FACULTY OF BIOSCIENCE ENGINEERING

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COLOUR, LIPID AND PROTEIN OXIDATION IN BREAST AND THIGH MEAT OF BROILERS RAISED IN FOUR PRODUCTION SYSTEMS IN BELGIUM

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INTRODUCTION

- Influence of the broiler production system on the oxidative stability of meat has not been widely studied.
- Oxidation of myoglobin, lipids and protein are major causes of quality deterioration in meat.
- Differences in *in vivo* and *postmortem* muscle metabolism may affect the endogenous antioxidant defense system and the release of pro-oxidants and reactive oxygen species, resulting in potential differences in resistance against oxidation.

OBJECTIVE

To compare oxidation in breast and thigh meat from broilers produced in four different production systems in Belgium.

Conclusion

- ✓ Despite differences among systems, lipid oxidation was low with no risk of rancidity.
- ✓ Protein oxidation was not affected by system.
- ✓ Meat from Intensive and BCC systems was paler, less red and less yellow, and tended to be more colour-stable than meat from Bio and Slow growth systems.

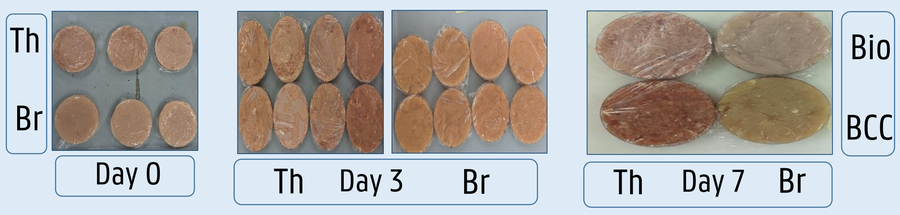
MATERIALS AND METHODS

- Four broiler production systems with distinctive characteristics were selected
- From each production system, 5 farms were chosen, and 15 broilers (mixed sex; 3 broilers per farm) were slaughtered and sampled
- On day 2 after slaughter, meat from thigh and breast muscles was minced and placed in petri dishes, for the following analyses:

Characteristics	Intensive	BCC	Slow growth	Bio/Organic
Breed	Ross 308	RedBroM	Ja 757	RUBY XL (SASSO)
Age at slaughter (days)	39-42	42-45	56	73-76
Live weight at slaughter (kg)	2.6-2.8	2.4-2.6	2.1-2.3	2.3-2.5
Stocking density (kg/m^2)	42	30	27-33	21
Outdoor access	No	No	Yes (limited)	Yes

1. Colour and Colour Stability

- Colour lightness (L^*), redness (a^*), and yellowness (b^*) were measured with Hunterlab Miniscan.
- Meat samples were exposed to light (1600 – 2200 lux) for 7 days at 4°C to assess colour stability.
- The difference (d1 – d7) in colour lightness (ΔL), redness (Δa), yellowness (Δb) and total colour difference (ΔE) was calculated ($\Delta E = [(\Delta L)^2 + (\Delta a)^2 + (\Delta b)^2]^{1/2}$) as measures of colour stability.



2. Lipid Oxidation (TBARS)

- On day 7, the samples were vacuum packed and frozen at -80°C until analysis of lipid and protein oxidation.
- Lipid oxidation was assessed in duplicate, spectrophotometrically by the thiobarbituric acid reactive substances (TBARS) method.

3. Protein Oxidation (PCC)

- Protein carbonyl compounds (PCC) were measured spectrophotometrically by the 2,4-dinitrophenylhydrazine (DNPH) method.

Distribution of Broilers Farms

Data Analysis

The data were analyzed by one-way ANOVA with production system as a fixed factor and storage time as random factor, in R studio.

RESULTS

1. Lipid Oxidation

Breast: Higher in Bio than in Intensive and BCC chickens ($P < 0.05$).

Thigh: Higher in Bio and BCC than in Intensive and Slow growth chickens ($P < 0.05$).

2. Protein Oxidation

Not affected by production system ($P > 0.05$).

3. L^*, a^*, b^* (d0)

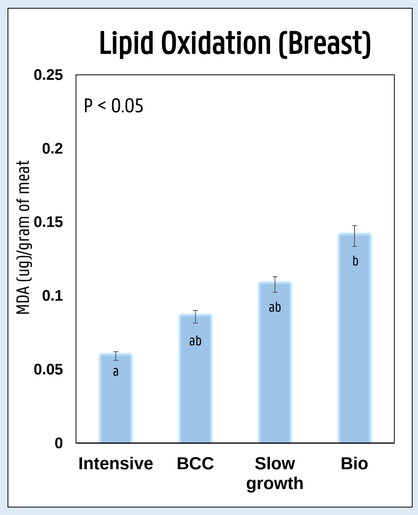
L*: Higher in Intensive and BCC than in Slow growth and Bio chickens for both muscles ($P < 0.01$).

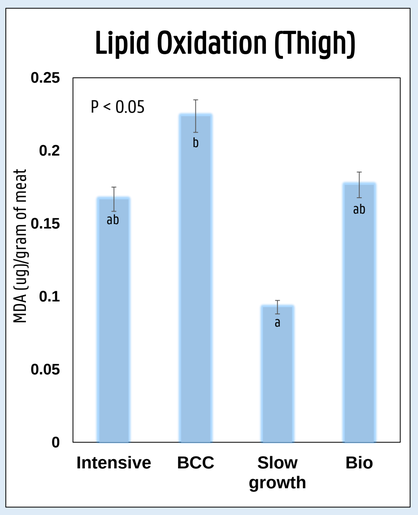
***a* and b**: Lower in Intensive and BCC compared to Slow growth and Bio chickens for both muscles ($P < 0.01$).

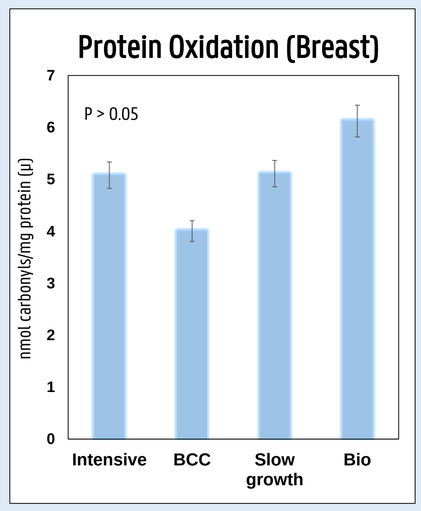
4. Δa and ΔE (d1 – d7)

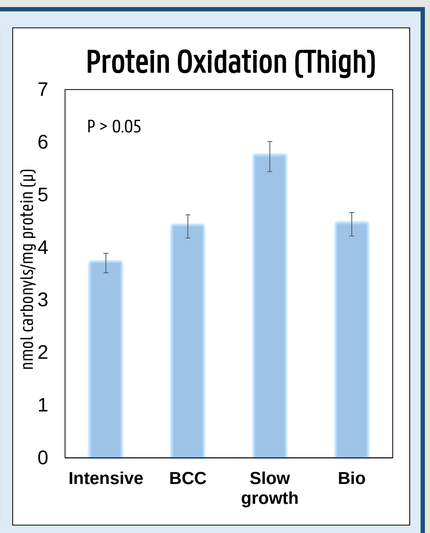
Breast: ΔE was higher in slow growth chickens than in Intensive, and intermediate for BCC and Bio chickens ($P < 0.05$). Δa was not affected ($P > 0.05$).

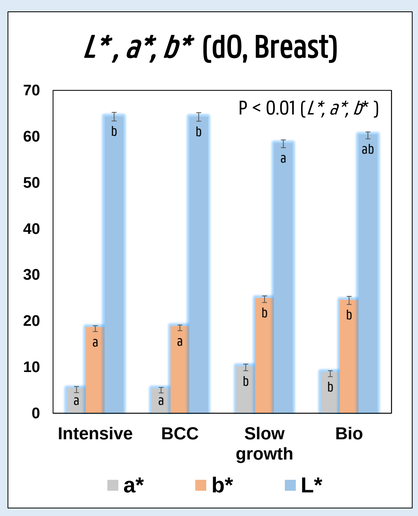
Thigh: ΔE was higher in Slow growth and Bio compared to BCC and Intensive chickens ($P < 0.05$). Δa was not affected ($P > 0.05$).

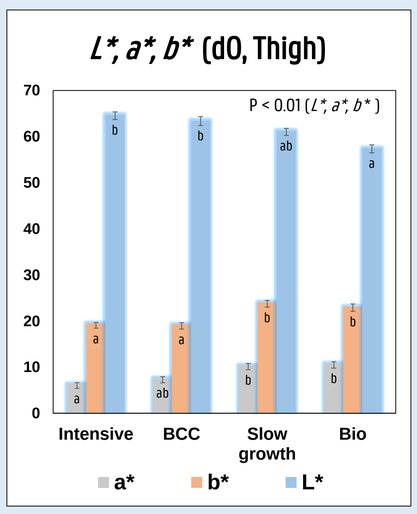


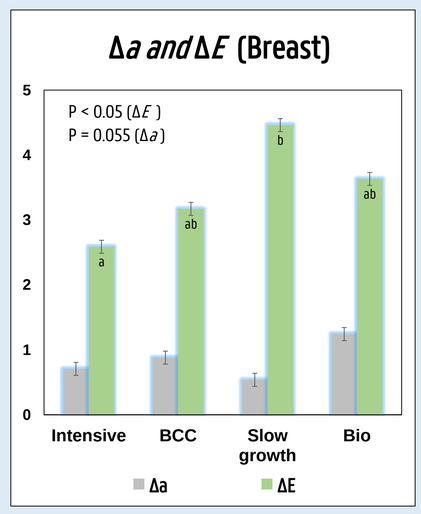


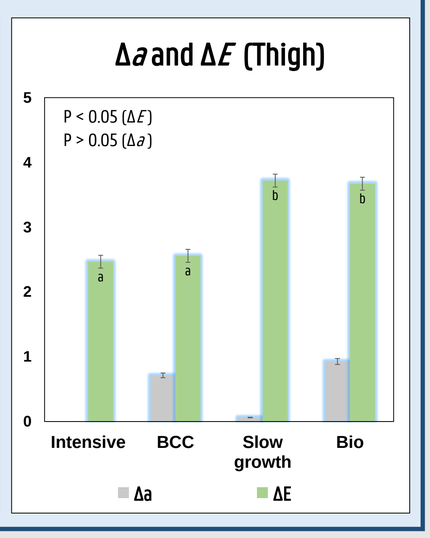












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