



A genetic history of the line 1 Herefords at the United States Range Livestock Experiment Station,  
Miles City, Montana  
by Robert C Church

A THESIS Submitted to the Graduate Faculty In partial fulfillment of the requirements for the degree  
of Master of Science in Animal Industry  
Montana State University  
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**Abstract:**

This study was undertaken to analyze the results of twelve years of Inbreeding of a line of beef cattle In which selection of sires was based primarily on their record of performance. The cattle are owned by the Montana Agricultural Experiment Station and were raised at the United States Range Livestock Experiment Station at Miles City, Montana. The two half-brother foundation sires of the line were unrelated to the foundation cows. It was originally planned to carry out half-brother sister matings but due to natural causes this plan could not be followed entirely. The bull offspring of the line were first selected and tested in the feed lot; second, selected on their test results and types; and third, those selected were bred to a random-selected group of cows from the station herd. Eight randomly-selected steers from these matings were then tested in the feed lot and the line herd sires were selected on the basis of their steer progeny test results.

Seven factors were studied in the steer progeny performance results. These were average birth weight, average weaning weight, average final weight, average daily gain on feed, average weaning score, weighted slaughter grade, and weighted carcass grade. There, were five factors studied from each bull's record of performance. These were birth weight, weaning weight, final weight, daily gain on feed, and weaning score. Statistical analyses of the sires regression on his steer offspring were made in regard to birth weight, weaning weight, and final weight.

The rate of gain on feed has increased through the years in both the bulls and their steer offspring. The line was found to be more closely related to one of the two foundation sires through more of one's daughters being selected for replacements in the line. The line is not what would be considered an intensely inbred line. It is hoped that the results of this line will encourage other breeders of cattle to follow a similar breeding program.

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## INTRODUCTION

In 1931 the Bureau of Animal Industry of the United States Department of Agriculture began a series of projects to develop lines of inbred cattle for the purpose of crossing. These lines were to be selected for superiority in rate of gain, weaning weight, fertility and other factors of economic importance to the rancher.

The development of inbred lines of beef cattle where selection is based on record of performance is entirely new in the history of beef cattle breeding. Inbred lines of beef cattle have been developed since the beginning of the historical record of beef cattle, and most of our present day pure breeds of animals were founded through rather intense inbreeding, but to base selection entirely on record of performance combined with inbreeding is a new phase in the beef cattle industry. Gudgell and Simpson in this country inbred to Anxiety 4th and at one time had one of the most intensely inbred herds in history (12). The United States Range Livestock Experiment Station, Miles City, Montana in cooperation with the Montana Agricultural Experiment Station in 1936 undertook to produce an inbred line of cattle. Line 1 was developed at the Station and has proven to be an exceptionally productive strain of cattle.

It is the purpose of this study to present a genetic history of the Line 1 Herefords at the Range Station and to give the record of performance of this line to the present time. It is hoped that a study of the results of this line of Herefords will encourage other breeders to undertake such a breeding program in their own herds and thus make available to the

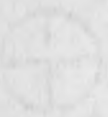
industry more breeding cattle that have a higher economic value to the commercial producer.

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REVIEW OF LITERATURE

Willham (14), in his genetic history of Hereford Cattle in the United States found within the breed an inter se relationship of 8.8 per cent in 1930. The inbreeding coefficient for the Hereford Cattle was 8.1 per cent. Another of his findings was that Beau Brummel a grandson of Anxiety 4th had a relationship of 24.6 per cent to the breed in 1930. Willham's techniques of computation were based on a random sampling of the breed.

It is a noteworthy fact that the present day breeds were founded by the crossing of lines that were developed through the use of rather close inbreeding. Wright (17), reported that the Dutchess line of Shorthorns as bred by Thomas Bates was maintained with an average inbreeding coefficient of 40 per cent. The relationship to Colling's bull Favourite through eight generations fell gradually from 76 per cent to 57 per cent. Wright stated that this high degree of inbreeding could lead to success only in the hands of an exceptional cattle judge.

Lush, et al. (7), found in their study of the Holstein Fresian Cattle that there is a tendency for the breed to form into families, but that these families are broken up because the more popular families are used for outcrossing and the less popular ones are discarded or are outcrossed with sires of the other families. They also found that the higher producers of the breed were no more inbred to or more closely related to remote ancestors but that they were more closely related to more recent ancestors.

Lush (6), reported that a herd of cattle was 16.9 per cent inbred after twenty years as a closed herd. The coefficient of inbreeding was kept low through the use of two herd sires in the two preceding generations.

He presented this paper as a practical demonstration that a moderate-sized herd could follow this breeding policy and still keep the coefficient of inbreeding low, conserve fairly well desirable characteristics of an early ancestor, and also maintain a fairly high average individual merit.

Lush and Anderson (3), found in their study of Poland-China swine that the breeding systems used for 44 years probably eliminated about 10 per cent of the heterozygosity found in the foundation animals. To quote Lush and Anderson, "About six-tenths of one per cent of the existing heterozygosity has been lost per generation. This is about one-twentieth as fast as heterozygosity would be lost in a one-sire-herd and about one-tenth as fast as it would be lost in a herd permanently closed to outside blood but with two equally used sires in service each generation."

It was determined by Comstock and Winters (2), that through selection in the early stages of inbreeding the effects of 15 per cent inbreeding per generation could be offset in the case of growth and  $2\frac{1}{2}$  per cent in the case of number of litter. They also found that inbreeding effected fertility more than it did growth rate and therefore advocated that everything possible should be done to make selection for fertility more possible.

Macaulay (10), in his corn breeding experiments, found that through inbreeding and strict selection he was able to increase uniformity within the strain, produce an earlier maturing strain, and increase the productivity of the strain.

Knapp, et al. (4), state that eight steers were sufficient to test a bull's ability to transmit efficiency of feed utilization. They also















































































































































