GENETIC DIVERGENCE IN COMPONENT STRAINS OF KARAN-FRIES CATTLE

R. K. Sethi
National Dairy Research Institute

M. Gurnani
National Dairy Research Institute

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GENETIC DIVERGENCE IN COMPONENT STRAINS OF KARAN-FRIES CATTLE

R.K. SETHI and M. GURNANI
NATIONAL DAIRY RESEARCH INSTITUTE, KARNAL 132 001 INDIA.

SUMMARY

Data on 50 percent and higher Holstein Friesian crossbred genetic groups revealed significant differences with respect to age at first calving, first lactation 305 days yield, dry period and service period. 91.7 percent of the divergence among genetic groups was contributed by 305 days lactation yield. F1 crossbreds formed separate clusters. Among the higher crosses (75% and above) genetic groups involving only 2 breeds formed separate cluster from genetic groups involving three breeds. Three breed cluster was farthest from the F1 crossbreds cluster. There was an indication of all the clusters having animals of good genetic potential.

INTRODUCTION

Crossbreeding of Zebu cattle with different exotic breeds has improved the milk production at a significantly rapid rate. The production performance in almost all the genetic groups is found to be higher than Zebu cattle. In other crossbreeding experiments it is found that there is decline in production from F1 to F2 generations. Therefore, multiple breed crossing, for supposedly exploiting non additive genetic variance, produced no significant improvement (Sethi et al., 1982), over first generation (F1) crosses. The F1 crossbreds produced highest milk and calved at the youngest age group than any of the other grades. This indicated absence of any significant role of non genetic effects with regard to most of the important economic and adoptive traits. As a result of this all the genetic groups with 50 percent or more Friesian inheritance were pooled to formulate Karan Fries breed, though performance in different genetic groups differed, differences based on simultaneously several production traits indicate overall divergence among genetic groups (Taneja et al., 1979; Sharma, 1981). Performance of genetic groups in different clusters subsequently in the herd is yet to be observed.

MATERIALS AND METHODS

The data for this investigation were collected from the available records of all those genetic groups which were merged to form Karan-Fries breed (Fig. 1) in 1980. These animals involved in different genetic groups were born from 1973 to 1978. Some of the HS (Holstein X Sahiwal) animals were produced at Indian Agricultural Research Institute, New Delhi and later on shifted to MDRI, Karnal. Information on age at first calving and on first lactation traits (305 days yield, lactation length, dry period, service period and calving interval) was compiled. One-way analysis of variance of non-orthogonal data (Harvey, 1966) was conducted for testing differences among genetic groups for individual traits. Dispersion matrix of variances and co-variances was obtained and Mahalanobis D2 statistics and clusters were formulated (Tocher method) as illustrated by Singh and Chaudhry, 1977. All the animals in

<table>
<thead>
<tr>
<th>6 months weight</th>
<th>12 months weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>151.80</td>
<td>222.20</td>
</tr>
<tr>
<td>82.80</td>
<td>126.30</td>
</tr>
<tr>
<td>86.45</td>
<td>151.30</td>
</tr>
</tbody>
</table>

(Average weight for both sexes)

...more text...
different genetic groups (involved in Karon Fries) were traced to the end of 1985, to find out the percentage of culling. The symbols used for various breeds in crossbreeding programme were H: Holstein Friesian, B: Brown Swiss, J: Jersey, T: Tharparkar and S: Sahiwal.

RESULTS AND DISCUSSION

Data on all the traits on animals in each genetic groups involved in Karon Fries breed (Fig.1) was put to analysis to find out the test of significance.

Differences based on individual traits:

The average and standard errors for age at first calving, first lactation 305 days yield, lactation length, dry period, service period and calving interval for all the genetic groups involved in Karon Fries are tabulated in Table 1. Animals in different genetic groups commenced their first lactation in the years mentioned in the table. Differences due to years were estimated to be non-significant which, therefore, are not likely to contribute in genetic divergence between various groups. The differences for age at first calving, 305 days milk yield, dry period and service period among various genetic groups were found to be statistically significant. Holstein x Tharparkar (HT F1) indicated better performance than any other crossbred genetic group. These findings are in accordance with the earlier reports on the same data (Nagarcenkar and Rao, 1982; Bhatnagar, 1984).

Divergence based on several traits:

Based on the test of significance on individual traits among various genetic groups multivariate analysis of data were conducted including only 4 traits for which significant differences were observed. Dispersion matrix was obtained from the error component of variances and co-variances of these traits.

Distance between genetic groups: The distance between various genetic groups based on four traits was found to be statistically significant (p<0.05). 91.7% of the divergence was contributed by the 305 days lactation milk yield, 8.3% by the dry period whereas service period and age at first calving did not contribute significantly in the divergence. These estimates are different from those of Taneja, 1973 and Sharma, 1981 in the Holstein x Sahiwal crosses. This difference in contribution of a trait to divergence is due to the extent of variation between genetic groups and correlations among traits.

Pooling of genetic groups in clusters: The genetic groups were pooled into clusters on the basis of closeness of distance. Three clusters were formed.

Cluster - I: HT (75%), HT (87.5%), HS (75%), HS (87.5%)
Cluster - II: HT (F1), HS (F1)
Cluster - III: HBT (75%), HJ1 (75%)

The F1 crossbred groups (75% and more) with two higher crosses with more than 2% The intra and inter-cluster divergence indicates that the three breeds from the 50% F1 crossbred as contributing to genetic divergence between various groups.

Performance of clusters in the herd were retained in the herd by the following 31.9% in cluster I (Table 1). Cluster II left the herd from cluster I, which have lowest performance and potential since culling pattern. The clusters was uniform. This rate was higher in 87.5% grades diseases and reproductive problems HJ1 crossbred genetic groups (K) from Table 1 from the number of

REFERENCES


SETHI, R.K., NAGARCENKAR, R. and performance of progeny of three N.


in Karan Fries) were traced.

The crossbreeding programme was, J: Jersey, T: Tharparkar.

DISCUSSION

Animals in each genetic group (1) was put to analysis to find

cors for age at first calving, dry period, etc for all the genetic groups

ed in Table 1. Animals in

ir first lactation in the

rence due to years were

ich, therefore, are not like

ven groups. The
g, 305 days milk yield, dervious genetic groups were for

Holstein x Tharparkar (HT F 1 ) and any other crossbred genetic group

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which significant differences

from the error

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tribution of a trait

ent of variation between

ants. The genetic groups were

of closeness of distance.

(87.5%), HS (75%), HS (87.5%)

F 1 ), I (75%).

The F 1 crossbred groups formed a separate cluster, higher

crosses (75% and more) with two breeds formed one cluster and

higher crosses with more than 2 breeds formed another cluster. The

tra and inter-cluster distance are presented in Fig. 2. These

icate that the three breed crosses (75%) were farthest

from the 50% F 1 crossbred as compared to the 2 breed higher cross.

performance of clusters in the herd, 36.4 percent of the animals

retained in the herd by the end of 1985 in cluster II followed by 31.9 percent in cluster III and 27.6 percent in

ler I (Table 1). Cluster III indicated largest distance from

eter II as compared to cluster I whereas more number of animals

eld the herd from cluster I, which indicate that cluster III

hich have lowest performance also had animals of good genetic

ential since culling pattern and management of animals in all

the clusters was uniform. This is due to the fact that culling

rate was higher in 87.5% grades involved in cluster I due to
diseases and reproductive problems as compared to in the HST and

crossbred genetic groups (Kulkarni, 1985) as is also evident

Table 1 from the number of animals retained upto 1985.

REFERENCES


Table 1. First lactation performance of animals which were added to constitute KARAN-FRIES breed.

<table>
<thead>
<tr>
<th>Genetic group</th>
<th>No. of cows added in 1980</th>
<th>Year of first calving (months)</th>
<th>Age at first calving (days)</th>
<th>305 days milk yield (kg)</th>
<th>Lactation length (days)</th>
<th>Dry period (days)</th>
<th>Service period (days)</th>
<th>Calving interval (days)</th>
<th>Animals retained at the end of 1985 No. %</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLUSTER-I</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H x HT (75%)</td>
<td>74</td>
<td>77-80</td>
<td>34.8±0.5</td>
<td>3028±82</td>
<td>377±12</td>
<td>67±3.5</td>
<td>177±12</td>
<td>446±12</td>
<td>28 37.8</td>
</tr>
<tr>
<td>H x ½HT (87.5%)</td>
<td>5</td>
<td>79-80</td>
<td>42.6±1.4</td>
<td>3942±63</td>
<td>477±60</td>
<td>87±3.5</td>
<td>227±60</td>
<td>496±85</td>
<td>0 0.0</td>
</tr>
<tr>
<td>H x HS (75%)</td>
<td>25</td>
<td>75-80</td>
<td>33.8±0.8</td>
<td>3061±109</td>
<td>370±15</td>
<td>95±17.0</td>
<td>168±21</td>
<td>467±22</td>
<td>5 20.0</td>
</tr>
<tr>
<td>H x ½HS (87.5%)</td>
<td>3</td>
<td>75-80</td>
<td>33.0±3.0</td>
<td>3037±180</td>
<td>37±47</td>
<td>52±8.5</td>
<td>150±54</td>
<td>425±50</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Overall</td>
<td>107</td>
<td></td>
<td>34.8±0.4</td>
<td>3032±178</td>
<td>380±10</td>
<td>74±5.0</td>
<td>172±10</td>
<td>452±11</td>
<td>33 27.6</td>
</tr>
<tr>
<td>CLUSTER-II</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H x T (50% F₁)</td>
<td>74</td>
<td>74-79</td>
<td>28.7±0.4</td>
<td>3686±67</td>
<td>345±9</td>
<td>59±3.8</td>
<td>131±11</td>
<td>405±11</td>
<td>28 37.8</td>
</tr>
<tr>
<td>H x S (50% F₁)</td>
<td>25</td>
<td>71-80</td>
<td>35.0±1.2</td>
<td>3597±117</td>
<td>341±19</td>
<td>83±128</td>
<td>121±22</td>
<td>427±22</td>
<td>8 32.0</td>
</tr>
<tr>
<td>Overall</td>
<td>99</td>
<td></td>
<td>30.3±0.5</td>
<td>3664±58</td>
<td>344±10</td>
<td>65±4.0</td>
<td>129±10</td>
<td>410±10</td>
<td>36 36.4</td>
</tr>
<tr>
<td>CLUSTER III</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H x BT (75%)</td>
<td>24</td>
<td>78-80</td>
<td>36.8±0.8</td>
<td>2461±96</td>
<td>369±25</td>
<td>57±3.5</td>
<td>115±13</td>
<td>395±13</td>
<td>11 45.8</td>
</tr>
<tr>
<td>H x JT (75%)</td>
<td>45</td>
<td>78-80</td>
<td>33.8±0.5</td>
<td>2292±75</td>
<td>361±24</td>
<td>69±5.2</td>
<td>143±15</td>
<td>420±15</td>
<td>11 24.4</td>
</tr>
<tr>
<td>Overall</td>
<td>69</td>
<td></td>
<td>34.8±0.5</td>
<td>2346±62</td>
<td>363±18</td>
<td>65±7.0</td>
<td>134±12</td>
<td>413±12</td>
<td>22 31.9</td>
</tr>
<tr>
<td>F. test</td>
<td></td>
<td></td>
<td>17.8*</td>
<td>327.7*</td>
<td>1.4</td>
<td>2.5*</td>
<td>6.1*</td>
<td>1.6</td>
<td></td>
</tr>
</tbody>
</table>

* (P<0.05) H = Holstein Friesian, T = Tharparkar, S = Sahiwal, B = Brown Swiss, J = Jersey

FIG. 2. MATING PLAN FOR EVOLVING KARAN-FRIES STRAIN

- SAHIWAL (S) → HOLSTEIN FRIESIAN (H) → THARPARKAR (T) → BROWN SWISS (B) → JERSEY (J) → ZEBU CATTLE BREEDS
- EXOTIC BREEDS

...
### CLUSTER-II

<table>
<thead>
<tr>
<th></th>
<th>H x T (50% F₁)</th>
<th>H x S (50% F₁)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>74</td>
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<td></td>
<td>131±11</td>
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<tr>
<td></td>
<td>405±11</td>
<td>427±22</td>
<td>410±10</td>
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<tr>
<td></td>
<td>28</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>37.8</td>
<td>32.0</td>
<td>36.4</td>
</tr>
</tbody>
</table>

### CLUSTER III

<table>
<thead>
<tr>
<th></th>
<th>H x BT (75%)</th>
<th>H x JT (75%)</th>
<th>Overall</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>24</td>
<td>45</td>
<td>69</td>
</tr>
<tr>
<td>H x BT (75%)</td>
<td>78-80</td>
<td>78-80</td>
<td>78-80</td>
</tr>
<tr>
<td>H x JT (75%)</td>
<td>36.8±0.8</td>
<td>33.8±0.5</td>
<td>34.8±0.5</td>
</tr>
<tr>
<td>Overall</td>
<td>2461±96</td>
<td>2292±75</td>
<td>2346±62</td>
</tr>
<tr>
<td></td>
<td>369±25</td>
<td>361±24</td>
<td>363±18</td>
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<td>11</td>
<td>11</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>45.8</td>
<td>24.4</td>
<td>31.9</td>
</tr>
</tbody>
</table>

### F. test

|                     | 17.8*          | 327.7*         | 2.5*    | 6.1*   | 1.6   |

* (P<0.05)  
H = Holstein Friesian, T = Tharparkar

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**FIG. 2. MATING PLAN FOR EVOLVING KARAN-FRIES STRAIN**

![Diagram of mating plan for evolving Karan-Fries strain]
FIG. 2. CLUSTER DIAGRAM INDICATING INTRA AND INTER-CLUSTER DISTANCE

POPULATIONS IN CLUSTER

I: HT 75%, HT 87.5%, HS 75%, HS 87.5%
II: HTF1, HSF1
III: HBT 75%, HJT 75%

This is a follow-up report on some specific hybrids of Bovine yak (Bood, Bood, and Bood yak) with a view to improving the scope for research by enlarging the scope for research on the Yak Commission of India. The relevant information in respect of the Yak, male, female, and sub-dam yak (Bood, Bood, and Bood yak) may be found in the text.