

Feeding Methods: Time Limited and Alternating Protein and Fiber Levels for Lambs

S. C. Arp¹ and F. N. Owens²

Story in Brief

Sixty crossbred lambs averaging 93 lb were individually penned and fed the same ingredients (cracked corn, soybean meal, cottonseed hulls) in five different manners. One group had access to the diet, 12.5 percent crude protein (CP) and 20 percent cottonseed hulls (CSH), ad libitum. A second group was fed the same diet but had access to feed for only one hour each day. A third group received (on alternate days) diets containing 15 percent CP and 10 percent CSH, and a fourth group received (on alternate days) diets containing 10 percent CP and 30 percent CSH. Lambs fed free choice consumed 16 percent more feed ($P < .01$) than those fed for a limited time and gained 10 percent more rapidly. This gave the limit fed lambs a six percent advantage in feed efficiency. Alternating high and low roughage diets reduced feed intake by 10 percent and rate of gain by 9 percent while alternating protein levels decreased feed intake by five percent and rate of gain by 10 percent. Results indicate that an alternating protein level may reduce efficiency. Limiting the time of access to feed may stabilize digestion and improve efficiency, though severe restriction will reduce rate of gain as well. Results may not apply to group fed animals. Reduced feed efficiency with diets of varying chemical composition suggests that feed should be thoroughly mixed prior to delivery to feed bunks.

Introduction

Growing and finishing lambs usually are provided ad libitum access to a constant diet. Alternating high and low roughage diets each day may avoid some of the adverse effects of concentrate on roughage digestion in the rumen. The purpose of this experiment was to determine the effect of alternating the protein and fiber content of diets each day and limiting the time of access to feed, on feed intake, daily gain and feed conversion efficiency.

Materials and Methods

Sixty crossbred lambs averaging 93 lb were allotted by weight into three groups. Within each group, five wethers were randomly allotted to one of four treatments. Lambs were housed in individual pens and fed a diet of cracked corn, soybean meal, and cottonseed hulls (CSH). One treatment had ad libitum access to the diet (Table 1) which contained 12.5 percent crude protein (CP) and 20 percent CSH. The second treatment group had ad libitum access to

¹Graduate Assistant, ²Professor of Animal Science

Table 1. Diet composition^a

Ingredients %	Treatments				
	Low protein	High protein	Low fiber	High fiber	Normal
Corn	73.5	60.0	78.1	55.5	66.8
Soybean meal	5.7	19.3	11.1	13.8	12.5
Cottonseed hulls	20.0	20.0	10.0	30.0	20.0
Calcium carbonate	.8	.7	.8	.7	.7

^a455 IU vitamin A and 120 IU vitamin D added per pound of feed.

feed for only one hour each day. The third treatment group received (on alternative days) diets containing 15 percent CP and 10 percent CP (Table 1) while the fourth treatment group received (on alternative days) diets containing 10 percent CSH and 30 percent CSH. Daily weighbacks were taken for treatments of high/low protein, high/low roughage and the limit fed lambs. Weighbacks for the control group were taken once each week. Weights were taken at the beginning and end of the 49-day feeding period following 24 hours without feed and water. Weights were adjusted for wool weights as lambs were sheared the third week of the trial. Feed intake, average daily gain and feed conversion efficiency were monitored.

Results and Discussion

The discussion that follows will be presented in two parts, first comparing ad libitum versus limited time access to feed and, second, alternating levels of protein and roughage.

Lambs with ad libitum access to feed consumed 16 percent more ($P < .01$) feed than limit fed animals and gained 10 percent more weight (Table 2). This calculates to an improvement in feed efficiency for limit fed animals of six percent. Increased efficiency with limit feeding could be due to increased digestibility caused by a slower rate of passage with lower feed intake. Another possibility is an increased gut size, absorptive capacity or metabolic efficiency as shown with meal fed rats, pigs and chickens (Brownlee and Moss, 1959; Fabry, 1967; Leveille, 1970). A third possibility is a reduced incidence of digestive upsets due to the regularity of feedings though no disorders were externally apparent

Table 2. Performance data comparisons

Item	Treatments	
	Ad libitum	Limit fed
Average daily gain, lb	.486	.444
Daily feed intake, lb	2.88 ^a	2.49 ^b
Feed/gain	6.04	5.69

^{ab}Means in a row with different superscripts differ statistically ($P < .01$).

Table 3. Performance data comparisons

Item	Treatments		
	Ad libitum	Alternating fiber	Alternating protein
Average daily gain, lb	.486	.442	.440
Daily feed intake, lb	2.88 ^a	2.60 ^b	2.75 ^{ab}
Feed/gain	6.04	6.03	6.33

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

during the trial. Data suggest that limiting the time of access to feed may slightly improve feed efficiency of individually fed lambs. Further testing with group fed animals is needed.

Lambs with ad libitum access to the totally mixed diet ate 11 percent more ($P < .05$) feed than the lambs fed diets with alternating levels of roughage and five percent more than lambs fed diets with alternating levels of protein (Table 3), while gains were reduced about 10 percent with both treatments. Superior efficiency of the lambs receiving the alternating levels of roughage can be attributed to the fact that these lambs consumed 35 percent more feed on the days the low CSH diet was offered than on days the higher CSH diet was provided. Animals fed alternating levels of protein consumed nearly identical amounts of the low and high protein diets. Variations in diet composition (protein and fiber level) tended to reduce efficiency suggesting that thorough mixing of a diet prior to feeding is beneficial.

Literature Cited

- Brownlee, A. and W. Moss. 1959. Brit. Vet. J. 115:225.
Fabry, P. 1967. In: Handbook of Physiology. Alimentary Canal. Washington, DC: Am. Physiol. Soc., 1967, sect. 6, Vol 1, Chapt. 3, p. 31.
Leveille, G. A. 1970. Fed. Proc. 29:1294.