RESEARCH BULLETIN 772 JUNE, 1961

UNIVERSITY OF MISSOURI COLLEGE OF AGRICULTURE
AGRICULTURAL EXPERIMENT STATION
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Creep Feeding Studies With Lambs

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(Publication authorized June 6, 1961)

COLUMBIA, MISSOURI

CONTENTS

ACKNOWLEDGMENT

This bulletin is a report on Department of Animal Husbandry Research Project 142, "Methods of Lamb Production."

Aureomycin and Grant-in-Aid funds were furnished by American Cyanamid Company. The Distillers Research Association furnished the dried distiller's corn solubles used in tests.

Mr. Jack Rhoades, University Shepherd, assisted with the experiments.

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INTRODUCTION

A sheep producer in order to reduce expenses and increase efficiency of production needs to produce the maximum weight of lamb per ewe which is consistent with high market grade. A ewe that raises twin lambs reduces the overhead chargeable to each lamb by 50%, but quite often she fails to suckle well enough to provide the nutrients necessary for fast growth and early fattening. As a consequence, twin lambs are too often insufficiently finished to command top prices when early spring lambs are selling at a premium. The lambs must either be held over the summer and fattened in dry lot in the fall or fed grain during the summer. Neither of the alternatives is attractive because the market price usually declines by fall and lambs often do not make economical gains during hot weather. Furthermore, those on pasture face almost sure parasitism. Sheep producers need methods to insure marketing of choice lambs by the middle of June.

A newborn lamb begins life as a monogastric animal. It continues to have a simple digestive system until it starts eating fibrous feeds and rumination is begun. Since farm animals with simple stomachs are extremely efficient in converting feed to gains, it would be theoretically possible for a young lamb to make excellent use of concentrates providing the concentrates are digestible and palatable.

It was postulated that almost any high energy ration consumed by lambs in large quantities would result in improved gains and fattening, particularly by twins. Since most infants have some preference for foods it seemed reasonable to expect lambs to accept some feeds more readily than others. Thus, acceptability of a ration may have an important bearing on feed consumption and gains of suckling lambs.

A series of experiments was conducted with the following objectives:

(a) To determine what kinds of feeds and forms of feeds appeal to suckling lambs.

(b) To test the theory that a palatable feed results in faster, more efficient gains than one which lambs like less.

(c) To determine value of adding antibiotics to a creep ration.

REVIEW OF LITERATURE

Some of the earliest reports of creep feeding tests with lambs were made by Harper, 1930, and King and Harper, 1931. They could show no advantage of

feeding shelled corn to lambs which were suckling heavily milking ewes on excellent pasture.

The same conclusion was reached by Tennessee workers, 1932-1934, Bohstedt and Darlow of Wisconsin (1931), Dyer and Weaver at the Missouri Experiment Station (1940), and others since that time.

A few comparisons of rations have been made, but in most instances the pastures were excellent, thus no advantage could be shown for feeding grain, let alone a mixed ration. However, there is in the literature a suggestion that feed consumption could possibly be improved by formulation of rations for palatability.

Protein supplements have been observed to affect feed consumption. Weber (1930) stated that linseed oilmeal would improve palatability of lamb rations. Leveck of the Mississippi Station (1935) reported that lambs fed only cottonseed oilmeal made faster gains than similar lambs fed a mixture of corn, oats, wheat bran, and cottonseed oilmeal.

Watson and Fenn (1942) reported that if given their choice, lambs preferred corn over barley, and Briggs (1938) observed that a mixture of equal parts of whole oats and cracked barley appeared to be eaten more readily by suckling lambs than whole oats or cracked barley fed alone.

On the other hand, Kentucky researchers (1951) were unable to demonstrate benefits from feeding a mixture composed of six parts ground shelled corn, three parts crushed oats, and one part pea-sized linseed oilmeal, compared with shelled or cracked corn.

Willman (1935) reported that a mixture of cracked corn, whole oats, wheat bran, and linseed cake was more palatable than cracked corn alone. Lambs fed the mixture consumed more feed and gained faster and more efficiently than those on cracked corn, but Garrigus (1951) observed that lambs consumed corn alone more readily than corn plus a milk substitute. Later he compared corn alone versus a commercial sweet feed. Lambs demonstrated their preference for the sweet feed by eating 13 percent more of it.

All the reports cited give information which is incidental to the experiment. Little or no published information is available on tests designed and run solely for the purpose of determining palatability of feed ingredients, mixtures of feeds, and the effect of physical form on acceptability of lamb rations. Published information on the effects of antibiotics in creep rations for lambs also is scarce.

MATERIALS AND METHODS

With the exception of the two experiments with aureomycin in creep rations, lambs used in the tests were purebreds from the college flock. Before lambs were assigned to lots they were placed in outcome groups based on breed, age, whether twins or singles, body weight, and thrift. They were then assigned at random to treatments. Lambs were weighed individually each week. Rations

were offered to lambs in wooden boxes 1.5 feet wide x 2.5 feet long and 6 inches deep. The boxes were placed in troughs and lambs were allowed to eat the feed that appealed to them. Boxes were rotated daily to eliminate positional effect.

Ground yellow corn was included in all acceptability tests; it was used as the standard by which feed consumption was measured. Feed consumption of the ground corn was assigned a value of one and palatability ratings were figured from that base. Once each week all feed was removed from boxes and replaced. During the week fresh feed was added as needed so that boxes were never empty. Excrement and any feed which may have had contact with it was removed and weighed. All experiments were conducted on University farms at Columbia.

Data for rate of gain were analyzed by analysis of variance, according to Snedecor (1950).

RESULTS

Experiment I

The first experiment with palatability was conducted in the spring of 1958. The objective was to observe consumption of various feed ingredients and mixtures of ingredients which could conceivably be used for creep feeding lambs, and to determine whether or not lambs have preferences for certain feeds. Ingredients such as rolled oats, whole oats, corn, and soybean oilmeal which were reputed to be very tasty to lambs were included in the test to determine their relative palatability. This was also the reason for including mixtures which had long been used by successful sheep producers. Another group of feeds, such as cerelose and dried skim milk and mixtures of these ingredients, was included to determine the reaction of lambs to ingredients and mixtures which were similar to the solids in milk.

Twenty-five lambs, weighing approximately 25 pounds apiece, were in the group given access to the feeds in the beginning, but others were added as they became big enough to eat feed. The greatest number of lambs on test at any one time was approximately 50. Lambs were on test for 12 weeks. Rations and individual ingredients are shown in Table 1.

Almost from the first, lambs had a definite preference for soybean oilmeal over any other single ingredient. Since they ate it so readily, to the exclusion of other feeds, it was taken away after a short period.

Contrary to the belief of many sheepmen, the lambs did not appear to care much for oats in any physical form. Nor did they eat rations well in which they were included. The most acceptable ration was #14 which was a pelleted version of ration #9. The fourfold increase in feed eaten when the mixture was pelleted is interesting. This was in line with the frequent observations made with fattening lambs and other species that pelleting improves palatability.

The most promising mixtures fed in meal form appeared to be those consisting of corn, wheat bran, and soybean oilmeal. Since the lambs consumed up to 77 percent more of the mixtures than of corn, the results tend to confirm practices by sheepmen who originally used such combinations.

TABLE 1-COMPOSITION AND PREFERENCE RATINGS OF CREEP RATIONS

Ration Number	1	2	3	4	5	6	7	8
Ground Corn %	100	60	33 1/3		30	20	50	20
Wheat Bran %		30			20			
Soybean Oilmeal %		10	33 1/3	30	20	20	20	20
Crimped Oats %			33 1/3					
Rolled Oats %				30		20	30	20
Whole Oats %					30			
Dried Skim Milk %				30		20		10
Distillers Dried Solubles %						20		20
Cerelose %				10				10
Rating	1	1.77	.26	1.23	.28	1.02	.70	.75

Ration Number	9	10	11	12	13	14[1]	15	16
Ground Corn %	60	60	60			60		75
Wheat Bran %	10	10	10			10	100	
Soybean Oilmeal %	15	30		100		15		25
Crimped Oats %								
Rolled Oats %					100			
Distillers Dried Solubles %	15		30			15		
Cerelose %								
Rating	.57	1.67	.10	1.68	.30	1.99	.57	1.52

1. Ration 14 was pelleted.

This trial indicated that lambs did have a marked preference for certain feeds, and that the physical form of feed may be very important.

Experiment II

Objective of the second creep feeding test, conducted in 1958, was to determine the response of suckling lambs to aureomycin in creep rations.

Fifty-three northwestern ewes and their 83 lambs were used in the test. With the exception of eight lambs, all were sired by Southdown rams. Average lambing date of the lambs was March 14. Ewes had previously been on a wintering test and that was considered in making up outcome groups. Other factors were birth dates and weights of lambs, whether lambs were singles or twins, and weights of lambs at the time they were put on test. Lambs from outcome groups were assigned at random to two lots. Rations were the same for all lambs with the one exception that aureomycin was added to rations of Lot II.

Two similar fields were used for pasture. The groups were rotated between fields each week to rule out differences in forage. A creep was placed in the shed adjacent to the pen where each group of sheep was kept at night and another was put in the pasture near the sunshade. Lights over feed troughs were left on all night.

The experiment was conducted in two phases. During the first 67 days aureomycin was incorporated into the ration at a level of 10 mg per pound of

feed. During the last 42 days the aureomycin level was raised to 40 mg per pound of feed in an effort to determine the effect of higher intakes of the antibiotic. Results are shown in Table 2.

TABLE 2-RESPONSE OF SUCKLING LAMBS TO AUREOMYCIN IN CREEP RATIONS

Phase 1.	Lot I	Lot II
Treatment	Control	Aureomycin
Level of Aureomycin per lb feed	None	10 mg.
Number days on test	67	67
Original number on experiment	41	42
Number on test at end of Phase 1	35[1]	34[1]
Initial weight April 1 (lbs)	14.47	14.34
Weight June 7 (67 days)	53.7	52.8
Average total gain (lbs)	39.23	38.55
Average daily gain (lbs)	.58	.57
Feed consumed daily/lamb (lbs)	.22	.21
Aureomycin consumed/lamb (mg)	.00	2.04
Creep feed per pound gain (lbs)	.43	.40
Phase 2.		
Level of Aureomycin per lb feed	None	40 mg.
Number days on test	42.0	42
Number of lambs	35	34
Average final weight (lbs)	69.83	70.09
Average gain (lbs)	16.06	17.28
Average daily gain (lbs)	.38	.41
Feed consumed daily (lbs)	.78	.75
Aureomycin consumed daily (mg)	0.00	30.0 mg.
Creep feed per pound gain (lb)	2.05	1.82
Average fleece weight per lamb (lb)	2.55	2.59

1. Reasons for removing lambs from tests:
Mothers of 7 lambs expired and 7 lambs died (3 from listerellosis, 2 from poisonous plants and two from accidents.)

All lambs were thrifty and made acceptable gains. Pastures were good in the beginning and ewes apparently were producing an abundant flow of milk. Little or no scouring occurred. Characteristically, lambs ate very little creep ration and thus intake of aureomycin was low. There was no discernible difference in appearance of lambs in the two lots. Gains and feed consumption were almost identical. These are the results often obtained from antibiotics in other species when no stress condition or low level of infection is present.

As the second phase progressed, pastures deteriorated due to dry weather. Gains of lambs declined as the quantity and quality of pasture declined. The lambs increased creep feed consumption and as a consequence consumed more aureomycin. Although gains and feed efficiency were in favor of lambs fed aureomycin, the differences were not significant. Appearance of all lambs was good with no evident difference between groups.

These results suggest again that lambs derive little benefit from antibiotics when they are healthy and under no stress. Lambs fed aureomycin had slightly

heavier fleeces, but differences were not significant. It was interesting to note the increase in creep feed consumption when pastures became sparse. This lends further weight to the argument that creep feeding is at its best when for any reason the milk supply of the ewe is inadequate.

Experiment III

The third experiment had the following objectives:

a. To compare further the palatabilities of mixtures for creep feeding lambs.
b. To determine the effect of physical form of feed on palatability.
c. To compare the effect of two levels of aureomycin in creep rations.

Thirty purebred Hampshire and Shropshire ewes and their 40 lambs were divided into two groups as described previously. The two groups of lambs were given access to the same six rations, which differed only in the amount of aureomycin they contained. The rations fed to Lot I contained 10 mg. aureomycin per pound of feed. Those fed to Lot II contained 30 mg. per pound of feed. Feed was offered to lambs in the manner described for the first palatability test.

The two lots of ewes and lambs occupied similar quarters and grazed similar pastures during the test. Results of the palatability comparisons are shown in Table 3.

TABLE 3-COMPOSITION AND PREFERENCE RATINGS OF CREEP RATIONS BY SUCKLING LAMBS (55 DAYS)

Formula Number	1	2	2P	3	3P	4
Form	Meal	Meal	Pellet	Meal	Pellet	Meal
Ground Yellow Corn %	100	60	60	60	60	60
SBOM 44% C.P.		30	30	10	10	15
Wheat Bran		10	10	30	30	10
Distillers Dried Corn Solubles						15
Palatability Rating[1]	1.00	6.10	7.79	3.36	3.55	3.17

1. Rating = $\frac{\text{Consumption of ration}}{\text{Consumption of ground corn}}$

Lambs ate the most of ration #2, which was composed of 60 percent ground corn, 30 percent soybean oilmeal, and 10 percent bran. Palatability apparently was improved by pelleting the feed in the case of both rations 2 and 3, but the improvement was not as great as that observed in preliminary trials. All the mixtures were more acceptable than ground corn.

Table 4 gives results of the comparison of levels of Aureomycin.

All lambs were healthy and vigorous throughout the test. Adding aureomycin to creep mixtures for suckling lambs gave no apparent advantage. This was in agreement with the first experiment in which healthy, thrifty lambs failed to respond to aureomycin in creep feed.

TABLE 4-EFFECT OF TWO LEVELS OF AUREOMYCIN IN CREEP RATIONS FOR SUCKLING LAMBS

	Lot I	Lot II
Aureomycin level/pound of feed (mg.)	10	30
Number of lambs	20	20
Average birth weight (lbs)	8.72	8.94
Average initial weight (lbs)	16.56	14.98
Average final weight (lbs)	45.85	43.40
Average gain (lbs)	29.29	28.42
Average days on test	55	55
Average daily gain (lbs)	.53	.52
Total creep ration/lamb (lbs)	26.43	26.70
Average feed consumption/lamb daily (lbs)	.48	.48
Creep feed/pound gain (lbs)	.90	.94
Mg. Aureomycin/pound average body weight	.16	.48

Experiment IV

The fourth experiment, which was conducted during the spring of 1959, had the following objectives:

a. To determine the response of creep fed lambs to aureomycin in rations.
b. To determine effect on palatability of adding sweeteners to creep rations.
c. To compare acceptability of mixed rations with that of ground shelled corn.

Sixty late spring lambs out of northwestern ewes and sired by Southdown rams were separated into outcome groups and assigned at random to two lots of 29 and 31 lambs each. Ground shelled corn was again used as the standard for comparing acceptability of rations. The mixture of 60 percent ground corn, 30 percent soybean oilmeal, and 10 percent bran was used along with three variations of it. In each case, 5 percent of the corn was replaced with a different sweetener. The sweeteners were cerelose, cane molasses, and corn syrup. The only difference in treatment of Lots I and II was the addition of antibiotic at the rate of 30 mg. per pound of feed in all mixtures fed to Lot II. No antibiotic was given to Lot I.

Results of the palatability test are shown in Table 5.

TABLE 5-COMPOSITION AND PREFERENCE RATING OF CREEP RATIONS BY SUCKLING LAMBS

Formula Number	1	2	3	4	5
Form	Meal	Meal	Meal	Meal	Meal
Ground Corn %	100	60	55	55	55
SBOM 44% C.P-	---	30	30	30	30
Wheat Bran %	---	10	10	10	10
Cerelose %			5		
Cane Molasses %				5	
Corn Syrup %					5
Preference Rating					
Lot 1	1.0	1.92	2.03	2.42	2.19
Lot 2	1.0	2.82	2.92	2.99	2.97

Ranking of rations in order of preference was the same for both lots of lambs although the lambs in Lot II appeared to prefer the mixed rations somewhat more than those which did not receive aureomycin. There was little difference in consumption of the mixed rations although feed consumption was slightly in favor of the mixtures which contained sweeteners. From these results lambs appear to find sweet feed more acceptable, but the effect of sweetening is very small. Again, as in previous trials, lambs consumed much more of the mixed rations than of the corn.

Results of the aureomycin test are shown in Table 6.

TABLE 6-RESPONSE OF SUCKLING LAMBS TO AUREOMYCIN IN CREEP RATIONS

	Lot I	Lot II
Aureomycin/pound feed (mg.)	0	30
Number of lambs	31	29
Average initial weight (lbs)	20.35	19.79
Average final weight (lbs)	57.16	59.28
Average gain (lbs)	36.81	39.49
Average days on test	76	77
Average daily gain (lbs)	.48	.51
Average creep feed consumption daily per lamb (lbs)	.23	.24
Daily intake of aureomycin (mg.)	None	7.0
Average live grade[1]	5.3	5.7

1. Grades based on USDA standards of 1957 and were assigned numerical value as follows:

Low Choice - 7
High Choice - 6
Medium Good-5

With the exception of one lamb on aureomycin and two in the control lot, all lambs were quite healthy. Pastures were excellent and the ewes were producing a heavy flow of milk. The lambs ate very little feed and consumed only a small amount of aureomycin. Lambs fed aureomycin made slightly faster average gains, but the differences were not statistically significant.

Results of the experiment confirm previous work in which no response was obtained from aureomycin when lambs were thrifty and making good gains. Reaction of lambs to creep feed was typical in that they ate very little of it when ewes were obviously producing an abundant supply of milk.

Experiment V

The fifth experiment was conducted during the spring of 1960. The objective was to study further the effects of pelleting, adding a sweetener, source of protein, and adding alfalfa meal on acceptability of creep rations.

Thirty-nine late spring purebred lambs and their dams were used in the trial. The test was conducted in the same manner as those reported previously. Ewes were grazed on good bluegrass pasture throughout the test. Results are shown in Table 7.

TABLE 7-COMPOSITION[1] AND PREFERENCE RATING OF CREEP RATIONS BY SUCKLING LAMBS (63 DAYS)

Formula Number	1	2	3	4	5	6
Form	Shelled	Pellets	Pellets	Pellets	Pellets	Pellets
Shelled Corn%	100					
Ground Corn %		100	55	60	60	60
Soybean Oilmeal %			30		30	30
Wheat Bran %				10		10
Alfalfa Meal %			10		10	
Linseed Oilmeal %				30		
Corn Syrup %			5			
Crude Protein %	8.7	8.7	20.6	17.5	21.0	20.7
Acceptability Rating[2]	1.00	5.06	9.63	4.94	10.25	8.41

1. Aureomycin was added to all rations except shelled corn at the rate of 20 mg. per pound.

2. Acceptability rating = $\frac{\text{Consumption of ration}}{\text{Consumption of shelled corn}}$

The pelleted mixed rations were again more acceptable than shelled corn. This confirmed results of four previous tests which indicated that lambs had definite preferences for feeds.

In this trial the replacement of bran with alfalfa meal apparently made the formula somewhat more appealing. In a previous trial there was some suggestion that addition of syrup made creep rations more appetizing, but in this trial no preference for syrup was noted. One of the most interesting observations was the apparent increase in palatability due to grinding and pelleting corn. Lambs consumed five times as much of it after it was ground and pelleted. Feed consumption per lamb was 0.26 pound daily. This is in line with previous observations that lambs eat a very small amount of any creep ration when ewes are good milkers and are grazing excellent pastures.

Experiment VI

The sixth in the series of creep feeding tests was conducted during the early spring of 1960.

The four palatability tests gave strong indications that lambs do have decided preferences for certain ingredients, mixtures of ingredients, and form in which the feed is fed; but a preference test leaves unanswered the question of what lambs would do if they had only one feed available. Would they eat it in as large quantities and gain as fast and efficiently as lambs which were fed a ration formulated on the basis of palatability studies? This experiment was conducted to answer the questions.

Thirty-six purebred Hampshire and Corriedale ewes and their 46 early lambs were assigned to outcome groups and divided at random into two lots of 22 and 24 lambs. They were then assigned at random to two treatments. Lot I received shelled yellow corn in a creep and Lot II received a ground mixed pelleted ration composed of 60% ground yellow corn, 30% soybean oilmeal, and 10% wheat bran. Ewes and lambs were kept in similar dry lots from the begin-

ning of the experiment on March 4 to April 9. They were rotated each week between lots to rule out positional effect. They were turned on similar rye pastures April 9, and remained there until May 26. The two groups were alternated in the two pastures weekly to minimize differences in forage.

Initially, 32 ewes and 39 lambs were started on test; at the end of two weeks, four more ewes and seven lambs were added and they remained on the experiment throughout.

Results of the experiment are shown in Table 8.

TABLE 8 - A COMPARISON OF SHELLED CORN AND A GROUND MIXED PELLETED RATION FOR CREEP FEEDING LAMBS

Lot Treatment	I Shelled Corn	II Mixed Ration
Number of Lambs	24	22
Average Initial Weight (lbs)	23.0	23.8
Average final weight (lbs)	64.7	72.9
Average gain (lbs)	41.7	49.1
Average days on test	81.0	80.0
Average Daily gain (lbs)		
All lambs	.510	.614[1]
Singles	.586	.700[2]
Twins	.467	.552[3]
Feed consumption/lamb/day (lbs)	.35	.80
Average final live grade	5.2	6.04[4]

1. Significant at ($P< .05$)
2. Significant at ($P< .025$)
3. Significant at ($P< .01$)
4. Grades were assigned numerical values as follows:
   - Medium choice - 8
   - Low choice - 7
   - High good - 6
   - Medium good - 5
   - Low good - 4

The lambs on the pelleted mixture consumed 228 percent more feed and they gained 20 percent faster. The difference in rate of gain was significant ($P<.05$). Investigators generally have observed that creep feeding is most beneficial to twins. Thus twins on the more palatable ration would be expected to gain faster than twins on a feed of which they ate less. This difference amounted to 19 percent and was highly significant ($P<.01$). Difference in singles was 19 percent in favor of lambs on the pelleted mixed ration which was significant ($P<.025$). It was easy to pick the group fed the more palatable mixture. They had more bloom and appeared thriftier. They graded ⅓ of a grade higher alive than those fed corn.

One very interesting observation, shown in Figure 1, was the great reduction of feed consumption which occurred in both groups of lambs for two weeks following the date they were turned on pasture. The lambs ate some more as

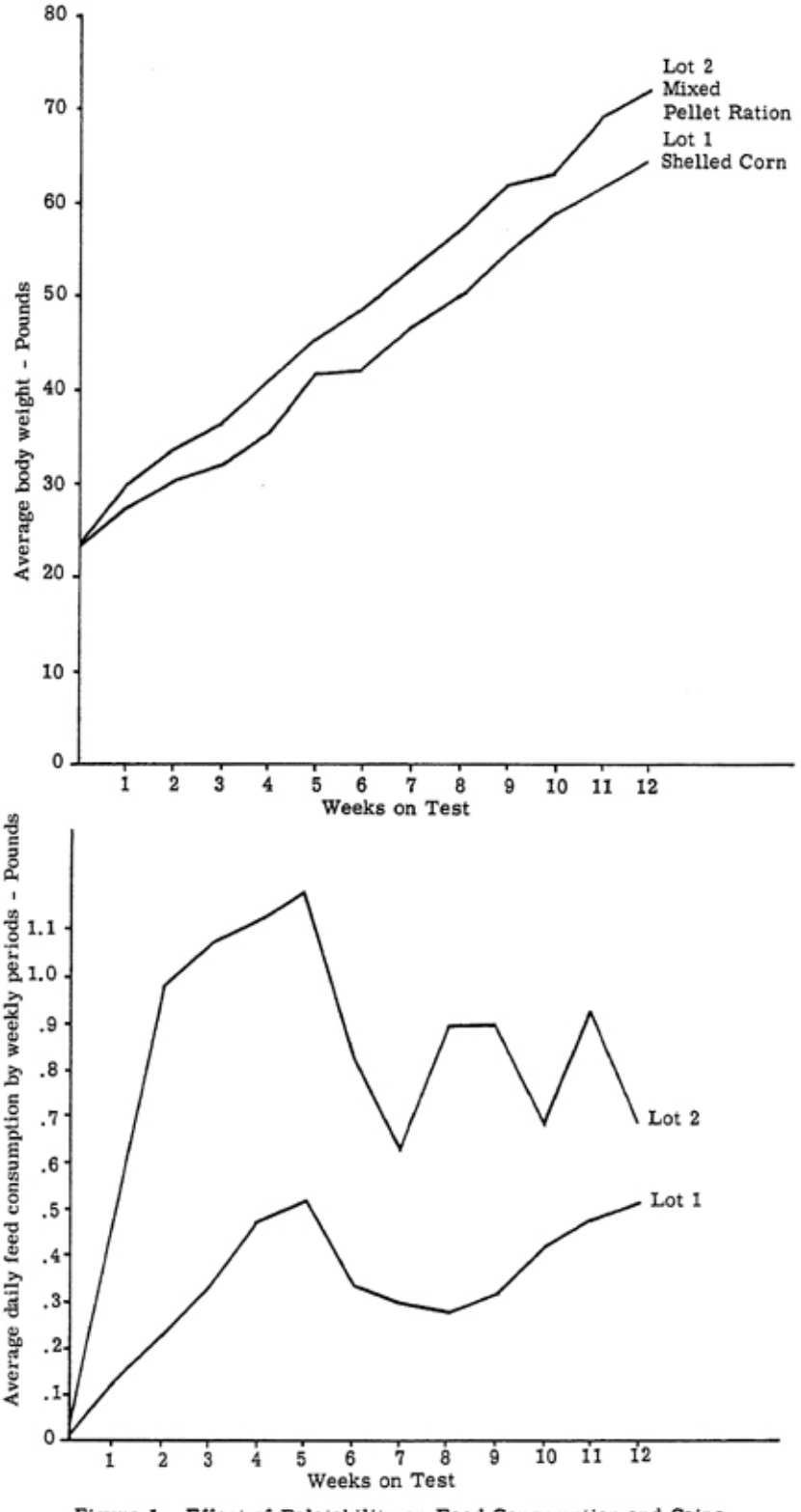

Figure 1. Effect of Palatability on Feed Consumption and Gains of Lambs

the period progressed, but they never again equalled their consumption before they were allowed to graze.

There was no ready explanation for the reduction in feed consumption which occurred during the tenth week, nor was there any apparent reason for the erratic feed consumption of the last two weeks of the test.

Figure 1 also shows that lambs on the pellets soon were heavier and maintained the advantage throughout the experiment.

SUMMARY

Three hundred eighteen lambs were used in six creep feeding experiments designed to study palatability of individual ingredients and mixtures of ingredients and effect of physical form of feed and antibiotics on growth of lambs. In four palatability studies, lambs had a decided preference for certain feeds and a disdain for others. The most acceptable single ingredient tried was soybean oilmeal. A mixture of 60 percent corn, 30 percent soybean oilmeal, and 10 percent bran or alfalfa meal was the most acceptable mixture tried. Pelleting feeds in all cases improved palatability. From the results of these tests, it appeared doubtful if sweeteners enhanced the appeal of creep rations.

In the three experiments with antibiotics lambs were healthy and vigorous and ewes were milking well; no advantage was observed from use of the antibiotics.

In an experiment in which shelled corn was compared with a pelleted mixture composed of 60 percent ground corn, 30 percent soybean oilmeal, and 10 percent bran, lambs ate 228 percent as much of the mixed pelleted ration, gained approximately 19 percent faster, and graded higher alive than those on shelled corn. Placing ewes and lambs on pasture resulted in greatly decreased feed consumption of lambs and they never again ate as well as they did prior to going on pasture.

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