



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA



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Effect of top-dressed arginine supplementation in different periods of gestation on productive performance of sows and metabolomic consequences

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Background

Arginine (CEAA by NRC (2012)) → Proline, Ornithine and nitric oxide → placental angiogenesis (Wu et al., 2017).

Early gestation

- increases the number of total born
- increases the number of born alive
- improves the quality of amniotic fluid

(Li et al., 2010; Li et al., 2014)

Late gestation

- increases the birth weight of piglets
- improves litter uniformity (Hong et al., 2020; Moreira et al., 2020)



All gestation

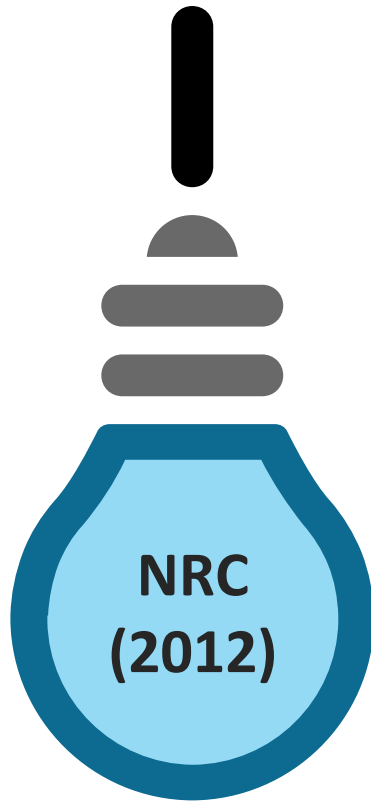
- increases the birth weight of piglets
- increases litter size
- increases the number of born alive

(Gao et al., 2012; Wu et al., 2012, Luise et al., 2020)



Background

Meta-analysis on Arg
supplementation on gestation
(Virdis et al., 2023)



3.2 – 7.9 g/d*



10.5 – 22.3 g/d

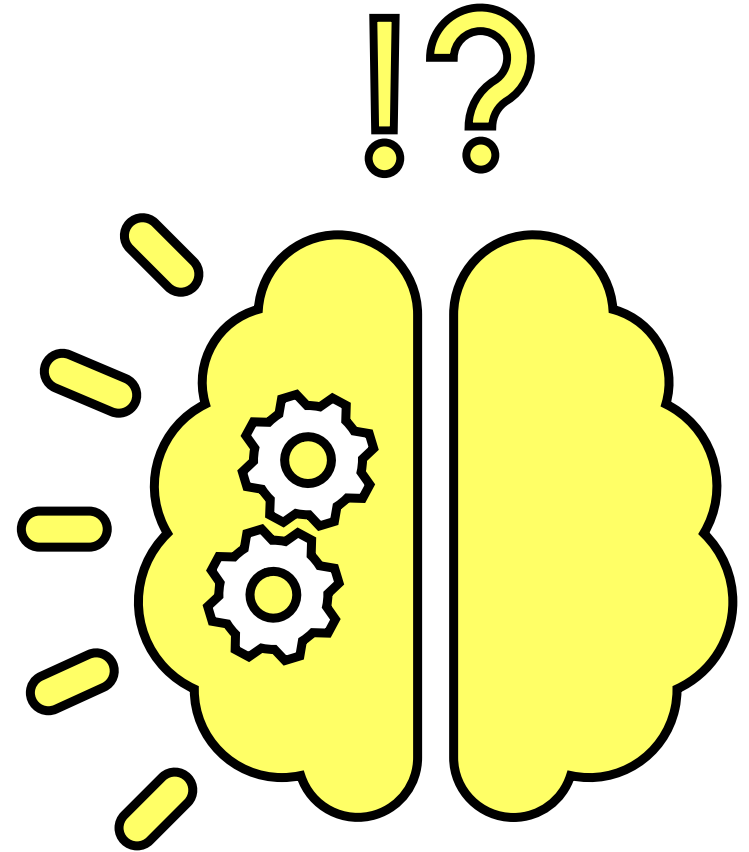


37.1 – 39.3 g/d
(quadratic model)

Hypothesis

Arg requirement of modern breed should be revised.

Supplementation of 21.8 g/day of top dressed Arg could improve the performance of sows at farrowing, colostrum composition and growing performance of piglets and could show different effects based on the period of supplementation.



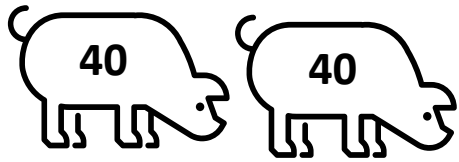
Aim

The aim of this study was to evaluate the effects of Arg supplementation during different periods of gestation and during different seasons on the productive performance of sows and piglets and on colostrum composition.

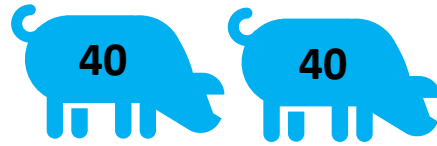


Materials and methods

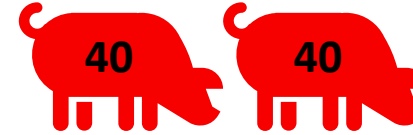
320 sows



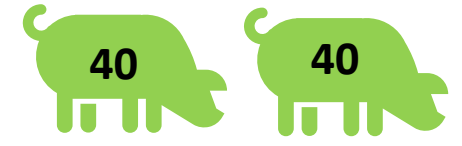
CO: fed with a standard diet (16.5 g/day)



Early35: CO + 21.8 g/day Arg during the **first 35 days of gestation**



Late45: CO + 21.8 g/day Arg during the **last 45 days of gestation**



COM: CO + 21.8 g/day Arg during **all gestation**

Arg:Lys ratio in CO group = 0.93

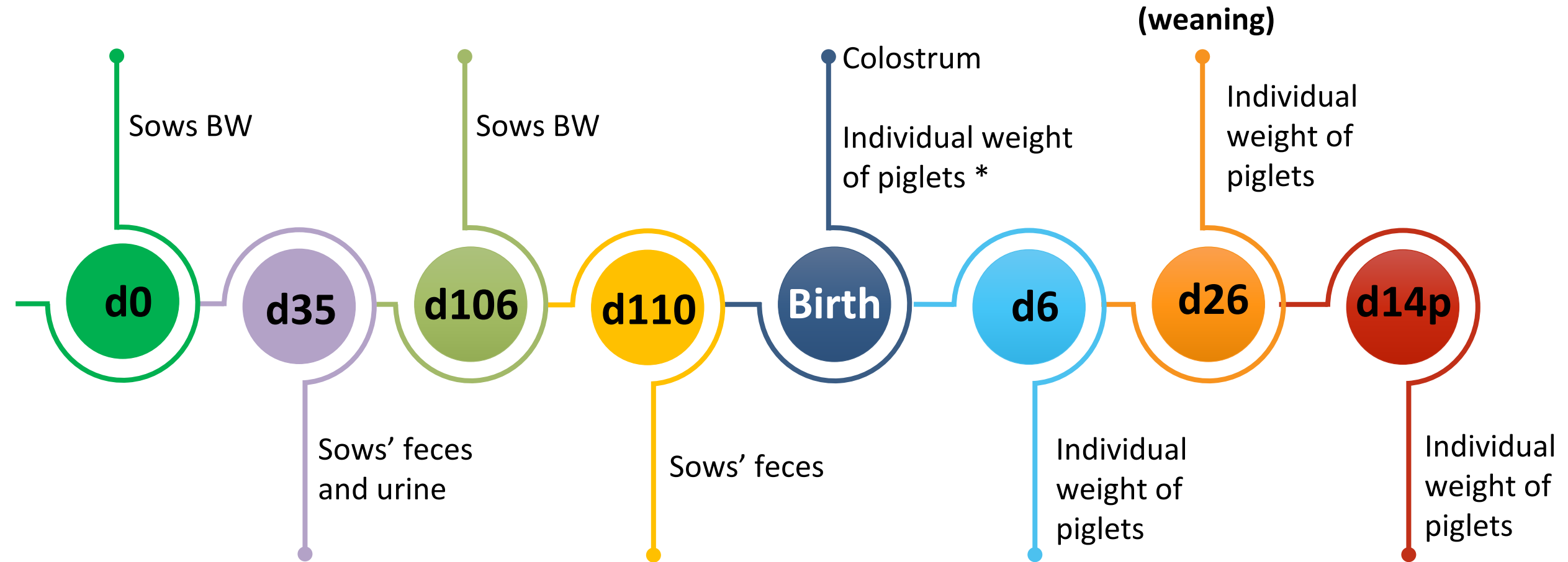
Arg:Lys ratio in Arg groups = 2.16

Average daily feed intake = 2.5 kg

This dose of Arg was chosen based on the results obtained by Viridis et al. (2023).



Materials and methods



* Classification based on type (TB, TBA,..) and weight →

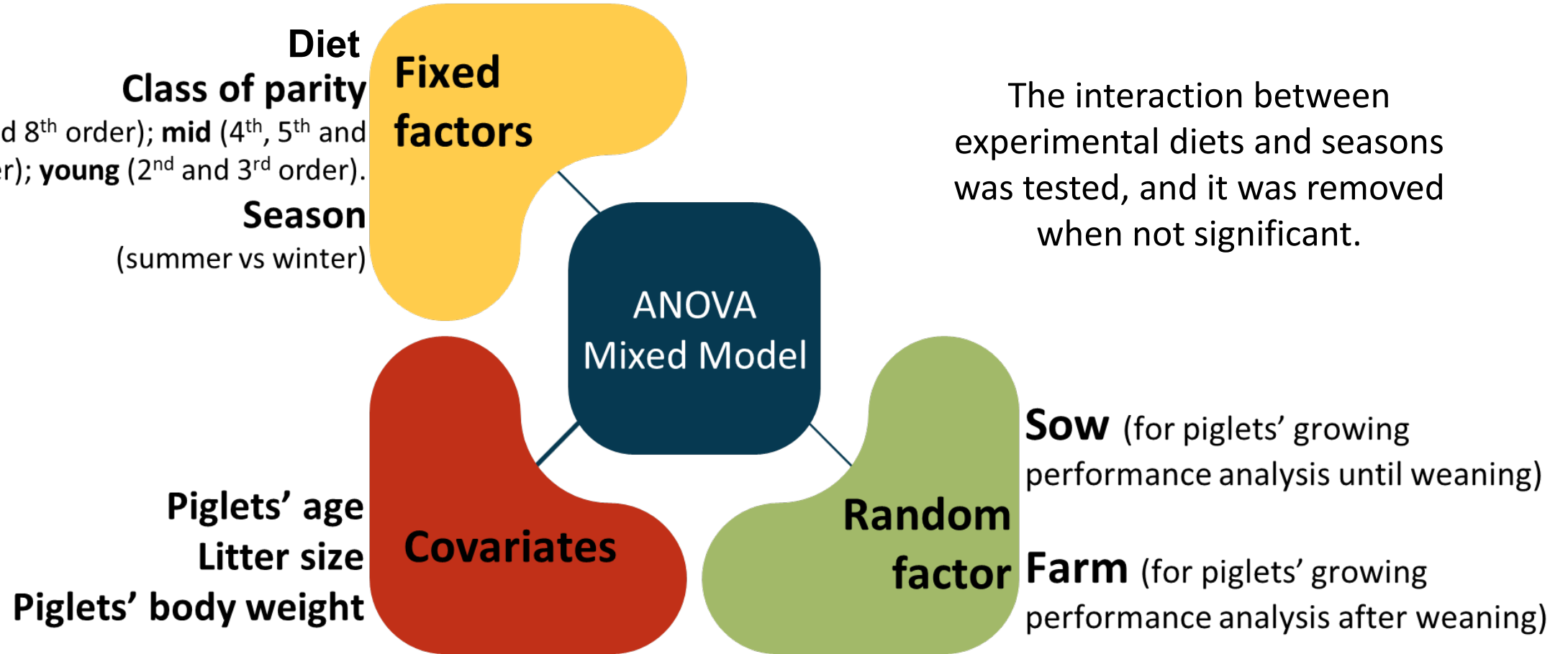
Lowbirth weight: < 1.00 kg (< 2.2 lb)

Normal birth weight: 1.00 – 1.70 kg (2.2 – 3.75 lb)

High birth weight: > 1.70 kg (> 3.75 lb)



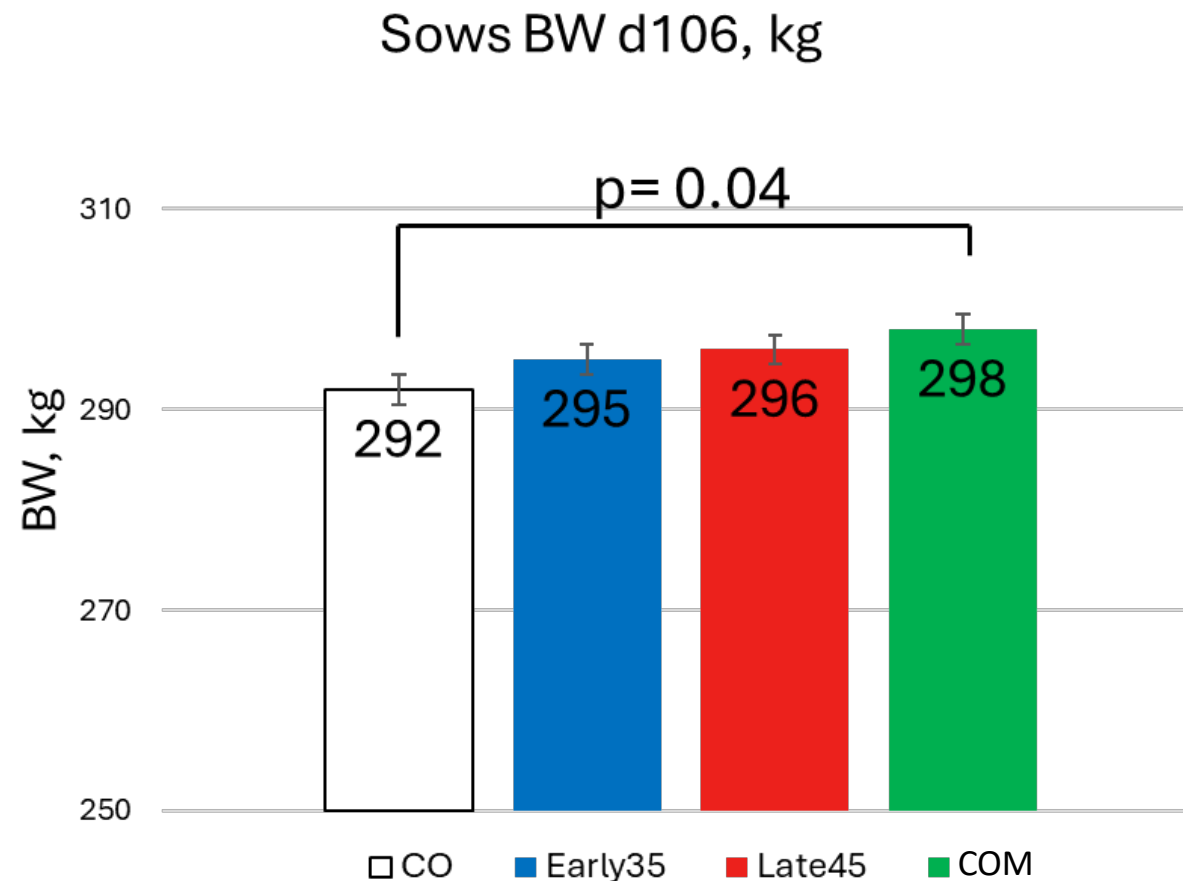
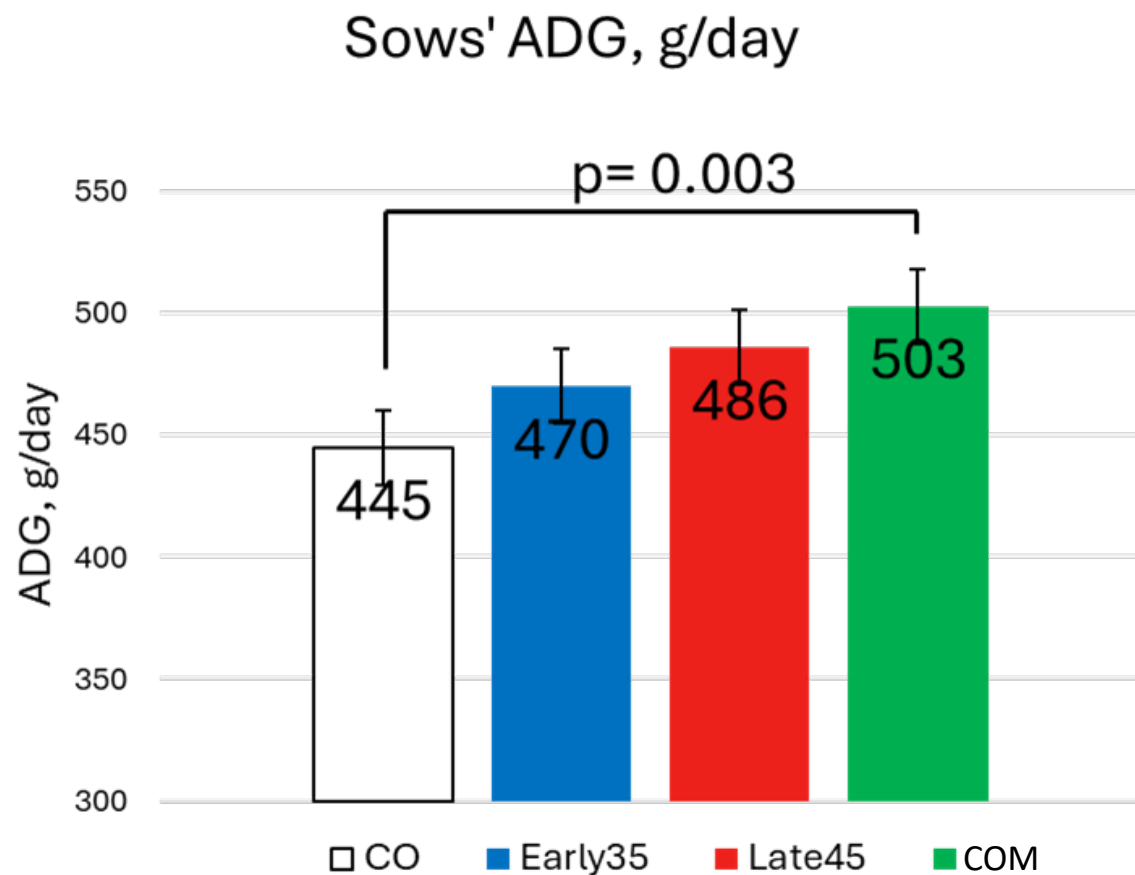
Statistical analysis



After the normalization, data were analyzed using Partial least squares-discriminant analysis (PLS-DA) on MetaboAnalyst 6.0 and the variable importance projection (VIP) scores were determined for diet. For the univariate analyses, the data of the colostrum were fitted using a linear mixed model which included diet and season as fixed factors



Results – growing performance of sows



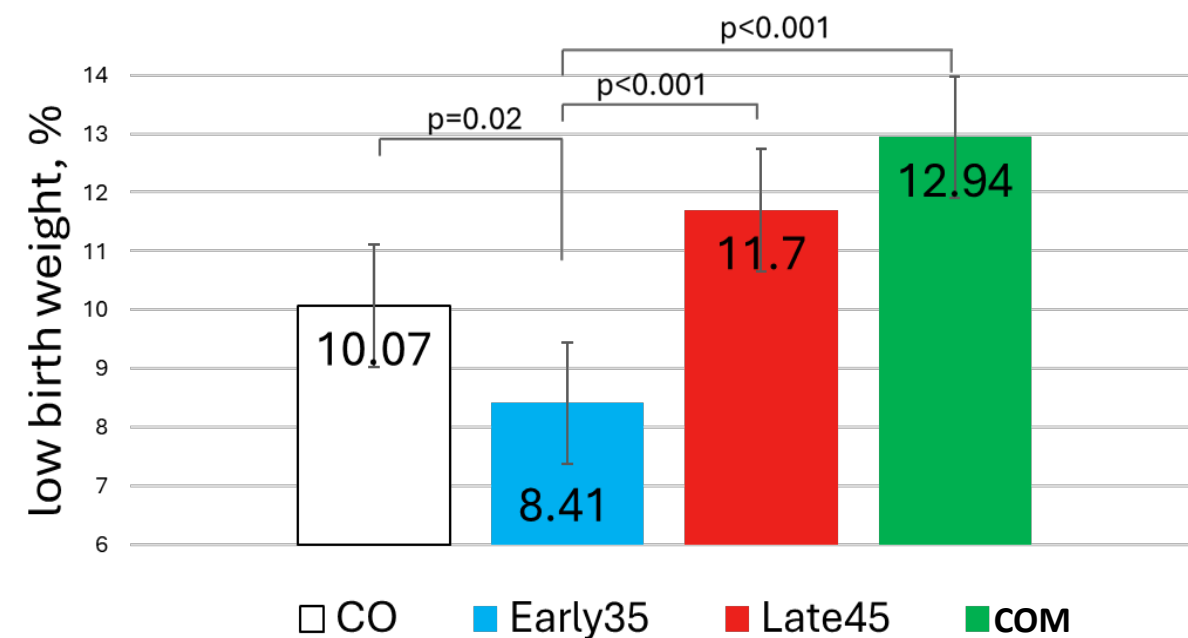
Results – sows performance at farrowing

Parameter	Diet				SEM	p-value
	CO	Early35	Late45	COM		Diet
Total born, n	18.0	17.4	17.7	18.7	0.39	0.108
Total born alive, n	15.5	15.6	15.6	16.3	0.35	0.400
Stillborn, %	10.39 ^A	8.11 ^B	9.04 ^B	9.70 ^A	0.33	<0.001
Mummified, %	1.86 ^{AB}	1.43 ^B	1.62 ^B	2.17 ^A	0.15	0.002
Crushed, %	1.74 ^B	1.74 ^B	1.82 ^B	3.15 ^A	0.18	<0.001
Hypo-vital, %	1.40 ^B	1.91 ^a	2.25 ^A	2.42 ^A	0.15	<0.001



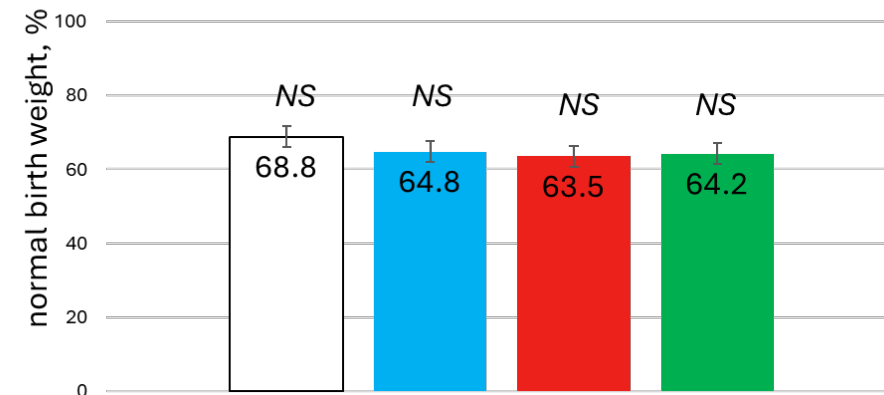
Results – birth weight classification

Percentage of low birth weight piglets

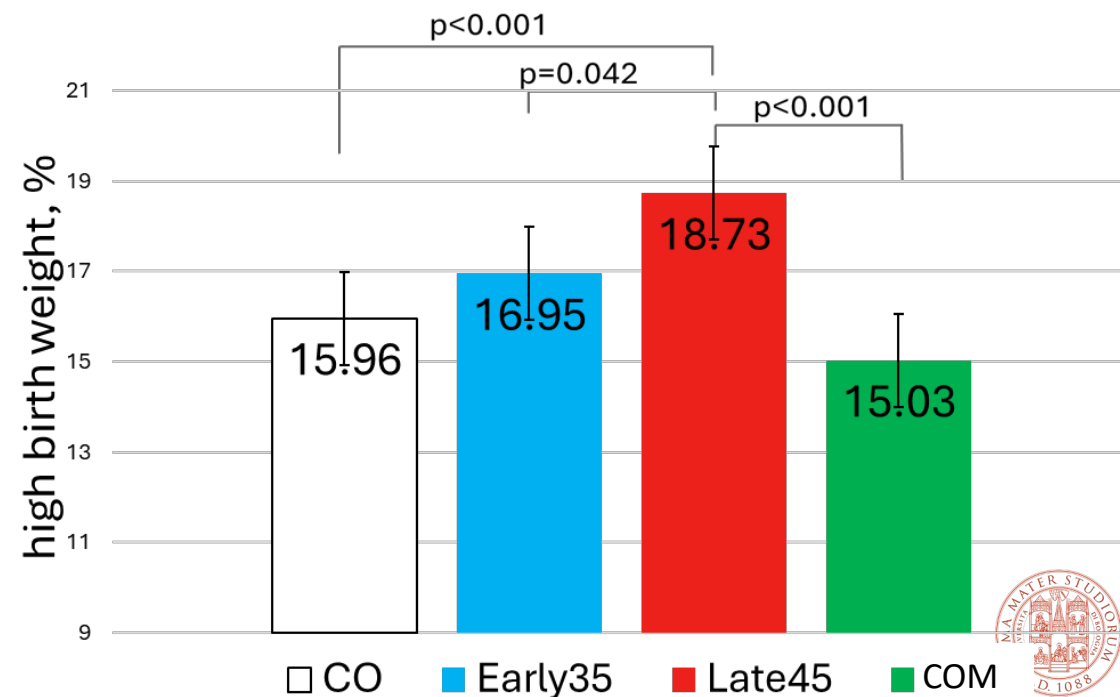


- Lowbirth weight: < 1.00 kg
- Normal birth weight: 1.00 – 1.70 kg
- High birth weight: > 1.70 kg

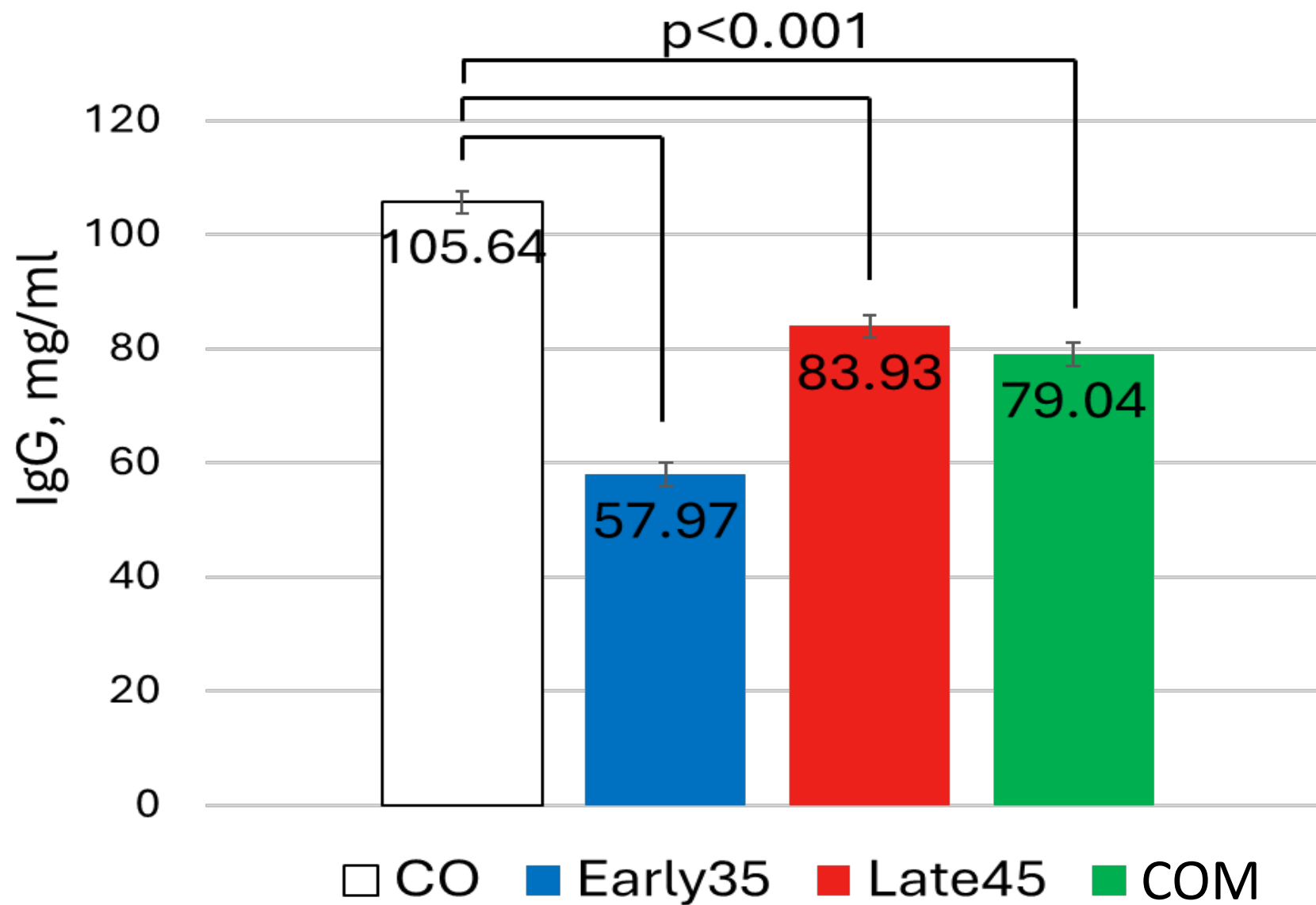
Percentage of normal birth weight piglets



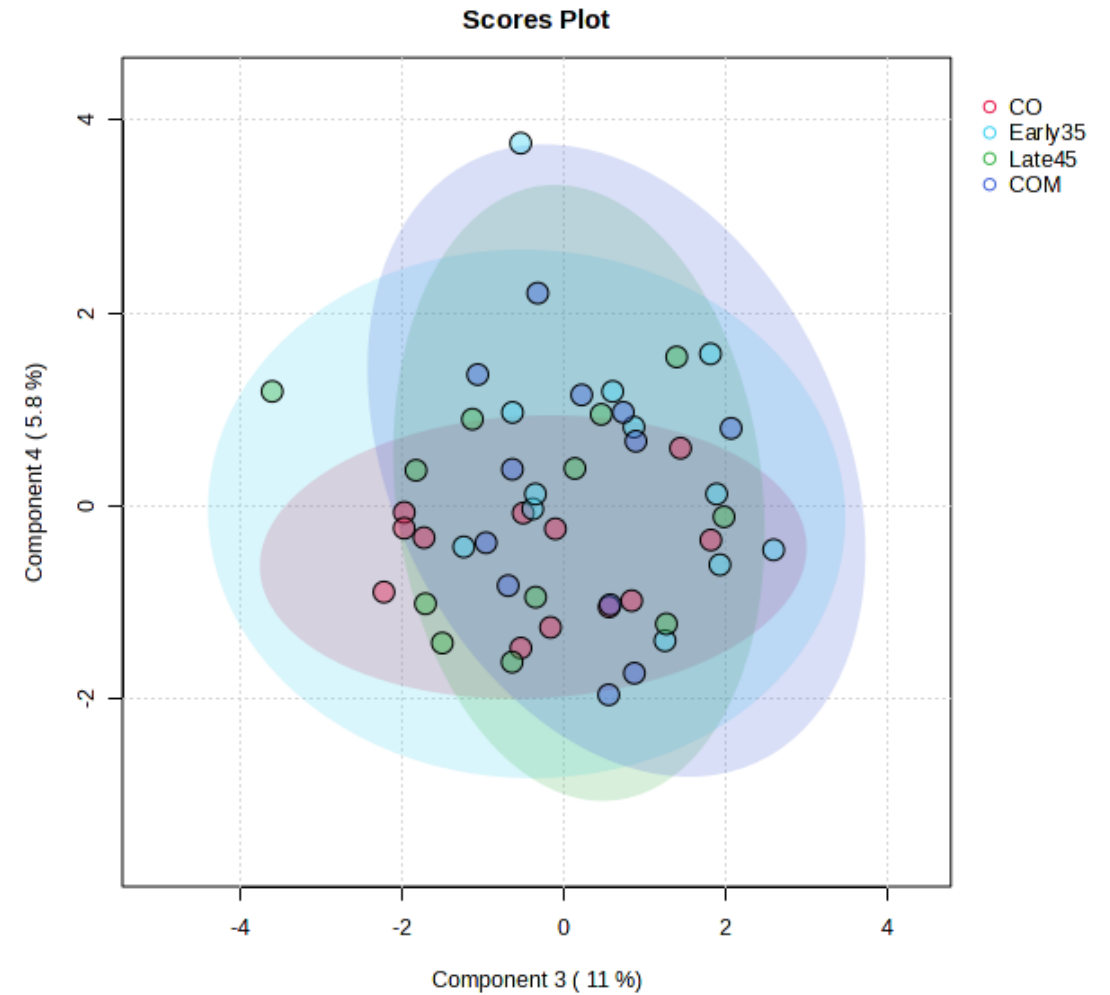
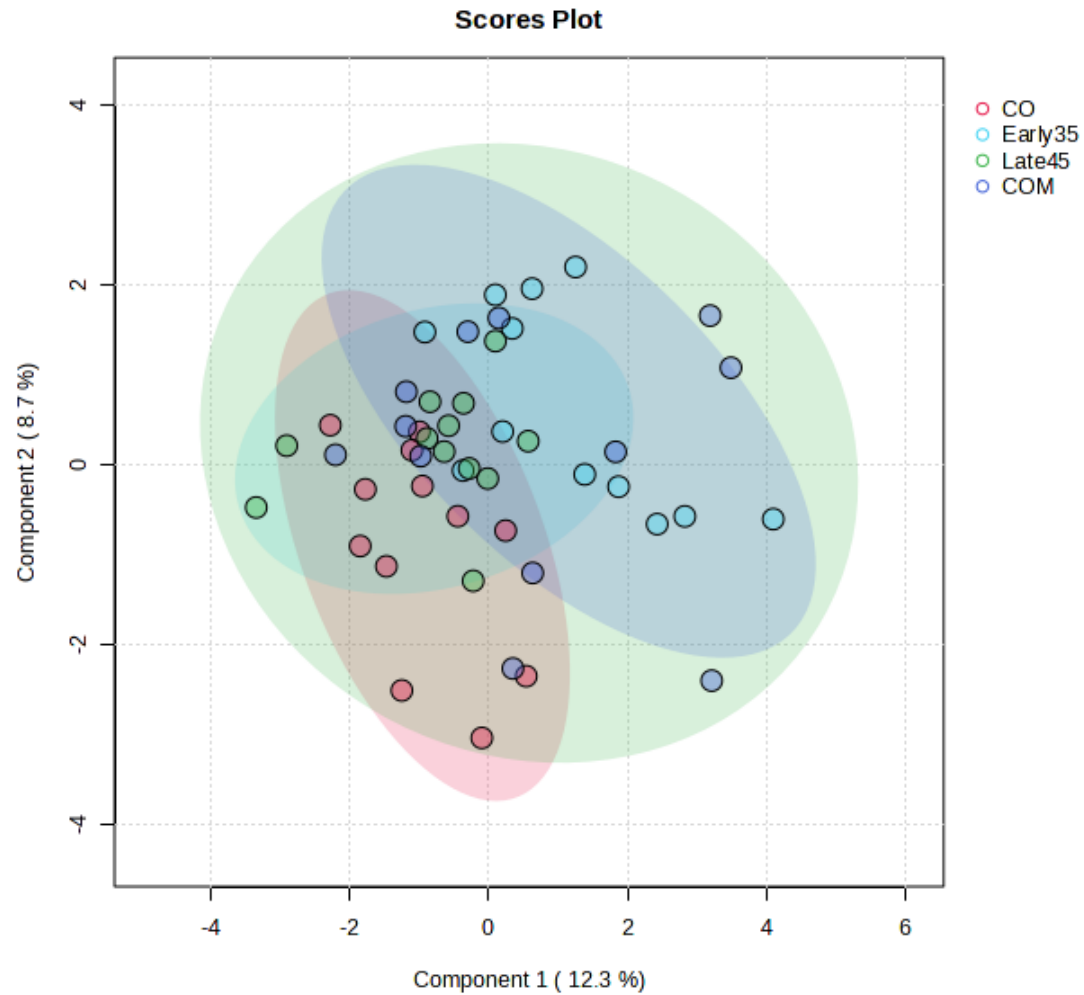
Percentage of high birth weight piglets



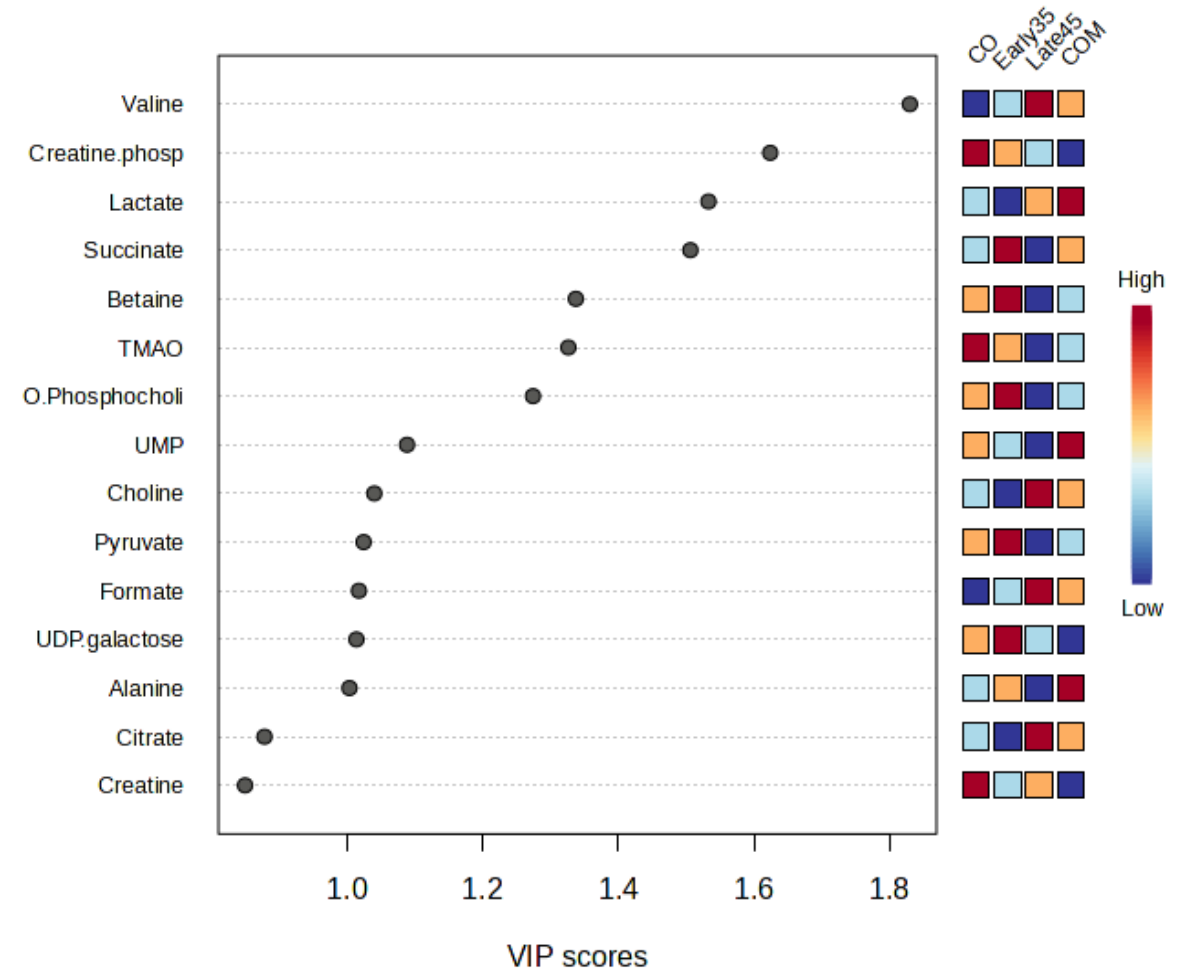
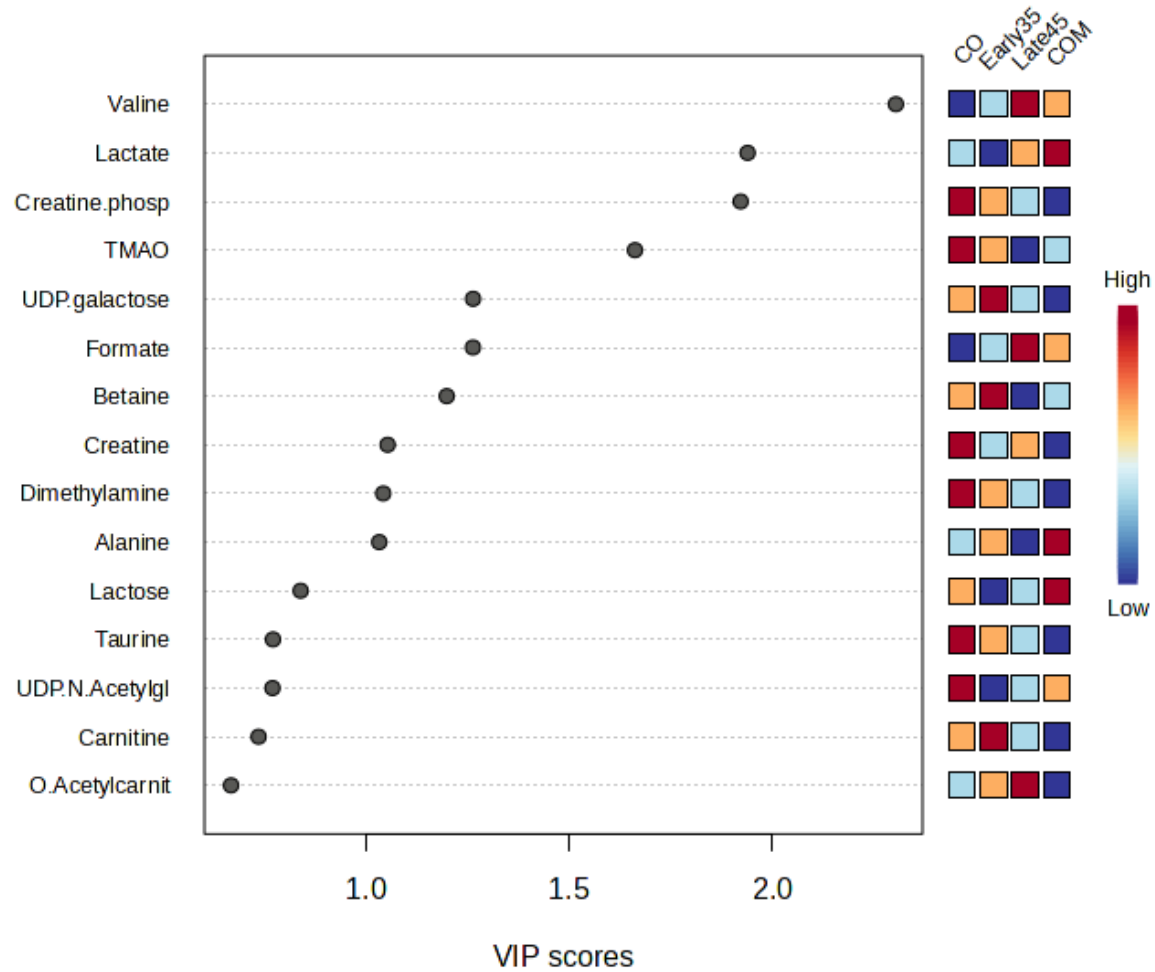
IgG concentration in sows colostrum



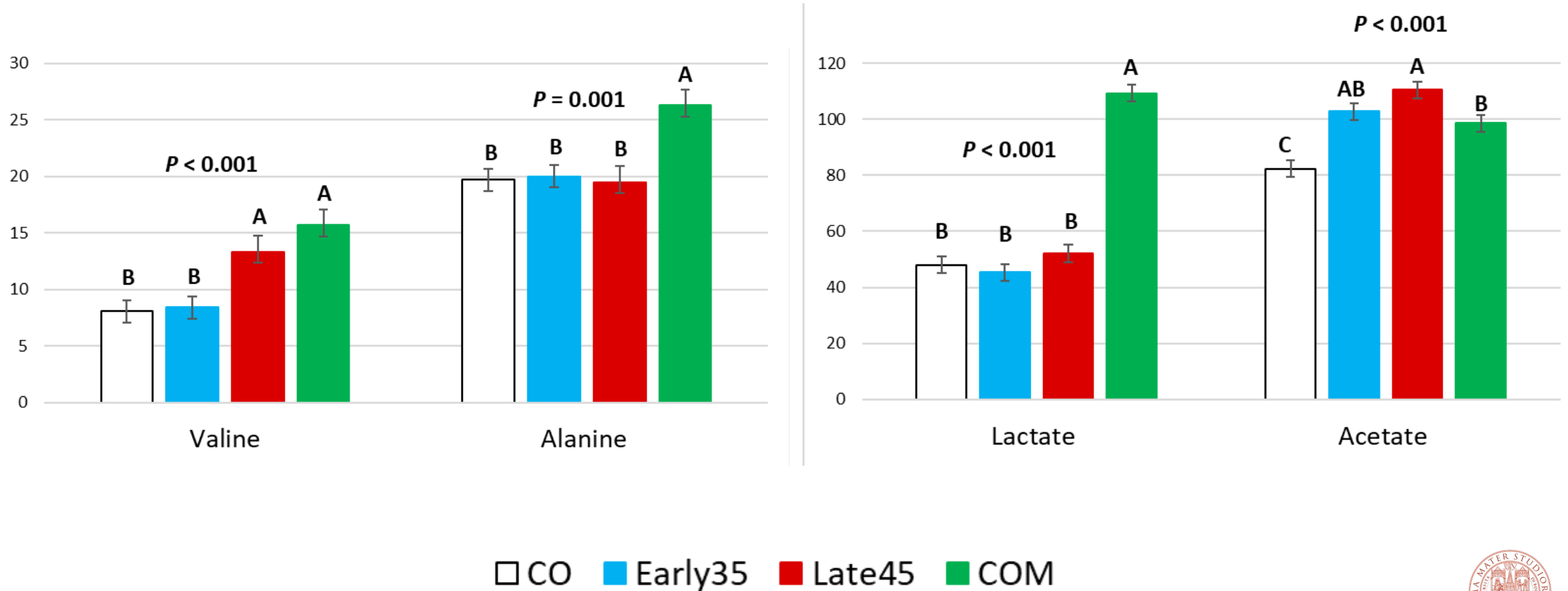
Results – metabolome characterization of colostrum



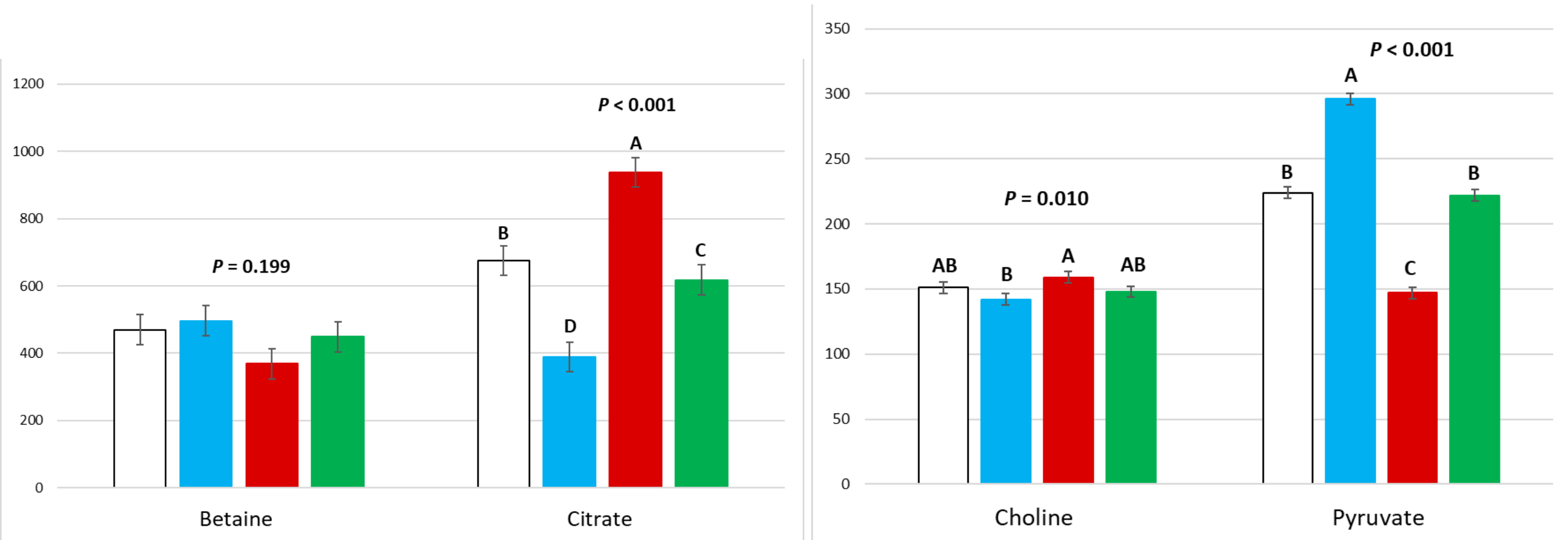
Results – metabolome characterization of colostrum



Results – metabolome characterization of colostrum



Results – metabolome characterization of colostrum



□ CO ■ Early35 ■ Late45 ■ COM



Take home message

21.8 g/d added Arg

- Does not affect litter size or birth weight
- Increases the high birth weight when supplemented during late gestation

- Increases the percentage of crushed and hypo-vital if supplemented during all gestation
- No interaction between season and diet



- Reduces the number of stillborn if supplemented during early or late gestation
- Reduces the percentage of low birth if supplemented in early gestation

- Decreases the colostral concentration of IgG



Thanks for your attention



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