

Summary of the doctoral thesis. Marzena Cwynar „The use of mother cow lines in the selection and improvement of functional features determining the production longevity”.

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Poland's accession to the European Union has largely contributed to the development of the cattle population in Poland by allowing unrestricted imports of semen, bulls, and heifers. As a result, recent years have witnessed not only a rapid increase in the average milk yield of the cows, but also a clear genetic progress in many functional traits. In the general population, however, intensive directional selection for productive traits has considerably shortened the productive life of dairy cows to only 2-3 lactations. Productive longevity of the cows is an important factor affecting rearing and housing costs, and thus influencing production profitability. In evaluating the breeding value of cow longevity, conformation traits correlated with the length of productive life are used. Most of these are strongly correlated to longevity, but they range between 0.15 and 0.40 on average. Longevity is influenced by all productive and performance traits of the cows, and the length of productive life, other than accidents, is largely determined by the cow's owner. Therefore, rather than the maximum first lactation milk yield, the principal goal should be a balanced combination of high average lifetime yield, longevity and health of the cows.

The scientific aim of the study was to determine the effect of genetic and environmental factors on the production and phenotypic parameters of cattle selected for productive longevity. The utilitarian aim of the study was to obtain long-lived cows with good production, fertility and health parameters, and to show the possibility of selecting cows for maintaining maternal lines of high breeding value on the farm.

The experiment used a group of 197 Polish Holstein-Friesian (PHF) cattle maintained at the Farm Complex Kietrz Sp. z o.o. The experimental cows were assigned to maternal lines. A total of 19 maternal lines spanning three generations of the cows were used in the study. Eight out of the 19 lines were analysed in particular detail. This classification was made because, considering longevity of the cows representing the analysed lines as well as the milk parameters over six lactations, too many lines were found to have no offspring with more than six lactations. Basic production parameters (305-day lactation yield of milk, fat, protein, lactose and solids) were analysed. Based on test-day records, data on somatic cell

count and fat to protein ratio of each cow in successive lactations were also collected. To this end, production data of the cows from the SYMLEK system (test-day milkings) were used and productivity based on daily measurements of milk from the AFIFARM system was analysed.

It was found in the study that the milk and the milk protein and lactose content gradually increased in the cows up to fifth lactation, but gradually decreased in the subsequent lactations. Detailed analysis of the yields within individual maternal lines showed that the difference between the lines with highest and lowest daily milk production was 7.75 kg milk. At the same time, differences between the mean yields of the cows in the first and second milking sessions during 24 hours were very low. Out of the 19 lines under study, 8 lines showed no differences between the sessions, in 8 lines the yield was higher in the first milking session, and in 3 lines in the second session only. The analysis of milk somatic count in the studied cows demonstrated that in 12 lines the milk had a somatic cell count of 400,000 and met the national standards, and in 7 lines the milk considerably exceeded the standards with as many as 636,000 somatic cells. As a result, the daily milk production level decreased in 13 lines. In the case of fat content, a visible decline was observed in only 4 lines, while 9 lines showed an increase in the milk protein content of the cows (from 0.2% to 0.4%) and a decrease in lactose content. Significantly, the increasing mean number of lactations was accompanied by an increase in the mean lactation persistency. For the cows up to the second lactation this value did not exceed 20%, and in the group up to the fourth lactation, it did not exceed 70%. Thus, cows with the highest lactation persistency were also characterized by the highest production (56.14 kg) in the mean daily milking at peak lactation, with lactation persistency of 70.1-80%. Cows that entered lifetime production with a high lactation persistency (40% and over) in the first or second lactation, and showed a production level of around 50 kg at peak lactation, experienced a considerable decrease in lactation persistency. The cows with low medium lactation persistency at the start of milk production in the first lactation and the production level of less than 45 kg, experienced a gradual increase in lactation persistency in subsequent lactations, e.g. from 41.23% to 66.61% or from 16.17% to 63.63%. It is worth noting a high variation in gestation length in the cows from different lines. The difference between the shortest and longest gestation length (229.31 vs 288.14 days) was 58.83 days. The maternal lines had easy calvings ranging from 64.00% to 94.45%. Only 6 out of the 19 cow lines experienced difficult births. The study showed that the dams had a highly significant effect both on the milk yield per lactation and on the yield of fat, protein, lactose and solids. The milk somatic cell count is largely dependent on the animal's predisposition

inherited from the mother. There was no dam effect on lactation persistency, which is strongly and highly correlated to lactation and lactation number.