Summary

Contemporary consumer trends and constantly growing awareness of issues related to environmental protection and animal welfare, but also healthy and rational nutrition, have caused the constantly developing poultry market to look for alternative, more ecological solutions.

The high demand for the best quality meat meant that the poultry industry began to use not only fast-growing genetic lines of broiler chickens, but also native and locally adapted breeds of the laying or general utility type, which were reared in less intensive conditions. The introduction of these breeds into production also meant that the unwanted one-day-old roosters, were used in the production of capon meat, whose culinary value and unique taste have been confirmed by many scientists around the world.

The aim of this study was, using microscopic techniques and specialized staining methods, to assess the occurrence of histopathological changes and to assess the accumulation of adipose tissue in selected skeletal muscles and internal organs in capons and roosters at different stages of rearing. In skeletal muscles, the diameter of muscle fibers and giant fibers was analyzed. The degree of lymphatic tissue in internal organs was examined at different stages of rearing. All mentioned research objectives were aimed at determining the appropriate slaughter age of birds, taking into account appropriate production parameters. The analyzes performed and the results obtained were aimed at determining whether Rhode Island Red roosters could be used for the production of capon meat.

The experiment was carried out on 200 one-day-old cockerels. On the first day, the birds were weighed and marked, then placed in identical pens. During bird rearing, regular measurements of weight and feed consumption were carried out. The birds were fed ad libitum. In accordance with Commission Regulation (EC) No. 543/2008 and with the consent

of the Local Ethical Committee in Olsztyn (Poland - No. 16/2014), in the 8th week, randomly selected 100 males were subjected to surgical castration. The procedure was performed by a qualified veterinarian. The birds underwent infusion general anesthesia for the procedure.

After the procedure, the birds were divided into two research groups (capons) and a control group (cockerels).

Before the castration procedure, in the 4^{th} and 8^{th} week of rearing, from 8 randomly selected birds blood was collected for testosterone level determination. Then, every 4 weeks from the 12^{th} to the 28^{th} week of rearing, blood was collected from 8 cockerels and 8 capons.

For histological analysis, 6 birds were slaughtered in both research groups during weeks 12, 16, 20, 24, and 28 of breeding. Next, during the autopsy, samples of internal organs (sections of the digestive tract, heart, lungs, kidneys, spleen, thymus, bursa of Fabricius, liver and testicles in roosters) as well as the pectoralis major muscle and the thigh muscle were collected. All collected samples were fixed and subjected to histopathological processing. The tissues were cut into thin sections and subjected to morphological analysis. A 3-point scale was used to determine the concentration of fat in skeletal muscles and organs. The last analysis performed on the breast muscles was the analysis of the diameter of muscle fibers and the diameter of giant fibers in cockerels and capons at various stages of rearing.

The obtained results were subjected to statistical analysis using the Statistica 2010 program. The arithmetic mean was calculated and the standard deviation was measured from the collected numerical material. The numerical data were prepared by performing one-way or two-way analysis of variance - ANOVA and non-parametric tests - chi-square test. The statistical significance of differences in the compared means was determined using Duncan's test (significance level $P \leq 0.05$).

The statistical analysis performed was used to formulate the following conclusions.

The number of histopathological changes in the examined tissues and internal organs was similar in both sex groups. Only the accumulation of fat tissue is different, but this change is a very desirable change. Moreover, histological analysis showed that Rhode Island Red birds were characterized by a lower total number of unwanted lesions compared to of the Green-legged Partridge or Leghorn breeds.

The concentration of adipose tissue was higher in the thigh muscles, and its intensity increased in capons from the 16^{th} week in 3 locations (around the vessels, in the perimysium and endomysium); also in the pectoral muscle, higher fat deposition results were recorded in capons over the 16^{th} week of rearing. Those results were higher and more favorable than in Green-legged Partridge and Leghorns. The analyzed fiber diameter changed in both sex groups. Smaller muscle fibers were recorded in capons in weeks 12 and 16, and giant fibers in weeks 12 and 20.

The analysis of internal organs did not show any negative impact of castration on morphological changes or depletion of lymphatic system. The distribution of fat tissue in internal organs was higher and more intense in capons.

All the obtained results clearly indicate that Rhode Island Red capons reach the appropriate weight and fatness at the age of 20 weeks. Additionally, comparison with other breeds proves that Rhode Island Red roosters are good choice for producing high-quality meat.