EFFECTS OF BREEDING SEASON, NUTRITIONAL ENVIRONMENT AND LAMBING MANAGEMENT ON LAMB PRODUCTION OF SOUTHWEST RAMBOUILLET EWES

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ABSTRACT

Effects of season, nutritional environment and lambing management were studied on the numbers and weights of lambs produced in fine-wool sheep in southwestern New Mexico over a 2-yr period. One group of ewes was maintained and lambed on arid range (range-range). A second group was maintained on range except during lambing and early lactation (range-pasture). The third group was maintained on irrigated pasture (pasture-pasture). Groups 2 and 3 were lambed together on irrigated pasture or in drylot, depending on the season, and maintained as one group on pasture until the lambs averaged 60 d of age. At about 60 d of age, all lambs were weaned and fed in the drylot as one group. Fall lamb production was much lower ($P<0.001$) than at other seasons of the year. Changing the breeding time for the fall lambing from April to mid May greatly improved lamb production. The primary problems with fall lambing appeared to be a lower percentage of ewes showing estrus and a lower twinning rate. Lamb production based on birth and survival rate and weaning weights of ewes lambing on range was markedly lower to lamb production of range-managed ewes lambing in drylot or on pasture ($P<0.001$). The difference was primarily due to low lamb survival on the range. The causes of loss appear to be predation, deficient mothering ability and exposure. Lambing season had no real effect on wool production, but pasture-managed ewes produced 0.4 kg more grease wool than ewes kept continuously on the range ($P<0.05$). Lamb production can be improved by lambing ewes in drylot or on pasture, by avoiding lambing during coldest months, and by providing shelter from cold and wind the first 3 d of life.

Key words: rangesheep, lambing management, nutrition, breeding season, lamb production

INTRODUCTION

Lamb production on arid Southwest ranges is characteristically low, (70 to 80%; 1). Deficient mothering ability of ewes, including an

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insufficient level of lactation, droughts, inclement weather at lambing time and predators, especially golden eagles and coyotes, have contributed to low lamb production (2). No range flocks have been operated in southwest New Mexico in recent years, apparently due to a history of severe predation. Introduction of the first experimental flock in 1983 of 102 mature ewes resulted in a 60% loss during the first year, mostly to coyote predation (3). However, implementation of a predator control program using guard dogs has made sheep production possible.

Breeding seasons, feeding and lambing management practices under arid Southwest range and pasture conditions need to be examined to determine if lamb production can be improved.

MATERIALS AND METHODS

Rambouillet-type range ewes (mostly 2 to 5 yr of age) were obtained from several sources in New Mexico and Texas. In 1984, ewes were individually identified, randomized by place of origin and age and placed into three management groups. The first group was bred and managed on irrigated tall wheatgrass and bermuda grass pasture, 34 km south of Las Cruces, NM, in Anthony, TX, and lambed in confinement except for March and April, when they lambed in pasture (pasture-pasture group). The second group (range-pasture group) was bred and managed together with the range-range group on the fenced, arid desert Jornada Experimental Range, 32 km north of Las Cruces, and lambed in confinement or in pasture while combined with the pasture-pasture group. The range-range group was bred and managed with the range-pasture group on the Jornada range and lambed alone on the range, with little human intervention except for the identification of dams and lambs and the docking of lambs after they were several days old. Management conditions on the range made the acquisition of accurate lambing data difficult, thus statistical comparisons of lamb production rates among the three groups is limited to the numbers and weights of lambs weaned at 60 d of age and their weights at 120 d of age. However, inasmuch as the range-pasture and the range-range groups were a random sample from a population bred and maintained on range as one group until the start of lambing, it is reasonable to assume that number of lambs born in each group would be similar.

Ewes in each management group were further subdivided at random to four breeding-time groups (I, March 28 to April 30; II, July 16 to August 20; III, August 31 to October 4; IV, November 1 to December 5). All ewes were exposed to semen-tested, whiteface rams (Rambouillet and Rambouillet crossbreds) in multisire breeding groups. The study was repeated in 1985. Breeding response to the April 1984 (Group I) breeding was so poor that it was rescheduled to begin on May 20 in the 1985 breeding program and extended to July 3, making it about 10 d longer than the other groups. The breeding times for the other groups remained essentially the same.

Because the sheep used in our study came from several sources and had been shorn at different times, only a 1-yr wool production record was obtained. Sheep were first shorn in our study on May 9 and 10, 1985,

and on April 23, 24 and 25, 1986. Therefore, the grease fleece weights represent a 350-d period.

To compare the pasture-pasture and range-pasture management groups, a 2x4x2 factorial (year by season by group) analysis of variance was performed on ewe lambing and twinning rates, percentage of ewes lambing, percentage of lambs born alive, average birthweight of lambs per ewe and total birthweight per ewe (4). Comparisons of management groups with respect to weaning percentage, and weight of lamb weaned and weight of lamb at 120d of age were made using 2x4x3 (year by season by group) factorial analysis of variance. In addition, grease fleece weights for the second year were analyzed in a 4x3 (season by group) factorial analysis.

A major limitation of the statistical analysis is attributed to re-randomizing some ewes and to the replacement of some ewes in the second year. Hence, in the analysis of data, correlations between the same ewes in different years could not be evaluated. The above procedure will result in a more conservative test and in approximate P-values, but should only create a problem when P-values are marginal (i.e., near 0.05).

RESULTS AND DISCUSSION

Season (breeding or lambing time) influenced the ($P<0.02$) percentage of ewes that lambed. The fall (September 1985, October to November 1986) lambing season resulted in a lower ($P<0.02$) percentage of ewes lambing (36.1%) than the December to January (74.9%), February (82.3%), and April (76.7%), lambing seasons, which did not differ ($P>0.05$). These results are similar to seasonal effects observed by previous workers (5-9). However, the effect of season on twinning rate of ewes (1.30, 1.53, 1.53 and 1.42, respectively) was not significant in this study. Shelton and Morrow (8) noted a seasonal effect on twinning rate. The primary difference between our two studies may be simply sample size. Management of the pasture-pasture and the range-pasture groups did not effect either the percentage of ewes lambing or the twinning rate. This finding indicates that ewes can be maintained on the range for 9 mo, until they are ready to lamb, with essentially the same production efficiency as ewes maintained continuously on irrigated pasture, provided range ewes lamb and the lambs are then raised under conditions more favorable than those found on the range.

More total lambs (1.10 vs 0.90) and more live lambs (1.07 vs 0.82) were born ($P<0.001$) in 1985 than in 1984 ($P<0.05$). Season also influenced both of these variables. Fall lambing rates differed from the other three seasons, which all had similar lambing rates. A year by season interaction was detected ($P<0.05$) for the percentage of live lambs. The reason for this interaction may be explained by the fact that the 1984 December-January lambing season was marked by stormy and cold weather and some lambs died which were subsequently classified as dead at birth. Although the year by group interaction was not significant, pasture-pasture ewes were anemic at the time of the 1984 December-January lambing season due to heavy stomach worm infestation. Many lambs were born weak and neonatal mortality was much higher in this group than

the other groups (Table 1). The treatment of the pasture-pasture and range-pasture groups showed no effect on either the number of lambs born or the number of live births. Lambs born in 1985 were heavier ($P<0.05$) than lambs born in 1984 (4.4 vs 4.2 kg). Total birth weight also differed ($P<0.05$) among groups. The pasture-pasture group had an average lamb birth weight per ewe of 6.6 vs 5.5 kg for the range-pasture group ($P<0.01$). Since the number of lambs did not differ between groups, differences in average total lamb weight per ewe was due to heavier average birth weight per lamb for pasture-pasture ewes.

Although fewer lambs were born in the fall, average birth weight was higher than at other seasons ($P>0.05$). A report by Shelton (10) suggested that in Texas high temperatures during late gestation can lead to fetal dwarfing and high lamb mortality. Two factors may account for the heavier than expected birth weights in the fall lambing in our study: First, incidence of multiple births was lower in the fall than at other seasons (1.3, 1.5, 1.5 and 1.4). Even though this difference in the rate of lambing was not significant because of the relatively small numbers, the size of the difference was substantial and could certainly contribute to observed differences in birth weight in the fall. Second, cool nights at Anthony, Texas, and in the Jornada Experimental Range (high desert, 1,170 and 1,320 m, respectively) combined to produce heavier lamb birth weights than expected. Lambing season did not affect average total lamb birth weight per ewe lambing during the four seasons.

Year, season and group treatment affected ($P<0.001$) the number of lambs weaned (Table 1). The fall season resulted in an extremely poor lamb weaning percentage (32%) compared with December-January (71%), February (75%) and April (75%). Fall lamb production reported by Shelton and Morrow (8) was also lower than at other seasons. This difference was primarily due to the low percentage of ewes lambing, which is related to a low incidence of estrus, ovulation rate, fertilization rate and to the high embryonic death rate that is characteristic of this time of year (11-13). Perinatal lamb deaths on range due to poor mothering, inclement weather and predators resulted in an extremely low, and economically unacceptable weaning percentage of 25% for the range-range group compared with 79% for the range-pasture group and 85% for the pasture-pasture group. A year by season interaction resulted from postponing the start of breeding until May 20 and extending it 10 d in the 1986 season. A season by group treatment interaction ($P<0.05$) appears to be related to better lamb performance on the range (range-range) during spring (April) lambing than during other seasons when compared with the other treatment groups.

Season and group treatment each affected ($P<0.001$) the weight (kg) of lambs at weaning (Table 2). The year by season interaction was again detected ($P<0.01$). Year, season and group treatment all had significant effects ($P<0.01$, <0.001, and <0.0001, respectively) on the weight of lambs at approximately 120 d of age. The significant year by season interaction ($P<0.01$) was due to the previously discussed management changes. However, a change in response to season of the range-range ewes that was different from the two treatment groups lambing in confinement was also noted. This difference ($P<0.02$) is believed to be due to differences in survival rate among seasons in the range-range group.

Table 1. Effects of Management and Season on Lambing and Survival Rates

Year of study	Breeding season	Lambing season	Management Treatment: Pasture-Pasture Lambing[a] No. of Ewes	Ewes Lambing %	Lambing %	Weaning %	Lamb Mortality %	Range-Pasture Lambing[a] No. of Ewes	Ewes Lambing %	Lambing %	Weaning %	Lamb Mortality %	Range-Range Lambing[a] No. of Ewes	Weaning %	Estimates of[b] Ewes Lambing %	Lambing[a] %	Lamb Mortality %
1984																	
	Apr	Sep	18	11	11	11	0	18	17	28	11	60	18	0	17	28	100
	Jul-Aug	Dec-Jan[c]	18	78	128	67[d]	48[d]	18	72	94	89	6	18	0	72	94	100
	Sep	Feb[c]	18	83	128	94	26	18	67	100	83	17	18	11	67	100	89
	Nov	Apr	18	72	124	112	10	18	83	111	89	20[e]	18	44	83	111	60
1985																	
	May-Jun	Oct-Nov	16	50	69	69	0	18	67	78	67	14	18	39	67	78	50
	Jul-Aug	Dec-Jan[c]	21	76	124	114	8	15	73	113	107	5	14	43	76	112	62
	Sep	Feb[c]	20	85	150	115	23	17	94	124	112	10	15	27	94	124	78
	Nov	Apr	20	80	115	90	22	14	71	93	79	15	19	42	71	93	55

[a]Percent based on ewes exposed and in flock at start of lambing.
[b]Estimate from percent ewes lambing and lambing percent in range-confinement lambing group.
[c]Lambed in confinement and moved to pasture when 2 to 4 wk old.
[d]Pasture-managed ewes were anemic at this time due to a heavy infection with stomach worms. Season was stormy and cold.
[e]In addition three lambs were killed by dogs in this group only. Total mortality was 35%.

Table 2. Effects of Management and Season on Weaning Weights (kg) of Lambs (60 d of age)[a]

		Management Treatment						
		Pasture-Pasture Lambing		Range-Pasture Lambing		Range-Range Lambing		
Year of Study	Lambing Season	No. of Ewes	Weaning Weight[b]	No. of Ewes	Weaning Weight[b]	No. of Ewes	Weaning weight[b]	Weaning wt. means
1984-85								
	Sep	18	1.69	18	1.51	18		1.07
	Dec-Jan[c]	18	14.54	18	21.87	18		12.14
	Feb[c]	18	20.72	18	17.97	18	1.69	13.46
	Apr	18	24.04	18	23.36	18	12.78	20.05
	Treatment $\bar{x}$		15.25	72	16.18	72	3.62	11.68
1985-86								
	Oct-Nov	16	18.40	18	13.53	18	8.16	13.36
	Dec-Jan[c]	21	24.81	15	20.53	14	6.74	17.01
	Feb[c]	20	20.07	17	20.83	15	5.72	15.39
	Apr	20	13.40	14	11.93	19	6.54	10.62
	Treatment $\bar{x}$	77	19.17	64	16.57	66	6.53	14.10
	Study Treatment $\bar{x}$	149	17.21	136	16.38	138	5.08	12.89

[a]Differences: Season, $P<0.01$; treatment, $P<0.001$; year by season, $P<0.01$.
[b]Weight of lambs produced per ewe in flock at start of lambing.
[c]Lambed in confinement and moved to pasture when 2 to 4 wk old.

Mean weaning weightsof lambs at 60d were lighter (5.1 kg; $P<0.0001$) for range-range ewes than for pasture-pasture ewes (17.2 kg) and range-pasture ewes (16.4 kg). This weight difference was due to the lower survival rate and lower rate of gain among range-range group lambs. Total lamb weight at approximately 120 d of age demonstrated this same difference (range-range group weights = 6.7 kg, pasture-pasture group = 23.1 kg, and range-pasture group = 23.4 kg). Effect of season on lamb production was similar to the effect of season on the number of lambs weaned and surviving at scoring time. Production of lambs born in the fall (7.2 kg at weaning and 9.2 kg at scoring) was lower than in the other three seasons (December-January = 14.6, February = 14.4, and April = 15.3 kg at weaning and December-January = 21.6, February = 19.9 and April = 20.3 kg at scoring).

Group treatment, but not season or treatment by season, affected ($P<0.05$) grease fleece weight. Mean grease fleece weights for groups pasture-pasture, range-pasture and range-range were 4.6, 4.4 and 4.2 kg, respectively. The pasture-pasture group had a heavier average grease fleece weight than the range-pasture and range-range groups. Studies by Ferguson (14), Moran (15) and Schinckel (16) show a relationship between nutrition and wool growth. This suggests that the lightest fleece weights range-range group are due to a lower nutritional plane of the ewes maintained continuously on the range.

Arid rangeland of the Southwest can be more efficiently managed for lamb production. One approach would be to simply increase the lamb survival rate by improving the nutrition of ewes by supplementation before, during, and following lambing, and by providing more protection for lambs against predators and inclement weather. However, control over environmental problems on the range can prove very difficult and at times impossible. Results from our study suggest that ewes be lambed in small pastures or drylots with available shelters and that they be checked each morning and evening. Ewes and lambs need to be kept on pasture or drylot until the lambs are early-weaned at 45 to 60 d of age and the ewes returned to the range. This procedure would allow 9 to 10 mo of range use and maximize survival rates of lambs.

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