

Summary

The analyses of influence polymorphisms occurring in chosen genes have on utility traits in cattle and rating of milk's technological use by paternal groups

The aim of the dissertation was to specify the influence of polymorphisms occurring in the chosen genes on milk yield, reproduction rate, causes of culling and rating of milk's technological use by five paternal groups in Polish Holstein-Frisian Black and White cattle located in one of the large scale farming herds in Wielkopolskie Voivodeship. The analysed genes were: kappa-casein, beta-lactoglobulin and ghrelin. Age of first calving, intercalving period, calving-to-conception interval and insemination index were chosen among reproduction indicators. The influence of identified genotypes on course of labour; calves vitality and cause of culling in first three 305-days long lactations were put under analysis. There were five paternal groups chosen: German, French, Dutch, Polish and American and rating of milk's technological use in two seasons: spring-summer and autumn-winter was being analysed within the groups.

The study group contained 598 Polish Holstein-Frisian black and white cows, kept in freestalls system, which were rated by Polish Federation of Cattle Breeders and Milk Producers (PFoCBaMP). Data about first, second and third 305-days long lactation was collected for each cow from the documentation run by PFoCBaMP and stacked in the farm. For the study, blood was collected, from which DNA was isolated and amplified using PCR method, for further analysis of genotypes PCR-RFLP method was used.

In the kappa-casein gene three polymorphisms were identified (*AA*, *AB*, *BB*) conditioned by two alleles – *A* and *B*. Allele *A* occurred four times more frequently than allele *B* (0.791 and 0.209 accordingly). The highest milk yield was found in cattle with *BB* genotype in comparison to the *AA* genotype cattle ($P \leq 0.05$). Comparing first-time heifers to multipara cows, data has shown, that the highest fat and protein efficiency as well as fat and protein content occurred in the *BB* cows. The *BB* genotype was also associated with most beneficial quality of the chosen reproductive traits, in case of CCI and CI those values were statistically relevant in comparison to other genotypes ($P \leq 0.05$).

In the study of beta-lactoglobulin gene there were too found three polymorphisms conditioned by two alleles. The highest milk yield was found in the *BB* cattle, which was substantially higher than in cattle with *AA* genotype ($P \leq 0.05$). Relevantly higher yield was found in multipara cows in comparison to first-time heifers ($P \leq 0.01$ and $P \leq 0.05$). Multipara cows showed higher fat and protein yield ($P \leq 0.05$, $P \leq 0.01$) than first-time heifers, for all of the genotypes identified. No influence of any of the genotypes on the reproduction traits has been observed.

In the ghrelin gene, only two out of possible three genotypes have been found, genotype *CC* occurred rarely. No significant influence of the studied polymorphism on milk yield has been found. Cows with *CT* genotype showed higher milk (9901kg), fat (380kg) and protein (329) yield, than *CC* cattle (9754kg, 373kg, 323kg, accordingly). It was observe that multipara cows had significantly higher milk, protein and fat yield than first-time heifers ($P \leq 0.05$, $P \leq 0.01$) for both identified genotypes.

There was no influence on course of labour found among any of the genotypes studied. Taking under consideration the influence of studied genes on frequency of particular culling's causes in the analysed herd, no relevant influence has been found. Main causes of culling in the heifers were the same as general causes of culling in Poland, which are: sterility, reproductive system diseases, metabolic diseases, digestive system diseases and utter diseases.

Rating of milk's technological use in two seasons, judged by paternal groups has shown that the milk was of good quality. Too low pH could have been an effect of acidation in transport, other parameters fit in the required norms. Milk collected from cows bred with Dutch bulls (3.38%) contained significantly ($P \leq 0.05$) more protein than milk collected from cows bred with Polish bulls (2.91%). Moreover, milk collected from cows bred with Polish bulls showed significantly

shorter ($P \leq 0.05$) clotting times than milk collected from cows bred with French bulls. The season, during which the milk has been collected, had influence on the results. In the winter, milk contained more casein and general protein than in the summer, in case of protein the data was significantly relevant ($P \leq 0.05$).

To sum up the influence of studied genotypes on production traits in the herd studied, it can be asserted, that the most beneficial genotypes are *BB CSN3*, *BB LGB* and *CT GHRL*. The subject literature is lacking in data about association between milk protein and ghrelin polymorphisms on reproduction index, it is recommended to continue research in this field. Information about correlation between bull's origin and technological use of milk is valuable for breeders and milk processing manufacturers. Thanks to these information and efficient selection, breeders can breed cattle representing the most needed milk quality.