Session 32

Effects of caponization on meat quality, lipid composition and selected physiological characteristics of broilers and male layers

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Introduction

Caponization results in androgen deficiency and increased overall fatness. The accumulation of body lipids plays an important role in meat quality. The aim of the present study was the evaluation of the effects of caponization on meat quality, lipid composition and selected physiological characteristics of broilers and male layers.

Materials and Methods

Three experiments were conducted as shown on tab. 1. For the evaluation of breast meat quality pH_{24}, colour, cook loss, shear values and intramuscular fat were measured along with lipid composition of intramuscular and abdominal fat. Also, abdominal adipose tissue cellularity was measured along with NADP-enzymes activity in the liver. Serum concentrations of cholesterol, triglycericides, HDL-cholesterol and testosterone were also evaluated. In addition, total RNA was extracted from liver and abdominal adipose tissue of Lohmann intact males and capons, c-DNA synthesized and gene expression of ICDH and MDH was measured using a relative quantification Real –Time assay. Data were analyzed using GLM procedures fitting the treatment as the fixed factor.

Table 1: Design of the experiments

Exp.	Hybrid (type)	Duration (wk)	Slaughters (wk)
1	Redbro (medium)	18	6, 9, 12, 15, 18
2	Redbro (medium)	24	24
3	Lohmann (Slow)	34	26, 30, 34

Caponization: Redbro at 3 wks, Lohmann at 6 wks

Results and Discussion

Meat quality was affected by the caponization mainly in terms of colour (fig. 1) and intramuscular fat (IMF) and in a lesser extent in terms of shear values (tab. 2). Specifically, caponization resulted in an increase of L values, b* values and IMF and a decrease of a* values. Caponization also presented the tendency to decrease shear values but the differences were not always significant. With respect to abdominal adipocytes cellularity (tab. 3), the proportion of fat in the abdominal fat tissue and the adipocytes volume was greater in capons in comparison to intact males (P<0.05) while the number of adipocytes presented the tendency to increase as the fat deposition was expanding with age.

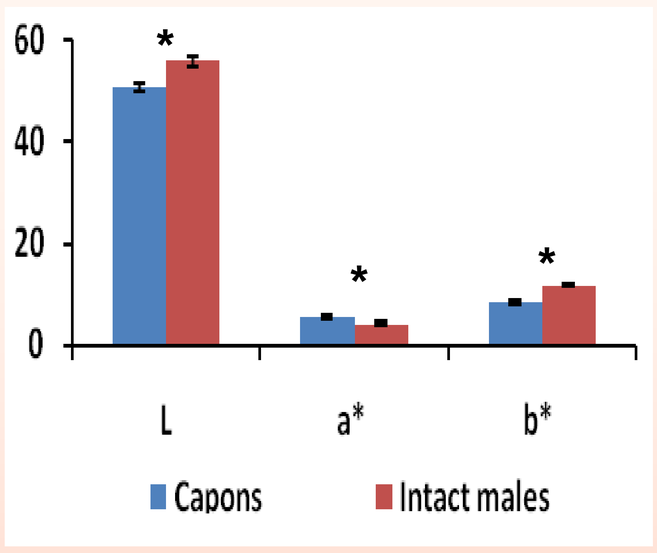

Figure 1: Colour constituents (L, a*, b*) of Redbro intact males and capons at 24 weeks of age (exp 2) (*: P<0.05)

With respect to the serum lipoproteins, caponization presented the tendency to increase their concentrations but the differences were not always significant. In the liver, malate dehydrogenase activity was increased in the Redbro capons at 24 wks of age but the same result was not observed for the Lohmann capons at any age.

Table 2: Shear values (SV) and intramuscular fat (IMF) of Redbro intact males and capons at 24 weeks of age (exp 2)

	Intact males	Capons
SV*10² (N/mm²)	$9.9^{a} \pm 0.5$	$8.1^{b} \pm 0.5$
IMF (%)	$1.13^{b} \pm 0.15$	$1.80^{a} \pm 0.18$

^{a,b} Means in a row with different superscripts differ significantly (P<0.05)

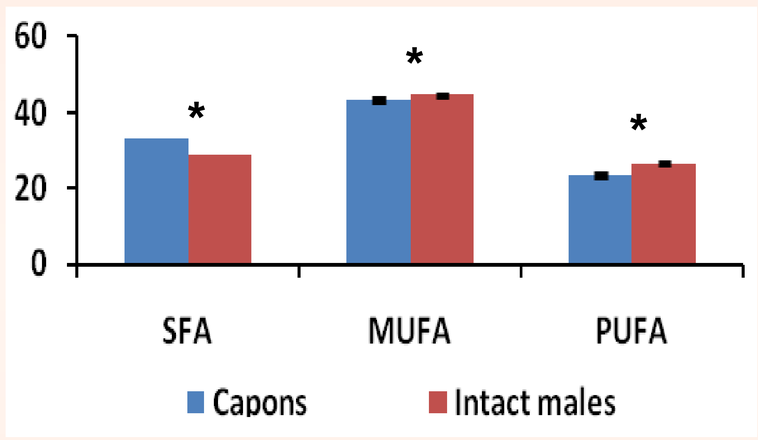

Figure 2: Fatty acid composition [% (w/w)] of total lipids in intramuscular fat tissue of Redbro capons and intact males at 18 wks of age (exp 1) (*: P<0.05)

As far as the lipid composition of IMF is concerned, caponization induced an increase of SFA accompanied with a decrease of MUFA and PUFA (fig. 2). As a result, the atherogenic index of capons was increased but it remained in acceptable levels in terms of a healthy diet (below 1).

Table 3: Fat, adipocytes number (AN) and volume (AV) of the abdominal fat tissue (AFT) in Lohmann intact males and capons at 34 wks of age (exp 3)

	Intact males	Capons
Fat in AFT (%)	$45.6^{b} \pm 1.7$	$83.6^{a} \pm 1.7$
AN [log (n*10⁶)/g tissue]	$2.0^{b} \pm 0.1$	$2.4^{a} \pm 0.1$
AV (pl)	$21^{b} \pm 6$	$410^{a} \pm 29$

^{a,b} Means in a row with different superscripts differ significantly (P<0.05)

Table 4: Relative expression of icocitrate (ICDH) and malate (MDH) dehydrogenase gene in liver and abdominal adipose tissue of Lohmann intact males and capons (exp 3)

	ICDH	MDH
	Liver	
Intact males	2.10 ± 0.25	2.07 ± 0.49
Capons	1.94 ± 0.27	3.38 ± 0.53
	Abdominal adipose tissue	
Intact males	7.19 ± 0.82	0.22 ± 0.04
Capons	5.38 ± 0.82	0.31 ± 0.05

According to Tab. 4 caponization did not alter the expression of ICDH and MDH genes both in the liver and the abdominal adipose tissue. MDH gene expression in the adipose tissue was very low in comparison to the liver since the main site for the de novo synthesis of fatty acids in birds is the liver.

Conclusion

The main effect of caponization is the increase of fat deposition on the carcass. This increase significantly altered several aspects of meat quality, resulting in chicken meat of “special quality”. Moreover, this increase significantly altered some physiological parameters of capons fat metabolism, but not always significant and with variations regarding the hybrid and age.