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Abstract

Simmental and Hereford bulls were fed individually three levels of energy per breed for 200 days beginning shortly after weaning. Then all bulls were adjusted to a roughage ration for 10 days, before grazing brome pasture for 38 days as one group. High energy did not decrease semen quality or sex drive. Energy level affected scrotal circumference of the Simmentals but not Herefords. Weight loss on pasture did not decrease semen quality or sex drive.

Keywords

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Effect of Energy Intake on Semen Characteristics, Sex Drive, and Scrotal Circumference of Yearling Beef Bulls

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Summary

Simmental and Hereford bulls were fed individually three levels of energy per breed for 200 days beginning shortly after weaning. Then all bulls were adjusted to a roughage ration for 10 days, before grazing brome pasture for 38 days as one group. High energy did not decrease semen quality or sex drive. Energy level affected scrotal circumference of the Simmentals but not Herefords. Weight loss on pasture did not decrease semen quality or sex drive.

Introduction

Studies at other universities indicate that high energy diets can decrease semen production of two-year-old beef bulls and sex drive of yearlings. Extremely low energy diets beginning at a young age can delay puberty and permanently impair sperm production. The objective of this study was to determine the effects of the normal range of energy usually fed to beef bulls after weaning on semen characteristics, sex drive and scrotal circumference of yearling bulls.

Procedure

Twenty-nine Simmental and 27 Hereford bulls were individually fed three levels of energy per head (Table .1) from an average age of 212 (weaning) to 412 days, ending in May. Then bulls were adjusted to a roughage ration for 10 days and grazed as one group on brome pasture for 38 days, ending in June. The nutritional scheme represents the range of energy normally fed to beef bulls from weaning to approximately 14 months of age, followed by a typical diet for bulls during the breeding season. All diets exceeded NRC protein and mineral requirements. Bulls were allotted to energy levels by herd of origin, sire, age, weight and hip height. At 25-day intervals, weight, height at the hip and scrotal circumference were measured after bulls were held off feed and water overnight. Backfat thickness was measured by ultrasonic scanning at the end of the individual feeding period. To measure sex drive, bulls were subjected to a serving capacity test at the end of the individual feeding period (May) and at the end of the pasture period (June). Four bulls were penned with three restrained, ovariectomized heifers in induced estrus. The number of mounts and services were recorded for 30 minutes. In May and June, semen was collected from all bulls with an artificial vagina and evaluated for volume, concentration, motility, aged acrosomes and percentage normal sperm.

Results were statistically analyzed one breed at a time and no breed comparisons were intended.

Results and Discussion

Initial measurements, May backfat and actual gains are shown in Table 1. The only semen characteristic affected by energy level was an unexplainable depression in semen volume for the Simmentals fed the medium level of energy. The only semen characteristic affected by month of collection was a decrease in motility for Herefords from May to June.

For Simmentals there was no overall effect of energy level on the number of services during the serving capacity tests (Table 4.2), but there was an interaction between month and energy level. The decrease in the number of services between May and June was greater for bulls on the medium and high levels of energy. Mounts per service were not affected by energy level, but were higher in June than May.

For Herefords the number of services increased as energy level increased but mounts per service were not affected (Table 4.2).

Simmentals fed more energy had larger mean scrotal circumferences in May. That advantage was maintained even at the end of the pasture period in June. Thus, small differences in scrotal circumference of bulls under different management may be the result of nutritional variations. Energy level did not affect scrotal circumference of the Hereford bulls.

Correlations with May backfat indicate that none of the energy levels resulted in bulls being too fat for optimum semen quality or sex drive. The Hereford bulls maintained or lost weight while on pasture, but that had no effect on semen characteristics (Table 4.3) or the number of services.

In general, Simmental bulls on the low level of energy gained weight while on pasture and those on medium and high energy levels maintained or lost weight. There was a positive statistical correlation between weight change on pasture and change in semen quality (Table 4.3). But bulls that gained more weight on pasture had lower semen quality at the beginning of the pasture period as indicated by the negative correlations between pasture weight change and May semen quality. Thus, Simmental bulls thin enough to gain weight on pasture from May to June had lower semen quality in May and more improvement in semen quality during the pasture period than Simmental bulls losing weight.

The range in May backfat thickness for the Simmentals was small. In this case, pasture weight change may have been a more accurate indication of body condition than backfat thickness. The correlations between weight change on pasture and semen quality indicate that some of the Simmental bulls were fed too little during the individual feeding period to have high semen quality in May.

High energy levels did not decrease semen quality and sex drive of yearling bulls. Within the range of energy normally fed to beef bulls up to 14 months of age, producers may be more likely to underfeed larger framed breeds like Simmentals, than overfeed British breed bulls like Herefords.

Table 4.1. Energy Intake, Initial Measurements and Actual Gains

	Simmental			Hereford		
	Low	Medium	High	Low	Medium	High
Number of bulls	10	9	10	9	9	9
Daily metabolizable energy intake (Mcal per day) during the individual feeding period						
Day 0-75	13.99	18.12	21.51	12.79	16.32	19.29
Day 76-150	14.47	19.22	24.18	13.38	17.69	23.19
Day 151-200	15.78	20.68	26.80	14.34	18.87	24.91
Day 0-200	14.62	19.17	23.83	13.40	17.47	22.16
Individual feeding period						
Initial age, days	211	212	212	211	208	213
Initial hip ht, in.	44.5	44.1	44.5	41.3	40.9	40.9
Initial wt., lbs	547	534	540	505	505	509
Average daily gain,lbs	1.70	2.49	2.82	1.85	2.29	2.82
May backfat, in.	.11	.13	.18	.24	.28	.41
(range)	(.08-.15)	(.08-.20)	(.10-.22)	(.15-.30)	(.20-.40)	(.22-.60)
Pasture period (May to June)						
Average daily gain,lbs	1.12	-.51	-.75	.13	-.88	-1.56

Table 4.2. Effect of Energy Intake and Month on Sex Drive and Scrotal Circumference

	Simmental				Hereford			
	Low	Medium	High	All Simmental	Low	Medium	High	All Hereford
Number of services[1]								
May	3.4^{ab}	4.0^{a}	3.3^{bc}	3.3^{d}	2.6	3.3	3.8	3.2^{d}
June	3.3^{ab}	1.8^{c}	1.8^{c}	2.3^{e}	1.6	2.3	3.4	2.4^{e}
Mounts per service								
May	7.2	8.7	5.2	7.0^{d}	5.9	4.8	3.3	4.7
June	8.7	15.0	13.8	12.5^{e}	6.7	9.3	4.3	6.8
Scrotal circumference, in.								
May	34.2^{a}	35.4^{b}	35.7^{b}	35.1^{d}	33.1	34.0	33.8	33.6
June	35.0^{a}	36.1^{b}	36.4^{b}	35.8^{e}	33.3	33.6	33.1	33.3

[1]The only interaction between energy level and month was for the number of services for Simmentals (P = .04).

^{a,b,c}Within breed means with different superscripts differ (P<.05).
^{d,e}Means in the same column with different superscripts differ (P<.05.

Table 4.3. Partial Correlations with Weight Change While on Pastre (May to June)[1]

	Simmental			Hereford		
	May	June	Change (May to June)	May	June	Change (May to June)
Semen characteristics						
Volume	-.04	.14	.15	-.15	.04	.14
Concentration	-.20	.06	.18	.02	-.03	-.04
Motility	-.43	.09	.36*	-.07	-.01	.03
Normal sperm	-.46**	.31	.59**	-.02	-.22	-.14

[1]The model included age as an independent variable.
*P<.05; **P<.01.