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1-1-1988

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Germ Plasm Evaluation in Cattle

Larry V. Cundiff, Robert M. Koch, and Keith E. Gregory[1,2]

Introduction

Breed differences in performance characteristics are an important genetic resource for improving efficiency of beef production. Diverse breeds are required to exploit heterosis and complementarity through crossbreeding and to match genetic potential with diverse market requirements and climatic zone-feed resource situations. Genetic variation among breeds can be used to provide an array of beef products that differ widely in fat and caloric content. Diverse feed resources will continue to be used for cow herds among and within different geographical regions of the U.S. Thus, it is important to characterize breeds of cattle representing different biological types for a wide spectrum of bioeconomic traits contributing to beef production. This report presents preliminary results from the first two of five calf crops to be produced in the fourth cycle of the Germ Plasm Evaluation Program (GPE) at MARC.

Procedure

GPE program has been conducted in four cycles. Table 1 shows the mating plan for Cycles I, II, III, and IV. Each cycle has been initiated by mating Hereford and Angus cows by artificial insemination (AI) to sires of diverse breeds. Semen from the same Hereford and Angus bulls has been used throughout to produce a control population of Hereford-Angus reciprocal crosses in each cycle of the program. In addition to the repeated use of semen from control Hereford and Angus bulls, new samples of Hereford, Angus, and Charolais bulls born since 1982 are being added in Cycle IV to evaluate genetic trends within these breeds. New breeds being evaluated in Cycle IV include the Longhorn, Salers, Piemontese, Galloway, Nellore, and Shorthorn. An effort is being made to sample at least 20, and preferably 30, sires to produce about 200 calves per sire breed in five calf crops (1986-1990). Semen from 14 original control Angus, 11 original control Hereford, 16 current Angus, 23 current Hereford (10 horned and 13 polled), 21 Longhorn, 10 Piemontese, 20 Charolais, 24 Salers, 19 Galloway, 18 Nellore, and 21 Shorthorn bulls was used by AI in the 1985 and 1986 breeding seasons to produce the two calf crops included in this report. Following an AI period of about 45 days, two Angus, two Hereford, two Charolais, two Gelbvieh, and two Pinzgauer bulls were used by natural service in single-sire breeding pastures for about 21 days. These breeds are being used in clean-up matings to increase ties to previous cycles and facilitate eventual pooling of results over all four cycles of the program.

Calving occurs in the spring, beginning late March and ending in mid-May. Calves are weighed, tattooed, and tagged for identification. Male calves are castrated within 24 hr of birth. Calves are creep fed whole oats from mid-July until weaning in early October.

Calving difficulty scores are assigned to each calf at birth. The percentage of calves requiring assistance at birth (taken with a calf puller, surgically removed, and abnormal presentation) are presented in this report. Calf survival is the percentage of all calves born that survived until weaning. Birth wt and 200-day weaning wt are also presented in this report.

The data were analyzed by least-squares procedures. The analytical model for calving difficulty, calf survival, and birth wt included effects of breed group (26 sire breed by dam breed groups), sex (steers *vs* heifers), cow age

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[2]The authors would like to acknowledge W. Gordon Hays, Richard B. Jones, Darrell E. Light, and others who have assisted with conducting this research.

Table 1—Sire breeds used in the germ plasm evaluation program[a]

Cycle I (1970-72)	Cycle II (1973-74)	Cycle III (1975-76)	Cycle IV (1986-90)
F_1 crosses from Hereford or Angus dams (Phase 2)			
Hereford	Hereford	Hereford	Hereford
Angus	Angus	Angus	Angus
Jersey	Red Poll	Brahman	Longhorn
S. Devon	Brown Swiss	Sahiwal	Salers
Limousin	Gelbvieh	Pinzgauer	Galloway
Simmental	Maine-Anjou	Tarentaise	Nellore
Charolais	Chianina		Shorthorn
			Piemontese
			Charolais
			Gelbvieh
			Pinzgauer
3-way crosses out of F_1 dams (Phase 3)			
Hereford	Hereford		
Angus	Angus		
Brahman	Brangus		
Devon	Santa Gertrudis		
Holstein			

[a]Hereford and Angus sires, originally sampled in 1969, 1970, and 1971, have been used throughout the program. In Cycle IV, a new sample of Hereford and Angus sires produced after 1982 are being used and compared to the original Hereford and Angus sires.

(3- to 10-yr-old), birth yr (1986, 1987), and breed group x sex interaction. The analytical model for 200-day wt was the same, except that birth date was included as a covariate.

Results

Breed group means averaged over Hereford and Angus dams are shown in Table 2 for calving difficulty, birth wt, calf survival, and 200-day wt. Again, it is emphasized that these results are preliminary, involving only the first two of five calf crops to be produced in Cycle IV. Means for traits such as percentage calving difficulty and percentage calf survival should be regarded as especially preliminary because they have large experimental errors (e.g., one calf affects each breed group mean about 1%).

F_1 progeny by current Hereford and Angus sires were heavier at birth (4.9 lb) and weaning (20 lb) than F_1 progeny by original Hereford and Angus sires, indicating that significant genetic change for growth rate has accrued in these breeds between the late 1960's and the early 1980's. This was expected in view of the selection emphasis that seedstock breeders for both of these breeds have placed on growth rate during this period. It is surprising that, in the first two calf crops of Cycle IV, the increase in birth wt for progeny of current *vs* original sires has not been associated with an increase in calving difficulty. However, the Hereford and Angus cows producing these calves were 3 through 10 yr of age. Calving difficulty is not expected to be a serious problem in cows calving at these ages.

Relative to Hereford-Angus crosses, the results for Charolais, Gelbvieh, and Pinzgauer are consistent with those observed in previous cycles of the program for calving difficulty, birth wt, and 200-day wt. Early indications are that progeny sired by Galloway and Longhorn bulls are lighter at weaning than progeny sired by original or current Hereford and Angus bulls while progeny sired by Nellore and Salers bulls are heavier at weaning than progeny sired by original or current Hereford and Angus bulls. Weaning wt of progeny sired by current Hereford and Angus, Shorthorn, and Piemontese bulls were similar.

Table 2—Breed group means for preweaning traits (1986 and 1987 calf crops)

Breed group	No. calves born	No. calves weaned	Calv. diff., %[a]	Birth wt., lb	Calf surv., %[b]	200-day wt lb	200-day wt ratio[c]
Original HA-x	94	88	3.8	78.7	93.0	438	100.0
Current HA-x	111	101	3.0	83.6	90.4	458	104.6
Charolais	97	86	11.9	87.8	86.7	479	109.4
Gelbvieh	131	123	1.5	86.6	93.5	474	108.2
Pinzgauer	121	115	5.7	88.2	94.9	476	108.7
Shorthorn	83	77	0.0	85.4	92.8	463	105.7
Galloway	84	82	1.3	80.1	97.0	431	98.4
Longhorn	101	91	.9	72.3	90.4	421	96.1
Nellore	92	87	7.2	88.5	94.0	483	110.3
Piemontese	104	100	4.4	84.1	95.6	455	103.9
Salers	90	82	1.0	83.6	91.6	467	106.6

[a]Percentage requiring assistance.
[b]Percentage of calves born that survived to weaning.
[c]Ratio expressed in percentage units relative to the mean for Hereford-Angus F_1 crosses.