



ELSEVIER

Contents lists available at SciVerse ScienceDirect

Small Ruminant Research

journal homepage: www.elsevier.com/locate/smallrumres

Phenotypic variation in residual feed intake and performance traits in rams



R.R. Cockrum*, R.H. Stobart, S.L. Lake, K.M. Cammack

Department of Animal Science, University of Wyoming, 1000 E. University Avenue, Department 3684, Laramie, WY 82071, United States

ARTICLE INFO

Article history:

Received 17 October 2012

Received in revised form 4 May 2013

Accepted 7 May 2013

Available online 31 May 2013

Keywords:

Performance test

Residual feed intake

Sheep

ABSTRACT

The objectives of this study were to (1) evaluate relationships in rams between residual feed intake (RFI) and pre-test variables such as birth type and age put on performance test, (2) determine if relationships exist between RFI and carcass characteristics, growth traits, and wool traits in rams, and (3) identify the adequate length of testing necessary to determine individual RFI ranking in sheep. University of Wyoming performance tested rams, whiteface wool breed (WB; $n = 183$) and meat breed (MB; $n = 147$), were evaluated for feed intake traits using an automated feed intake system. Whiteface wool breed rams were composed of three contemporary groups (WB1 = Fall 2009, WB2 = Fall 2010, and WB3 = Fall 2011) and MB rams were composed of two contemporary groups (MB1 = Summer 2010 and MB2 = Summer 2011). Carcass, growth, wool, pre-test variables, and weekly weight measurements were collected for rams. Weekly and trial RFI values were calculated separately within each contemporary group. There were no relationships between trial RFI and carcass, growth, or wool traits. However, there was a tendency ($P = 0.054$) for a positive correlation (0.23) between trial RFI and scrotal circumference in WB2, and a positive (0.46; $P < 0.001$) and a negative correlation (-0.28 ; $P = 0.068$) between belly score and trial RFI in WB1 and WB3, respectively. Weekly variation of RFI estimates was consistent from wk 7 to 15, and was lowest at wk 9 (d 63) for WB rams. The lowest and most consistent weekly variation of RFI in MB rams occurred in wk 5–6, suggesting that a testing period of 40–60 d is sufficient to estimate RFI in sheep. Furthermore, RFI values and RFI rankings generated after wk 6 were consistent throughout the testing period. These preliminary results indicate that RFI is not adversely correlated to carcass, growth, or fleece traits in sheep, and that performance test periods currently used in the University of Wyoming Ram Test are sufficient to estimate RFI.

© 2013 Elsevier B.V. All rights reserved.

1. Introduction

To support a world population increase of 34% by 2050, livestock producers face a growing dilemma to reduce feed costs and increase production by 70% while using less land and feedstuffs (U.S. Census Bureau, 2011). A potential

solution is to select for feed efficiency traits. In the past, producers have primarily focused on feed conversion ratios; however, animals with similar ratios differ in feed intake and rate of gain. As an alternative to feed conversion, Koch et al. (1963) proposed selecting for residual feed intake (RFI) as an indicator for feed efficiency. Residual feed intake is the deviation of actual intake from predicted intake for a given measure of growth (ADG) and body weight (metabolic mid-weight). Currently, the swine, poultry, and cattle industries are investigating the effectiveness of selecting for feed efficiency using RFI. The sheep industry, however, has yet to fully investigate the potential impacts

* Corresponding author at: Department of Animal Sciences, Colorado State University, 200 West Lake, 1171 Campus Mail, Fort Collins, CO 80523-1171, United States. Tel.: +1 970 491 1442; fax: +1 970 491 5326.

E-mail address: Rebecca.Cockrum@colostate.edu (R.R. Cockrum).

Table 1
Composition of diets used for the University of Wyoming Performance tests.

Item	Diet composition	
Whiteface wool breed ram test ($n = 183$) ^a		
Active drug	Chlorotetracycline (50 g/ton)	
Crude protein	15.0%	
DM	88.9%	
ADF	76.1%	
IVDMD	78.1%	
Crude fiber	24.0%	
TDN	78.0%	
DE (Mcal/kg)	3.43	
ME (Mcal/kg)	2.81	
Reported ingredients ^c	Forage products, processed grain byproducts, roughage products	
Item	Diet 1 composition	Diet 2 composition
Meat breed ram test ($n = 147$) ^b		
Active drug	Lasalocid (30 g/ton)	Lasalocid (25 g/ton)
Crude protein	13.6%	14.9%
DM	95.6%	95.7%
ADF	28.0%	29.1%
NDF	36.5%	38.2%
IVDMD	74.6%	79.4%
Crude fiber	21.0%	23.0%
TDN	79.0%	75.0%
DE (Mcal/kg)	3.48	3.30
ME (Mcal/kg)	2.85	2.71
Reported ingredients ^c	Roughage products, grain products, forage products, and plant protein products	Roughage products, grain products, forage products, and plant protein products

^a Whiteface wool breed (WB) ram performance test diet. Administered for 140 d for contemporary groups 1 ($n = 60$) and 2 ($n = 75$). Contemporary group 3 ($n = 48$) was administered diet for 84 d. Diet formulated for late-maturing rams to target a DM intake at 3.55% of BW (CHS, Inc., Sioux Falls, SD).

^b Meat-breed (MB) ram performance test diets 1 and 2 for contemporary groups 1 ($n = 77$) and 2 ($n = 70$). Rams were administered diet 1 for the first half of the performance test and diet 2 for the second half of the performance test to account for growth requirements. Both diets were formulated for early-maturing rams to target DM intake at 5.00% of BW (Ranch-Way Feeds, Fort Collins, CO).

^c Specific ingredients in diets were proprietary to the manufacturer and unavailable to researchers.

associated with selecting for RFI on carcass merit, growth traits, reproduction traits, and fleece characteristics. For RFI to be an appropriate measure of feed efficiency in the sheep industry it must not be unfavorably correlated with such traits. Furthermore, any influences of pre-test sources of variation such as birth type (BT) or age put on performance test (AOT) on RFI ranking need to be determined. Finally, while upwards of 60 d of feed intake measurements are needed to accurately estimate RFI in beef cattle (Sainz and Paulino, 2004), the necessary duration in sheep is unknown. Therefore, the objectives of this research were to (1) determine relationships between RFI and pre-test variables (i.e. BT and AOT) in rams, (2) determine relationships between RFI values and carcass merit, growth traits, and wool characteristics in rams, and (3) determine the appropriate length of time needed to accurately estimate individual RFI ranking in sheep.

2. Materials and methods

2.1. Animal procedures

All animal procedures were approved by the University of Wyoming Animal Care and Use Committee. Daily feed consumption for whiteface wool breed (WB; $n = 183$; 7.00 ± 0.78 mo age) and meat breed (MB; $n = 147$; 4.14 ± 0.33 mo age) rams were collected using the GrowSafe System (GrowSafe Systems Ltd., Airdrie, AB, Canada) during standard performance tests at the University of Wyoming. Whiteface wool breed rams consisted of primarily Rambouillet and Rambouillet \times Targhee breeds while MB rams consisted of Suffolk and Hampshire breeds. Whiteface wool breed rams consisted of three contemporary groups: WB1 = Fall 2009

($n = 60$), WB2 = Fall 2010 ($n = 75$), and WB3 = Fall 2011 ($n = 48$). Meat breed rams consisted of two contemporary groups: MB1 = Summer 2010 ($n = 77$) and MB2 = Summer 2011 ($n = 70$). Each ram was fitted with an electronic identification device (EID) in his ear. Each time a ram inserted his head into the bunk, the GrowSafe System scanned his EID to record the amount of feed consumed (i.e. feed disappearance) and the time spent for each event. Rams were group-housed in a single large pen with shelter and had equal access to five GrowSafe nodes where they were fed ad libitum. Feed intake information collected by the GrowSafe System was used to determine individual RFI values. Table 1 illustrates the diet specifications for the WB ram tests (CHS Inc., Sioux Falls, SD) and MB ram tests (Ranch-Way Feeds, Fort Collins, CO) and additional laboratory diet analysis details (Department of Animal Science, Nutrition Laboratory, Laramie, WY). Rams were fed a commercial diet formulated according to NRC recommendations of 3.55% DM of body weight for late maturing rams (WB; 2.87 kcal/kg) and 5.00% DM of body weight for early maturing rams (MB; 2.87 kcal/kg; NRC, 2001). Diets between WB and MB performance tests did not differ greatly in digestibility or energy measures and were similar in nutrient composition; therefore, differences in performance were not expected to be attributed to diet.

Table 2 describes each contemporary group, including number of rams on test, initial weight, BT, AOT, and test duration. Daily feed intake was measured for 140 d for each WB1 and WB2 rams and 84 d for WB3 rams; the intake collection period for WB3 rams was shorter due to equipment malfunction. For MB1 and MB2 rams, daily feed intake was measured for 76 d and 75 d, respectively. These were standard MB lamb performance test durations versus WB lamb performance tests employed at the University of Wyoming's annual ram tests; longer test durations are typical for WB breeds to account for fleece measurements. Monthly weights were collected on WB1 and WB3 rams; 25 d weights were collected on MB1 rams. To allow us to be able to assess weekly RFI variation, weekly BW measurements were needed. Therefore, WB2 rams were weighed weekly after wk 6, and MB2 rams were weighed weekly starting wk 1. This provided us with 14 and 12 wk of weekly BW measurements (and hence RFI estimates) for the WB2 and MB2 rams, respectively. Pre-test

Download English Version:

<https://daneshyari.com/en/article/5795886>

Download Persian Version:

<https://daneshyari.com/article/5795886>

[Daneshyari.com](https://daneshyari.com)