

SUMMARY REPORTS ON OTHER PROJECTS

Cow-Calf

Problems Associated with Induced Superovulation and Superfetation in Beef Cows

E. J. Turman, Monte R. Johnson and D. F. Stephens

Previous research has demonstrated that the incidence of multiple births in beef cattle can be greatly increased by injections of the gonadotropic hormone preparation, pregnant mare serum (PMS). The treatments imposed on cows calving in 1971 were designed to study the effectiveness of PMS injections that are timed from a synchronized estrus rather than from a naturally occurring estrus. If feasible, this would greatly reduce the labor requirements by eliminating the need for daily heat checks and PMS injections on an individual cow basis.

Estrus was synchronized in a total of 51 cows by feeding an oral progestogen (CAP, Eli Lilly Co.) for 18 days. Most cows were in estrus on day-2, 3 or 4 following the last feeding of CAP. Day-3 was designated as the average day of estrus and PMS injections were timed from this date, being administered to all cows on the 5th and 17th day following the average day of estrus. A group of 15 control cows were not synchronized and also received their PMS injections on day-5 and 17 following the naturally occurring estrus in each individual cow.

Fewer synchronized cows conceived at the first post-PMS estrus when superovulation would be expected to occur as a result of PMS injections. Thus, multiple births would be expected only to conceptions at this estrus, and in our research to date this has held true with no exceptions. The numbers of cows conceiving at the first post-PMS estrus were: controls, 9 or 60 percent, and synchronized, 10 or 19.6 percent. However, the multiple birth response of the synchronized group was good, with 8 of the 10 cows producing multiple births, compared to 4 of the 9 control cows. The total multiple births obtained in 1971 from both groups of

cows were 7 sets of twins, 4 sets of triplets and 1 set of quadruplets.

The results obtained in the control group of cows is comparable to that observed in previous years in cows treated similarly. The multiple birth response of synchronized cows is encouraging. It's use could do much to make PMS treatments more practical. However, additional research is needed to attempt to improve conception rates.

Publications

The following articles have been published from this project during the past year.

- Johnson, Monte R. 1971. Induction of multiple births in beef cows by injection of pregnant mare serum (PMS) and human chorionic gonadotropin (HCG). MS Thesis, Oklahoma State University.
- Laster, D. B., E. J. Turman, D. F. Stephens and R. E. Renbarger. 1971. Ovulation rates of beef cows and heifers treated with equine gonadotropin (PMS) and chorionic gonadotropin (HCG). *J. Animal Sci.* 33:443.
- Laster, D. B., E. J. Turman, D. F. Stephens and Renbarger, 1971. Superovulation of beef cows and heifers by injection of pregnant mare serum (PMS) following estrus synchronization by means of an oral progestogen. *Okla. Agr. Exp. Sta. Misc. Publ.* MP-85:24.
- Laster, D. B., E. J. Turman, B. H. Johnson, D. F. Stephens and R. E. Renbarger. 1971. Effect of sex ratio in utero on degree of transformation and chimaerism in neo-natal bovine freemartins. *J. Reprod. Fertil.* 24:361.
- Turman, E. J., D. B. Laster, R. E. Renbarger and D. F. Stephens. 1971. Multiple births in beef cows treated with equine gonadotropin (PMS) and chorionic gonadotropin (HCG). *J. Animal Sci.* 32:962.
- Turman, E. J. 1971. Superovulation and multiple births. *Charolais, Banner* (November, 1971) 7:137.
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Selection for Increased Weaning Weight and Yearling Weight in Beef Cattle

R. R. Frahm

The beef cattle selection study being conducted at the Fort Reno Livestock Research Station involves both purebred Angus and Hereford cattle. The objective of this study is to determine the direct and correlated genetic responses to selection based on weaning weight and yearling weight, respectively. The experimental design for this study is presented in Okla. Agr. Exp. Sta. Misc. Pub. 85:150. Of particular interest in this study will be the magnitude of the genetic correlation between weaning weight and yearling weight since it will largely determine the extent to which weaning weight performance data can be utilized as an indicator of genetic potential for rapid growth over the entire growth curve.

Several more years of data will be required before critical evaluation of selection responses can be made in this study. Comparisons can, however, be made that will provide some indication of the genetic changes that are perhaps occurring in the selection lines. Since the study was initiated in 1964, the level of performance for both weaning weight and yearling weight in lines being selected on the basis of weaning weight has been very similar to that in lines being selected on the basis of yearling weight. While this information does not indicate the amount of change in performance due to selection, it does suggest that the genetic changes resulting from selection based on weaning weight and yearling weight have been similar thus far in the study.

Comparing performances of approximately the top 20 percent of the bulls produced in the selection lines (one Hereford and one Angus line selected on weaning weight and one Hereford and one Angus line selected on yearling weight) provides some indication of the genetic relationship between weaning weight and yearling weight. During the past 4 years the top bulls in the two weaning weight lines had an average weaning weight ratio of 1.12 whereas their average yearling weight ratio was 1.08. Of these 32 top bulls based on weaning weight only 6 were below average on yearling weight. The top 32 bulls in the two yearling weight lines had an average yearling weight ratio of 1.12 whereas their average weaning ratio was 1.10. Of these top 32 bulls based on yearling weight only two were below average based on weaning weight.

These comparisons indicate that the top bulls in the four selection lines tended to be above average for both weaning weight and yearling weight, and regardless of which trait selections were based on the use of these selected bulls would be expected to result in genetic improvement for both traits.

Publications

- Cardellino, Ricardo and R. R. Frahm. 1971. Evaluation of two types of age of dam correction factors for weaning weight in beef cattle. *J. Anim. Sci.* 32:1078.
- Deutscher, G. H. and J. V. Whiteman. 1971. Productivity as two-year-olds of Angus-Holstein crossbreds compared to Angus heifers under range conditions. *J. Anim. Sci.* 33:337.
- Frahm, R. R., L. E. Walters and C. R. McLellan, Jr. 1971. Evaluation of K^{40} count as a predictor of muscle in yearling beef bulls. *J. Anim. Sci.* 32:463.
- Frahm, R. R., D. G. Wagner, D. F. Stephens and R. E. Renbarger. 1971. Comparison of cottonseed hulls and wheat straw as a roughage ingredient in steer finishing rations. *Okla. Agr. Exp. Sta. Misc. Pub.* 85:42.
- Frey, John J. 1971. Evaluation of cow type classification score and its relationship to cow productivity. M.S. Thesis, Okla. State Univ. Library.
- Frey, John, R. R. Frahm and D. F. Stephens. 1971. Relationship between cow type classification score and cow productivity. *Okla. Agr. Exp. Sta. Misc. Pub.* 85:7.
- Frey, John, R. R. Frahm and D. F. Stephens. 1971. Type classification score as related to cow productivity. *J. Anim. Sci.* 33:199 (abstract).
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Comparison of Productivity Among Certain F_1 Crossbred Cow Groups

R. R. Frahm

Research has shown that production in terms of pounds of calf weaned per cow exposed for breeding can be increased at least 15 percent through utilization of a systematic crossbreeding program. Crossbreeding increases production by providing an opportunity to capitalize on combining the desirable characteristics of two or more breeds and by taking advantage of heterosis. The particular traits that have shown the most gain from heterosis have been those affecting reproductive efficiency and maternal performance of the cow and early growth rate of the calf. Thus, the crossbred cow is a major component of increased production through crossbreeding.

The purpose of this newly initiated study is to compare lifetime productivity under range conditions of eight F_1 crossbred cow groups (Hereford-Angus, Angus-Hereford, Simmental-Angus, Simmental-Hereford, Brown Swiss-Angus, Brown Swiss-Hereford, Jersey-Angus and Jersey-Hereford) when mated to a terminal cross sire of a third breed. The eight F_1 crossbred cow groups will consist of 45 cows each made from appropriate matings to comparable sets of Angus and Hereford cows made over a three year period. A foundation herd of 200 Angus and 200 Hereford cows that are typical of good commercial Angus and Hereford cattle in Oklahoma have been assembled at the Lake Carl Blackwell range to produce the respective eight F_1 crossbred cow groups starting with the 1972 breeding season. The lifetime productivity of each crossbred cow group (approximately 10 calf crops) will be compared when mated to a common set of bulls.

Shorthorn and Red Poll bulls will be used to sire the calves produced by the crossbred cows as 2-year-olds. Charolais bulls will be used for the second and subsequent calves until the three different age groups of crossbred cows all reach maturity at which time one other breed can be introduced in any one year for comparison with Charolais as a terminal cross sire breed. Decisions relative to which breed or breeds to involve in this comparison will be delayed until that point in the study is reached pending evaluation of data available on potential terminal sire breeds at that time.

Data will be collected on the reproductive and maternal performance of the cows, growth rate of all calves to weaning and feedlot performance and carcass evaluation of the steer calves.

Results from this study will provide basic information on how systematic crossbreeding programs utilizing available genetic resources (breeds) can be developed that will maximize production under Oklahoma range conditions.

Relationship Between Properties of Southern Forages and Animal Response

J. E. McCroskey

Research studies have shown that forages grown in the southern part of the United States have different chemical characteristics, and are frequently lower in quality than forages grown in the central and northern states.

In an attempt to characterize as completely as possible the chemical and physical characteristics of these forages, Oklahoma has joined with 12 other southern states in a regional forage study. The primary objective of this cooperative study is to obtain detailed chemical properties and animal responses from seven species of forages which are characteristic of those grown in the southern states. Each forage will be harvested at three stages of maturity. Departments of Animal Science, Agronomy and Biochemistry are cooperating in this effort.

Oklahoma's contribution is to produce four species of forages (alfalfa, bermudagrass, fescue and a sorghum-sudan hybrid), each at three stages of maturity. Animal data to be collected on these forages include rate of gain, feed efficiency, voluntary feed intake and a determination of digestible energy, metabolizable energy, and net energy. In addition, detailed laboratory analyses will be determined to characterize the forages with regard to all chemical properties known to be important in measuring quality.

During the summer of 1971, a sorghum-sudan hybrid (haygrazer) was harvested. Laboratory analyses and animal response data are in the process of being collected. One forage will be produced each year until all four forages have been studied.

Upon completion of the regional project, the seven forages will be rather completely characterized with regard to animal response and chemical composition standpoints. These data should be quite useful in determining the feeding value of these and other similar southern forages.

Development of Regression Equations for Predicting Performance of Cows and Calves Grazing Bermudagrass Pastures

J. E. McCroskey

Prediction of performance of grazing animals is rather difficult and depends primarily upon the quality of forage available and the amount the animal consumes. There are no accurate, direct methods for measuring or predicting the amount of bermudagrass which grazing cattle consume. Therefore, a study was initiated at the Ft. Reno Experiment Station to determine intake of grazed bermudagrass by cows and calves, and to establish mathematical equations for predicting intake.

Midland Bermudagrass fertilized at three levels of nitrogen (60, 180, and 300 lb. N./A.) will be used in an attempt to obtain a wide range in quality of bermudagrass pasture. Sixty Angus X Hereford crossbred cows, calving for the first time in the spring of 1972, will be assigned to the three treatments at calving time and will be used to measure forage intake at five times during the year over a five-year period. Intake of pasture by their calves will be determined three times during the nursing period. Esophageal fistulated cows and calves will be used to collect forage samples for laboratory analysis. In addition to forage intake determination, data will be collected on forage available per acre, cow weight changes, and calf weaning weights.

At the end of the study data obtained on forage chemical characteristics, yield of forage, and intake of grass by cows and calves will be used to establish regression equations for predicting intake of bermudagrass. For practical use, we should be able to calculate forage intake and animal performance if we have a measure of the amount of forage available, and its chemical characteristics.

Results of the first year's study will be reported in the 1973 Animal Sciences and Industry Research Report.

Studies on Nutritive Value of Wheat Pasture

R. R. Johnson, M. McGeehon and I. Williams

Although small grain pasture has been a valuable source of winter grazing for cows, stockers and sheep for several years, studies on the nutritive value of winter small grain forage are very limited. The impossibility of harvesting sufficient small grain forage for digestion studies and growth trials in stalls and pens makes such an investigation even more difficult. Consequently, a study was initiated this past year to utilize newer laboratory methodology to investigate the nutritive characteristics of small grain pasture.

Wheat pasture samples are being harvested from experiment station plots at various times during the winter. The samples are frozen in the field at the time of harvest by placing in dry ice and stored at -20° C. Special techniques are used to grind this material without thawing or dehydrating it so that the samples analyzed are truly representative of the type of material consumed by animals.

Samples are being analyzed for:

Soluble carbohydrate

Cell wall constituents

Acid detergent fiber

Total crude protein

Non protein nitrogen

Rate of ammonia liberation when incubated with rumen microorganism

Dry matter disappearance and gas production when incubated with rumen microorganisms

Preliminary data accumulated to date shows that the total crude protein may be as high as 30 percent of the dry matter and decreases to 15-20 percent toward the latter part of the winter season. Approximately $\frac{1}{6}$ of this crude protein is in the form of non-protein nitrogen in early harvests. Soluble carbohydrate is low (8 percent) in late October but increases (15-20 percent) in late November. Samples harvested after that date have not yet been analyzed.