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Genetic polymorphism of bone morphogenetic protein receptor type-1 (BMPR1B) gene in crossbred does of Bihar

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Bihar is predominantly inhabited by Black Bengal breed of goat. However, crosses with other breeds like Jamunapari, Barbari, Sirohi and Jakharna are also available (De *et al.* 2007). Moreover, the twinning percentage of these crosses was found comparable with prolific Black Bengal breed of goat. But the genetic basis of their prolificacy has not been studied. Genes affecting prolificacy in small ruminants include bone morphogenetic protein receptor type-1 gene (BMPR1B), growth differentiation factor-9 (GDF9), bone morphogenetic factor (BMP15) gene, estrogen receptor gene, kisspeptin gene and others. BMPR1B gene which is also known as Fec B gene, was found polymorphic in Black Bengal goats. Since the crossbred goats in village include crosses of Black Bengal goats with Jamunapari, Barbari, Sirohi and Jakharna breeds, the present study aimed to study the polymorphism of BMPR1B gene in crossbred does of Bihar.

Apparently, blood samples of 100 crossbred does were randomly collected from different villages of Bihar. The history of litter size in respective kidding for every doe was collected from the farmers. DNA was extracted from white blood cells using a standard phenol/chloroform/ isoamyl alcohol extraction protocol (Sambrook and Russel 2001). Allele specific amplification of the BMPR1B gene was achieved by method described by Polley *et al.* (2009). Allele discrimination was based on size differentiation (bp) of respective alleles in BMPR1B gene.

Allele specific amplification of BMPR1B gene in crossbred goats revealed that BMPR1B gene is polymorphic in nature. Two alleles A (wild type nucleotide-non carrier) and G (*Fec B* mutant nucleotide carrier) were identified at this locus. Three different genotypes AA (1100 bp), AG (1100 bp and 136 bp) and GG (136 bp) were detected. The presence of the 'A' nucleotide in wild type animals codes for glutamine amino acid but presence of 'G' replaces this amino acid with arginine. The frequency of A allele and G allele were 0.48 and 0.52, respectively in the population studied. This indicated predominance of mutant type (G) nucleotide in village goats.The genotypic frequencies of genotypes AA, AG and GG in the crossbred does were 0.16, 0.62 and 0.22, respectively. Similar alleles (A and G) were reported by Polley *et al.* (2009) and Kumari *et al.* (2015) in Black Bengal goat breed from West Bengal and Bihar, respectively. Kumari *et al.* (2015) reported that AG and GG genotypes existed in equal frequency in the Black Bengal goat population. The allelic frequencies for A and G alleles were 0.25 and 0.75, respectively. Predominance of mutant type (G) nucleotide in Black Bengal goats was similar to the findings of present study.

Several studies have reported BMPR1B gene as the major gene that influences prolificacy in small ruminants (Davis *et al.* 2006, Fabre *et al.* 2006, Hassan *et al.* 2007). The findings of the present study indicated sign of introgression of mutant allele (G) from Black Bengal goat into Jamunapari, Barbari, and Sirohi goats at village level.The variation in litter size among the genotypes revealed the benefits of introgression of Fec B mutation in the crosses. The litter size showed variation among the three genotypes of crossbred goats. Percentage singles, twins and triplets were 69, 29 and 2 in AA genotype; 42, 52 and 6 in AG genotype and 14, 66 and 20 in GG genotype, respectively**.** The twinning percentage in AG and GG genotype in crossbred does was 52 and 66, respectively. This was higher than the twinning percentage reported in parent breeds. The Jamunapari is a tall, white and large size milk goat breed with twinning percentage about 52% (Rout *et al.* 2000). Kumar *et al.* (2001) reported litter size of 1.06 with 5.2% twins in Sirohi breed of goats. Barbari goat breed is a prolific breed with twinning percentage of 49.3 (Acharya 1982). The findings of present study suggest that genetic upgradation for prolificacy in goats is taking place at village level, due to introgression of Fec B gene from Black Bengal breed of goat. Further studies are required for validation of results on large sample size. Bhowmik *et al.* (2014) reported that introduction of Jamunapari genes resulted in improvement of meat and milk yield traits of Black Bengal goats. So, future studies can be

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targeted in this direction to solve low milk production issues leading to high kids' mortality in Black Bengal breed.

SUMMARY

Screening of bone morphogenetic protein receptor type-1 gene (BMPR1B gene) also known as Fec B gene polymorphism was done for detecting the genetic basis of prolificacy in crossbred does of Bihar. The study revealed two allelic variants (A=0.48 and G=0.52) and three genotypes (AA=0.16, AG=0.62 and GG=0.22).The findings of thestudy indicate sign of introgression of mutant allele (G) into Jamunapari, Barbari, and Sirohi goats at village level from Black Bengal breed. The variation in litter size among the genotypes revealed the benefits of introgression of Fec B mutation in the crosses. The litter size showed variation among the three genotypes. Percentage singles, twins and triplets were 69, 29 and 2 in AA genotype; 42, 52 and 6 in AG genotype and 14, 66 and 20 in GG genotype, respectively.

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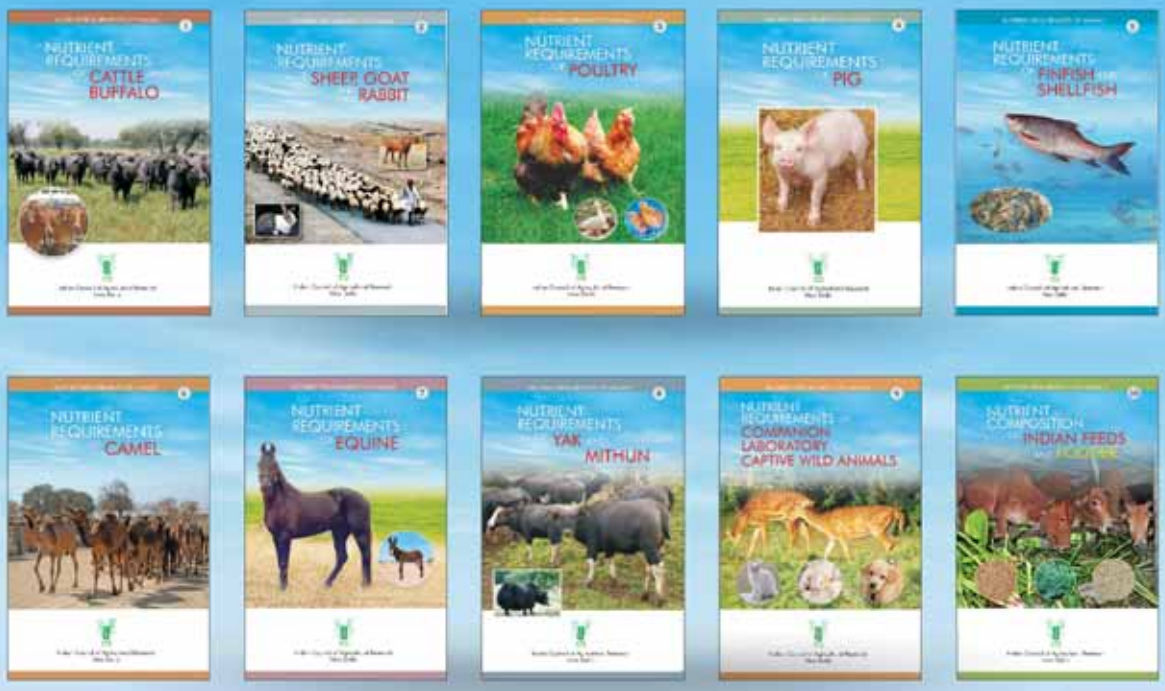
NUTRIENT REQUIREMENTS OF ANIMALS



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