1986

GENETIC DIVERGENCE IN COMPONENT STRAINS OF KARAN-FRIES CATTLE

R. K. Sethi
National Dairy Research Institute

M. Gurnani
National Dairy Research Institute

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. F_1 crossbreds formed separate cluster. 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 F_1 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 F_1 to F_2 generations. Therefore, multiple breed crossing, for supposedly exploiting non additive genetic variance, produced no significant improvement (Sethi et al., 1982), over first generation (F_1) crosses. The F_1 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 NDRI, 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 Mahalnobis D^2 statistics and clusters were formulated (Tocher method) as illustrated by Singh and Chaudhry, 1977. All the animals in different genetic groups (involved in Karan 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 Karan Fries breed (Fig.1) was put to analysis to find out the test of significance.

<u>Differences based on individual traits</u>:

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 Karan 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 F_1) 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).

<u>Divergence based on several traits</u>:

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 towards 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 (F_1), HS (F_1).
Cluster -III: HBT(75%), HJI(75%).

The F_1 crossbred groups
crosses (75% and more) with two
higher crosses with more than 2
The intra and inter-cluster dis
These indicate that the three b
from the 50% F_1 crossbred as co

Performance of clusters in the
were retained in the herd by th
followed by 31.9 percent in clu
cluster I (Table 1). Cluster I
cluster II as compared to clust
left the herd from cluster I, w
which have lowest performance a
potential since culling pattern
the clusters was uniform. This
rate was higher in 87.5% grades
diseases and reproductive probl
HJI crossbred genetic groups (K
from Table 1 from the number of

REFERE

BHATNAGAR, D.S. 1984. Glimpse
Karnal. Publication No. 206, N

KULKARNI, N.R. 1985. Incidence
production in crossbred animals
University, Kurukshetra.

NAGARCENKAR, R. and RAO, M.K. 1
exotic crosses for productive a
Indian J. Anim.Sci., **52**: 129-13

SHARMA, N. 1981. Discriminatio
dairy animals. M.Sc. Thesis, K

SETHI, R.K., NAGARCENKAR, R. an
performance of progeny of three
cattle. *Indian J. Anim. Sci.*,

SINGH, R.K. and CHAUDHARY, B.D.
Quantitative genetic analysis.

TANEJA, V.K. 1973. Genetic ana
Ph.D. Thesis, Agra University,

TANEJA, V.K., BHAT, P.N. and GA
in various Sahiwal x Holstein c
54 : 69-74.

in Karan Fries) were traced
rcentage of culling. The
crossbreeding programme we
s, J: Jersey, T: Tharparkar

DISCUSSION

imals in each genetic group
1) was put to analysis to f

its:

ors for age at first calvin
tation length, dry period,
for all the genetic groups
ed in Table 1. Animals in
their first lactation in th
ferences due to years were
ich, therefore, are not like
between various groups. T
ng, 305 days milk yield, dry
rious genetic groups were fo
Holstein x Tharparkar (HT F
any other crossbred genetic
rdance with the earlier repo
Rao, 1982; Bhatnagar, 1984).

:

icance on individual traits
variate analysis of data we
for which significant diffe
was obtained from the error
ances of these traits.

The distance between various
s was found to be statistic
e divergence was contribute
8.3% by the dry period whe
lving did not contribute
These estimates are differe
rma, 1981 in the Holstein x
in contribution of a trait
extent of variation between
nong traits.

ters: The genetic groups wer
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 intra and inter-cluster distance are presented in Fig. 2. These indicate that the three breed crosses (75%) were farthest from the 50% F_1 crossbred as compared to the 2 breed higher crosses.

performance of clusters in the herd: 36.4 percent of the animals were 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 cluster I (Table 1). Cluster III indicated largest distance from cluster II as compared to cluster I whereas more number of animals left the herd from cluster I, which indicate that cluster III which have lowest performance also had animals of good genetic potential 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 HBT and HJI crossbred genetic groups (Kulkarni, 1985) as is also evident from Table 1 from the number of animals retained upto 1985.

REFERENCES

BHATNAGAR, D.S. 1984. Glimpses of livestock development at NDRI, Karnal. Publication No. 206, NDRI, Karnal, India.

KULKARNI, N.R. 1985. Incidence of culling and its impact on milk production in crossbred animals. M.Sc. Thesis. Kurukshetra University, Kurukshetra.

NAGARCENKAR, R. and RAO, M.K. 1982. Performance of Tharparkar exotic crosses for productive and reproductive traits. Indian J. Anim.Sci., 52: 129-138.

SHARMA, N. 1981. Discrimination between various genetic groups of dairy animals. M.Sc. Thesis, Kurukshetra University, Kurukshetra.

SETHI, R.K., NAGARCENKAR, R. and SUNDARESAN, D. 1982. Comparative performance of progeny of three and four breed crosses in dairy cattle. Indian J. Anim. Sci., 52: 928-932.

SINGH, R.K. and CHAUDHARY, B.D. 1977. Biometrical methods in Quantitative genetic analysis. Kalyani Publishers, New Delhi.

TANEJA, V.K. 1973. Genetic analysis of Holstein x Zebu crosses. Ph.D. Thesis, Agra University, Agra.

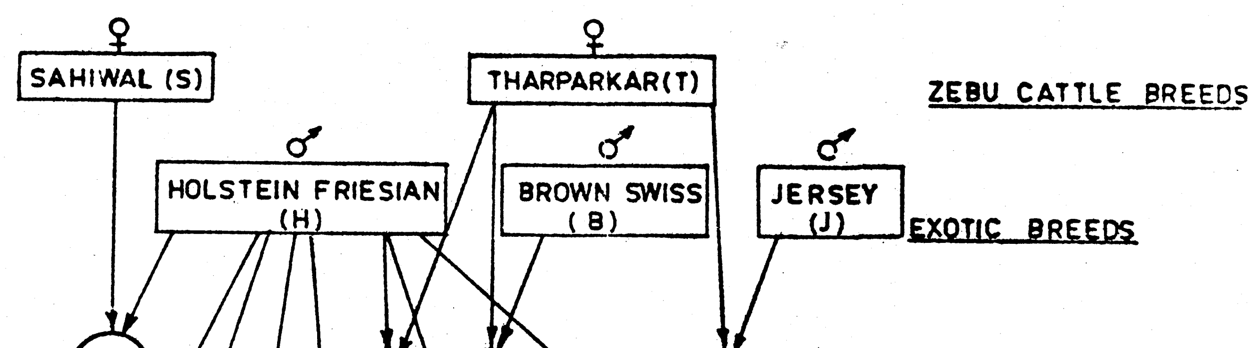
TANEJA, V.K., BHAT, P.N. and GARG, R.C. 1979. Genetic divergence in various Sahiwal x Holstein crossbred grades. Theor. Appl. Genet. 54 : 69-74.

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

Genetic group	No. of cows added in 1980	Year of first calving	Age at first calving (months)	305 days milk yield (kg)	Lactation length (days)	Dry period (days)	Service period (days)	Calving inter-val (days)	Animals retained at the end of 1985 No.	%
CLUSTER-I										
H x HT (75%)	74	77-80	34.8±0.5	3028±82	377±12	67±3.5	177±12	446±12	28	37.8
H x ⅞HT(87.5%)	5	79-80	42.6±1.4	2942±163	477±60	87±33.5	227±60	496±85	0	0.0
H x HS (75%)	25	75-80	33.8±0.8	3061±109	370±15	95±17.0	168±21	467±22	5	20.0
H x ⅞HS(87.5%)	3	-80	33.0±3.0	3037±180	373±47	52±8.5	150±54	425±50	0	0.0
Overall	107		34.8±0.4	3032±178	380±10	74±5.0	172±10	452±11	33	27.6
CLUSTER-II										
H x T (50% F_1)	74	74-79	28.7±0.4	3686±67	345±9	59±3.8	131±11	405±11	28	37.8
H x S (50% F_1)	25	71-80	35.0±1.2	3597±117	341±19	83±12.8	121±22	427±22	8	32.0
Overall	99		30.3±0.5	3664±58	344±10	65±4.0	129±10	410±10	36	36.4
CLUSTER III										
H x BT (75%)	24	78-80	36.8±0.8	2461±96	369±25	57±3.5	115±13	395±13	11	45.8
H x JT (75%)	45	78-80	33.8±0.5	2292±75	361±24	69±5.2	143±15	420±15	11	24.4
Overall	69		34.8±0.5	2346±62	363±18	65±7.0	134±12	413±12	22	31.9
F. test			17.8*	327.7*	1.4	2.5*	6.1*	1.6		

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

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



CLUSTER-II										
H x T (50% F_1)	74	74-79	28.7±0.4	3686±67	345±9	59±3.8	131±11	405±11	28	37.8
H x S (50% F_1)	25	71-80	35.0±1.2	3597±117	341±19	83±12.8	121±22	427±22	8	32.0
Overall	99		30.3±0.5	3664±58	344±10	65±4.0	129±10	410±10	36	36.4
CLUSTER III										
H x BT (75%)	24	78-80	36.8±0.8	2461±96	369±25	57±3.5	115±13	395±13	11	45.8
H x JT (75%)	45	78-80	33.8±0.5	2292±75	361±24	69±5.2	143±15	420±15	11	24.4
Overall	69		34.8±0.5	2346±62	363±18	65±7.0	134±12	413±12	22	31.9
F. test			17.8*	327.7*	1.4	2.5*	6.1*	1.6		

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

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

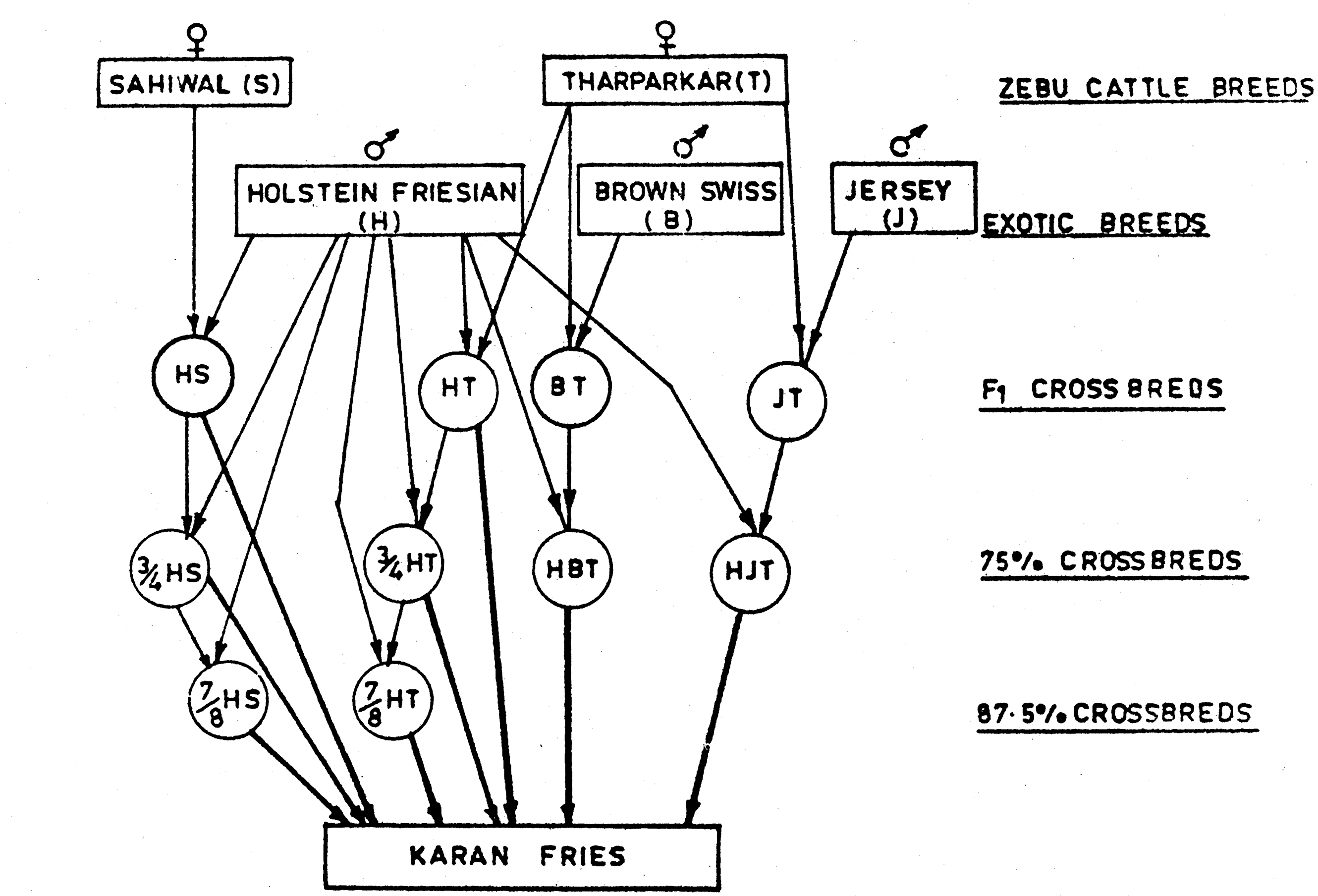
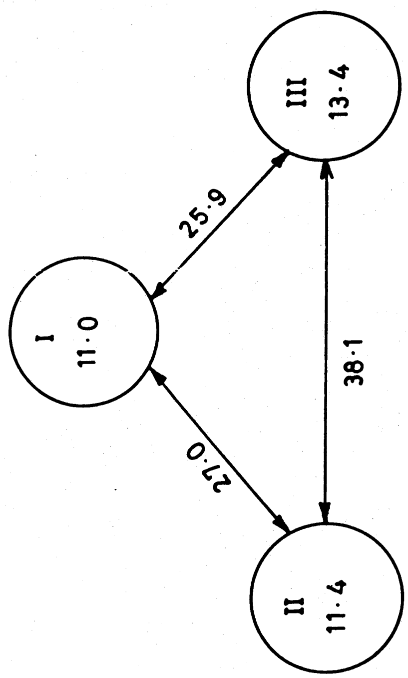


FIG. 2. CLUSTER DIAGRAM INDICATING INTRA AND INTER-CLUSTER DISTANCE



POPULATIONS IN CLUSTER

I : HT 75%, HT 87·5%, HS 75%, HS 87·5%

II: HTF1, HSF1

III: HBT 75%, HJT 75%

INTER-SPECIFIC HYBR
Follow-up Report on Successfu
and *Bos taurus* in H

H. R. KALIA* and C. I

SUMMA

This is a follow-up report
between Yak *(Bos grunniens* x *Bos*
Himachal Pradesh (India) with a vi
than the one in existence by subst
(Zabu) with superior *Bos taurus* (J
manipulations made possible the na
reciprocally. The information rela
given in the text.

RESULTS AND

Subsequent to earlier communi
three (3) more hybrids were born at
Station of the Himachal Pradesh Ag
The relevant information in respec
in the following table:

Sr No	Parentage Sire x dam	Sex of Calf	Date of Birth	Bod Bi
1	JerseyxYak	Male	3-5-81	17.
2	JerseyxYak	Male	8-5-82	13.
3	YakxJersey	Female	13-4-83	-
4	YakxJersey	Female	26-10-85	16.

The hybrids from Jersey dams ca
because seasonality in this breed, u
female hybrids, in particular, are o
the academic and economic viewpoints
animals is too small for intensive i
for enlarging the scope for research
that the government of India through
tural Research has set up a National
eastern State of Nagaland, the Yak i
expected to receive greater fillip i

* Former Geneticist and Vice Chanc
** Assistant Scientist, HP Agri Uni