



EXTENSION

BEEF CATTLE RESEARCH UPDATE

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July 2022

Effects of Backgrounding-Phase Rate of Gain on Performance and Carcass Characteristics of Feedlot Steers

Backgrounding calves after weaning and before entry into the feedlot is a common practice in the cattle feeding industry. Backgrounding programs aim to achieve a less-than-maximal growth, ultimately suppressing fat deposition and promoting maturation of lean tissue and bone.¹ Limiting backgrounding growth rate is accomplished by reducing the energy content of the diet through the inclusion of roughages or by limit feeding a high-concentrate diet. Using net energy equations to determine the quantities of feed required to meet a specified growth rate may allow for more precise management of cattle before the finishing phase. South Dakota State University research determined the effect of differing programmed rates of gain during the backgrounding phase on subsequent finishing-phase growth performance and carcass characteristics.²

In this study, 144 steers were randomly assigned to 1 of 3 backgrounding growth rate treatments (8 steers/pen, 6 pen replicates/treatment) from study initiation to 900 lb of body weight (BW). Treatments consisted of 3 different growth rates: 2.00, 2.50, or 3.00 lb/day, which were achieved using prescribed offerings of a common corn silage-based backgrounding diet. Prescribed dry matter (DM) offerings were calculated using net energy equations³ Feed deliveries were programmed to achieve the caloric intake necessary to support the growth rate of each treatment. Cattle were fed twice daily (8:00 am and 3:00 pm) in equal amounts to the nearest 1 lb (as-is basis) at each delivery. Steers were weighed individually in the morning before feed delivery every 21 days, and prescribed feed offerings were adjusted to ensure steers were achieving targeted growth rates. When each treatment reached the target BW of 900 lb at the end of the backgrounding phase, steers were transitioned for 7 days to a finishing diet. From this point on, treatments were managed similarly. The steers were slaughtered by treatment, when the average backfat of the treatment was visually appraised to be 0.55 inches.

The backgrounding, finishing, and cumulative performance of steers grown at varying rates of gain during the backgrounding phase are shown in Table 1. Body weights at the end of the backgrounding phase were close to the targeted BW of 900 lb. By design, backgrounding phase average daily gains (ADG) and dry matter intake (DMI) linearly increased with growth rates ($P < 0.01$), as steers were offered prescribed amounts of DM to achieve the growth rates of each of each treatment. Daily gains for all 3 treatment groups were greater than targeted values (13, 13, and 4% greater for 2.00, 2.50, and 3.00 lb/day groups, respectively). The authors speculated that the 3.00 ADG group may have been nearing ad libitum intake, explaining why the percentage difference from the target was less than that for the other two groups. Gain efficiency (Gain:Feed ratio) also increased linearly with increasing backgrounding-phase growth rates ($P < 0.01$). A greater backgrounding growth rate resulted in a 20% increase in gain efficiency (0.167 vs. 0.139 for 3.00 and 2.00 ADG groups, respectively.) in the backgrounding phase. The backgrounding phase lasted 76, 61, and 54 days for 2.00, 2.50, and 3.00 lb/day groups, respectively.

The finishing phase in this experiment lasted 112 to 113 days among treatments. Final body weight linearly decreased with increasing backgrounding growth rates ($P = 0.02$). Similarly, ADG ($P = 0.02$) and DMI ($P = 0.01$) linearly decreased during the finishing phase with increasing backgrounding growth rates, thus resulting in no difference in finishing phase Gain:Feed ratios ($P \geq 0.16$).

Cumulative ADG linearly increased with greater backgrounding growth rates calculated on a live weight basis ($P = 0.02$). Dry matter intake responded quadratically ($P = 0.03$), as DMI increased from the 2.00 to 2.50 ADG treatment, where it reached a plateau. There was a tendency for a linear increase in Gain:Feed ratio with greater backgrounding growth rates calculated on a live weight

basis ($P = 0.07$). Carcass-adjusted final BW linearly decreased with greater backgrounding growth rates ($P = 0.04$), whereas carcass-adjusted ADG linearly increased ($P = 0.03$). Carcass-adjusted Gain:Feed ratio responded quadratically ($P = 0.05$), where it decreased from 2.00 to 2.50 ADG and increased from 2.50 to 3.00 ADG.

Table 1. Backgrounding, finishing, and cumulative performance of steers grown at varying ADG during the backgrounding phase.¹

Item	Backgrounding ADG Target ²			P-values	
	2.00	2.50	3.00	Linear	Quadratic
Backgrounding					
Initial BW, lb	734	732	734	0.95	0.75
End BW, lb	906	906	902	0.53	0.72
ADG, lb	2.27	2.82	3.13	<0.01	0.05
DM Intake, lb	16.32	18.26	18.79	<0.01	<0.01
Gain:Feed	0.139	0.155	0.167	<0.01	0.39
Days	76	61	54	--	--
Finishing					
Final BW, lb	1385	1365	1349	0.02	0.93
ADG, lb	4.28	4.08	3.97	0.02	0.69
DM Intake, lb	26.55	26.04	25.23	0.01	0.56
Gain:Feed	0.161	0.156	0.157	0.16	0.33
Days	112	113	113	--	--
Cumulative Live Basis					
ADG, lb	3.46	3.64	3.68	0.02	0.43
DM Intake, lb	22.40	23.31	23.15	0.01	0.03
Gain:Feed	0.154	0.156	0.159	0.07	0.68
Days	188	174	167	--	--
Cumulative Carcass-adjusted basis³					
Final BW, lb	1409	1367	1374	0.04	0.09
ADG, lb	3.59	3.64	3.84	0.03	0.37
Gain:Feed	0.161	0.156	0.166	0.14	0.05

¹All BW are shrunk 4%.

²Treatments targeted backgrounding-phase ADG of 2.00, 2.50, or 3.00 lb/day.

³Carcass-adjusted final BW = hot carcass weight divided by 0.625.

Adapted from Blom et al., 2022.

The carcass characteristics of steers grown at varying rates of ADG during the backgrounding phase are presented in Table 2. Restricting backgrounding growth rate linearly increased hot carcass weight ($P = 0.04$). Dressing percent, marbling score, and yield grade all responded quadratically to increasing growth rate. Dressing percent decreased from the 2.00 ADG to 2.50 ADG treatment and then increased again from 2.50 ADG to 3.00 ADG ($P = 0.04$). Marbling score increased from 2.00 to 2.50 ADG and then decreased between 2.50 and 3.00 ADG ($P = 0.05$). Yield grade decreased from 2.00 ADG to 2.50 ADG and then plateaued. ($P = 0.02$).

These researchers concluded that a lower rate of gain during the backgrounding phase can improve finishing-phase performance and increase final BW. However, a greater number of days on feed is required. The compensation of growth during the finishing period offset the lower average daily gain during the backgrounding period such that there was little overall effect on daily gains or gain efficiency. Increases in hot carcass weight were also achieved with lower backgrounding growth rates, although greatest carcass quality may be realized with only modest restrictions in growth rate. These authors also noted that the “optimal rate of gain is likely different for different types and classes of cattle, and the results of this study are likely attributed to the rate of gain relative to mature size, rather than the absolute rates of gain.”

Table 2 Carcass characteristics of steers grown at varying rates of ADG during the backgrounding phase.

Item	Backgrounding ADG Target ¹			P-values	
	2.00	2.50	3.00	Linear	Quadratic
Hot Carcass Weight, lb	882	853	860	0.04	0.08
Dressing Percent	63.7	62.5	63.6	0.91	0.04
Ribeye area, sq in	13.24	13.83	13.72	0.07	0.14
12th-rinb fat, in	0.63	0.58	0.60	0.32	0.22
Marbling score ²	592	642	598	0.83	0.05
Yield Grade	3.55	3.15	3.24	< 0.01	0.02

¹Treatments targeted backgrounding-phase ADG of 2.00, 2.50, or 3.00 lb/day.

²Marbling score: 500 = Small⁰, 600 = Modest⁰.

Adapted from Blom et al., 2022.

¹ Block, H.C., J.J. McKinnon, A.F. Mustafa, D.A. Christensen. 2001. Manipulation of cattle growth to target carcass quality. *J. Anim. Sci.* 79:133-140.

² Blom, E. J., W. W. Gentry, R. H. Pritchard and K. E. Hales. 2022. Effects of backgrounding-phase rate of gain on performance and carcass characteristics of feedlot steers. *Appl. Anim. Sci.* 38: 279-284.

³ NASEM (National Academies of Sciences, Engineering, and Medicine). 1984. *Nutrient Requirements of Beef Cattle*. 6th ed. The National Academies Press.

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