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THE EFFECTS OF COW NUTRITION, CREEP FEEDING AND WEANING TIME ON WEANING PERFORMANCE OF FALL-BORN CALVES[1,2]

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Summary

Trials in two successive years with a total of 169 Hereford and Hereford-Angus cow-calf pairs evaluated the effects of two levels of winter energy supplementation for lactating cows and creep feeding of fall-born calves. Half of the calves from each winter treatment group were weaned on the April turnout date and allotted to either alfalfa-fescue or alfalfa-orchardgrass irrigated pasture. The remaining calves were moved to native range with their mothers and weaned by August 1 of both years.

Increasing the cows energy intake by the addition of .7 and 1.1 kg rolled barley per head daily resulted in increased ($P<.05$) ADG during the winter of .07 and .06 kg for trials 1 and 2, respectively. However, calves from the low energy cows had increased ($P<.10$) ADG after spring turnout, resulting in no difference between high and low energy treatments by August 1.

Daily creep consumption of 1.3 kg per head increased ($P<.01$) ADG by .15 and .25 kg and increased ($P<.01$) turnout weights by 20.4 and 30.3 kg for trials 1 and 2, respectively. No significant creep x cow energy level interactions were found during the winter treatment period. Creep fed calves maintained a gain advantage through the summer regardless of weaning time, resulting in 16.9 and 40.0 kg heavier ($P<.01$) August weights for trials 1 and 2, respectively.

Early weaning and moving to irrigated pasture decreased ($P<.01$) ADG resulting in calves 28.1 and 54 kg lighter ($P<.01$) than late weaned calves by August for trials 1 and 2, respectively. Calves grazing the alfalfa-fescue pastures gained less ($P<.01$) than those grazing alfalfa-orchardgrass pastures.

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Introduction

The sagebrush-bunchgrass range of eastern Oregon matures early and has a steady decline in nutritive quality thereafter, resulting in decreased milk production and calf gains in late summer and fall (Raleigh 1970). Raleigh *et al.* (1970) and Kartchner *et al.* (1979) have shown that fall versus spring calving produces a larger calf by spring turnout that can more efficiently utilize the early season high quality forage.

The most critical nutritional period for fall-calving cows is during the wintering period. The demands of lactation increase the energy requirements of the cow and, therefore, forage intake is greater than that of dry spring-calving cows. However, it is equally important not to over feed during the wintering period as this decreases the energy efficiency and this excess energy could be better utilized by direct supplementation of the calf. Turner *et al.* (1970) supplemented *ad libitum* meadow hay to supply 85 and 100% of the National Research Council's recommended energy requirements and determined the effects on performance of fall-calving cow-calf pairs. Calf daily gains from mid-December to mid-April and from mid-December to weaning in August were not different ($P>.05$) due to energy levels of the cows. There was also no difference in reproductive performance due to treatment. Foster and Raleigh (1973) have shown that direct supplementation of the calf during the wintering period results in significantly greater calf gains and weaning weights, however, the economics of creep feeding depend on the market value of calves to feed cost relationship. Ward (1970) also concluded that although creep feeding resulted in heavier weaning weights it may not be economically practical especially if the calves are to be held over and sold as yearlings.

Irrigated pastures, when available, should provide a complementary forage source for a fall-calving program (Gomm, 1979). In late summer as forage quality decreases or under conditions of low forage supply, weaned calves can be moved to irrigated pastures of high forage quality. Irrigated pastures produce greater yields than range and the forage is of high quality throughout the summer. Fall-born calves which are 5 to 6 months of age by April could be weaned onto the high quality irrigated pastures when undesirable range conditions are indicated and produce good gains through the summer.

The objectives of these trials were to further evaluate the effects of creep feeding and winter energy requirements of the cow on calf performance through weaning. Early weaning in April and moving to either alfalfa-fescue or alfalfa-orchardgrass irrigated pastures was compared to leaving the calves with the cows on range and weaning in August.

Experimental Procedure

Seventy-eight cow-calf pairs in trial 1 and 91 cow-calf pairs in trial 2 consisting of Hereford and Hereford-Angus breeding were assigned in December by cow age and production index and calf weight and sex to a 2 X 2 factorial experiment. Treatments consisted of two levels of supplemental energy for wintering lactating cows and two levels of creep feed for the calves.

During the 120 day winter study period of trial 1, the cows received either meadow hay (IRN 1-03-181) alone as the low energy treatment or meadow hay supplemented with .7 kg rolled barley (IRN 4-07-939) per head daily as the high energy treatment. Meadow hay was in low supply during trial 2 because of the drought conditions the preceding spring and summer, therefore, frost damaged wheat hay

(IRN 1-05-171) was substituted. Wheat hay is similar to meadow hay for nutritive quality with the exception of lower digestible energy values (NRC, 1971). The daily barley supplements were increased in trial 2 to .7 kg and 1.8 kg for the low and high energy treatments, respectively, to account for the lower energy value of the wheat hay.

Half of the calves from each cow treatment group in both trials had access to creep feed during the December to April wintering period. The pelleted creep ration consisted of 80% alfalfa hay (IRN 1-00-063), 13% rolled barley, 5% molasses (IRN 4-04-696) and 2% salt.

Half of the calves from each previous winter treatment group were weaned in April and moved to irrigated pasture. The remaining calves were moved to native range with the cows and were weaned by August 1.

The early weaned calves were allotted by weight and previous treatment to either alfalfa-fescue (*Medicago sativa L.-Festuca arundinacea* Schreb.) or alfalfa-orchardgrass (*Medicago sativa L.-Dactylis glomerata L.*) irrigated pastures. The calves remained on pasture 117 days in trial 1 and 119 days in trial 2 and were weighed off the study at the same time the calves on range were weaned. The effects of the early weaning pasture treatments, late weaning and previous winter treatments on August calf weights and daily gains were compared.

Least squares analysis of variance for factorial designs and one-way classifications were conducted on the data with differences in treatment means tested by the Student's t test or by using Least Significant Difference as described by Steel and Torrie (1960).

Results and Discussions

The effects of the cow energy treatments on calf turnout weights and average daily gains (ADG) are shown in table 1. The increased energy supplementation of .7 and 1.1 kg per day resulted in increased ($P<.05$) ADG of .07 and .05 kg during the winter study period for trials 1 and 2, respectively. The increased ADG resulted in heavier ($P<.10$) calves by spring turnout for trial 1 but not for trial 2. Although the ADG of calves were significantly increased by the increased energy supplementation, the differences were small. The economics appear to be unfavorable as it took 10.0 and 20.4 kg of barley to produce 1.0 kg of calf gain for trials 1 and 2, respectively. Turner *et al.* (1970) found no advantage to the higher level of energy supplementation in similar trials.

Creep consumption was similar for both trials with calves consuming 1.3 kg per day during the winter study period (table 2). The effects of creep feeding on calf trunout weight and ADG are also shown in table 2. Creep feeding increased ($P<.01$) ADG during both trials resulting in 20.4 and 30.3 kg heavier ($P<.01$) turnout wieghts for trials 1 and 2, respectively. These results agree with those reported by Foster and Raleigh (1973) in trials which were conducted under similar conditions. The direct supplementation of the calf was much more efficient than increasing the energy intake of the cows. Calves required 8.7 kg creep in trial 1 and 5.2 kg creep in trial 2 per kg increased gain. The difference in creep efficiency between trials is again probably related to differences in roughage sources fed to the cows. The lower quality of the wheat hay in trial 2 probably resulted in reduced calf gains due to either a reduction in cow milk production or decreased hay intake by calves. This would result in an increase in efficiency of the creep. No significant (P>.10) creep by cow treatment interactions were found.

A comparison of the alfalfa-fescue and alfalfa-orchardgrass early weaning treatments is shown in table 3. Early weaned calves grazing alfalfa-orchard-grass pastures gained faster (P<.01) than calves grazing alfalfa-fescue pastures for both trials resulting in heavier (P<.01) August calf weights for trial 1 but not trial 2. Calves from the previous low energy cow treatment had increased (P<.05) ADG of .08 and .07 kg over calves from the previous high energy cow treatment on the irrigated pastures for trials 1 and 2, respectively. This resulted in no difference (P>.10) in August calf wieghts due to cow energy treatments.

The effects of previous winter treatments and weaning time on August calf weights and ADG are shown in table 4. Previous cow energy treatments had the same effect on calf gains on range as it did on irrigated pasture. The increased gains by calves from the previous low energy cow treatment resulted in no difference between gains from December to August and August calf weights due to the winter cow treatments.

Calves from the previous non-creep treatments showed similar trends with increased (P<.01) ADG over creep fed calves from turnout to August for trial 1. However, December to August ADG were greater (P<.01) for the creep fed calves in both trials. This resulted in heavier (P<.05) August calf weights for the creep fed calves.

Early weaned calves had lower (P<.01) August weights and December to August ADG compared to calves weaned off range in August for both trials. These results indicate that direct supplementation of fall-born calves during the wintering period is more efficient than supplementation of the cow. Also, weaning the calf off range in late summer results in a heavier calf than early weaning and grazing on irrigated pasture. However, the calf gains on irrigated pasture were satisfactory and irrigated pasture should be considered as a valuable complement to the range forage resources. Irrigated pastures increase the manager's flexibility and decrease the effects of seasonal fluctuations in range forage availability and quality.

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TABLE 1. THE EFFECTS OF COW NUTRITION ON AVERAGE DAILY GAINS AND CALF TURNOUT WEIGHTS

Item	Trial 1			Trial 2		
	Low	High	(SEM)	Low	High	(SEM)
No. calves	38	40		45	46	
Initial wt, kg	51.2	51.5		52.3	51.4	
Turnout wt, kg	136.9^{a}	145.3^{b}	(5.00)	123.5	129.4	(2.9)
ADG, kg	$.71^{c}$	$.78^{d}$	(.02)	$.57^{c}$	$.62^{d}$	(.02)

a,b Means within trials, in the same row with different superscripts differ significantly ($P < .10$).
c,d Means within trials, in the same row with different superscripts differ significantly ($P < .05$).

TABLE 2. THE EFFECTS OF CREEP FEEDING ON AVERAGE DAILY GAINS OF CALF TURNOUT WEIGHTS

Item	Trial 1			Trial 2		
	No creep	Creep	(SEM)	No creep	Creep	(SEM)
No. calves	39	39		47	44	
Initial wt, kg	50.4	52.4		52.2	51.5	
Turnout wt, kg	130.9^{a}	151.3^{b}	(5.00)	111.3^{a}	141.6^{b}	(2.9)
ADG, kg	$.67^{a}$	$.82^{b}$	(.02)	$.47^{a}$	$.47^{b}$	(.02)
Creep intake, kg/day		1.3			1.3	
Kg creep/kg gain		8.7			5.4	

a,b Means within trials, in the same row with different superscripts differ significantly ($P < .01$).

TABLE 3. THE EFFECTS OF EARLY WEANING TREATMENTS ON CALF WEIGHTS AND AVERAGE DAILY GAINS

Item	Trial 1			Trial 2		
	Fescue	Orchard	(SEM)	Fescue	Orchard	(SEM)
No. calves	19	20		20	20	
Days on treatment	117	117		119	119	
Turnout wt, kg	127.1	135.5		128.4	128.6	
August wt, kg	210.0^{a}	238.2^{b}	(5.28)	200.0	208.7	(4.78)
ADG, kg	$.63^{a}$	$.85^{b}$	(.02)	$.59^{a}$	$.66^{b}$	(.016)

a,b Means within trials, in the same row with different superscripts differ significantly ($P < .01$).

TABLE 4. THE EFFECTS OF PREVIOUS TREATMENTS ON AUGUST CALF WEIGHTS AND AVERAGE DAILY GAINS

	Cow treatments		Calf treatments		Weaning time		
Item	Low	High	No Creep	Creep	Early	Late	(SEM)
Trial 1							
Turnout wt, kg	136.9	145.3	130.9[a]	151.3[b]	136.2	145.9	(5.0)
August wt, kg	237.9	237.7	229.4[c]	246.3[d]	223.8[a]	251.9[b]	(5.2)
ADG, kg (118 days)[g]	.85[e]	.79[f]	.84	.81	.74[a]	.90[b]	(.024)
ADG, kg (238 days)[h]	.79	.79	.75[a]	.82[b]	.73	.84	(.016)
Trial 2							
Turnout wt, kg	123.5	129.4	111.3[a]	141.6[b]	130.2	127.6	(2.9)
August wt, kg	230.4	233.0	211.7[a]	251.7[b]	204.7[a]	258.7[b]	(3.2)
ADG, kg (119 days)[g]	.89[c]	.84[d]	.89[a]	.84[b]	.62[a]	1.11[b]	(.014)
ADG, kg (245 days)[h]	.72	.74	.65[a]	.81[b]	.62[a]	.84[b]	(.011)

[a,b]Means within treatment groups in the same row with different superscripts differ significantly (P<.01).

[c,d]Means within treatment groups in the same row with different superscripts differ significantly (P<.05).

[e,f]Means within treatment groups in the same row with different superscripts differ significantly (P<.10).

[g]ADG from turnout to August.

[h]ADG from December to August.