

ABSTRACT

Key-words: roosters, rooster castration, rearing performances, meat quality

The term "capon" originates from ancient Rome, being assigned to animals (especially roosters) that undergo the castration procedure. Even in those times, it was observed that the removal of testicles leads to increased body weight and improved sensory characteristics of the obtained meat.

Although the sex ratio is approximately equal at hatching, there is no need for males in egg-producing birds and a need of 15-20% for breeding birds; an exception to this rule is broilers, where both sexes are used.

Therefore, a large number of one-day-old males remain available for capon production, offering consumers a high-quality meat alternative to what modern poultry farming currently provides (industrial chickens, slow-growing chickens, organic chickens, certified chickens, etc.).

*The doctoral thesis titled "**Research on rooster castration technique and meat quality obtained**" aimed to study the growth performance of capons produced from the commercial chicken hybrid Hubbard and of those obtained from the local breed Transylvanian Naked Neck. Two corresponding experiments were organized using the biological material:*

Experiment no. 1 "Results regarding the meat production performance of capons obtained from the Hubbard chicken hybrid":

- *Lm-1 (Hubbard roosters)*
- *Lexp-1 (Hubbard capons)*

Experiment no. 2 "Results regarding the meat production performance of capons obtained from the Transylvanian Naked Neck breed":

- *Lm-2 (Transylvanian Naked Neck roosters)*
- *Lexp-2 (Transylvanian Naked Neck capons).*

The roosters studied in both experiments were acquired at 5 weeks of age and were slaughtered in the 20th week. Castration of the experimental groups was performed surgically at the 7th week.

Throughout the study period (35-140 days), the birds were subjected to identical growth conditions, including microclimate and administered feed (combined feed with 17,31% crude protein and metabolizable energy of 2810 kcal/kg combined feed).



The study focused on growth performance (body weight dynamics, exits from the flock, combined feed consumption, feed conversion ratio), quantitative meat production (slaughter weight, hot and cold carcass weight, slaughter yield, proportion of cut portions in the carcass, weight of edible organs, abdominal fat proportion, meat/bone ratio), and meat quality (sensory analysis, pH value, chemical composition focusing on water, dry matter, protein, lipids, cholesterol, fatty acids, minerals, non-nitrogenous extractives, energy value, histological characteristics).

The impact of castration on weight gain was evident on the day of slaughter at 140 days of age. In the Hubbard hybrid, the weight of Lm-1 (roosters) was 5366,60 g, while that of Lexp-1 (capons) was 5773,78 g. Similar differences were observed at Transylvanian Naked Neck breed, where Lm-2 (roosters) weighed 3860,93 g and Lexp-2 (capons) weighed 4188,57 g.

The average daily weight gain for Hubbard roosters (Lm-1) was 42,05 g/bird/day, and for capons (Lexp-1) it was 45,92 g/bird/day. For Transylvanian Naked Neck breed, Lm-2 (roosters) showed a daily weight gain of 32,87 g/bird/day, and Lexp-2 (capons) had a daily gain of 35,55 g/bird/day.

Over the 15-week rearing period, the control groups (Lm-1, Lm-2) did not register flock exits. However, in the experimental groups where castration was performed at 7 weeks of age, losses of 30% (6 heads) were observed in Lexp-1 (Hubbard capons) and 50% (10 heads) in Lexp-2 (Transylvanian Naked Neck capons).

Combined feed consumption was 99,21 g/bird/day for Lm-1, 101,71 g/bird/day for Lexp-1, 91,30 g/bird/day for Lm-2, and 87,96 g/bird/day for Lexp-2. Feed conversion ratio was calculated based on individual consumption, resulting in values of 2,35 kg feed/kg gain for Lm-1, 2,22 kg feed/kg gain for Lexp-1, 2,79 kg feed/kg gain for Lm-2, and 2,52 kg feed/kg gain for Lexp-2.

Slaughter yield calculations revealed that in the Hubbard hybrid, the hot carcass yield was 74,43% for Lm-1 and 76,00% for Lexp-1. For the Transylvanian Naked Neck local breed, the hot carcass yields were 66,11% for Lm-2 and 67,88% for Lexp-2.

Analysis of anatomical portions of the carcasses revealed that in the Hubbard hybrid, proportions for breast with bone and skin were 27,75% (Lm-1) and 29,82% (Lexp-1), the upper thighs were 19,09% (Lm-1) and 20,01% (Lexp-1), while lower thighs were 16,12% (Lm-1) and 16,33% (Lexp-1). Wing proportion was 12,02% (Lm-1) and 14,46% (Lexp-1), and giblet proportion was 25,02% (Lm-1) and 19,38% (Lexp-1).

For the second experiment (Transylvanian Naked Neck birds), proportions of 26,98 (Lm-2) and 27,34 (Lexp-2) were highlighted for breast with bone and skin; upper thighs represented 18,96% for Lm-2 and 19,65% in capon carcasses (Lexp-2), while lower thighs marked values of 16,13% for roosters (Lm-2) and 16,19% for



capons (Lexp-2). Wings accounted for 11,91% of rooster carcasses (Lm-2) and 13,17% of capon carcasses (Lexp-2), while gizzards occupied 26,02% of intact bird carcasses (Lm-2) and 23,66% of castrated rooster carcasses (Lexp-2).

Regarding the weight of edible organs, there were no significant differences among the four batches studied for heart weight, but differences were noted for liver weight. In Lm-1 roosters, a weight of 57,14 g was found for the liver, while in Lexp-1 capons, it was 99,72 g. A similar situation was observed in the second experiment (Transylvanian Naked Neck breed), where the liver weight of Lm-2 roosters was 57,23 g, while the liver weight of Lexp-2 capons was 65,63 g. The weight of capon gizzards in Hubbard Lexp-1 was 20,39 g higher than that of roosters (Lm-1). In the second experiment, the difference between the experimental (Lexp-2) and control (Lm-2) groups was 10,41 g.

For the abdominal fat proportion, values of 1,22% were recorded for Lm-1, 2,35% for Lexp-1, 0,96% for Lm-2, and 1,93% for Lexp-2.

The meat-to-bone ratio was 8,92/1 for Lm-1, 9,01/1 for Lexp-1, 6,28/1 for Lm-2, and 7,14/1 for Lexp-2.

Following sensorial analysis of samples taken from the four groups, high scores were obtained, leading to their placement in the "Very good" category.

The pH values determined immediately after slaughter ranged from 6,27 for breast from Lexp-1 to 6,86 for wings from Lm-1. In the case of the second experiment (Transylvanian Naked Neck breed), the minimum pH was 6,21 for breast meat from non-castrated birds (Lm-2), while the maximum was 6,91 for lower thighs of the same batch.

Regarding the muscle tissue of birds from the first experiment (Hubbard hybrid) it exhibited a water content ranging from 70,40%, as recorded for the upper thighs of capons (Lexp-1), to 73,70%, found in the breast of roosters (Lm-1).

The lowest protein concentration (20,38%) was determined in the wings of roosters (Lm-1), while the highest (23,01%) was in the breast of capons (Lexp-1).

The proportion of lipids in the breast of capons (Lexp-1) was 3,50%, 1,92% higher than the value established for the same cut from Hubbard roosters (Lm-1). The highest fat content (6,90%) was identified in the upper thighs of castrated birds (Lexp-1).

The highest cholesterol content (0,22%) was detected in the lower thighs of capons (Lexp-1), while the lowest (0,12%) was recorded for the breast of non-castrated roosters (Lm-1).

Following gas chromatography analyses, the highest content of saturated fatty acids (SFA) was 40,57 g FAME/100 g FAME, determined in the lower thighs of roosters (Lm-1), while the minimum value was 30,47 g FAME/100 g FAME for the lower thighs of capons (Lexp-1). Based on the determinations, it was established that the lowest concentration of monounsaturated fatty acids (MUFA) was 35,84 g FAME/100 g FAME for the lower thighs of capons (Lexp-1), and the highest detected



was 40,73 g FAME/100 g FAME for the same anatomical portion, originating from roosters (Lm-1). For polyunsaturated fatty acids (PUFA), the determined values ranged from 17,98 g FAME/100 g FAME for the lower thighs of roosters (Lm-1) to 33,97 g FAME/100 g FAME for the lower thighs of capons (Lexp-1).

By relating omega-6 fatty acids to omega-3 fatty acids, the lowest value was 5,06 for the capons' breast (Lexp-1), while the highest value was 17,86, noted for the upper thighs of castrated roosters (Lexp-1).

Chemical analyses conducted on meat samples from birds in the second growth experiment (Transylvanian Naked Neck breed) revealed minimum water content values of 72,68%, in the lower thighs of Lexp-2 capons, and the maximum established was 73,78%, for the breast from the same batch.

The lowest protein content was 20,02%, observed in the wings of roosters (Lm-2), while on the opposite end, the maximum was 22,77%, found in the breast of capons (Lexp-2).

The breast of roosters (Lm-2) exhibited the lowest lipid content at 1,22%, whereas the upper thighs of capons (Lexp-2) marked a percentage of 3,58.

The established values for cholesterol concentration ranged from 0,08%, for the roosters' breast (Lm-2), to 0,19%, for the upper thighs of capons (Lexp-2).

The determinations focusing on saturated fatty acids (SFA) content in the meat samples resulting from the slaughter of birds in the second growth experiment (Transylvanian Naked Neck breed) indicated values ranging from 30,26 g FAME/100 g FAME for the lower thighs of roosters (Lm-2), to 31,97 g FAME/100 g FAME for the upper thighs of roosters (Lm-2). The lowest amount of monounsaturated fatty acids (MUFA) was 32,23 g FAME/100 g FAME, detected in the upper thighs of castrated roosters (Lexp-2), while the highest detected value was 37,44 g FAME/100 g FAME, for the lower thighs of roosters (Lm-2). Regarding polyunsaturated fatty acids (PUFA) content, the anatomical portion that exhibited significant differences was the upper thigh, with a value of 32,39 g FAME/100 g FAME for Lm-2 roosters, whereas for Lexp-2 capons, it was 36,01 g FAME/100 g FAME.

The highest content of omega-6 fatty acids was identified in the upper thighs of capons (Lexp-2), at 34,09 g FAME/100 g FAME, while the highest concentration of omega-3 fatty acids was determined for the breast of roosters (Lm-2), at 2,53 g FAME/100 g FAME.

Based on the histological analyses conducted, it was concluded that the highest proportion of muscle tissue was in the semimembranosus muscle (70,27% in Lm-1; 71,24% in Lexp-1; 66,68% in Lm-2; 68,31% in Lexp-2), whereas the lowest was in the superficial pectoralis muscles (63,16% in Lm-1; 65,13% in Lexp-1; 62,65% in Lm-2; 63,51% in Lexp-2).

In terms of muscle fiber density, the first experiment highlighted the triceps brachii muscles, which recorded approximately 809,00 muscle fibers/mm² in both



studied batches (Hubbard hybrid). In the experiment conducted on Transylvanian Naked Neck breed, the highest fiber density was 1262,19 muscle fibers/mm² for the triceps brachi of roosters (Lm-2), with 220,45 muscle fibers/mm² more fibers than capons (Lexp-2).

Based on the results obtained under the experimental conditions proposed by us, the following recommendations can be made:

- Obtaining capons based on specialized hybrids for meat production, as they exhibit rapid growth rates, better feed conversion, and superior meat quality.*
- Implementing orchidectomy (castration) only for individuals with a body weight of at least 1500 g, as they are more resilient to surgical procedures.*
- Exploring less invasive surgical solutions to minimize post-operative mortality.*
- Continuing the researches on rooster castration in poultry, as it remains an area of great interest for both researchers and practitioners in the field of poultry farming.*

