



Influence of L-Glu and L-Gln supplementation in broilers subjected to an *Eimeria* challenge on performance

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Introduction

- Birds raised in modern rearing conditions will inevitably encounter *Eimeria* spp., the ubiquitous intestinal parasites that cause coccidiosis. This infection damages the host mucosal cells, impairing nutrient digestion and absorption, increasing plasma protein leakage and cell permeability, and thus affecting weight gain, feed efficiency and mortality (Madlala *et al.*, 2021).
- In birds infected by coccidiosis, some nutrients such as amino acids are used to support immune system and repair the intestinal damage, creating amino acids deficiencies (Klasing, 2007; Lee and Rochell, 2022).
- Dietary glutamate (L-Glu) supplementation was shown to improve growth performance in broiler under sanitary challenge and glutamine (L-Gln) improved performance by maintaining an optimal antioxidant status and immune function (Bartell and Batal, 2007; Oxford and Selvaraj, 2019). L-Glu and L-Gln being closely linked metabolically, a supplementation of both amino acids may have a synergistic effect and would modulate growth performance and resiliency of broiler under *Eimeria* infection.

⇒ **OBJECTIVE:** Study the broiler chicken response to L-Gln and L-Glu supplementation during an *Eimeria* challenge.

Materials & Methods

- 1800 male day-old Ross 708 chicks
- 72 floor pens | 25 birds/pen
- 3 feeding phases: starter (day 0 to 9), grower (day 10 to 24) and finisher (day 25 to 35)
- Diets based on corn and soybean meal:
 - formulated to meet Ross 708 nutrient specifications (Aviagen, 2019) according to the feeding phase
 - only differing by their Gln and Glu content: L-Gln and/or L-Glu supplemented at 0.5% on-top of the diets from d0
- 6 dietary treatments (12 replicates/treatment):

	NC	PC	100Gln	66Gln + 33Glu	33Gln + 66Glu	100Glu
Coccidiostat & antibiotic*	no	yes	no	no	no	no
L-Gln	no	no	5g/kg	3.3g/kg	1.7g/kg	no
L-Glu	no	no	no	1.7g/kg	3.3g/kg	5g/kg

*coccidiostat: Monteban 100: 10mg Narasin/kg; antibiotic: BMD 110: 77mg Bacitracin Methylene Disalicylate/kg

- Feed and water *ad libitum*
- Temperature and light controlled
- CHALLENGE:** at day 10, half of the pens were challenged with oral gavage of 1mL of an *Eimeria* culture (*E. acervulina*, *E. maxima*, and *E. tenella* mixture) while the others received equal volume of 0.9% saline
- MEASUREMENTS & CALCULATIONS:**
 - body weight (BW) recorded at d0, d10 and d35
 - BW gain (BWG), feed intake (FI) and feed conversion ratio (FCR) calculated for the periods 0-10d and 0-35d
- STATISTICS:** The experimental unit was the pen. The performance data were analysed using mixed models with the pen as random effect:
 - pre-challenge period: one-way ANOVA with diet as fixed factor
 - complete period: two-way ANOVA with fixed effects of diet, challenge and their interaction. The interaction was removed from the model if not significant ($P > 0.05$)

Results & discussion

Pre-challenge period (d0-10):

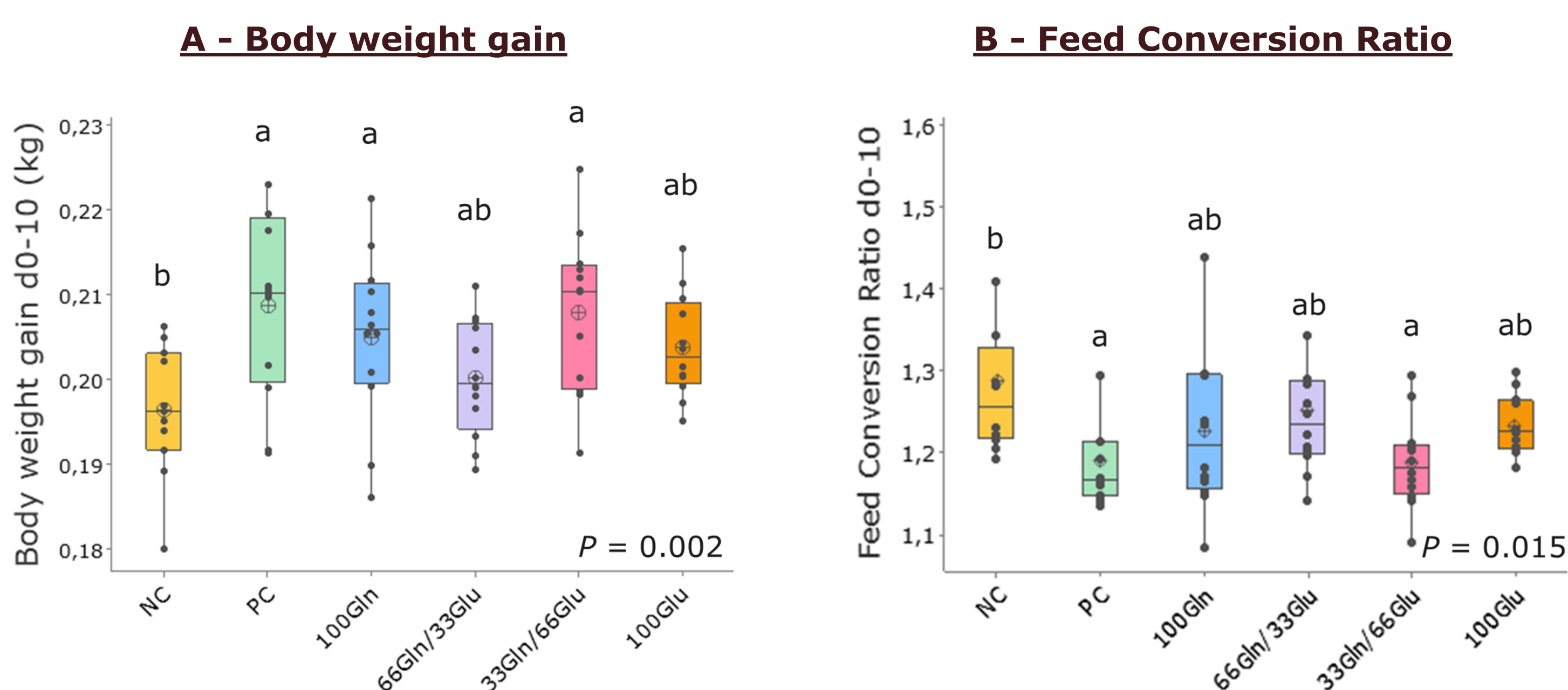


Figure 1: Effect of Gln and/or Glu supplementation on performance (A - Body weight gain and B - Feed Conversion Ratio) of broiler chickens (d0-10)

Complete period (d0-35):

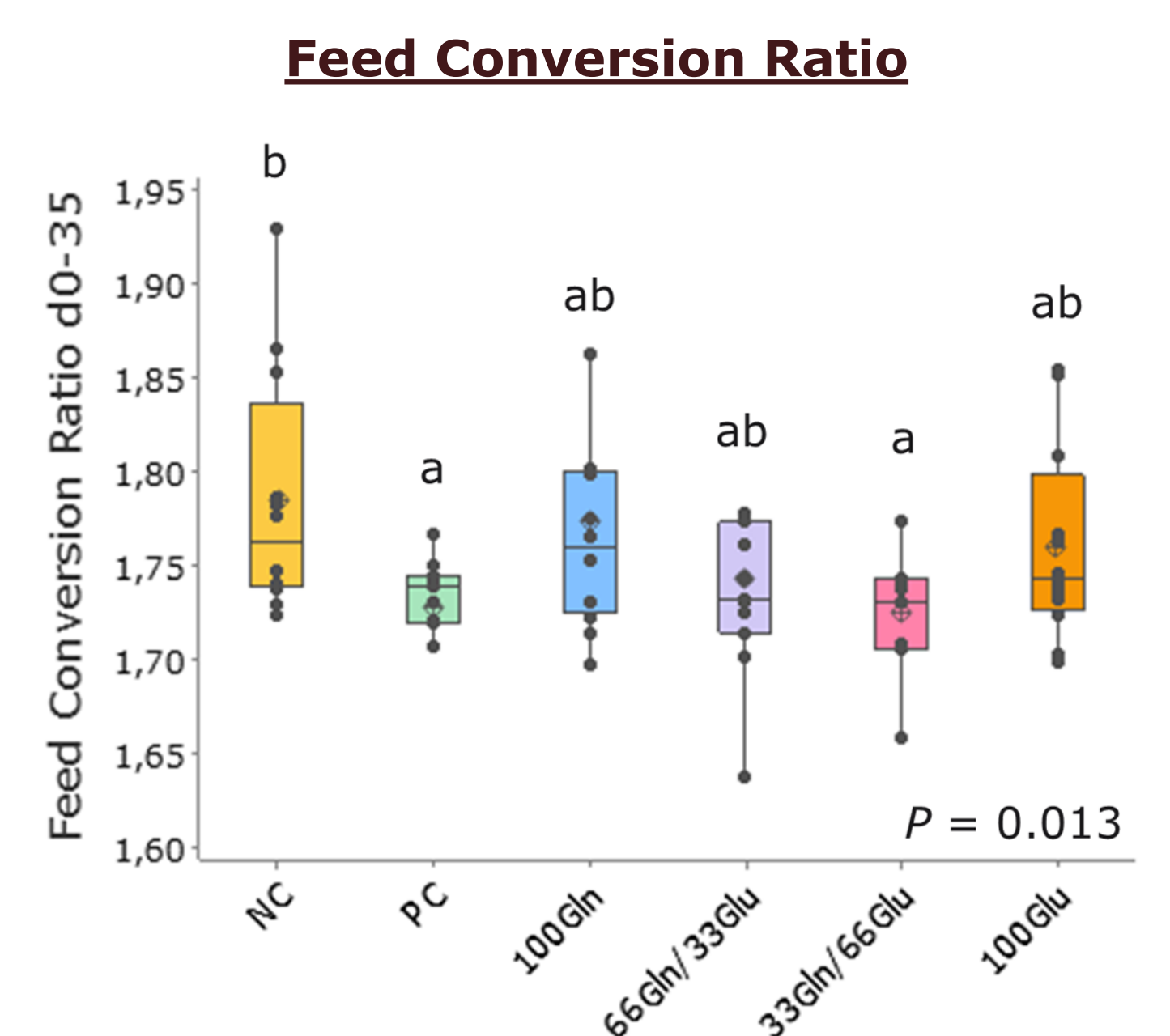


Figure 2: Effect of Gln and/or Glu supplementation on feed conversion ratio of broiler chickens (d0-35)

- Pre-challenge period:** birds receiving PC and 33Gln+66Glu diets had improved BWG ($P = 0.002$) and FCR ($P = 0.015$) compared to birds fed with NC, the other being intermediate (Figure 1)
- Complete period:** no interaction was found between [diet] and [challenge] => main effects:
 - CHALLENGE:** strong and significant effect on performance with challenged birds having decreased BWG (-7%) and FI (-6%), and increased FCR (+4%) compared to unchallenged birds ($P < 0.001$)
 - DIET:** the birds fed PC and 33Gln+66Glu diets had a significant better FCR compared to the birds receiving NC, the other Gln/Glu combinations being intermediate ($P = 0.013$; Figure 2)

Conclusions

These results demonstrated that, for broiler chickens, the combination 33%Gln+66%Glu performed as well as the PC diet and better than the NC diet, independent of the challenge