

Identification of Gdf9 Gene And its Relationship with The Prolific Traits on Indonesian Local Goats

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ABSTRACT

Local goats is very potential for breeding program which suitable to the Indonesia local conditions. The sampling was conducted in four genotypes of the Indonesian local goats (amounts 149 goats) namely: 25 animals Kacang goats, 29 head PE goats, 35 Muara goats and 60 Samosir goats. The goats blood were with absolute Ethanol. DNA extracted analyzed by PCR and RFLP methods for GDF9 gene. The result showed that the identification of GDF 9 gene promoter were polymorphic than and have our relationship with the prolific traits on the twinning does on Kacang and PE genotypes of goats, but were monomorphic on the Samosir and Muara genotypes of goats.

Key Words: GDF9 gene, The Indonesian local goat, Fecundity gene

INTRODUCTION

Prolificacy is known as reproductive characteristic of animal that can produce multiple births. This trait is controlled by a single gene. The prolific gene itself was controlled by a well-known as the family genes fertility, a bone morphogenetic protein receptor type 1B (BMPR1B). This gene is also known as *Fecundity Boorola* (FecB) (Souza *et al.* 2001; Davis 2005, Davis *et al.* 2006); *growth differentiation factor 9* (GDF9), called FecG (Hanrahan *et al.* 2004); *bone morphogenetic protein 15* (BMP15) is called the FecX (Hanrahan *et al.* 2004; Galloway *et al.* 2000). Three genes fecundities above are classified as TGF- β super family who have been identified in mammals.

Kacang goat has an average of litter size between 1.56 - 1.98 kids per birth (Sodiq *et al.* 2003; Hoda 2008), for PE goats around 1.3-1.7 kids per birth (Sodiq *et al.* 2003), but for Samosir and Muara goats there were no reports their prolificacy. The purpose of this research is to identify the diversity of GDF9 gene in two groups, namely non-prolific group and prolific group of Kacang, PE, Samosir and Muara goats.

MATERIALS AND METHODS

Blood samples of Kacang and PE goats were from Indonesian Goats Research Station, while blood sample of Samosir and Muara goats were taken from local farmers in Samosir district and the Muara goats from farmers in the North Tapanuli district, North Sumatra Province. Blood sample collected were resulted 149 tubes of DNA of a group of single kid per birth and of a group of twin kids per birth.

Amplification of GDF9 genes in the promoter were using Takara Thermal Cycler primary AF 211 *forward* CCTCAGTCTTCTCCTCGGTTCC and AF 212 *reverse* CTGGAA GTGG GAGAAGTGG which refers to Dong *et al.* (2005). Amplification GDF9 produces the DNA with long-term 1972 pb based sticking in primary minimally futuristic setting DNA- *Beatrice Capra hircus* with accession number EF446168. Nucleotides edited with the program Bio Edit version 6.0.7. DNA sequence edited aligned *Beatrice Capra hircus* published in genbank

(<http://ncbi.nlm.nih.gov>). Alignment Clustal W version 8.1 in the program MEGA-4 (Tamura *et al.*, 2007). In processing to determine the structure of genes BLASTN v. 2.2.25 program was used and were analyzed using MEGA version 4 program.

RESULT

Gene GDF9 amplification using AF 211 primary and AF 212 produces fragments of DNA with long-term 1296 pb (Figure 1).

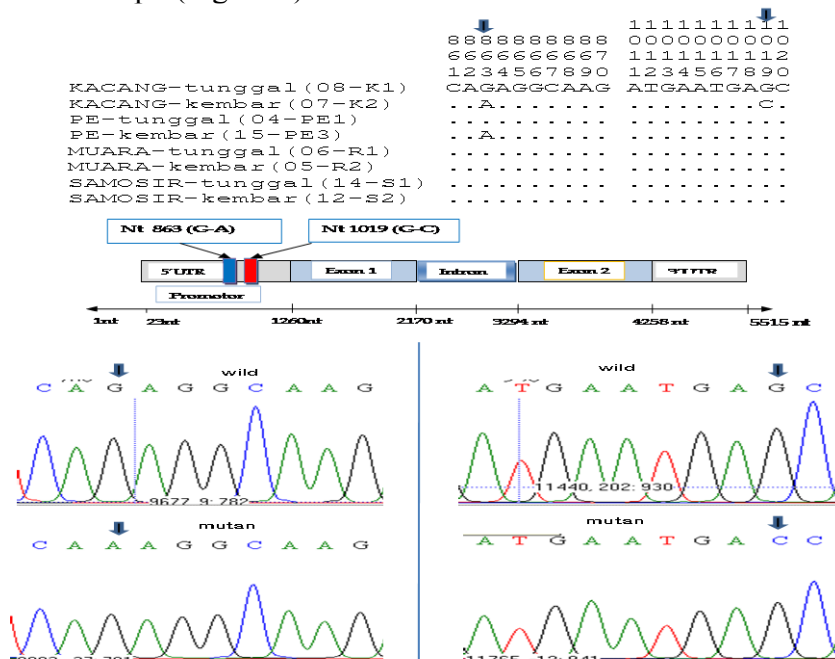


Figure 1. Gene mutation nucleotides GDF9 road promoter in the current prolific does (mutants) and *non*-prolific parent (wild) in Kacang goat and PE goats.

Mutations in GDF9 gene can increase the high ovulation and litter size. Ruminants with small genotypes heterozygote carrier will increase ovulation average 1.5 with average litter size 1.0. While genotypes surviving carrier will increase the ovulation average 3.0 with average of litter size 1.5 (Davis, 2005). If the result of GDF9 gene amplification that has been cut off with enzymes were still in doubt, then it should be verified by sequencing method. The sequence in its genes GDF9 shows that there is a polymorphisms one nucleotide a mutation substitution G - nucleotide position in A to 836 in Kacang goat and PE, and the mutations substitution G - C at Kacang goats at the site of the 1019 AD.

DISCUSSION

Diversity of GDF9 gene on prolific goats is varied and influenced by genotypes and DNA position. The roads GDF9 exons 1 and 2 in prolific Black Bengal goats is a well-known monomorphic, but in a Jining Gray goats is reportedly polymorphic (Feng *et al.*, 2010). This result is almost the same with the result reported by Polley *et al.* (2009). The mutation of nucleotides GDF9 allele gene in the promoter in the Kacang and PE goats can add hits the variety gene selection of prospective GDF9 for financing the development of prolific goats. Trace nucleotides GDF9 gene is thought to be related to polymorphic and setting prolificacy nature of White goat (Xu and qin *et al.* 2009), Jining Gray goat (Feng *et al.* 2010), while this gene is also monomorphic in Black Bengal goats (Polley *et al.*, 2009), Boer and Huanghuai goats (He 2010). Based on the mutations that are parsimony trace nucleotides gene GDF9 road promoter shows that the Indonesian local goats were in the cluster development and more closely with Jining Gray goat of China.

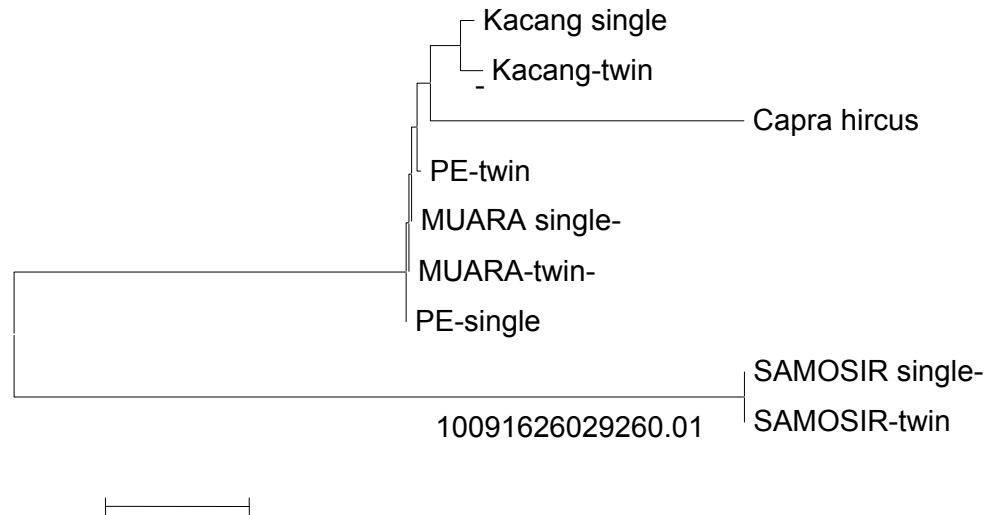


Figure 2. Dendrogram of Indonesian local goats based on the roads trace nucleotides promoter gene GDF9 NJ method, bootstrap 1000x

IMPLICATIONS

Mutation of GDF9 gene road promote polymorphic and there is a relationship of recent global gene GDF9 mutation with the nature prolific of Kacang goats and PE goats. GDF9 gene diversity in of Muara and Samosir goats were monomorphic.

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