

INTISARI

Sapi Jawa-Brebes (Jabres) ditetapkan sebagai kekayaan plasma nutfah ternak Indonesia yang harus dilindungi dan dilestarikan. Sapi induk Jabres memiliki ciri khas yaitu kemampuan beranak mencapai 15-20 ekor pedet selama masa hidupnya. Akan tetapi, belum adanya penanda genetik khusus reproduksi dan terjadinya penurunan populasi mengancam kelestarian genetik sapi Jabres. Oleh karena itu, eksplorasi karakteristik reproduksi dengan menggunakan gen leptin, IGF-1, dan FSHR penting untuk melestarikan genetik sapi Jabres. Penelitian ini dibagi dalam 4 (empat) tahap. Penelitian Tahap I: Karakterisasi reproduksi sapi induk Jabres dan pengaruh *body condition score* (BCS) terhadap reproduksi sapi induk Jabres. Data reproduksi yaitu estrus setelah beranak (ESB), hari tidak bunting (HTB), dan jarak beranak (JB) diperoleh dari 88 ekor sapi induk Jabres melalui wawancara peternak. Data BCS ternak diperoleh melalui penilaian langsung pada kondisi ternak dengan skala penilaian 1 sampai 5. Karakteristik ESB, HTB, dan JB sapi Jabres yaitu $101,6 \pm 41,23$, $139,9 \pm 54,99$, $410,9 \pm 54,42$ hari. Karakteristik HTB dan JB sapi Jabres dipengaruhi ($p < 0,05$) oleh BCS. Sapi dengan BCS 3 memiliki HTB dan JB lebih pendek dibandingkan sapi Jabres BCS 2. Penelitian Tahap II: Identifikasi keragaman gen leptin dan pengaruhnya terhadap parameter reproduksi sapi induk Jabres. Sampel darah diperoleh dari 17 ekor sapi induk Jabres. Prosedur yang digunakan adalah PCR dan analisis sekuens. Sapi Jabres memiliki kekerabatan paling dekat dengan *Bos javanicus* (0,0021) dibandingkan bangsa sapi lain berdasarkan sekuens dari ekson 3 gen leptin. Dari perbandingan dengan *Bos taurus*, teridentifikasi 4 mutasi di ekson 3 gen leptin pada sapi Jabres di posisi g.3257C>T, g.3260T>Y, g.3272T>Y, dan g.3356C>T. Genotipe g.3260T>Y dan g.3272T>Y berada dalam *Hardy-Weinberg equilibrium* (HWE). Mutasi g.3272T>Y cenderung mempengaruhi ESB ($p = 0,052$), HTB ($p = 0,059$), dan JB ($p = 0,067$) sapi induk Jabres. Variasi ini juga berkorelasi ($p < 0,05$) dengan BCS sapi induk Jabres. Genotipe heterozigot TC dan homozigot CC (resesif) pada g.3272T>Y memiliki karakteristik reproduksi dan BCS yang lebih baik dibandingkan genotipe homozigot TT (dominan). Penelitian Tahap III: Pemetaan mutasi gen IGF-1 dan pengaruhnya terhadap reproduksi sapi induk Jabres. Sampel darah diperoleh dari 45 ekor sapi induk Jabres. Prosedur yang digunakan adalah PCR- RFLP dengan enzim *Sna*BI. Analisis RFLP gen IGF-1 dengan enzim *Sna*BI menghasilkan genotipe tunggal CC (dominan) dengan ukuran fragmen 249 bp. Penelitian Tahap IV: Kajian deteksi variasi gen FSHR dan korelasinya dengan reproduksi sapi induk Jabres. Sampel darah diperoleh dari 45 ekor sapi induk Jabres. Prosedur yang digunakan adalah PCR-RFLP dengan enzim *Faq*I. Semua amplikon produk PCR gen FSHR dipotong oleh enzim *Faq*I menjadi 2 fragmen dengan ukuran 128 dan 28 bp. Semua sapi Jabres hanya memiliki genotipe tunggal GG (dominan) berdasarkan fragmen DNA dari gen FSHR. Hasil penelitian ini dapat disimpulkan bahwa mutasi g.3272T>Y pada gen leptin berpotensi sebagai penanda genetik kesuburan reproduksi sapi induk Jabres. Disisi lain, FSHR G-278A/*Faq*I dan IGF-1 C-512T/*Sna*BI bukan penanda genetik kesuburan reproduksi sapi induk Jabres.

Kata kunci: FSHR, IGF-1, Leptin, Mutasi, Reproduksi, Sapi Jabres

ABSTRACT

Jawa-Brebes (Jabres) cattle is an indigenous Indonesian breed classified as having a protected and preserved livestock germplasm. The Jabres cow is renowned for unique reproductive characteristics, including a calving rate of 15–20 calves during the lifespan. However, no genetic markers and the decrease in population threaten sustainability of Jabres cows. Thus, characterization of reproductive traits using diversity of leptin, IGF-1, and FSHR genes is vital to preserve Jabres cows. The research was divided into 4 (four) studies. Study I: Characterization of reproductive traits of Jabres cows and the effect of body condition score (BCS) on them. Reproductive data, namely post-partum estrous (PPE), days not pregnant (DNP), and calving interval (CI) of 88 Jabres cows were obtained through farmer interviews. The BCS data was obtained through direct assessment on a scale of 1 to 5. The PPE, DNP, and CI of Jabres cows were 101.6 ± 41.23 , 139.9 ± 54.99 , 410.9 ± 54.42 days, respectively. The DNP and CI were influenced ($p < 0.05$) by BCS. Jabres cows with BCS 3 had shorter DNP and CI than cows with BCS 2. Study II: Identification of leptin gene diversity and its effect on reproductive parameters of Jabres cows. Blood samples were obtained from 17 Jabres cows. The PCR and sequence analysis were used in the study. Jabres cows had a closer relationship with *Bos javanicus* (0.0021) than other breeds based on exon 3 of leptin gene sequences. Based on the comparison with *Bos taurus*, four mutations were identified in exon 3 of the leptin gene in Jabres cows at positions g.3257C>T, g.3260T>Y, g.3272T>Y, and g.3356C>T. The g.3260T>Y and g.3272T>Y genotypes were in Hardy-Weinberg equilibrium (HWE). The g.3272T>Y mutation tended to affect PPE ($p = 0.052$), DNP ($p = 0.059$), and CI ($p = 0.067$) of Jabres cows. The variation was also correlated ($p < 0.05$) with BCS of Jabres cows. The TC (heterozygote) and CC (recessive) genotypes in g.3272T>Y had better reproductive traits and BCS than the TT (dominant) genotype. Study III: Mapping IGF-1 gene mutations and their effect on reproduction in Jabres cows. Blood samples were attained from 45 Jabres cows. PCR-RFLP with *Sna*BI enzyme was used in the study. The RFLP analysis of the IGF-1 gene with *Sna*BI enzyme resulted in a single genotype CC (dominant) with a fragment size of 249 bp. Study IV: Detection of FSHR gene variation and its correlation with reproduction parameters of Jabres cows. Blood samples were obtained from 45 Jabres cows. The PCR-RFLP with *Faq*I enzyme was employed in the study. All amplicons of FSHR gene were cut by *Faq*I enzyme into 2 fragments with sizes of 128 and 28 bp. All Jabres cows only had a single GG (dominant) genotype. In conclusion, the findings concluded that g.3272T>Y mutation of exon 3 leptin gene is a potential marker for fertility traits of Jabres cows. In contrast, neither FSHR G-278A/*Faq*I nor IGF-1 C-512T/*Sna*BI is a possible genetic marker for fertility in Jabres cows.

Keywords: FSHR, IGF-1, Jabres cows, Leptin, Mutation, Reproduction