

Preliminary results of PRIN Project «EU Meat Changes»



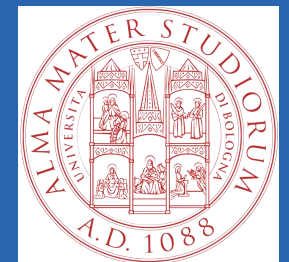
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NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Experimental design - UNIBO trial



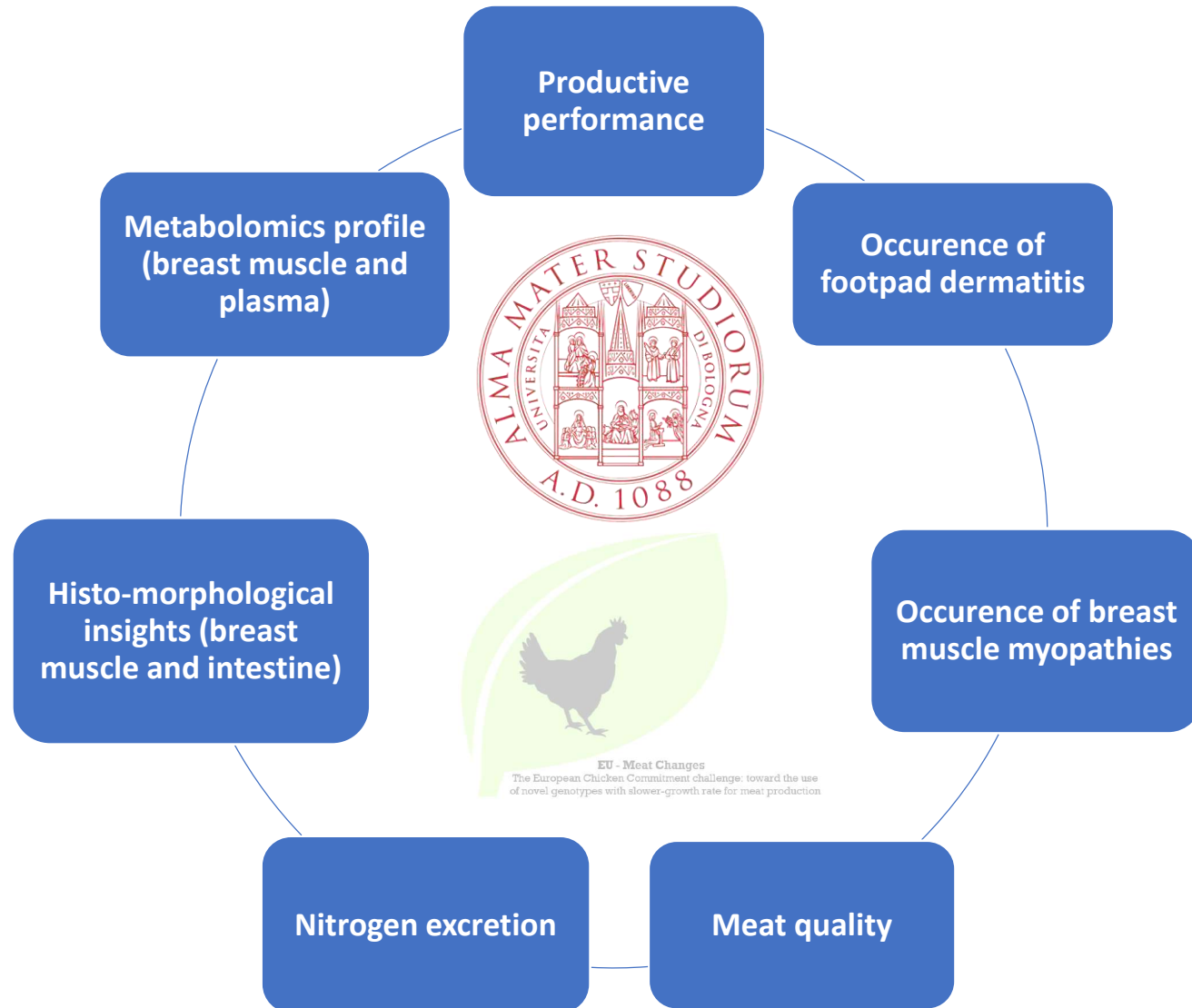
		<i>Genotype</i>		
		<u><i>FG</i></u> <i>Ross 308</i>	<u><i>MG</i></u> <i>Ranger Gold</i>	<u><i>SG</i></u> <i>Grey Kabir NN</i>
		FG-CON	MG-CON	SG-CON
<i>Diet</i>	<i>CON</i>	FG-CON	MG-CON	SG-CON
	<i>LOW</i>	FG-LOW	MG-LOW	SG-LOW

300 birds/group
(6 replicate pens
of 50 birds)

CON diet: Conventional basal diet formulated to meet FG broilers requirements

LOW diet: CON diet with reduced crude protein-to-metabolizable energy ratio (-10% protein), which is representative of commercial diets used for slower-growing chickens

Activities conducted by the UNIBO group



Experimental diets

	Starter (0-13 d)		Grower (14-27 d)		Finisher (28 d – slaughter)	
<i>Ingredients (%)</i>	CON	LOW	CON	LOW	CON	LOW
Corn	29.2	35.9	32.5	39.1	39.2	45.4
Wheat	25.0	25.0	25.0	25.0	25.0	25.0
Soybean meal	17.5	15.9	17.7	15.9	16.3	14.9
Full-fat soybean	10.7	5.47	13.7	8.63	8.63	3.97
Pea	3.00	3.00	3.00	3.00	3.00	3.00
Sunflower meal	3.00	3.00	3.00	3.00	3.00	3.00
Corn gluten meal	3.00	3.00	0.00	0.00	0.00	0.00
Vegetable oil	1.51	1.51	1.75	1.75	2.00	2.00
Others	7.09	7.26	3.47	3.64	2.81	2.69
<i>Chemical composition</i>						
AMEn (kcal/kg)	3.016	3.016	3.070	3.070	3.100	3.100
Crude protein (%)	22.50	20.34	20.51	18.29	18.50	16.51
Lipids (%)	5.43	4.62	6.11	5.38	5.55	4.84
Ashes (%)	4.86	4.67	4.42	4.27	4.02	3.82
Av. Lys (%)	1.25	1.15	1.15	1.04	1.02	0.90
Av. Met+Cys/Av. Lys	0.75	0.74	0.77	0.77	0.80	0.80
Av. Arg/Av. Lys	1.07	1.06	1.11	1.09	1.12	1.10
Total calcium (%)	0.68	0.68	0.58	0.58	0.54	0.52
Total phosphorous (%)	0.54	0.54	0.44	0.43	0.37	0.35

Growth performance in the overall rearing cycle

(FG: 0-34 days; MG = 0-50 days; SG = 0-77 days)

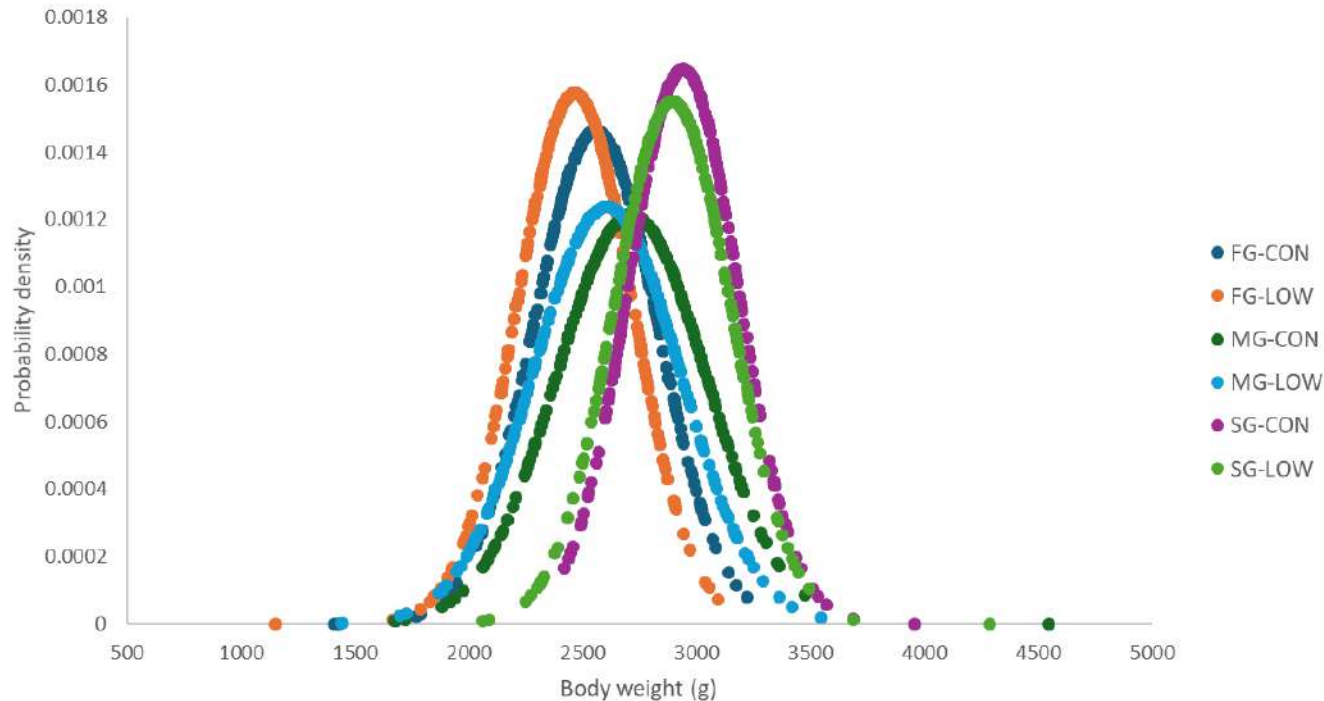
Trait	Group						Genotype (G)			Diet (D)		SEM	P-value		
	FG-CON	FG-LOW	MG-CON	MG-LOW	SG-CON	SG-LOW	FG	MG	SG	CON	LOW		GxD	G	D
DWG (g/bird/d) [§]	69.6	66.9	52.9	50.8	37.0	36.9	68.3 A	51.9 B	37.0 C	53.2	51.5	2.18	0.06	<0.001	<0.001
Final BW (g/bird)	2482 d	2375 e	2686 b	2581 c	2891 a	2877 a	2429 C	2633 B	2884 A	2686	2611	33.2	0.04	<0.001	<0.001
DFI (g/bird/d) [§]	100.2	99.2	94.6	93.1	99.2	98.6	99.7 A	93.9 B	98.9 A	98.0	97.0	0.54	0.86	<0.001	0.10
FCR [§]	1.440 e	1.482 d	1.790 c	1.833 b	2.679 a	2.673 a	1.461 C	1.811 B	2.676 A	1.969	1.996	0.09	0.02	<0.001	<0.01
Mortality [†] (%)	1.33	2.00	1.00	1.65	0.67	1.00	1.67	1.33	0.83	1.00	1.55	0.01	0.96	0.42	0.29

§ Corrected for mortality.

Means showing different letters are significantly different (A,B: P<0.01; a,b: P<0.05).

DWG, daily weight gain; BW, body weight; DFI, daily feed intake; FCR, feed conversion ratio; SEM, standard error of the mean.

Body weight uniformity at slaughtering

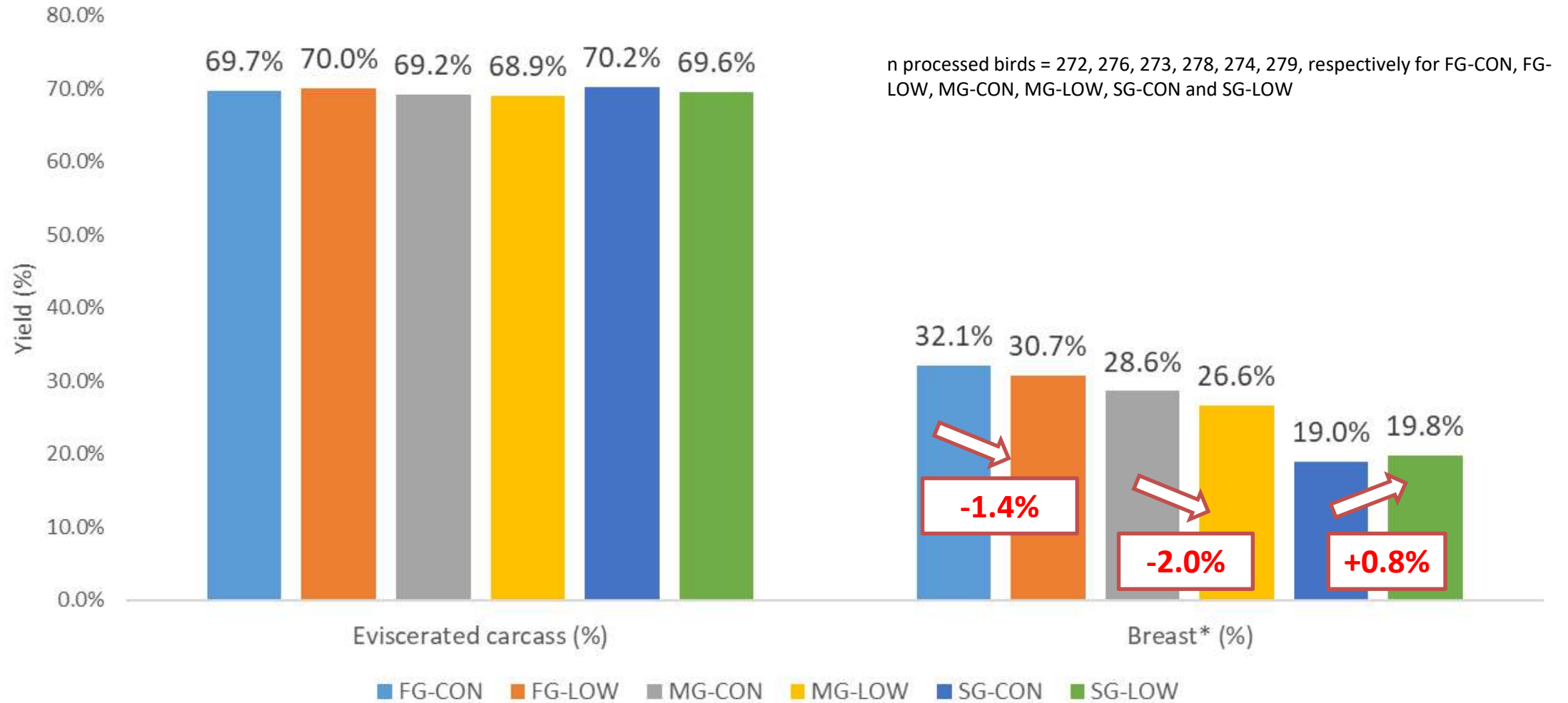


Group	CV (%)
FG-CON	10.7%
FG-LOW	10.3%
MG-CON	12.1%
MG-LOW	12.4%
SG-CON	8.2%
SG-LOW	8.9%

Factor	Comparison	P-value
Genotype	FG vs. MG	$P < 0.001$
	FG vs. SG	$P < 0.0001$
	MG vs. SG	$P < 0.0001$
Diet	CON vs. LOW	0.11

Comparison	P-value
FG-CON vs. FG-LOW	0.54
MG-CON vs. MG-LOW	0.72
SG-CON vs. SG-LOW	0.20

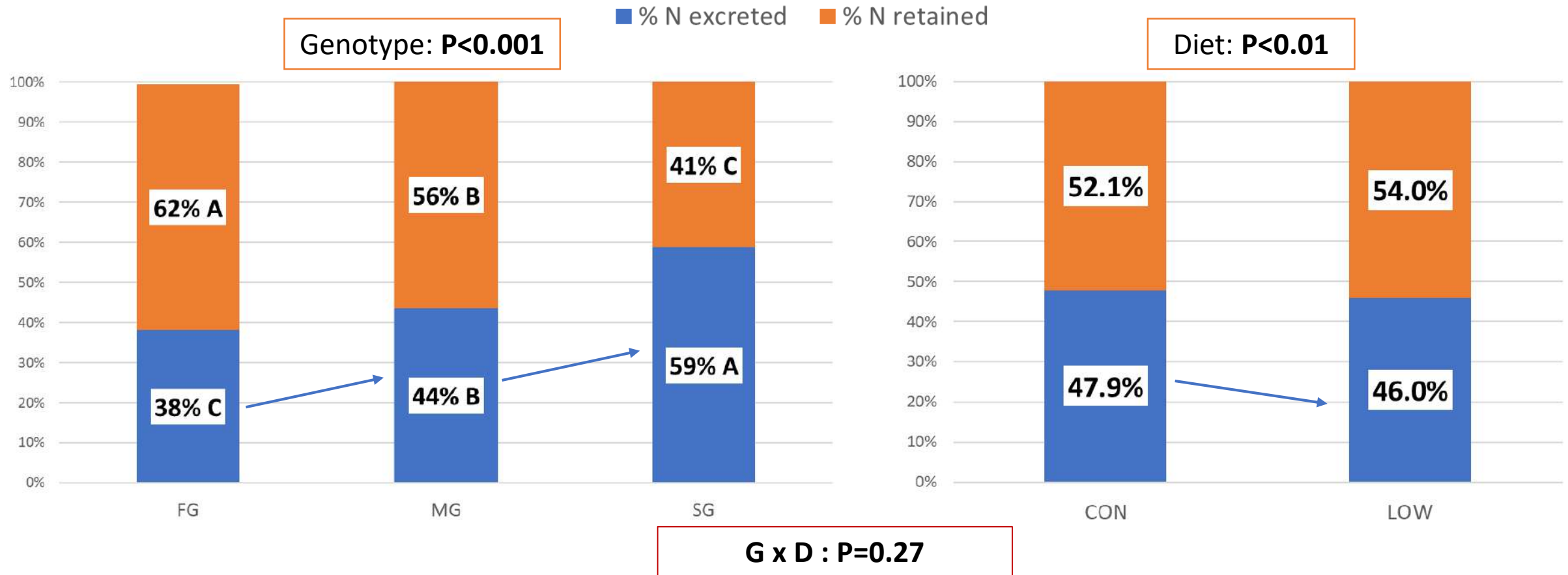
Slaughter yields



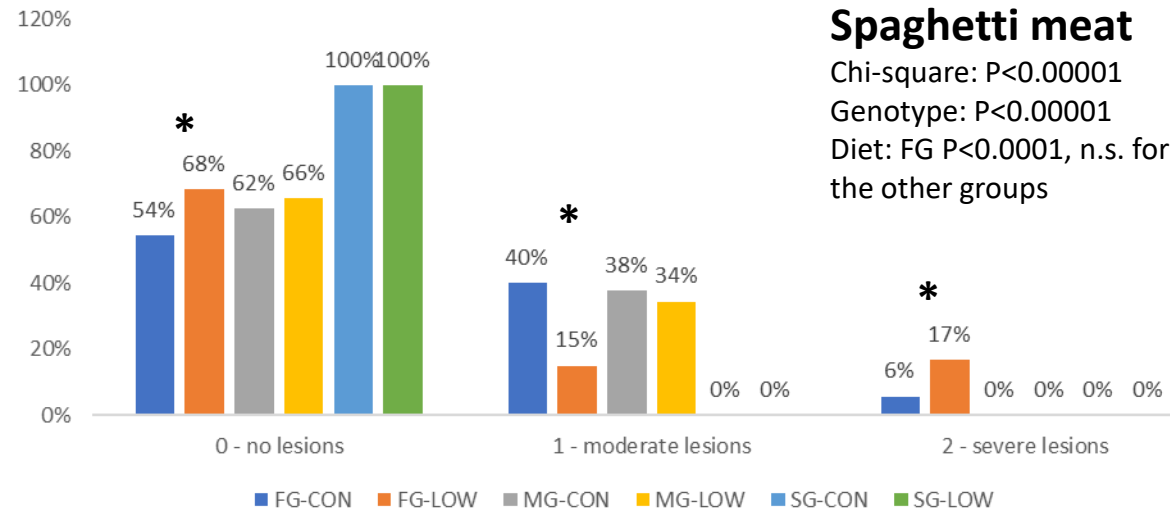
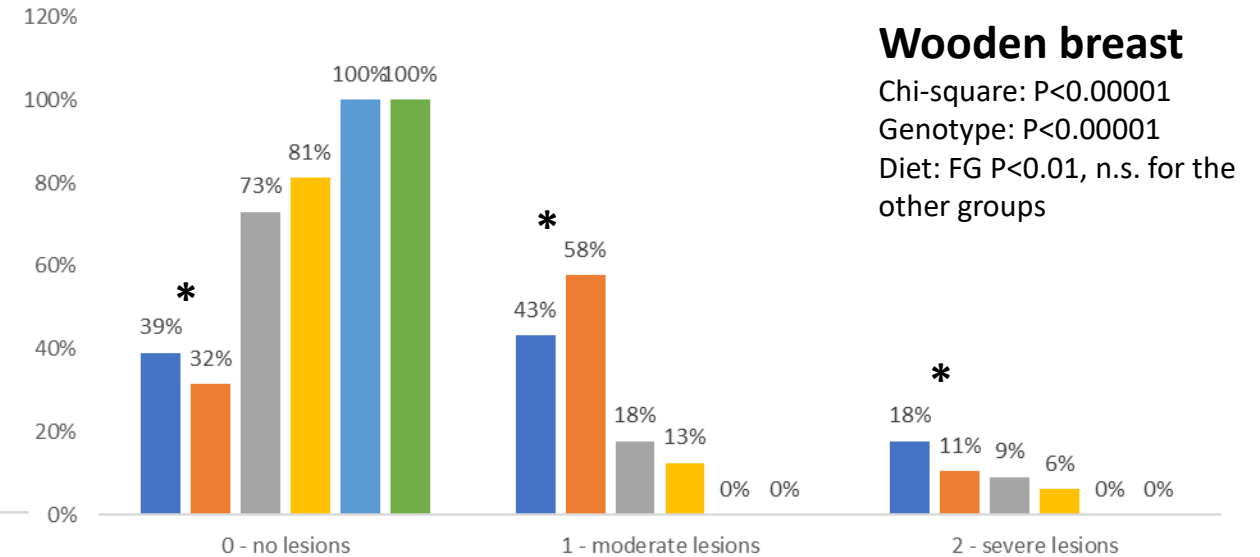
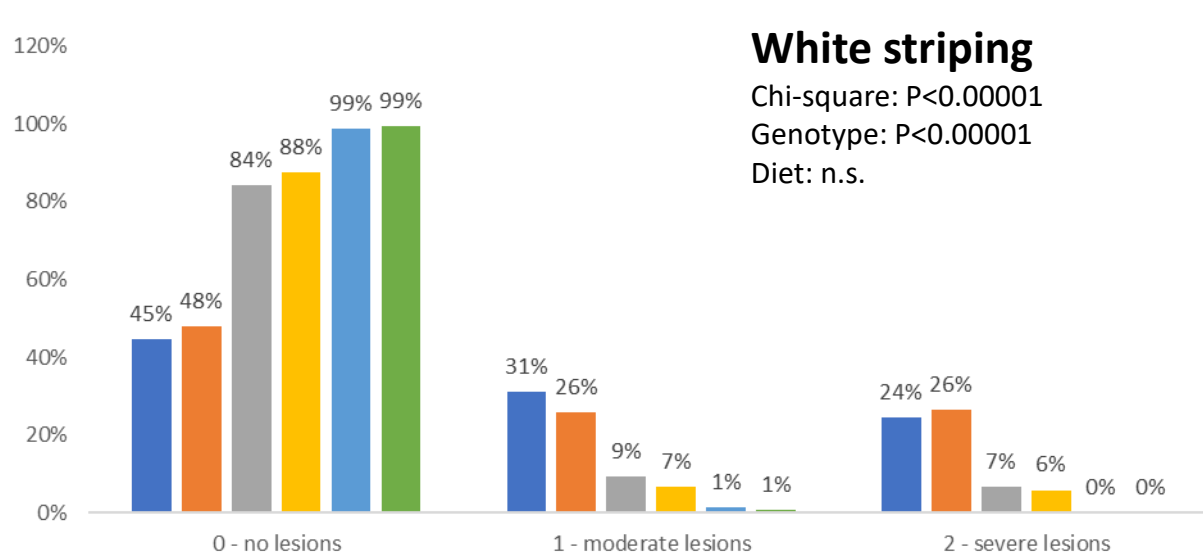
*expressed as percentage of eviscerated carcass weight

Nitrogen excretion (indirect method)

N excretion (g/kg BWG)	Group								Genotype (G)			Diet (D)		SEM	GxD	P-value	
	FG-CON	FG-LOW	MG-CON	MG-LOW	SG-CON	SG-LOW			FG	MG	SG	CON	LOW			G	D
	17.5 E	15.8 F	24.1 C	21.3 D	46.5 A	42.6 B			16.7 C	22.7 B	44.5 A	29.4	26.6	2.04	0.02	<0.001	<0.001



Occurrence of breast muscle abnormalities



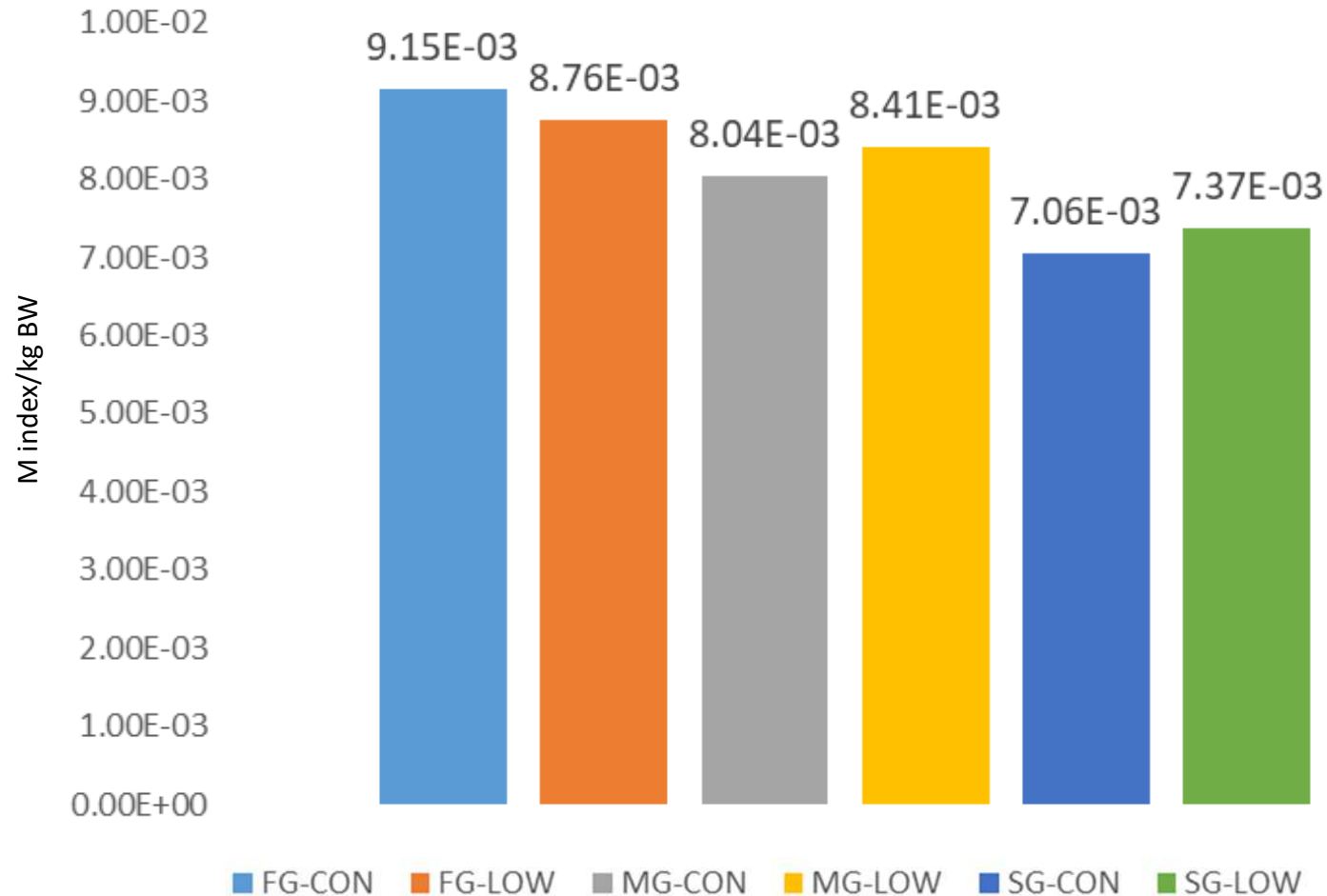
n breasts = 197, 228, 197, 224, 150, 150, respectively for FG-CON, FG-LOW, MG-CON, MG-LOW, SG-CON and SG-LOW

Breast meat quality

	Group						Genotype			Diet		P-value			
	FG-CON	FG-LOW	MG-CON	MG-LOW	SG-CON	SG-LOW	FG	MG	SG	CON	LOW	SEM	GxD	G	D
N.	15	15	15	15	15	15	30	30	30	45	45				
pHu	5.77	5.76	5.53	5.56	5.43	5.55	5.77x	5.55y	5.49y	5.58	5.62	0.02	0.094	<0.001	0.067
L*	46.68	46.19	54.07	53.21	53.45	51.15	46.43y	53.64x	52.30x	51.40	50.19	0.42	0.309	<0.001	0.018
a*	1.97	2.66	2.27	3.24	2.53	2.89	2.32y	2.76x	2.71x	2.26	2.93	0.09	0.280	0.046	<0.001
b*	2.76	3.19	4.91	5.20	4.90	6.10	2.97y	5.05x	5.50x	4.19	4.83	0.18	0.344	<0.001	0.020
Shear force (kg/g)	4.30	4.37	6.36	5.74	6.22	6.78	4.34y	6.05x	6.50x	5.63	5.63	0.14	0.071	<0.001	0.974
TBARS (mg MDA/kg meat)	0.52	0.47	0.48	0.50	0.90	0.82	0.50y	0.50y	0.86x	0.63	0.60	0.40	0.880	<0.001	0.625
Carbonyls (nmol/ mg of protein)	2.64ab	3.27ab	1.98ab	1.63ab	3.70a	1.44b	2.96	1.81	2.57	2.78	2.12	0.22	0.022	0.085	0.125

Histo-morphological insights - Jejunum

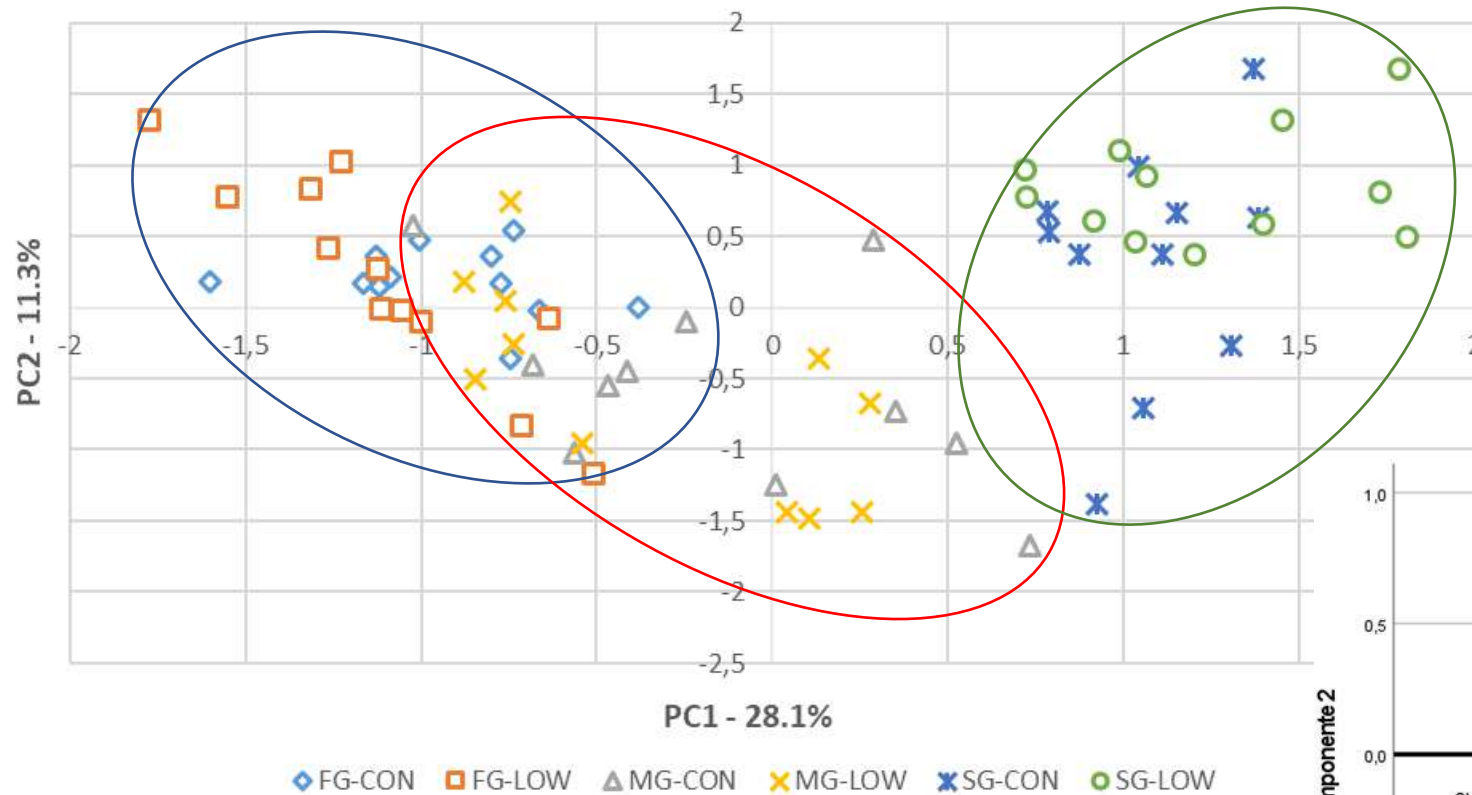
Absorptive mucosal surface (M per kg BW)



Mucosal-to-serosal amplification ratio
 $M = (\text{villus surface} + \text{unit base} - \text{villus base}) / \text{unit base}$
where
villus surface = $\pi (\text{villus length} \times \text{villus width})$,
unit base = $\pi (\text{villus width}/2 + \text{crypt width}/2)^2$,
villus base = $\pi (\text{villus width}/2)^2$
Trevisi et al. (2009)

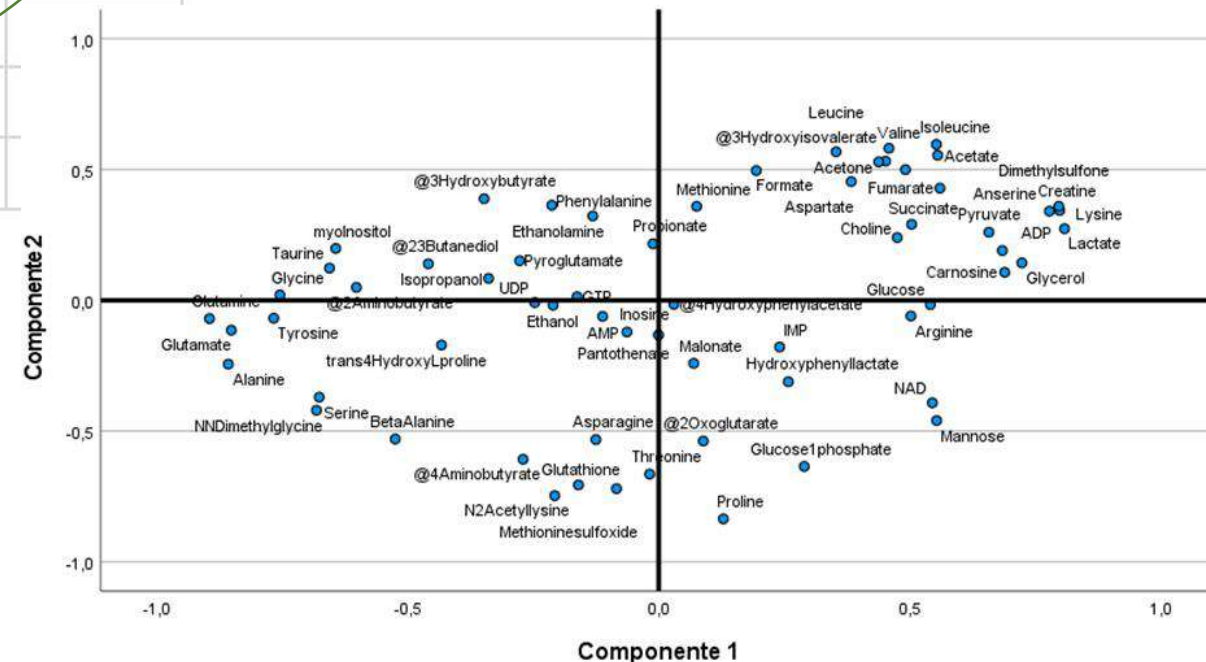


Metabolomics profile (^1H -NMR) - Breast muscle

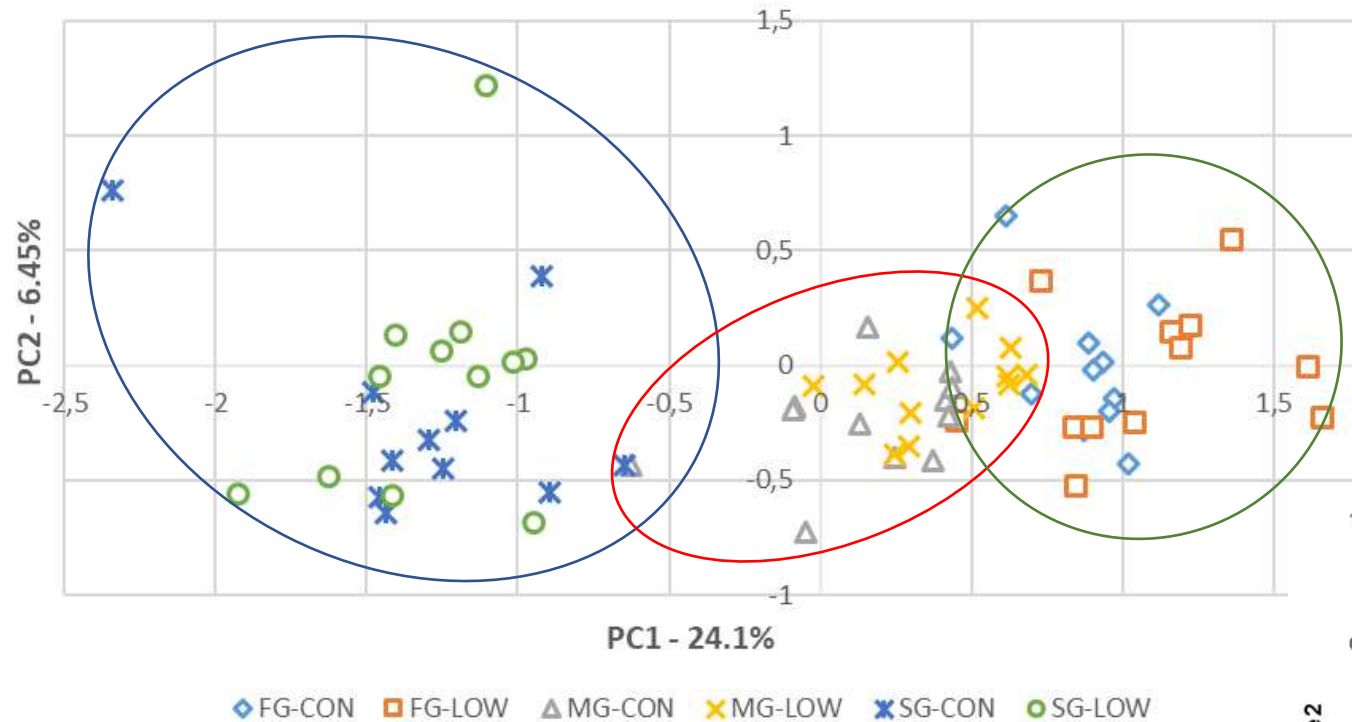


#66 identified metabolites:

- # 8 *genotype x diet* ($P < 0.05$)
- # 52 *genotype* ($P < 0.05$)
- # 9 *diet* ($P < 0.05$)

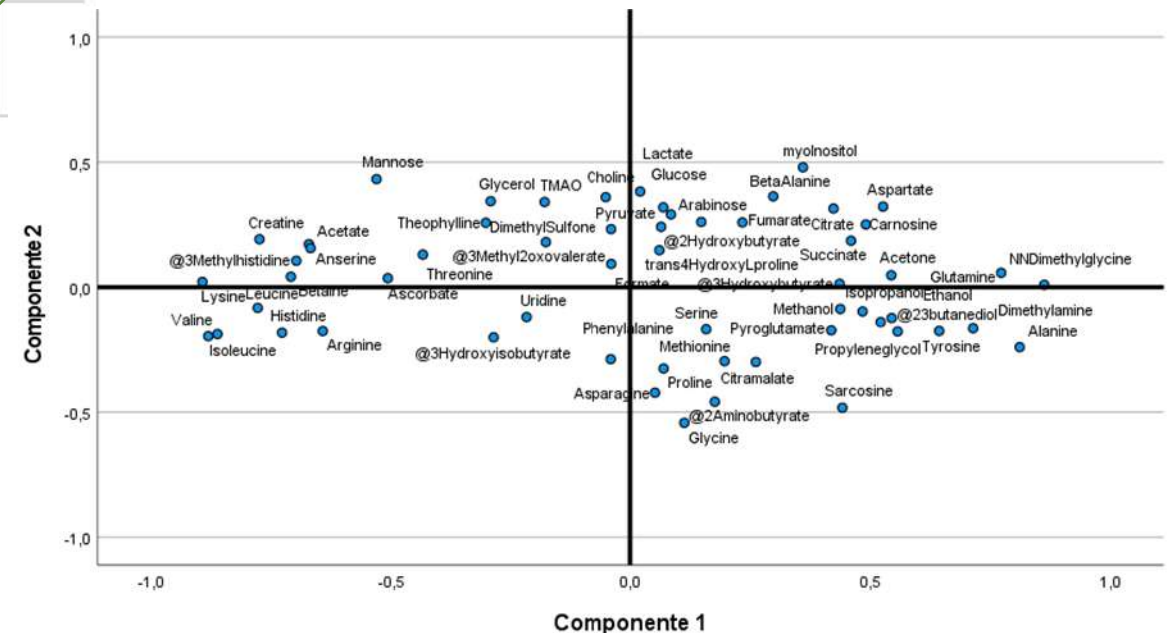


Metabolomics profile (^1H -NMR) - Plasma



#58 identified metabolites:

- # 5 *genotype x diet* ($P < 0.05$)
- # 38 *genotype* ($P < 0.05$)
- # 9 *diet* ($P < 0.05$)



Conclusions and future activities

Conclusions based on preliminary findings:

- The different dietary protein-to-energy ratio affected productive traits, breast meat yield and nitrogen excretion in a genotype-dependent manner
- Breast myopathies occurrence, meat quality traits, histo-morphological features, and metabolomics profiles are primarily affected by the genotype, even though the diet induced interesting effects that merit to be further investigated



Future activities:

- (Try to) find a metabolic/physiological meaning of the observed variations and provide practical information to poultry producers
- Further investigate these aspects with different experimental designs (other genotypes? different dietary treatments?...)



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