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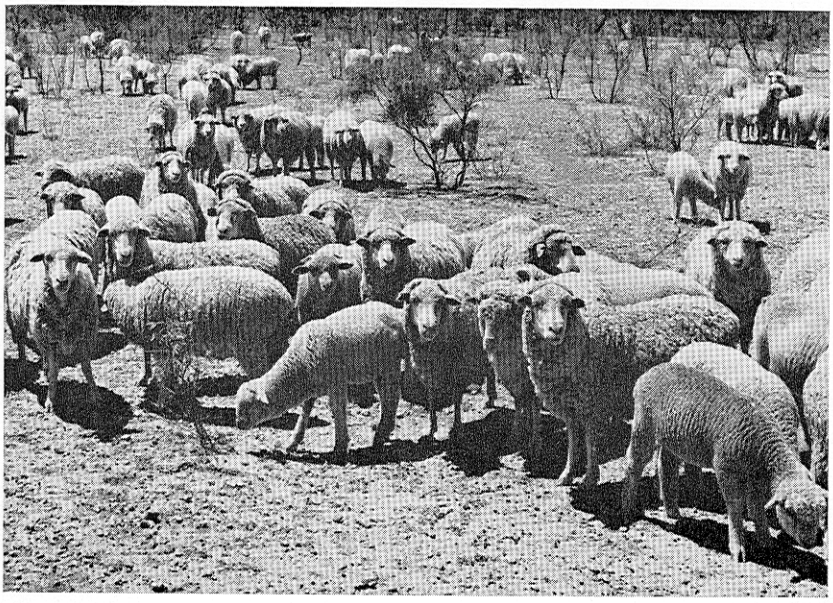
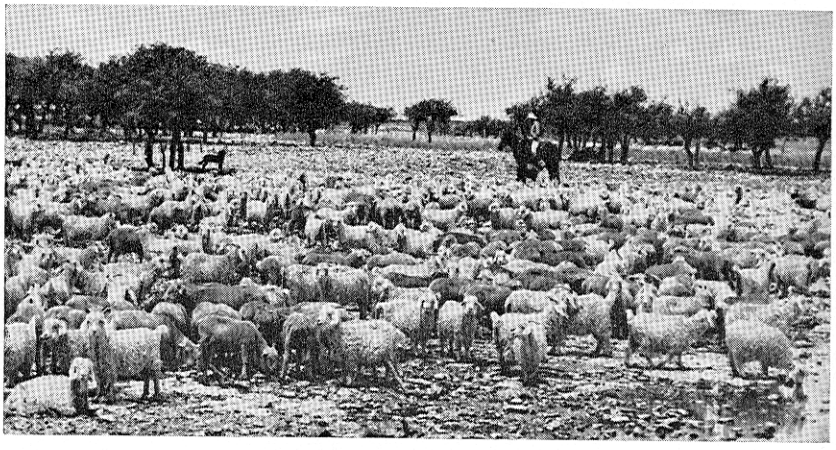


Sheep and Angora Goat, Wool and Mohair Research Reports



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The Effect of Protein Level During Late Gestation on Birth Weight and Survival of Lambs Out of Ewes Under Heat Stress

Maurice Shelton and J. E. Huston

THE PRESENT TREND to earlier lambing or multiple or year around lambing indicates that a larger number of lambs will be born in summer or fall. It is a well documented fact that lambs born in late summer or fall will be somewhat smaller than those born in winter or spring, as a result of a fetal dwarfing effect caused, in part, by high environmental temperatures. In earlier work, an attempt was made to reduce this temperature hazard by improving the level of feed intake or changing the concentrate-to-roughage ratio in the ration. Neither of these practices indicated a beneficial effect on birth weight among ewes subjected to heat stress.

EXPERIMENTAL PROCEDURE

An attempt was made to determine what effect an increased protein intake would have on the phenomenon of fetal dwarfing at high temperatures. Comparable groups of ewes were maintained for approximately the last half of gestation in cooled (approximately 75° F.) and heated (approximately 90° F.) chambers. The ewes remained in the control chambers constantly from the time they were put in until they lambed. Each group was fed two different levels of protein. The lower level was selected approximately as near as possible the NRC (National Research Council) recommendation for ewes of this type (0.20 pounds digestible protein daily). The higher level was selected to approach 150 percent of these NRC recommendations (0.29 pounds digestible protein). The rations fed were as outlined in Table 1.

TABLE 1. HIGH AND LOW PROTEIN RATIONS FED TO EWES IN STUDY

Ingredient	Low protein ration, percent	High protein ration, percent
Sorghum hay	40	40
Alfalfa hay	10	10
Cottonseed meal	5	16
Oats	15	4
Sorghum grain	28	28
Bone meal	1	1
Trace mineral salt	1	1
Vitamin A[1]		

[1]Added to both rations.

Each ration was fed at the rate of 2.6 pounds per ewe daily. The calculated crude protein contents of the low and high protein rations were 9.6 and 12.8, respectively. The analyzed values were 10.6 and 13.8 percent. These precentages are higher than is normally required by ewes of this type, but they are necessary in this case because the level of feed intake is below normal. Feed intake in both groups was limited to the level, based on prior experience, which would be consumed in the heat chamber.

The results are shown in Table 2. Differences between the two temperature treatments are statistically significant in both birth weights and number of surviving lambs. This is as expected and agrees with earlier results. The differences between protein levels are not statistically significant, but nevertheless appear to hold some interest. Increasing protein above an adequate amount did not exert a beneficial effect under conditions of heat stress. Furthermore, there is a strong indication that a high level of protein intake exerted a deleterious effect on birth weights of lambs born of ewes maintained under heat stress conditions during gestation. The numbers are inadequate to expect the observed differences to be statistically significant. The existence of such an effect, if it exists, could be rationalized by the fact that protein has a higher heat increment and thus would

TABLE 2. THE INFLUENCE OF TEMPERATURE AND PROTEIN LEVEL ON BIRTH WEIGHT AND MORTALITY OF LAMBS

Treatment	Number of ewes	Number of lambs born		Average birth weight		Number of lambs raised	Percent of total
		Singles	Twins	Singles	Twins		
Cooler—low protein	10	7	2	10.44	6.50	7	77.8
Cooler—high protein	10	3	10	10.40	8.32	11	84.6
Heater—low protein	13	8	4	8.04	6.65	7	58.3
Heater—high protein	11	6	6	7.28	5.45	6	50.0

Some Results of Multiple Lambing Programs with Sheep

Maurice Shelton and J. E. Huston

RECENT DEVELOPMENTS have made it possible, and in many cases economically feasible, to practice multiple or speeded-up lambing. The developments referred to are (a) control of screwworms, (b) widespread adoption of the practice of early weaning and (c) increased use of high concentrate rations in lamb feeding. The use of high concentrate rations often makes it possible to economically develop early weaned lambs in drylot. Producers should be prepared to adopt the latter two practices when needed before considering multiple lambing schemes. Lambing more frequently than once per year is possible because sheep have only a 5-month gestation period and successful programs can be based on lactation periods as short as 2 months. Major nutrient expenditures on the part of the ewe are required only for the last 6 weeks of pregnancy and during lactation. Thus, ewes on a high level of nutrient intake have the capability of an increased level of production. Theoretically, it would be possible to lamb twice per year. Individual ewes have done this, but it has not been possible to approach this on a flock basis.

Some type of multiple lambing scheme has been practiced at the McGregor Research Center since 1959. Only small numbers of ewes were involved in this program and thus data are limited. The ewes lambed in pasture and no special management schemes were employed. These ewes were maintained on good forage at all times, but only occasionally were offered supplemental feed. Some results are shown in Table 3 in comparison with the normal results for this station. Although based on small numbers, these data show an average of 76.5 percent more lambs born in the multiple lambing schemes and 43.5 percent more lambs raised, indicating a somewhat higher death loss under multiple lambing. These ewes were lambed under pasture conditions with no special treatment. At least a part of the increased death losses may be attributed to predators, but it may also be the case that increased lamb loss is a direct result of more frequent lambing.

Some Schemes for More Frequent Lambing

Continuous lambing—although not clearly shown by these data, continuous lambing or maintaining rams with ewes throughout the year obviously will yield the greatest total number of lambs. Disadvantages are that lambs will be irregular in age and size and it will be impossible to manage ewes according to stage of pregnancy or lactation. Regardless of these limitations, it appears that this scheme will find widespread acceptance.

Rebreeding after early weaning of lambs—This scheme has the advantage that more uniform lamb crops can be produced, and ewes can be managed according to stage of gestation or lactation. Also, the time of lambing can be controlled and, where advisable, lambing at less favorable seasons can be avoided. This is the scheme likely to be favored by most producers.

Attempt to lamb twice per year—Presently, it is not possible to lamb twice per year on a flock basis.

TABLE 3. SOME RESULTS OF MULTIPLE LAMBING SCHEMES

Treatment	Type of ewes	Number of animals	Duration of study, years	Lambing results calculated to 12-month basis	
				Percent lambs born	Percent lambs raised
Once per year lambing	Mature fine-wool	1,139	Regular station flock	122.0	99.7
Continuous lambing	Mature fine-wool	20	2	241.0	156.7
Rebreeding after early weaning	Fine-wool, 1 yr. age at start	30	2½	190.0	140.0
Continuous lambing	Aged ewes	24	1	164.5	133.0
Summary of multiple lambing schemes				198.5	143.2
Advantage over single lambing season				76.5	43.5

be expected to increase heat stress; by this is meant that the catabolism or breakdown and excretion of excess protein liberates energy in the form of heat. Caretakers noted that the ewes on high protein levels were under noticeably greater stress, and that they passed a large amount of water. In addition to economy, these data suggest a second reason for exercising caution in choosing protein level for pregnant ewes in summer or early fall. It should be pointed out that even the low protein groups of ewes received a daily protein allowance considered adequate under normal conditions.

However, this can be approached by using hormones at least once per year. The hormones in question are not now generally available on the market, but they are likely to be available at an early date. Details concerning this procedure will be given in other reports.

Studies on the Use of Exogenous Hormones to Stimulate Lamb Production in Fine-wool Ewes[1]

Maurice Shelton, Salah Ayachi and J. E. Huston

EXTENSIVE RESEARCH has been conducted for a long time with the goal of utilizing exogenous hormones to stimulate fertility in sheep. At present, these materials hold some interest for possible use in stimulating mating out of season or at the less favorable seasons, early rebreeding after lambing and increasing the lambing rates at any time of the year. At present, no procedures are available to producers which are both successful and economical. However, progress is continually being made and this report is concerned with a test of certain products currently under investigation.

There are three general types of hormones which are directly involved in reproduction in the sheep. The first of these is produced by the pituitary and is known as the Gonadotrophic or gonad-stimulating hormone. This material consists of at least two fractions, one of which is responsible primarily for stimulation of follicle growth and the second for leutinization or rupture of the follicle. As yet this material cannot be synthesized and must be obtained from natural sources. As a result, it is relatively expensive and is somewhat lacking in standardization and purity. One of the most common sources is the serum of pregnant mares; thus, it is commonly referred to as PMS. The other two hormones are estrogen and progesterone, both of which are produced by the ovaries. Both of these hormones can be produced synthetically, and a large number of closely related active forms are available. The gonadotrophic hormones are the only ones which will actually stimulate ovulation or the release of ovum from the ovaries. However, it has been known for a long time that ovulation produced in this manner will not be accompanied by estrus or heat unless the animal has been previously treated with or exposed to progesterone. Much of the earlier work has been concerned with the development of a satisfactory procedure for the necessary progesterone therapy. These studies have involved both injectible and oral forms, neither of which has been found to be completely satisfactory.

Recently, a newer progestin in the form of a vaginal suppository has become available for investigational use. This material consists of a polyurethane sponge impregnated with 20 mg. flurogestone acetate. The sponges treated in this manner are referred to as syncro-mate pessaries by the manufacturer and are hereafter referred to as pessaries in this report. The present report is concerned with a series of studies evaluating this product along with PMS in stimulating fertility in sheep.

EXPERIMENTAL

Three separate trials have been conducted at the McGregor Station in which the following three treatments have been compared.

Treatment 1—Control.

Treatment 2—Pessaries implanted and remained in place for 16 days. Rams were placed with ewes at removal of pessaries.

Treatment 3—Pessaries were implanted and remained in place for 16 days. Twenty-four hours following removal, the ewes were given an injection of PMS and placed with the rams. In all except a few ewes, 500 I.U. of PMS was used. In one trial some ewes were given 750 I.U. of PMS, but for simplicity in reporting the two levels of PMS are combined.

For simplicity, the three trials are combined in a single tabulation. All three trials involved what could be described as "problem ewes."

The first involved lactating ewes in which pessaries were implanted within 30 days of lambing.

Another group involved dry, fat ewes treated in

[1]This work was supported in funds and research materials by G. D. Searle Co., Chicago, Illinois and Ayerst Laboratories, Incorporated, New York, N. Y.

January after failing to lamb in one and, in some cases, two seasons.

The third trial involved a group of low fertility ewes treated in June. The combined results of these three trials are reported in Table 4. Data concerning the treatments employed are not encouraging. In these problem ewes, only 58.7 percent exhibited what may be termed a synchronized estrus, and only 52.3 percent that were mated at the synchronized estrus lambed from this mating. The PMS brought significantly more of the ewes into estrus, but only 41.3 percent settled from this mating. Neither treatment increased the total number of ewes which lambed and there is some suggestion that the opposite may be the case. The lambing rate was increased only in the case of those ewes which received PMS and lambed from the synchronized estrus, 136 percent for the treated group as compared to 127 percent for the controls.

Earlier workers using other forms of synthetic progestins have noted the problem of low fertility at the synchronized estrus. However, these studies generally have shown that fertility is normal at the second estrus. This is of little value in those cases when the ewes are not regularly cycling and thus could not be expected to show a second estrus. One technique that has shown promising results has been that of giving a second injection 16 days after the first to insure a second estrus and breeding at this time. Two trials were conducted in which this was added as a fourth treatment to the three already outlined. One of these was conducted at the McGregor Station and the ewes were slaughtered approximately 30 days after the second estrus. The number of corpora lutea (ovulation sites) and embryos were recorded. The size or crown rump length of the embryos made it possible to determine at which estrus period the ewes settled. Results are shown in Table 5. This experiment was conducted with aged Ram-

TABLE 4. SOME RESULTS OF USING SYNCROMATE PESSARIES AND PMS IN MATING OF PROBLEM EWES AT McGREGOR STATION

Treatment	Number of ewes at beginning	In estrus first 5 days		Number of ewes present at lambing	Lambing from synchronized estrus			Total lambing			
		Number	Percent		Number	Percent ewes showing estrus	Percent of total ewes	Number	Percent	Number of lambs	Lambing rate
Control	125	42	33.6	119				100	84.0	127	1.27
Pessaries only	75	44	58.7	74	23	52.3	31.3	52	70.3	65	1.25
Pessaries + PMS	98	80	81.6	95	33	41.3	34.7	72	75.8	98	1.36

TABLE 5. SLAUGHTER STUDIES WITH AGED FINE-WOOL EWES FOLLOWING TREATMENT WITH SYNCROMATE PESSARIES AND PMS

Treatment	Number of ewes	Number in estrus first 5 days	Number present at slaughter	Number pregnant	Number settling at first or synchronized estrus	Number of embryos
Control	12	1	12	12		16
Pessaries only	12	11	12	10	3	12
Pessaries PMS	12	11	12	11	1	10
Pessaries + 2 PMS injections	11	10	10	10	9	13

TABLE 6. RESULTS OF COMBINATIONS OF SYNCROMATE PESSARIES AND PMS IN MATING LACTATING EWES, JAMES L. POWELL RANCH

Treatment	Number of ewes	Mating response		Lambing results					
		Number[1] mated	Percent	Number of ewes present	Number classified pregnant	Percent	Number lambing in first 5 days[2]	Lambing rate	Projected total lamb production as percent of ewes present[3]
Control	65	24	36.9	52	23	44.2	11	1.00	44.2
Pessaries only	61	31	50.8	51	14	27.5	9	1.00	27.5
Pessaries + single PMS	64	49	76.6	55	30	54.5	19	1.32	65.5
Pessaries + 2 PMS	89	78	87.6	83	55	66.3	34	1.35	80.7

[1]Recorded for first 5 days only.

[2]The ewes were actually observed for 5 days starting on June 14. With the variation in gestation it is probable that the number of ewes lambing from hormone treatment was slightly greater than shown here.

[3]Based on assumption that ewes lambing after first 5 days would lamb at same rate as controls.

bouillet ewes in late summer and thus the control ewes performed well. Again, the fertility at the first or synchronized estrus was very poor, but those mated after the second PMS injection did well. A similar trial was conducted at the James L. Powell Ranch. The animals involved were lactating, aged fine-wool ewes. The treatments were applied in January after the ewes had lambed in November. The ewes were in very poor condition at the time of mating. Since these were range ewes, an exact tabulation of the lambs born is not possible. Results of this trial are shown in Table 6. These data confirm that pessaries alone do not improve the number of ewes lambing. One injection of PMS appeared to have some value, but two injections gave a much better response.

SUMMARY

These data do not lend much encouragement at the present time to efforts to improve fertility in sheep by means of hormone therapy. Only pessaries followed by a series of two PMS injections apparently gave favorable results. It is evident that cost of this series of treatments would place restrictions on its application. In addition to this, the supply of PMS available in this country would be inadequate for extensive application of the practice at present.

Research in this area is continuing, and it is hoped that a procedure can be developed to improve fertility at the first synchronized estrus, thereby resulting in considerable savings in both time and drugs.

The Influence of Month or Season of Birth on Birth Weight and Mortality of Lambs

Maurice Shelton and J. E. Huston

DEATH LOSSES OF LAMBS prior to market represents a major loss to the sheep industry. On the McGregor Station, this has been one of the most disappointing aspects of attempts to improve lamb production. Over the 9-year period, 1957-65, inclusive, 6,049 lambs have been born in this flock. Of this number, 1,136 or 18.8 percent have died prior to weaning. This loss, although seemingly high, is not out of line with that reported by other research workers. It is probably not greatly out of line with producer losses, although the latter may not be aware of the extent of their losses. Most of the ewes in the station flock are lambed in drylot to facilitate collection of lambing records. Sheds are available in these lots, but the majority of the lambs are dropped in the open. Although lambing occurs in confinement, it has not been possible or deemed practical to provide 24-hour supervision or the intensive care and supervision necessary to reduce death losses. The death losses have probably been somewhat greater under this system than would have been true in the case of lambing on the range, especially if predator losses are not a factor and if some protection in the form of native vegetation is available.

In the McGregor flock, the majority of the lambs were born in the fall, but some were dropped during every month of the year. It would be interesting to determine the relationship between birth weights and losses by month or seasons of the year. For the most part, these data represent losses up to the first weighing of lambs at approximately 2 months of age and at which time some of the lambs were weaned. Numerous reports have shown that the majority of the losses occur within the first week. Thus, the death losses reported here represent essentially losses from birth to market age. Parasites apparently caused some losses in lambs at ages of 3-6 months that were born in spring or early summer. This report is not concerned with the parasite problem.

Data organized by months of the year are shown in Table 7. Data organized by seasons of the year are shown in Table 8. The seasons used were as follows Winter—December 15 to March 15; Spring—March 15 to June 15; Summer—June 15 to September 15; and Fall—September 15 to December 15.

TABLE 7. BIRTH WEIGHTS AND DEATH LOSSES OF LAMBS BY MONTHS

Month of birth	Number of lambs	Average birth weight, pounds	Mortality, percent
January	369	9.1	19.8
February	241	9.4	34.8
March	115	9.4	21.8
April	134	8.8	11.9
May	204	9.0	13.7
June	36	9.5	11.4
July	116	8.8	9.5
August	143	7.7	11.2
September	69	8.0	4.4
October	1,938	7.4	19.7
November	2,135	8.1	18.3
December	549	8.9	17.8

TABLE 8. BIRTH WEIGHTS AND DEATH LOSSES OF LAMBS BY SEASONS

Season	Number of lambs	Average birth weight	Death losses, percent	120-day weight of lambs[1]
Winter	919	9.2	23.9	77.7
Spring	418	9.0	14.6	56.2
Summer	303	8.2	9.9	52.0
Fall	4,409	7.9	18.7	71.3

[1]These data are based, for the most part, on lamb gains made under natural grazing conditions, and can be modified greatly by more recent management techniques of early weaning and high concentrate feeding.

These data show the expected variation in birth weights by season of the year. Other work has shown that the low birth weights during late summer and fall is due largely to high environmental temperatures during gestation, but poor nutrition at this season also is a factor. However, low temperatures at lambing appears to be more important than high temperatures in contributing to death losses. The 9.9 percent losses for the summer season is about as low as can be expected under commercial conditions. The long term losses on the Sonora Station are slightly in excess of 10 percent for a small group of ewes which have been lambed under intensive care. Although the lambs are stronger at birth during the winter season, death losses are 14 percent higher than in summer.

Low birth weight no doubt contributes to the 18.7 percent losses in the fall season. It has also been established that low birth weight is associated with smaller weaning weight. Within a given season or management system, there is an approximately 6 pounds increase in weaning weight for each 1 pound increase in birth weight up to the optimum weight of approximately 10 pounds.

The lamb gains as shown in Table 8 indicate the problems involved in choice of lambing season. To these complications should be added that of seasonal variation in fertility of the ewe. Extensive work on this station clearly indicates that there is no single best lambing season, and this is one of the primary reasons for the current interest in multiple lambing.

These data represent what happened under the conditions at McGregor and these exact conditions would not necessarily be duplicated on other property in the state.

Some Environmental Factors Affecting Birth and 120-day Weights of Lambs

Maurice Shelton and J. W. Bassett

A PRODUCER MAY increase gross income to a sheep enterprise by increasing the number and weight of lambs marketed. A project has been under way for several years at the McGregor Station designed to study factors affecting lamb weights and methods of improving rate of growth. One of the first steps in making an analysis of the data obtained is to determine the effect of certain uncontrollable environmental factors on animal performance. These determinations were made primarily for the purpose of adjusting for these factors in other analyses, but the quantitative expression of these effects should be of some interest to producers.

The factors studied were age of ewe, sex of lamb, season of birth and type of birth (single or twin, etc.). The method of analysis was the least squares procedure by which it is theoretically possible to calculate each factor independent of others in the same analysis. The results are shown in Table 9. Producers wishing to make preliminary selections based on weaning weights should make some adjustment for the factors outlined here as well as age of lamb as an additional variable. Theoretically, adjustment factors apply only to the flock on which they were calculated. However, producers seldom have the time or data necessary to calculate adjustment factors for their own property. Thus, they will find it necessary in most cases to use those calculated on an experimental flock. For this reason, percentage deviations are usually more valid than deviations expressed in actual pounds. Producers who wish to do so usually can devise ways of circumventing the effects of most of these variables except for that of type of birth. This remains as a major impediment to selection of range lambs based on weaning weight. It should be remembered that the weights used here are 120-day weights and the differences would be somewhat greater if based on a weight more comparable to a sale weight.

TABLE 9. ENVIRONMENTAL FACTORS AFFECTING BIRTH AND WEANING WEIGHT OF LAMBS

Effects studied	Birth weight		120-day weight			Adjustment factor for correction to mean[1]
	Number of lambs	Calculated values		Number of lambs	Calculated values	
Total and mean	3,467	7.6		2,737	66.2	
Age of dam, years						
1	68	6.3		48	61.8	107.1
2	915	7.0		737	63.6	104.1
3	641	7.7		522	68.9	96.1
4	571	7.9		453	68.7	96.4
5	473	8.1		356	70.2	94.3
6	381	8.1		286	69.8	94.8
7	195	8.0		156	66.7	99.3
8	173	7.5		141	63.1	104.9
Over 8	50	7.5		38	66.6	
Sex: Male	1,790	7.8	Male	804	68.5	96.6
			Castrated	441	66.1	100.2
Female	1,677	7.3	Female	1348	59.9	110.5
Season of birth:						
Fall	2,911	6.6		2328	63.4	104.4
Winter	467	8.0		365	71.3	92.8
Spring	89	8.0		44	63.9	103.6
Type of birth:						
Single	1,656	8.9	Single	1421	79.7	83.1
Twin	1,787	7.3	Twin/Single	279	72.3	91.6
			Twin/twin	1021	68.7	96.4
Triplet	24	6.5	Triplet/twin	15	55.2	119.9

[1] In the use of these adjustment factors the observed weight of a lamb should be multiplied by the appropriate factor to adjust to the mean weight. For illustration, a 68-pound single male lamb born in the fall of the year out of a 2-year-old dam would adjust to approximately 59.3 pounds. An alternate set of factors may be readily calculated to adjust weights to any given base such as a single male lamb out of a mature ewe born in the fall of the year.

These data indicate the expected age of dam effect in which ewes less than 3 years of age or older than 6 produce significantly lighter weight lambs. The differences in weight are sufficiently great to frequently make a large difference in the proportion of the lambs going as "fats" off the range. Producer reaction to this will vary, but one suggestion is that the ewes be crossbred during their prime productive life (3-6 years) for slaughter lamb production. Young or old ewes could be bred straight for replacements, since age of the ewe does not affect her genetic merit. There also is good data to support the belief that females which grow off more slowly at an early age have a longer productive life. However, this is an advisable practice only if the replacement ewes are given an opportunity to grow out properly and reach a satisfactory state of physiological development before they enter the breeding flock.

The expected sex and type of birth differences were noted, but these offer little opportunity for alternative management practices. The one exception to this is the possibility of leaving the males uncastrated. This possibility will be covered in more detail in other reports.

The effect of season of year on birth and 120-day weight should hold some interest. Fall-born lambs are smaller at birth than winter or spring lambs. This lack of size definitely contributes to increased lamb mortality, but the losses among fall-dropped lambs may not necessarily be more than is lost due to extremes in weather in the case of winter and early spring lambs. Winter-born lambs have a substantially better growth rate than either fall or spring lambs. In recent years, it has been possible to overcome some of the slow growth of spring-born lambs by early weaning and giving the lambs access to high concentrate rations along with adequate protection from internal parasites.

The Importance of Breed and Individuality of Sire in Slaughter Lamb Production

Maurice Shelton and J. W. Bassett

CHOICE OF SIRES represents one of the important decisions in a sheep enterprise. This involves not only a choice of breeds, but of individual animals within a breed. At the McGregor Research Center, some data have been collected utilizing rams of the Rambouillet, Delaine Merino, Columbia, Suffolk, Hampshire and Dorset breeds. These include the more important of the breeds available in Texas or at least a representative breed of the various types available.

The data on sire breeds are shown in Table 10. These data show the usual advantage for crossbreeding. As a group, 1.9 fewer crossbred lambs died for each 100 born than of pure Rambouillet. Expressed as a percent of lambs dying, this represents a 9.8 percent decrease as a result of crossbreeding. Excluding the Dorset-sired lambs, the crossbreds were 7 pounds heavier at 120 days, and 28.3 percent more of them graded choice or were estimated to be acceptable as slaughter lambs on the date at which the first group of lambs were sold. Fertility data from rams of the different breeds are not known because most often individual ewes were exposed to both blackfaced and whitefaced rams during a season. They were either run together or alternated in order not to lose a lamb crop from an individual infertile ram and still permit sire identification based on face color of offspring. Differences in fertility between the ram breeds were not marked, but higher death losses of the medium wool rams were evident. This, plus higher initial costs, indicate that ram charges would be higher for the medium-wool rams, although this is not necessarily true of the Columbia rams. However, these higher costs were still comparatively minor when compared to the advantages of crossbreeding.

In respect to choice of breeds it appears that Dorsets should be ruled out in commercial programs. Either the Suffolk, Columbia or Hampshire rams could be justified. Columbia rams tended to sire faster gaining lambs, but these did not grade as well as others and do not carry the black face which labels them as crossbred lambs. In this test, Suffolk-sired lambs showed a slight advantage over Hampshires, but the differences were minor. Research at other locations has shown that lambs sired by Hampshire x Suffolk crossbred rams are comparable to those sired by the purebreds, and that the rams themselves have slightly improved longevity. Rams of this type have not yet been tested in Texas, but producers might be able to take advantage of the greater vitality of the crossbred rams as shown by other workers.

SELECTION OF INDIVIDUAL RAMS

Selection of individual rams specifically for slaughter lamb production would be based largely on their ability to sire faster growing lambs or higher grading lambs. Some attempts have been made to estimate the heritability of these characteristics in the McGregor flock. The results are shown in Table 11.

TABLE 11. SOME HERITABILITY ESTIMATES FOR 120-DAY WEIGHT AND SLAUGHTER GRADE

	Rambouillet rams	Blackface rams
120-day weight		
Half sib unadjusted	.4430	.2157
Half sib adjusted	.4736	.2543
Sire-offspring correlation, unadjusted	.2242	.1886
Sire-offspring correlation, adjusted	.1350	.0
Slaughter score		
Half sib unadjusted	.2805	.0670
Half sib adjusted	.3284	.1983

TABLE 10. INFLUENCE OF BREED OF SIRE ON CERTAIN COMPONENTS OF SLAUGHTER LAMB PRODUCTION

Breeding of dam	Breeding of sire	Number of lambs born	Average birth weight, pounds	Lambs lost		Average 120-day weight, pounds	Percent grading choice or better at first draft
				Number	Percent		
Rambouillet	Rambouillet	1,598	7.1	309	19.3	65.7	42.3
Rambouillet	Hampshire	769	7.8	137	17.8	71.0	72.1
Rambouillet	Suffolk	538	7.6	92	17.1	72.3	78.6
Rambouillet	Dorset	278	6.7	45	16.2	59.5	64.5
Rambouillet	Columbia	273	7.7	49	17.9	74.9	61.0
Merino	Merino	247	6.7	52	21.0	57.2	19.7

These calculated values vary considerably as would be expected because these represent statistical estimates made from biological populations. In general, the following conclusions seem to be indicated:

1. Heritability of both characteristics are higher when Rambouillet rams are bred to Rambouillet ewes than is the case of blackface rams bred to fine-wool ewes,
2. Estimates based on half-sib estimates yield higher values than parent-offspring correlations, but the latter probably is a more accurate expression of the true situation.
3. The true heritability of both characteristics is low.

How much can a producer afford to pay for a superior ram?

For Crossbreeding:

Based on data presented in Table 10, it is recommended that crossbreeding be practiced if replacements are not to be kept.

Given the following assumptions, we can calculate the relative value of rams of different weights at weaning:

Heritability of gain in crossbreeding program .....15 percent
Price of lambs .....22¢ per pound
That a sire will sire 110 lambs raised to market (3 to 4 years of use)

Using these values, each 10 pounds difference in the weight of ram lambs at weaning would contribute to an overage of $18.15 increased value in a lifetime of use. A total of 20 pounds, which would represent a broad contrast in weaning weight for ram lambs, would represent a theoretical difference of $36.30 in value between the two rams. These data indicate that producers cannot justify paying large differences in prices of rams used in a crossbreeding program so long as they are typical representatives of the breeds involved.

In Purebred Programs:

If replacement animals are to be kept it is recommended that purebred rams of one of the fine-wool breeds be used. It has been shown that heritability of slaughter lamb characters are higher in a purebreeding program than in a crossbreeding program. In addition, selection of rams in a purebreeding program should consider a number of additional characters which contribute to wool production, fertility or adaptability. Ideally these rams would be selected by use of an index applied to complete performance data. In earlier work concerned with the performance testing programs, it has been estimated that a difference of as much as $700 in value can be attributed to rams representing the extremes normally encountered in the performance testing program. This value was based on the assumption that replacement females, but not males, were to be kept. If replacement rams are to be kept, this value would be much higher, but it would be extremely difficult to attempt to calculate.

These data indicate that most of the effort in ram selection should be devoted to selecting rams to sire replacement animals, and that in general this effort is well justified.

Eighteen Years of Ram Performance Testing

J. W. Menzies

RAM PERFORMANCE testing was initiated at the Sonora Station in 1948 and has been conducted each year since. The purpose of this report is to outline the method of testing rams, the characters measured and the progress made during the last 18 years.

TESTING PROCEDURES

Ram lambs between 5 and 10 months of age are placed on test in September each year and fed for 168 days. The rams are shorn, then weighed on to the test. They are self-fed a ration consisting of 70 percent chopped alfalfa and 30 percent whole oats. They are weighed off of test at the end of 168 days and then shorn. The fleeces are scoured individually and the following fleece data are obtained and adjusted to a 1-year basis: grease fleece weight, clean fleece weight and staple length. Fiber diameter is measured. Physical characteristics measured or scored include average daily gain, feed per 100 pounds gain, face cover score, skin fold score, belly cover score and conformation score.

The scoring system is as follows:

A. Face cover. 1. Open around eyes and below. 2. Open around eyes but partially covered below. 3. Covered with circle or channel at eye. 4. Wool blind.

B. Skin folds. 1. Smooth. 2. Few folds on neck. 3. Folds on neck, few folds on body. 4. Moderate to heavy folds on neck and body.

C. Belly cover. 1. Covered. 2. Covered but showing a definite breaking line low on the side. 3. Some wool on belly but belly wool coming high onto the sides. 4. Very little wool on belly.

RESULTS

Figures 1 and 2 and Table 12 are based on overall yearly averages, using only Rambouillets and include between 10 and 18 breeders. Each breeder selects his rams on a slightly different basis. Therefore the rate of progress is not as fast as one could expect under uniform selection procedures.

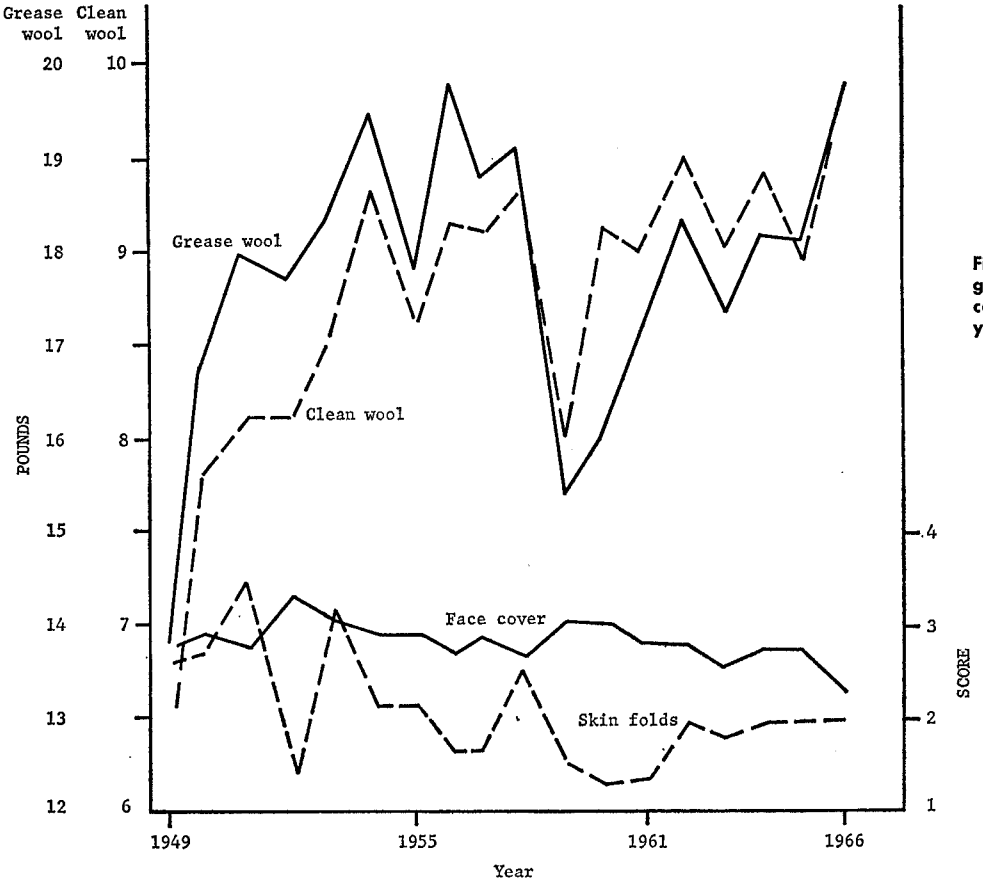

Figure 1. Average values for grease wool, clean wool, face cover and skin folds for the 18-year period, 1949-66, inclusive.

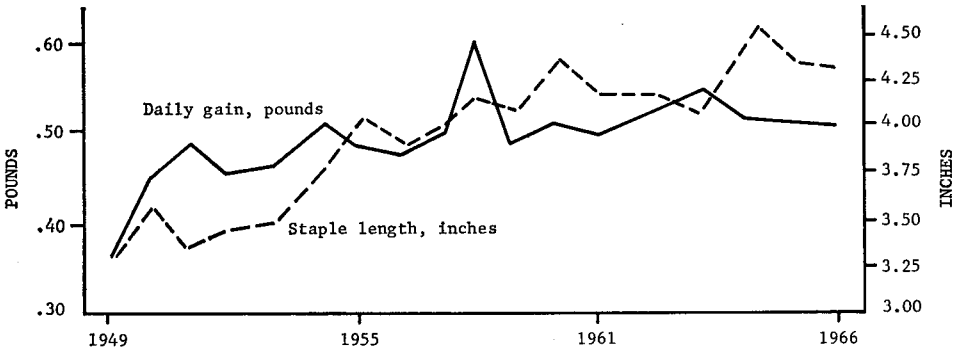

Figure 2. Average values for daily gain and staple length for the 18-year period, 1949-66, inclusive.

TABLE 12. AVERAGE OF RAMBOUILLET RAMS ON TEST IN 1949-66

Year	Staple length, inches	Daily gain	Grease wool pounds	Clean wool	Face[1] cover score	Skin[2] folds
1949	3.4	.37	13.8	6.6	2.7	2.6
1966	4.3	.51	19.8	9.9	2.3	2.0
Difference	+ .9	+.14	+ 6.0	+3.3	− .4	− .6

[1]Face cover score: (1) Open (4) Closed
[2]Skin fold score: (1) Covered (4) Bare

The fall in average grease and clean fleece weight in 1958 was attributed to a switch in rations resulting in poor performance and a high incidence of urinary calculi. Otherwise, no abnormalities occurred which would affect the results.

In the 18 years of testing, grease fleece weight rose from 13.8 to 19.8 pounds, a net increase of 6 pounds. Clean fleece weight rose from 6.6 pounds to 9.9 pounds, a net rise of 3.3 pounds. At the same time the faces have opened up to a Number 2.3 and skin folds to relatively smooth Number 2.0. These data show that one can increase the grease and clean wool production in sheep without increasing face cover or skin folds.

In general, the average ram coming off the Sonora test today will weigh 25 pounds more than his 1949 counterpart. He is capable of gaining .15 pound per day faster and will produce 1 additional inch in staple length. He will produce 6 pounds more grease wool and 3.3 pounds more clean wool. He is able to do this with a more open face and less skin folds than his 1949 brother.

What is the impact of this increased production on the sheep industry? It is impossible to tell. However, a large percent of the breeders whose rams are represented in the above data sell between 600 and 1,500 rams each year.

An Outlined Procedure for Performance Testing:

1. Select promising ram lambs at weaning.
2. Identify each animal, shear and weigh.
3. Place rams on good pasture or self-feed.
4. Weigh rams just before spring shearing to determine rate of gain.
5. Shear at regular shearing time or after 6 months.
6. Score animals for wool weight, staple length, face cover, skin folds and belly cover.
7. Select the animal which rates high in all the above characteristics and conforms to acceptable standards in body type and wool quality.

Acceptability of Various Creep Rations for Young Lambs

J. W. Menzies

SUCCESSFULLY STARTING young lambs on creep feed is sometimes a problem, particularly if the flock has not been subjected to supplementary feeding. The purpose of this experiment was to determine which feeds are most acceptable to young lambs and what physical form is preferred.

PROCEDURE

The experiment was conducted in February 1966. One-hundred-and-fifty young lambs, averaging 2 weeks of age, were given access to 10 different rations. These rations were offered free-choice in open troughs.

A large creep feeding pen was constructed near the flock watering facilities. The 10 rations were placed in 10 different troughs within the pen. Each ration was as readily obtainable as the next; therefore, any differences in feed consumption should be due to the feed offered.

RESULTS

Table 13 shows the pounds of feed consumed during the first 19 days of the feeding period.

The table reveals that the ration consisting of 90 percent cracked milo, 5 percent molasses and 5 percent cottonseed meal was far more readily accepted by the young lambs than were any of the other rations, with 139 pounds consumed. The 95 percent milo and 5 percent molasses ration was second in acceptability, with 66 pounds consumed.

The rolled corn and whole oat based rations proved to be unacceptable. This was probably due partially to the physical form of the rations, as both had much larger particle size than the milo rations.

Considering the milo rations, cottonseed meal and molasses increased the acceptability of the ration.

After the first 3 weeks of feeding, the lambs readily

TABLE 13. RATIONS FOR STARTING LAMBS ON CREEP FEED, AND FEED CONSUMPTION

Ingredient	Percent	Day number: Pounds feed placed in trough																		Total, pounds
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
Corn (rolled)	100	5																			5
Corn (rolled) Molasses	95 5									5											10
Corn (rolled) Molasses Cottonseed meal	90 5 5	5								5											10
Milo (cracked)	100	5								7		5									17
Milo (cracked) Molasses	95 5	5				8	6			7			5		5		6	7	7	10	66
Milo (cracked) Molasses Cottonseed meal	90 5 5	5				8	11			10	10	10	10	10	10	10	10	10	10	15	139
Oats (whole)	100	5																			5
Oats (whole) Molasses	95 5	5																			5
Oats (whole) Molasses Cottonseed meal	90 5 5	5																			5
Corn (rolled) Milo (cracked) Oats (whole) Molasses Cottonseed meal	30 30 30 5 5	5								5										5	15

accepted any of the rations placed before them. This 3-week starting period could possibly be shortened to 2 weeks, as it was observed during the second week that when the most acceptable ration was exhausted, the lambs began to consume the other rations in the order of their preference.

SUMMARY

Of the ten rations tested, the 90 percent milo (cracked), 5 percent molasses and 5 percent cottonseed meal ration was the most acceptable for starting young lambs on creep feed. The 95 percent milo (cracked) and 5 percent molasses ration also was acceptable. Particle size may have influenced the acceptability of the ration, as the lambs preferred the finer ground ration. Molasses and cottonseed meal plus molasses increased the acceptability of the ration.

An Evaluation of Various Protein Sources for Lamb Finishing Rations

J. E. Huston and Maurice Shelton

RECENT DEVELOPMENTS in the livestock industry have increased the emphasis on supply of livestock feeds. Intensification of the sheep and goat industry is changing its image from that of a strictly foraging operation to a carefully planned business in which a significant part of the animal's nutrient requirements are supplied in the form of mixed feed. In Texas, the major sources of energy and protein have been sorghum grain and cottonseed meal, respectively, and supplies have been adequate. However, the recent decrease in cotton acreage has resulted in dramatic decrease in cottonseed meal supplies, and prices have skyrocketed. The research discussed in this report was conducted to evaluate other sources of protein by comparing performance of feeder lambs fed these various protein concentrates.

PROCEDURE

Seventy-three feeder lambs were randomly divided into six treatment groups and were placed in separate pens for 38 days. One lamb died in pen 1 (control ration) from an unknown cause. Throughout the treatment period, the lambs were self-fed the rations listed in Table 14.

These basic feed ingredients were selected for this study in order to formulate a ration in which protein was limiting, and are not necessarily recommended for lamb fattening rations.

RESULTS AND DISCUSSION

Results of the feeding trial are given in Table 15. These results indicate that any of the protein sources studied can be used in meeting an animal's protein

TABLE 14. RATIONS FED FEEDER LAMBS DURING 38-DAY TREATMENT PERIOD

Ingredient	Treatments 1	2	3	4	5	6
	Percent of rations					
Cottonseed hulls	25	25	25	25	25	25
Sorghum grain	50	50	50	50	50	50
Oats	19		3	11	11	17
Cottonseed meal		19				
Soybean meal			16			
Blood meal				8		
Feather meal					8	
Urea						2
Molasses	5	5	5	5	5	5
Ground limestone	0.5	0.5	0.5	0.5	0.5	0.5
Trace mineralized salt	0.5	0.5	0.5	0.5	0.5	0.5
	100	100	100	100	100	100
Calculated crude protein (percent)	7.5	13.0	12.6	12.9	12.9	12.8
Cost of protein supplement per 100 pounds feed[1] (Includes oats and protein concentrate), dollars	.46	.83	.78	.73	.67	.51
Approx. cost per 100 pounds feed (Cost of feed ingredients x 125%), dollars	2.55	3.00	2.95	2.88	2.80	2.61

[1]Costs were calculated using prices quoted F.O.B. Fort Worth, in Dec. 10, 1966 issue of Feedstuffs magazine.

TABLE 15. PERFORMANCE OF LAMBS ON RATIONS CONTAINING VARIOUS SOURCES OF PROTEIN

	Treatments 1	2	3	4	5	6
Average initial weight, pounds	74.9	75.6	72.7	73.9	72.8	75.7
Average final weight, pounds	97.7	102.7	100.2	100.7	99.2	101.8
Average gain, pounds	22.8	27.1	27.5	26.8	26.4	26.1
Average daily gain, pounds	0.60	0.71[1]	0.72	0.71	0.69	0.69
Average daily feed intake, pounds	3.72	4.18	3.92	3.70	3.89	4.08
Pounds of feed per pound of gain	6.2	5.9	5.4	5.3	5.6	5.9
Cost per pound of gain	15.81	17.7	15.93	15.26	15.68	15.40

[1]One lamb from group 2 gained only 2 pounds and was obviously sick at the end of the feeding period. The average daily gain, feed intake, feed conversion and cost of gain for the remaining lambs were 0.77, 4.18, 5.4 and $16.20, respectively.

requirement, although small differences did occur. All treatment groups which received some type of protein concentrate performed distinctly better than the control group. The cottonseed meal ration was consumed more readily but produced the most expensive gain, while the group receiving the ration containing blood meal had the lowest dietary intake and also the lowest cost of gain of those tested. The apparent economical gain by the control group is deceiving since time in the feedlot was not given cost consideration. Also, the control lambs were visually inferior at the end of the feeding trial.

Urea is not a natural protein but can be synthesized into usable protein by bacteria in the lamb's stomach and was used very satisfactorily in this experiment. Normally, urea can be used as the sole source of supplemental protein in high energy fattening rations without being a health hazard, but animal performance usually suffers. This is particularly true during periods when feed intake is a major problem such as during hot summer months. At the present time, the use of urea in pasture and range supplements should be limited to that necessary to supply one-third of the dietary crude protein.

It appears that other sources of protein can be used in sheep rations in place of cottonseed meal and that at present prices would be economical. Additional work is being done with a wider range of protein sources and results will be made available later.

The Influence of Forced Exercise and Ration on the Feedlot Performance of Ewe and Wether Lambs

C. W. Spaeth, Z. L. Carpenter, G. T. King, Maurice Shelton and J. W. Bassett

HIGH CONCENTRATE rations for finishing lambs are increasingly being used by commercial lamb feeders. Research efforts have shown that the addition of stilbestrol to the finishing ration can result in increased feed efficiency and greater profits.

This research was conducted to study the effects of forced exercise and ration on the feedlot performance of ewe and wether lambs.

Considerable interest exists, especially among show lamb exhibitors, regarding the influence of forced exercise on the feedlot performance of lambs.

EXPERIMENTAL PROCEDURE

Forty-eight lambs from selected sires under the same management practices were made available from the flock at the Livestock and Forage Research Center, McGregor. The lambs were placed on feed at College Station at an average weight of 47 pounds. They were allotted to insure that four ewe lambs and four wether lambs were included in each of six lots and were placed on the rations as shown in Table 16.

TABLE 16. RATIONS USED IN LAMB STUDY

Ingredient	Concentrate ration	Stilbestrol ration	Conventional ration
	Percent		
Alfalfa	10.00	10.00	10.00
Cottonseed hulls			25.00
Cottonseed meal	15.00	15.00	22.00
Rolled milo	67.25	67.25	35.50
Molasses	5.00	5.00	5.00
Ammonium chloride	0.50	0.50	0.50
Urea	0.50	0.50	0.50
Calcium carbonate	0.75	0.75	0.50
Trace mineral	0.10	0.10	0.10
Salt	0.90	0.90	0.90
Aureomycin	25 mg/lb. feed	25 mg/lb. feed	15 mg/lb. feed
Vitamin A	500 IU/lb. feed	500 IU/lb. feed	500 IU/lb. feed
Diethylstilbestrol		1 mg/lb. feed	

Each ration was fed to an exercised and a non-exercised lot of lambs. The exercised lambs were required to run an obstacle course, ¾ mile long, which contained 20 hurdles approximately 14 inches in height. The feed troughs were raised 12 inches which forced the lambs to stand on a 12-inch step and thus possibly cause the muscles in the hind legs to be exercised more than those in the nonexercised lots. The lambs had feed and water available on a free-choice basis throughout the 85-day test.

RESULTS AND DISCUSSION

The average feed intake per head for each treatment and ration is shown in Figure 3. It is readily noticed that the nonexercised lambs consumed more feed than the exercised lambs. This was surprising since the exercised lambs were expected to use more energy as the result of the exercise treatment. However, it is anticipated that the hot, humid climate at College Station in combination with the tiring exercise and inability of the lambs to readily adjust to the exercise treatment caused a decrease in overall vigor and resulted in a lower feed consumption per head. Figure 3 also illustrates that more feed was consumed by the lambs fed the conventional ration than either of the other two rations. This is in general agreement with previous reports which indicate that as the level of concentrate increases, there is a reduction in the feed consumption.

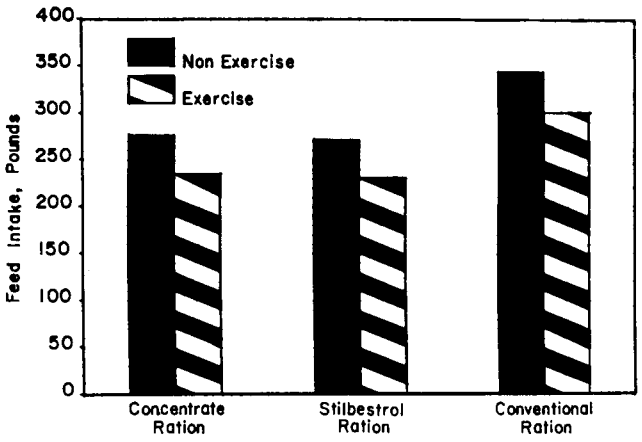

Figure 3. Average feed intake for each treatment and ration.

Figure 4 shows the average feed required per 100 pounds of gain for each treatment and ration. A definite difference does not seem to exist between treatments but it might be noted that more feed is required per 100 pounds of gain when the conventional ration is fed. This is again in agreement with previous research reports which indicate that an increase in the roughage level of the ration will result in an increase in the feed required per 100 pounds of gain.

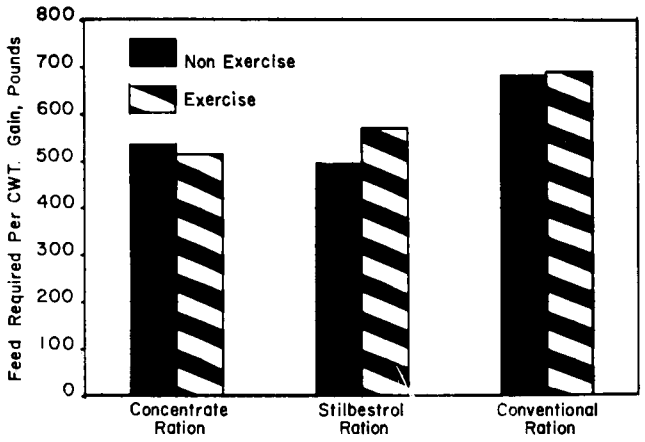

Figure 4. Average feed required per 100 pounds of gain for each treatment and ration.

The cost of 100 pounds of feed was calculated as follows:

Concentrate ration	$2.50
Stilbestrol ration	$2.60
Conventional ration	$2.33

Figure 5 illustrates that although the conventional ration was the cheapest to buy, it was the least economical when considering the cost in producing 100 pounds of gain.

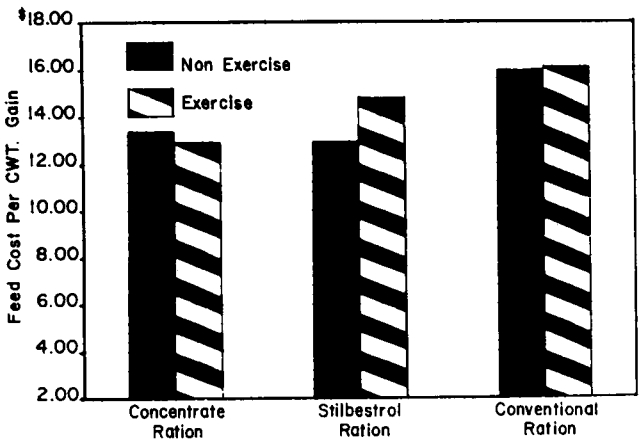

Figure 5. Average feed cost per 100 pounds of gain for each treatment and ration.

Figure 6 illustrates the average daily gain for each treatment and ration. There is a definite advantage in average daily gain to the nonexercised lambs over the exercised lambs. This is expected since the nonexercised lambs consumed more feed. The difference in average daily gain between treatments were found to be statistically significant when subjected to the analysis of covariance. A definite difference in average daily gain among rations did not exist.

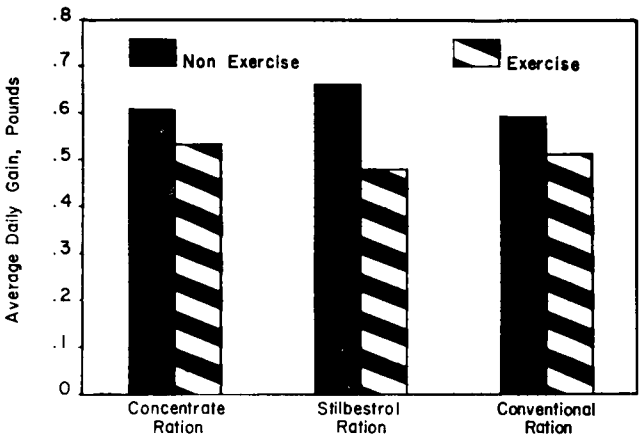

Figure 6. Average daily gain for each treatment and ration.

SUMMARY

Based on the data from the 48 lambs, the exercise treatment resulted in a lower feed consumption and a lower average daily gain. It is believed that climatic conditions along with the tiring exercise and inability to adjust to this treatment were partially the cause of the lower feed consumption and lower average daily gain. The exercise treatment had no great effect on the feed efficiency.

Furthermore, these data indicate that the conventional ration was consumed at a higher level and was the most inefficient ration. No profound difference between the concentrate and the stilbestrol rations were found for any of the traits considered.

Effect of High Salt Intake on Protein Utilization

J. E. Huston and Maurice Shelton

A COMMON PRACTICE throughout the rangelands of Texas is using salt to limit intake of a concentrate feed to a desired level. Animals generally will refuse to consume great amounts of salt, therefore, the level of consumption of a mixed concentrate feed (or supplement) can be regulated by including rather high levels of salt in the mix. There has been a great deal of discussion concerning whether animals are adversely affected due to such high salt loads. The research which is discussed in this report was conducted to determine the effects of high salt intake on the productivity of ewes and, more specifically, on protein utilization.

TABLE 17. PERFORMANCE OF PRODUCTION FLOCKS IN DRYLOT

	Control	Control plus salt
Number of ewes initially	7	8
Number of ewes added	10	8
Sheep days on treatment	1,458	1,401
Number of ewes dying	2	5
Number of lambs born	7	7
Number of lambs raised	4	0
Total weight added, pounds	2,348	2,326
Total final weight, pounds	1,870	1,365
Total weight loss, pounds	478	961
Average weight loss of surviving ewes, pounds	16.2	20.5

EXPERIMENT 1

Experiment 1 involved the feeding of two groups of ewes in drylot the following rations:

Ingredients	Ration 1, percent	Ration 2
Sorghum grain	95	Ration 1
Urea	2	plus
Ground limestone	1	10 percent
Bone meal	1	salt
Trace mineralized salt	1	

One group of ewes was fed 1.7 pounds per ewe per day of control ration (Ration 1) and group 2 was fed 1.87 pounds of Ration 2 daily. Therefore, each ewe received 1.70 pounds of basal ingredients and those in group 2 received .17 pound of additional salt daily. The results of this study are given in Table 17. Although neither group performed well, the group consuming excess salt performed distinctly worse. Their appearance closely resembled that of ewes in the state of extreme undernutrition. Probably neither group was receiving sufficient feed to meet maintenance requirements, however, the salt seemed to increase the problem, suggesting that it had an effect on the efficiency of utilization of the ration components. It was apparent during the study that the

TABLE 18. EFFECT OF HIGH SALT INTAKE ON WATER INTAKE, URINE VOLUME AND PROTEIN[1] UTILIZATION

	Control	Control + salt
Feeder lambs		
Number of animals	12	6
Daily feed intake (gm)	500	556
Daily protein intake (gm)	68.0	68.0
Net retained protein (gm)	20.7	19.0
Daily water intake (liters)	1.21	2.95
Daily urine volume (liters)	.62	2.37
Pregnant ewes		
Number of animals	2	2
Daily feed intake (gm)	700	778
Daily protein intake (gm)	81.8	81.8
Net retained protein (gm)	8.3	− 1.9
Daily water intake (liters)	2.61	7.29
Daily urine volume (liters)	.69	4.70

	Urea control	Urea + salt	Cottonseed meal control	Cottonseed meal + salt
Pregnant ewes				
Number of animals	1	1	2	2
Daily feed intake (gm)	500	556	500	556
Daily protein intake (gm)	59.4	59.4	59.4	59.4
Net retained protein (gm)	13.4	10.1	15.5	13.8
Daily water intake (liters)	1.55	6.24	2.16	3.65
Daily urine volume (liters)	1.18	4.63	1.77	2.91

[1]All protein values refer to crude protein (N X 6.25).

group receiving salt drank a great deal more water, resulting in a high urine output and muddy conditions in the lot.

EXPERIMENT 2

Experiment 2 was a series of feeding studies to determine the influence of high salt intake on water intake, urine volume and efficiency of protein utilization. Metabolism stalls, which allow for total separate collection of feces and urine, were utilized in these studies. Comparisons were made on the rations fed in Experiment 1 and on equal protein rations containing cottonseed meal in three metabolism studies. Results are summarized in Table 18.

In each case, the inclusion of a high level of salt in the rations had a lowering effect on protein retention. However, the differences were not very great and are probably of minor importance, except when an animal is on a maintenance ration containing a marginal level of protein or when the animal is in the state of increased production (late pregnancy). In these situations, this small observed difference in protein utilization could mean the difference between normal health and production of the animal and a condition of malnutrition. It is probably sound management to use increased levels of salt to control intake of a concentrate supplement when a generous amount of forage is available. However, producers should exercise caution when trying to limit a mixture which represents the major part of an animal diet by including a high level of salt, particularly during the last 3 to 4 weeks of pregnancy.

A Comparison of the Efficacy of Certain Drugs for the Treatment of Internal Parasites of Sheep and Goats

Maurice Shelton and Charles T. Engelking

REGARDLESS OF the preventative measures or sanitary practices employed, most producers of sheep and goats eventually find it necessary to practice drenching as a part of their parasite control program. Thus, every producer is eventually faced with the problem of choosing a drench from among those available. On a world-wide basis, extensive research has been conducted and extensive literature is available comparing efficacy and safety of various drug preparations. However, these data are seldom available to the producer in a form intelligible to him at the time he must make the decision.

EXPERIMENTAL

In the summer of 1966 some rather extensive trials were conducted to test the effectiveness of the various preparations on the market in this area. The testing procedure employed consisted of a comparison of fecal egg count before and after treatment, along with body weight changes for a period of 1 to 2 weeks after drenching. The latter was used as a measure of any adverse effect which the drugs might have on the animal. Egg counts were conducted using the McMaster Counting Chamber. Only gastro-intestinal nematodes were included in these counts. In any given sample the relative numbers of the various species could not be determined.

The method of fecal egg counts has limitations, but it is the only practical way in which tests of several products can be conducted utilizing significant numbers. The most serious limitation is that it does not permit an expression of effectiveness against individual species. However, in this case it is assumed, as in most others, that we are dealing with a mixed infestation with *Haemonchus contortus* being the primary parasite. Earlier in the season a cultural examination was made of a group of sheep on the station. In this group, *Haemonchus contortus* was found to comprise approximately 75 percent of the parasites present compared to 24 percent for the *Trichostrongylus* sp. and 2 percent for the *Nematodirus* sp.[2] Many of the animals used were not noticeably parasitized and frequently did not show high egg counts, but this does not appear to limit the validity of the drug comparisons.

RESULTS

Trial 1

The first trial involved 107 head of ewe lambs with an average weight of 77.6 pounds. They were

[2]These data were provided courtesy of Gary Boring, Merck Drug Company, College Station, Texas.

TABLE 19. RESULTS OF DRENCHING SHEEP WITH SEVERAL AVAILABLE ANTHELMINTICS

Treatment	Number of animals	Average initial weight	EPG count		Change, percent	Percent of controls on date of second count	Body weight change 2 weeks post treatment, pounds
			Initial	1 Week post-treatment			
		Trial 1—ewe lambs treated July 19, 1966					
Control (no treatment)	18	78.0	1,764	3,906	+121.4		+0.8
Phenothiazine,[1] 2 oz.	18	75.1	1,175	506	− 56.9	13.0	+0.1
Thibenzole, 1 oz.	18	77.6	1,139	183	− 83.9	4.7	+0.2
Thibenzole, 2 oz.	18	77.0	1,342	28	− 97.9	0.7	−1.3
Tox-I-Ton,[2] 10 cc.	18	80.8	708	444	− 37.0	11.4	+1.3
Wormulsion,[3] 10 cc.	17	78.0	812	747	− 8.0	19.1	−4.9
		Trial 2—Yearling ewes drenched August 3, 1966					
Control	10	109.7	890	2,200	+147.1		−2.2
Phenothiazine,[1] 2 oz.	10	113.3	1,030	180	− 82.5	8.2	−0.6
Thibenzole, 1 oz.	10	113.5	1,540	550	− 64.3	25.0	−5.0
Thibenzole, 2 oz.	10	110.3	450	50	− 88.9	2.3	−2.0
Tox-I-Ton,[2] 10 cc.	10	109.8	2,430	1,300	− 46.5	59.1	−2.2
Wormulsion,[3] 10 cc.	9	109.6	1,233	1,233	0.0	56.0	−3.2

[1]The phenothiazine used was the micronized product according to the label, but no particle size was given.

[2]Tox-I-Ton is a trade name product which, according to the label, contains copper sulphate, sodium arsenate and nicotine alkaloid.

[3]Wormulsion is a trade name product which, according to the label, contains carbon tetrachloride, copper arsenate, nicotine sulfate and copper sulfate as active ingredients.

randomly divided into six groups and treated on July 19 as outlined in Table 19. The dosages employed were according to manufacturers' directions for adult sheep.

Trial 2

The second trial involved 59 head of yearling ewes averaging 111 pounds. The initial fecal collections and treatments were made on August 3, 1966. The treatments employed and dosages used were exactly the same as those used in Trial 1. The results are also shown in Table 19.

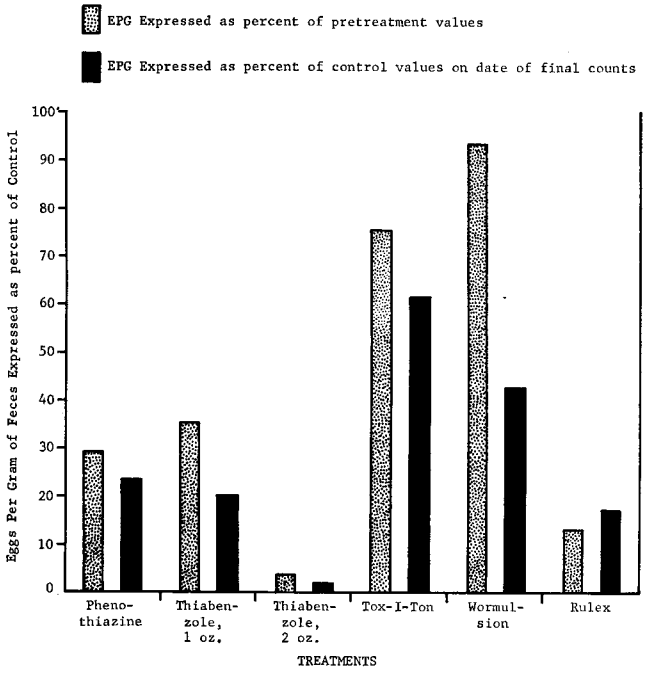

Figure 7. Summary of results of four trials evaluating various anthelmintics for sheep and goats. Results with Wormulsion and Rulex are not completely comparable, since they were not both used in all trials.

Trials 3 and 4

Trials 3 and 4 involved the same materials used with Angora goats except that Wormulsion was dropped from one trial and Rulex (a trade name for ruelene) was used in both trials on goats. The third trial involved mature billy or mutton goats and was started on August 24. The fourth trial involved aged Angora does treated on August 26. The results of both trials are shown in Table 20 and Figure 7.

DISCUSSION

All of the materials used appeared to have some effect against the parasites involved. The relative efficacy varied somewhat from one trial to the next. It is evident that none of the preparations used completely removed all the parasite load. The egg count recorded 1 week after treatment could be due to mature worms which were not removed or to a failure to remove immature worms, some of which reached maturity in the time since drenching. From this study, it is not possible to determine which of these factors are involved.

In these studies it is evident that only Thibenzole used at double the recommended rate was highly effective in removing the parasites involved. In the two trials in which it was used, ruelene also appeared to do a satisfactory job. Ruelene belongs to the class of compounds known as organophosphates, all of which have some element of toxicity. No death losses were attributed to the use of ruelene in these trials, but other experience on the station indicates that this drug should be used with utmost caution and

TABLE 20. DRENCHING RESULTS WITH ANGORA GOATS

Treatment	Number of animals	Average initial weight	EPG COUNT		Change, percent	Percent of controls on date of second count	Body weight change 2 weeks post treatment, pounds
			Initial	1 week post-treatment			
Trial 3—Mature billies and muttons treated August 24, 1966							
Control	5	93.8	813	925	+114.0		−2.0
Phenothiazine, 2 oz.	5	85.2	2,367	900	− 62.0	97.3	−1.0
Thibenzole, 1½ oz.	5	78.2	750	625	− 16.0	67.6	−0.8
Thibenzole, 2-3 oz.	5	105.0	1,717	0	−100.0	0.0	−0.4
Tox-I-Ton, 10 cc.	4	93.0	1,717	883	− 48.6	95.6	−0.3
Rulex,[1] 1 oz.	5	103.6	1,500	300	— 80.0	32.4	−0.6
Trial 4—Angora does treated August 26, 1966							
Control	10	71.1	975	1,070	+110.0		−0.2
Phenothiazine, 2 oz.	9	70.9	1,968	325	− 83.5	30.4	+0.3
Thibenzole, 1 oz.	10	74.7	1,170	255	− 78.2	23.8	+0.4
Thibenzole, 2 oz.	9	73.3	722	44	− 93.9	4.1	+0.4
Tox-I-Ton, 10 cc.	8	71.1	1,806	2,369	+131.2	221.4	+2.0
Wormulsion, 10 cc.	7	70.4	1,229	1,043	− 15.1	97.5	
Rulex,[1] 1 oz.	7	69.2	1,107	43	− 96.1	4.0	−0.3

[1]This is a trade name for a preparation containing only Ruelene as the active ingredient.

strictly according to directions. This often precludes the use of this drug with weak, rundown animals, especially goats, and this is one of the types commonly needing treatment for internal parasites.

The micronized phenothiazine and Thibenzole at the lower level appeared to be on about the same order of effectiveness and both these appeared to be substantially more effective than Tox-I-Ton and Wormulsion. In at least some of the trials, the latter appeared to be almost without value.

Based on body weight changes there was only one instance in which any adverse effects of the drugs were noted. When an adult dose of Wormulsion (10 cc.) was given to ewe lambs in the first trial, there was distinct evidence of body weight loss for the first 2 weeks. One animal in this group died of undetermined causes.

Based on local retail prices, the estimated cost of treating individual adult sheep and goats with the various drugs is approximately as follows: Wormulsion—3.5¢, Tox-I-Ton—4¢, Phenothiazine—5.5¢, Rulex —17¢, Thibenzole—1 oz. 10¢, and 2 oz. 20¢. Thus, it will be noted that the drug costs array themselves in approximately the same order as effectiveness. It is possible that more parasites can be killed per unit of drug cost with some of the less effective preparations. However, labor costs and the necessity for repeat treatments should be considered in decision making.

An Apparent Recessive Dwarf in Merino Sheep

Maurice Shelton

INHERENT FORMS of dwarfism have been identified in many species and breeds of livestock. To the writer's knowledge, the occurrence of dwarfism has not previously been reported in fine-wool sheep. The purpose of this paper is to report what appears to be a case of inherent dwarfism in Merino sheep.

In the fall of 1960, a ram lamb was born of, what breeding records show to be, registered Merino parentage. This animal was unusually good in both appearance and performance and was kept for a breeding ram. This ram did not show typical Delaine Merino characteristics in several respects. The flock at the McGregor station are descendants of a small flock originally brought from Texas A&M University in 1959. These animals all traced on one side of their pedigree to a ram imported from New Zealand several years back. Both at College Station and McGregor they had been selected for size, smooth body, wide horns and lack of excessive oil.

The ram in question was used extensively at McGregor. In the fall of 1962, a ram lamb, sired by the aforementioned ram, was observed to have a dwarfish appearance at weaning. This ram was kept for observation. The ram is now 4 years of age and has made very little anatomical development to this time. This apparent dwarf was used lightly for breeding in the 1964 and 1965 seasons. To date, he has sired 6 lambs which were raised to weaning. One of these turned out to be a dwarf, almost identical in appearance to his sire. Figures 8 and 9 are pictures of the original sire along with the first dwarf observed.

Figure 8. Original sire (right) and first dwarf, side view.

Figure 9. Original sire (right) and first dwarf, front view.

Based on observations of these two specimens the affected animals appear to be normal at and for a time after birth. By 3 to 4 months of age, it is obvious that the anatomical development, particularly of the limbs, is retarded. However, the more extreme contrasts noted here does not become obvious unless the animal is kept to an advanced age. Note also that both specimens show a bowed appearance of fore limbs with enlarged joints.

The fact that these two very unique animals have occurred within the same family line, and that the condition has not been observed in several thousand other animals raised on the McGregor station, strongly indicate that the condition is hereditary. Since the initial dwarf observed had two normal parents, the mode of inheritance would most likely be recessive. Both dwarf rams are being used in breeding tests to further study the inheritance of this characteristic.

The Influence of Forced Exercise and Ration on Carcass Merit of Ewe and Wether Lambs

C. W. Spaeth Z. L. Carpenter and G. T. King

NUMEROUS REPORTS are available regarding the effects of various rations and treatments on the carcass merit of lambs. In general the reports tend to indicate that reductions in carcass grade and amount of finish are attained through the addition of stilbestrol to the diet. Also, an increase in fat deposition is believed to be associated with an increase in the concentrate level of the ration.

It is a recommended practice by many show lamb feeders throughout Texas to subject lambs to intense running and jumping exercises prior to show in belief that fat deposition is decreased or that muscle is developed as the result of the exercises.

The purpose of this study was to determine the influence of forced exercise and ration on carcass merit of ewe and wether lambs.

EXPERIMENTAL PROCEDURE

Data were obtained on the 48 lambs that were utilized in the previous report. The lambs were slaughtered at the Meats Laboratory of Texas A&M University and were cut into closely trimmed retail cuts following normal cutting procedures. Loin-eye area measurements and fat thickness measurements were taken over the eye muscle between the 12th and 13th ribs. A taste panel was utilized to determine the various palatability attributes of the lamb legs.

RESULTS AND DISCUSSION

The average values for chilled carcass weight, loin-eye area, fat thickness measurements over the loin-eye muscle, percent of closely trimmed retail leg, loin, rack and shoulder, percent of kidney fat and percent of other excess trimmable fat are shown in Table 21.

Although no great difference in chilled carcass weight existed among rations, the carcasses from nonexercised lambs were heavier than those from exercised lambs. This is as expected, since the nonexercised groups consumed more feed and had a higher average daily gain.

The loin-eye area and fat thickness measurements were statistically adjusted for differences in carcass weight so that the values for each sex, ration and treatment could be meaningfully compared with one another. Table 21 illustrates that nonexercised and ewe lambs tended to have a slight advantage in loin-eye area as compared to the exercised and wether lambs, respectively. However, these differences were not found to be statistically significant. Very slight and nonsignificant differences were found among rations, treatments and sexes in the fat thickness measurements that were taken over the loin-eye muscle.

The average values for the percent leg, loin, rack and shoulder are shown in Table 21. These values indicate only slight differences due to ration in the percent of the high priced cuts, with the concentrate fed lambs having the lower yield. However, much greater differences were found between treatments and between sexes with the exercised and ewe lambs having a higher percent of leg, loin, rack and shoulder than the nonexercised and wether lambs, respectively. These differences in cutout yield were found to be

TABLE 21. AVERAGE VALUES OF IMPORTANT CARCASS TRAITS FOR EACH RATION, TREATMENT AND SEX

	Chilled carcass weight, pounds	Loin-eye area, square inches	Fat thickness, inches	Leg, loin, rack and shoulder, percent	Kidney fat, percent	Other excess trimmable fat, percent
Ration						
Concentrate	53.2	2.02	0.28	59.0	3.74	17.6
Stilbestrol	52.2	2.04	0.27	60.2	3.20	15.8
Conventional	52.1	2.06	0.27	60.1	3.68	16.6
Treatment						
Nonexercise	54.6	2.07	0.26	59.0	3.94	17.5
Exercise	50.4	2.01	0.28	60.5	3.14	15.8
Sex						
Wether	53.4	1.99	0.27	58.9	3.76	17.7
Ewe	51.6	2.09	0.27	60.6	3.32	15.6

statistically significant. The disadvantage in the percent of high priced cuts is believed to be partially due to the heavier carcass weight of the nonexercised and wether lambs and due to a relatively high negative correlation coefficient which was calculated between the percent of high valued cuts and carcass weight. This advantage in carcass cutout to the ewe lambs does not coincide with some previous research which has shown an advantage for wether lambs.

Carcasses from the stilbestrol-fed lambs tended to yield less kidney fat than those carcasses of the concentrate and conventional fed lambs. This difference in kidney fat was not statistically significant. A greater diversity in the percent of kidney fat was found between treatments and sexes. The nonexercised and wether lambs had a higher percent kidney fat than the exercised and ewe lambs. The magnitude of differences in the percent of other excess trimmable fat was basically the same as for kidney fat. In both cases the differences between treatments and sexes were found to be statistically significant. It is believed that this high percent of fat was responsible for the lower percent of leg, loin, rack and shoulder of the nonexercised and wether lambs.

The taste panel data revealed that the legs from exercised lambs were significantly more tender and more acceptable in overall palatability than those of the nonexercised lambs. These results are contrary to most popular belief on the subject, but do coincide with some previous research of this nature involving beef cattle.

CONCLUSION

Data revealed that very slight and nonsignificant differences in loin-eye area and fat thickness existed among ration, treatments and sexes. However, significant differences were found between sexes and treatments in the percent leg, loin, rack and shoulder, with the exercised and ewe lambs having the advantage. It might be noted that this advantage in carcass cutout was not the result of the building of muscle by the exercise treatment, but rather was the result of less fat deposition. It is anticipated that a more intense exercise treatment under more ideal climatic conditions might have resulted in considerably different results. Nonexercised and wether lambs had a significantly higher percent of kidney fat and other excess trimmable fat than did the exercised and ewe lambs. This factor alone accounted for a great deal of the decrease in cutability of the wether and nonexercised lambs.

Taste panel data indicated that the legs of exercised lambs had a significantly greater tenderness value than those that were not exercised. No precise explanation is given for this but these results are in general agreement with other reports available on the subject.

Effect of Live Oak Leaves on Protein Utilization and Mohair Production of Angora Goats

J. E. Huston and Maurice Shelton

THE LIVE OAK tree, *Quercus virginiana,* is a common plant in Texas and exists as the dominant species in many areas of the Edwards Plateau region. For many years ranchers of this region have taken advantage of its presence by maintaining groups of browsing animals (particularly goats and deer) which readily consume leaves of the scrubby evergreen. Ranchers usually use this practice for the dual purpose of controlling the spread of this invading plant, thereby improving range conditions and for increasing income through sale of products and hunting privileges. However, there are some published experimental evidence which attributes little nutritional value to live oak leaves. This material is known to be high in minerals and moderately high in protein, but earlier work has shown the latter to be almost completely indigestible. Two experiments were conducted at the McGregor Research Center during the summer of 1966 in an attempt to assess more accurately the value of live oak leaves for livestock feed.

EXPERIMENTAL

Experiment 1 was an attempt to determine the digestibility of oak leaf protein and how efficiently such digested protein is utilized by the Angora goat. Four yearling Angora muttons were selected for uniformity of size and age and were placed in individual metabolism stalls. These stalls were designed to comfortably accommodate a single animal on an expanded metal floor to allow for quantitative separation and total collection of feces and urine. The animals were given access to feed and water in a removable galvanized feed and water pan hung over the stall opening.

Many attempts were made to adjust these goats to rations containing live oak leaves as either the sole or major ingredient. However, the goats refused to eat a high level of oak leaves (fresh or dry), so the rations listed in Table 22 were used.

TABLE 22. RATIONS FED ANGORA GOATS

	Control ration	Oak leaf ration
	Pounds	
Oats	75	75
Cottonseed meal	15	15
Molasses	10	10
Oak leaves		15
Total	100	115

The oak leaves which were finely ground and mixed in this ration were collected by hand in April 1965 and contained 11.2 percent crude protein on an air-dry basis. At the onset of the experiment, goats 1 and 2 were fed 690 grams (1.52 pounds) of the oak leaf ration, and goats 3 and 4 received 600 grams (1.32 pounds) of the control ration daily. On this basis, all animals received equivalent amounts of the control ration, and the oak leaves were included as an additional ingredient to goats 1 and 2. Following collection of data, this order was reversed so that each goat was subjected to both rations to allow for a more accurate comparison. Total nitrogen was determined in feed, feces and urine by the Kjeldahl procedure, and crude protein was calculated (N × 6.25). The results are shown in Table 23.

TABLE 23. CRUDE PROTEIN VALUES FROM METABOLISM STUDY[1]

	Control ration	Oak leaf ration	Percent change
Protein intake (gm)	83.9	92.8	+10.6 %
Digestible protein (gm)	62.9	66.5	+ 5.7 %
Urinary protein (gm)	38.0	33.1	−12.9 %
Net retained protein (gm)	24.8	33.4	+34.7 %**
Apparent Protein Digestibility			
Basal protein	75.0%	75.0%	
Oak leaf protein		30.6%	
Weighted average	75.0%	71.7%	− 4.42%

[1]All tabulated values are average crude protein values from four goats.

**Probability of differences being due to chance is less than 1 percent.

Experiment 2 was an open-lot feeding experiment in which 10 Angora muttons were allotted to each of two pens so that average body weight and past mohair production between the two lots were approximately equal. Both groups received a mixture of ⅓ ground sorghum hay, ⅓ alfalfa hay and ⅓ ground sorghum grain, free choice, for 56 days. During this period, fresh live oak brush was cut daily (excluding Sunday) and placed in lot 2. Total consumption of live oak leaves is not known but it was a relatively small amount. Mohair growth was determined from four

shorn patches on each goat. Results are shown in Table 24.

TABLE 24. PERFORMANCE OF ANGORA MUTTONS ON CONTROL AND OAK LEAF RATIONS

	Lot 1 (Control)	Lot 2 (Oak Leaf)	Difference	
			Average	Percent
Number of animals	10	10		
Average daily feed intake, basal ration pounds	2.68	2.49	−0.19	− 7.1
Initial weight, pounds	84.3	84.0		
Final weight, pounds	89.1	87.8		
Gain, pounds	4.8	3.8	−1.0	
Mohair growth, 56 days				
Length, inches	1.92	1.95	+0.03	+ 1.6
Weight, gm/sq. in.	0.673	0.871	+0.198	+29.4**

**Probability of difference being due to chance is less than 1 percent.

DISCUSSION

If one assumes that the digestibility of the basal ration protein remains constant when fed separate or in combination with oak leaves, the digestibility of oak leaf protein was 30.6 percent in this experiment. Although this observation conflicts with earlier reports, which have assigned near zero digestibility to oak leaves, the value reported here would be considered very poor in comparison with other more common feed stuffs. It was apparent from the onset of these experiments that goats will not willfully or otherwise ingest oak leaves to the extent that they will represent the entire diet or even a large part thereof. Therefore, it should be pointed out that an evaluation of oak leaves as a source of dietary nutrients cannot be considered separate and apart from their associated feed. This is apparent in Table 23, in that even though the total digested protein was increased by feeding the oak leaf ration, the urinary protein decreased, thereby significantly increasing the net retained protein ($P < .01$). This suggests that something is present in the oak leaves which improves the utilization of digested protein. The better efficiency of utilization of digested protein resulting in a 34.7 percent increase in net retained protein probably best explains the 29.4 percent increase ($P < .01$) in mohair production in experiment 2. It would appear doubtful that such an increase can be attributed to either the added protein or energy since the basal ration was quite adequate in both. Results of experiment 2 (Table 24) tend to agree in that daily basal feed intake was reduced when goats were allowed to freely browse oak leaves. Perhaps a likely explanation for this demonstrated effect on mohair growth is the high mineral content of live oak leaves (4-7 percent ash). The mineral requirements of Angora goats have not been established, but there is some evidence that they are higher than those of sheep. Because of the low intake of leaves, along with the low digestibility of protein, this material would make relatively little contribution to the animals' protein requirements. The observed effect of a small amount of oak leaves on protein utilization holds considerable interest and justifies further investigation.

Protein Supplementation of Mutton Goats on Pasture

J. E. Huston and Maurice Shelton

AN EXPERIMENT was conducted between July 27, 1965 and April 6, 1966 to investigate whether Angora mutton goats need protein supplement and whether urea can used to replace natural protein in such a range supplement. Thirty-two mutton (castrated male) goats were randomly assigned to four groups and were grazed together on a pasture containing almost equal areas of native grasses and common bermudagrass. A fifth group of six goats was added shortly after the beginning of the experiment which represented a control (treatment 1). The pasture contained numerous cool-season species, therefore, the nutritional stress was below average. These goats were penned twice weekly, divided into treatment groups and fed 1¼ pounds per goat of the supplements shown in Table 25.

TABLE 25. SUPPLEMENTS FED MUTTON GOATS ON PASTURE

Treatment groups	1	2	3	4	5
Ingredients, percent					
Cottonseed meal		85.0	63.0	38.0	
Ground milo			19.0	41.0	85.0
Urea			3.0	6.0	
Bone meal		15.0	15.0	15.0	15.0
Total		100.0	100.0	100.0	100.0

This rate of supplementation supplied about 0.10 pound digestible protein on a per day basis (groups 2, 3 and 4) which is approximately one-half of what is thought to be the protein requirement for 80-100 pound mutton goats. Group 1 did not receive any supplement and group 5 received no protein concentrate. They were drenched for control of internal parasites twice during the course of the experiments.

RESULTS

Initial and final shorn body weights and grease fleece weights are given in Table 26. Group 1 had a higher record of mohair production than the other groups and this should be considered when comparing the results. These results indicate that Angora muttons can benefit, both in producing mohair and maintaining body weight, from some type of supplementation. The cottonseed meal supplement was more effective than either C.S.M. - Milo-Urea or milo in maintaining a high level of mohair production and body weight. Urea was not found suitable for a protein supplement for Angora goats on pasture in this study; however, the urea-containing supplements were less palatable, and less of each of these was consumed. Additional studies are being conducted to fully determine whether urea can be successfully used in feed supplements.

TABLE 26. BODY WEIGHT CHANGES AND MOHAIR PRODUCTION OF ANGORA MUTTONS RECEIVING VARIOUS PROTEIN SUPPLEMENTS

	Group number				
	1	2	3	4	5
Mohair production, history,[1] pounds/month	1.99	1.74	1.70	1.84	1.70
Test period, pounds/month	1.37	1.49	1.32	1.33	1.38
Percent of mohair history	68.8	85.6	77.6	72.3	81.2
Shorn body weights, pounds					
Initial weight	99.0	87.5	86.3	89.4	96.5
Final weight	74.1	86.9	80.1	81.5	93.1
Weight change	−14.9	− 0.6	− 6.2	− 7.9	− 3.4

[1]Determined from records of past production.

Supplemental Feeding of Weaned Angora Kids

J. W. Menzies

THE POSTWEANING development of Angora kids frequently is neglected by the producer, resulting in a small, poorly developed replacement animal. This period between weaning in the fall and good pasture conditions in the spring is critical to the kid's development. Winter pasture conditions are inadequate to sustain growth.

PROCEDURE

Sixty head of Angora kids weighing an average of 30 pounds were divided into three groups and supplementally fed on good pasture. Group 1 received a daily allocation of .6 pound of a pelleted milo-vitamin A ration. Group 2 received .9 pound daily of a pelleted mixed ration consisting of 78 percent milo, 11 percent cottonseed meal, 10 percent molasses, 1 percent mineral supplement plus 2000 IU of vitamin A per pound. Group 3 received the same ration as Group 2 except that they were self-fed and consumed 1.1 pounds of feed daily.

The feeding period was from November 23, 1965 to March 5, 1966, 102 days.

RESULTS

Table 27 shows the performance of the kids on the three supplemental rations. Although Ration 1 (milo plus vitamin A) was theoretically inadequate at the level fed, the kids gained 7.9 pounds during the 102-day period. They entered the breeding flock at a weight of 51 pounds. Group 2, limit fed a milo-meal ration, gained 2.2 pounds more during the winter than Group 1, at a cost of $1.10 more. They outsheared Group 1 by .6 pound in the spring and .5 pound in the fall and went into the breeding flock weighing 3.1 pounds more. Group 3, self fed milo-meal ration, gained 3.8 pounds more than Group 1 and 1.6 pounds more than Group 2 during the winter. Group 3 outsheared Group 1 by .8 pound on 2 shearings and entered the breeding flock weighing 4.5 pounds more.

SUMMARY

All three rations included in the experiment were found to be adequate to sustain growth in 30-pound weaned Angora kids. It should be remembered that Group 1 received .3 pound less daily than Group 2. All rations were pelleted.

TABLE 27. SUPPLEMENTAL FEEDING WEANED KIDS. FEEDING PERIOD: 11/23/65 TO 3/5/66. 102 DAYS

Rations, pelleted	Number head	Average pounds fed per day	Initial weight	Final weight	Total gain	Cost for 102 days,	3/25/66 Fleece weight	7/14/66 Fleece weight	10/66 Breeding weight
			— — — — Pounds — — — —			Dollars	— — — Pounds — — —		
1. Milo + 2,000 IU Vitamin A per pound	20	.6	31.4	39.3	7.9	$1.63	2.9	3.3	51.0
2. Milo-meal limit fed	20	.9	31.3	41.4	10.1	$2.73	3.5	3.8	54.4
3. Milo-meal self-fed	20	1.1	30.9	42.7	11.7	$3.74	3.3	3.7	55.3

Ration 1. Ground milo + 2000 I.U. per pound, pelleted
Rations 2 and 3. Ground milo, 78 percent.
Cottonseed meal, 11 percent
Molasses, 10 percent
Mineral, 1 percent
Vitamin A, 2,000 IU/pound

The Influence of Level of Protein on Performance of Billy Kids Fed in Drylot

J. E. Huston and Maurice Shelton

Poor performance and often ill health of kid goats at or around weaning is a perennial problem to goat producers. This often is attributed to a combination of poor nutrition at this season of the year and parasitism. Work at the McGregor station, along with producer experience, indicates that the protein requirements of goats are higher than with most other species and may be a critical factor in their ability to survive periods of stress. The present trial was conducted in the summer of 1966 with weaning age billy kids to ascertain the desired protein level for this age group.

Three lots of twelve billy kids each were placed in drylot on experimental rations as outlined in Table 28. Data relating to body weight changes are based on a 71-day period while fleece data are based on a 51-day growth period. The results are shown in Table 29. During the test period, a number of the animals became unthrifty from what appeared to be coccidiosis. There appeared to be a distinct relationship between protein level and degree of unthriftiness. In the low protein lot, all except two goats lost weight and most appeared to be suffering from some form of parasitism. Although formulated to be low in protein, this ration should have maintained the animals in a healthy vigorous state in the absence of other complicating factors. Four goats died, although one death occurred the day after the experiment was closed. In the intermediate lot, only two of twelve showed evidence of parasitism, and only one in the high protein lot. A fecal examination was made on all animals appearing to be suffering from parasitism. These showed a relatively low nematode egg count (1,017 EPG), but high counts for coccidial oocysts (35,408 oocysts per gram) and a large number of strongyloides (7,000 EPG). The significance of the latter is not clear since it is not considered that this species does serious damage. Packed red cell volumes were determined on all the kids surviving to the end of the experiment as an index of animals which might be attributed to parasitism. These differed somewhat between the protein levels, but did not show the very low values often associated with extreme parasitism.

A response to the increased protein level was evident in these experiments, not only in fewer death losses, but in body weight gains and increased fleece weight as well. The improvement in performance with the 4 percent increase from 16 to 20 percent was not as great as an increase in an equivalent amount from 12 to 16 percent. These data would indicate that a protein level of up to 20 percent would be desirable with kids of this age. It has been shown with other species that protein level plays a part in resistance to parasite infestation. It seems entirely possible that this may be a part of the explanation for the high protein requirements of goats or conversely their susceptibility to parasitism. It is interesting to note that the low protein group produced about one-half as much mohair as the high protein group while in a negative protein balance. This ability to produce mohair under conditions of undernutrition suggests that poor nutrition is a much greater danger to animals with high genetic potential for mohair production and should be avoided. These observations indicate that the level of nutrition, especially protein, should be further evaluated with animals of different levels of genetic potential for mohair production.

The rations fed in this experiment were formulated to give approximately equal energy but variable protein, and they are not necessarily suggested as developing rations for billy kids.

TABLE 28. EXPERIMENTAL RATIONS FED BILLY KIDS

Ingredients	Ration 1	Ration 2	Ration 3
		Percent	
Alfalfa hay	10	10	10
Sorghum hay	30	30	30
Oats	18	15.5	13.5
Sorghum grain	30	25	20
Cottonseed meal	10	16.8	23
Urea		0.75	1.5
Bone meal	1	1	1
Trace mineralized salt	1	1	1
Calculated crude protein	12	16	20

TABLE 29. PERFORMANCE OF BILLY KIDS ON RATIONS WITH THREE LEVELS OF PROTEIN

	Low	Medium	High
Number of animals initially	12	12	12
Number of animals dying	4[1]	0	0
Average initial weight, pounds	52.2	46.9	50.3
Average final weight, pounds	44.0	50.8	56.1
Average weight change, pounds	− 8.2	+ 3.9	+ 5.8
Average daily feed intake, pounds	1.90	2.55	2.70
Average fleece weight, pounds			
51 days	0.94	1.61	1.82
6-month basis	3.4	5.7	6.5
Red cell volume in percent (PCV)	20.6	24.7	25.8

[1]Includes one animal that died the day after the experiment closed.