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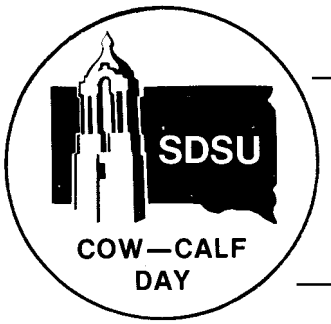

INDIVIDUAL AND MATERNAL HETEROSIS IN ANGUS AND CHAROLAIS RECIPROCAL CROSS COWS AND THREE BREED CROSS CALVES UNDER TWO MANAGEMENT SYSTEMS

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Summary

Records on 115 Angus, Charolais and reciprocal cross cows and their 423 calves raised under drylot and pasture management were used to evaluate individual heterosis for cow weight, height and milk production. Maternal heterosis for their three breed cross calves for preweaning and postweaning traits was also estimated. Individual heterosis estimates for cow weight, height and milk production were significant for cows raised under pasture management but were small and not significant for cows in drylot. Estimates of maternal heterosis were generally not significant in either drylot or pasture management regimes with the exception of postweaning feed efficiency in drylot calves. There was a consistent trend, however, for estimates of maternal heterosis to be larger in pasture calves than drylot calves.

Introduction

Crossbreeding is being utilized as a management tool to increase the efficiency of beef production. Among the benefits of crossbreeding is the expression of both individual and maternal heterosis or hybrid vigor. Magnitudes of heterosis should be estimated so that it can be most efficiently utilized in the traits where heterosis is expressed. The potential for the level of heterosis to depend on management should also be evaluated. The purpose of this research was to compare individual and maternal heterosis in cows raised in drylot with cows raised in pasture management.

Methods

Records from 423 calves born from 1972 to 1976 from 115 cows were used in this study. These calves were part of a project designed to evaluate the effect of cow size and breeding on efficiency of beef production. Four breed groups of cows were utilized, Angus (A), Angus x Charolais (AC), Charolais x Angus (CA) and Charolais (C), where the first named breed in the crossbreds designates breed of sire. Cows from each group were randomly allotted to either a drylot management regime or a pasture management regime. Cows in drylot were individually fed chopped alfalfa hay and alfalfa pellets plus ground ear corn during lactation. Alfalfa pellets were varied so that weight changes of cows in a particular breed and age group in drylot matched weight changes of a similar half-sib group on pasture. This was done to match TDN consumption of both management groups as closely as possible. Calves in drylot were allowed access to creep feed twice daily and overnight during the preweaning phase. This was done in an attempt to compensate for pasture calves having access to grass. Cows in pasture management were pastured on alfalfa-brome, reed canarygrass and sudan grass

as needed from the middle of May to the first of November. Pasture cows were lotted during the winter months and fed a ration of alfalfa hay, oat straw or grass hay and corn silage at levels designed to result in recommended weight changes for the different ages of cows. Calves on pasture were allowed access to creep feed approximately 3 weeks prior to weaning. All cows in both management groups were bred to the same bull in a given year. Polled Hereford bulls were used for the 1972, 1973 and 1974 calf crops, a Salers bull was used for the 1975 calf crop and a Limousin bull was used for the 1976 calf crop.

Birth weights and weaning weights were taken on all calves. Cows were weighed and height at withers taken when their calves were weaned in late October each year. Milk production of the cows was estimated in June, July, August and September at approximately the same time each year. After weaning each year, a total of 72 calves were individually fed out to slaughter with each management group being represented. Calves were fed a 20% roughage starter ration to a predetermined weight (heifers = 625 pounds, steers = 700 pounds) and a 10% roughage finishing ration for a predetermined number of days (heifers = 119 days, steers = 140 days). Calves were weighed 1 day prior to slaughter and carcass data were taken on each calf slaughtered.

Results

Means for cow traits for each breed and management group are given in table 1 along with estimates of heterosis. There was evidence ($P<.05$) of heterosis for cow weight, height, weight-height ratio and milk production in pasture management but not in drylot. Under pasture management crossbred cows weighed 50 pounds more, were .4 inch taller and gave .8 pound more milk per day than straightbred cows.

Means for calf preweaning traits for each breed and management group and maternal heterosis estimates are given in table 2. Heterosis was not significant in either management group for preweaning traits. Magnitudes of heterosis were larger in pasture than drylot, however, and the 11 lb. maternal heterosis for 205-day weight in pasture management is important if we could expect it to be repeated. Heterosis for weaning efficiency was small and unimportant in drylot.

Means for postweaning traits of calves from each breed and management group and maternal heterosis estimates are given in table 3. Maternal heterosis in drylot was significant and unfavorable for postweaning efficiency and TDN of cow and calf per pound of slaughter weight. All other estimates of maternal heterosis were not significant. Estimates of maternal heterosis for slaughter age, slaughter weight, postweaning ADG and retail cut yield were more favorable for pasture than drylot. Heterosis estimates for postweaning TDN and postweaning efficiency were unfavorable for both management groups but to a lesser degree in drylot management.

This research suggests that it might be possible to alter magnitudes of both individual and maternal heterosis through management. However, it appears that reductions in heterosis for traits such as cow weight or calf birth weight would also result in unfavorable changes in heterosis for other traits. The results from the maternal heterosis estimates are inconclusive and more data are needed to substantiate the trends noted. In addition, the entire economic picture must be considered before altering management in an attempt to reduce birth weights or cow weights of crossbred cows and calves.

Table 1. Cow Traits for Each Breed and Management Group

Breed group	Cow weight at weaning (lb)		Cow height at weaning (in.)		Milk production (lb/day)	
	Pasture	Drylot	Pasture	Drylot	Pasture	Drylot
AA	858	964	44	45	12.1	11.9
AC	1041	1012	48	47	13.4	11.9
CA	990	1036	46	47	13.0	10.8
CC	1074	1087	49	48	12.7	10.3
Individual heterosis	50**	-1	.5*	.5	.8*	.2

* Heterosis is significantly different from zero (P<.05).
** Heterosis is significantly different from zero (P<.01).

Table 2. Calf Preweaning Traits for Each Breed and Management Group

Breed group	Birth wt. (lb)		Preweaning ADG (lb/day)		205-day wt. (lb)		Cow and calf TDN/ weaning wt.	
	Pasture	Drylot	Pasture	Drylot	Pasture	Drylot	Pasture	Drylot
AA	73	77	1.69	2.02	422	495	--	10.8
AC	81	79	1.76	2.07	444	504	--	11.0
CA	77	79	1.76	2.05	436	497	--	10.9
CC	81	84	1.72	2.07	436	504	--	11.0
Maternal heterosis	2	-1.5	.06	.02	11	-1	--	.1

Table 3. Calf Postweaning Traits for Each Breed and Management Group

Breed group	Postweaning TDN (lb)		Postweaning ADG (lb/day)		Postweaning TDN/gain	
	P[a]	D[b]	P	D	P	D
AA	2840	2673	2.20	2.05	5.4	5.9
AC	2902	2671	2.29	2.02	5.5	6.0
CA	3045	2752	2.24	1.96	5.7	6.2
CC	2867	2592	2.27	2.05	5.2	5.9
Maternal heterosis	120	79	.03	-.06	.3	.2*

[a,b] P represents pasture, D represents drylot.
* Heterosis is significantly different from zero (P<.05).

Table 4. Calf Slaughter Traits for Each Breed and Management Group

Breed group	Slaughter Age (days)		Slaughter Wt. (lb)		Retail cut yield		Cow and calf[c] TDN/slaughter wt.	Cow and calf[c] TDN/retail cuts
	P[a]	D[b]	P	D	P	D		
AA	451	432	957	955	341	350	8.3	23.0
AC	445	433	983	950	372	359	8.6	22.9
CA	449	436	981	946	374	359	8.6	23.0
CC	451	427	992	948	400	367	8.5	22.6
Maternal heterosis	-4	5	8	-4	2.5	.5	.2[+]	.2

[a,b] P represents pasture, D represents drylot.
[c] Efficiencies measured in drylot only.
[+] Heterosis is significantly different from zero (P<.10).