the protein in mature green leaf cells (Zucker and Stinson, 1962) indicating that most of the chloroplasts are in the leaves. Most of the insoluble protein is in the chloroplasts according to Howarth et al. (1973) and Stifel (1967). Terry and Tilley (1964) stated that the proportion of alfalfa stems increased with age and that the digestible fibrous material in the leaves was similar at different stages of maturity. It can be concluded that insoluble protein level is fairly constant in leaves and as the lower protein stem grows, the total dry matter increases lowering the percentage of insoluble protein. Dry matter, ash, nonprotein nitrogen, soluble protein and ADF values for the two stages of growth were not different.

The difference between the samples collected from the rumen cardial region and the alfalfa plant samples is due to selection by the animals as mentioned by Blazer et al. (1960), Hardison et al. (1954), Hodgson et al. (1942) and Holmes (1962). The dry matter and soluble protein contents were lower for the rumen samples than for the plot samples in both treatments. The ash content was higher in the rumen samples than in the alfalfa

TABLE 1. Mean analyses of pregrazed alfalfa plot samples and rumen samples obtained from the cardial region of two rumen-fistulated animals per treatment during 21 regrowth periods.

	25-day regrowth				35-day regrowth			
		Rumen samples				Rumen samples		
	Plot	Day 1	Day 3	Day 5	Plot	Day 1	Day 3	Day 5
	%				%			
Dry matter	22.7	14.3[a]	15.2[b]	14.6[ab]	24.6	14.6[a]	14.9[a]	16.0[b]
Ash[d]	8.0	11.3[ab]	10.9[a]	11.5[b]	7.6	9.7[a]	10.3[b]	10.1[ab]
Total crude protein[d]	21.0[2]	24.9[c]	20.8[b]	18.8[a]	18.6[1]	23.4[c]	21.5[b]	17.5[a]
Insoluble protein[d]	13.2[2]	17.8[c]	14.8[b]	13.3[a]	11.3[1]	16.7[c]	15.0[b]	12.7[a]
Nonprotein nitrogen[d]	5.3	6.2[b]	4.8[a]	4.6[a]	4.9	6.0[c]	5.2[b]	3.0[a]
Soluble protein[d]	2.7	1.3	1.6	1.5	2.4	1.4	1.4	1.5
Acid detergent fiber[de]	30.8	31.1[a]	35.4[b]	40.6[c]	32.8	31.0[a]	34.5[b]	40.2[c]

[a,b,c]Values within rows of means of rumen samples within treatments with different superscripts indicate a significant difference ($P<.05$).

[d]Dry matter basis.

[e]Based on samples from one fistulated animal per treatment.

[1,2]Values within row of means of plot samples with different superscripts indicate a significant difference ($P<.05$).

samples, due to salivary contamination which is in agreement with the work of Lesperance et al. (1960). ADF for the initial rumen samples from the 25-day treatment equalled those for initial plot samples, and increased with plot grazing time. The ADF contents of the rumen samples from the two regrowth treatments were similar. The insoluble protein content was higher for the rumen samples than for the plot samples but then decreased towards the level of the plot samples. By day 5 the insoluble protein in the 25-day regrowth rumen samples closely corresponded to that in the alfalfa plot samples while the 35-day regrowth had more herbage permitting the cows to be more selective and did not decrease to the plot level. A similar lag was noted in the decreases in the total crude protein and nonprotein nitrogen in the rumen samples from the 35-day plots. The total crude protein level for the 25-day regrowth fell below the initial plot level on day 3 while the 35-day level fell below its initial plot level on day 5.

The means of the rumen sample analyses for the regrowth periods are shown in table 2. The dry matter and total crude protein differences were significant ($P<.06$), as was the difference between treatments for ash content ($P<.05$). The 35-day treatment had the highest dry matter content. Both treatments had the similar proportions of soluble and insoluble protein, ADF, and nonprotein nitrogen.

Regression analyses were carried out using dry matter consumption as the dependent variable, and 1) ash, dry matter, insoluble protein, nonprotein nitrogen, soluble protein, and

TABLE 2. Treatment means of analyses of rumen samples obtained at the cardial region of two rumen-fistulated animals per treatment over 21 regrowth periods.

	Regrowth		Statistical probability
	25-day	35-day	
	%		
Dry matter	14.7	15.1	.054
Ash[a]	11.2	10.0	.000
Total crude protein[a]	21.5	20.8	.053
Insoluble protein[a]	15.3	14.8	.087
Nonprotein nitrogen[a]	5.2	5.0	.300
Soluble protein[a]	1.5	1.5	.988
Acid detergent fiber [ab]	35.7	35.2	.456

[a]Dry matter basis.

[b]Based on samples from one fistulated animal per treatment.

acid detergent fiber or 2) total crude protein contents as independent variables. There were no significant regressions with 35-day treatment. The 25-day treatment consumption appeared dependent only on insoluble protein content ($r = .74$) forming the equation $Y = -649 + 77(X)$ (Y is consumption per 5 day period and X is the insoluble protein content). Combining like sets of independent variables of the two treatments gave no significant regressions. The regression indicated greater consumption with 25-day regrowth alfalfa that had higher initial insoluble protein content. Since the insoluble protein is concentrated in the leaves, it appears that with more leaves there is more consumption. The lack of a similar relationship for the 35-day regrowth is difficult to explain because the amount of leaves should have been the same, even though the 25-day treatment had higher insoluble protein levels ($P<.05$), probably due to greater leaf to stem ratio.

Difficulty in sampling may explain why the treatments did not have similar linear regressions. The taller 35-day regrowth alfalfa plants tended to bend or curl over more than the shorter 25-day old alfalfa plants making initial sampling more difficult and less accurate. The taller samples were more easily trampled making it more difficult to obtain postgrazed samples. With more available dry matter in the 35-day treatments, the consumption may have been more uneven making it more difficult to get representative post-grazed samples. There is also the possibility that the larger amount of feed may have altered the animal's eating behavior.

CONCLUSION

Grazing 25- (bud to midbloom) or 35-day (mid- to late bloom) regrowth alfalfa is comparable to drylot fed alfalfa hay. Although the 35-day regrowth averaged more dry matter per 5-day period, it is not known if it would have supported more animals during the entire grazing trial. The influence of the two regrowth periods on the alfalfa stand was not observed due to rotation of the treatments on the individual plots.

LITERATURE CITED

Acord, C.R. 1970. Alfalfa pastures compare favorably with grass-legume pastures and other field crops in Utah. Utah Sci. 31:7.

Anonymous. 1952. Pasture and range research techniques. Agron. J. 44:39.

Association of Analytical Chemists. 1975. Official methods of analysis. 12th ed. Washington, D.C.

Barr, A.J., J.H. Goodnight, J.P. Sall and J.P. Helwig. 1976. A user's guide to SAS 76. Sparks Press. Raleigh, N.C.

Bartley, E.E., G.W. Barr and R. Mickelsen. 1975. Bloat in cattle. XVII. Wheat pasture bloat and its prevention with poloxalene. J. Anim. Sci. 41:752.

Bechtle, R.M. 1977. Personal communication.

Blazer, R.E., R.C. Hammes Jr., H.T. Bryant, W.A. Hardison, J.P. Fontenot and R.W. Engel. 1960. The effect of selective grazing on animal output. Page 601 in Proc. Int. Grassl. Congr. 8th.

Cowlishaw, S.J. 1951. The effect of sampling cages on the yields of herbage. J. Brit. Grassl. Soc. 6:179.

Foley, R.C., D.L. Bath, F.N. Dickinson, and H.A. Tucker. 1973. Dairy Cattle: Principles, Practices, Problems, Profits. Lea and Febiger. Philadelphia.

Goering, H.K. and P.J. Van Soest. 1970. Forage fiber analyses (apparatus, procedures, and some applications). USDA Agr. Handbook 379.

Hardison, W.A., J.T. Reid, C.M. Martin and P.G. Woolfolk. 1954. Degree of herbage selection by grazing cattle. J. Dairy Sci. 37:89.

Heinemann, W.W. and L.F. Rogers. 1973. Irrigated pastures for cattle in Central Washington. Wash. Agr. Exp. Sta. Bull. 783.

Hodgson, R.E., J.C. Knott, V.L. Miller and F.B. Wolberg. 1942. Measuring the yield of nutrients of experimental pastures. Wash. Agr. Sta. Bull. 411.

Holmes, W. 1962. Grazing management for dairy cattle. J. Brit. Grassl. Soc. 17:30.

Howarth, R.E., J.M. McArthur and B.P. Goplen. 1973. Bloat investigations: Determination of soluble protein concentration in alfalfa. Crop Sci. 13:677.

Lee, C. and D. Smith. 1972. Changes in the concentration of nitrogenous fractions in alfalfa herbage with advance in maturity. Agron. J. 64:326.

Lesperance, A.L., V.R. Bohman and D.W. Marble. 1960. Development of techniques for evaluating grazed forage. J. Dairy Sci. 43:682.

Muncrief, H.J. 1977. Personal communication.

National Academy of Sciences, National Research Council. 1976. Nutrient requirements of beef cattle. 5th ed. Washington, D.C.

Porter, R.M. and S.R. Skaggs. 1958. Forage and milk yields from alfalfa under three different harvesting systems. New Mexico Agr. Exp. Sta. Bull. 421.

Ross, R. 1977. Grazing irrigated alfalfa vs. grass. Irrigation Age. 11(8):12.

Sell, O. E. and L.R. Sisk. 1971. Feeding dairy heifers on temporary winter pastures. J. Dairy Sci. 54:456. (Abstr.)

Snedecor, G.W. and W.G. Cochran. 1974. Statistical Methods. Iowa State University Press. Ames, Iowa.

Stifel, F.B. 1967. Relationships between alfalfa leaf chloroplasts and bloat. Ph.D. Dissertation. Iowa State University. Ames, Iowa.

Stiles, D.A., E.E. Bartley, G.L. Kilgore, F.W. Boren, R.L. Ott and J.G. Clark. 1968. Comparative value of alfalfa pasture, bromegrass pasture, or alfalfa hay for lactating dairy cows. J. Dairy Sci. 51:1620.

Stiles, D.A., E.E. Bartley, A.D. Dayton, H.B. Perry, G.L. Kilgore and F.W. Boren. 1970. Growth of Holstein calves fed alfalfa pasture, alfalfa greenchop, or alfalfa hay. J. Dairy Sci. 53:489.

Stiles, D.A., E.E. Bartley, G.L. Kilgore, F.W. Boren and H.B. Perry. 1971. Comparative value of alfalfa pasture, alfalfa greenchop, or alfalfa hay for lactating dairy cows. J. Dairy Sci. 54:65.

Terry, R.A. and J.M.A. Tilley. 1964. The digestibility of the leaves and stems of perennial ryegrass, cocksfoot, timothy, tall fescue, lucerne and sainfoin, as measured by an *in vitro* procedure. J. Brit. Grassl. Soc. 19:363.

Wooding, F. J., G. M. Paulsen and L. S. Murphy. 1970. Response of nodulated and nonnodulated soybean seedlings to sulfur nutrition. Agron. J. 62:277.

Woodman, H. E. and R. E. Evans. 1935. Nutritive value of lucerne. IV. The leaf-stem ratio. J. Agr. Sci. 25:578.

Zucker, M. and H. T. Stinson, Jr. 1962. Chloroplasts as the major protein-bearing structures in Oenothera leaves. Arch. of Biochem. and Biophys. 96:637.

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MASTER OF SCIENCE

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Three groups of closely matched Holstein heifers were used to compare two maturities of alfalfa pasture (25- and 35-day regrowth) with alfalfa hay fed in drylot. Two rumen-fistulated animals were in each of the grazing groups to facilitate intake sampling. The average daily gains were: Group A (25-day regrowth) 1.06±.7 kg; Group B (35-day regrowth) 1.03±.05 kg; and Group C (alfalfa hay in drylot) .95±.03 kg. Dry matter consumption per 5 day period was 369 and 476 kg for Groups A and B, respectively (significantly different $P<.05$). The dry matter intake per 100 kg of body weight was 1.6 and 2.1 kg for Groups A and B, respectively. Intake difference may have been due to Group B cattle having more feed ($P<.01$) available (1189±75 kg/period) than Group A cattle (891± 51 kg/period).

Total crude portein and insoluble protein concentrations were greater in the 25-day than in the 35-day regrowth alfalfa ($P<.05$). Dry matter and total crude protein contents of the cardial region rumen samples for the two regrowth periods differed ($P<.06$) as did the ash content ($P<.05$). The 35-day alfalfa regrowth cardial region samples contained more dry matter than the 25-day samples, but were lower in ash and total crude protein.

Consumption was correlated positively ($r=.74$) to insoluble protein content for the 25-day regrowth alfalfa herbage. That relation was $Y = -649 + 77(X)$ (Y = consumption/period and X = insoluble protein content). Significant correlation was not found for the 35-day regrowth alfalfa.