Association between genetic markers for PRRS resilience and productivity in pigs

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Summary

Porcine reproductive and respiratory syndrome (PRRS) is one of the most challenging diseases causing important economic losses in the pig industry worldwide. The high virulence and mutation rate of PRRS virus limit the efficacy of vaccination programs. Previous research has identified several PRRS response-associated markers and selective breeding was suggested as an alternative to improve PRRS resilience. Even so, it is important to investigate the effects of these genetic markers on pigs' productivity. The aim of our study is to assess the association of previously reported PRRS-associated markers within seven immune-related genes (rs80800372 in *GBP1*, rs340943904 in *GBP5*, rs322187731 in *GBP6*, rs1107556229 in *CD163*, rs338508371 in *SGK1*, rs80928141 in *TAP1*, and a 275-bp insertion in the promoter of *MX1*) with production traits in pigs. A set of about 600 Duroc pigs were genotyped for the selected genetic markers using end-point PCR (*MX1*), allelic discrimination (*GBP1*_rs80800372), and high-resolution melt protocols (*GBP5*_rs340943904, *GBP6*_rs322187731, *CD163*_rs1107556229, *SGK1*_rs338508371 and *TAP1*_rs80928141). Effects of these genetic markers on production traits (body weight, carcass weight, backfat thickness, intramuscular fat content and composition) were assessed using a linear model. Data were adjusted for the fattening batch, age at slaughter, and two markers associated with fat content and composition (rs80912566 in *SCD* and rs709596309 in *LEPR*). In addition, the intramuscular fat content was included in the model when analysing the fatty acid composition. Genetic markers within *GBP5*, *GBP6*, and *CD163* did not impact pigs' productivity. Regarding *GBP1*_rs80800372, also known as WUR1000125, the favourable G allele was associated with a greater backfat thickness ($P < 0.01$) and intramuscular fat content ($P < 0.05$). The C allele of *SGK1*_rs338508371, which has a positive impact in PRRS-infected sows, was only associated with lower palmitoleic (C16:1; $P < 0.001$) and eicosadienoic (C20:2; $P < 0.01$) content in *gluteus medius*. The beneficial A allele of *TAP1*_rs80928141, enhanced backfat thickness ($P < 0.05$), C16:1 ($P < 0.01$), and C20:2 ($P < 0.01$) content. In addition, the 275-bp insertion in the promoter of *MX1*, which relates to lower abortion rates in PRRS-infected sows, showed lower body weight and backfat thickness at 120 days of age, without adversely affecting production traits at slaughter. Taken together, our results showed that PRRS-associated markers have no relevant negative effect on growth and meat quality traits. Therefore, pigs can be selected for increased PRRS resilience without compromising their overall productivity. The exemption to this is *GBP1*_rs80800372, whose effect over fatness could be beneficial to some production lines.

Keywords: PRRS, resilience, productivity, pigs.