

Differences in Carcass and Meat Quality between Organically Reared Cocks and Capons

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Summary

The aim of the present study was to compare carcass and meat quality traits of ecologically reared capons and cocks. The experiment comprised 60 layer-type Slovenian hybrid Prelux-G chickens. Half of the animals were caponized at the age of 52 days (app. 0.5 kg body mass) and another half were left entire males. All chickens were reared on the same farm respecting requirements for ecological farming. Chickens were fed commercial feed mixtures combined with the free access to pasture. After the slaughter (185 days), the chickens were dissected and main carcass parts were weighed. Meat quality (pH, colour, water-holding capacity) and chemical composition (protein, water, intramuscular fat) were determined. Birds of both groups had similar weight of carcass and body parts, except for weight of the thighs with drumsticks and offal weight, which were significantly lower in capons. The main differences in carcass traits appeared in the abdominal fat tissue. Capons had more abdominal fat. Meat physico-chemical characteristics (pH, drip loss) were similar in both groups, except for the colour. Capons had lighter (higher Minolta L* value) and less red (lower Minolta a* value) colour of meat as cocks. There was no difference between capons and cocks in the content of muscle proteins, water and intramuscular fat.

Key words

poultry, caponization, carcass quality, meat quality

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Aim

Rearing of capons is a traditional agricultural practice, which was lost in the last decades because of more profitable broiler production. Lately, the consumers demand more variety and quality of poultry meat. This has led to the revival of traditional breeds or rearing practices, one of such being rearing of the capons, which is especially recognized in the Mediterranean countries. The main effect of cock castration is the increase of various fat deposits, abdominal, subcutaneous and intramuscular fat (Tor et al., 2005) that has been shown to result in the improved sensory quality of meat (Miguel et al., 2008). Rearing of capons is often practiced with traditional breeds that were not submitted to the selection exhibiting thus slower growth rate (Miguel et al., 2008; Muriel Duran, 2004). Due to this fact, rearing of capons is very suitable also for ecological farming. In Slovenia, capon meat is presently produced in very small amounts. It represents a delicacy and is served only for special occasions. The studies related to capon rearing in ecological farming are lacking, therefore it was our aim to analyse the effect of the caponization on carcass composition and meat quality respecting standards of ecological production.

Material and methods

Animals and rearing – The experiment was carried out on the ecological family farm. In the experiment 60 male chickens of a layer-type Slovenian hybrid Prelux-G were used. Requirements for ecological rearing were respected (EC 834/2007, EC 889/2008). At the age of 52 days (app. 0.5 kg body mass), half of the animals (n=30) were randomly selected and surgically caponized. After the castration, capons and cocks were kept indoors in separate pens (8 m² per animal) with free access to pasture (4 m² per animal). Animals were fed *ad libitum* with ecological cereals and commercial feeding mixtures (Vitakorn Biofuttermittel Ges. mbH, A-7023 Pöttelsdorf, Mühlweg); a starter Vitakorn GA1 was fed in the first 52 days, followed by 14 days feeding of corn and Vitakorn GK-9, from then on only home-grown cereals were fed. Chickens were slaughtered (after a fasting overnight) at the age of 185 days in small private slaughter facility in a close proximity of rearing stable (no transport). Slaughterhouse procedure included stunning, exsanguination, vapour scalding, feather plucking, removing of intestine and overnight cooling at 4°C.

Carcass composition – A day after the slaughter, the carcasses were weighed and partial dissection was performed in order to obtain the weights of main commercial parts: thighs with drumsticks, wings, breasts, neck, back, intestinal fat and offal (heart, liver, spleen, testicles).

Meat quality traits – The measurements of colour parameters and pH were taken in the breast (*pectoralis major*) and thigh (*semimembranosus*) muscles. The measurements of pH were taken in duplicate using a MP120 Mettler Toledo pH meter fitted with a combined glass electrode InLab427 (Mettler-Toledo, GmbH; 8603 Schwarzenbach, Switzerland). The measurements of colour (Minolta CIE L*a*b*) were taken on a freshly cut muscle surface using a Minolta Chroma Meter CR-300 (Minolta Co. Ltd, Osaka, Japan) with an 11 mm diameter aperture and D65 illuminant, calibrated against a white tile. A 2.5 cm piece of breast muscle was taken for the determination of drip loss (EZ drip loss) ac-

ording to the method described in Christensen (2003). Drip loss was determined in duplicate, after 24 and 48 hours of storage at 4°C, and expressed as a percentage of the initial sample weight. Samples of breast and thigh muscles were taken to the laboratory where intramuscular fat, protein and moisture content were determined using calibration models based on NIR spectra of minced meat samples (spectrometer NIR Systems model 6500, Silver Springs, MD, USA) according to Prevolic et al. (2010). Additionally, water-to-protein ratio was calculated.

Statistical analysis – Statistical analysis was carried out by SAS 9.1 (2002) using GLM procedure with fixed effect of sex in the model. In the case of carcass traits cold carcass weight was added in the models as a covariate. Least squares means (LS means) were compared using the PDIF option in SAS.

Results and discussion

Carcass traits – A significant effect of caponization on the weight of abdominal fat depot, offal and thighs with drumsticks was obtained, whereas for the weight of wings a tendency towards significance was noted (Table 1). The biggest difference between capons and cocks was observed for abdominal fat which was over two-fold heavier in capons compared to cocks. The differences, though smaller, were observed also for the offal weight (15% lower in capons), weight of thighs (5% lower in capons) and weight of wings (2.8 % lower in capons). No differences in carcass weight in the present study denotes similar growth rate of capons and cocks reared to the age of six months and respecting ecological standards. The literature is not consistent in regard to the effect of the caponisation on growth rate. While some researchers report higher weight or growth rate of capons (Mast et al., 1981; Tor et al., 2002; Chen et al., 2010), other studies report no differences between capons and cocks (Zanusso et al., 2001; Muriel Duran, 2004; Miguel et al., 2008). It is likely, that the inconsistency of results obtained in different studies is due to the genotype (fast or slow growing) or rearing system used. The results reported in the literature are also inconsistent in regard to the weight of carcass parts. Capons were reported to exhibit heavier wings (Muriel Duran, 2004), breast (Muriel Duran, 2004; Tor et al., 2002; Miguel et al., 2008) and thighs (Tor et al., 2002), whereas the results obtained in the present experiment indicated lower weight of the thighs with drumsticks for capons. Here again, the differences in the results can be due to the breed, rearing conditions and the timing of castration used in different studies. In regard to fat deposition, the results of the present as well as other studies are straightforward; as it is well known the main effect of cock castration is the increase of fat depots (Tor et al., 2002; Miguel et al., 2008; Tor et al., 2005), due to the altered metabolism and increased fat deposition (Cason et al., 1988).

Meat quality and composition – There was no difference in pH value and water-holding capacity between capons and cocks (Table 2), whereas significantly lighter (thighs) and less red (thighs and breasts) meat was observed in capons compared to cocks. Consistent with our results, no differences between capons and cocks were generally reported for meat water holding capacity (Miguel et al., 2008; Sirri et al., 2009; Chen et al., 2010; Symeon et al., 2010). However, lighter colour of meat observed for capons in the present study corroborates some previous reports (Miguel

Table 1. LS means (standard errors) for carcass traits of capons and cocks

	Capons	Cocks	P-value	
			Sex	CW
Number of animals	30	30		
Cold carcass, g	1784.9 (50.6)	1767.5 (50.5)	0.8081	/
Abdominal fat, g	81.5 (5.0)	37.3 (5.0)	<0.0001	<0.0001
Offal, g	68.2 (2.2)	80.5 (2.2)	0.0003	<0.0001
Neck, g	148.0 (5.3)	159.9 (5.3)	0.1320	0.0002
Thighs with drumstick, g	542.1 (5.2)	569.0 (5.2)	0.0014	<0.0001
Wings, g	195.1 (2.1)	200.5 (2.1)	0.0877	<0.0001
Breasts, g	385.2 (5.7)	383.6 (5.7)	0.8408	<0.0001
Back, g	455.0 (6.7)	447.3 (6.7)	0.4328	<0.0001

CW – cold carcass weight.

Table 2. LS means (standard errors) for meat quality traits of capons and cocks

	Capons	Cocks	P-value	
Number of animals	30	30		
Thighs with drumstick (<i>m. semimebranosus</i>)				
pH	5.97 (0.01)	6.06 (0.07)	0.2545	
Minolta L*	55.1 (0.58)	48.8 (1.52)	0.0006	
Minolta a*	3.9 (0.29)	11.7 (2.24)	0.0018	
Minolta b*	10.0 (0.44)	10.0 (1.29)	0.9838	
Breasts (<i>Pectoralis major</i>)				
pH	5.88 (0.04)	5.82 (0.04)	0.2718	
Minolta L*	46.2 (0.89)	47.8 (1.15)	0.2753	
Minolta a*	17.8 (0.67)	13.8 (1.72)	0.0365	
Minolta b*	9.3 (0.59)	9.1 (0.55)	0.7446	
Drip loss, %	1.23 (0.21)	1.16 (0.29)	0.8365	

Table 3. LS means (standard errors) for meat chemical composition of capons and cocks

	Capons	Cocks	P-value	
Number of animals	30	30		
Thighs with drumsticks (<i>m. semimebranosus</i>)				
Intramuscular fat content, %	7.3 (1.61)	6.6 (1.94)	0.2467	
Protein content, %	19.3 (0.78)	19.2 (0.89)	0.8429	
Water content, %	71.8 (0.70)	72.2 (1.05)	0.1952	
Breasts (<i>Pectoralis major</i>)				
Intramuscular fat content, %	1.46 (0.28)	1.41 (0.33)	0.6390	
Protein content, %	23.8 (0.30)	23.7 (0.20)	0.3208	
Water content, %	73.1 (0.58)	73.0 (0.67)	0.7904	

et al., 2008; Sirri et al., 2009; Symeon et al., 2010) and may be explained by lower level of heme pigments reported for capons (Sirri et al., 2009).

Chemical composition – No significant difference between capons and cocks was observed for meat chemical composition (Table 3). In contrast with the majority of literature reports (Tor et al., 2005; Miguel et al., 2008; Sirri et al., 2009; Symeon et al., 2010), in the present study we could not confirm the hypothesis of higher intramuscular fat content of capon meat.

Conclusion

Capons and cocks had similar growth rate, resulting in similar carcass weight at slaughter. Capons exhibited higher content of abdominal fat and somewhat lower weight of thighs with drumsticks. In regard to meat quality, caponization resulted in brighter colour of capon meat, whereas anticipated higher intramuscular fat was not observed.

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