DETEKSI *SINGLE NUCLEOTIDE POLYMORPHISM* DAN HUBUNGAN *POLYMORPHISM* GEN *MELANOCORTIN 4 RECEPTOR* TERHADAP SIFAT PERTUMBUHAN DAN *FEED INTAKE* PADA KAMBING BLIGON

INTISARI

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Gen *melanocortin* 4 *receptor* (MC4R) merupakan gen yang mempengaruhi aktivitas saraf simpatik, fungsi adrenal dan tiroid, dan sebagai media kerja leptin dalam meregulasi keseimbangan energi dan homeostasis. Penelitian ini bertujuan untuk identifikasi *single nucleotide polymorphism* (SNP) gen MC4R pada kambing Bligon dan hubungannya terhadap sifat pertumbuhan dan *feed intake* pada kambing Bligon. Materi penelitian 1 adalah sampel darah dari 77 ekor kambing Bligon yang dipelihara di kelompok wanita tani (KWT) Gama Ngudi Lestari, Banyusoco, Gunung Kidul. Penelitian 2, data genotip kambing Bligon dan data sifat pertumbuhan pada umur 0 hari (lahir) dan 3 bulan (sapih) sebanyak 77 ekor dan 1 tahun sebanyak 50 ekor yang dipelihara di Banyusoco. Penelitian 3, penelitian dilakukan pada dua kondisi yaitu kondisi terkontrol (Laboratorium/Fakultas Peternakan) dan tidak terkontrol (Lapangan/Banyusoco). Kambing Bligon umur 3 bulan sebanyak 23 ekor dipelihara di Laboratorium (kondisi terkontrol) dan 23 ekor kambing dipelihara di Banyusoco (kondisi tidak terkontrol) kemudian diamati *feed intake* pada umur 4 dan 7 bulan. Metode identifikasi genotip menggunakan sekuensing dan PCR-RFLP menggunakan enzim *Kpn*I (G_GTAC'C) pada Penelitian 1. Penelitian 2 dilakukan penimbangan berat badan, ukuran tubuh (panjang badan, lingkar dada, tinggi gumba dan tinggi pinggul), pertambahan berat badan harian (PBBH) pra sapih dan PBBH pasca sapih kemudian data-data tersebut diasosiasikan dengan data genotip kambing Bligon. Variabel yang diamati pada Penelitian 3 antara lain *feed intake*, nutrien tercerna, kecernaan nutrien dan *feed conversion ratio* (FCR). Data-data tersebut diasosiasikan dengan genotip kambing Bligon. Hasil Penelitian 1, dua polimorfisme DNA gen MC4R teridentifkasi pada daerah ekson (g.998A/G dan g.1079C/T). Pada SNP g.998A/G membentuk 3 genotip yaitu AA, AG dan GG dan SNP g.1079A/C menyebabkan tiga genotip yaitu CC, CT dan TT. Hasil Penelitian 2, genotip AA dan AG menunjukkan berat sapih, panjang badan sapih, lingkar dada sapih, lingkar dada setahun dan tinggi gumba setahun lebih tinggi dibandingkan dengan genotip GG pada lokasi SNP g.998A/G. Berdasarkan SNP g.1079C/T, genotip CC dan CT memiliki berat sapih, PBBH pra sapih dan lingkar dada setahun lebih tinggi dibandikan dengan genotip TT. Hasil Penelitian 3 menunjukkan bahwa SNP g.1079C/T memiliki efek signifikan pada kecernaan bahan kering (BK), bahan organik (BO), dan *total digetible nutrients* (TDN) kambing Bligon umur 7 bulan yang dipelihara di Fakultas Peternakan di mana genotip CC memiliki kecernaan BK, BO dan TDN lebih tinggi dibandingkan dengan genotip TT dan kecernaan BK, protein kasar (PK), ekstrak tanpa nitrogen (ETN) dan TDN pada kambing Bligon umur 7 bulan yang memiliki genotip CT lebih tinggi daripada genotip CC yang di pelihara di Banyusoco. Perubahan basa pada SNP g.988A/G dan g.1079C/T dapat digunakan untuk identifikasi genotip kambing Bligon dan dapat direkomendasikan sebagai *marker*

untuk seleksi ternak untuk sifat pertumbuhan berat sapih, panjang badan sapih, lingkar dada sapih, lingkar dada setahun dan tinggi gumba setahun lebih tinggi (SNP g.988A/G) dan berat sapih, PBBH pra sapih dan lingkar dada setahun (g.1079C/T). Pada penelitian ini hanya SNP g.1079C/T yang dapat direkomendasikan sebagai *marker* untuk seleksi ternak berdasarkan kecernaan kecernaan BK, BO dan TDN pada kondisi terkontrol dan kecernaan BK, PK, ETN dan TDN pada kondisi tidak terkontol.

Kata kunci: MC4R, kambing Bligon, sifat pertumbuhan, *feed intake*, FCR

DETECTION OF SINGLE NUCLEOTIDE POLYMORPHISM AND ASSOCIATION OF MELANOCORTIN 4 RECEPTOR GENE POLYMORPHISM WITH GROWTH TRAITS AND FEED INTAKE IN BLIGON GOAT

ABSTRACT

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Melanocortin 4 receptor (MC4R) gene has been regarded to have major impacts on sympathetic nerve activity, adrenal and thyroid function, and leptin action in regulating energy balance and homeostasis. This study aimed to identify MC4R gene variants in Bligon goat and their association with growth traits and feed intake. This study was divided into three sub-studies (Study 1, Study 2 and Study 3). Blood samples of 77 Bligon goats managed in KWT Gama Ngudi Lestari, Banyusoco, Gunung Kidul, were used in Study 1. In Study 2, data on genotype and growth traits at different ages (birth = 0 day of age with n=77; weaning = 3 months of age with n=77; yearling = one year of age with n=50) were collected. In Study 3, two farms were used for raising animals, including laboratory's farm of the Faculty of Animal Science (FAS) UGM with controlled condition (number of raised goats = 23) and Banyusoco farm with uncontrolled condition (number of raised goats = 23). At 4 and 7 months of age, all studied goats were observed for feed intake. In Study 1, genotype of each goat was determined using sequencing and PCR-RFLP with *Kpn*I restriction enzyme (G_GTAC'C). In Study 2, data on body weight, body size (body length, heart girth, shoulder height and hip height), pre- and post-weaning daily weight gain were collected and tabulated. Similarly, In Study 3, data on feed intake, digestible nutrient, nutrient digestibility and feed conversion ratio (FCR) were also collected. Further, genotypic data based on MC4R gene polymorphism of Bligon goats were associated with growth traits and feed intake. The results of Study 1 showed that two SNPs (g.998A/G and g.1079C/T) were found in the exonic region of MC4R gene of Bligon goats. Accordingly, 3 genotypes (AA, AG and GG for SNP g.998A/G and CC, CT and TT for SNP g.1079A/C) were identified. In Study 2, the results showed that animals with AA and AG genotypes based on SNP g.998A/G showed higher weaning weight, weaning body length, weaning heart girth, yearling heart girth and yearling shoulder height than other animals with GG genotype. Based on SNP g.1079C/T, animals with CC and CT genotypes had higher weaning weight, pre-weaning daily gain and yearling heart girth than those with TT genotype. In Study 3, it was found that there was a significant effect of SNP g.1079C/T on the digestibility of dry matter (DM) and organic matter (OM) and total digestible nutrients (TDN) of 7 months old Bligon goats kept on the laboratory's farm, in which animals with CC genotype had higher digestibility of DM, OM and TDN compared to those with TT genotype. Further, SNP g.1079C/T had also a significant effect on the digestibility of dry matter, crude protein, nitrogen free extract and TDN of 7 months old Bligon goats raised in Banyusoco farm, in which animals with CT genotype had higher feed intake compared to those with CC genotype. In conclusion, both the identified SNPs can be used for genotype identification of Bligon goats. They may also prove to be useful as genetic markers for weaning weight, weaning body length, weaning heart girth, yearling heart girth

and yearling shoulder height (SNP g.988A/G) and weaning weight, pre-weaning daily weight gain and yearling heart girth (SNP g.1079C/T). Meanwhile, only SNP g.1079C/T may prove to be useful as genetic markers for the digestibility of DM, OM and TDN in control condition and digestibility of DM, CP, ETN and TDN in uncontrol condition.
Keywords: MC4R, Bligon goat, growth traits, feed intake, FCR