

PERFORMANCE OF YEARLING LAMBS ON WHEAT FORAGE AND A NON-PROTEIN-NITROGEN DIET

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Story in Brief

Recent reports have indicated that grazing wheat forage improves performance when animals are subsequently placed on a diet high in non-protein-nitrogen. The purpose of this study was to evaluate the response of sheep to this management system. Lambs were fed either freshly cut wheat forage or a concentrate diet for 50 days (Phase I) and then fed a common concentrate diet containing 1% urea for 56 days (Phase II). Daily feed or forage intake and average daily gain were determined in both phases. Changes in blood and rumen nitrogen levels were also determined during phase II. The results indicated that sheep fed wheat forage gained only 0.13 lbs per head per day in contrast to 0.23 lbs per head per day for sheep fed a concentrate ration. This poor performance was due to the low dry matter content of the forage and an inability of the sheep to compensate for this by increasing forage intake. There were no differences in animal performance during phase II and the presence of 1% urea in the diet did not significantly increase rumen or blood nitrogen levels. The results of this study indicate that sheep on wheat pasture may not be able to consume enough forage to maintain an acceptable growth rate without supplemental energy. The failure of the sheep fed wheat forage to show improved performance on a non-protein-nitrogen diet could have been due either to their poor condition at the end of phase I or to the failure of a 1% urea diet to challenge their ability to handle nitrogen.

(Key Words: Wheat forage, Lambs, Non-protein-nitrogen, Feed intake)

Introduction

Winter wheat (*Triticum aestivum* L.) is a major source of pasture for ruminants in the Southern Great Plains, however, animal performance on wheat pasture and during the subsequent finishing phase varies considerably. Although overall average daily gains for beef cattle grazing wheat are generally good, animal performance during the first 2-4 weeks on pasture is poor. This has generally been attributed to the low dry matter content of the forage with animal performance improving as adaptation occurs. It has also been proposed that beef cattle grazed on wheat demonstrate increased performance when they are subsequently fed a diet high in non-protein nitrogen. However, the data in this regard are controversial. The purpose of this study was to characterize the response of sheep on wheat pasture and on a diet high in non-protein nitrogen in order to 1) obtain individual feed intake data for animals on wheat forage; information which has

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not been previously reported; 2) determine if grazing wheat pasture provides an advantage when animals are placed on a finishing ration; and 3) if so, whether this is related to differences in utilization of non-protein-nitrogen.

Materials and Methods

Twenty-one yearling lambs with a mean weight of 63.9±1.3 lbs were placed in individual pens (1.5 ft²) and randomly assigned to one of two groups in this study. In phase I of the study (50 days), 10 animals (WF) were fed freshly cut wheat forage ad lib. and 11 animals (P) were fed 0.03 lbs DM/lb BW of a concentrate diet (Pellet I). In phase II of this study (56 days), all lambs were fed ad lib. a diet containing 1% urea by weight (Pellet II).

Animal weights were determined at the beginning and end of each phase and feed intake was recorded daily by animal in both phases. Rumen and blood samples were taken 2 and 6 hours, respectively, after feeding at the end of phase I and on days 10, 21, 37 and 51 of phase II. Samples were analyzed for rumen ammonia and pH, plasma urea nitrogen, glucose and total protein and serum albumin. Seventy-two hour digestion trials were conducted on 3 animals from each group starting on day 50 of phase I and days 15, 30 and 56 of phase II. During phase I, feed and forage were sampled twice weekly and during phase II feed was sampled weekly. Feed and forage samples were analyzed for DM, ADF, NDF, OM and total N.

Results and Discussion

The composition of the three diets used in this study is indicated in Table 1. At the start of phase I, dry matter content was low (18%) and increased over the duration of the trial to a final value of 48%. This significantly limited the ability of the WF animals to ingest an adequate amount of dry matter (Table 2) during phase I. The sheep in this study were not able to adapt to this situation by increasing forage intake, therefore, ADG of the WF groups (0.13 lbs per head per day) was nearly 50% of that in the P group (0.23 lbs per head per day). Although the wheat forage was more digestible than the concentrate diet (83% vs 64%, $p<0.01$), this advantage was offset by the high ash content of the wheat forage as compared to that of the concentrate (Table 1).

In phase II there were no significant differences in either ADG or feed intake between the two groups. Nor were there consistent significant differences in rumen pH, plasma total protein and glucose or serum albumin. Although animals on WF showed significantly elevated

Table 1. Composition (% of total) of diets and wheat forage

Composition	Forage	Pellet (I)	Pellet (II)
N	3.8	1.9	1.9
NDF	44.8	50.4	48.0
ADF	29.3	34.7	29.9
DM	12.1-48.0*	88.0	88.0
ASH	20.4	4.7	3.3
OM	79.6	95.2	96.7

Table 2. Average animal daily nutrient intake (lbs) at weekly intervals during phase I.

TRT	Weeks						
	1	2	3	4	5	6	
I	P	2.1 ^b	2.2 ^a	2.2 ^a	2.2 ^a	2.2 ^a	2.2 ^a
	WF	6.0 ^b	6.6 ^b	5.4	6.3 ^b	6.1 ^b	6.4 ^b
DMI	P	1.8 ^d	1.9 ^c	2.0 ^c	2.0 ^c	2.0 ^c	2.0 ^c
	WF	1.0 ^d	1.3 ^e	1.0 ^d	1.5 ^f	1.9 ^g	2.0 ^g
	P<	0.01	0.01	0.01	0.01	NS	0.10

Values within a row with the same superscript are not significantly different ($p>0.05$).

Levels of rumen ammonia (88 mg %) and plasma urea nitrogen (28 mg %) at the end of phase I, there were no differences between groups for the variables in phase II. In addition, rumen ammonia levels and plasma urea nitrogen levels in phase II on a diet containing 1% urea nitrogen were not significantly different from those levels seen in the P group of phase I on a urea free diet.

The results indicate that, under the conditions of this study, the performance of sheep on wheat pasture is limited by the dry matter content of the forage as these animals seemed unable to increase forage intake during periods of sustained low dry matter content. Furthermore, feeding wheat forage had no significant effect on subsequent animal performance on a diet containing 1% urea. Finally, a diet containing 1% urea by weight did not significantly elevate either rumen ammonia or plasma urea nitrogen in these animals. It may be that any ability of wheat forage to increase animal performance on a nonprotein nitrogen diet was confounded in this study by either the disparity in animal condition between the groups at the end of phase I, the inability of a 1% urea diet to challenge the animals ability to handle high nitrogen levels in phase II or both.