Effect of heat stress on growth performance, stress response and carcass traits of fast, medium, and slow-growing broilers chickens

UNIPD Team

Marco Birolo, Fabrizio Pirrone, Eleonora Nalon, Rina Verdiglione

EU - Meat Changes

The European Chicken Commitment challenge: toward the use of novel genotypes with slower-growth rate for meat production

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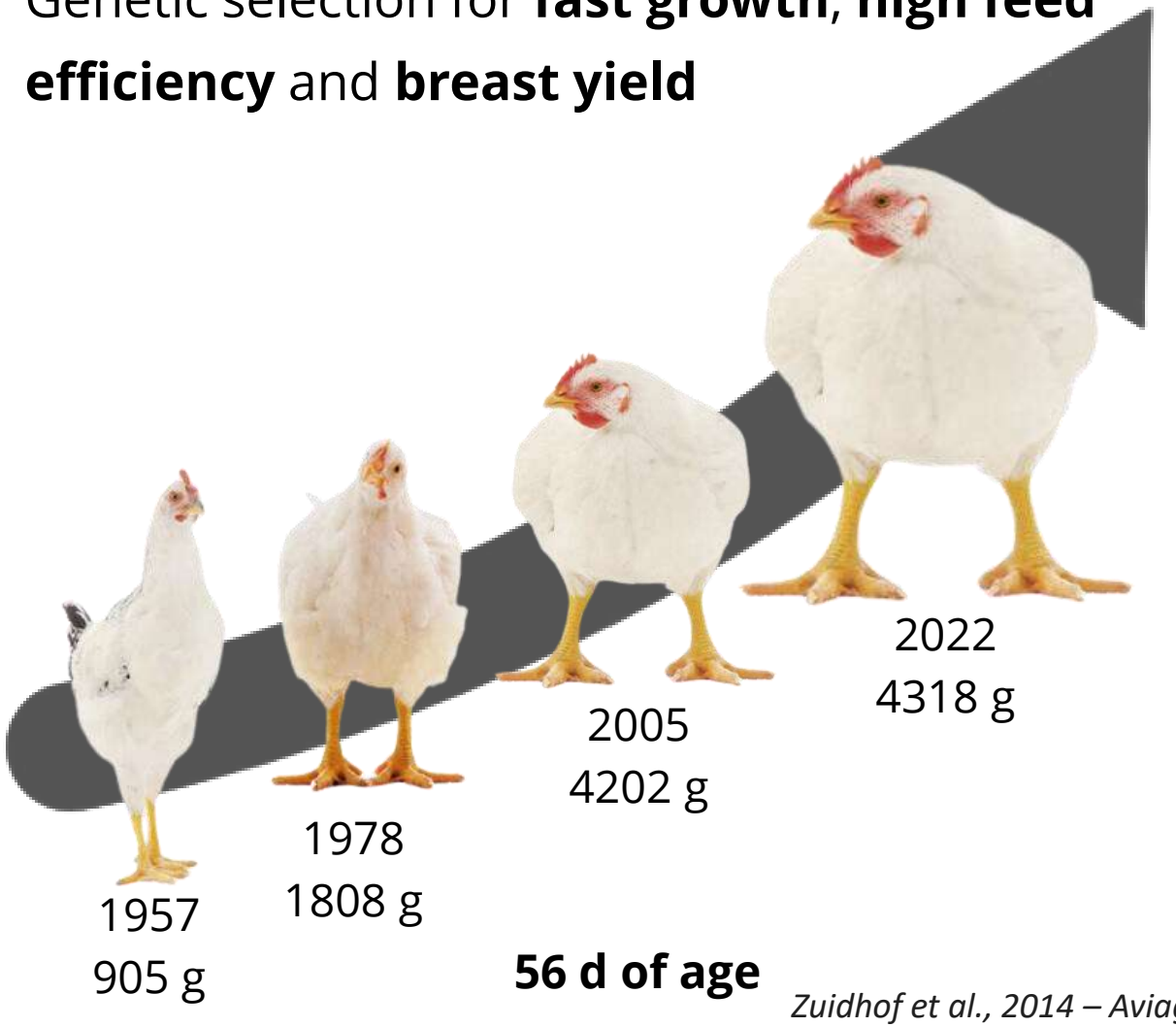
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

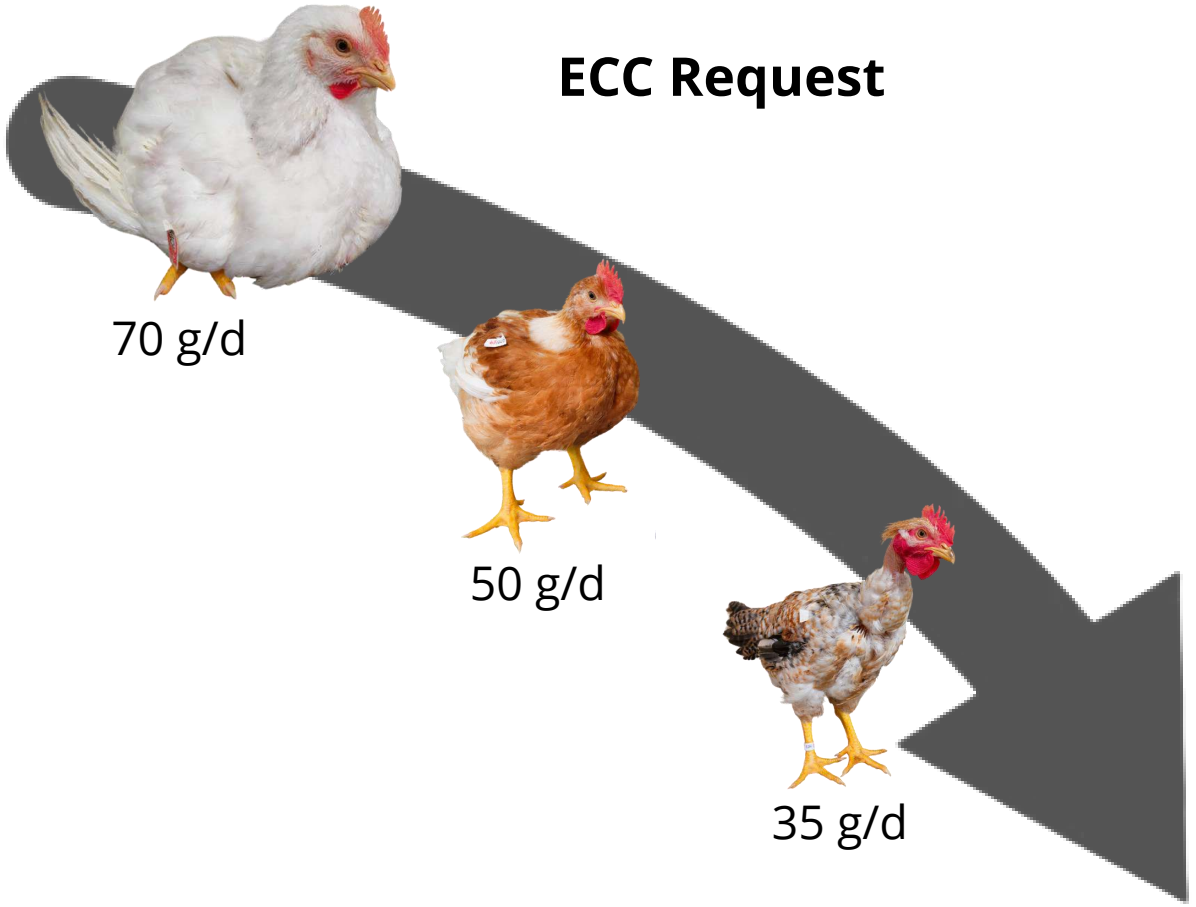
UNIVERSITY OF PADUA
DEPARTMENT OF AGRONOMY, ANIMALS, NATURAL RESOURCES AND ENVIRONMENT

Introduction

Genetic selection for **fast growth**, **high feed efficiency** and **breast yield**



ECC Request

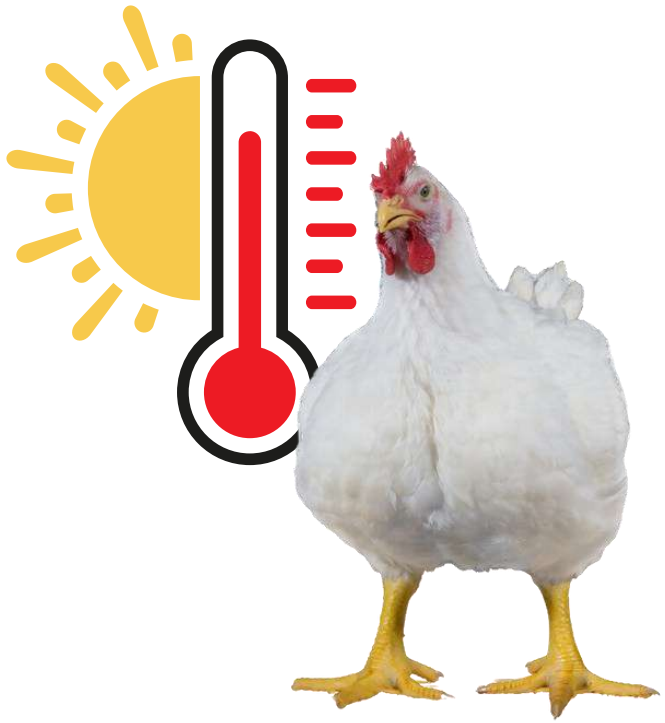


Zuidhof et al., 2014 – Aviagen, 2022

Heat stress

Physiology

↓ Immune response
↓ Metabolism
↓ Muscular pH
Intestinal barrier dysfunction



Performance

↓ Body weight
↑ FCR (Feed conversion rate)

Behavior

↓ Feed consumption
Panting
Stretching the neck
Spread wings away from the body
Search for cold areas
Dustbathing

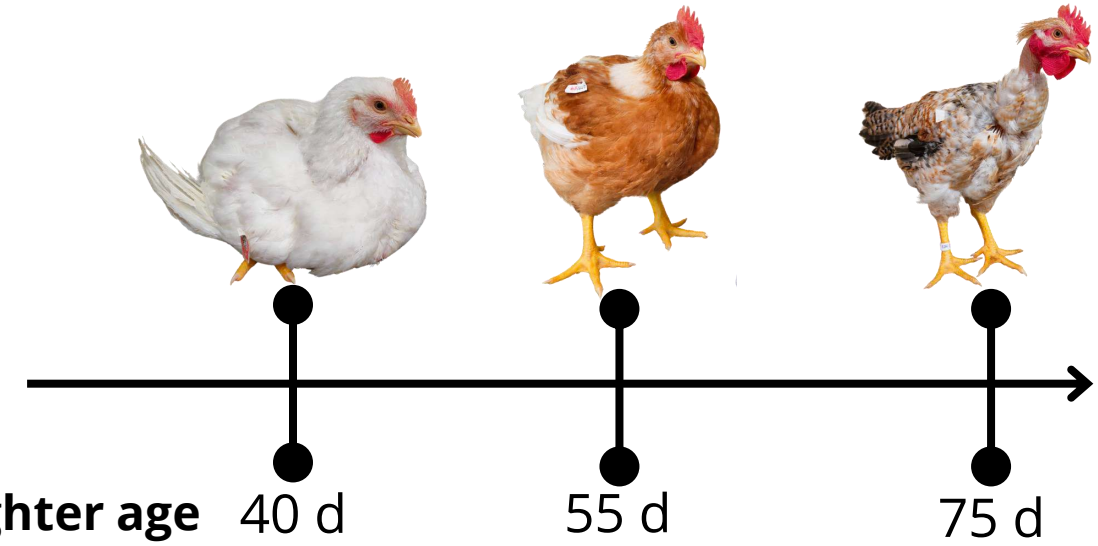
Meat quality

↓ Quality
↓ WHC
↓ Juiciness
Color change

Material and methods

A total of 720 male chicks, one day old, whit different growth rate:

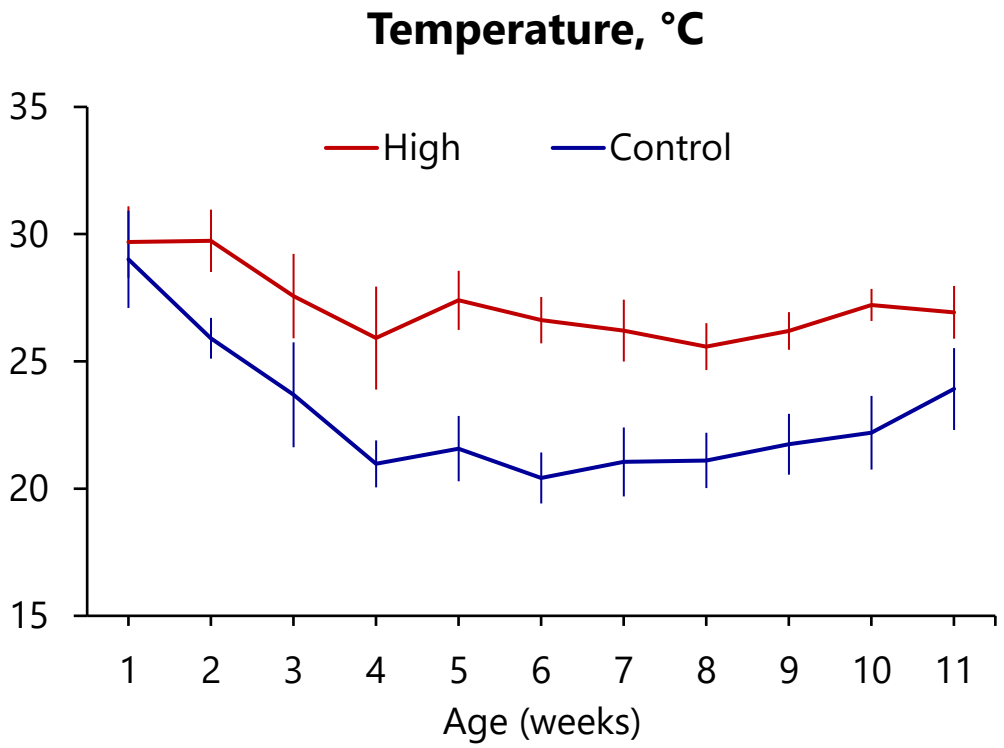
- 240 Ross 308 (fast-growing - **FG**)
- 240 Ranger Gold (medium-growing - **MG**)
- 240 Naked Neck Kabir (slow-growing - **SG**)

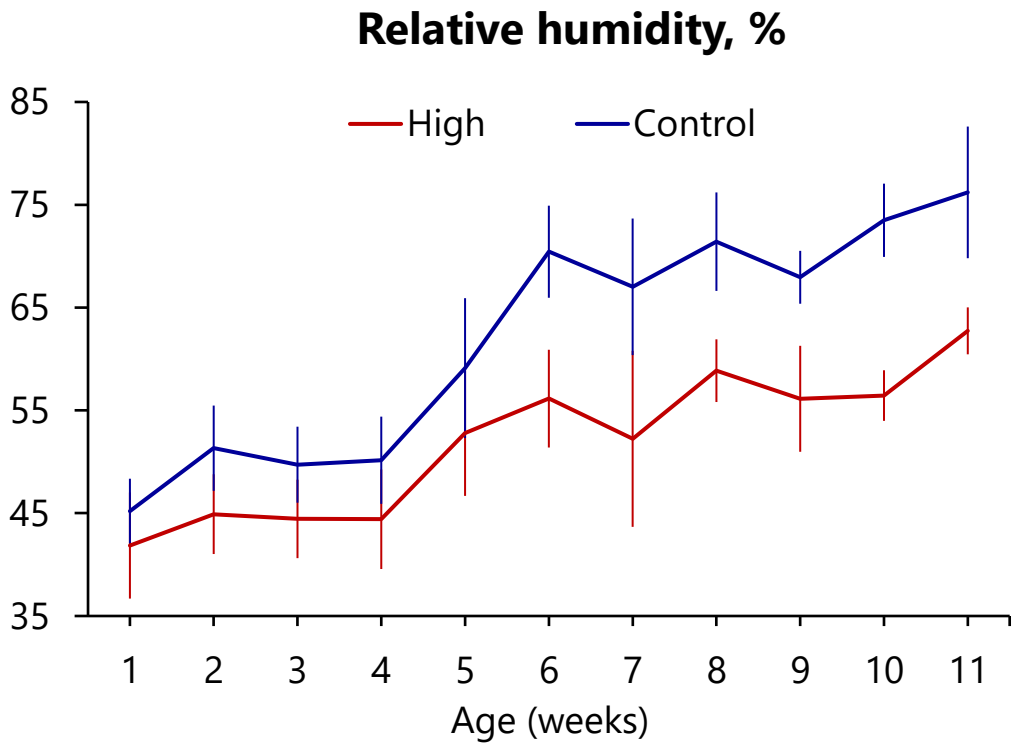


36 collective pens

- 18 pens in thermoneutral conditions **C group**
  - 9 pens **with perches**
  - 9 pens **without perches**
- 18 pens in high-temperature conditions **H group**
  - 9 pens **with perches**
  - 9 pens **without perches**

Material and methods





Material and methods

In vivo recordings

Live weight (individually one a week)

Feed intake (pen level, daily)

Mortality (individually daily)

Corticosterone level

Postmortem recordings

Slaughter yield

Footpad lesions

Breast myopathies

Main cuts yield and meat quality traits

Results: Growth performance

	Genotype (G)			Temperature (T)		P value	
	FG	MG	SG	Control	High	G	T
One-day old weight, g	47.7[a]	40.4[c]	41.8[b]	43.6	43.0	<0.001	0.291
Final weight, g	2752	2799	2745	2909	2623	0.092	<0.001
Daily weight gain, g/d	70.0[a]	51.5[b]	37.1[c]	56.0	49.7	<0.001	<0.001
Feed intake, g/d	109[a]	91.4[b]	89.0[b]	101	91.7	<0.001	<0.001
Feed conversion ratio	1.58[c]	1.89[b]	2.53[a]	2.03	1.97	<0.001	0.066

Ross 308
FG

1 day

40 days

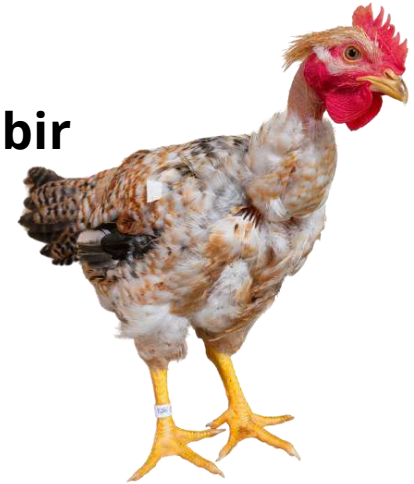
Ranger Gold
MG

1 day

55 days

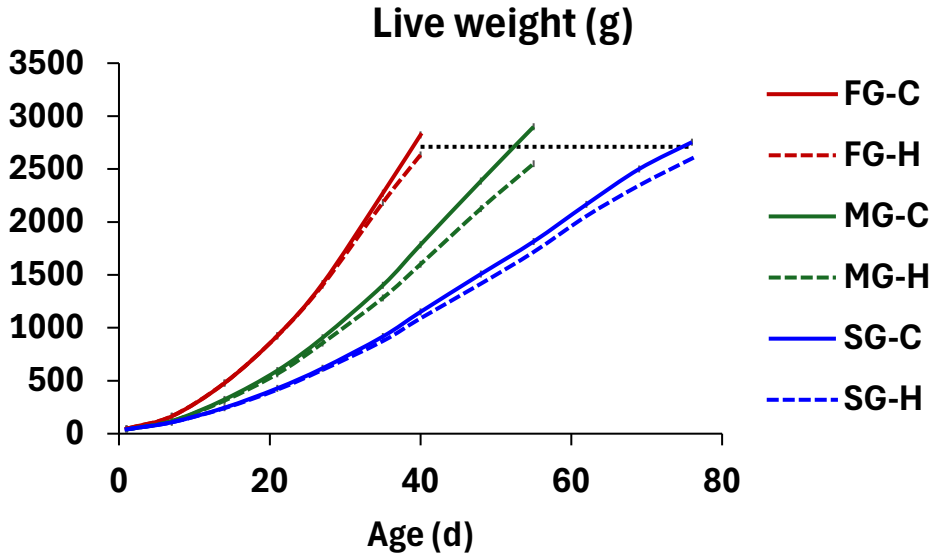
Naked Neck Kabir
SG

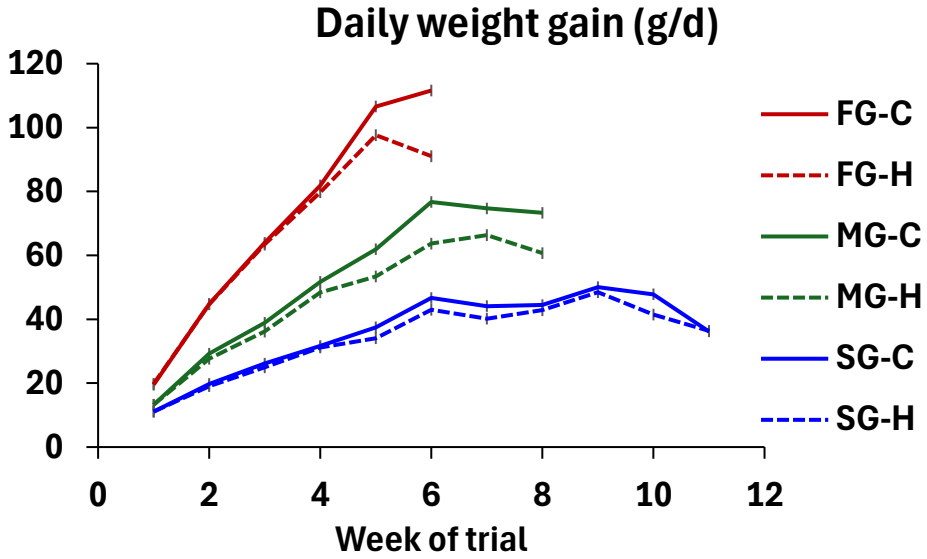
1 day

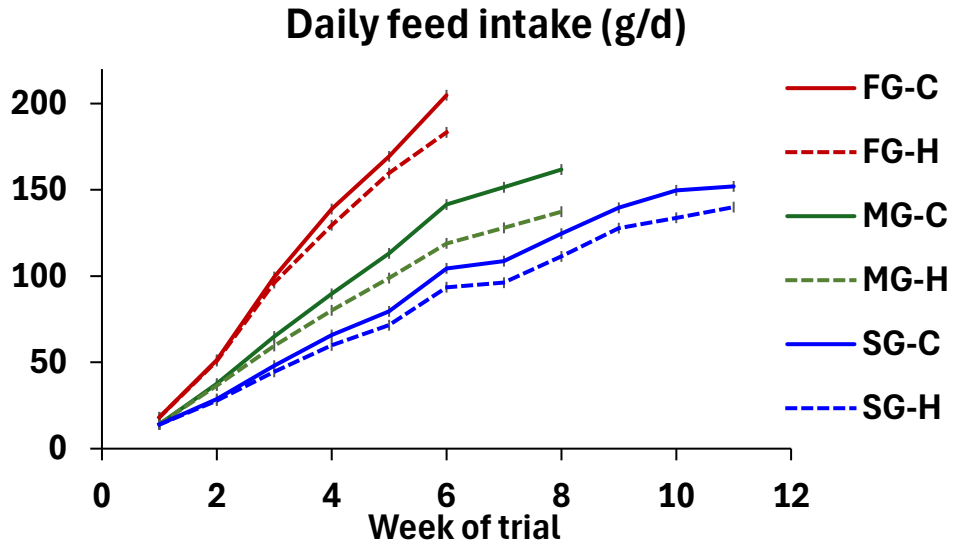


75 days

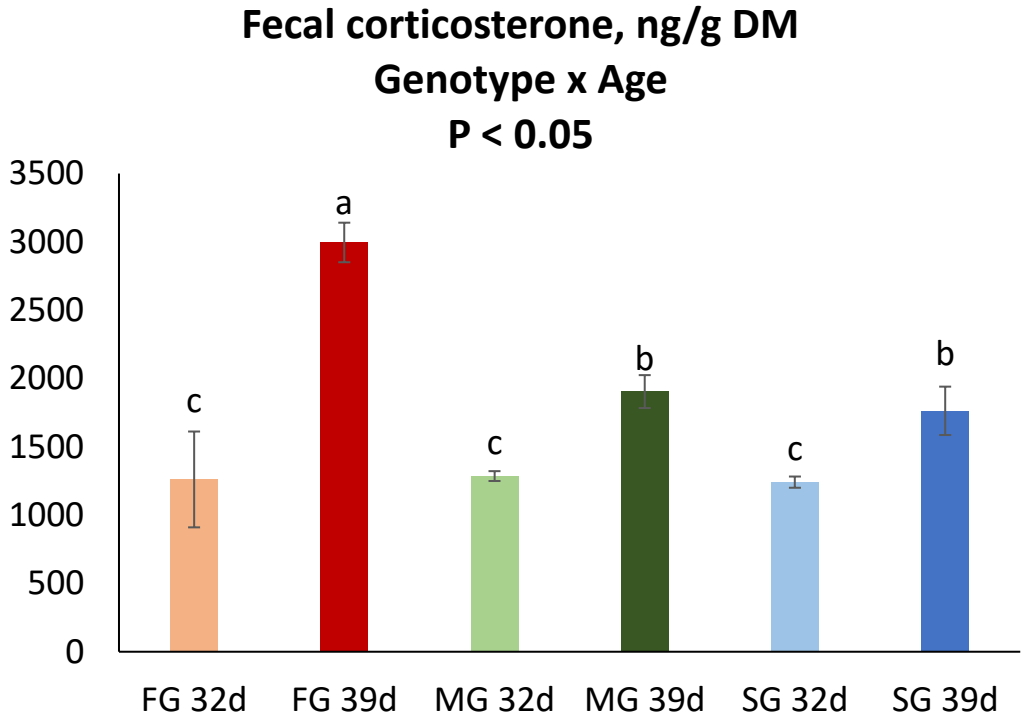
Results: Growth performance

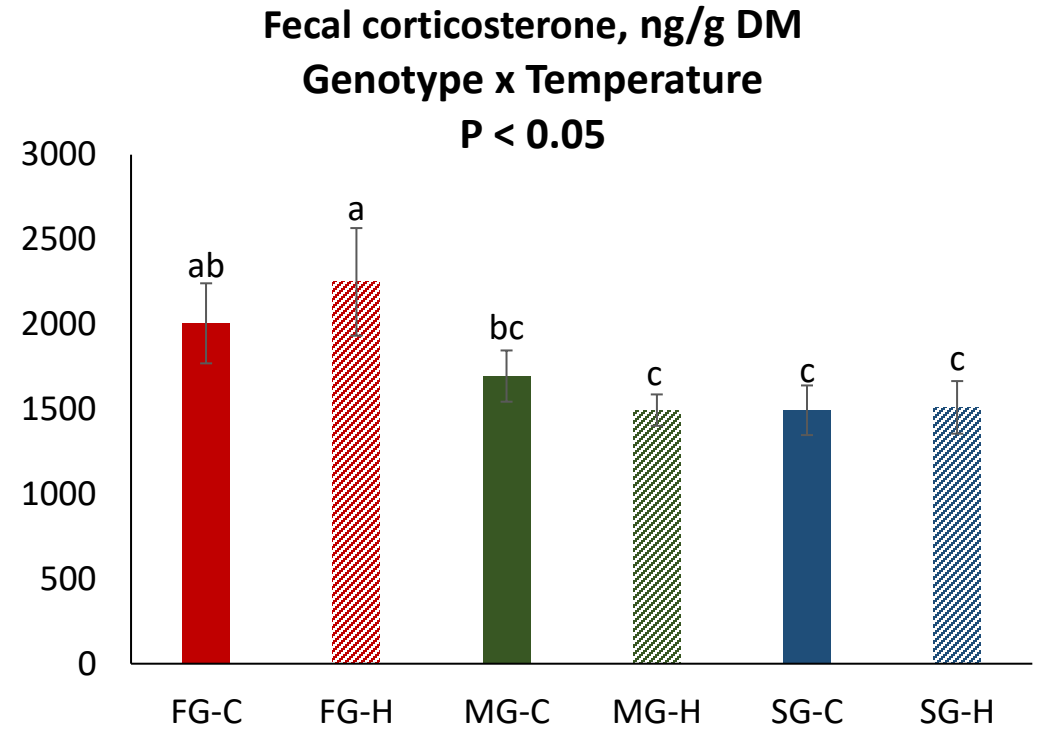


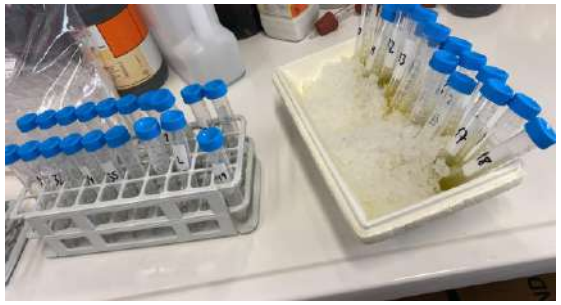


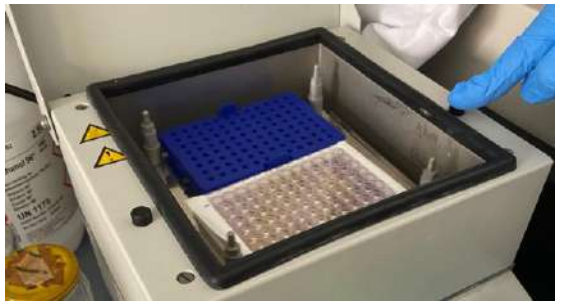


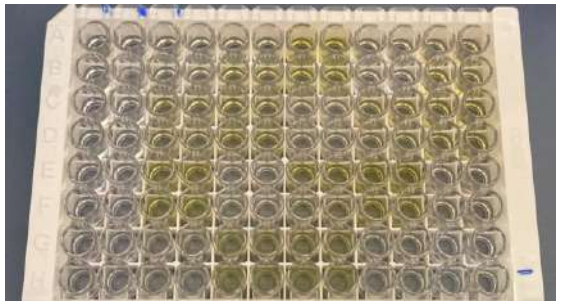
Results: Stress indicator



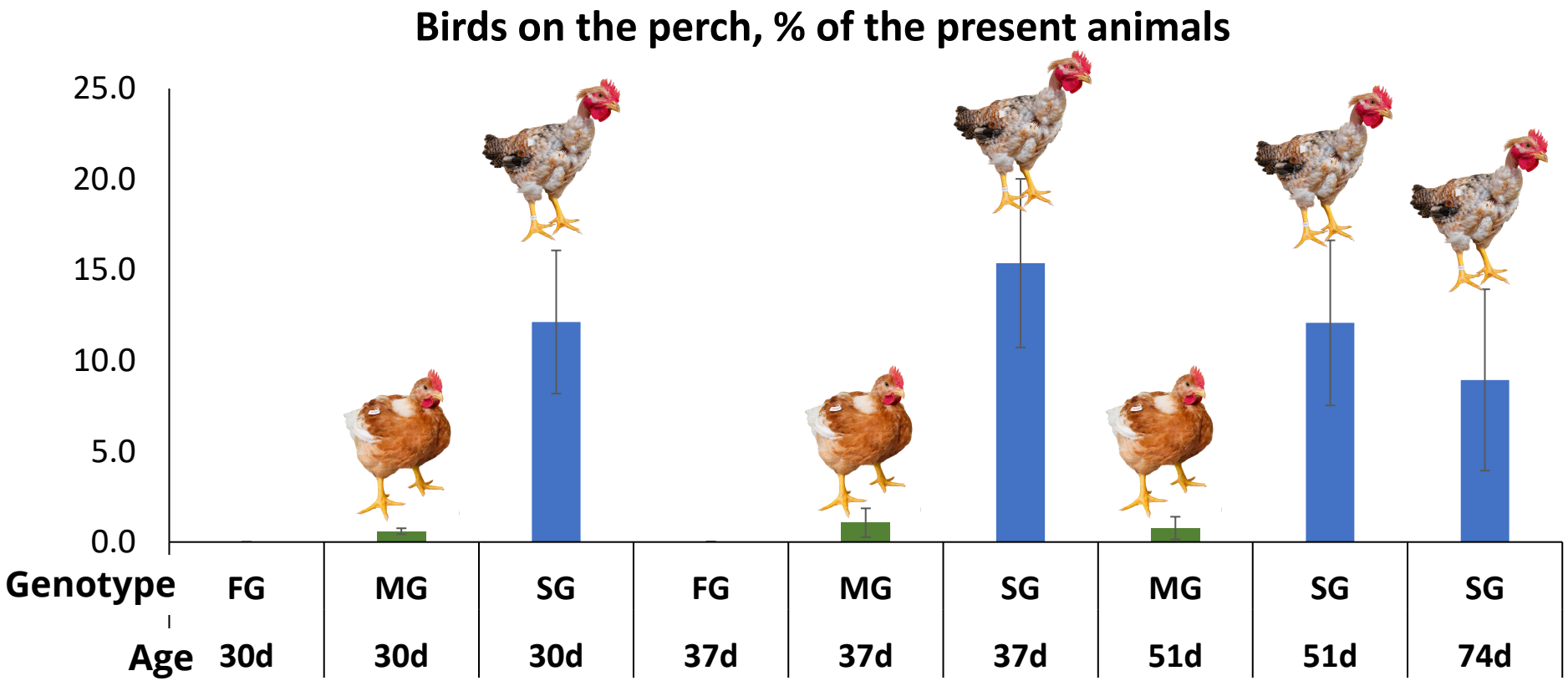




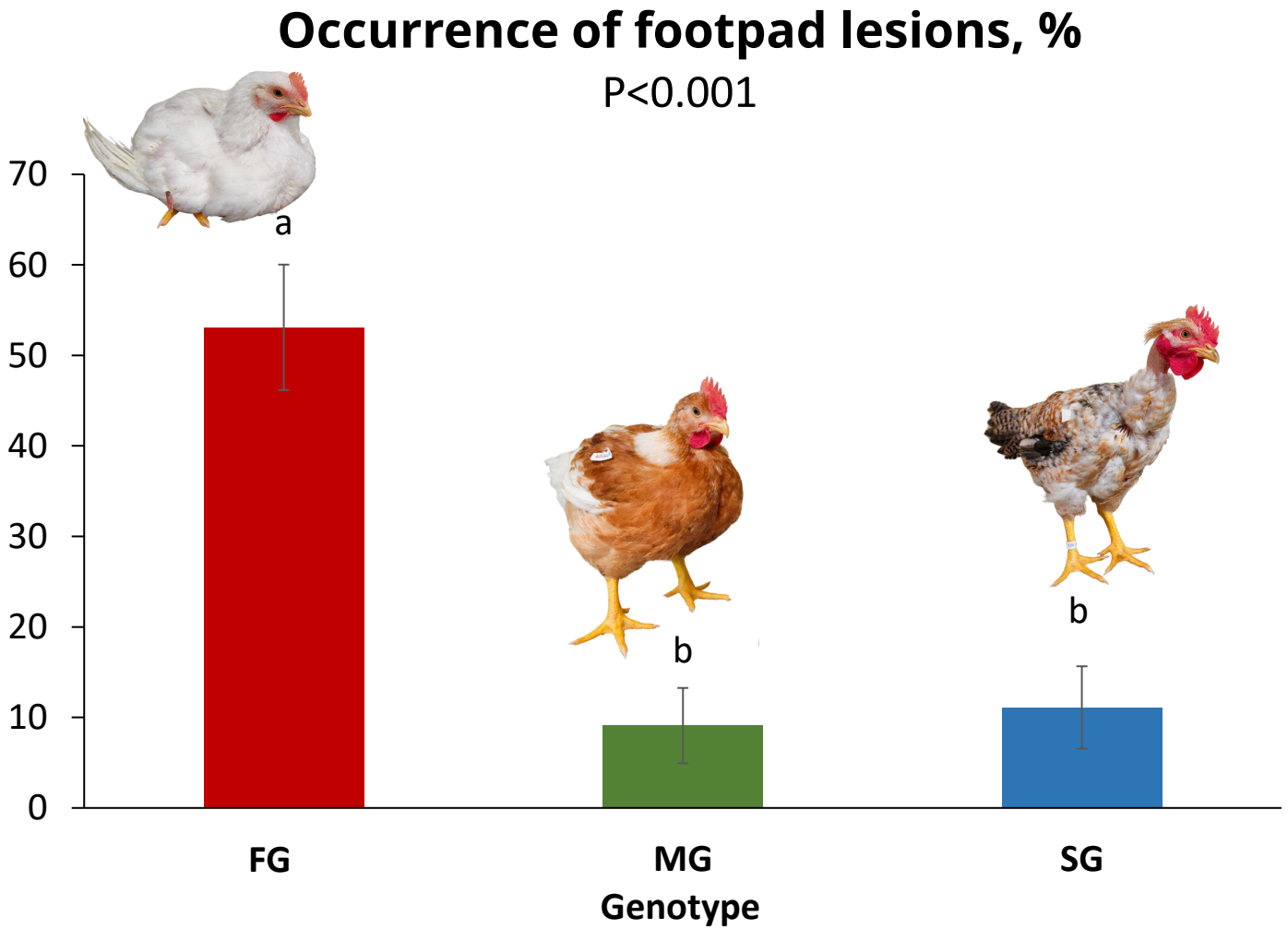




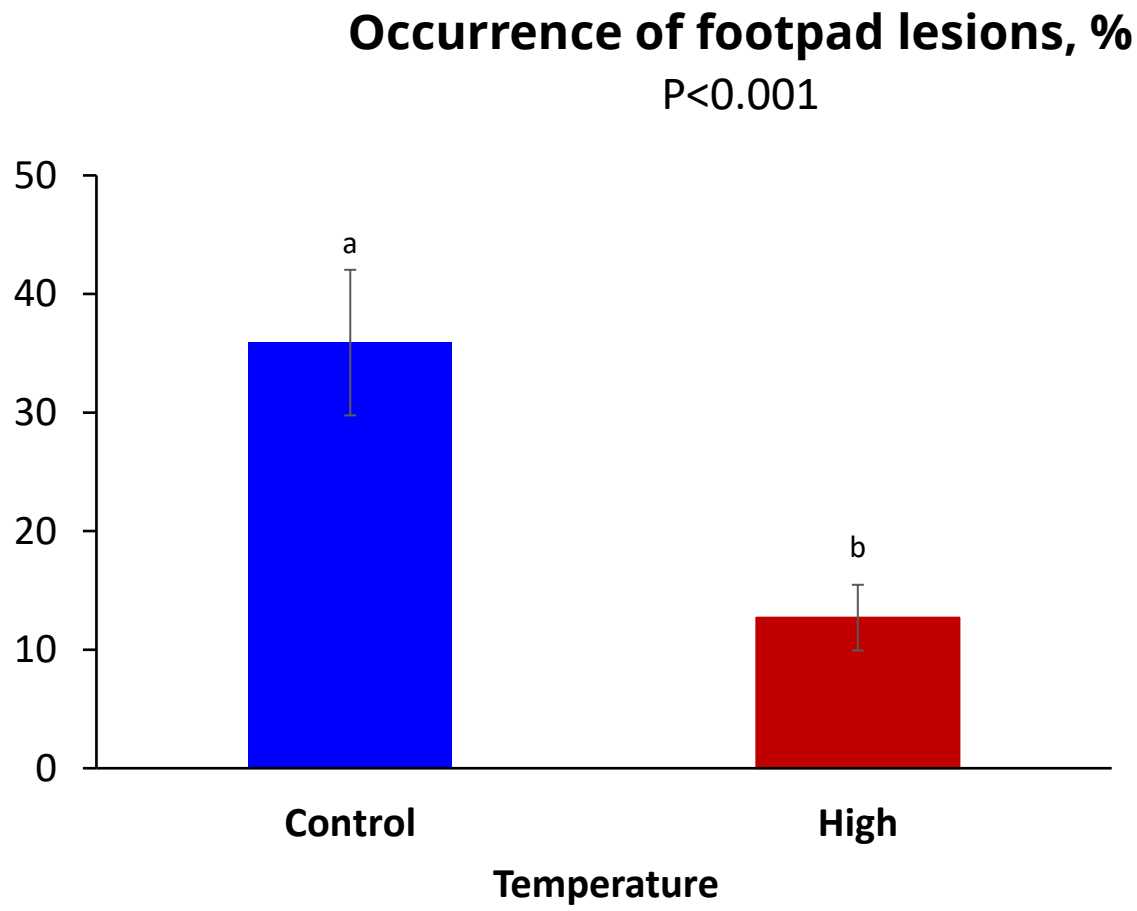
Results: Perch use according to age and genotype



Results: Footpad lesions



Results: Footpad lesions

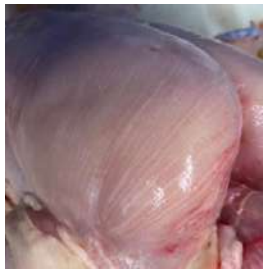


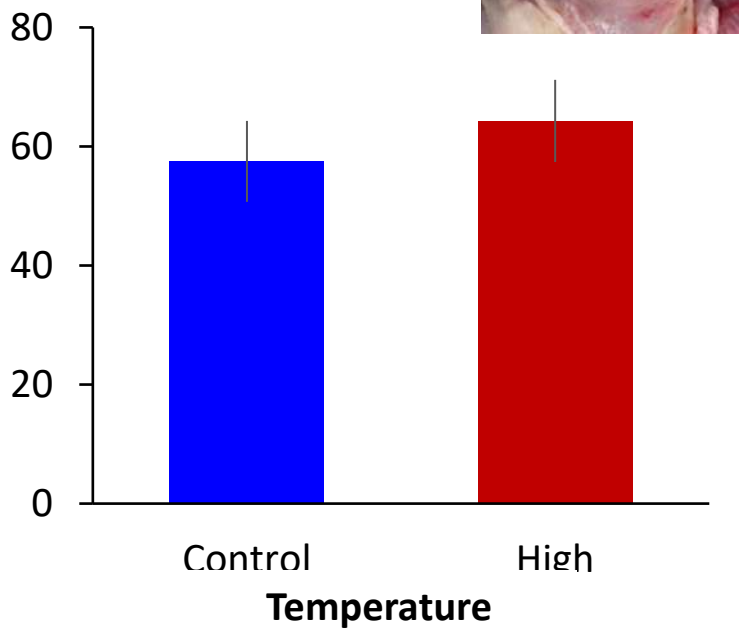
Results: Myopathies

(observed only in Ross 308 genotype)

Incidence of **White Striping**, %

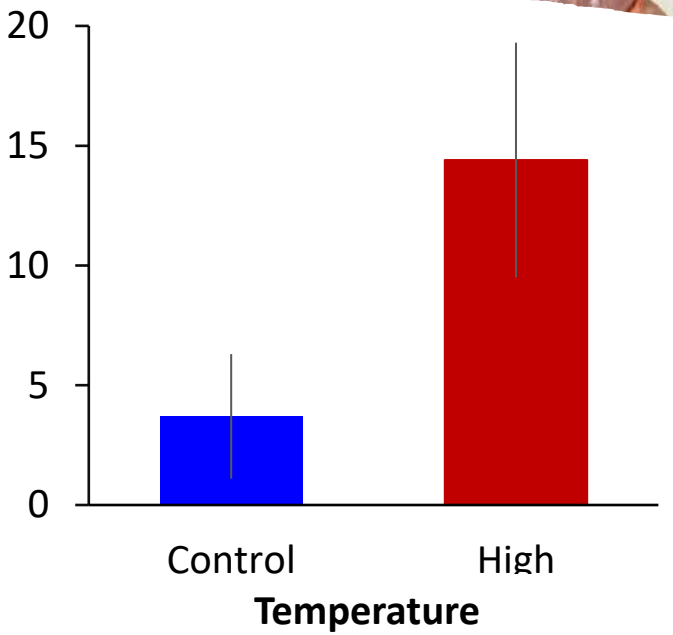
P=0.482





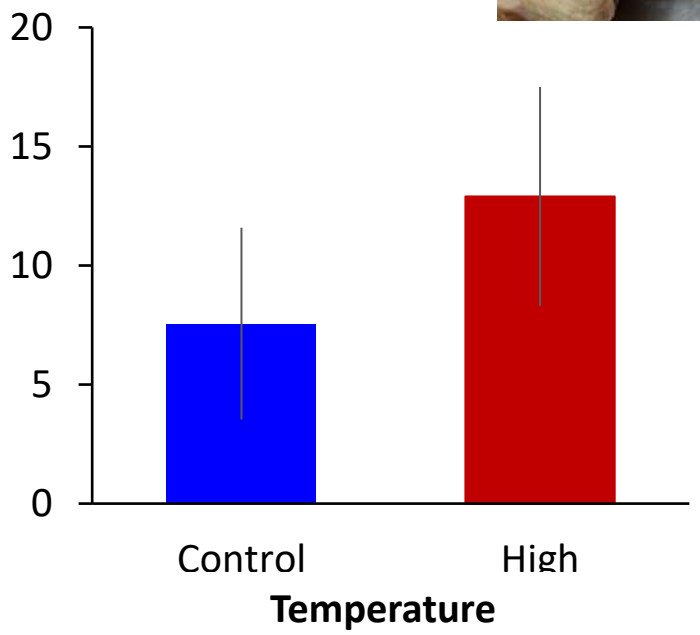
Incidence of **Wooden Breast**, %

P=0.048



Incidence of **Spaghetti Meat**, %

P=0.388



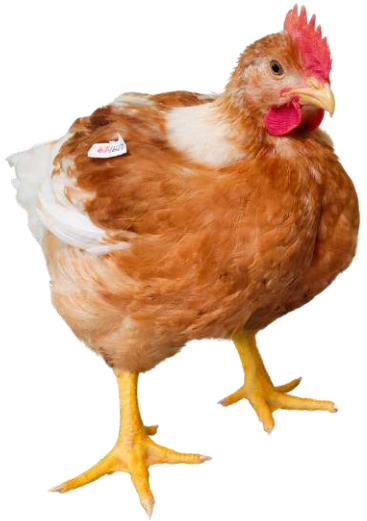
Results: Carcass traits

	Genotypes (G)			Temperature (T)		P value	
	FG	MG	SG	Control (C)	High (H)	G	T
Cold carcass weight without feet, g CC	1921^{a}	1971^{a}	1840^{b}	1979	1842	<0.001	<0.001
Slaughter yield, %	71.1^{b}	72.5^{a}	68.9^{c}	70.6	70.9	<0.001	0.018
Breast yield, % CC	37.9^{a}	36.0^{b}	29.0^{c}	34.6	34.1	<0.001	0.009
Pectoralis major, % CC	23.6^{a}	22.1^{b}	15.8^{c}	20.7	20.3	<0.001	0.014
Wings, % CC	10.0^{c}	11.0^{b}	12.1^{a}	10.9	11.1	<0.001	0.003
Thighs, % CC	17.0^{b}	16.6^{b}	17.9^{a}	17.0	17.4	<0.001	0.026
Drumsticks, % CC	14.1^{b}	14.1^{b}	15.7^{a}	14.5	14.7	<0.001	0.039

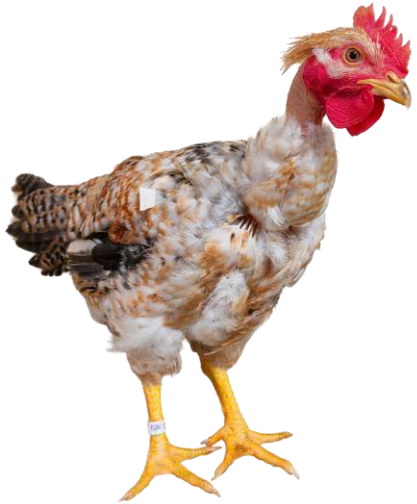
Conclusions

Compared to

Ross 308:



- +15 days to reach 2.75 kg
- Comparable slaughter results and carcass traits
- Valid alternative in **conventional** farming



- Higher adaptability to unfavorable thermal conditions
- Difficult to ensure sustainable performance in conventional production systems
- Valid alternative in **alternative** farming systems