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Effect of Extended Light on Growth and Fall Reproductive Performance of Crossbred Ewe Lambs



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Summary

This trial (III) completed a three-year study evaluating the effect of artificially extending the photoperiod in mid-winter on weight gain and reproductive performance of April-born crossbred ewe lambs exposed at 12 to 13 months of age. Ewe lambs exposed to extended light gained more weight during the trial, were heavier at mating time, had a higher percent lambing, and more lambs per ewe lambing. A higher percentage of FDT ewe lambs lambled compared to the HFDT ewe lambs. Timing and length of treatment appear important along with notable year differences. Based on this study, light treatment offers a cost effective method to improve both gain and reproductive performance of maiden ewe lambs.

Key Words: Ewe Lambs, Reproductive Performance, Puberty

Introduction

Previous work at SDSU and numerous other stations has shown poor success in getting ewe lambs to lamb for their first time in the fall. Under natural conditions during the spring (April-May), day length is increasing which inhibits cyclic activity in the ewe. Exposure to short days has been shown to stimulate estrous activity. However, facilities necessary to achieve a light tight chamber on a large scale is not cost effective. It was hypothesized that if day length is artificially extended prior to the anticipated breeding season and allowed to return to a natural shorter day cyclic activity might be initiated in ewe lambs. This study was based on the hypothesis that ewe lambs need to experience a "long day" followed by a "short day" after they are old enough and big enough to initiate puberty.

Experimental Procedure

In Trial III (See Sheep 95-3 for report on Trials I and II.) 208 1/4 Finn-1/4 Dorset-1/2 Targhee ewe lambs were randomly assigned to either a natural ambient photoperiod (control) or an extended light exposure (EL) group. Growth rate was assessed by comparing weights taken on October 19, 1994 (initial weight), to weights obtained on February 9, 1995, and March 16, 1995 (prebreeding weight). Control and EL lambs were handled as a common group until December 1, 1994, when the EL treatment was initiated and continued until February 10, 1995. Control and EL lambs received similar diets. Ewes in the treated group were exposed to 18 hours of light per day (natural ambient plus artificial light) with artificial light treatment from 1630 until 0100 daily. Light was provided by four 500 watt Halogen lamps. Light intensity averaged 22 ft candles at ewe eye level. All ewe lambs were co-mingled and managed as a single group following light treatment. Teaser rams were introduced to the flock April 1, 1995, and were replaced with intact semen tested rams 14 days later for a 35-day breeding season.

Results and Discussion

The results of Trial III are presented in Table 1 along with the results of the two previous trials. Ewe lambs exposed to the extended light treatment gained significantly more weight and were heavier prebreeding than controls in Trial III. In addition, 83.8% of the treated ewes lambled compared to 57.3% of the controls with a significantly higher prolificacy rate (1.36 vs 1.20, respectively). Ewe lambs were of two different crosses in Trials I and II. Hampshire cross ewe lambs gained more weight and were heavier than the FDT ewe lambs both

years, but in both years (Trials I and II) none of the control HFDT ewes lambed and reproductive response to light treatment was lower than for FDT ewes. The lambing percentage for EL-treated FDT ewes was higher than for the control FDT ewes in all three trials (Figure 1). This response improved from Trial I to III for both the treated and control ewes. HFDT ewe lambs also responded but at a lower level (Figure 2). The change in protocol from Trial I vs Trials II and III with a longer day (18 vs 16 hours) that started earlier (December 1 vs January 1) was expected to elicit a higher response. However, the increased response from Trial II to III can not be explained by a change in protocol since the same procedures were used in both trials. Light intensity was slightly higher in Trial III than in Trial II. It is interesting to note that as the percent lambing improved for the treated ewes it also improved for the controls. Cyclic activity among females has been demonstrated to

elicit cyclic activity in both cyclic and anestrous females in a number of species. Since controls and treated lambs were co-mingled and exposed as a single group, it is hypothesized that this is the reason for the controls' response in this study.

Conclusions

1. Treatment with extended light was an effective means to increase conception rate in April-born crossbred ewe lambs mated for September-October lambing.
2. Breeds responded at different levels.
3. Significant year effects were noted.
4. Improved weight gain resulted from the extended light treatment.

Table 1. The effect of extended light on weight and reproductive performance of crossbred ewe lambs

	Trial								
	I ^a			II ^b			III ^c		
	C	EL	P*	C	EL	P	C	EL	P
Final wt (kg)									
FDT ^d	60.8 ± .86	63.4 ± .89	.04	66.4 ± .80	67.3 ± .80	.40	65.8 ± .74	68.2 ± .73	.02
HFDT ^e	60.5 ± 1.26	63.2 ± 1.32	.14	70.0 ± 1.80	67.3 ± 1.75	.74			
Overall wt gain (kg)									
FDT	25.6 ± .69	26.8 ± .70	.19	24.4 ± .58	24.2 ± .58	.79	27.1 ± .45	29.1 ± .44	<.01
HFDT	26.2 ± 1.02	29.7 ± 1.06	.02	26.8 ± 1.60	30.9 ± 1.56	.08			
Lambing percentage									
FDT	4.0	9.9	.16	31.8	57.5	<.01	57.3	83.8	<.01
HFDT	0.0	4.5	.29	0.0	36.8	<.01			
No. of lambs/ewe lambing									
FDT	1.00 ± .27	1.42 ± .17	.22	1.18 ± .06	1.08 ± .05	.20	1.20 ± .06	1.36 ± .05	.05
HFDT	0.0	1.00	NA	0.0	1.14 ± .14	NA			

^aControl ewes were exposed to the ambient photoperiod and extended light treated ewes were exposed to 16L:8D from January 4, 1993, to February 19, 1993.

^bControl ewes were exposed to the ambient photoperiod and extended light treated ewes were exposed to 18L:6D from December 1, 1993, to February 10, 1994.

^cControl ewes were exposed to the ambient photoperiod and extended light treated ewes were exposed to 18L:6D from December 1, 1994, to February 10, 1995.

^dFDT = Finn-Dorset-Targhee.

^eHFDT = Hampshire x FDT.

*The P-value for mean comparisons within trial.

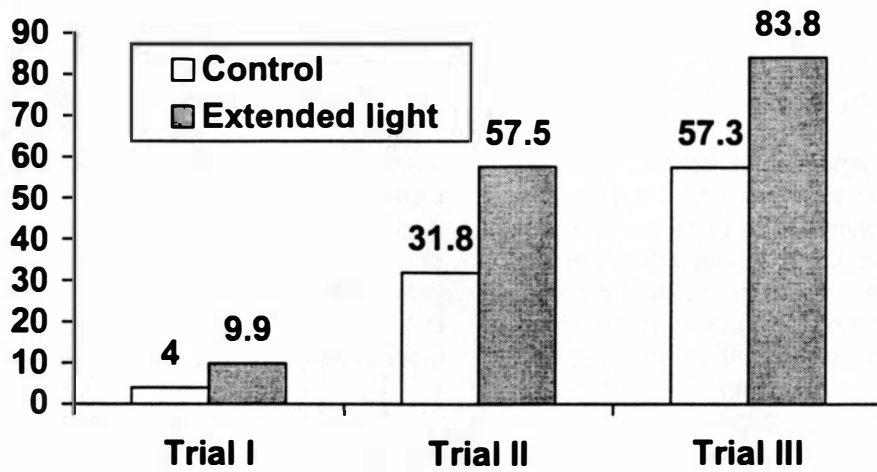


Figure 1. Lambing percentage for FDT ewe lambs.

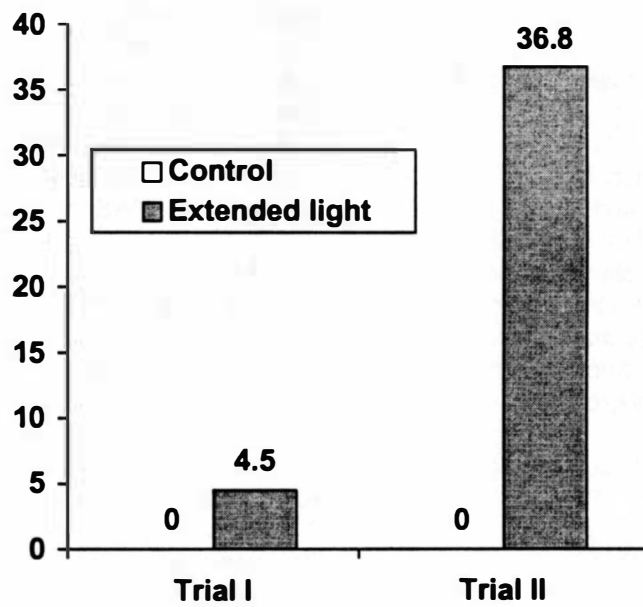


Figure 2. Lambing percentage for HFDT ewe lambs.