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USDA-DHIA Sire Summaries-AI Advantage

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USDA-DHIA Sire Summaries-AI Advantage

Abstract

USDA-DHIA Sire Summaries are published semiannually and provide the dairy industry with an accurate evaluation of the transmitting ability of bulls for milk and milk components. Genetic potential is established at the time of conception. Therefore, current service sires represent the primary means of improving the genetic base of the future herd. Based upon first evaluation of daughters of AI and non-AI bulls, the data clearly indicate the genetic superiority of bulls selected by the AI industry. Dairy producers are strongly urged to select service sires from the Active AI bull listings.; Dairy Day, 1987, Kansas State University, Manhattan, KS, 1987;

Keywords

Dairy Day, 1987; Kansas Agricultural Experiment Station contribution; no. 88-114-S; Report of progress (Kansas Agricultural Experiment Station); 527; Dairy; Artificial Insemination (AI); Genetics; Milk production

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USDA-DHIA SIRE SUMMARIES — AI ADVANTAGE

E.P. Call

Summary

USDA-DHIA Sire Summaries are published semiannually and provide the dairy industry with an accurate evaluation of the transmitting ability of bulls for milk and milk components. Genetic potential is established at the time of conception. Therefore, current service sires represent the primary means of improving the genetic base of the future herd. Based upon first evaluation of daughters of AI and non-AI bulls, the data clearly indicate the genetic superiority of bulls selected by the AI industry. Dairy producers are strongly urged to select service sires from the Active AI bull listings.

Introduction

The need to progeny test dairy bulls to evaluate their transmitting ability for production traits became apparent more than 50 years ago. Milk production is a sex-limited trait (bulls don't give milk), and the heritability for milk is about 25% ($h^2 = .25$). Early methods to rank the genetic ability of bulls included simple daughter averages adjusted for age and length of lactation and daughter-dam comparisons. Both systems failed to accurately evaluate bulls, since environmental influences accounted for about 75% ($e^2 = .75$) of the variation among cows' production. Artificial insemination (AI), high speed computers, and increased enrollment of producers into the National Dairy Herd Improvement Program (NDHIP) provided the mechanisms for the USDA-DHIA Sire Summary Program.

The Predicted Difference System

The Predicted Difference (PD) System provides the means to: (1) rank bulls with one another and (2) estimate the inferiority or superiority of a bull's future daughters compared with the genetic base (breed average). The current genetic base is 1982 or PD82, which means that a zero bull (PD = 0) is an average sire for two-year old cows calving in 1982. The equation used to calculate PD is:

$$PD82 = R(D - MCA + SMC) + (1-R)AM$$

Where: R = Repeatability or accuracy of the information, based upon no. of daughters and distribution among herds.

D = Average production of daughters.

MCA = Average production of contemporaries or herdmates.

SMC = Average sire merit for contemporaries - adjusts for genetic level of herdmates.

AM = Ancestor merit - adjusts for differences in genetic ability of ancestors.

Evaluating Bulls Based Upon PD82

The July, 1987, USDA-DHIA Sire Summary serves as an excellent example that real differences exist among bulls. The most accurate comparison of groups of bulls is based upon the first evaluation, which involves two-year old daughters without selection pressure that would occur later in the Active AI group. As shown in Table 1, either within breed or among breeds, the AI group has a distinct advantage overall. While the main advantage of the PD system is to rank bulls for selection purposes, monetary benefits may also be estimated. For example, in Table 1, the average PD\$ superiority of a daughter by an AI bull is + \$56 compared to the average daughter of a non-AI bull. This means that on average, daughters of AI bulls will have \$56 more milk sold for each lactation.

The AI advantage is even greater when the Active AI bulls are selected as a group, as noted in Table 2. All breeds considered, the active AI bulls' daughters are + \$125 superior to the average daughters of non-AI bulls. These differences are real and have economic impact on the dairy herd. Selecting bulls based upon the PD system assures that the herd of tomorrow will be better genetically and more profitable. Cows selected for milk production convert feed into milk more efficiently.

Read More About It

1. Sire Summary List (DyS-2977). North Central Regional Publication 137. July, 1987. Kansas State University. Manhattan (Extension Dairy Science).

2. Sire Evaluation Procedures for Yield Traits. NCDHIP Handbook. 1986. Kansas State University, Manhattan (Extension Dairy Science).

Table 1. Comparison of first-evaluation AI-proved bulls with contemporary non-AI sires. July, 1987.

| Breed | AI Predicted Difference | | | | Non-AI Predicted Difference | | | |
|-------------|----------------------------|------|-----|-----|--------------------------------|------|----|-----|
| | M | %F | F | \$ | M | %F | F | \$ |
| Ayrshire | +343 | -.05 | + 6 | +29 | - 71 | -.05 | -9 | -19 |
| Brown Swiss | +271 | -.04 | + 6 | +24 | +105 | +.01 | +6 | +15 |
| Guernsey | +482 | -.03 | +19 | +58 | - 32 | +.00 | -2 | - 5 |
| Holstein | +436 | -.02 | +13 | +46 | -125 | +.00 | -4 | -14 |
| Jersey | +327 | +.00 | +16 | +44 | + 4 | -.01 | -2 | - 3 |
| All Breeds* | +432 | -.02 | +13 | +44 | -104 | +.00 | -4 | -12 |

*No. of bulls: AI = 706; Non-AI = 1,707

Table 2. Comparison of active, proved AI bulls with all non-AI sires. July, 1987.

| Breed | AI Predicted Difference | | | | Non-AI Predicted Difference | | | |
|-------------|----------------------------|------|-----|-----|--------------------------------|------|-----|-----|
| | M | %F | F | \$ | M | %F | F | \$ |
| Ayrshire | +432 | -.03 | +12 | +44 | - 79 | -.03 | - 7 | -15 |
| Brown Swiss | +719 | -.01 | +27 | +84 | -165 | +.01 | - 5 | -17 |
| Guernsey | +756 | -.04 | +29 | +89 | -151 | +.00 | - 7 | -20 |
| Holstein | +865 | -.01 | +30 | +96 | -320 | +.01 | -11 | -35 |
| Jersey | +764 | -.03 | +33 | +95 | -176 | +.01 | - 7 | -22 |
| All Breeds* | +831 | -.01 | +29 | +93 | -291 | +.01 | -10 | -32 |

*No. of bulls: AI = 668; Non-AI = 13,118



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