

Electrophoretic Haemoglobin Types in Jersey Cattle in Gujarat State

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ABSTRACT

Two Jersey farms (1) the IDC Project Farm, Anand, (2) the SAGP Bidaj Farm, Bidaj, are established in Gujarat State as "Bull Mother Farms" to provide Jersey bulls necessary for crossbreeding programme of our country. The Jersey animals of both the farms have been brought from two different countries, i.e. Australia and Denmark, respectively. It was proposed to study genetic architecture of Jersey animals of two different origin, with respect to haemoglobin types. Agar gel electrophoresis technique was used to study various haemoglobin types. Blood samples from 199 Jersey animals of Anand farm and 85 Jersey animals of Bidaj farm were collected. The gene frequency of Hb^A and Hb^B alleles in Anand farm was 0.493 and 0.507, respectively, while in Jersey animals of Bidaj farm it was 0.635 and 0.365, respectively. The gene frequencies of both the alleles were in genetic equilibrium in both the farms. The gene frequencies of both the alleles differed significantly between the Jersey animals of both the farms.

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INTRODUCTION

THE GENETIC POLYMORPHISM in blood proteins and milk proteins have been studied in last 25 years only. Cabannes and Serain (1955) were first to report the presence of three different haemoglobin types in Algerian cattle. Bangham (1957) found out that different haemoglobin types i.e. Hb-AA, Hb-AB and Hb-BB were governed by two different codominant alleles, Hb^A and Hb^B. Since then genetic polymorphism in haemoglobin have been studied in Indian and Exotic cattle breeds by many research workers. Uptill now five different haemoglobin alleles have been located. These are Hb^A, Hb^B, Hb^C, Hb^D and Hb^K. It was thought worthwhile to investigate

the haemoglobin types and their frequencies in two Jersey farms, (1) the Indian Dairy Corporation Project Jersey Farm, Anand, under the control of the Gujarat Agricultural University, Ahmedabad (2) Sabarmati Ashram Gaushala Project, Bidaj Farm, Bidaj, managed by National Dairy Development Board, Anand, in Gujarat State.

MATERIALS AND METHODS

Blood samples from 199 Jersey animals of Anand farm and 85 Jersey animals from Bidaj farm were collected. All animals above six months of age were included in present study. About five millilitre blood was collected in glass vials using Sod. Citrate as anti coagulant.

Haemolysates were prepared containing 5.0 gm per cent haemoglobin. Agar gel electrophoretic technique as proposed by Ivor Smith (1960) was used for typing of haemoglobin. 1.0% amido black soln. was used for staining the gel. Haemoglobin phenotypes were identified as Hb-AA, Hb-AB and Hb-BB on the basis of their relative migration. (Bangham 1957).

RESULTS AND DISCUSSION

Three different haemoglobin types Hb-AA, Hb-AB and Hb-BB were found. The haemoglobin types were determined according to their rate of migration towards the anode from the point of origin. (Bangham 1957). Haemoglobin type Hb-AA was represented by one

slow migrating band, Hb-AB was presented by one slow migrating band and one fast migrating band, and haemoglobin type Hb-BB was represented by one fast migrating band.

The distribution of various haemoglobin types Hb-AA, Hb-AB and Hb-BB and the gene frequency of two alleles Hb^A and Hb^B in the Jersey animals of Anand farm and Bidaj farm are presented in Table 1. The gene frequencies of Hb^A and Hb^B alleles were examined for genetic equilibrium in both the farms. The gene frequencies of Hb^A and Hb^B alleles were found in genetic equilibrium (Table

Shreffler and Salisbury (1960), Hojgaard *et al* (1960), Nikolajczuk

TABLE 1
Gene and genotypic frequencies of haemoglobin types.

Herds	No. of observations	Genotypic Frequency			Gene Frequency	
		Hb-AA	Hb-AB	Hb-BB	Hb ^A	Hb ^B
Anand	199	0.2462 (49)	0.4925 (98)	0.2613 (52)	0.493	0.507
Bidaj	85	0.3765 (32)	0.5176 (44)	0.1059 (09)	0.635	0.365

TABLE 2
Observed number of animals with three different haemoglobin types and their expected number assuming Hardy Weinberg equilibrium.

Herds	Haemoglobin types	Observed		Expected		X ²	D.F.
		No	%	No.	%		
Anand	Hb-AA	49	24.62	48.35	24.30	0.2425	1
	Hb-AB	98	49.25	99.48	49.99		
	Hb-BB	52	26.13	51.16	25.71		
Bidaj	Hb-AA	32	37.65	34.27	40.32	1.1601	1
	Hb-AB	44	51.76	39.41	46.36		
	Hb-BB	09	10.59	11.32	13.32		

N.S. = Non Significant.

(1967) and Naik *et al* (1963) have reported the gene frequency of Hb^B allele ranging from 0.35 to 0.40 in Jersey cattle of America, Denmark, Poland and India, respectively. The result obtained in present study for the Hb^B allele in Bidaj farm is in agreement with the above results. Moustgaard and Möller (1962) found the gene frequency of Hb^B allele in Danish Jersey animals even lower than present findings for the Jersey animals of Bidaj farm. Busch (1968) reported the gene frequency of Hb^B allele as 0.5 in Jersey animals. The present results obtained for the Jersey animals of Anand farm are in agreement with his results. Bangham (1957), Grimes *et al* (1957), Salisbury and Shreffler (1957) and Bangham and Blumberg (1958) have reported the gene frequency of Hb^B allele around 0.6, in Jersey animals of European countries, which is higher than the gene frequency obtained for the Hb^B allele in the Jersey animals of both the farms.

Comparison of gene frequencies of haemoglobin variants in two Jersey farms:

The differences between farms for the gene frequencies of Hb^A and Hb^B alleles were found significant. The Jersey animals on Anand and Bidaj farms have been brought from Australia and Denmark, respectively. The possible reason for the differences in gene frequencies could be the difference in selection practices for the Jersey animals in these two countries for many years, which might have indirectly drifted the gene frequencies of haemoglobin alleles well apart.

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