

TERMINAL SIRE PROGRAMS USING BEEF-DAIRY CROSSBRED CATTLE (1)

Programme terminal pour les taureaux reproducteurs croisés pour
la production de viande et du lait

Terminale Programme für viehzuchten von gekreuzten Rind
für Fleisch- und Milchleistung

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The economic value of crossbreeding in beef cattle has been reviewed and substantiated. However, most of the crossbreeding research has involved breeds specialized and accepted for beef production. The most important economic character improved by crossing of beef breeds is fertility. It has been concluded that reproductive efficiency is of low heritability, affected positively by heterosis, and is primarily dependent on management regime (particularly post-calving energy level). Within the last few years, beef producers of the United States have become interested in increasing milk production, in order to obtain heavier calf weaning weights. The purpose of this research was to determine the production level and response to various environmental influences of beef-dairy crossbred cows used in a terminal sire crossing program. The characters measured in this study include reproductive efficiency, pre-weaning calf growth rate, post-weaning weight gain and carcass desirability, and other characters reflecting total production.

METHODS AND MATERIALS

Data were collected on 1032 progeny of Angus-Holstein F_1 females randomly mated to Angus or Polled Hereford bulls. The calvings occurred over a 10-yr. period. The herd, owned and maintained by the State Correctional Institution at Rockview, Bellefonte, Pennsylvania, originated from the institution's dairy herd.

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Lower-producing Holstein cows and one-half of the first-calf heifers were bred to Angus bulls. The F_1 heifers were incorporated into the beef herd. The heifers first calved at 23.0 to 28.5 months. The only culling criteria imposed on the herd was for sterility and calving interval. The heifers and cows were fed a ration consisting of grass-legume hay, and pea (*Pisum sativa*) and corn (*Zea mays saccharata*) cannery waste silages according to NRC (1964) recommendations during confinement from approximately November 15 to May 1. During re-breeding in confinement, feed offered was increased approximately 20% compared with NRC recommendations. After the start of the breeding season, females of all ages were maintained together. Rotational grazing of nitrogen-fertilized pastures of primarily Kentucky bluegrass (*Poa pratensis*) and Peenlate orchrdgrass (*Dactylis glomerata*) began on approximately May 1.

At approximately 4 months of age, the bull calves were castrated. Creep feeding was initiated at an average age of 8 months. The 205-day weights were taken from monthly weighing closest to the respective ages. The 305-day weights were taken when the calves were 298 to 312 days of age and adjusted to a 305-day basis. After weaning, steers and heifers were group-fed an *ad libitum* ration of 85% corn (*Zea mays*) and 15% oats (*Avena sativa*). In addition, 0.45 Kg of soybean meal and 2.3 Kg. long hay were fer per head daily. Steers and heifers were slaughtered at individual unshrunk weights of 467 and 415 Kg, respectively.

The cattle were fasted for 24 hours prior to slaughter. Carcasses were chilled at 0°C for 48 hr. Subjective estimates of quality indicators (marbling and carcass grade) were obtained. *Longissimus* area and fat thickness were taken on both sides (SCHOONOVER *et al.*, 1967). Percent cutability (MURPHY *et al.*, 1960) was obtained. WARNER-BRATZLER (W-B) shear value recorded was the average of four 2.54 cm cores from the 12th rib section and deep-fat fried at 150°C for 3 min. An eight-member trained taste panel was employed to hedonically evaluate cooked samples from a 12th rib section for tenderness, flavor and juiciness (BERRY and ZIEGLER, 1969).

Most of the statistical analyses were nested within years with sire and sex as main classes and slaughter weight as a continuous independent variable.

RESULTS AND DISCUSSION

General means

Means for certain performance and carcass characters are presented in Table 1.

Average 205- and 305-day weights of the calves are quite desirable, particularly considering that the 205-day weights were obtained before the calves had access to grain. The 305-day (weaning) weights were obtained after approx. 1.5 months of *ad libitum* grain offering to the calves. The desirable weights of the calves are primarily attributable to increased milk production of the beef-dairy crossbred cow, as discussed in more detail later. The weaning weights were obtained on essentially an all forage program. Slaughter age, *longissimus* area, fat thickness and cutability were also desirable compared to production means reported with other breeding programs.

Milk production: DEUTSCHER and WHITEMAN (1971) observed 43% more milk from first-calf Angus-Holstein F_1 vs. Angus heifers. WILSON *et al.* (1969, 1970)

TABLE 1
 MEANS OF GROWTH AND CARCASS CHARACTERS
 (N = 1032)

Item	Mean
205-day wt., Kg	235
305-day wt., Kg	309
Slaughter age, days ^a	426
Carcass grade	Choice
<i>Longissimus</i> area, cm ²	72.9
Fat thickness, cm	1.37
Cutability, % ^b	49.8

^a Slaughter was on individual filled weight endpoints of 467 and 415 Kg for steers and heifers, respectively.

^b Cutability is the estimate of closely trimmed, boneless retail cuts from the chuck, rib, loin and round (MURPHY *et al.*, 1960).

estimated 240-day milk production of mature Angus-Holstein cows to be approx. 75 % more than from Hereford or Angus straight or crossbred mature cows. JOANDET and CARTWRIGHT (1969) concluded that Hereford and Hereford-Brahman cows provided inadequate milk for calf growth through the second and fourth months of lactation, respectively.

Reproductive performance: Previous studies with straight and crossbred beef cows (i.e., WILTBANK *et al.*, 1965) concluded that post-partum energy intake has an important effect on reproductive efficiency. An antagonism does exist between level of milk production and fertility, because of the effective competition for feed energy to maintain milk flow. To compensate for this competition for feed energy approximately 20 % additional feed was offered from approximately 20 through 75 days postpartum.

Three cases of ketosis have occurred, which can be attributed to insufficient amounts of readily available energy at calving. Reproductive efficiency, measured as percent of cows exposed to breeding that wean calves, has averaged 89 %, with 93 % of the cows bred. Conversely, DEUTSCHER and WHITEMAN (1971) obtained pregnancy percents of 63 and 13 % for Angus and Angus-Holstein heifers exposed for breeding for second calves under range conditions. WILSON *et al.* (1969) also observed significantly decreased calving percents when mature Angus-Holstein cows were fed 85 or 100 % compared to 115 % NRC recommendations.

Calf healt: Nutritional scours *per se* have not been a significant cause of calf deaths. However, *E. coli* infections have occurred during three wintering periods when the cows were maintained in confinement (GLANTZ *et al.*, 1972).

Udder healt: Important frequencies of bacterial mastitis have not been observed. WILSON *et al.* (1971) concluded after sampling 44 *F₁* cows for a 205-day lactation that chronic mastitis did not depress production of any cows included in the study. In similar trials, udder quarter losses and indicators of chronic mastitis have been greater in straight-bred Angus, Hereford and Shorthorn herds. One management practice practice that decreases udder problems is the elimination of hand-milking early in lactation when the calves cannot consume the available milk.

Production of cows of different ages: There was a lesser difference between weaning weights of calves from heifers in their first or second lactations than straight or crosses among beef breeds (BAIR *et al.*, 1972). However, further data suggest that calf weights and fertility level decrease more rapidly after crossbred dams reach 11 years of age compared to decreases observed in straight or crosses among beef breeds. Therefore, although beef-dairy females approach maximum production earlier in life, production also decreases earlier in life.

Post-weaning performance: It should be indicated that the calves from the Angus-Holstein cows are relatively fat when weaned at 305 days. These cattle were fed a high-concentrate ration from approx. 2 months pre-weaning until slaughter. Desirability and efficiency of post-weaning performance of calves resulting from this crossing program have not been evaluated under high-forage rations. However, with high-forage post-weaning rations, energy level would be reduced compared to post-weaning levels observed in this study.

Since this is a terminal sire program, all steers and heifers are slaughtered. Based on previous reports, the use of resulting 3/4 beef-1/4 dairy heifers may not be advantageous because of the fatness of the heifers at weaning, which may reduce subsequent milk flow, and possibly fertility and longevity of sustained production.

Carcass characters: The measures of carcass leanness (Table 1), indicate that the beef-dairy terminal sire program resulted in carcasses with relatively small amounts of excess fat. Lean acceptability was evaluated objectively (W-B shear) and subjectively (taste panel. ZIEGLER *et al.* (1971) concluded that these cattle were mature at about 14 months of age, with only 1.37 cm of fat covering and sufficient marbling to be graded U. S. Choice; the carcasses were highly acceptable by both current market and taste panel standards.

SUMMARY

Data were obtained from an Angus-Holstein F_1 cow herd, bred to Angus and Polled Hereford bulls over a 10-year period. Individual and herd average performance has been desirable for most economically important characters. Results indicate that reproductive performance of beef-dairy crossbred cows may be drastically reduced with inadequate energy intake during the rebreeding season. Feed for the cows was composed entirely of forage, with grain used only for the progeny. Nutritional scours and mastitis have not been a serious problem. The relation of dam age and weaning weight differs from previous studies with straight or crossbred beef cows in that maximum production is approached at an earlier age, and production appears to decrease markedly at approx. 11 years of age. Mean slaughter age of steers and heifers (467 and 415 Kg, respectively) was 426 days. Retail cut yield, amount of excess fat and lean quality were acceptable based on current U. S. standards.

RESUME

Au long de dix années on a recueilli des données sur l'accouplement d'un troupeau de vaches provenant de la F_1 du croisement Angus-Holstein, avec des taureaux Angus et Polled Hereford. Les rendements individuels et de l'ensemble du troupeau ont été satisfaisants dans la plupart des caractéristiques économiquement plus importantes. Les résultats obtenus indiquent que le rendement reproductif des vaches provenant du croisement de races laitières et de boucherie peut être fortement réduit si l'on diminue l'ingestion d'énergie pendant les époques du deuxième et suivants accouplements. On nourrit les vaches uniquement avec des fourrages, tandis que le grain fut réservé pour les veaux. Les diarrhées et mastites n'ont pas posé un grand problème. Le rapport entre l'âge de la mère et le poids au sevrage est différent à d'autres obtenus de préalables études avec des races de boucherie purs ou croisées, dans lesquelles on obtient la plus grande production étant les animaux plus jeunes, et dont la production tend à diminuer nettement à l'âge d'onze ans. L'âge moyenne d'abattage des veaux ment au découpage, la quantité d'excédent de graisse et la qualité de la viande castrés et des génisses (467 et 415 Kg respectivement) fut de 426 jours. Le rendement furent acceptables, selon les critères actuels des Etats Unis.

ZUSAMMENFASSUNG

Die Unterlagen für diese Untersuchungen stammen von einer Angus-Holstein F_1 Kühherde, eine Untersuchung, die über eine Zeitspanne von 10 Jahren mit Angus und ausgewählten Hereford Bullen durchgeführt wurde. Individuelle und Herdendurchschnittsleistung waren für die wirtschaftlich wichtigsten Merkmale erwünscht. Die Resultate ergeben, dass reproduktive Leistung der Fleisch/Milch Mischrasse durch ungenügende Energieeinnahme während der Wiederzeugungszeit drastisch reduziert wird. Das Futter für die Kühe bestand vollkommen aus Forage. Getreide wurde nur für die Jungen benutzt. Ernährungsbedingtes Scheuern oder Mastitis waren kein ernstes Problem. Die Beziehung zwischen dem Alter des Muttertieres und dem Entwöhnungsgewicht weicht von früheren Forschungsergebnissen mit rein oder mischgezeugten Kühen ab indem maximale Produktion in einem früheren Alter erreicht wird. Die Produktionsfähigkeit scheint im Alter von 11 Jahren merklich zu schwinden. Das durchschnittliche Schlachalter für Ochsen und junge Kühe (467 und 415 Kg respektive) war 426 Tage. Einzelhandelsertrag, Betrag des überschüssigen Fettes und Magerqualität waren akzeptabel, basiert auf dem derzeitigen Durchschnitt der jetzigen U.S. Richtmasse.

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