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Instituut voor Landbouw-, Visserij- en Voedingsonderzoek

GHENT UNIVERSITY

XVI European Poultry Conference
24th – 28th June 2024

Effects of electrolyzed-reduced water and functional amino acid supplementation in drinking water to alleviate heat stress in broilers

Renée De Baets, Gunther Antonissen,
Jeroen Degroote, Evelyne Delezie

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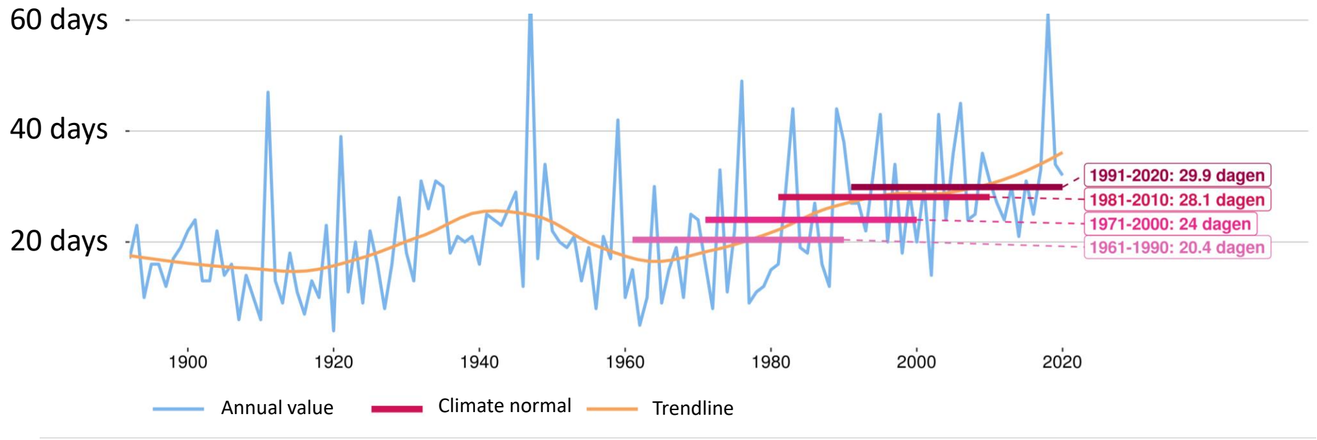
HEAT STRESS

BELGIUM

Annual number of warm days in Belgium between 1892 – 2020

Warm day = day with a maximum temperature equal to or higher than 25 °C



→ Increase in: number of warm days, duration of heat waves, maximum temperature

HEAT STRESS

POULTRY

Poultry Sensitive:

- Feathers
- Lack of sweat glands
- High metabolic heat production

Consequences:

- ↓ Animal welfare
- ↓ Feed intake
- ↓ Quality end products
- Economic losses
- Mortality

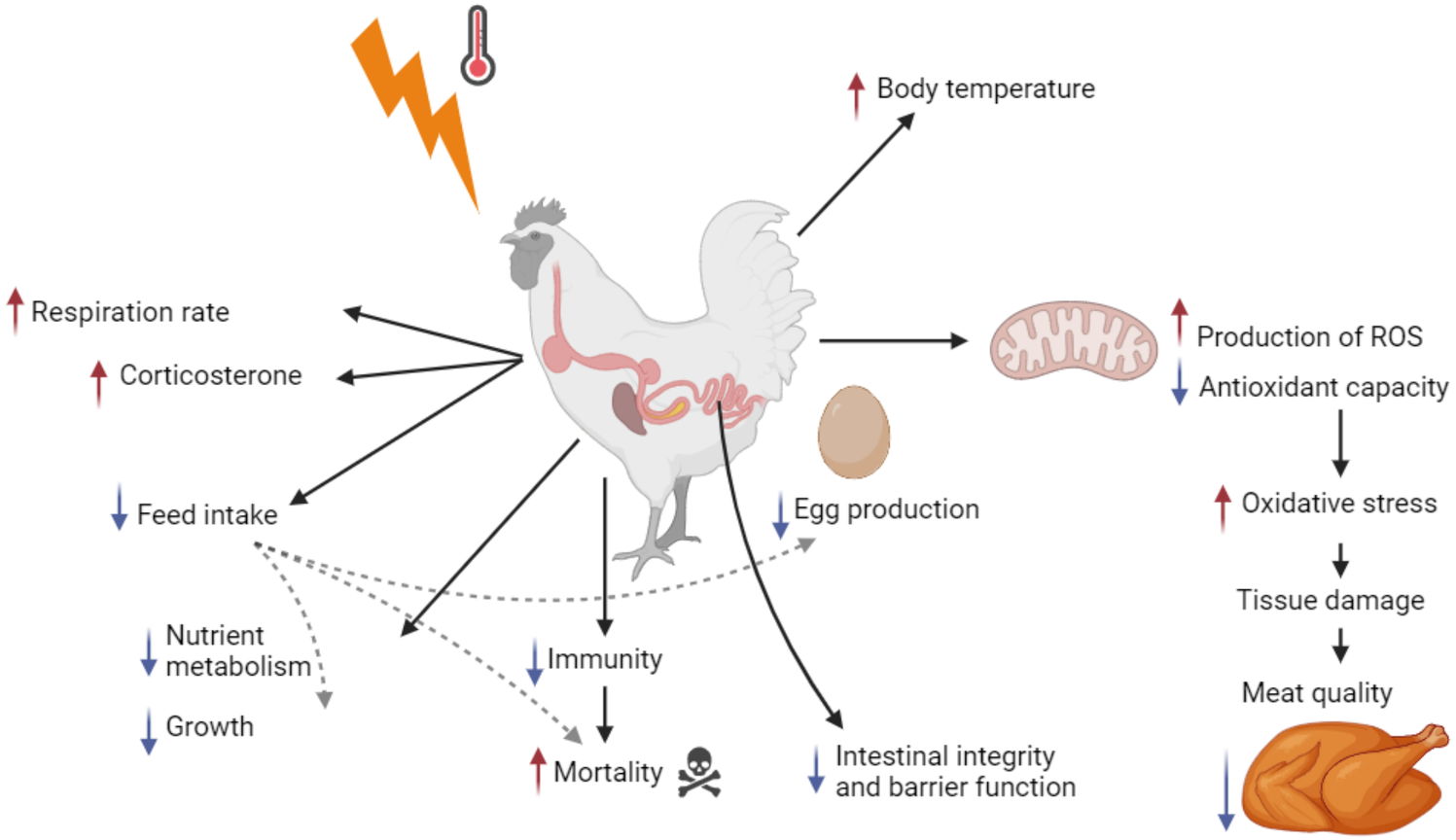


Image created in BioRender
Adapted from: Shehata et al., 2020

EXPERIMENTAL SET-UP

Breed:

- Ross 308
- Male

Feed:

- Commercial standard feed (3 phases)

Treatments:

- 4 treatments (drinking water)
- D25 -39
- 9 pen replicates per treatment
- 20 chickens per pen

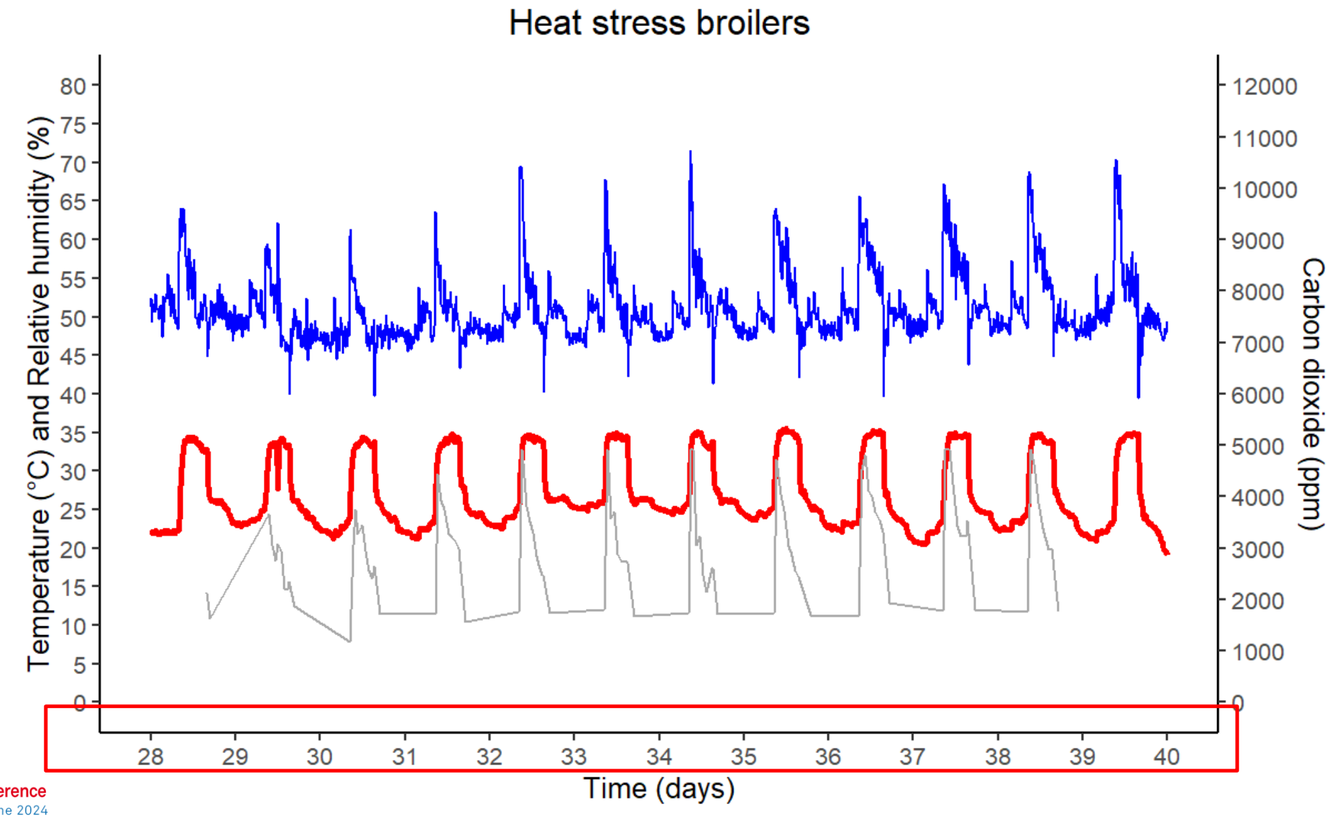
T3	T4	T2	T1	T4	T2	T1	T3	T2	T1	T3	T4	T1	T3	T4	T2	T3	T2
T2	T4	T3	T1	T4	T3	T2	T1	T3	T1	T4	T2	T2	T1	T3	T4	T1	T4

EXPERIMENTAL SET-UP

HEAT STRESS PROTOCOL

6h

RH: 50-60%



TREATMENTS

DRINKING WATER

All treatments provided from day 26

Electrolyzed reduced water (10%)

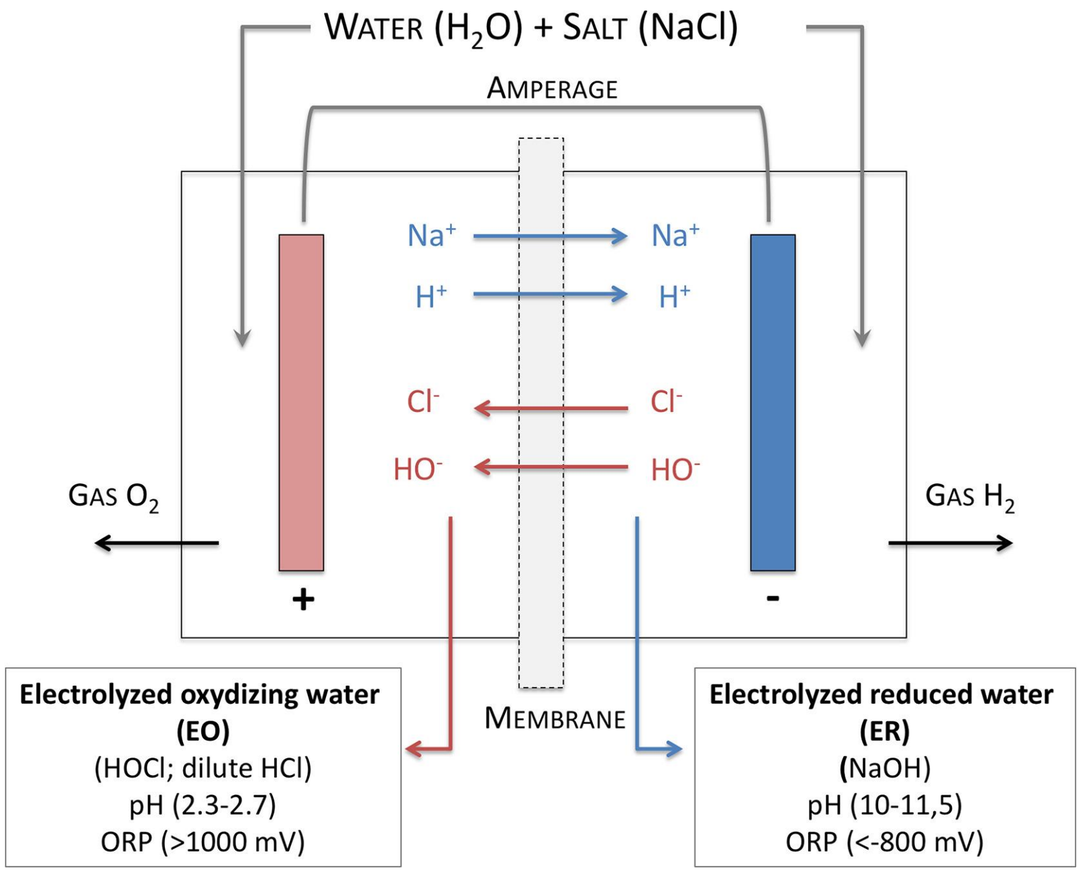
Functional amino acids

Electrolyzed reduced water (100%)

Control

TREATMENTS

ELECTROLYZED REDUCED WATER



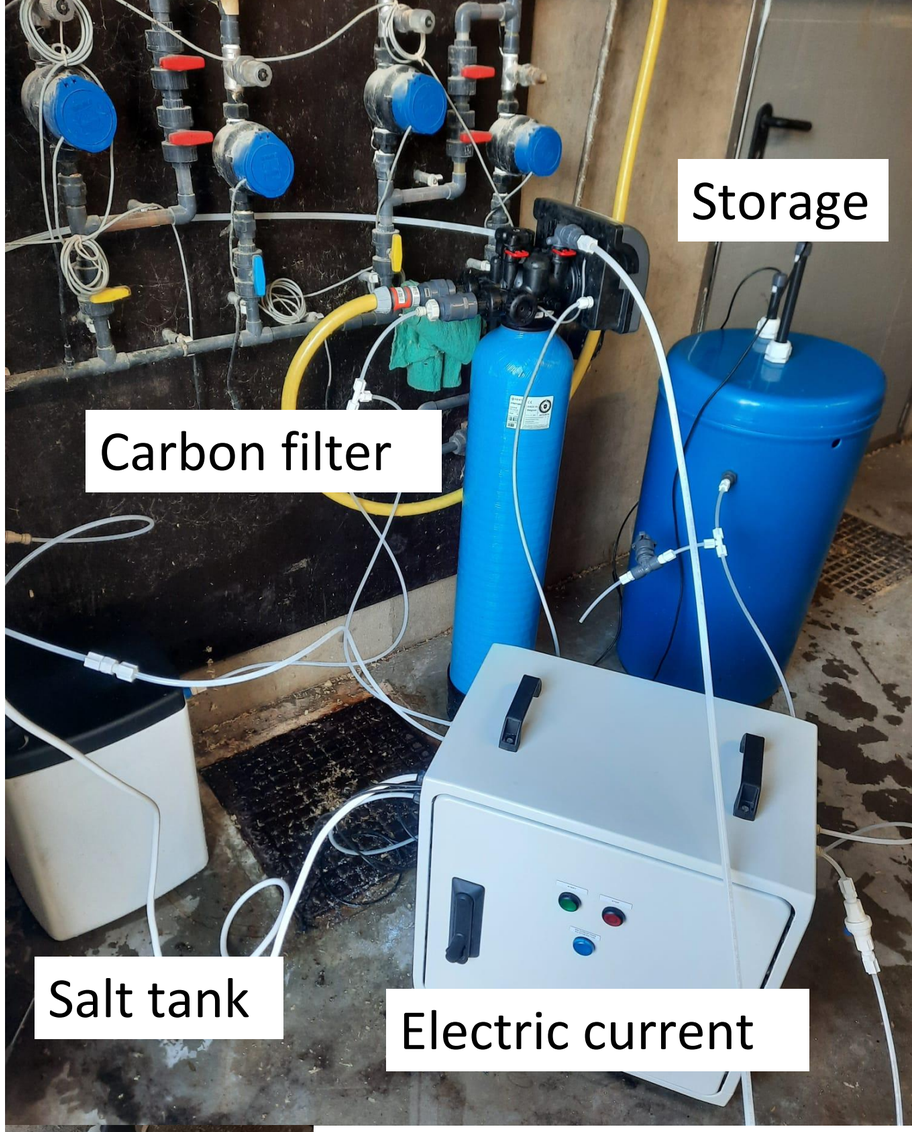


Image from: Machado et al., 2016

TREATMENTS

FUNCTIONAL AMINO ACIDS

L-arginine (4,5 g/L)

- Essential AA
- ↑ immunity
- Stimulates glutathione synthesis and activates Nrf2 pathway
- Precursor for the synthesis of creatine, polyamines, and nitric oxide (NO)
- Stimulates secretion of insulin-like growth factors

L-monosodiumglutamate (3 g/L)

- Sodium salt of glutamic acid
- ↑ intestinal immunity

L-threonine (2,5 g/L)

- Essential AA
- Major component of intestinal mucin
- Major component of immunoglobulins

References: Dozier et al., 2000, Corzo et al., 2007, Bortoluzzi et al., 2018 Liang et al., 2018,

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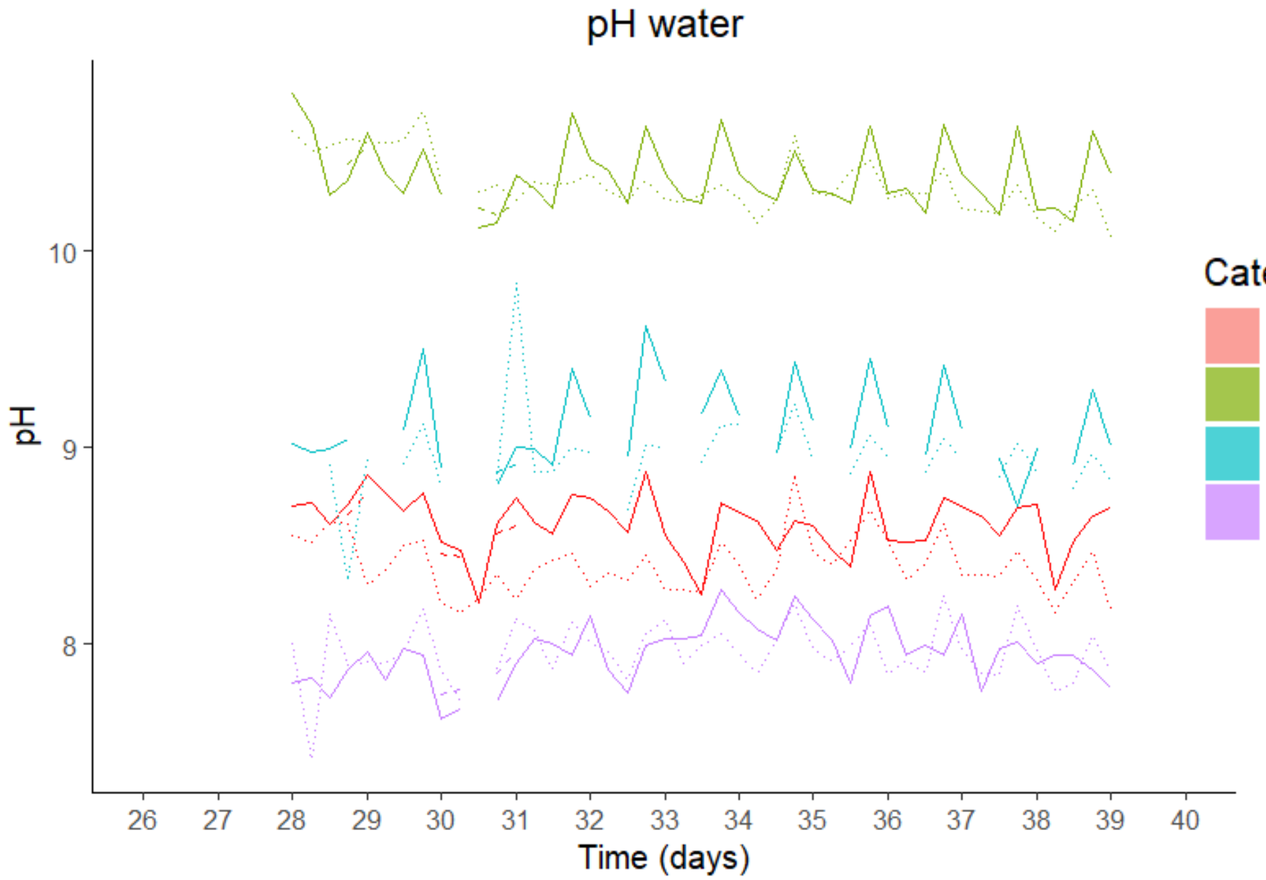
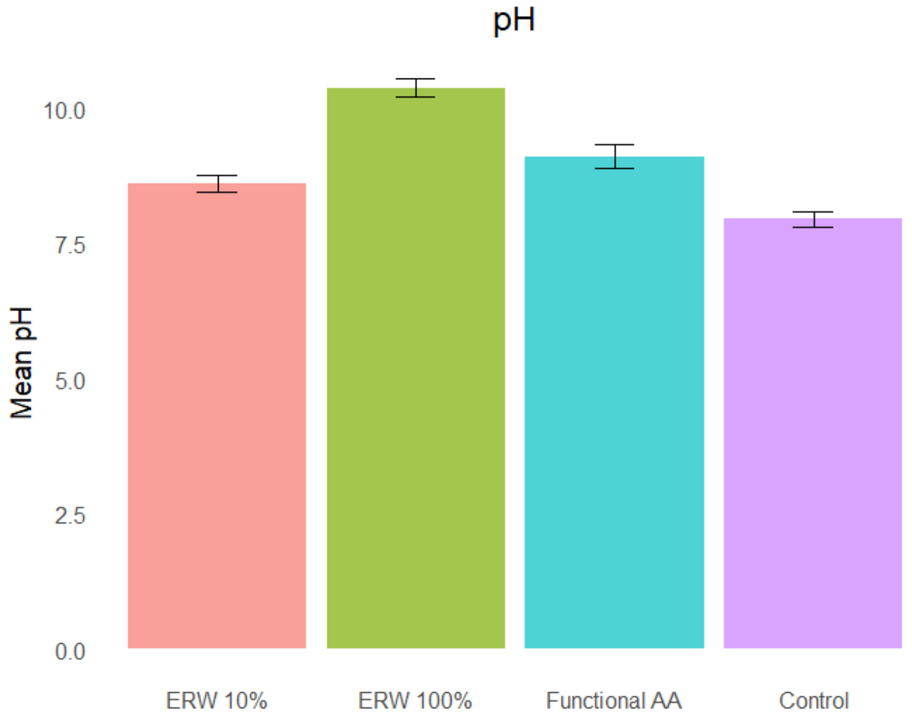
RESULTS

DRINKING WATER pH

- 3 times/day
- At the start and end of drinking water line

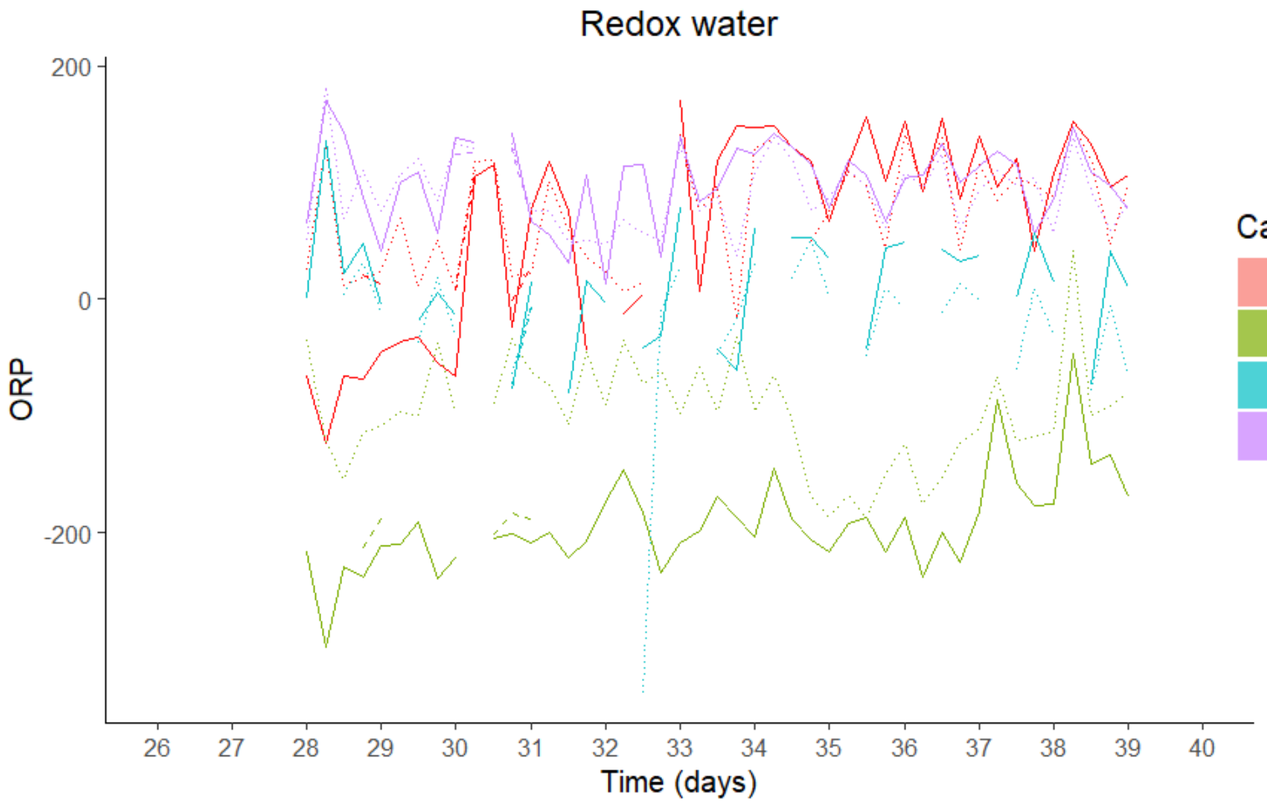


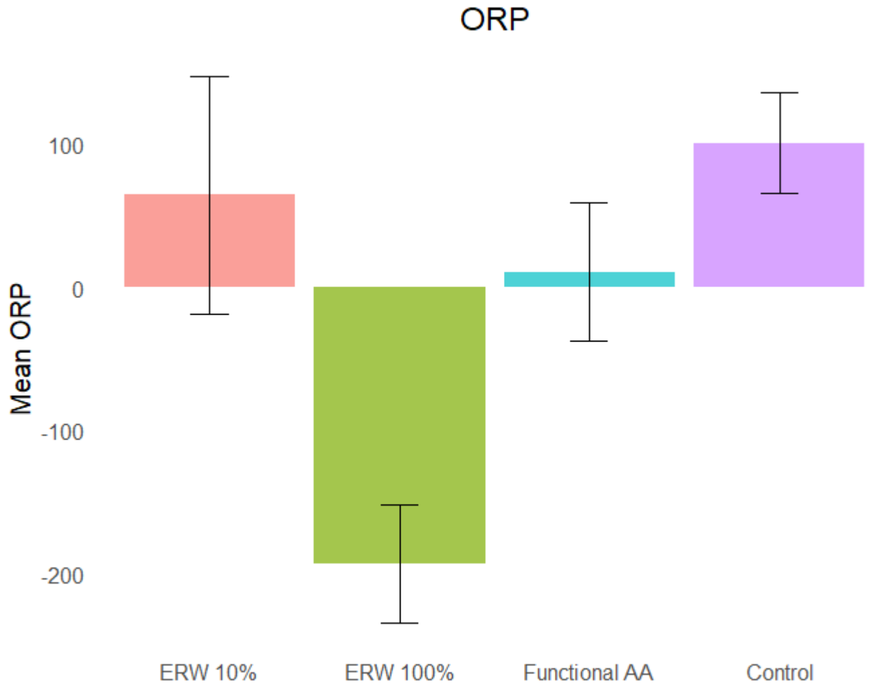


RESULTS

OXIDATION-REDUCTION POTENTIAL (ORP)

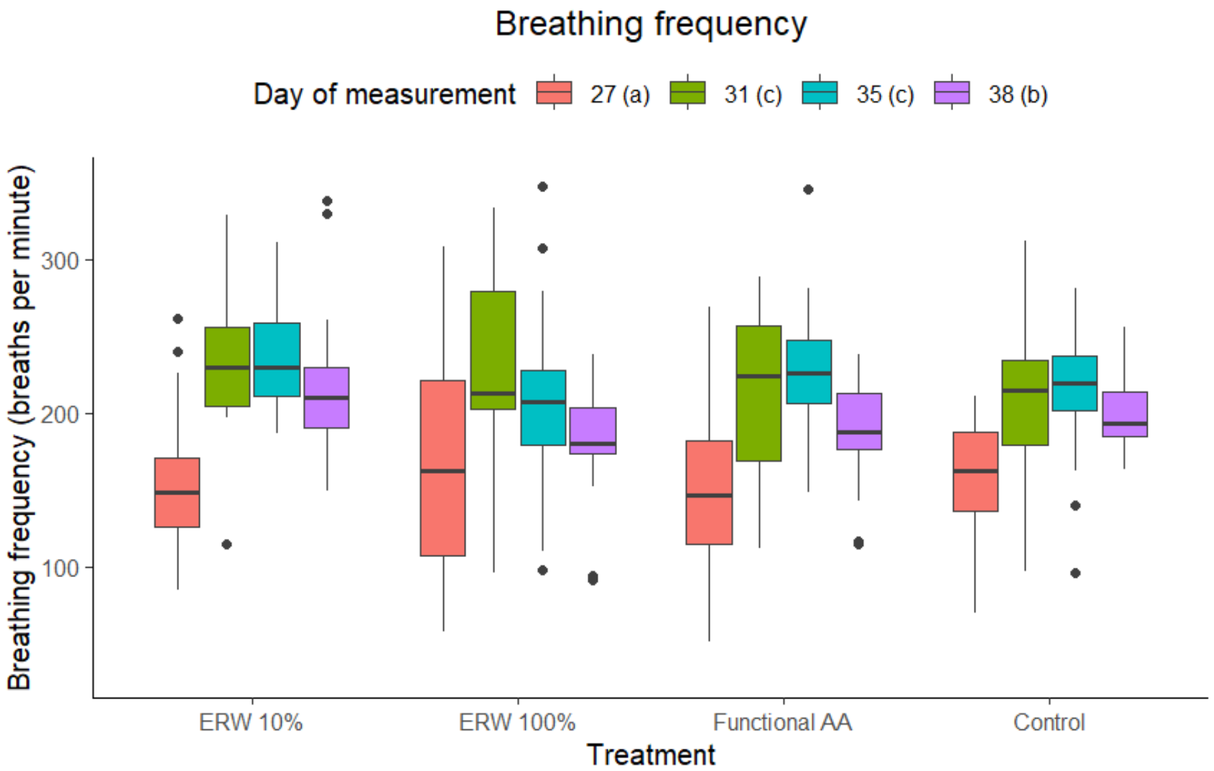
- 3 times/day
- At the start and end of drinking water line

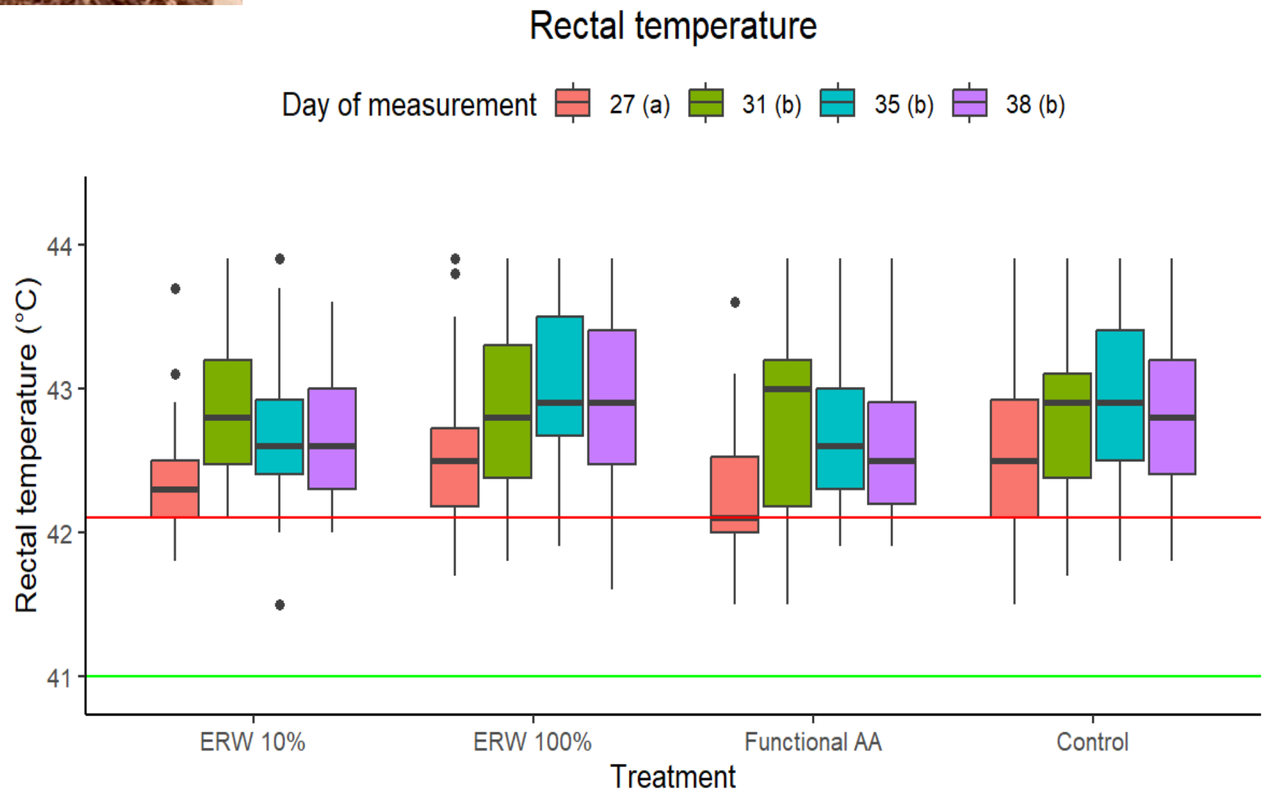




RESULTS

ANIMAL PARAMETERS





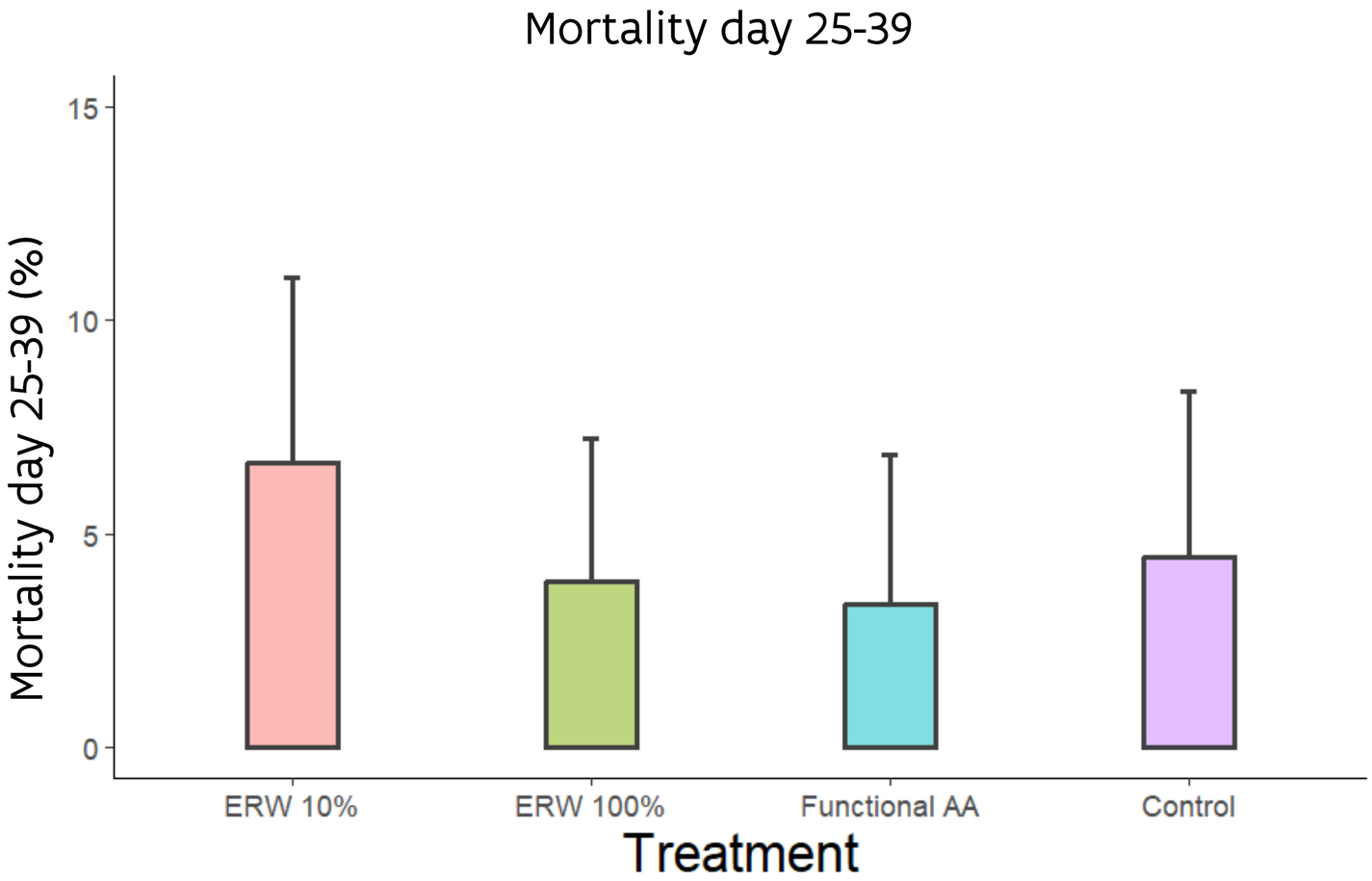
- 2 chickens per pen
- 9 pens/treatment

- No effect of treatments (p = 0,629)
- Increased breathing frequency and rectal temperature at d31, 35 and 38 compared to d25 (p < 0,01)

- 4 chickens per pen
- 9 pens/treatment

RESULTS

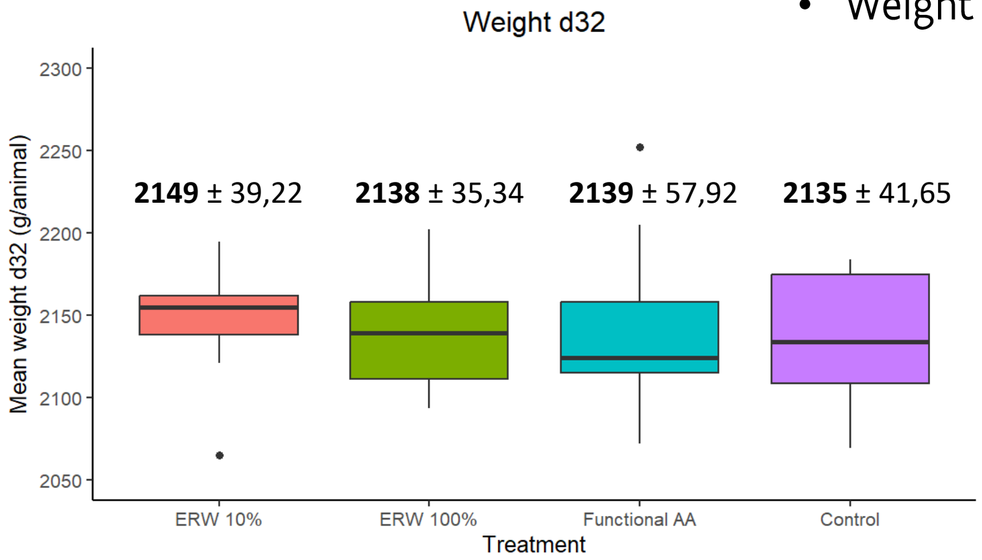
MORTALITY

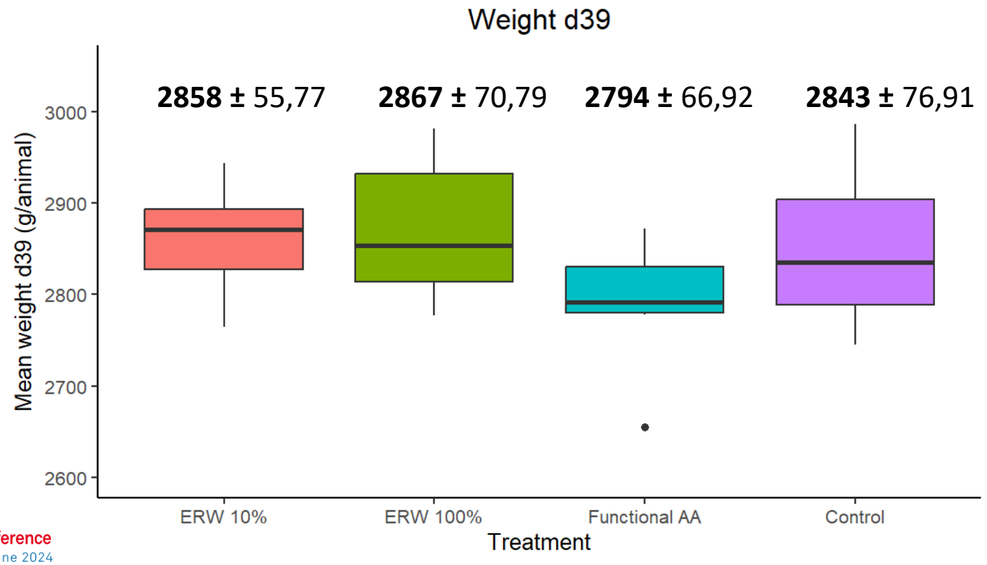


RESULTS

FUNCTIONAL AMINO ACIDS

- Weight d32: p = 0,924
- Weight d39: p = 0,150

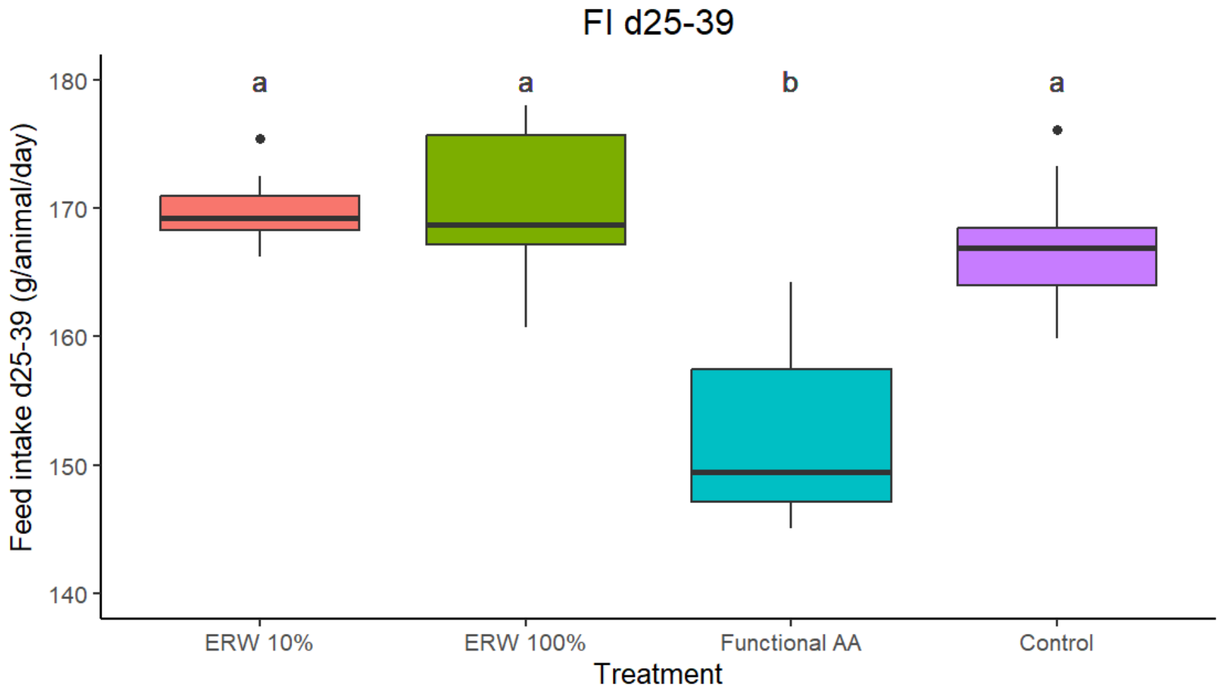


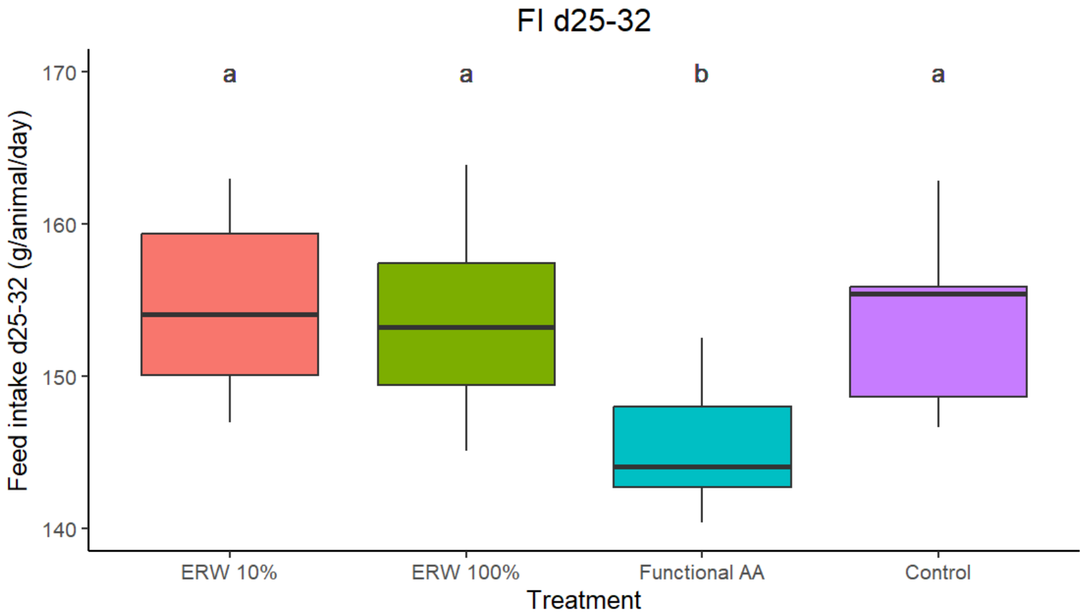


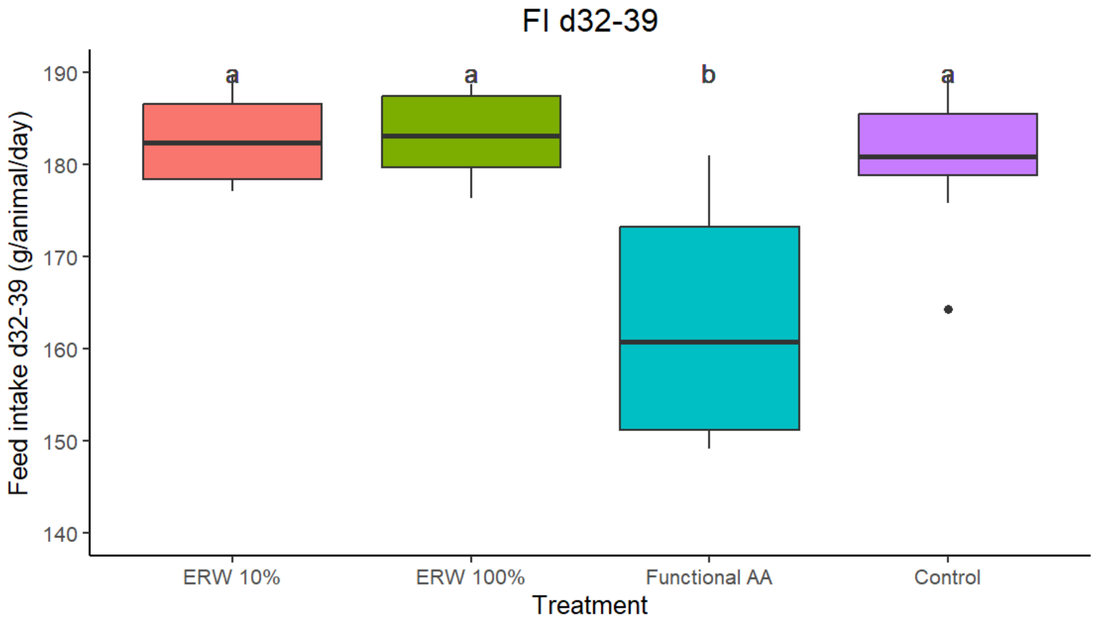
RESULTS

FEED INTAKE

- Feed intake d25-32: p < 0,01
- Feed intake d32-39: p < 0,01
- Feed intake d25-39 **(-5,2%):** p < 0,01



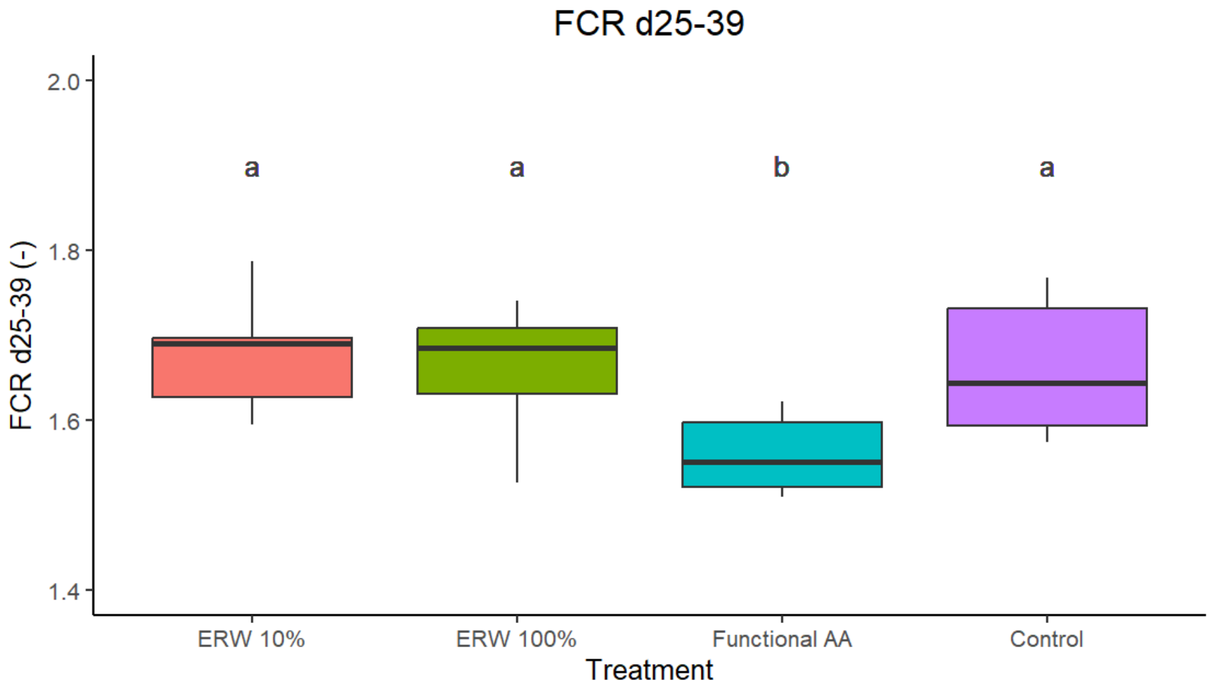


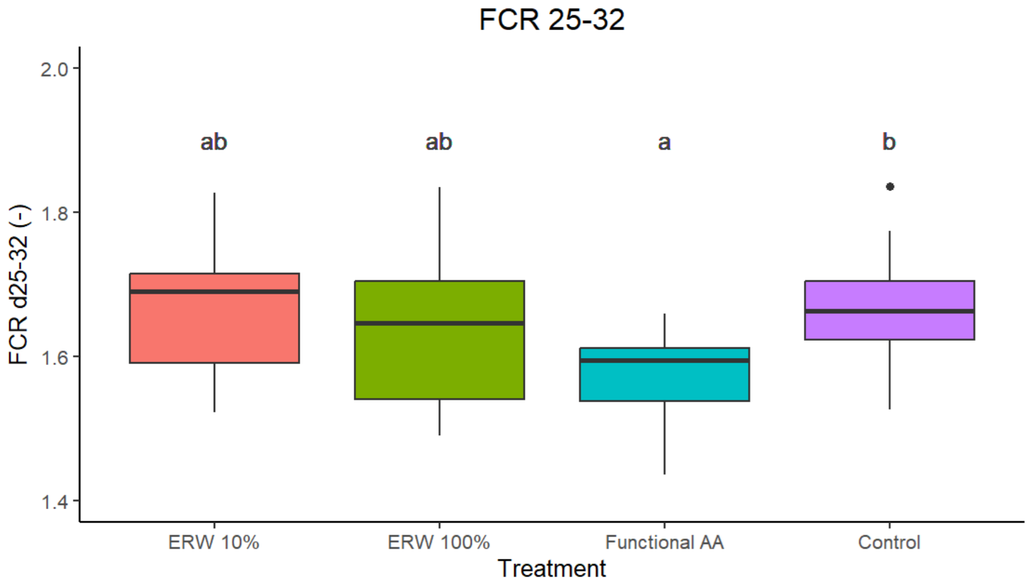


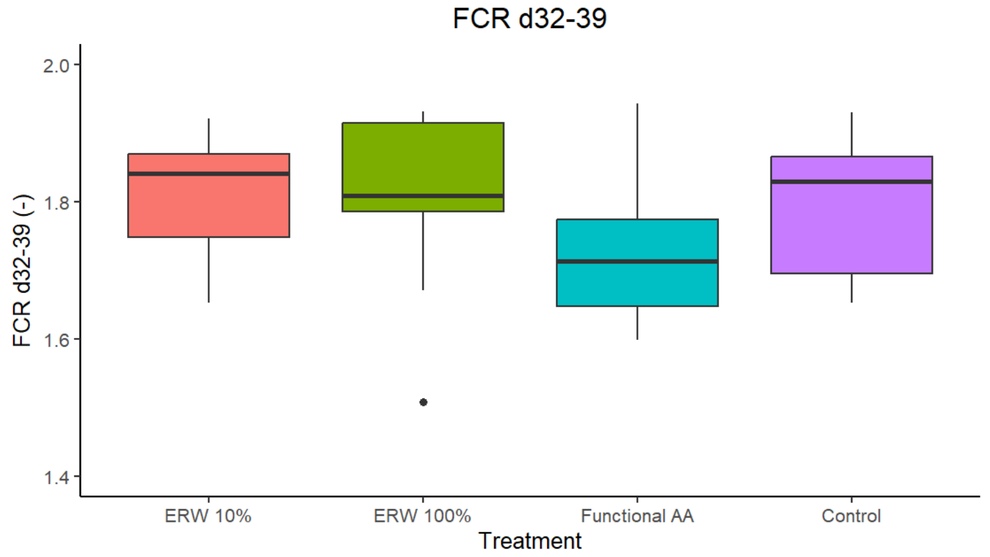
RESULTS

FEED CONVERSION

- Feed conversion ratio 25-32: p = 0,03
- Feed conversion ratio d32-39: p = 0,272
- Feed conversion ratio 25-39 **(-6,1%)**: p < 0,01



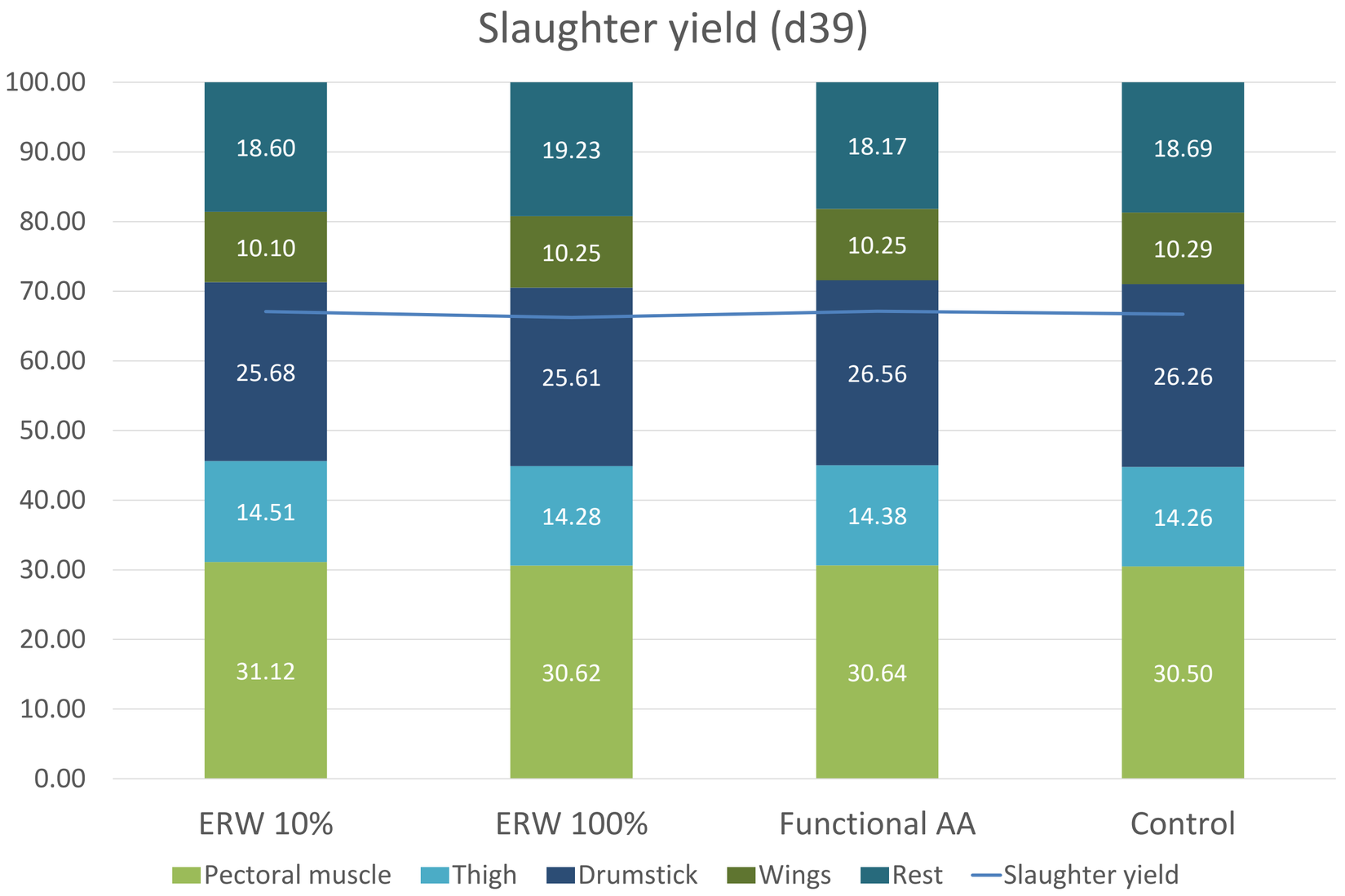




RESULTS

MEAT QUALITY

- Slaughter yield: p = 0,517
- Pectoral muscle: p = 0,390
- Thigh: p = 0,241
- Drumstick: p = 0,251
- Wings: p = 0,855
- Rest: p = 0,102



- 3 chickens with a mean weight per pen
- 7 pens/treatment

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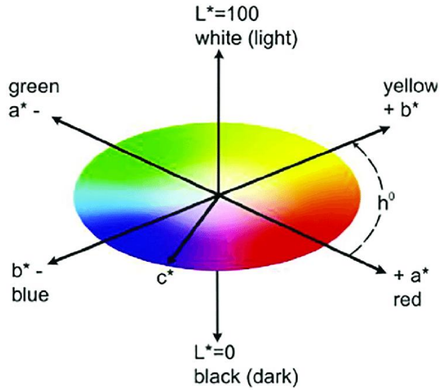
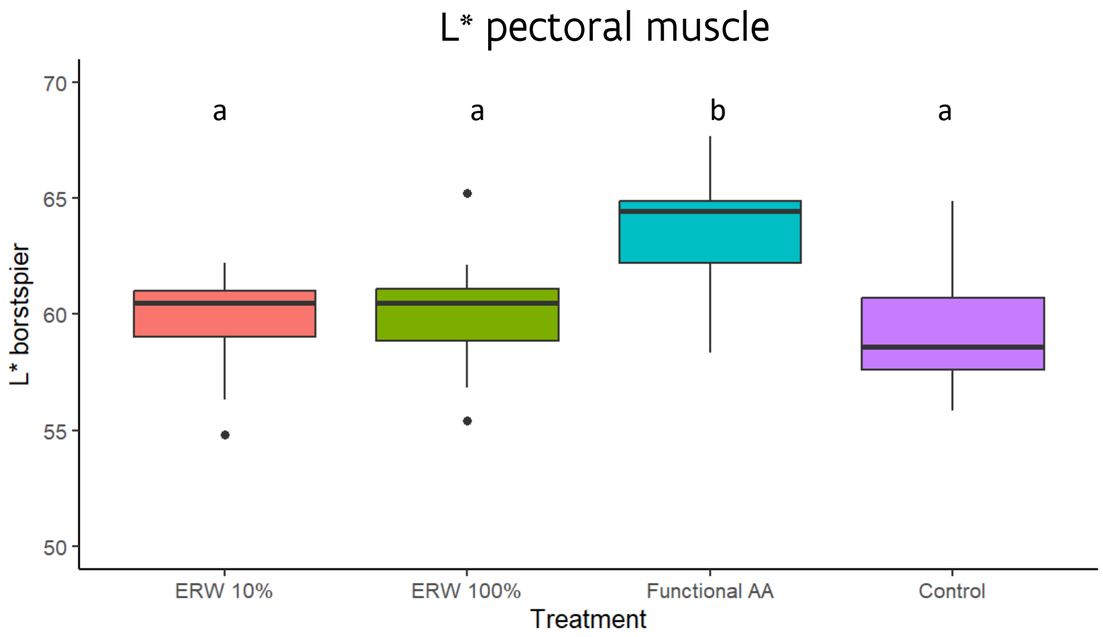
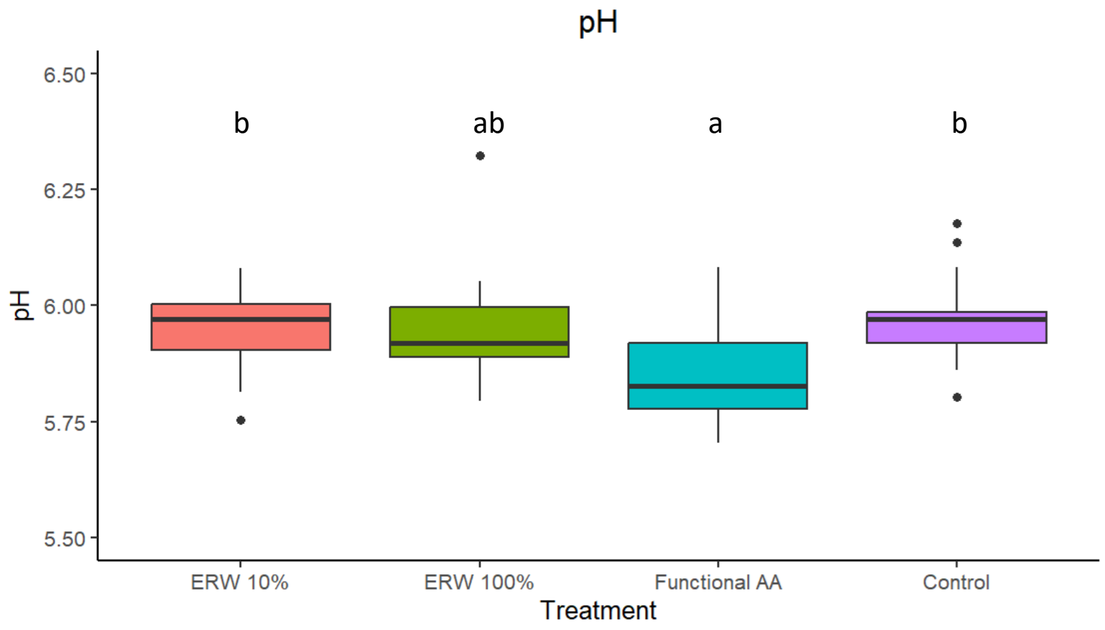
RESULTS

pH & COLOUR



- Colour:
  - L*: p < 0,01
  - A* en B* no difference
- pH: p = 0,01





- 3 chickens with a mean weight per pen
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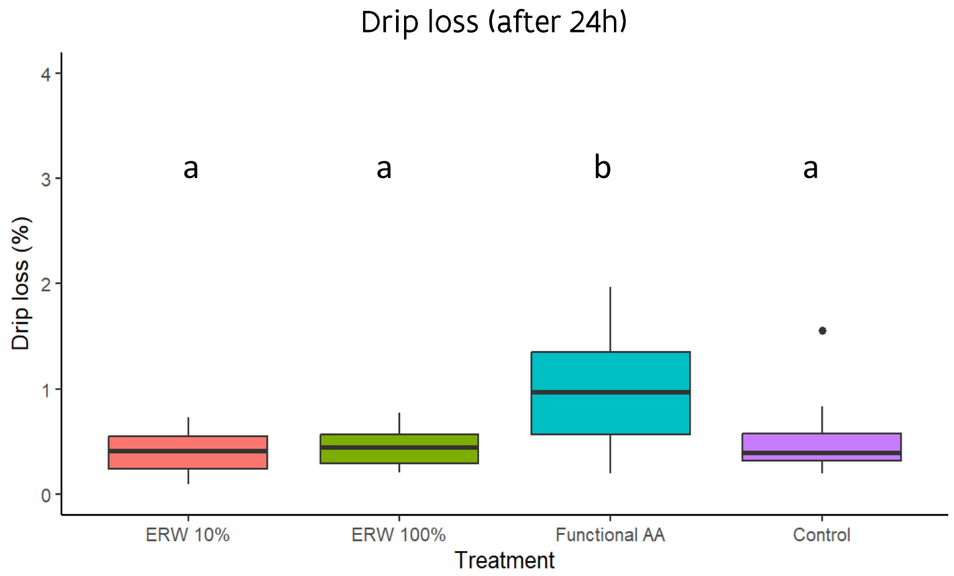
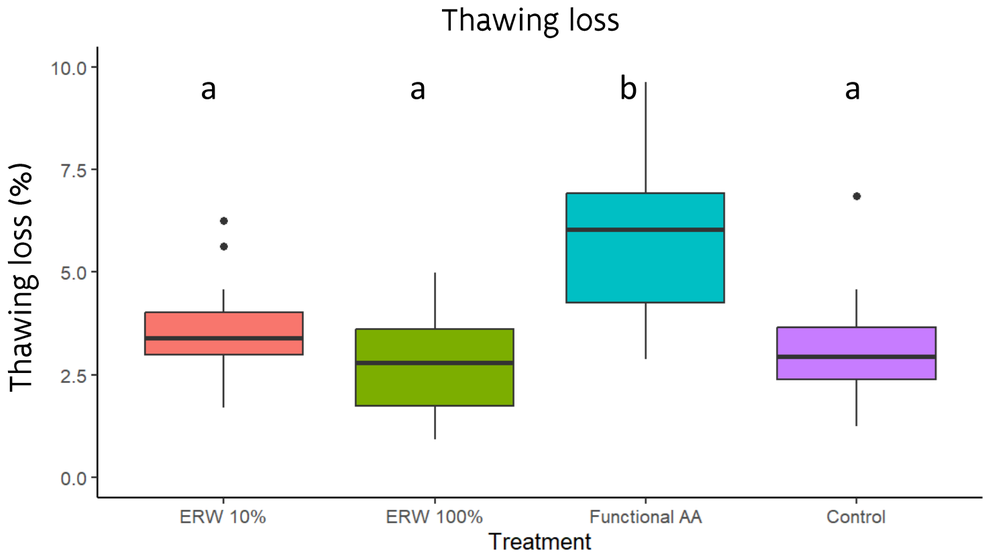
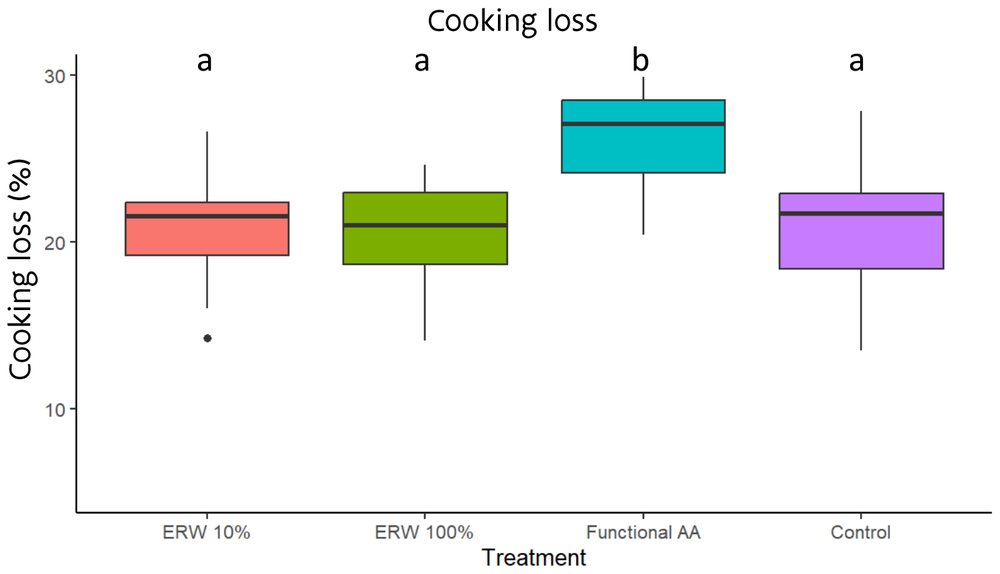
RESULTS

WATER HOLDING CAPACITY

- Thawing loss: p < 0,01
- Cooking loss: p < 0,01
- Drip loss: p < 0,01







CONCLUSION

- Heat stress model was effective
- No effects of electrolyzed reduced water at 10% or 100%
- Functional amino acids in drinking water during d25-39:
  - Reduced growth and feed intake, but better feed conversion ratio
  - No effects on final BW or carcass yield
  - Pectoral muscle: paler, lower pH
  - Lower water holding capacity

→ Reason:
  - Concentration suboptimal?
  - Other factors (e.g. contamination)?

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Thank you

Questions?

Contact: renee.debaets@ilvo.vlaanderen.be

Flanders Research Institute for
Agriculture, Fisheries and Food
Scheldeweg 68
9090 Melle – België
T + 32 (0)9 272 26 07
www.ilvo.vlaanderen.be

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