

Dairy Cattle

inheritance of growth, reproduction and milk production characteristics

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Genetic studies with plants and small animals have yielded considerable information of great fundamental and economic value. Dairy cattle, on the other hand, with their long gestation period, single birth, and relatively short life span, do not lend themselves to rapid progress in compiling sufficient data for sound conclusion.

The principal purpose of a long-time investigation of the genetics of dairy cattle, initiated in 1918, has been to accumulate basic data concerning the inheritance of characteristics in any way related to growth, reproduction and milk production. Secondly, an attempt has been made, through sire to daughter matings, to fix in relatively pure state the hereditary factors for high production.

When such intense inbreeding is practiced, it is inevitable that any hereditary defect present in the germ plasm of the sire will eventually appear in his inbred offspring.

The University experiments have uncovered eight such defects, only one of which had been previously reported in Jersey cattle. Their mode of inheritance and methods by which their appearance in the herd can be eliminated has been established.

In addition three different physical deformities of dairy cattle have been found in breeders' herds and have been proven to be hereditary. In two of these cases the owners had been wrongly advised that the difficulty was due to nutritional deficiencies or over-feeding and had, over a period of several years, attempted unsuccessfully to eliminate the condition by proper feeding.

Jerseys

That the attempt to concentrate in the Jersey herd the genetic factors for high production has been to some extent successful is evidenced by the following data collected over a period of 20 years through the coöperation of practical dairymen and breeders.

Sons of University experimental sires are loaned to selected coöperators for the purpose of testing the progress of the investigation. Hence the laboratories of the University are extended to the field, resulting in a greater accumulation of data than would otherwise be possible. These

dairymen are visited semiannually, and all data concerning milk production, breedings and calvings, and identity of all animals are carefully recorded. They agree to retain all daughters of University sires until they have completed at least one lactation, hence no selection is practiced in the proving of sires. The production records of all daughters of each sire are compared on a comparable basis with the records of their dams.

Of the 42 sires so far proven on a total of 1,407 daughter-dam comparisons, 76% have brought about an increase in production of their daughters over their dams. This compares with a figure of less than 50% for all bulls proved throughout the United States in dairy herd improvement associations.

These University bulls have varied in their degree of inbreeding. The fat production of the Junior two-year-old daughters of the less highly inbred bulls averaged 357 pounds. Their dams averaged 334 pounds. On the same basis the daughters of the more highly inbred bulls have averaged 389 pounds of butterfat. Their dams averaged 354 pounds. These data will, of course, require further analysis, but it now appears evident that the more highly inbred bulls have sired the highest producing daughters. The hereditary ability of these experimentally produced sires to transmit production to their daughters is reflected in the average production of the test herds in which they have been used.

The data concerning the effect of degree of inbreeding on calf mortality have been analyzed and published. While the

results have varied with each sire family, in general mortality increases with the higher degrees of inbreeding.

The growth data on Jerseys have been analyzed and will be published in the near future. Briefly, inbreeding without selection adversely affects birth weight and early growth, but at maturity the difference in height and weight of inbred and out-crossed Jerseys is not statistically significant.

Holsteins

The breeding experiments with the Holstein herd have yielded some interesting results. Having established a very highly inbred herd through successive generations of sire to daughter matings, it was found, contrary to the results obtained with Jerseys that both mature size and milk production had decreased with the higher degrees of inbreeding. Since sire families vary in response to inbreeding, this is not considered a breed difference. When these highly inbred cows were mated to an unrelated inbred bull, the resulting progeny have shown a very significant increase in production and growth even greater than that of the original cows.

Such results may be of considerable importance and suggest that hybrid vigor may be involved, similar to the results obtained through the crossing of inbred lines of corn to produce the hybrid seed now used by the majority of corn growers. It also suggests that the results obtained through the crossing of breeds might be duplicated within the breed with none of the disadvantages attending the former.

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This progress report is based upon Research Project No. 716, started in 1918 at the University of New Jersey by W. M. Regan, now Professor of Animal Husbandry and Animal Husbandman in the Experiment Station, Davis. The entire experiment, including the animals involved and data so far collected, was moved to the University of California in 1923.

University Sires Increase Butterfat Production in Test Herds

Herd No.	Before Using University Sires		After Using University Sires	
	No. of cows in herd	Average yearly* production lbs. B. F.	No. of cows in herd	Average yearly production lbs. B. F.
1	40	300	37	393
2	21	304	98	420
3	19	304	65	421
4	17	339	31	443
5	12	350	37	516
6	16	354	97	565
7	45	356	73	508
8	17	360	38	510
9	36	371	56	459
Ave.	25	338	59	475

* Dairy Herd Improvement Association records.