EFFECT OF SEASON ON THE MAINTENANCE ENERGY REQUIREMENTS OF FEEDLOT STEERS

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Story in Brief

Apparent daily maintenance energy requirements for feedlot steers received in the Oklahoma Panhandle in the spring, summer, fall and winter seasons were 45.2, 49.2, 49.8 and 47.4 kcal/weight,lb$^{.75}$, respectively. Both heat and cold stress appeared to cause an increase in maintenance energy requirements.

(Key Words: Feedlot, Steers, Maintenance Requirements, Climate.)

Introduction

Climate (season, temperature) influences maintenance energy requirements of cattle (NRC, 1981). The maintenance energy requirement most consistently relates to impact from cold (Johnson, 1986). Field studies generally indicate that maintenance energy requirements increase from 1 to 1.5% per effective ambient temperature (EAT) unit below approximately 20°C (Johnson, 1986). The NRC (1976, 1984) estimates the maintenance requirement as: NEm (kcal/day) = 42.6 (mean weight, lb)$^{.75}$. Johnson (1986) reviewed feedlot data from Canada, Colorado, Iowa and Minnesota and suggested the following adjustment for cold temperatures: NEm = [42.6 + .637(20 - °C)]$W_{lb}^{.75}$. The purpose of this study was to look at the effect of climate or season on maintenance energy requirements of feedlot steers fed in western Oklahoma.

Materials and Methods

Weekly dry matter intake (DMI) records were obtained from a large feedlot in western Oklahoma for all pens of cattle marketed between January, 1983, and December, 1985. Excluding dairy steers and beef heifers,

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this represented 2,051 pens of steers. These were primarily steers of British breeding, usually crossbred with a small portion of steers with detectable Brahman breeding (238 pens). Most cattle had been purchased from western Oklahoma and the Texas Panhandle. Most were yearlings when started on feed and were fed for 114 to 165 days. DMI for this three year period are based on a total of 296,367 cattle or a mean of 145 steers per pen.

Data available for each set of cattle included feedlot purchase weight, initial feedlot arrival weight, final weight and number of days on feed. The data was divided into the following four receiving seasons (season that cattle were received in yard) such that each season would have a nearly equal number of days: January 29 through April 30 (92 days), May 1 through July 30 (91 days), July 31 through October 29 (91 days) and October 30 through January 28 (91 days). The number of pens received in each of these seasons were 604 (90,972 hd), 416 (56,543 hd), 585 (84,855 hd) and 445 (63,997 hd). Mean monthly temperatures for this three year period (1983-1985) were obtained from the weather station at Hooker, OK.

Since daily gain was known for each pen, it was possible to calculate the net energy for gain requirements (NEg) for each pen. The amount of daily feed intake used in meeting the NEg requirement was then calculated. By difference, the amount of feed left to meet maintenance requirements was determined. Assuming the net energy gain equations are correct, apparent NEm requirements for each season were then calculated. Apparent NEm requirements ($kcal/W_{lb}^{.75}$) were calculated using both the 1976 and 1984 NRC NEg equations. For steers weighing less than 574 lb the 1976 NRC steer calf equation or the 1984 NRC medium-frame calf equation were used. For steers weighing more than 574 lb, the yearling steer equation of Lofgreen (1977) or the 1984 NRC large-frame yearling equation were used.

Results and Discussion

The effects of season or climate on maintenance energy requirements are shown in Table 1. In all seasons, apparent maintenance energy requirement was greater than the base of 42.6 $kcal/W,lb^{.75}$ suggested by the NRC (1976, 1984). The maintenance requirements for steers fed over the spring, summer, fall and winter months were 45.2, 49.2, 49.8 and 47.4 $kcal/weight,lb^{.75}$, respectively using the NRC (1976) equations. This analysis indicates little effect of season on maintenance energy requirements. Maintenance energy requirements tended to be greatest for steers fed during the summer months and fall months. This data suggests that both cold and heat stress cause maintenance requirements to increase. Differences in apparent maintenance energy requirements between seasons in this Oklahoma feedlot and those suggested by Johnson (1986) could possibly be

Table 1. Effect of season on maintenance energy requirements.

Season received	Average period fed[a]	Initial wt, lb	Avg. temp, °F	Avg. range temp, °F	DMI lb	ADG lb	Apparent NEm[b] 76	std.err.	84	86
Jan 29 - Apr 30	Mar 15 - Aug 3	693	66.2	32.1 - 59.9	20.31	3.17	45.2	.565	47.6	43.3
May 01 - Jul 30	Jun 15 - Nov 4	706	72.0	58.3 - 87.4	20.31	3.04	49.2	.563	50.9	41.2
Jul 31 - Oct 29	Sep 15 - Feb 1	697	45.3	54.3 - 82.9	20.57	2.95	49.8	.564	50.9	50.6
Oct 30 - Jan 28	Dec 15 - May 5	693	42.8	24.0 - 49.8	20.13	2.97	47.4	.567	49.3	51.5

[a]140 days
[b]76: Calculated using NRC (1976) and Lofgreen (1977) NEg equations.
84: Calculated using NRC (1984) NEg equations.
86: Calculated using Johnson (1986) equation which adjust NEm requirement based on temperature.

attributed to hotter summers and moderate winters in Oklahoma as opposed to the data base from which Johnson developed his equation (Canada, Colorado, Iowa and Minnesota).

There are two major ways by which season or climate influences maintenance energy requirements of cattle: first, that due to acclimatization as a consequence of prolonged exposure to a thermal environment, and second, that due to an immediate increase in heat production necessary for maintenance of homeothermy when the animal is exposed to an acute heat or cold stress. Season could also influence maintenance energy requirements by altering animal activity or behavior. However, it is doubtful that animal activity was altered to any degree by season. Hoffman and Self (1973) in an Iowa study reported no difference in time spent eating or lying for feedlot steers fed in summer or winter. However, time spent drinking tended to be greater in summer than winter. Similar effects of season on behavior of feedlot cattle was also noted by Ray and Roubicek (1971).

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