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Haemoglobin polymorphism in Gir crossbred cattle

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ABSTRACT : Haemoglobin polymorphism was investigated using blood sample of 141 Gir crossbred cattle including 80 half breed (50% Holstein Friesian × 50% Gir) and 61 triple crossbred (50% Holstein Friesian + 25% Jersey + 25% Gir) belonging to Research cum-Development Project, M.P.K.V., Rahuri (M.S.). Gir crossbred cattle were typed for haemoglobin using the electrophoretic technique (PAGE). Haemoglobin was polymorphic among the Gir crossbred cattle. The three phenotypes were observed viz., Hb AA, Hb AB and Hb BB in all the Gir crossbred cattle indicated the presence of two co-dominants alleles Hb^A and Hb^B controlling the occurrence of these three phenotypes. The heterozygous phenotypes Hb AB was most frequent, followed by homozygous phenotypes Hb AA and Hb BB. The gene frequency of Hb^A allele was more than Hb^B allele in half bred and triple crosses as well as overall Gir crossbred population. The electrophoretograms of haemoglobin at different ages of animal did not exhibit any change in the banding pattern/mobility of bands. The Chi-square (χ^2) test revealed the population to be under Hardy-Weinberg equilibrium with Hb^A and Hb^B genes.

KEY WORDS : Crossbred cattle, Gene frequency, Gir, Haemoglobin polymorphism

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INTRODUCTION

The bovine haemoglobin was first demonstrated by Cabbanes and Serain (1955). Several workers have reported the significant association between these haemoglobin types and economic traits in various exotic and Indian breeds. The existence of such association will help to select animals at very early age. Also, various crossbreeding programmes with different exotic inheritance were taken up in India and the frequency distribution of haemoglobin types in some of these crosses is not yet known. Hence, the present study was undertaken to study the haemoglobin polymorphism in Gir crossbred cattle which is one of the principal Zebu or *Bos indicus* breeds in India and is used for both dairy and beef production. It has been also used locally in the improvement of Red Sindhi, Sahiwal and Brahman breeds in North America.

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MATERIALS AND METHODS

The investigation on haemoglobin polymorphism in Gir crossbred cattle was carried out at Research-cum Development Project on Cattle, M.P.K.V., Rahuri (M.S.). The crossbred cattle included 80 animals of 50 per cent Holstein Friesian + 50 per cent Gir (IFG) and 61 animals of 50 per cent Holstein Friesian + 25 per cent Jersey + 25 per cent Gir (IFJG). Haemolysate were prepared from the blood sample collected from Gir crossbred animals belonging to 0-3, 3-6, 6-12, and above 12 months of age groups as per the method described by Beherent (1957) for haemoglobin typing.

The polymorphic variants of haemoglobin, was done by vertical slab gel electrophoresis in polyacrylamide gel (PAGE) using a discontinuous buffer system at low temperature (4 - 8°C) with slight modification (Davis, 1964). Resolving gel with pH 8.8 were prepared by weighing 12.114 g tris-hydroxymethyl aminomethane in 80 ml distilled water and adding 1 N HCl drop wise to make the final volume 100 ml. Similarly, stacking gel with pH 6.8 was prepared with same chemicals. The electrophoresis was conducted initially at 30 mA till the samples migrated into running gel and subsequently at 50 mA at constant voltage. For separation of the haemoglobin bands electrophoretic run was continued for 6-8 hours. Staining of the haemoglobin bands was done in rinising solution of 1 per