1995

Effect of Extended Light on Growth and Reproductive Performance of Ewe Lambs: Progress Report

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SHEEP 95-3

Summary

This study evaluated the effect of an artificially extended photoperiod in mid winter on the reproductive performance of April-born ewe lambs exposed at 12 to 13 months of age. Ewe lambs exposed to extended light (EL) gained more weight and more lambed than controls (C) in both trials. However, the lambing response was considerably higher in Trial II when the treatment was started earlier and was of longer daily duration. Subsequent work is in progress to validate these results.

Key Words: Ewe Lambs, Photoperiod, Reproduction

Introduction

Previous work at SDSU and numerous other locations report poor success when mating ewe lambs to lamb for their first time in the fall. This is true regardless of whether they are born the previous fall (7 to 8 months of age at exposure) or the previous spring (12 to 13 months of age at exposure). It appears that the triggering factor is a shift in the daily period of time they are exposed to light versus dark.

Under natural conditions during the spring (April-May), day length is increasing which inhibits cyclic activity. It was hypothesized that, if the day length is extended artificially prior to the desired breeding season and allowed to return to a natural shorter day, cyclic activity might be improved. This study was initiated to evaluate the effect of an artificially extended photoperiod in mid winter on reproductive performance of April-born ewe lambs exposed at 12 to 13 months of age.

Experimental Procedure

Trial I. Finn-Dorset-Targhee (FDT, n = 146) and Hampshire x FDT (n = 46) ewe lambs born in April of 1992 were exposed to natural daylight (C) or extended light (EL) from January 4 to February 19, 1993. In the treated group (EL) artificial light (≈ 16.5 ft candles at eye level) was provided from 1700 to 2300 daily, approximating 16 hours of light per day. All lambs were managed as a single group except during the light exposure period and were limit fed a growing diet of 20% corn, 20% oats, 20% corn silage, and 40% alfalfa hay. Teaser rams were introduced April 1, 1993, and replaced with intact rams April 15 for a 35-day breeding exposure.

Trial II. One hundred seventy-one FDT and 37 HFDT April 1993 born ewe lambs were exposed to natural daylight (C) or extended light (EL) from December 1, 1993, to February 10, 1994. In the EL group artificial light (≈ 18 ft candles at eye level) was provided from 1600 to 0100 daily approximating 18 hours of light per day. All other management practices were as described for Trial I.

Results and Discussion

Trial I (1992-93). Lambs exposed to EL gained more weight and were heavier than controls on April 6, 1993, just prior to breeding (Table 1). Initially FDT ewe lambs were heavier than HFDT lambs. However, HFDT ewe lambs gained more weight during the study. Breed of ewe did not affect intermediate or prebreeding weights. Percent lambing by treatment and breed of ewe is shown in Table 2. More (P = .12) of the EL group lambed than controls

Prepared for Sheep Day, June 8, 1994.

Table 1. Least squares means (± SE) of ewe lamb weights by treatment (lb) - Trial I

	Treatment		
	Control	Extended light	p value
9/29/92	75.9 ± 1.32	78.9 ± 1.36	.29
2/25/93	121.7 ± 1.61	124.5 ± 1.65	.17
4/6/93	133.5 ± 1.74	139.3 ± 1.78	.01
Wt change	57.4 ± 1.39	61.4 ± 1.43	.03
	Breed of ewe		
	FDT	HFDT	
9/29/92	78.9 ± .99	74.8 ± 1.76	.04
2/25/93	124.3 ± 1.21	121.9 ± 2.16	.34
4/6/93	136.6 ± 1.30	136.2 ± 2.42	.86
Wt change	57.6 ± 1.03	61.4 ± 1.91	.09

Table 2. Chi square analysis of percent lambing by treatment group and breed of ewe - Trial I

Item	(n)	Percent lambing	p value
Treatment group			
Control	3/96	3.1	.12
Extended light	8/96	8.3	
Breed of ewe			
FDT	10/146	6.8	.23
HDFT	1/46	2.2	

(8.3 vs 3.1%, respectively). Only one (2.2%) HFDT ewe lambed compared to 10 (6.8%) of the FDT ewes. Light treatment significantly improved gain in this trial and resulted in more ewes lambing. Lambing results were encouraging, although not high enough to be practical.

Trial II (1993-94). Lambs in the extended light group gained more weight (P=.06) than controls and were similar (P=.51) in weight to controls on March 29, 1994, prior to breeding (Table 3). Initially FDT and HFDT ewes were similar in weight. However, HFDT ewes gained approximately 10 lb more weight during the study and were heavier on both March 11 and March 29 prior to breeding than FDT ewes. A higher percentage (Table 3) of the EL group lambed (54.8%) than controls (27.9%). Also, more FDT ewes lambed (46.2%) than HFDT

Table 3. Least squares means (± SE) of ewe lamb weights by treatment (lb) - Trial II

	Treatment		
	Control	Extended light	p value
9/29/93	93.2 ± 1.9	91.3 ± 1.9	.50
11/29/93	104.8 ± 1.7	104.4 ± 1.7	.88
3/11/94	145.4 ± 2.0	145.9 ± 2.0	.86
3/29/94	150.3 ± 2.1	152.2 ± 2.1	.51
Wt change	56.5 ± 1.6	60.7 ± 1.6	.06
	Breed of ewe		
	FDT	HFDT	
9/29/93	93.7 ± 1.1	90.8 ± 2.4	.28
11/29/93	104.4 ± 1.0	104.8 ± 2.2	.88
3/11/94	142.4 ± 1.2	148.9 ± 2.6	.02
3/29/94	147.4 ± 1.3	155.1 ± 2.7	<.01
Wt change	53.6 ± .95	63.6 ± 2.0	<.01

Table 4. Chi square analysis of percent lambing by treatment group and breed of ewe - Trial II

Item	(n)	Percent lambing	p value
Treatment group			
Control	29/104	27.9	<.01
Extended light	57/104	54.8	
Breed of ewe			
FDT	79/171	46.2	<.01
HDFT	7/37	18.9	

ewes (18.9%). Lambs born per ewe lambing were not different (P<.20) between controls and treated ewes (1.21 ± .09 and 1.11 ± .07) or between breeds (1.19 ± .13 vs 1.13 ± .04) for the HDFT and FDT ewes, respectively. The percentage of ewes responding to the extended light treatment in this trial was much higher than for Trial I. Starting treatment December 1 vs January 4 and simulating an 18-hour day vs a 16-hour day may be the reason for the improved response. The Trial II protocol will be repeated in 1994-95 to confirm or reject this hypothesis.