EVALUATION OF PERFORMANCE OF BROWN SWISS-ZEBU CROSSES FOR CERTAIN ECONOMIC TRAITS

Evaluation des performances du croisement Brune Alpine × zebu en ce qui concerne des divers caractères économiques

Valoración de los rendimientos del cruce parda alpina × cebú con referencia a diversos caracteres económicos

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From time to time various temperate climate breeds like Friesian, Jersey, Ayrshire, Red Danish, Kerry and Brown Swiss have been used for crossbreeding with indigenous Zebu cattle to augment milk production in India. In this paper the reproductive and production performance of Brown Swiss (B. S.) crosses with Sahiwal (Sh.) and Red Sindhi (R. S.) maintained at National Dairy Research Institute, Karnal, have been evaluated.

Material and methods

The records of B. S. × Sh. (F_1 and F_2), B. S. × R. S. (F_1 and F_2) and their contemporary Sh. and R. S., during the years 1965-1971 were considered. The two crossbred groups B. S. × Sh. and B. S. × R. S. were analysed separately. The filial generations within each group are referred to as strain during discussion of results.

The available data on age at first calving (A. F. C.), service period (S. P.), calving interval (C. I.), breeding efficiency (B. E.), lactation milk yield (L. M. Y.), lactation length (L. L.) and dry period (D. P.) upto fifth lactation were studied. The B. E. was estimated according to the method of Wilcox *et al.* (1957). The repeatability of milk yield was estimated by the method of intra-class correlation.

Results and discussion

The data on A. F. C., S. P., C. I. and average B. E. are presented in Table I.

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Age at first calving

The differences for A. F. C. between pure bred Zebu and crossbred strains were significant ($P < 0.01$); the F_1 had lower A. F. C. than F_2 in both the groups, the difference being significant in B. S. × Sh. crosses ($P < 0.01$). The F_1 animals had lower A. F. C. than even the purebred exotic (B. S. cows). This could be due to adaptation incompatibility of B. S. CARNEIRO and LUSH (1954) have similarly observed A. F. C. of 44.0 among B. S. in Brazil. The reports by DANDAPANI (1962) on Jersey × B. S. crosses; WIJERATNE (1970) on Holstein and Jersey crosses with Sinhala similarly showed higher A. F. C. in F_2 heifers. As reported by NAIDU and DESAI (1965) the superior performance of F_1 over F_2 and B. S. suggests the doubtful nature of inheritance of sexual maturity in entirely additive manner.

Service period and calving interval

These were lowest in F_1 followed by F_2 and Zebu. The differences were found to be highly significant ($P < 0.01$) among the strains within each group. In general all the crossbred strains performed better than the Zebu except in case of B. S. × R. S. (F_2) which may be due to small number of observations. The present results agree with those of SEN *et al.* (1953) on Ayrshire crosses with Sh. and R. S., SUNDARESAN *et al.* (1954) on B. S. × R. S. and Jersey × R. S. crosses, DANDAPANI (1962) and AGARWALA (1968) on Jersey × R. S., and SING and DESAI (1966) on Holstein × Sh. crosses. As in the present study WIJERATNE (1970) also reported poorer performance of F_2 crosses.

Breeding efficiency

The average breeding efficiency was lowest in Sh. followed by B. S. × R. S. (F_2), R. S., B. S. × Sh. (F_2), B. S., B. S. × Sh. (F_1) and B. S. × R. S. (F_1) in ascending order (Table I). The differences among strains were found to be significant only on B. S. × Sh. group. No comparative reports are available on Zebu × exotic crosses.

Correlations between birth weight and A. F. C., growth rate and A. F. C.

The phenotypic correlation between birth weight and A. F. C. and growth rate and A. F. C. were -0.41 ± 0.09 ($P < 0.01$) and -0.34 ± 0.15 ($P < 0.05$) respectively in Sh. In other strains these correlations were not significant. The present findings agreed with those of NAIDU and DESAI (1970) in Friesian × Sh. The negative correlations indicate the necessity of further studies in this direction to establish firm basis for selecting animals based on higher birth weight and faster growth rate fo rearlier age at first calving.

Lactation milk yield

The average L. M. Y. based on available records were 1730 ± 34.66 Kg among Sh., 3235 ± 62.52 Kg among B. S. × Sh. (F_1), 2585 ± 164.27 Kg among B. S. × Sh. (F_2). Similar figures for the R. S. group were 1636 ± 55.01 Kg, 3062 ± 129.55 Kg and 2097 ± 252.77 respectively. The average milk yield among B. S. pure bred

TABLE 1

AVERAGE VALUES OF DIFFERENT REPRODUCTIVE TRAITS FOR PUREBRED AND CROSSBRED COWS

Strains	Age at first calving (months)		Service period (days)		Calving interval (days)		Breeding efficiency (%)	
	No.	Mean ± S. E.	No.	Mean ± S. E.	No.	Mean ± S. E.	No.	Mean ± S. E.
Sahiwal	135	40.76 ± 0.63	193	159.3 ± 7.65	198	458.8 ± 7.24	106	82.07 ± 1.33
B. S. × Sh. (F_1)	75	29.56 ± 0.38	168	115.4 ± 5.88	174	398.1 ± 5.54	53	90.78 ± 1.53
B. S. × Sh. (F_2)	26	34.97 ± 1.07	14	129.2 ± 22.70	14	406.4 ± 24.25	10	89.53 ± 5.54
Red Sindhi	56	39.83 ± 0.62	61	137.0 ± 11.04	63	424.6 ± 14.19	34	89.26 ± 0.90
B. S. × R. S. (F_1)...	16	30.86 ± 0.88	57	92.6 ± 6.93	59	375.9 ± 6.66	16	97.04 ± 1.16
B. S. × R. S. (F_2)...	8	33.69 ± 1.29	3	163.7	3	459.0	3	83.58
Brown Swiss	9	32.50 ± 1.46	13	108.5 ± 18.08	14	393.4 ± 15.01	6	90.48 ± 5.07

No. = Number of observations. S. E. = Standard Error.

cows was 2399 ± 175.82 Kg F_1 cows consistently excelled in milk production followed by F_2 and pure bred Zebu. In the case of R. S. group pure bred B. S. was superior to F_2 crosses. The differences among the strains in both the groups were highly signficant ($P < 0.01$).

The results agreed with the findings of SUNDARESAN *et al* (1954) and AGARWALA (1968) among B. S. × R. S. crosses; BRANTON *et al* (1966) among B. S., Jersey and Holstein crosses with R. S.; NAGARCENKAR (1969) among Holstein × R. S. and Ayrshire crosses with Sh. and R. S.; and TANEJA and BHAT (1971) among Holstein × Sh. crosses who have all reported that the crossbreds were significantly superior in milk production over the Zebu dams and contemporaries.

The lactation yields in different lactations revealed that the milk yield in crossbreds increased steadily upto 4th or 5th lactation, whereas in case of R. S. there was only a marginal increase upto 3rd lactation and no such trend was noticed in Sh. cows.

Although the observations by BRANDT *et al.* (1968) among Guernsey, B. S. and Holstein crosses, by BERESKIN and TOUCHBERRY (1966) among Holstein and Guernsey reciprocal crosses revealed no major non-additive type of inheritance for milk yield, the significant difference between F_1 and F_2 cows in the present study suggests the influence of non-additive genic effects. PEARSON and MCDOWELL (1968) in their review on crossbreeding reported upto 11 % heterosis effect on milk production. However, it must be noted that the sires of all F_1 cows were progeny tested with indexes higher than the average of the breed, whereas the sires of the F_2 cows were selected on the basis of their dams' performance and could not be far superior to the average of the F_1 group.

A trend of better combining ability of Sh. with B. S. as compared to R. S. × B. S. was observed on critical examination of the data as presented in Table II. This could be due to better combining ability of Sh. with B. S. as compared to R. S. with B. S.

Lactation length and dry period

The average L. L. of crossbred ranged from 313 to 323 days and D. P. from 62 to 89 days, whereas it was 339 and 115 days for Sh., 300 and 129 days for R. S. and 306 and 86 days for B. S. respectively. The differences among different strains in L. L. was not significant but the same were significant ($P < 0.01$) in case of D. P. These reports agreed in general with those of other workers cited earlier.

Repeatability of milk yield

The repeatability estimates based on first three lactations for Sh., B. S. × Sh. (F_1) and B. S. × R. S. (F_1) were 0.488 ± 0.105, 0.406 ± 0.098 and 0.386 ± 0.162 respectively. In R. S. the estimate was found to be of the order of zero, which could be due to smaller size of the sample. These estimates agreed with the findings of AMBLE *et al.* (1958) and KOONER and SUNDARESAN (1970) whose reports ranged from 0.341 to 0.610.

TABLE 2

FIRST LACTATION YIELD OF CONTEMPORARY SAHIWAL AND RED SINDHI CROSSBRED DAUGHTERS (F_1)

Brown Swiss Sire No.	Sire Index in U. S. A (Kg)	Sahiwal crosses					Red Sindhi crosses				
		No.	Dams Av. L. M. Y. (Kg)	Mid parent value (Kg) (A)	Daughter L. M. Y. (Kg) (B)	Difference (B-A)	No.	Dams Av. L. M. Y. (Kg)	Mid parent value (Kg) (A)	Daughters average L. M. Y. (Kg) (B)	Difference (B-A)
2	5045	9	1964	3455	2779	— 676	2	1398	3222	3161	— 61
3	5662	8	1981	3817	2977	— 840	2	2616	4136	1742	— 2374
4	5299	3	1852	3576	3867	+ 291	1	2331	3818	2791	— 1027
5	5995	2	2210	4102	3375	— 727	3	1332	3663	2641	— 1022
6	5939	7	1635	3786	3205	— 581	2	1755	3842	2201	— 1641
				Average ...		— 507					— 1229

L. M. Y. = Lactation Milk Yield.

SUMMARY

It will be interesting to further investigate the effect of non-additive genic effects in milk production among different filial generations of crossbred animals. The combining ability of different temperate breeds with various Zebu breeds needs also further exploration to exploit best productive ability in the tropical environment.

RESUME

Des investigations postérieures sur l'effet de gènes non-additifs en relation avec la production laitière entre diverses générations filiales d'animaux croisés seraient intéressantes. La capacité de combinaison des différentes races de pays tempérés avec de différentes races de zébus nécessite un plus grand approfondissement pour profiter de la plus grande capacité productive sous des conditions tropicales.

RESUMEN

Serían interesantes investigaciones posteriores sobre el efecto de genes no aditivos en relación con la producción lechera entre diversas generaciones filiales de animales cruzados. La capacidad de combinación de las diferentes razas de países templados con varias razas de cebú necesita mayor profundización para la mayor capacidad productiva bajo condiciones tropicales.

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