Effect of Season and Regrazing on Diet Quality of Burned Florida Range

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Abstract

Diet crude protein and in vitro organic matter digestibility (IVOMD) of diets of esophageally fistulated steers were compared for a pasture grazed June to September ("summer" pasture) and again in January to March ("winter-regraze") with a pasture grazed in "winter-only". The longevity of improvement in diet quality due to burning also was measured. Grass and forb yields were determined before and after grazing. Dietary crude protein and IVOMD were greater ($P<0.05$) on the summer (8.4% and 47%) as compared to the winter-only pasture (6.7% and 32%) in both years. Diet protein concentration of the winter-regraze pasture (7.6%) was not different ($P>0.05$) from summer or winter-only diets in both years. IVOMD in diets from the winter-regraze (36%) was intermediate and significantly different from the summer and winter-only pasture in the first year. Diet IVOMD in the second year was not different ($P>0.05$) on the winter-regraze (34%) and winter-only (32%) pastures. Diet quality was not different ($P>0.05$) in summer (8.2% protein, 46% IVOMD) beginning 4 months after a burn as compared to forage quality in summer 16 months after the burn (8.5%, 47%, respectively). Compared to grazing in winter only, grazing in summer may improve digestibility of forage from range when that range is regrazed the following winter, but protein and energy of the summer range will be deficient for lactating cows.

Ranching has been a cow-calf industry in Florida where cattlemen have been limited by infertile, sandy soils, wide variations in rainfall and temperature, and a poor annual distribution of low quality forage from extensively managed subtropical pastures. Although weaning weight, production/cow, and production/ha increase with intensification (Peacock et al. 1974), dollar returns/cow can decrease (Anderson and Hipp 1973). Many Florida ranchers have found that the greater cost of increased calf production from fertilized, introduced forages can be offset with low cost of range.

Some nutritional deficiencies of Southeastern U.S. range have been recognized. A seasonal decline (April to December) in nutritive value 44 to 32% TDN, respectively) was accompanied by declining forage intake and cow weights in Georgia (Hale et al. 1962). Range forage in Georgia may vary from 4 to 8% crude protein and 25 to 45% digestibility as determined by in vitro procedures on hand-collected samples (Lewis et al. 1975).

There are few methods for improving the quality of range forage. Perhaps diet quality could be improved through control of grazing time. Many ranchers utilize their fertilized pastures during summer while deferring use of native pastures until winter when plants are often senescent and forage quality is low. It has been shown that crude protein and IVOMD (in vitro organic matter digestibility) in creeping bluestem *(Schizachyrium stoloniferum)* in winter were improved by clipping (Kalmbacher et al. 1981, Kalmbacher et al 1985) or grazing (Kalmbacher and Martin 1986) during the growing season. It was our hypothesis that summer grazing of native pastures would result in higher quality forage for winter grazing.

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Materials and Methods

The study was conducted at the University of Florida's Ona Agricultural Research Center in south-central Florida. The study area has been described (Kalmbacher et al. 1984). Two 8.1 ha native pastures were grazed (Fig. 1). One was grazed during summer and will be referred to as 'summer' pasture, then regrazed in the winter, when referred to as 'winter-regraze' pasture. The second pasture was grazed in 'winter-only' and will be referred to as such. The summer pasture was first grazed from 16 June to 26 Aug. 1980. During this time 101 diets were sampled from 4 esophageally fistulated Brahman-cross steers (325 kg). Forage was collected from 5 fistulated steers on the winter pastures between 12 Jan. and 15 Mar. 1981, when a total of 111 and 108 diet samples were collected from the winter-regraze and winter-only pastures, respectively. Collections on summer pasture in the second year were made from 9 June to 15 Sept. 1981, when 89 diets were sampled. The winter pastures were grazed from 3 Jan. to 16 Mar. 1982, when 81 and 75 diets were sampled.

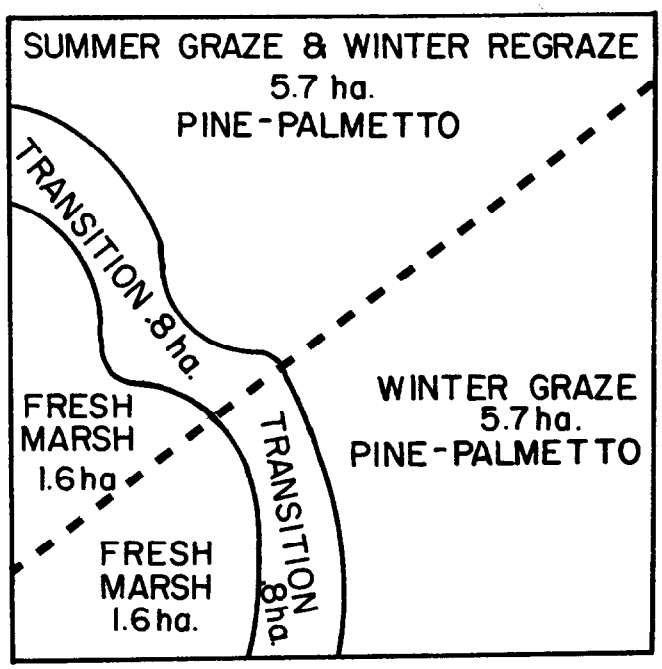

Fig. 1. *Pasture layout of grazing study area. Ona, Florida. 1980–82.*

Esophageally fistulated steers were allowed a 2-week adjustment on the study pasture prior to collection. Animals were coralled at night to aid in capture at 0800 hr, to insure appetite, and to minimize regurgitation during collection. A 1.0- to 1.5-kg sample of ingested forage was usually obtained once per day in 15 to 20 minutes in screen-bottom collection bags. The fistulated steers were herded back to the pen, collection bags removed, cannulae replaced, and steers fed 0.5 or 1.0 kg/steer (summer or winter, respectively) of mixed grain. Minerals and water were provided *ad libitum*. Animals were released after collections but penned and fed the same amounts in evening.

Diets collected by steers were spread on screen frames, dried at 50° C for 24 hours, and ground (0.5-mm mesh). Samples were analyzed for crude protein (Gallaher et al. 1976, Isaac and Johnson 1976) and IVOMD (Moore and Mott 1974, 1976).

Nonfistulated steers were used during collection periods to assure uniform grazing and provide additional grazing pressure. Stocking rates in 1980 and 1981 (including nonfistulated steers) for summer and winter pastures were 55 and 53 animal unit grazing days/ha, respectively. Stocking rates for these respective pastures in 1981–82 were 59 and 40 animal unit grazing days/ha.

Data analysis used the general linear model (GLM) procedure of the statistical analysis system (SAS) (Helwig and Council 1979). Replications were the 4 or 5 esophageally fistulated steers.

Eighteen permanent transects were established in the 16.2-ha study area to determine range yield. Three transects were located at random in each of 3 range sites of each pasture (Fig. 1). Transects were 215 m long on pine-palmetto sites, 36 m on fresh marsh sites, and 90 m on transition sites. Within each transect on pine-palmetto, transition, and fresh marshes, 66, 45, and 12, 0.25 m^2 quadrats were clipped. Forage was cut near the soil surface or water level in the marsh, and vegetation was sorted into creeping bluestem, *Andropogon* spp., carpet grasses (*Axonopus* spp), maidencane *(Panicum hemitomon),* "other grasses", and forbs. Forage was dried (50° C) for 48 to 72 hr, and reweighed for yield determination. This was done in January 1980, and then pastures were back-fire burned in February. Pastures were resampled prior to grazing in June 1980 and January 1981, and after grazing in August 1980 and March 1981.

Results and Discussion

Season Effects

Crude protein and IVOMD

There was a significant ($P<0.05$) decline in diet crude protein and IVOMD from summer to winter-only pastures in both years (Table 1). Year had no significant effect on either crude protein or IVOMD and differences among seasons and all pastures were consistent both years. Protein in winter diets (avg. 6.7%) was about 1.6 percentage units lower than it was in summer (avg. 8.3%). There was an average 14.7 unit decline in diet IVOMD. Differences in diet quality were largely due to weathering and aging, and an increase in diet shrub content (Kalmbacher et al. 1984). Shrubs that constituted a large portion of the winter diet contained more crude protein than grass but were lower in IVOMD (Long 1983).

Table 1. Diet crude protein and IVOMD of five esophageally fistulated steers grazing two range pastures; one in summer and again in winter, and the other in winter-only. Ona, Florida 1980-1982.

	Forage Quality Index			
	CP	IVOMD	CP	IVOMD
	1980-81		1981–82	
	%			
Pasture-season				
Summer	8.2 a[1]	46.4 a	8.5 a	47.1 a
Winter-regraze	7.5 ab	35.9 b	7.6 ab	34.3 b
Winter-only	6.8 b	32.2 c	6.6 b	32.1 b

[1]Means within a column followed by the same letter are not different (Duncan's MRT, $P<0.05$).

Regrazing Effects

Crude protein

Crude protein content of diets were not different ($P>0.05$) between the summer and winter-regraze pastures (Table 1). There may be 2 reasons for this observation. First, cattle were able to select a relatively good diet from the poor forage that was available during winter. Selection included shrubs which were fairly high in crude protein in mid-winter and also spring growth of high protein forbs. Secondly, grasses, except maidencane, carried- over from September to December maintained protein contents similar to that in summer (Long 1983). Most of the forage available in winter was carried-over because there were little regrowth between September and December (Fig. 2).

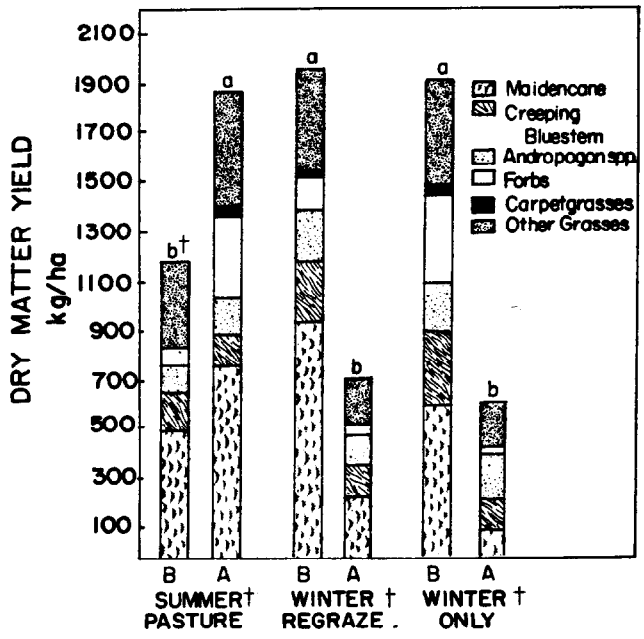

Fig. 2. *Species composition of available forage before (B) and after (A) grazing. Ona, Florida. 1980–1981. Difference in pasture yield before and after grazing significant ($P<0.05$).*

Diet crude protein was 0.7 to 1.0 percentage units higher on the winter-regraze as compared to the winter-only pasture in 1981 and 1982, respectively (Table 1). This slight improvement was brought about by younger, less weathered regrowth on the winter- regraze pasture. These differences in crude protein between winter-regraze and winter-only pastures were not significant ($P>0.05$). The amount of forage on offer was similar in these 2 pastures (Fig. 2), and botanical composition of the winter diets was not different ($P>0.05$) (Kalmbacher et al. 1984).

IVOMD

The difference in diet IVOMD between summer and winter-regraze pastures was significant ($P>0.05$) in both years (avg. 11.7 percentage units) (Table 1). Diet IVOMD was also different between diets from the winter-regraze and winter-only pasture (avg. 5.0 percentage units) in 1981, but not different in 1982. Comparison of the changes in percentage units indicates that seasonal effects had a greater influence on diet IVOMD than regrazing effects.

The decline in diet IVOMD from summer to the 2 winter-grazed pastures was due more to differences in age of forage carried over from summer than changes in diet composition, which have been mentioned. Forage was 4 to 7 months old on the summer, 3 to 11 months old on the winter-regraze, and 11 to 13 months old on the winter-only pasture in the first year. Regrowth during summer and between October and December on the winter-regraze pasture was probably lower in lignin (ADL) and acid detergent fiber (ADF) fractions than forage on the winter-only pasture. The relationship between ADL and ADF with IVOMD has been observed in creeping bluestem of different maturities (Kalmbacher et al. 1981).

Seasonal Trends

Diet crude protein of the 2 winter pastures started and continued in the same order of magnitude (Fig.3). Diet IVOMD from these 2 pastures started about 35%, but IVOMD on the winter-only pasture declined, while the winter-regraze remained rather constant.

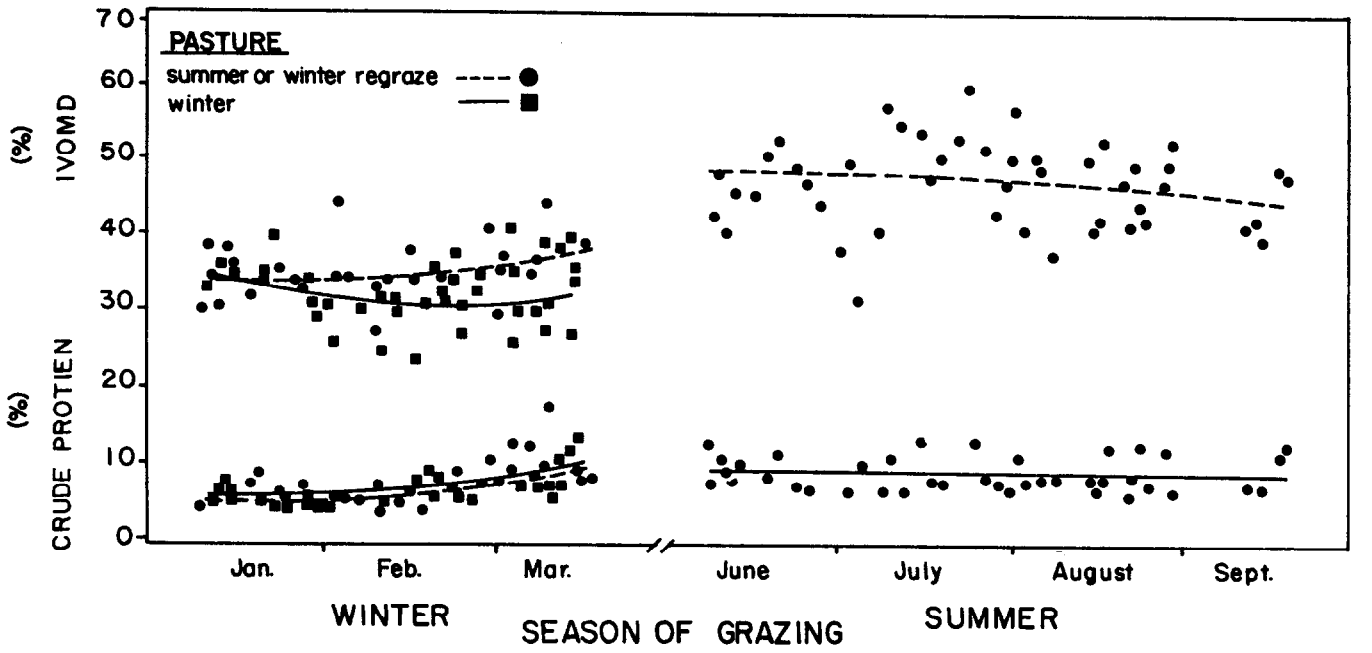

Fig. 3. *Crude protein content and in vitro organic matter digestibility (IVOMD) in diets of 5 esophageally steers grazing range in summer, regrazing the summer pasture in winter, and winter only. Values represent averages of diets over steers on that collection date. Ona, Florida. 1980–81 and 1981–82.*

The reason for apparent differences in IVOMD is not known, and there is no statistical method for establishing differences in the slopes of the lines. Each point in Figure 3 was an average of the respective quality index for the fistulated steers, and curves were empirically determined (Reimsch 1967). Variation in diet IVOMD seemed to be less early in winter but increased when all steers grazed better quality spring growth as well as older winter forage.

Longevity of Burning Effects

Diet protein and IVOMD from the 1980 summer pasture represented diet quality 4 to 7 months after a burn, while in 1981 they represented the diet 16 to 19 months after a burn. The similarity in quality of summer diets of 1980 and 1981 indicated that cattle selected a diet that was not different ($P>0.05$) in protein and digestibility in summer regardless of whether or not the range had been burned the previous winter. Crude protein IVOMD of hand-clipped creeping bluestem and other forages declined 4 to 6 months after a February burn (Kalmbacher et al. 1985, Hilmon and Lewis 1962, Lewis et al. 1975), which indicates that the advantage due to burning was already lost during the first summer. It had been a concern that diet quality would decline 1 or more years after a burn, but animal selectivity can apparently overcome quality losses demonstrated in clipping studies.

Pasture Yield

There was less ($P<0.05$) forage at the beginning of summer than there was at the end (Fig. 2), which indicated diet quality was not limited by amount or kind of forage. Winter-regraze pasture yield (2,010 kg/ha) was not different ($P>0.05$) from winter-only yield (1,920 kg/ha) even though the winter-regraze pasture had been formerly grazed from June to September. About 65% of the grass and forbs (1,300 kg/ha) were eaten or lost during the winter grazing period (Fig. 2).

Weathering and trampling losses were visually estimated to be 70%, thus 30% of the 1,300 kg/ha utilized. On wiregrass *Aristida stricta)* range, which yielded 2,600 kg/ha and was stocked at 35 animal unit grazing days/ha, about 40% utilization was measured (Lewis and McCormick 1971).

It is estimated that cattle (avg. 430 kg), which were stocked at 45 and 53 animal unit grazing days/ha, consumed about 8.6 and 6.4 kg/head/day of grass and forb dry matter on winter-regraze and winter-only pastures, respectively. This was about 1.7 to 2.0% of body weight not considering shrub consumption, which was 21 and 29% of diet dry matter in the winter regraze and winter only pastures, respectively (Kalmbacher et al. 1984). Forage intake on wiregrass range in Georgia varied from about 1.5 to 2.3% of body weight (Hale et al. 1962).20

Study Implications

As compared to grazing in winter only, regrazing a pasture in winter did not improved diet protein significantly in either year, but IVOMD was improved in 1 year. Because this was a minor improvement in quality, it is doubtful that it would be important in reducing supplementation needs. Cattle may be at the maximum of intake because of limitations in rumen capacity, yet their diets may still be deficient in protein and energy (National Research Council 1984). The most pressing problem with this range does not appear to be production but forage quality.

Most range research in the Southeast has been conducted on wiregrass range, a connotation which implies a poor condition class with 25% or less of the yield of forage coming from higher yielding bluestems, etc. (Yarlett 1974). Range in this study was in good condition, with 50% or more of the forage from grasses like creeping and chalky bluestems. Fostering such grasses may provide cattlemen with more forage (Yarlett 1965), but there doesn't appear to be an improvement in diet quality as a result of the change in botanical composition.

These data demonstrate a strong need to introduce forages on Florida range with better nutritional potential. Even when range should have been high in quality 4 to 7 months after a burn, average diet crude protein and energy would not be adequate for lactating cows (National Research Council 1984). Winter range, regardless of grazing history, would not maintain a cow in any physiological condition without supplementation.

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