INDIVIDUAL MINERAL SUPPLEMENT INTAKE BY EWES SWATH GRAZING OR CONFINEMENT FED PEA-BARLEY FORAGE

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Impact Statement

Mineral intake was highest by grazing ewes in 2011 and 2010, intermediate by ewes in confinement in 2010 and lowest by ewes in confinement in 2011. This study found a large variation in mineral supplement intake by individual ewes (CV of 34–67%), and indicated there may be up to 0.10 of ewes in a flock which consume only trace amounts. A better understanding of the factors that regulate mineral supplement intake could possibly improve the effectiveness of mineral supplement programs.

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SUMMARY

Previous research has reported high variation in intake of self-fed protein and/or energy supplements by individual animals, however little is known about variation in consumption of mineral supplements. Sixty mature range ewes (non-pregnant, non-lactating) were used in a completely randomized design repeated 2 years to determine if feeding method of intercropped field pea and spring barley forage (swath grazed or fed as hay in confinement) affected individual ewe mineral consumption. Ewes in confinement consumed more forage DM than grazing ewes in 2010, but less than grazing ewes in 2011. Mean mineral intake was highest by grazing ewes in 2011 and 2010 (average 2.4 oz/d), intermediate by confinement ewes in 2010 (2.0 oz/d), and lowest by confinement ewes in 2011 (1.1 oz/d). A year×treatment interaction existed for mineral intake CV which was higher for confinement ewes in 2011 (67 *vs.* 34%), but was not different between treatments in 2010. In this study, variation in individual ewe intake of mineral supplement was large in both grazing ewes and ewes fed hay in confinement.

INTRODUCTION

A major limitation to providing appropriate mineral nutrients to sheep is a lack of understanding factors affecting individual animal supplement consumption. Bowman and Sowell (1997) reported that some cows refuse protein and energy supplements altogether, while others consume excessive amounts. Deviation from the targeted supplement intake can negatively impact animal production. Interpretation of data from grazing trials with supplementary feeding is difficult due to the lack of information concerning the quantity of supplement consumed by each animal in a group-feeding situation (Nolan et al., 1975). Researchers have looked at individual intake of protein and energy supplements (Curtis et al., 1994), but few studies have evaluated variation in individual consumption of mineral. The objective of this study was to determine if feeding method of pea–barley forage (swath grazing or hay fed in confinement) affected individual ewe mineral consumption.

PROCEDURES

All animal procedures were approved by the Montana State University Agricultural Animal Care and Use Committee (Protocol #2009-AA04). The study was conducted at the Montana State University's Fort Ellis Research Station in Bozeman, MT during fall 2010 and fall 2011.

Sixty mature western whiteface range ewes were selected from the Bair Ranch in Martinsdale, MT to be used in 2010. The ewes (144 ± 13 lb body weight; BW) were non-pregnant, and non-lactating. For the

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second year, 60 mature western whiteface range ewes (136 ± 14 lb BW, non-pregnant, non-lactating) were selected from the Red Bluff Research Ranch near Norris, MT.

The swath grazing treatment consisted of 3 pastures (10 ewes/pasture) where pea–barley forage had been mechanically swathed and left in the field. The confinement feeding treatment consisted of 3 pens (10 ewes/pen) where pea-barley hay (harvested from the same field where the swath grazing pastures were located) was fed. The experiment consisted of 7 days for diet adaptation, followed by 7 days of data collection.

Throughout the experiment, ewes had ad libitum access to forage, water, and a commercial mineral supplement (Payback – Sheep Range Mineral 16-8, Cenex Harvest States, Inc., Great Falls, MT).

One mineral feeder was placed in each confinement pen and grazing pasture. Mineral feeders were checked daily and kept full of mineral. Throughout the entire experiment, ewes on both treatments were moved into handling facilities daily and dosed with gelatin capsules filled with 2 g Cr_2O_3 as an external marker to estimate fecal output (FO). During the data collection, all ewes were gathered daily, and fecal grab samples were collected via rectum.

Distribution of supplement intake was evaluated by grouping ewes into four mineral supplement intake categories; none (≤0.35 oz/d), low (0.4–1.0 oz/d), average (1.0–3.0 oz/d) and high consumers (≥3.0 oz/d).

Data were analyzed using the GLM procedure of SAS (9.1 version, 2003) for a completely randomized design. Ewe was the experimental unit for mineral supplement, and forage intake. Pasture or pen (a group of 10 ewes) within year was the experimental unit for the coefficient of variation (CV) of supplement intake, and supplement intake distribution. Means were separated using the LSD procedure when a significant *F* value was found ($P \leq 0.05$).

RESULTS AND DISCUSSION

Year by treatment interactions were seen for forage DMI ($P < 0.01$), expressed both as lb/d and as lb/100 lb BW (Table 1). Ewes in confinement in 2011 consumed the least amount of mineral supplement. Ewes grazing in 2010 consumed a similar and intermediate amount of supplement to those in confinement in 2010, and to those grazing in 2011.

Ewes in confinement had a lower (P = 0.05) minimum supplement intake (average 0.35 oz/d) compared with ewes grazing (average 1.2 oz/d). Mineral supplement intake CV demonstrated a year by treatment interaction (P = 0.05). In 2010, ewes in confinement and grazing had similar supplement intake CV (55.4 *vs.* 46.5%, respectively). In 2011, ewes in confinement had a greater supplement intake CV compared with ewes grazing (67.2 *vs.* 33.7%, respectively).

The proportion of ewes consuming ≤0.35 oz/d of mineral was not affected by year, treatment, or the interaction ($P \geq 0.08$; Table 1), and averaged 0.03. The proportion of ewes consuming an average amount of supplement was greater (P = 0.04) for grazing ewes compared with ewes in confinement (0.71 *vs.* 0.50, respectively). In addition, the proportion of ewes consuming a high level of supplement was greater (P = 0.04) for ewes swath grazing than for those in confinement (0.26 *vs.* 0.12, respectively).

Intake of mineral supplement was similar for grazing and confinement-fed ewes during the first year, but higher for grazing ewes the second year (Table 1).

Doreau et al. (2004) suggested that salt block intake was higher when cows were fed at low intake, probably due to boredom. However, in our study, ewes had ad libitum access to forage, and a greater proportion of grazing ewes consumed an average and a high level of supplement compared to ewes in confinement. Ducker et al. (1981) found that as the grazing area per ewe increased so did the proportion of ewes not consuming feed-block. Therefore, increased consumption of mineral by grazing ewes could be due to the small area of the grazing plots. Confinement pens measured 0.12 acres, but hay was fed in the same designated areas every day reducing the amount of travel past mineral feeders by ewes.

The previous experience with supplements, social interactions, and forage quality and availability have been shown to influence the amount of supplement consumed by individual animals (Bowman and Sowell, 1997) and may have affected the distribution of mineral supplement intake in our study. The variation in mineral supplement intake seen in this study was similar to the variation in individual animal intake of protein and energy supplements reported by Bowman and Sowell (1997).

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Table 1. Individual performance, forage DMI, mineral supplement DMI, and mineral supplement DMI distribution by ewes consuming pea-barley forage in confinement or swath grazing.

	Treatment							
	2010		2011			P value[2]		
Item	Conf.	Grazing	Conf.	Grazing	SEM	Year	Trt	Year×Trt
Initial weight, lb[1]	142.3	145.6	133.8	139.0	1.09	0.02	0.07	0.66
ADG, lb/d[1]	0.53	0.46	0.26	0.24	0.023	<0.01	0.26	0.70
Forage DMI, lb[1]	5.7[b]	4.2[a]	4.4[a]	5.5[b]	0.14	0.96	0.40	<0.01
Forage DMI, lb/100 lb BW[1]	8.6[b]	5.9[a]	7.3[a]	8.6[b]	0.23	0.21	0.30	<0.01
Mineral supplement DMI, oz/d[1]	2.0[b]	2.2[bc]	1.1[a]	2.6[c]	5.2	0.10	<0.01	<0.01
Supplement DMI, oz[3]								
Minimum[3]	0.35	0.88	0.35	1.44	4.0	0.08	0.05	0.07
Maximum[3]	4.13	4.13	2.91	4.27	14.4	0.31	0.21	0.22
Supplement DMI CV, %[3]	55.4[bc]	46.5[ab]	67.2[c]	33.7[a]	5.33	0.92	0.04	0.05
Supplement DMI, proportion of ewes[3]								
None, ≤0.35 oz[3]	0.03	0	0.10	0	0.019	0.35	0.08	0.34
Low, 0.4 – 1.0 oz[3]	0.14[a]	0.07[a]	0.50[b]	0[a]	0.065	0.07	<0.01	0.01
Average, 1.0 – 3.0 oz[3]	0.66	0.69	0.33	0.72	0.059	0.14	0.04	0.07
High, ≥3.0 oz[3]	0.17	0.24	0.06	0.28	0.035	0.59	0.04	0.27

[1]Experimental unit was individual ewe; number of ewes per treatment was 28 in 2010; in 2011 it was 29 in confinement (Conf.), and 28 in grazing.

[2]*P* value for the ANOVA *F* test of year, treatment, and the interaction.

[3]Experimental unit was confinement pen or grazing pasture; n = 3 per treatment per year.

[a-c]Means within a row with different superscripts differ (P<0.05).