SEMEN QUALITY AND LIBIDO OF RAMS OF DIFFERENT MUTTON BREEDS IN THE SUMMER MONTHS

by

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INTRODUCTION

Sheep production has been an important livestock production enterprise in the United States for many years. Ranchers and farmers have made many changes in production methods during this time to make it more profitable.

Lamb production is influenced to a large extent by the reproductive efficiency of the males and females; therefore, it is very important that the sheep raiser know more about the normal reproductive process of sheep so he can secure maximum lamb crops.

Most breeds of sheep breed only during late summer and fall. Breeding at this time permits the birth of lambs from December to March and even on into the summer months. Many farmers and ranchers in Kansas and other parts of the United States prefer that lambs be dropped as early in the fall as possible so the lambs will be large enough to sell before the hot season starts in late spring and summer. The top seasonal market prices are generally obtained in early spring and late winter. Early lambing is essential if these are to be obtained. Many purebred sheep breeders prefer fall lambing with part of the flock because it facilitates the use of young males for sale, showing, and breeding.

Since the gestation period of the domesticated sheep, genus Ovis, is approximately 150 days, the ewes must be bred in May, June, or July in order to produce lambs early enough to be

benefited by more favorable climatic conditions for growth as well as a high market price.

It has not been clearly demonstrated whether it is entirely the fault of the ewes if they fail to produce early lambs. Rams may also be responsible if there is a decline in their fertility during summer months. One of the purposes of this experiment was to study reproductive potency of the rams of mutton breeds during the season of the year when ewes must be bred to produce fall lambs.

The other purpose of this experiment was to compare the reproductive potency of different breeds of rams. This information would help the commercial breeder to select a breed that has a high breeding efficiency during the summer months, and thus enable him to secure a higher lambing percentage during the fall lambing season.

LITERATURE REVIEW

Many farmers and ranchers who raise sheep in Kansas and the Southwestern States assume that rams of mutton breeds are poor breeders during the summer months of June and July because of the seasonal high temperature.

According to Rice and Andrews (6), high environmental temperatures may cause temporary sterility, and perhaps a permanent sterility, if the temperature of the testis is elevated above the body temperature which is approximately 105° F.

The testes are very sensitive to temperature changes; and if the scrotum cannot maintain these organs at the optimum temperature which is 102° F., there is a physiological disturbance of normal spermatogenesis which results in the production of poor quality semen. The fertility of the ram is also markedly reduced. An atmospheric temperature of 110°-115° F. may raise the scrotal temperature to a point at which it is detrimental to normal spermatogenesis. The scrotum is an efficient thermal regulator in the presence of environmental temperatures lower than 102° F.

The insulation provided by the covering of wool on the scrotum and the natural position of the scrotum, which is near coolness of the ground on humid days, provide considerable protection against high temperatures. Another factor which aids in preventing complete sterility is the normal cooling at nights.

McKenzie and Berliner (2) studied semen qualities of Hampshire and Shropshire rams in Missouri and reported that spermatogenesis was continuous during all months of the year, but noted that there were definite seasonal trends in the quality. The Hampshires appeared to have a maximum semen quality from August to January and that for the Shropshires ranged from October to January. A pronounced reduction in semen quality prevailed during the months of July and August.

According to Moore and Quick (4), the temperature in the scrotum is much lower than that of the peritoneal cavity and

found that the difference between the temperature of these two positions changed as the temperature of the external environment varied.

Rams possessing a large breeding capacity generally display a very active libido. There are several factors which affect the sex drive of a male. The greatest handicap of mutton rams is an excessive amount of fat. McKenzie and Phillips (3) state that rams in high condition are sluggish and unwilling to breed on decisively warm days. The mutton rams have a tendency to become fat more readily than other types of rams; therefore, the ration of mutton rams should be observed more closely.

Libido and sexual activity are very similar, and it is very important to know if rams have the ability to find an estrous ewe. A ram should also be able to make several breeding services a day over an extended period of time. McKenzie and Berliner (2) concluded that an average of five successive mounts by a ram during a ten-minute period was indicative of excellent libido.

Sperm motility is a very good indicator of fertility. If a ram does not have active sperm, his qualities as a breeder are poor. Schott and Phillips (7) found that the rate of movement of the normal sperm is very rapid. When placed in a proper media, mammalia spermatozoa were noted to move from 1-4 mm per minute, with an average of 3 mm per minute. Phillips and Andrews (5) found ram sperm in the ovarian bursa (funnel) of the ewe 30 minutes after copulation.

EXPERIMENTAL PROCEDURES

Animals Used

The animals used for this experiment were nine purebred stud rams of Kansas State College (Plates 1, 2, and 3). The groups included three Hampshires, three Shropshires, two Southdowns, and one Suffolk. They were fed the basic ration consisting of one-half oats, one fourth bran, and one-fourth corn at the rate of one pound per ram per day. The roughage was sudan pasture. The rams were housed in the college sheep barn during the summer of 1952 which was unusually hot and dry.[1]

At the beginning of the experimental period, two barren ewes were injected with a natural estrogenic hormone, Estrone, and the rams were permitted to mount them in a normal manner. A specially constructed chute (Plate 4, Fig. 1) retained the females relatively motionless during breeding or collection of semen. The rams became less timid after a series of preliminary mounts were accomplished.

Methods of Determining Valuation of Libido

The breeding activity of all rams was observed and recorded so that comparisons could be made. A series of ratings were used to classify all rams. Libido was rated as "excellent" if the ram mounted and served a ewe promptly; libido was rated as

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1. Average daily temperature 92°, average monthly rainfall 1/2" to compare with the ten-year average temperature 80°, rainfall 2".

EXPLANATION OF PLATE I

Figure 1	Hampshire Ram number 1	3 years old
Figure 2	Hampshire Ram number 2	2 years old
Figure 3	Hampshire Ram number 3	1 year old

PLATE I

Fig. 1

Fig. 2

Fig. 3

EXPLANATION OF PLATE II

Figure 1	Suffolk Ram	2 years old
Figure 2	Southdown Ram number 1	2 years old
Figure 3	Southdown Ram number 2	4 years old

PLATE II

Fig. 1

Fig. 2

Fig. 3

EXPLANATION OF PLATE III

Figure 1	Shropshire Ram number 1	1 year old
Figure 2	Shropshire Ram number 2	2 years old
Figure 3	Shropshire Ram number 3	3 years old

PLATE III

Fig. 1

Fig. 2

Fig. 3

"good" if he mounted and served within three minutes. Libido was rated as "fair" if the ram mounted and served between three and five minutes. If the ram was uninterested, he was rated as "poor". Breeding activity and libido of the rams was also observed upon turning them into a flock of ewes to search and find those in heat. The following ratings were given: if the ram was eager in his efforts, he was rated as "good"; if he was sluggish but attempted to search, he was given a "fair" rating; and if he was entirely uninterested, he was classified as "poor".

Collection of Semen

After the rams were familiar with breeding the ewes in the chute, an artificial vagina (Plate 5) was used to collect the semen. As the rams mounted the ewes, the penis was guided into the artificial vagina.

The artificial vagina was made from a number 2 automobile water hose (approximately six inches long) which was used as the outer jacket and a section of rubber tubing of soft flexible material as the inner lining. A valve was inserted in the outer casing to enable the collector to regulate air pressure between the layers (Plate 5, Fig. 1.). Water of approximately 110°-120° F. was placed between the two tubings and enough air was forced through the valve to produce satisfactory pressure for the rams. A lubricant of an oil-base gelatin (KY Jelly) was used to ensure free motion of the penis. A test tube was attached to the end

EXPLANATION OF PLATE IV

Figure 1 Chute constructed for confinement of ewe.

Figure 2 Ewe confined to chute.

Figure 3 Ram approaching ewe in chute for collection.

PLATE IV

Fig. 1

Fig. 2

Fig. 3

EXPLANATION OF PLATE V

Figure 1 Unconstructed artificial vagina.

Figure 2 Equipment used to bring about estrous and for collection of semen.

PLATE V

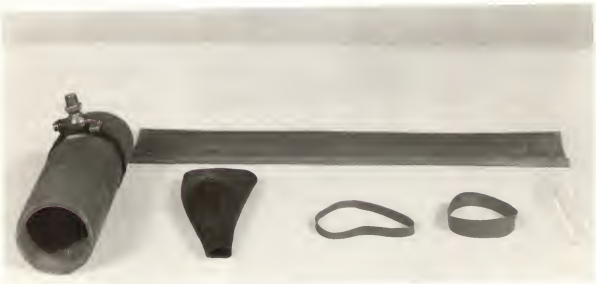


Fig. 1

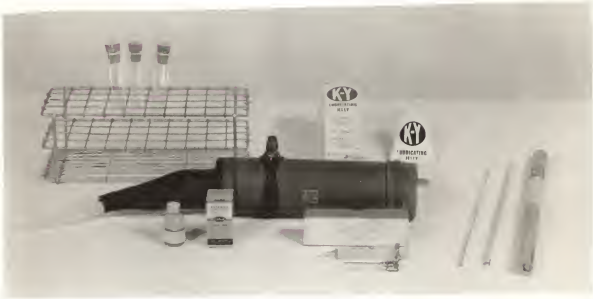


Fig. 2

of the inner lining by a funnel-shaped rubber tube to collect the ejaculate (Plate 5, Fig. 2).

Method of Determining Motility

Sperm motility was observed by placing a drop of semen at one end of a clean miscroscope slide. The drop of semen was drawn across the first slide as to make an even film.

This smear was made immediately after the semen collection to prevent the sperm from dying or becoming sluggish due to light, temperature, and other mechanical disturbances. The slide was examined with a miscroscope under high power for the whipping and movement of the sperm's tails. Motility was classified by numbers ranging from 1 to 5, with 5 indicating the greatest motility. If wave movements were seen due to rapid whipping of tails, the sample of semen was classified very high, number 5. If the tails were moving a reasonably active speed, motility was rated good or 4. If the sperm were moving at a progressive movement limited to individual sperm, it was rated fair by number 3. If they were very sluggish and moving slowly, they were classified as poor or 2; and if the sperm were dead, they were rated as 1 which meant no motility.

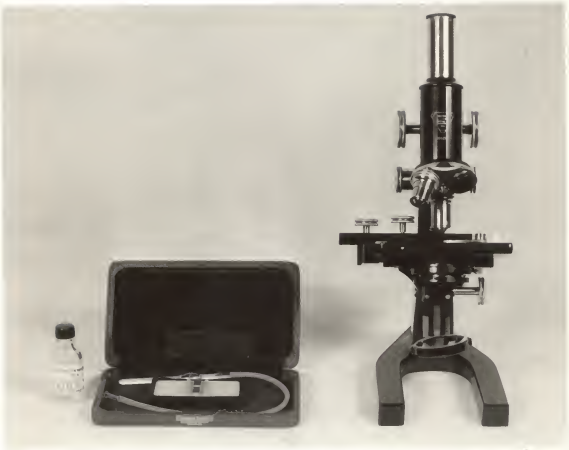
Method of Counting Sperm

A Hemecytometer (Plate VI) was used to make the sperm counts as described by Bergman and Hewitt (1) for counting red blood cells. The red blood cell diluting pipette and a diluting fluid

EXPLANATION OF PLATE VI

Equipment used for counting of sperm and for determining motility of the sperm.

PLATE VI



of 25% sodium citrate was used to make the semen dilution. The technique used was to draw semen within the pipette up to the .5 mark and then draw the diluting fluid into the pipette up to the 11 mark. After this step, the index finger and the thumb were placed over each end of the pipette and shaken well until the liquids were thoroughly mixed. A standard counting chamber was used. After placing a cover slip of the region of the slide with the marked area, a drop of diluted semen was placed at the edge of the cover slip so it could flow under the cover slip. The counting chamber was placed under high power objective of the microscope. Five blocks were counted on the field of 16 squares. These were the corners and the middle square of the field.

The sum of these squares equalled the number of sperm in 80 small squares. The small squares on the counting chamber covered an area of one square millimeter. Since each small square equalled 1/20 mm. square, it took 400 squares to make a square millimeter. Eighty squares equalled 1/5 square mm. The depth of the counting chamber was 1/10 mm. and the dilution was 1/200. Hence, the number of the sperm in 80 small squares times 5 times 10 times 200 equalled the number of sperm per cubic millimeter of semen. Therefore, 10,000 times 80 squares equalled the number of sperm per cubic millimeter. To obtain the total number of sperm in one ejaculation, the number of sperm per cubic millimeter was multiplied times 100 and the product was multiplied times the volume of semen the individual ejaculated.

EXPERIMENTAL RESULTS

The rams were ranked by breed and within breeds for semen quality and libido.

The breeding activity of the Hampshires and Suffolk in the ewe flock was high regardless of the extreme temperature which was witnessed during the collection period. The Southdowns and Shropshires ranked "good" for breeding activity in the ewe flock.

The Suffolk and Hampshires ranked higher than the Shropshires and Southdowns in regard to motility.

The Suffolk and Hampshires were never below the "excellent" rating (Table 1) for their breeding activity upon serving a ewe with the exception of four times when the Suffolk was rather timid and one yearling Hampshire was still inexperienced. The other exception was unexplainable.

The flock breeding activity of the Southdown and Shropshire rams were very similar. One ram of each breed was very active and one was rated "fair". This resulted in the two breeds receiving a "good" rating. The ratings of the four breeds of rams could be in two groups: "excellent" for the Hampshires and Suffolk, and "good" for Shropshires and Southdowns. It should be noted that the No. 3 Shropshire was rated "fair" in breeding activity although he was sterile.

The semen characteristics considered for its evaluation were volume, number of sperm per cubic millimeter, total number of

Table 1. Libido and activity.

Date	Rating & No.	Date	Rating & No.	Date	Rating & No.	Date	Rating & No.
Hamp I		**Suffolk**		**South I**		**Shrop I**	
6-12	good 2	6-12	timid -	6-14	excellent 3	6-12	excellent 3
6-24	excellent 3	7-12	good 2	6-25	excellent 3	6-25	excellent 3
7-12	excellent 3	7-22	excellent 3	7- 2	excellent 3	7- 2	excellent 3
7-22	excellent 3	8- 4	excellent 3	7-12	excellent 3	7-22	excellent 3
8- 4	excellent 3			7-22	excellent 3		
8-24	excellent 3			8- 4	excellent 3	**Shrop II**	
9-14	excellent 3			8-24	excellent 3	7- 2	fair 1
						7-12	fair 1
Hamp II				**South II**		7-22	good 2
6-12	excellent 3			6-24	fair 1	8- 4	good 2
6-25	excellent 3			7- 2	fair 1		
7- 2	excellent 3			7-12	fair 1	**Shrop III**	
7-12	excellent 3			7-22	fair 1	6-12	fair 1
7-22	excellent 3			8- 2	fair 1	6-25	fair 1
8- 4	excellent 3			8-24	fair 1	7-22	fair 1
8-24	excellent 3			9-14	fair 1	8- 4	fair 1
9-14	excellent 3					8-24	fair 1
						9-14	fair 1
Hamp III							
6-12	good 2						
6-25	excellent 3						
7-22	excellent 3						
8- 4	excellent 3						
8-24	excellent 3						
9-14	excellent 3						
Total	61		8		28		24
Average	2.9		2.66		2		1.71

Note: Ranked by numbers gives 3 maximum rate.

sperm per ejaculation and the motility of sperm (Table 2).

Motility, which was ranked by numbers, was highest in the Hampshires and Suffolk. The Suffolk received the highest individual motility rating. Motility scores for the three Hampshire rams showed considerable variability but on the average were higher than the mean scores of the Southdowns and Shropshires. The semen from these two later breeds received an average motility rating of "fair".

It was found that the sperm count of the Suffolk was 800,000 more sperm per cubic millimeter than the next highest rated individual which was a Southdown. The Suffolk's average number of sperm was 4,180,000 to the No. 1 Southdown's 3,312,000 sperm/mm^3. The No. 1 and No. 2 Hampshires were also rated high in total number of sperm with an average of 3,270,000 for seven collections and 3,260,000 for eight collections respectively. The No. 3 Hampshire, No. 2 Southdown and No. 2 Shropshire had approximately the same number of sperm per cubic millimeter of semen. The range was from 2,890,000 to 3,503,000. The No. 1 Shropshire, while being rated "excellent" in his activity and libido, had a comparative low sperm count. His count averaged 1,870,000 sperm per mm^3 of semen. The No. 3 Shropshire produced only dead sperm; however, a sperm count was taken and indicated from 1,350,000 to 3,625,000 sperm per mm^3. This indicated the continuous production of spermatozoa even though the sperm were dead at the time of ejaculation.

In the report by McKenzie and Berliner (2), the volume of semen per ejaculate ranged from .6 to 1 cc. per ram. There were

Table 2. Summation of semen quality analyzation.

Breed and No.	Volume (cc)	No. Sperm/mm3 (million)	Total (billion)	Motility
Hampshire I	1.250	3.270	3.9910	4.50
II	1.125	3.260	3.6980	5.00
III	.860	2.892	2.6282	3.50
Total	3.235	9.422	10.3172	13.00
$\bar{x}$	1.078	3.141	3.4391	4.33
Suffolk	1.625	4.180	6.7820	5.00
$\bar{x}$	1.625	4.180	6.7820	5.00
Southdown I	1.000	3.312	3.1792	3.00
II	.970	2.647	2.4934	2.40
Total	1.970	5.959	5.6726	5.40
$\bar{x}$	.985	2.980	2.8363	2.70
Shropshire I	.750	1.870	1.1168	3.00
II	1.064	2.830	2.4131	2.75
III	1.166	1.510	1.8050	1.00
Total	2.980	6.210	5.3349	6.75
$\bar{x}$	.993	2.070	1.7783	2.25

a few exceptions to this volume range in the semen collections in this study. In four collections, semen volumes ranged, from 2-2.50 cc. per ejaculation, but the average for the nine rams on 44 collections was 1 cc. The Suffolk surpassed all other individual with 1.625 cc. per collection. This was at the time when he was not being used for any breeding except for this experiment. The exceptionally high volume of semen per ejaculation for this ram may be explained to a certain extent because of the long intervals between each collection. The reason for the long collection intervals was because he often became timid or frightened, thus delaying the collection periods.

The Hampshires, Shropshires, and Southdowns ejaculated approximately 1 cc. per collection. The average column of the ejaculates were 1.073, .993, and .965 respectively. An analysis of variance was calculated for semen volume as described in Snedocor(8). There was no significance found between breeds and within breeds.

The analysis of variance of semen concentration (Table 3) revealed no significance between breeds, but there was a highly significant difference between rams. This is shown in the analysis chart with the f test stated at 4.46 at the 5% level. The f test was 8.34 for the number of sperm per cubic millimeter. There was no significant difference between rams within the same breed for motility, but for the test between breeds there was a very highly significant difference, with the f test of 5.12. This shows that there are some breeds with a higher semen motility than others.

Table 3. Analysis of variance.

	D/F	SS	MS	F
		Volume		
Breed	3	1.34	0.4467	2.33 Ins.
Rams, Same Br.	5	0.96	0.1920	2.14 Ins.
Dates-R&Br.	44	9.18	0.2086	
Total	52	11.48	----	
		No. / mm^3		
Breed	3	26.28	8.7600	2.75 Ins.
Rams, Same Br.	5	15.92	3.1840	8.34***
Dates-R&Br.	44	16.79	0.3816	
Total	52	58.99	----	
		Motility		
Breed	3	61.71	20.5700	5.12**
Rams, Same Br.	5	21.06	4.2120	Ins.
Dates-R&Br.	44	17.68	4.0182	
Total	52	100.45	----	

There were no analyses computed for libido because of the very similar actions of rams studied. The numbers were also too small to justify analyses.

The ranking of the rams as for sperm concentration and average total number of sperm per ejaculation was as follows: (1) Suffolk (6.782 billion); (2) Hampshires (3.4391 billion); (3) Southdowns (2.8363 billion); and (4) Shropshires (1.7783 billion).

In summarizing the data for all breeds, the Suffolk was most potent as a breeder in the summer months. The Hampshires were second and Southdowns third. This placed the Shropshires last irrespective of the one sterile ram.

SUMMARY AND CONCLUSIONS

The reproductive capacities of rams of different mutton breeds (Suffolk, Hampshire, Shropshire, and Southdowns) were studied during the summer months. Most of the experimental data was obtained in June or July; however, semen collections were made until September 14, 1952. Three Hampshires, three Shropshires, two Southdowns and one Suffolk were used in the experiment.

There were distinct differences among the mating desires of rams of different breeds as well as between rams within the same breed. The Suffolk's and Hampshires' libido were above that of the Shropshires and Southdowns on the average. The sterility of one Shropshire did not appear to influence his sex desires.

There were no significant differences in the production of sperm due to the effects of temperature during the extremely hot period. The sperm number did not vary to a great extent as to individual spermatogenesis.

Motility scores were similar for all ejaculates of individual rams. There were three rams which varied more than two points on their sperm activity scores. The Suffolk was most constant with an "excellent" rating for each collection. The Hampshires were second, Southdowns third, and the Shropshires were last. There was a wide variation in No. 1 and 2 Hampshires and No. 1 Southdowns. Except for the No. 3 Hampshire, the last collection was observed to have the highest motility rating during the entire collection period.

The rams could be divided into two distinct groups for breeding activity and semen quality. The Hampshires and Suffolk had the highest ratings. The Shropshires and Southdowns were rated somewhat lower than the two other breeds. When all scores were considered on an equal basis, the breeds ranked as follows: Suffolk, Hampshires, Southdowns, and Shropshires.

Late lambing from summer breeding did not appear to cause an inability of the rams to breed the ewes.

There are also indications that Suffolk and Hampshire rams may be more active and reliable breeders during the summer months.

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APPENDIX

APPENDIX

Date	Volume (cc.)	No/mm³ Million	Total Billion	Motility
Hampshire I				
June 12	1.00	4.45	4.450	4
June 24	1.50	3.85	5.775	4
July 12	1.50	3.26	4.890	5
July 22	1.00	3.70	3.700	3
Aug. 4	2.00	2.18	2.580	5
Aug. 24	1.00	2.58	2.580	5
Sept. 14	.75	2.91	2.182	5
Total	8.75	22.93	27.937	31
$\bar{x}$	1.25	3.27	3.991	4.5
Hampshire II				
June 12	1.50	3.51	5.265	5
June 25	1.00	3.00	3.000	5
July 2	1.00	3.00	3.000	5
July 12	1.00	3.50	3.500	5
July 22	1.00	3.56	3.560	5
Aug. 4	1.50	3.50	5.250	5
Aug. 24	1.00	2.91	2.910	5
Sept. 14	1.00	3.10	3.100	5
Total	9.00	26.08	29.585	40
$\bar{x}$	1.125	3.26	3.698	5
Hampshire III				
June 12	1.50	3.84	5.760	5
June 25	.75	2.80	2.100	4
July 22	1.00	2.77	2.776	4
Aug. 4	.66	3.10	2.046	3
Aug. 24	.75	2.67	2.002	2
Sept. 14	.50	2.17	1.085	3
Total	5.16	17.356	15.769	21
$\bar{x}$	.86	2.892	2.628	3.5

Date	Volume (cc.)	No/mm³ Million	Total Billion	Motility
		Suffolk		
June 12	1.50	4.23	6.345	5
July 12	1.50	4.50	6.750	5
July 22	2.00	4.10	8.200	5
Aug. 4	1.50	3.89	5.835	5
Total	6.5	16.72	27.130	20
$\bar{x}$	1.625	4.18	6.782	5
		Southdown I		
June 14	1.50	2.78	4.170	2
June 25	.75	3.00	2.250	3
July 2	1.00	4.10	4.100	3
July 12	1.00	3.66	3.660	3
Aug. 4	.75	3.50	2.625	2
Aug. 24	1.00	3.05	3.050	5
Total	7.00	23.19	22.955	21
$\bar{x}$	1.00	3.312	3.179	3
		Southdown II		
June 25	1.00	1.50	1.500	2
July 2	.66	4.00	2.664	2
July 12	2.50	2.25	5.625	3
July 22	.50	1.76	.880	2
Aug. 2	.63	2.10	1.323	2
Aug. 24	1.00	3.01	3.010	3
Sept. 14	.50	2.90	1.450	3
Total	6.79	17.52	17.45	17
$\bar{x}$	.97	2.647	2.493	2.4

Date	Volume (cc.)	No/mm^3 Million	Total Billion	Motility
		Shropshire I		
June 12	1.00	2.10	2.100	3
June 25	.50	1.50	.075	3
July 2	.50	1.68	.084	3
July 22	1.00	2.20	2.200	3
Total	3.00	7.48	4.459	12
$\bar{x}$	.75	1.87	1.11	3
		Shropshire II		
July 2	.25	2.41	.603	3
July 12	.63	3.40	2.125	2
July 22	2.50	2.71	4.075	3
Aug. 4	1.00	3.80	2.850	3
Total	4.38	11.32	9.653	11
$\bar{x}$	1.0637	2.83	2.413	2.75
		Shropshire III		
June 12	1.00	1.35	1.350	1
June 25	1.50	1.75	2.625	1
July 22	1.00	-----	-----	1
Aug. 4	1.50	-----	-----	1
Aug. 24	1.00	-----	-----	1
Sept. 14	1.00	1.44	1.440	1
Total	7.00	4.54	5.415	6
$\bar{x}$	1.166	1.51	1.805	1

SEMEN QUALITY AND LIBIDO OF RAMS OF DIFFERENT MUTTON BREEDS IN THE SUMMER MONTHS

by

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Sheep producers in the United States are confronted with a late lambing problem. This means the lambs are being dropped at a time of year when the breeders do not benefit from the economical advantages which occur. The factors are the highest seasonal trend of market prices, being free from insects, and usage of ram lambs for breeding, showing, and selling which is noticed by those who produce early lambs. To acquire these benefits, the ewes must be bred in middle summer and early fall.

One of the purposes of this experiment was to investigate the theory that rams are responsible for late lambing seasons with the temperature of the summer months being the decisive factor. The other purpose was to compare the reproductive potency of rams of different breeds to enable the commercial breeder to select a breed which will help him secure a higher lambing percentage during the early lambing season.

Nine rams, including three Hampshires, three Shropshires, two Southdowns, and one Suffolk, were used in this experiment.

Semen samples were collected as often as possible between June 2, 1952, and September 14, 1952. The samples were analyzed for motility of sperm, number of sperm, and volume of semen. During each collection performance, the activity and libido were cited.

The results indicated that these breeds of rams could be satisfactorily divided into two groups according to their reproductive capacities in the summer months, the first group being the Suffolk and Hampshire breeds with the highest abilities and the Shropshires and Southdowns as the lower-scored group.

The Hampshire and Suffolk rams surpassed the Southdowns and Shropshires in motility, number of sperm, and libido throughout the experiment. The volume of semen per collection was not significant between breeds.

Therefore, the conclusions of the experiment were that the rams do not seem to be responsible for the late lambing seasons, and the Hampshire and Suffolk rams would probably benefit the commercial producer to a greater extent for breeding in the summer months.