Age-related changes in the carcass tissue composition and distribution of meat and fat with skin in carcasses of laying-type cockerels

Altersabhängige Veränderung der Gewebezusammensetzung sowie Verteilung von Fleisch und Fett mit Haut im Schlachtkörper von Hähnen der Legeherkünfte

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Introduction

From time to time mass media in Poland inform about the common practice of euthanasia among cockerels treated as a “by-product” during laying hen production. According to the majority of poultry breeders and producers, layer-type cockerels are unsuitable for meat production and should not be used for this purpose due to higher, compared with broiler chickens, feed consumption per body weight unit and a worse slaughter value. However, very few papers deal with this problem.

The slaughter value of domestic fowls depends first of all on their carcass dressing percentage, carcass tissue composition and meat quality, as well as the distribution of particular tissue components in the carcass. As much meat as possible should be located in the most valuable carcass parts, i.e. the breast and legs, and less in the neck, wings and back. The distribution of tissue components has already been presented in carcasses of Pekin ducks (BOCHNO et al., 2004), Muscovy ducks (WILKIEWICZ-WAWRO et al., 2004) and broiler chickens (BOCHNO et al., 2003). However, available literature on the topic provides no information on age-related changes in their location in carcasses of laying-type cockerels. Therefore, the aim of the present study was to determine changes in the carcass tissue composition and distribution of meat and fat with skin in carcasses of laying-type cockerels aged two to 18 weeks.

Material and Methods

The experiment was performed on Astra S laying-type cockerels (n=188). After weighing the day–old chicks were randomly allocated to four 3.5 m x 2 m pens, 47 chicks in each. The lighting program was as follows: 23 hours constant light + 1 hour of darkness, at light intensity of 30 lux in the first weeks, and a gradual reduction to 10 lux from 7 to 21 days of rearing. Temperature was consistent with the common practice of euthanasia among cockerels treated as a “by-product” during laying hen production. According to the majority of poultry breeders and producers, layer-type cockerels are unsuitable for meat production and should not be used for this purpose due to higher, compared with broiler chickens, feed consumption per body weight unit and a worse slaughter value. However, very few papers deal with this problem.

From one day of age the cockerels were weighed at one-week intervals. Starting from the 2nd week, 10 cockerels selected at random (from all pens) were fasted for approx. 10 hours and slaughtered, scalped (approx. 1 min., temp. approx. 63°C), plucked and eviscerated. Then the heads, shanks and wing-ends were cut off. Chilled carcasses were divided into the following elements: neck, wings, legs, breast and back, which were then dissected into meat, skin with subcutaneous and intermuscular fat, and bones (ZIOLECKI and DORUCHOWSKI, 1989).

Statistical analysis (STATSOFT INC, 1995) of the material collected included the determination of:
1. arithmetic means (\( \bar{x} \)), coefficients of variation (v) and significant differences between age groups for body weight, carcass weight and weights of particular tissue components in the carcass;
2. age-related changes in the contents of particular tissue components in the carcass, and distribution of meat and fat with skin in carcass parts.

Results

Body weight, carcass weight and its tissue composition

The average body weight of one-day-old cockerels was 37 g. During the rearing period their body weights increased significantly to 669 g at six weeks of age and 2,327 g at 15 weeks of age, and remained at a similar level until the end of the experiment. Similar tendencies were noted in carcass weights (Table 1).

The carcass tissue composition expressed in grams is presented in Table 1, and expressed in per cent in relation to carcass weight – in Figure 1. The meat content of the whole carcass increased from 34.6 g in the cockerels slaughtered at the age of two weeks to 218 g in six-week-old ones and 1,038 g in those aged 17 weeks. Differences were statistically significant. The deposition of skin with fat (subcutaneous and intermuscular) was increasing significantly to the age of about 12 weeks (from 11.6 g in two-week-old cockerels to 190 g in 12-week-old ones). The weight of bones was increasing until 15 weeks of age (from 22.7 to 341 g).

The tendencies concerning the percentages of particular tissue components in carcasses are shown in Figure 1. The meat content was growing relatively slowly – from 46.22% in the cockerels slaughtered at two weeks of age to 62.41% in those slaughtered at 18 weeks. Over this period the content of skin with subcutaneous and intermuscular fat decreased slightly (from 15.44 to 11.91%). The bone content of carcasses decreased as well (from 30.33 to 20.74%).
Table 1. Arithmetic means (\(\bar{x}\)) and coefficients of variation (v) for body and carcass weight and weights of: meat, fat with skin and bones in carcass

<table>
<thead>
<tr>
<th>Specification</th>
<th>Characteristic</th>
<th>Age, weeks</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>Weight (g)</td>
<td></td>
<td>Aa</td>
</tr>
<tr>
<td>body</td>
<td></td>
<td>366</td>
</tr>
<tr>
<td>v</td>
<td></td>
<td>7.41</td>
</tr>
<tr>
<td>carcass</td>
<td></td>
<td>270</td>
</tr>
</tbody>
</table>

Means marked with letters are significantly different; capital letters – significance \(\alpha = 0.01\); small letters – significance \(\alpha = 0.05\)

**Distribution of meat and skin with fat in particular carcass parts**

Figures 2 and 3 present the distribution of meat and skin with fat respectively in particular carcass parts. The weights of tissue components from Table 1 were assumed as 100%, and then the percentage of a given component in particular carcass elements were calculated. The most meat was located in the breast and legs, and the least in the neck and wings. Until 18 weeks of age the location of this
tissue component changed only slightly. Its increase was noted in the legs (from 36.33 to 42.16%), and decrease in the breast (from 31.98 to 29.70%), back (from 18.55 to 17.77%) and wings (from 9.53 to 7.28%). The percentage of this tissue component in the neck, in relation to its total content in the carcass, remained at a similar level throughout the entire rearing period (3.67% at two weeks of age, 3.09% at 18 weeks).

Age-related changes in the distribution of skin with fat were also small (Figure 3). A growing tendency was observed in the legs (from 16.25% at two weeks of age to 21.26% at 18 weeks of age), and a falling tendency - in the back (from 25.77 to 22.39%) and breast (from 24.97 to 22.85%). The contents of these tissue components in the wings and neck remained at stable levels over the experimental period (approx. 17.5% and 15.5% respectively).

Discussion

Carcasses of laying-type cockerels (Figure 1), compared with carcasses of broiler cockerels (BOCHNO et al., 1999), contained much less meat (by approx. 6.5% at six weeks of age) and more bones (by approx. 10%). Furthermore, the meat distribution in carcasses of layer-type cockerels (Figure 2) is less advantageous than in broilers (BOCHNO et al., 2003) – less meat is located in the breast, and more in the legs and less valuable carcass parts, i.e. the neck, wings and back. The growth of meat located in the legs is observed until 18 weeks of age, whereas its content of the breast increases for the first four weeks only (Figure 2). In broiler chickens the situation is better – the meat content of the breast grows to 12 weeks of age, and decreases in the legs (BOCHNO et al., 2003).

As regards the distribution of skin with fat, it is more advantageous in layer-type cockerels than in broiler cockerels, with their lower amounts located in the most valuable carcass parts - breast and legs, and more in less valuable ones – neck, wings and back. Changes in their distribution, observed with age, are also smaller in layer-type cockerels (Figure 3) than in broiler cockerels (BOCHNO et al., 2003).

Compared with broiler chickens, layer-type cockerels are also characterized by worse production parameters, including carcass dressing percentage (BOCHNO et al., 1999;
Gerken et al., 2003; Damme and Ristic, 2003), a lower breast content and a higher leg content of the carcass (Gerken et al., 2003; Janiszewska et al., 1998), a worse meat-to-bone ratio (Janiszewska et al., 1998) and worse carcass outward appearances (Damme and Ristic, 2003). Moreover, laying-type cockerels show a higher level of feed consumption per unit of body weight, edible parts and meat content of the carcass (Bochno et al., 1999), as well as higher production costs per kg of body weight or meat (Damme and Ristic, 2003).

To sum up, carcasses of laying-type cockerels are characterized by a lower percentage of meat and a higher percentage of bones than carcasses of broiler cockerels. The meat distribution in their carcasses is less advantageous than in broilers, as less meat is located in the breast, and more in the legs and less valuable carcass parts, i.e. neck, wings and back. These results confirm that layer-type cockerels are unsuitable for intensive meat production.

Summary

The aim of the present study was to determine changes in the tissue composition and distribution of meat and fat with skin in carcasses of laying-type cockerels aged two to 18 weeks. The experiment was performed on Astra S laying-type cockerels (n=188). They were reared to the age of 18 weeks on deep litter, according to the general standards of broiler chicken rearing, and fed standard diets ad libitum.

The average body weight of one-day-old cockerels was 37 g and increased to 669 g at six weeks of age and to 2,394 g at 18 weeks. The meat content of their carcasses increased from 46.22% at two weeks of age to 62.41% at 18 weeks. The percentages of the other tissue components decreased over this period: skin with fat - from 15.44 to 11.91%, bones - from 30.33 to 20.74%. During the experimental period only minor changes were observed in the location of meat. Its increase was noted in the legs (from 36.33% at two weeks of age to 42.16% at 18 weeks), whereas it decreased - in the breast (from 31.98 to 29.70%), back (from 18.55 to 17.77%) and wings (from 9.53 to 7.28%). Similarly, slight changes only were found in the distribution of skin and fat, with a rising tendency in the legs, and a falling one in the back and breast. The results of the own investigations and those obtained by other authors show that carcasses of layer-type cockerels are characterized by a lower percentage of meat and a higher percentage of bones than carcasses of broiler cockerels. Meat distribution in the carcasses is less advantageous than in broilers - less meat is located in the breast, and more in less valuable carcass parts. These results confirm that layer-type cockerels are unsuitable for intensive meat production.

Key words
Layer-type cockerels, carcass, tissue composition, meat yield

Zusammenfassung


Stichworte
Legehybriden, Hähne, Schlachtkörper, Gewebezusammensetzung, Fleischfülle

References


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