supplemented cows, intermediate between the controls, was closer to that of negative controls.

Weight and condition loss comparisons in this trial indicated a low utilization of the NPN portion of the supplements, consistent with previous results obtained in the same area on similar dry winter range grass. In a previous trial, utilization of urea was greater than an extruded grain-urea product, but utilization of the extruded grain-urea products used in this trial (starea 44 and starea 70) was similar to urea.

Positive control calves gained significantly more than negative control calves. However, gains of calves in NPN-supplemented groups were not significantly different from positive controls, and significantly different from negative controls in only one case (urea). A lack of effect of supplement treatments on calf gain, even though weight loss of cows was affected, has been observed at this station. In short duration trials of this nature cows probably maintain milk production at the expense of body tissues.

Performance of Five-Year-Old Hereford, Hereford X Holstein and Holstein Females as Influenced by Level of Winter Supplementation Under Range Conditions

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Story in Brief

The performance of winter calving, 5-year-old Hereford, Hereford x Holstein and Holstein females under tallgrass range conditions was compared. Two levels of winter supplementation were imposed on groups within each breed at calving and extended through the winter.

As the level of winter supplement increased, winter weight loss decreased for cows in the Hereford x Holstein breed group. This trend was not evident in the Hereford and Holstein breed groups due to the increased lactation interval during the winter in treatments receiving the

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In cooperation with USDA, Agricultural Research Service, Southern Region.

higher supplement levels. Cows in the Holstein treatment groups did not effectively regain winter weight losses during the summer grazing period. Condition scores followed trends similar to winter weight losses and summer gains. Daily milk yields for Hereford, Hereford x Holstein and Holstein females were 14, 21, and 28 lb/day, respectively. Birth weights were 81.5, 84.5 and 102.5 lb., and weaning weights were 604, 658 and 763 lb., respectively. Low rebreeding performance was observed in the High Hereford x Holstein and Holstein groups and also in the Very High Holstein group.

Introduction

Increasing the weaning weight of calves is a principal goal in most commercial cow-calf enterprises. Weaning weight is one of the most important considerations in beef production, but we must not overlook the importance of the efficiency with which increases are attained. In most production situations, selection for increased weaning weight automatically results in selection for increased milk production because of the strong relationship between level of milk production of cows and weaned weight of the calf. The most rapid method of increasing milk production is by infusing genes for high milking ability from dairy animals.

The conversion of milk to calf gain is a rather efficient process within the limits of milk production in the beef cow. Within this range, the conversion is approximately 10 lb. of milk per lb. of gain. Preliminary data indicate that this conversion may not be as efficient at high levels of milk production. Increasing the level of milk production in the beef cow will be accompanied by increased feed requirements of the cow and may decrease the efficiency of beef production. The purpose of this study was to determine the influence of varying levels of winter supplementation on actual milk yield, calf performance and reproductive efficiency of range brood cows differing widely with milk production potential.

Procedure

Groups of Hereford, Hereford x Holstein and Holstein females have been maintained continuously under native tallgrass range conditions at the Fort Reno Livestock Research Station since they were one year old. Since first calving, groups of the Hereford and Hereford x Holstein females have been subjected to two levels of winter supplementation (Moderate and High) while three supplement levels have been fed to the Holsteins (Moderate, High and Very High).

The Moderate level consisted of that amount of winter supplemental feed necessary to allow good rebreeding performance in the Hereford

females. Previous experience at the Ft. Reno Station suggested a winter weight loss (including weight loss at calving) from fall to spring of 15 to 20 percent for mature cows.

The high level of winter supplement was established by the Hereford x Holstein females and consisted of that amount of supplement adequate to maintain a body condition and physiological activity comparable to the Moderate Herefords. Moderate and High levels were fed to groups of Hereford, Hereford x Holstein and Holstein females. An additional group of Holsteins received a Very High level of supplement. This level was calculated to maintain Holstein females in body condition similar to the Moderate Herefords and High Hereford x Holstein. This level was fed only to Holsteins.

The base breed treatment groups were the Moderate Hereford, High Hereford x Holstein and Very High Holstein females. These groups were fed (post calving) 2.6, 5.5 and 7.7 lb/head/day as 2-year-olds, 3.1, 6.3 and 9.2 lb/head/day as 3-year-olds and 2.7, 5.8 and 8.4 lb/head/day as 4-year-olds of a 30 percent crude protein supplement, respectively. As 5-year-olds they were fed 3.44, 5.65 and 7.81 lb/head/day, respectively. Within each nutritional treatment, the quantity of supplement fed each female was adjusted for difference in body size. Supplement intake by treatment and breed is summarized in Table 1.

The females were bred to Angus bulls as yearlings, and to Charolais bulls as 2, 3 and 4-year-olds. Kropp *et al.* (1972, MP-87) summarized their performance as 2-year-olds. Data from females as 3year-olds was reported by Holloway *et al.* (1973, MP-90) and performance as 4-year-olds was summarized by Lusby *et al.* (1974, MP-92). This report is relative to their performance as 5-year-olds. The 4-year-old females were artificially inseminated to one Charolais bull for 60 days and pasture exposed for 30

Table 1. Supplement Intake.

Item	Hereford		Hereford x Holstein		Holstein		
	Moderate	High	Moderate	High	Moderate[1]	High	Very High
Supplement, lb.[2]							
Total, winter[3]	337	577	349	604	--	514	848
Daily, pre-calving	0.64	1.28	0.57	1.26	--	1.15	1.68
Daily, post-calving	3.44	5.49	3.23	5.65	--	5.61	7.81

[1] No moderate Holstein treatment on range this year due to low rebreeding performance of cows the previous year.
[2] Soybean meal (44%), 60.1%; milo, ground, 30.3%; dehydrated alfalfa meal, 5.0%; dicalcium phosphate, 2.9%; Masonex, 13.0%; salt, 0.5%; plus vitamin A added at 10,000 IU/lb. of supplement.
[3] November 26, 1973 to April 16, 1974.

days to Charolais bulls.

Monthly individual cow weights (after 12-hour shrink) were taken from November, 1973 to October, 1974. Cow winter weight losses were calculated from November, 1973 to the lowest weight after calving (late April). Cow condition scores were taken prior to initiation, after termination, and before re-initiation of supplemental feeding. The scale for condition scores was 1 (very thin) to 9 (very fat).

All calves were weighted within 24 hours after birth and remained with their dams on native pasture until weaning; no creep was fed. During lactation, 24 hour milk production was estimated by the calf suckle technique. Milk production estimates were obtained in March, May and July.

Each calf was weaned at 240 ± 7 days of age. Weaning weights were adjusted to 240 days by interpolation or extrapolation. Age corrected weaning weights of heifer calves were adjusted to steer equivalent by multiplying by a factor of 1.05.

There was no Moderate Holstein treatment group this year due to the low rebreeding performance of cows receiving this level of supplement the preceeding year. All cows in this group which calved this year were needed in the drylot phase of the experiment.

Results and Discussion

Birth weights and 240 day sex-corrected weaning weights are presented in Table 2. Calves from Holstein cows were the heaviest at birth, averaging 103 and 102 lb. for High and Very High treatments, respective-

Table 2. Calving and Weaning Data.

	Hereford		Hereford x Holstein		Holstein		
Item	Moderate	High	Moderate	High	Moderate[1]	High	Very High
Number of calves weaned[2]	14	10	14	14	--	7	12
Male	4	6	7	6	--	5	10
Female	10	4	7	8	--	2	2
Calving date	1-18-74	1-4-74	1-5-74	1-9-74	--	1-28-74	1-5-74
Birth weight[3]	81	82	88	81	--	103	102
Adjusted weaning weight, lb.[4]	617	591	654	662	--	746	709

[1] No moderate Holstein treatment on range this year due to low rebreeding performance of cows the previous year.
[2] Calves weaned 240 ± 7 days.
[3] Birth weights not adjusted for calf sex.
[4] Weaning weights corrected for sex by multiplying heifer weaning weights by 1.05.

ly. Moderate and High Hereford x Holsteins averaged 88 and 81 lb., respectively. Moderate and High Herefords gave birth to calves averaging 81 and 82 lb., respectively. Level of winter supplement within each breed had little apparent influence on birth weight.

At weaning, calves from Hereford, Hereford x Holstein and Holstein cows weighed 604, 658 and 763 lb., respectively. Calf performance in previous years has indicated little influence of level of winter supplement of the dam on weaning weight. Apparent differences between weaning weights of calves within Hereford and Holstein breed treatment groups were probably a reflection of differences in birth dates (Table 2) which allowed heavier calves more time on lush summer pasture.

Cow Weight and Condition

The amount of winter weight loss within breed group decreased as the supplement level increased, however, the trend was not as marked as in the previous year. This was particularly evident within the Hereford and Holstein breed groups in which supplement level had little influence upon winter weight loss. The increased weight loss of High Hereford and Very High Holstein females may be attributed to the longer lactation in-

Table 3. Weight, Weight Change and Condition Score Data.

	Hereford		Hereford x Holstein		Holstein		
Item	Moderate	High	Moderate	High	Moderate[1]	High	Very High
No. head	14	13	14	14	—	7	12
Weight, lb.							
Fall, 1973 (pre-calving)	1023	1030	1047	1082	—	1183	1226
Spring, 1974 (mid-lactation)	884	864	838	899	—	983	1000
Fall, 1974 (post-lactation)	1083	1059	1089	1107	—	1172	1207
Weight change, lb.							
Winter	—139	—166	—209	—183	—	—200	—226
Summer	+179	+195	+251	+208	—	+189	+207
Year	+ 40	+ 29	+ 42	+ 25	—	— 11	— 19
Weight change, %							
Winter	— 13.6	— 16.2	— 19.9	— 17.0	—	— 16.9	— 18.4
Summer	+ 20.3	+ 22.6	+ 30.0	+ 23.1	—	+ 19.2	+ 20.7
Condition score[2,3]							
Fall, 1973	7.2	7.3	6.0	5.8	—	4.6	4.7
Spring, 1974	4.9	5.1	2.5	2.9	—	2.0	2.3
Fall, 1974	6.3	6.1	5.8	5.1	—	2.8	3.7

[1] No moderate Holstein treatment on range this year due to low rebreeding performance of cows the previous year.
[2] Condition score: very thin = 1, . . . , very fat = 9.
[3] Condition score based on those cows which weaned calves as 5-year-olds on range.

terval during the supplemental feeding period.

Average monthly cow weights are shown graphically in Figure 1. Weight losses between the first and third months may be largely attributed to calving weight losses. The lowest weights were observed during the second and third months of lactation.

As in previous years, condition scores generally reflected winter weight changes. Pre-calving condition scores did not appear to be influenced by the cows previous treatment. The lower pre-calving condition scores of Holstein breed groups suggests that both supplement levels (High and Very High) were inadequate for high producing females.

Milk Yields

Milk yields for 5-year-old Hereford, Hereford x Holstein and Holstein females are shown in Table 4. Level of winter supplement had no apparent affect on milk yield. Average milk yields for 5-year-old Hereford, Hereford x Holstein and Holstein females were 14, 21, and 28 lb/day, respectively. These groups produced 14, 20 and 27 lb/day as 4-year-olds; 14, 22 and 29 lb/day as 3-year-olds; and 13, 18 and 24 lb/day as 2-year-olds.

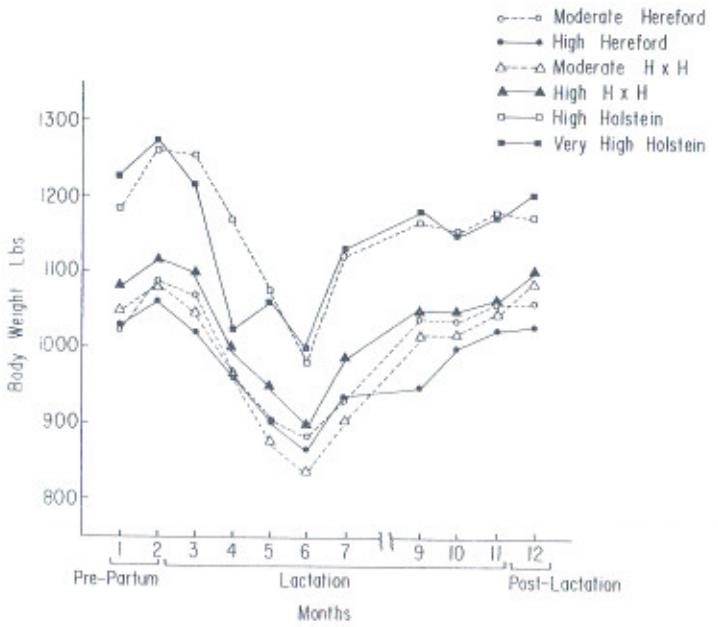

Figure 1. Body Weight Changes of Cows.

Table 4. Milk Production Data.

Item	Hereford		Hereford x Holstein		Holstein		
	Moderate	High	Moderate	High	Moderate[1]	High	Very High
Total lactation yield, lb.	3600	3120	4800	5280	—	6720	6720
Daily yield, lb.	15	13	20	22	—	28	28

[1] No moderate Holstein treatment on range this year due to low rebreeding performance of cows the previous year.

Reproductive Performance

Moderate and High Herefords and Moderate Hereford x Holstein females showed good rebreeding performance (Table 5). High Herefords x Holstein, High and Very High Holstein females did not maintain an adequate level of reproductive performance. Reasons for the low rebreeding performance of High Hereford x Holstein females (78.6 percent conception) are not readily apparent. Poor rebreeding performance among females in the High and Very High Holsteins (42.9 and 75.0 percent, respectively) may be due to the cumulative effects of a sub-optimal plane of nutrition for these high producing animals. Weight change and condition score data (Table 3) for females in these treatment groups indicate that the level of winter supplementation provided has not been adequate to meet their needs. As indicated previously, low rebreeding performance of the Moderate Holstein females resulted in their elimination as a range treatment group this year.

Table 5. Reproductive Performance.

Item	Hereford		Hereford x Holstein		Holstein		
	Moderate	High	Moderate	High	Moderate[1]	High	Very High
No. of females	15	13	16	14	—	7	12
No. of females bred	15	12	16	11	—	3	9
Rebreeding, % Conception	100.0	92.3	100.0	78.6	—	42.9	75.0
Days post-partum to apparent conception[2]	70	83	59	94	—	97	92

[1] No moderate Holstein treatment on range this year due to low rebreeding performance of cows the previous year.
[2] Based on service dates obtained from bulls fitted with chin-ball markers.

Economic Analysis

The economic analysis shown in Table 6 is based on Oklahoma 1974 prices. Different prices may be substituted as appropriate.

Several assumptions were employed in the economic analysis. Cost of native range was estimated at $85.00 per year per female for the Moderate Herefords. Individual roughage intakes were estimated in a drylot trial conducted concurrently and served as a basis for forage consumption of range cows. The percent of forage consumed (TDN basis) by each breed-treatment group in drylot compared to that of Moderate Herefords was multiplied by $85.00 to estimate the land cost of each group. The cost of supplement was estimated at $120.00 per ton.

The calves from the Hereford, Hereford x Holstein and Holstein females had an estimated value of $30.00, $29.00 and $27.00/cwt for steers with a $5.00/cwt discount for heifers. Estimated calf value was calculated by multiplying the adjusted 240-day weaning weight by their respective price/cwt and then calculating a weighted steer-heifer average. A sex distribution of 60 percent steers and 40 percent heifers was assumed for calves produced for sale.

As in previous years, the Holstein females weaned calves with the highest total value. However, adjustment for land and supplement costs removes this advantage. On the basis of return above land and supple-

Table 6. Economic Analysis.

	Hereford		Hereford x Holstein		Holstein		
Item	Moderate	High	Moderate	High	Moderate[1]	High	Very High
Land requirement, %[2]	100	101	117	103	—	141	133
Land cost/female, $	85.00	85.85	99.45	87.55	—	119.85	113.05
Supplement cost/female, $	21.06	36.06	21.81	37.75	—	32.13	53.00
Total land and supplement cost, $	106.06	121.91	121.26	125.30	—	151.98	166.05
Average value of calf, $	169.46	162.32	173.21	175.34	—	182.95	173.88
Return above land and supplement cost, $	63.40	40.41	51.95	50.04	—	30.97	7.83
Return adjusted for conception, $[3]	63.40	37.30	51.95	39.33	—	13.29	5.87

[1] No moderate Holstein treatment on range this year due to low rebreeding performance of cows the previous year.
[2] Expressed as % of Moderate Herefords as determined by forage intake in the drylot trial.
[3] Based on conception rate as 5-year-olds rebred for calving as 6-year-olds.

ment costs, it would appear that cows on the lower supplement levels yield the greatest return, $169.46 and $182.95 for the Hereford and Holstein breed treatment groups, respectively. In the Hereford x Holstein breed group, the higher supplement level showed the greatest return when expressed in this manner.

A more realistic profit picture is provided by adjusting for rebreeding performance. This adjustment was made by multiplying the return above feed cost per calf by percent conception of the cows as 5-year-olds. On this basis, Moderate Hereford females were the most profitable followed by Moderate Hereford x Holsteins, High Hereford x Holsteins and High Herefords. The low rebreeding performance of the High and Very High Holsteins made them uncompetitive. As indicated previously, the low rebreeding performance of Moderate Holsteins as 4-year-olds resulted in their exclusion as a breed treatment group this year.

Feedlot Performance and Carcass Merit of the Third Calves from Hereford, Hereford x Holstein and Holstein Cows

K. S. Lusby, R. D. Wyatt, D. F. Stephens and Robert Totusek

Story in Brief

Eighty-four Charolais crossbred calves from Hereford, Hereford x Holstein (Crossbred) and Holstein dams were fed from weaning (240±7 days of age) until each calf reached an anticipated grade of choice based on apparent fatness.

Holstein progeny were heavier in weight and larger in skeletal size at both weaning (entry to the feedlot) and at slaughter. Crossbred progeny were intermediate. Hereford progeny required the shortest feeding period and gained the most efficiently, followed by Crossbred progeny. Daily gains were the highest for Holstein progeny.

In cooperation with USDA, Agricultural Research Service, Southern Region.