

FEEDING METHOD AND PERFORMANCE OF GROWING LAMBS

M. A. Funk^{1,3}, A. L. Goetsch^{2,4},
F. N. Owens³ and K. B. Poling

Story in Brief

Thirty-six crossbred lambs (61 lb) were individually fed (ad libitum) rolled corn and chopped alfalfa in a 56-day experiment. Sheep either received a mixed diet (60 percent concentrate) at 0900 and 1700 hr (60C), an 80 percent concentrate diet at 0900 hr and a 40 percent concentrate diet at 1700 hr (ALT), all roughage at 0900 hr and all concentrate at 1200 hr (RC) or all concentrate at 0900 hr and all roughage at 1200 hr (CR). Average daily gain (ADG) for the entire experiment was greater ($P < .05$) for 60C and CR lambs than for ALT animals and greater ($P < .05$) for 60C than for RC sheep. During the first and last 14 day periods, ADG, intake and efficiency tended ($P > .05$) to be greater for 60C than for ALT lambs while these measurements tended to favor the CR diet during the middle two periods. In a second experiment with lambs fed similarly at 3.6 percent of body weight (dry matter basis), no differences in total tract digestibilities were observed. Results show no performance benefit from altering the method and time of offering roughage to finishing sheep.

Introduction

Lambs commonly consume medium concentrate, completely mixed diets ad libitum. A mixed diet may accentuate the negative associative effects between concentrate and roughage. Altering the feeding time of diet ingredients may reduce such detrimental associative effects or alter digesta flow to increase postruminal digestion. The objectives of this experiment were to investigate the effects of feeding roughage and concentrate at different times and proportions on performance and digestibility by lambs.

Materials and Methods

Experiment 1

Thirty-six crossbred lambs (61.2 lb) were allotted by weight and previous experimental treatment into four groups. A two-week preliminary period was employed to lessen effects of the previous experiment. Lambs were housed in individual pens and fed for 56 days. The dietary concentrate (rolled corn based):roughage (chopped alfalfa hay) ratio was 60 percent while the crude protein level was 14.1 percent. Feeding methods included 1) offering equal portions of the mixed diet (60 percent concentrate) at 0900 and 1700 hr (60C), 2) feeding equal quantities of an 80 percent concentrate diet at 0900 hr and a 40 percent concentrate diet at 1700 hr (ALT), 3) feeding all roughage at 0900 and all concentrate at 1200 hr (RC) and 4) vice versa

¹ Undergraduate Student ² Research Associate ³ Professor, Animal Science
⁴ Animal Care Supervisor

(CR). Animals had feed available ad libitum. Orts were weighed daily at 0800 hr and amounts of feed adjusted so that the total daily diet was 60 percent concentrate.

Lambs were weighed each 14 days at 0700 hr after being held off water for 12 hr. Hence, four two-week periods were used. Weights include a 4 percent shrink from liveweight. Initial shrunk weight was used as a covariate for statistical analyses of gain, feed intake and feed efficiency data.

Experiment 2

Twelve sheep (64.3 lb) were assigned to the four treatments described earlier. Chromic oxide was included in the concentrate portion of the diet as an indigestible marker. Lambs were allowed ad libitum access to feed for a 10-day period. Feed was then restricted to an intake equal to that of the animal eating the least (3.6 percent of body weight, dry matter basis). After 7 days of restricted intake, animals were fitted with fecal bags. Fecal subsamples were obtained three consecutive days, dried at 55 C, ground through a 2 mm screen, composited within lamb and analyzed for dry matter (DM), ash, starch, nitrogen (N), acid detergent fiber (ADF) and chromium. Total digestibilities were determined by changes in the ratio of chromium to feed constituents from feed to feces.

Results and Discussion

Experiment 1

Initial lamb weight (Table 1) was slightly lower for the 60C treatment; thus this variable was used as a covariate in some analyses. Although individual period data were omitted from tables for brevity, average daily feed consumption plateaued during period III for all treatments. Large increases in intake during the first periods reflect the previous low plane of nutrition of the lambs. Feed intakes (lb DM per day and percent of body weight; Table 1) of lambs fed 60C and CR diets tended to be greater than for lambs fed the ALT and RC diets. Total average daily gain (ADG, Table 1) was greater ($P < .05$) for 60C and

Table 1. Intakes, weights and feed efficiencies, experiment 1.

Item	Diet			
	60C	ALT	RC	CR
Weights, lb				
Initial	59.3	61.7	62.3	61.5
Final	92.7	88.7	91.0	93.4
Daily gain, lb/d	.596 ^a	.481 ^c	.512 ^{bc}	.571 ^{ab}
Daily feed				
lb/d	3.10	2.84	2.85	3.03
% of body weight	4.01	3.82	3.78	3.94
Feed/gain	5.28	6.00	5.73	5.36

^{abc} Means in a row with different superscripts differ ($P < .05$).

CR than for ALT animals. The ALT lambs had the lowest gain in all periods except the first. This contrasts with previous work in which gain and feed efficiency (F/G) of lambs assigned to a similar ALT treatment were highest (Galyean, personal communication). Environmental differences may be partially responsible for this discrepancy. Our trial was conducted during August, September and October with higher temperature and humidity and less temperature fluctuation between night and day than in the previous trial. With the ALT diet, heat increment should have been highest in the evening after consumption of the 40 percent concentrate diet. To meet cooler night temperatures, this energy could be useful. Our warmer night conditions would not have permitted this heat to be beneficial.

In period I, lambs fed the CR diet had the lowest ($P>.05$) ADG while these lambs had the greatest gains in the two subsequent periods. Perhaps microbial and host adaptation to the CR feeding regime required more time than adaptation to other diets. Alternatively, fill may have been lower with the CR diet. Omission of period I data from the analyses, reveals a similar ADG for lambs fed the 60C and CR diets (.57 and .57 lb/day, respectively) but a tendency for F/G to be superior for lambs fed the CR than the 60C diet (5.62 vs 5.72). If the ingested roughage occupied space in the rumen and forced exit of undigested concentrate, CR animals may have received the greatest quantity of post-ruminal nutrients. Rate of intestinal enzyme secretion or gut size could have changed also, although no carcass data were obtained. Poor performance of the RC sheep may have been partially due to the unlimited consumption of the roughage diet at 0900 hr which may have decreased consumption of concentrate at 1200 hr. Limiting the roughage fed in this regime may be a desirable option. The most desirable F/G measures were during the first period. This may reflect the low plane of nutrition these lambs had received previously. Trends in F/G (Table 1) parallel those of ADG. These measures proved highly related ($r=-.76$; $P<.01$).

Experiment 2

Total tract digestibilities are presented in Table 2. These different feeding methods had no significant effect on digestibility although feed intake in this experiment was slightly lower than in the first trial. Lower feed intake might mask some digestibility differences.

No advantage to these alternate feeding methods for finishing sheep was observed. Some of these methods may have proven more favorable had feed intake been limited, and younger animals may have responded to a greater degree. If increased post-ruminal digestion were desired, the CR feeding method might be preferable.

Table 2. Digestibilities, experiment 2.

Item	Diet			
	60C	ALT	RC	CR
Organic matter, %	78.5	79.1	79.7	78.7
Starch, %	98.4	98.5	98.9	98.8
Fiber, acid detergent, %	54.3	55.9	55.3	56.2
Nitrogen, %	62.0	70.1	72.8	68.7