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Association of ESR1 gene polymorphism with reproductive traits of sows of
Large White and Mirgorod breeds*

The speciality of the modern methodology in breeding is using the molecular information, received during genome analysis. This methodology can significantly accelerate the improvement of productivity traits and it is particularly useful in relation to the traits with low coefficient of inheritance while classic methods are not effective enough. The reproductive traits are one of the most important in pig farming, estrogen receptor 1 gene (*ESR1*) is involved in their control. Meanwhile, the use of *ESR1* locus polymorphism in the marker-assisted selection needs to determine the extent of its association with the reproductive traits of animals in those populations where it is planned to conduct such selection. Implementation of marker-assisted selection in Large White and Mirgorod breeds for improving the reproductive traits is an actual task, but a necessary step in this work is the associative analysis.

The purpose of the work is to research the association of polymorphisms of *ESR1* locus with some reproductive traits of sows of Large White breed (ULW-1 and ULW-3 lines) and sows of Mirgorod breed.

Materials and methods of research. Experimental groups: 1) the sows of Large White breed, ULW-3 line, bred in "Bahmutskiy Agrarian Union" farm, Donetsk region; 2) the sows of Large White breed, ULW-1 line, bred in "Stepne" farm, Poltava region; 3) the sows of Mirgorod breed, bred in «Named after Dekabristy» farm, Poltava region. All the experimental animals were previously genotyped on *RYR1* gene and had *RYR1*^{CC} genotype. The animals were genotyped on estrogen receptor 1 locus with aid of PCR-RFLP analysis on *PvuII*-polymorphic restriction site in the third intron of the gene – DNA marker for estrogen receptor 1 gene. Associations between genotypes and the studied traits were calculated using ANOVA in Excel 2007.

Results. ULW-3 sows with *ESR1*^{BB} genotype **turned out to have** 1.36 more piglets in a litter (analysing data from 2nd-4th farrows) comparing to animals with *ESR1*^{AA} genotype. There is a tendency for bigger amount of newborn piglets in the heterozygotes animals than in sows with homozygous *ESR1*^{AA}. A similar pattern appears in the 1st farrowing, the sows with *ESR1*^{BB} and *ESR1*^{AB} genotypes had the advantage in the total number of piglets at birth. In the experimental group of ULW-1 sows statistically proven patterns were not found, there was only a tendency to slight predominance of sows with *ESR1*^{BB} and *ESR1*^{AB} genotypes comparing to individuals with *ESR1*^{AA} genotype. In the experimental group of Mirgorod sows there was a tendency to have most part of individuals with heterozygous genotype. Analysis of prolificacy of ULW-3 sows due to their genotype for the estrogen receptor 1 gene confirmed the superiority of *ESR1*^{BB} and *ESR1*^{AB} genotypes comparing to *ESR1*^{AA} sows. According to 2nd-4th farrows, sows with *ESR1*^{BB} and *ESR1*^{AB} genotypes had the advantage in prolificacy comparing to *ESR1*^{AA} sows by 1.15 and 0.53 piglets, respectively. According to the 1st farrowing difference between genotypes was absent. *ESR1/PvuII*-polymorphism does not

influence on prolificacy of ULW-1 sows. According to the 1st farrowing the trend towards a higher level of prolificacy of Mirgorod sows with *ESR1*^{AA} genotype was found, while difference in 2nd-4th farrows between the groups was absent.

It was found that *ESR1/PvuII*-polymorphism impact on the total number of piglets at birth and prolificacy for ULW-3 sows is characterized by predominance of additive component with a little contribution of the dominant component, the similar trend is observed for ULW-1 sows. There is a complex nature of the impact of *ESR1/PvuII*-polymorphism on the reproductive traits of Mirgorod sows in the predominance of the dominant component.

Conclusions. The impact of polymorphism in estrogen receptor 1 gene on the total number of piglets in the litter after the birth and prolificacy in ULW-3 sows was detected. ULW-3 sows with *ESR1*^{BB} genotype have 1.36 more piglets in a litter (analysing data from 2nd-4th farrows) and 1.15 more comparing to animals with *ESR1*^{AA} genotype. *ESR1/PvuII*-polymorphism was not associated with total number of piglets in a litter and prolificacy in ULW-1 sows and Mirgorod sows. The counted parameters of additive-dominant model indicate that *ESR1/PvuII* polymorphism impact on the total number of piglets at birth and prolificacy for ULW-3 sows is characterized by predominance of additive component with a little contribution of the dominant component.

Keywords: pigs, Large White breed, Mirgorod breed, estrogen receptor 1 gene, reproductive traits, association analysis