



# A meta-analysis of effects of nutrition and management during the stocker and backgrounding phase on subsequent finishing performance and carcass characteristics

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## ABSTRACT

*The objective of this research was to conduct a meta-analysis of published studies to determine the effect of nutrition and management strategies during the stocker and backgrounding phase on subsequent finishing performance and carcass characteristics. Data sets were compiled to compare 1) the effect of calf-fed versus yearling production systems ( $n = 10$  experiments), 2) level of dietary starch during backgrounding ( $n = 13$  experiments), and 3) regression of subsequent finishing performance and carcass characteristics on stocker-phase ADG and initial finishing BW ( $n = 29$  experiments). Data were analyzed using mixed-model ANOVA or regression (Proc MIXED of SAS), and least squares means or regression coefficients were*

*weighted using the inverse of the SE of the dependent variable. Yearling cattle had greater ( $P \leq 0.01$ ) ADG and DMI but lesser G:F during finishing compared with calf-fed cattle, but there was little effect in carcass characteristics. Level of dietary starch during backgrounding had no effect on subsequent finishing performance or carcass characteristics. When adjusted for differences in initial finishing BW, ADG, and DMI, but not G:F, during finishing had a negative relationship ( $P \leq 0.05$ ) with stocker-phase ADG. Moreover, HCW, LM area, and KPH were positively related ( $P \leq 0.01$ ) with stocker-phase ADG and initial finishing BW, but when adjusted for rib fat thickness and HCW, marbling score had no relationship ( $P > 0.10$ ) with stocker-phase ADG or initial finishing BW. In conclusion, previous management can influence finishing performance, with the greatest factors being production system and stocker-phase ADG, but marbling score was not affected by production*

*system, level of dietary starch during backgrounding, or stocker-phase ADG.*

**Key words:** backgrounding, carcass characteristics, finishing performance, meta-analysis, stocker cattle

## INTRODUCTION

Many production systems exist to grow weaned calves before finishing, and animal scientists have had an interest in understanding the effect of these different production systems on subsequent finishing performance and carcass characteristics. Research has compared calf-fed (CF) and yearling-fed (YF) production systems (Gunter et al., 1996; Griffin et al., 2007), different stocker grazing systems (Hersom et al., 2004; Phillips et al., 2004), levels of starch in backgrounding diets (Sainz et al., 1995; McCurdy et al., 2010), and supplementation strategies (Horn et al., 1995; Shar-

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man et al., 2011) for stocker cattle on subsequent finishing performance and carcass characteristics. However, a single study cannot evaluate all of the possible management strategies used to grow cattle before finishing, which makes it difficult to fully understand the effect of different management strategies and possibly the value of cattle from different management systems to the feedyard.

Additionally, research reports conflicting results. Griffin et al. (2007), Winterholler et al. (2008), and Hudson et al. (2010) reported that YF cattle had lesser G:F during finishing but similar marbling score as CF cattle. Sainz et al. (1995) observed no difference in feed efficiency or marbling score between CF and YF cattle. Vasconcelos et al. (2009) reported no difference in feed efficiency, but CF steers had greater marbling scores compared with YF cattle. Comparing supplementation strategies for stocker cattle, Lake et al. (1974) and Lomas et al. (2009) reported that starch supplementation to grazing stocker cattle before finishing increased marbling scores; however, Horn et al. (1995), Bumpus (2006), and Sharman et al. (2013a) reported no effect of starch supplements on marbling score. Research has suggested that faster rates of gain during the stocker phase negatively affect finishing performance (Drouillard et al., 1991), but Hersom et al. (2004) reported no difference in ADG or G:F during finishing between steers with widely different growth rates during the stocker phase. Given the vast number of management strategies and the conflicting results among research reports, an analysis of published research results could provide meaningful results. Therefore, the objective of this study was to conduct a meta-analysis of published data to evaluate the effect of nutrition and management of weaned calves on subsequent finishing performance and carcass characteristics.

## MATERIALS AND METHODS

A meta-analysis of published research was conducted to evalu-

ate several aspects of nutrition and management during the stocker and backgrounding phase on subsequent finishing performance and carcass characteristics. A literature search was performed to identify published experiments comparing CF and YF production systems, starch content of the backgrounding diet, and rate of gain during the stocker phase. A total of 40 published articles from 1970 to present comprising 50 experiments met the criteria below. References for studies used in the meta-analysis can be found in the Supplemental Literature Cited (<http://dx.doi.org/10.15232/pas.2014-01330>). Article, experiment code, treatment description, number of animals, animal sex, and least squares means and SE for each treatment were recorded in a database. Least squares means and SE of experiment initial BW, stocker-phase ADG, initial finishing BW, final finishing BW, finishing ADG, finishing DMI, finishing G:F, HCW, LM area, 12th-rib fat thickness, KPH, USDA YG, and USDA marbling score were recorded.

### *Calf-Fed Versus Yearling Production Systems*

Twelve of the experiments included a comparison of a CF and YF production system; however, 2 experiments did not report SE of all variables and were excluded from the analysis. Thus 10 articles comprising 10 experiments were used in this analysis (Supplemental Table S1; <http://dx.doi.org/10.15232/pas.2014-01330>). Production systems were categorized as CF when normal-weaned calves were adapted to a high-grain diet shortly after weaning and fed ad libitum until slaughter. No early-weaning treatments were included in this analysis. All other production systems were categorized as YF and included such production systems as grazing on wheat pasture, silage- or hay-based growing diets, limit-fed high-concentrate diets, and wintering on low-quality forages followed by summer grazing. In all experiments, YF cattle were fed a similar finish-

ing diet as the CF cattle. Data were analyzed using a linear mixed model (Proc Mixed of SAS, SAS Institute Inc., Cary, NC) that included production system as a fixed effect and intercept as a random effect with the unstructured option used for the covariance structure for random effects of experiment (Littell et al., 2006). Least squares means were computed using the inverse of the squared SE for the dependent variable as a weighting factor (St-Pierre, 2001). Least squares means were compared using Tukey's W procedure and were considered different at  $P \leq 0.05$ ; tendencies were considered at  $P \leq 0.10$ .

### *Level of Dietary Starch During Backgrounding*

A total of 10 articles comprising 13 experiments compared growing diets that differed in grain content of the diet (i.e., starch content) fed to beef cattle in drylot for 56 to 145 d before finishing (Supplemental Table S2; <http://dx.doi.org/10.15232/pas.2014-01330>). In these experiments, the medium- or high-starch diets were limit-fed to provide similar  $NE_g$  intake and achieve similar rates of gain during the growing phase as the low-starch diet. This removed any confounding effect of energy intake and growth rate. Treatments were categorized as low- (LS), medium- (MS), or high-starch (HS) diets based on grain and  $NE_g$  content of the diets. Grain content,  $NE_g$  concentration, and growing ADG for HS, MS, and LS in each of the sub-data sets are presented in Table 1. Corn was the predominate cereal grain used; however, Sainz et al. (1995) used rolled wheat in the HS diet. Grain content of the diet was calculated from the reported ingredient composition of the experimental diets, where corn or sorghum silage was assumed to contain 50% grain. Nine experiments compared HS versus MS, and 7 experiments compared HS versus LS. Only 2 experiments compared MS versus LS; thus, this comparison was not analyzed. The data set was divided into 2 sub-data sets of either HS versus MS or HS versus LS.

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