Factors Related to Ram Fertility During May and June

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Story in Brief

A flock of 450 ewes and 64 rams is being utilized to measure the breeding effectivenss (aggressiveness and fertility) of rams. Rams that decreased 2 inches in scrotal circumference following fall breeding were classified as seasonal and those that did not decrease 2 inches were classified as non-seasonal. The most seasonal and most non-seasonal rams were tested to determine if change in scrotal circumference was related to ram effectiveness in May and June. Other rams were subjected to reduced light for 10 weeks before the breeding season and their breeding effectiveness was compared to random non-treated rams. The summary is preliminary, but several trends are evident. The predicted non-seasonal rams made considerably more matings (79.1% vs 50.3%), settled almost twice as many ewes (59.8% vs 32.9%), and had a higher conception rate (75.6% vs 65.4%) than the seasonal rams. The seasonal rams did not appear to regain sexual desire soon enough to breed adequately in May and June. The evidence is inconclusive as to the effect of shortening the daylength. Rams subjected to 8 hours of light mated more ewes (82.5% vs 71.4%) and had a similar conception rate (65.9% vs 67.5%) when compared to the normal daylength rams.

Introduction

A major problem in the sheep industry is the lack of yearlong fertility. Sheepmen that attempt to lamb their ewes from late summer to early winter experience a lower percent of ewes lambing (fertility) and fewer lambs born per ewe lambing (prolificacy). Only two sheep breeds (Dorset and Rambouillet) have acceptable fertility in the spring which allows for the fall lambing program in Oklahoma.

An effective breeding system requires a combination of a fertile, aggressive ram and a regularly cycling ewe. The type of sheep, nutrition level and quality of management all influence the results, and become more important during spring breeding than fall breeding. Even the best management and nutrition, however, cannot produce fertility in most sheep outside the normal fall breeding season.

The reasons are not fully understood how daylength can override domestic sheep management and set the fertility patterns in both the ewe and the ram thereby timing the resulting lamb crop. A thorough understanding of both the ewe and the ram is required to develop natural programs to improve sheep fertility throughout the year.

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Materials and Methods

During 1981 and 1982, 142 F_2 Finn x Dorset ewes, 64 F_2 Finn x Dorset rams and 308 western white-faced ewes were involved in a spring breeding program to help understand the seasonal breeding habits of rams. The western white-faced ewes consisted of 170 Rambouillet ewes and 138 ewes of various combinations of Finnish Landrace (Finn), Dorset and Rambouillet. The F_2 Finn x Dorsets were all produced at the station from the F_1 flock composed of 15 different sources of Finn and Dorset breeding. No selection was practiced on the F_1 sheep, and every attempt was made to allow the different sources to interbreed. Only rams over one year of age were used in the study and only rams with severe structural problems were culled.

The same experimental procedure was used as reported in the 1981 Animal Science Research Report. Both 1981 and 1982 results were combined for this report and the rams and ewes involved are shown in Table 1. A total of 22 single sire mating groups were used, and the ewes were randomly allotted making sure each group had an equal representation of the various ewe breeds and ages. The total number of rams in Table 1 represents the number of rams that were available to select rams from for each mating group. Test A was concerned with the ability to select *more* vs *less* fertile rams on the basis of change in scrotal circumference following the fall season. Test B was concerned with whether reduced light for 10 weeks prior to the breeding season (May 5-June 30) would increase the breeding effectiveness of rams.

All rams underwent a routine monthly evaluation. Two independent scrotal circumference measurements were made. To be evaluated, a ram was placed on his rump, and the holder supported the ram with his knee. The holder then grasped the upper portion of the scrotum with one hand and pushed both testes semi-firmly against the lower scrotum. The scrotal circumference was determined, the testes palpated for testicular or epididymidal abnormalities, and then a second independent circumference was determined. The measurements were taken with a fiberglass tape measure. All rams were weighed and condition scored using a score system of 1-9. Testes tone and sexual flush (inguinal cutaneous hyperemia) were also monitored. Only the scrotal circumference measurements are reported here.

The procedure of Test A involved classifying the rams with the most size change as seasonal (less fertile) or those with the least size change as non-season (more fertile). The seasonal ram was expected to settle less ewes during May and June breeding. Rams were classified using the scrotal circumference measurements taken after the rams were one year of age. Seasonal rams were those rams that lost more than 2 inches in scrotal circumference between the fall breeding season of October and November and the winter period, usually in January. Rams that did not lose 2 inches were considered less responsive to the change in seasons and were called non-seasonal rams. Two inches was an arbitrary point to divide the two groups of rams. Table 1 indicates the total number of rams in each group. The extreme rams in each group (those rams that lost the most in scrotal circumference and those that lost the least) were selected to represent each ram type during the spring breeding tests.

The procedure for Test B was that the rams must be fall born F_2 rams that are at least one year old. The rams are randomly allotted to either an 8-hour daylight treatment in which the rams are confined to a blackout chamber for 16 hours per day for 10 weeks before May 5th or a normal daylight (control) treatment. A random sample from each treatment group was taken to determine which rams were more effective for spring breeding. The total number of rams in the treatments is shown in Table 1. All rams were fitted with marking harnesses to record daily mating activity using rump marks for both tests.

Table 1. Allotment of rams and ewes in 1981 and 1982 for spring breeding tests involving ram selection based on scrotal circumference and artifical daylength.

Test	Ram Type	Total Number Rams Available	Number Rams Exposed to Ewes	Number Ewes Exposed
A	Seasonal	14	8[1]	244[1]
A	Non-seasonal	26	8	255
B	8-hrs daylight	10	8	202
B	Normal daylight	10	8[1]	198[1]

[1]Includes one ram from which the data was later removed since the ram would not breed and was replaced 10 days after the start of the breeding season.

Results

The summary of the reproductive performance of F_2 Finn x Dorset rams used in the two tests is preliminary but several trends are evident.

The average seasonal trend in scrotal circumference is shown in Fig. 1 for all F_2 rams over one year of age. October and November (the normal breeding season) are the months of peak scrotal circumference as well as observed sexual activity or desire in the ram flock. The scrotal circumference remains lower until late summer at which time the ram commences preparation for the annual breeding season.

To test the extent that change in scrotal circumference can predict the fertility level of a ram breeding in May and June, rams were divided into two groups. (Table 1 shows the numbers used). Figure 2 shows the average scrotal circumference pattern of all the rams in each classification, the extreme of which were used in the test. The large fluctuations in scrotal circumference in seasonal vs non-seasonal rams is demonstrated in Figure 2. The seasonal rams recover fairly fast from the large drop in January and have larger scrotal circumference than the non-seasonal rams during May and June breeding. The non-seasonal rams are more constant and do not show the large fluctuations as seen in the seasonal rams.

Figure 2 shows why one scrotal circumference measurement taken only once is of little value. Scrotal circumference must be measured over a period of months to obtain the correct information. If rams are selected for large scrotal circumference, different rams would be selected depending on the time of year or natural variation from ram to ram.

Eight extreme rams were selected out of each group to evaluate the breeding effectiveness of the two types of rams (Test A). The breeding effectiveness of the two ram types is shown in Table 2. The non-seasonal rams settled

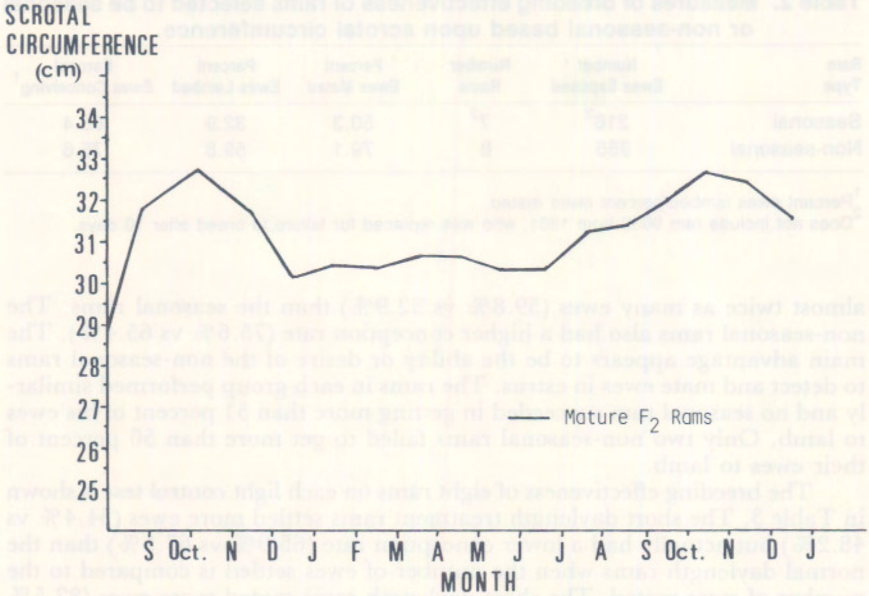

Figure 1. Scrotal circumference at monthly intervals of F_2 Finn x Dorset rams over one year of age.

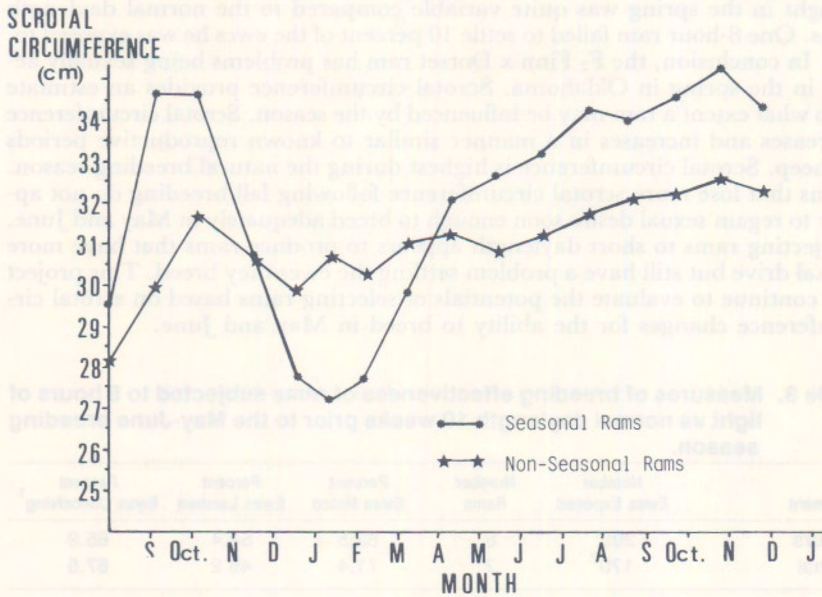

Figure 2. Scrotal circumference at monthly intervals of seasonal and non-seasonal F_2 *Finn x Dorset rams* over one year of age.

Table 2. Measures of breeding effectiveness of rams selected to be seasonal or non-seasonal based upon scrotal circumference.

Ram Type	Number Ewes Exposed	Number Rams	Percent Ewes Mated	Percent Ewes Lambed	Percent Ewes Conceiving[1]
Seasonal	216[2]	7[2]	50.3	32.9	65.4
Non-seasonal	255	8	79.1	59.8	75.6

[1]Percent ewes lambed/percent ewes mated.
[2]Does not include ram 9032 from 1981, who was replaced for failure to breed after 10 days.

almost twice as many ewes (59.8% vs 32.9%) than the seasonal rams. The non-seasonal rams also had a higher conception rate (75.6% vs 65.4%). The main advantage appears to be the ability or desire of the non-seasonal rams to detect and mate ewes in estrus. The rams in each group performed similarly and no seasonal ram succeeded in getting more than 51 percent of his ewes to lamb. Only two non-seasonal rams failed to get more than 50 percent of their ewes to lamb.

The breeding effectiveness of eight rams on each light control test is shown in Table 3. The short daylength treatment rams settled more ewes (54.4% vs 48.2%) but actually had a lower conception rate (65.9% vs 67.5%) than the normal daylength rams when the number of ewes settled is compared to the number of ewes mated. The short daylength rams mated more ewes (82.5% vs 71.4%) than the normal daylength rams. The implication of these results is that the 10 weeks of 8-hour light produced an increase in desire to mate but did not materially improve fertilizing capabilities. Ram response to 8 hours of light in the spring was quite variable compared to the normal daylength rams. One 8-hour ram failed to settle 10 percent of the ewes he was exposed to.

In conclusion, the F_2 Finn x Dorset ram has problems being sexually active in the spring in Oklahoma. Scrotal circumference provides an estimate as to what extent a ram may be influenced by the season. Scrotal circumference decreases and increases in a manner similar to known reproductive periods of sheep. Scrotal circumference is highest during the natural breeding season. Rams that lose more scrotal circumference following fall breeding do not appear to regain sexual desire soon enough to breed adequately in May and June. Subjecting rams to short daylength appears to produce rams that have more sexual drive but still have a problem settling the ewes they breed. This project will continue to evaluate the potentials of selecting rams based on scrotal circumference changes for the ability to breed in May and June.

Table 3. Measures of breeding effectiveness of rams subjected to 8 hours of light vs normal daylength 10 weeks prior to the May-June breeding season.

Light Treatment	Number Ewes Exposed	Number Rams	Percent Ewes Mated	Percent Ewes Lambed	Percent Ewes Conceiving[1]
8 hours	202	8	82.5	54.4	65.9
Normal	170[2]	7[2]	71.4	48.2	67.5

[1]Percent ewes lambed/percent ewes mated.
[2]Does not include ram 9032 from 1981, who was replaced for failure to breed after 10 days.

Currently, ewes that do not lamb when the producer desires can be culled. No selection is put on ram fertility in the spring since ewes are exposed to several rams and a ram of low fertility cannot be identified. High ram to ewe ratios to ensure effective breeding are an added expense to a producer breeding in the spring and results in reduced selection pressure.

Artifical programs are being developed to improve sheep fertility utilizing the fact that daylength regulates sheep reproduction. Reducing the amount of light in the spring simulates normal fall daylength and initiates the reproductive cycle in most sheep. Involving the ewes in such a system requires considerable facilities, but recent reports suggest that exposing the rams will increase flock fertility.

The purpose of this report is to give some preliminary results obtained from research designed to: 1) estimate the improved breeding performance of rams subjected to light control and 2) estimate the differences in performance of untreated rams selected on the basis of changes in scrotal circumference measurements to be more vs less fertile.