IMPACT OF BULL SELECTION BASED ON PEDIGREE AND TYPE IN A PUREBRED SAHIWAL HERD

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Pedigree and performance records of a purebred Sahiwal herd maintained during the years 1926 to 1966 were analysed to study the impact of bull selection based on pedigree and type on milk yield. Thirty bulls having data on at least five daughters per sire were evaluated by daughter-dam comparison, Equal-parent Index and Regression Index for their genetic worth. Daughter-dam comparison revealed that out of thirty sires, only seven bulls had their daughters' average milk yield above their dams. The overall decline of 270 pounds on the average was noticed in the milk yield of daughters as compared to their dams. The Equal-parent Indices showed that 8 bulls were above while the genetic worth of 20 bulls was below than that of their (sires') dams. Regression Indices ranked 10 bull above and 20 bulls below the herd average. The present study has indicated that although, these bulls were selected from high yielding cows on the basis of pedigree and type, yet progeny test information indicated most of them carrying poor sample of genes from their mothers. The selection on pedigree may be used as an aid to selection at younger age but final selection of bulls for intensive use by artificial insemination should be based on progeny test information.

INTRODUCTION

Selection of a dairy bull is one of the most important decision a breeder has to make. A bull has greater genetic influence on the herd than any particular cow because of larger number of offsprings it leaves for future herd replacement. As milk production is a sex-limited trait, the young bulls can only be selected on the basis of the pedigree information and the

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performance records of their collateral relatives. The use of pedigree information in the modern manner began in rural England late in the eighteenth century. Pedigree breeding was established in the times of famous English breeder-Robert Bakewell who lived from 1725 to 1795 (Lush, 1945). Later on, the selection on the basis of pedigree was found to be associated with certain merits and limitations. In bull selection it was found that if the exact breeding value of a bull was known, attention to Bull's ancestors was of little help in deciding whether to use such bull or not for breeding purposes.

In Indo-Pakistan Sub-continent, the sires have mainly been selected from high yielding cows on the basis of their conformation and other breed characteristics since early twenteith century. Some improvement in appearance and milk yield was achieved, but at present, a vast majority of herds are showing signs of deterioration in performance traits. Alongwith certain other factors, the selection of bulls merely on the basis of pedigree and type has also been speculated for this imparied situation. The bulls used in various herds upto the present time have never been assessed for their breeding values on the basis of the performance of their daughters. To explore the reality, the bulls used in a Sahiwal herd over a period of 41 years were judged for their worth.

MATERIALS AND METHODS

The pedigree and performance records of a purebred Sahiwal herd maintained during the years 1926 to 1966 were examined. Out of the total strength of 68 sires used in this herd, only 30 sires had sufficient data for bull evaluation. The sires with lactation data on at least five daughters were evaluated. This number of daughters per sire form the practical lower limit for fairly accurate progeny test information (Lush and MacGilliard, 1955; Hazel; 1963). The lactation records of daughters and mates (their dams) of the sires were standardized to a 305-day, mature equivalent basis by the correction factors developed from the same data (Ahmad, 1972). Variation in milk yield due to the number of lactation records per cow was removed by estimating cow's most probable producing ability. The comparison between the average milk yield expressed as most probable producing ability of daughters of a particular sire with their dams was made to assess apparently the relative merits of each sire. The sires were further evaluated by Equal-parent Index and Regression Index methods of expressing the progeny test (*Rice et al., 1957*). The bulls were grouped according to their Equal-parent Index being above or below the milk yields of the their (bulls') dams to

show the reliability of pedigree selection as compared with actual breeding worth. The bulls were also assessed on the basis of thier Regression Indices using overall herd average.

RESULTS AND DISCUSSION

The comparison between the milk yield expressed as cow's most probable producing ability of 617 daughters of 30 sires with their dams has been presented in Table 1.

TABLE 1. *Sire Evaluation Based on Daughter-Dam Comparison in a Sahiwal Dairy Herd.*

Daughters' milk yield above/below their dams	No. of Sires	No. of daughter-dam pairs per sire			Average milk yield (pounds)		Daughter–dam difference (pounds)		
		Av.	Range		Daughters	Dams	Av.	Range	
			From	To				From	To
Above	7	18	8	30	5301	5113	+188	+9	+280
Below	23	22	5	72	5011	5378	−367	−1037	−15
Overall	30	21	5	72	5079	5316	−270	−1037	+280

The overall average milk yield of daughters was 5079 pounds as compared to their dams who produced 5316 pounds. This suggested that the dams of these daughters were decidedly better in milk yield. When the average milk yield of daughters of individual sires were compared with their dams it was found that daughters of 7 sires yielded more milk than their dams (5301 versus 5113 pounds), while the daughters of 23 sires yielded less milk on the average than their dams (5011 versus 5378 pounds), thus affecting the overall average milk yield. The daughter-dam pairs used in this comparison averaged 21 and ranged from 5 to 72. The overall average decline in milk yield per sire was 270 pounds, the differences ranging from − 1037 pounds to +280 pounds.

The Equal-parent Indices of sires constructed to assess their producing abilities ranged from 3570 to 5913 pounds with an average of 4842 pounds. The average Equal-parent Index was markedly lower than the herd average of 5132 pounds. The comparison between the Equal-parent Indices of sires and 305-day first lactation yield of their dams (Sires' dams) had been presented in Table 2.

TABLE 2. *Equal-Parent Indices of the sires in Relation to the productivity of their dams.*

Equal-parent Indices above/ below the dams' milk yield	No. of Sire	Equal-parent Indices of sires (pounds)			Milk yield of the sires' dams (pounds)		
		Av.	Range		Av.	Range	
			From	To		From	To
Above	8	5254	4691	5913	4701	3877	5378
Below	20	4671	3570	5893	6415	5262	8032
Overoll	28	4842	3570	5913	5925	3877	8032

It was observed that the average milk yield among the sires' dams was much higher than the average Equal-parent Index of sires. The milk yield among the dams of the sires averaged 5925 pounds and ranged from 3877 to 8032 pounds. Twenty sires had their Equal-parent Indices below their dams, whereas 8 bulls proved to be superior as compared to their dams. This revealed that although, these bulls were selected from high producing cows on the bais of pedigree and type, yet most of them were inferior in milk production trait. They might have inherited poor sample half of the genes their mothers had carried for milk production. The information on milk yield of dams of two bulls was not available, hence only 28 sires were considered in this discussion.

Regression Indices of 30 bulls were also calculated. The average Regression Index of these bulls was 4987 pounds, the range being 4351 to 5522 pounds. Ten bulls had indices above the herd average while 20 bulls ranked below the herd average on this basis. The higher group of sires had average index of 5314 pounds with a range from 5139 to 5522 pounds, while the remaining 20 bulls had an average value of 4823 pounds and ranged from 4351 to 5077 pounds (Table 3).

TABLE 3. *Regression Indices of the Sires in Relation to the Herd Average.*

Regression Indices above/below the herd average	No. of Sires	Regression Indices (pounds)		
		Av.	Range	
			From	To
Above	10	5314	5139	5522
Below	20	4823	4351	5077
Overall	30	4987	4351	5522

Evident enough, the future sires selected on the basis of their pedigrees and type seemed to carry genes responsible for high milk production. The same sires when judged on the basis of the performance of their daughters had proven otherwise. This discrepency between the observed and expected performances led to conclude that pedigree and type were the poor indicator of the genes carried by the bull for milk production. The pedigree and type could be used as an aid to selection at younger age, but real genetic worth of the individual could only be determined after their progeny tests. Therefore, the present state of deterioration among the vast majority of herds might be due to the selection of bulls merely based on the pedigree and type. To save the herds from further deterioration, progeny tested bulls have to be introduced. Wide spread use of artificial insemination in this country has further warrented the use of progeny tested bulls.

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