Abstract

In recent years, in response to increasing demand for food, including raw meat, it has been necessary to improve production efficiency. In an effort to achieve faster, larger and cheaper production, the goal of breeding has become to improve the level of slaughter and fattening traits. The achievement of this effect carries an unfavorable phenomenon of meat quality decline. The increase in meatiness of pigs resulted in a deterioration of water holding capacity, change of meat color that was too light, an increase of drip loss and a decrease of intramuscular fat content. This resulted in lowering of meat culinary suitability and deterioration of flavor (Krzęcio et al., 2003). Meat quality is determined by a number of factors. These include both genetic (breed, sex, age) and environmental factors (nutrition, animal maintenance and transport, slaughter and post-slaughter handling and meat storage). Parameters that determine meat quality include flavor, aroma, color, juiciness and tenderness, i.e. organoleptic parameters.

Consumer expectations and demands are forcing an increasingly higher quality standard of raw meat and thus a new look at the genetic improvement aspect of pigs. In Poland, the process of improving pork quality has just begun. For this purpose, an intensive research is being carried out. Incorporating meat quality traits into the selection criteria creates opportunities to improve parameters important to consumers. Understanding the genetic factors influencing meat quality in the future can help select animals with a preferred genetic variant whose meat will exhibit favorable quality. This issue is currently a priority for pig producers and breeders. Therefore, the analysis of polymorphic variants of *ACTN3* gene in relation to pork quality parameters and other performance traits in pigs is justified due to the molecular mechanism nature, indicating variation in the function of encoded protein.

Objective. The aim of this study was to detect and analyze the polymorphism of *ACTN3* gene in the domestic pig (*Sus scrofa domestica*) and to establish potential relationships between individual genotypes and performance traits of pigs reared in Poland.

Materials and methods. The study included 578 individuals representing pigs of the conservative breed – Puławska (159) and high-productive breeds – Polish Large White (206) and Polish Landrace (213). The animals were kept under the same conditions at the Pig Performance Testing Station of the Institute of Animal Production PIB in Chorzelów. In the first study stage, amplification of *ACTN3* gene fragment was carried out by PCR and then obtained amplicons were subjected to Sanger sequencing. The obtained sequences, along with a reference sequence, were compared with each other to identify different variants of *ACTN3*

gene. Sequencing allowed for the detection of 4 single nucleotide polymorphisms (SNPs). They are located within the untranslated region (5'UTR) and the protein coding part of gene. Appropriate molecular methods (PCR-RFLP and ACRS-PCR) were developed, which allowed for genotyping the studied group of animals. The relationship between *ACTN3* genotypes and performance traits was analyzed using the SAS/STAT software with the adequate statistical model.

Results. The obtained data regarding polymorphic variants of *ACTN3* gene show that it is characterized by quite high variability. Identified polymorphisms significantly affected individual fattening and slaughter traits, meat quality, texture parameters of the *longissimus dorsi* and *semimembranosus* muscles as well as muscle fibers composition in pigs of different breeds.

Conclusions. The *ACTN3* gene may be a candidate for a genetic marker of selected performance traits in pigs kept in Poland.

Dagmara Antoń

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