

Effect of feed content and source of vitamin D on bone mineralization and performance of broilers

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Background

- Dietary supplementation of Vitamin D is required for optimum performance and skeletal integrity.
- Requirements of modern fast growing broilers may exceed EU limit of supplementation (5000 IU/kg of feed) during the grower period.
- Vit D can be supplied as either D3 or as 25-OH-D3 (25D3), which is an intermediate metabolite; 25D3 has been shown to be more effective than D3 in mediating effects.

Aims and Hypothesis

We hypothesize that:

- Broiler performance and bone mineralization will benefit from a higher vitamin D supplementation level and increased 25D3: D3 ratio in the feed than current recommended levels.
- Effects of increasing 25D3: D3 will be more pronounced at lower levels of vitamin D supply.

Methods and Materials

- 2880 d-old Ross 308 chicks, sexed and reared separately in 48 floor pens, each pen containing 60 birds.
- Birds were allocated to 9 diets differing in their source and content of vitamin D during the grower period (d1-21) adequate in Ca and P (**Table 1**).
- Gain (ADG), Feed Intake (ADFI) and FCR were measured over the growing period.
- At d21, birds were dissected and tibia dimensions, breaking strength, ash weight (g/kg of BW), ash percentage (%) and ash Ca and P percentage (%) .
- Results analysed with GLM with level (3) source (3) and sex as factors.

Table 1. Vitamin D supplementation level (IU/kilogram of diet) and vitamin D3 to 25-OH-D3 ratio in the 9 dietary treatments

Vit D level		D3 to 25D3 ratio		
		100% D3	50% D3: 50% 25D3	100% 25D3
Low	D3	2000	1000	0
	25D3	0	1000	2000
Medium	D3	4000	2000	0
	25D3	0	2000	4000
High	D3	8000	4000	0
	25D3	0	4000	8000

Results

- As expected females showed higher FCR and lower ADG whilst they had longer bones as a proportion of BW.
- Vit D level tended to interact with source ($p < 0.1$) for FCR; birds on the low level offered D₃ as the sole source of supplementation had the highest FCR (**figure 1A**).
- Vit D level affected tibia ash weight ($P < 0.05$); it was higher for birds on the High than the Medium and Low level of vitamin D (**figure 1B**).

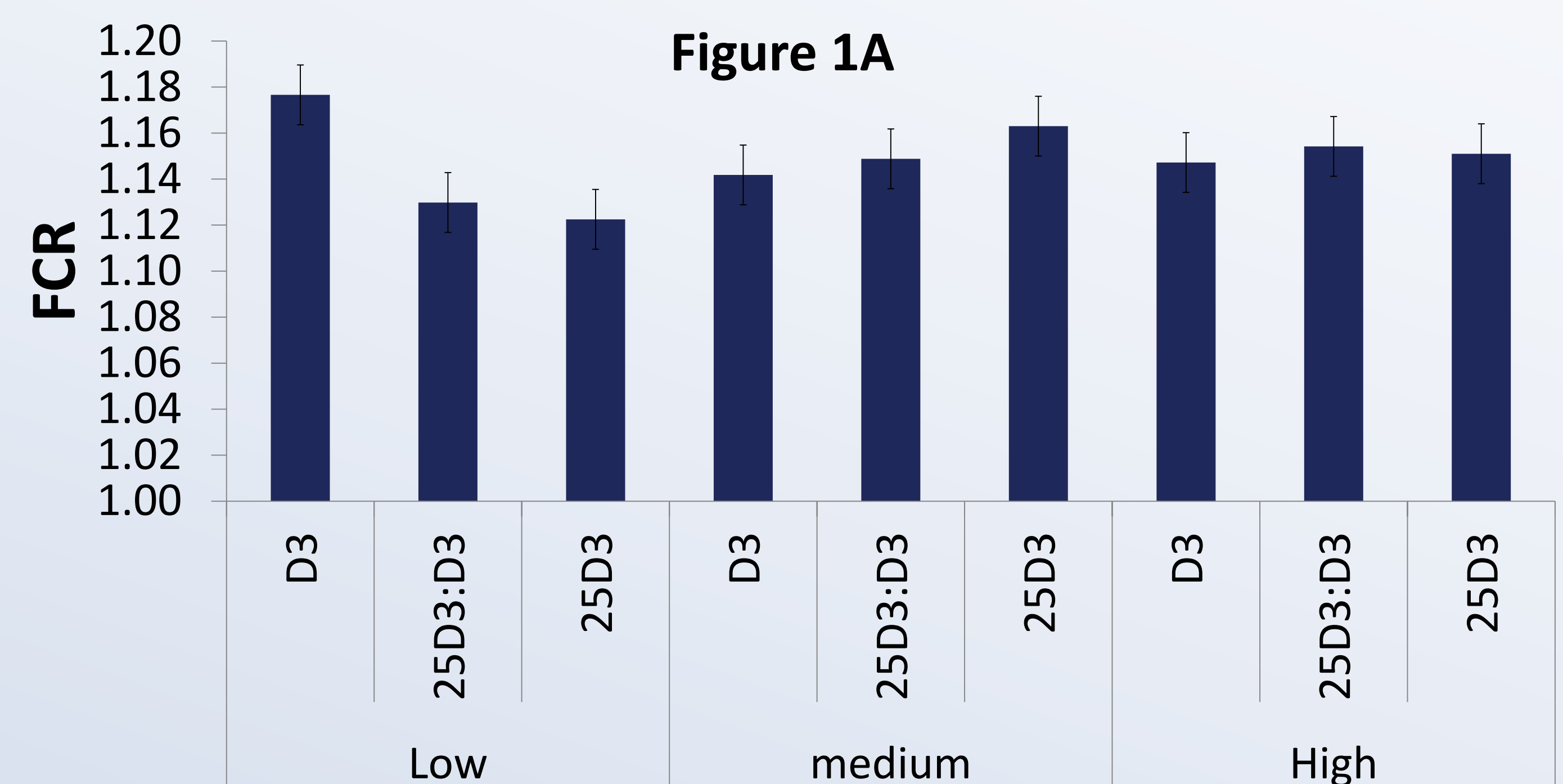


Figure 1A. FCR between d1 and d21 across the 9 dietary treatments

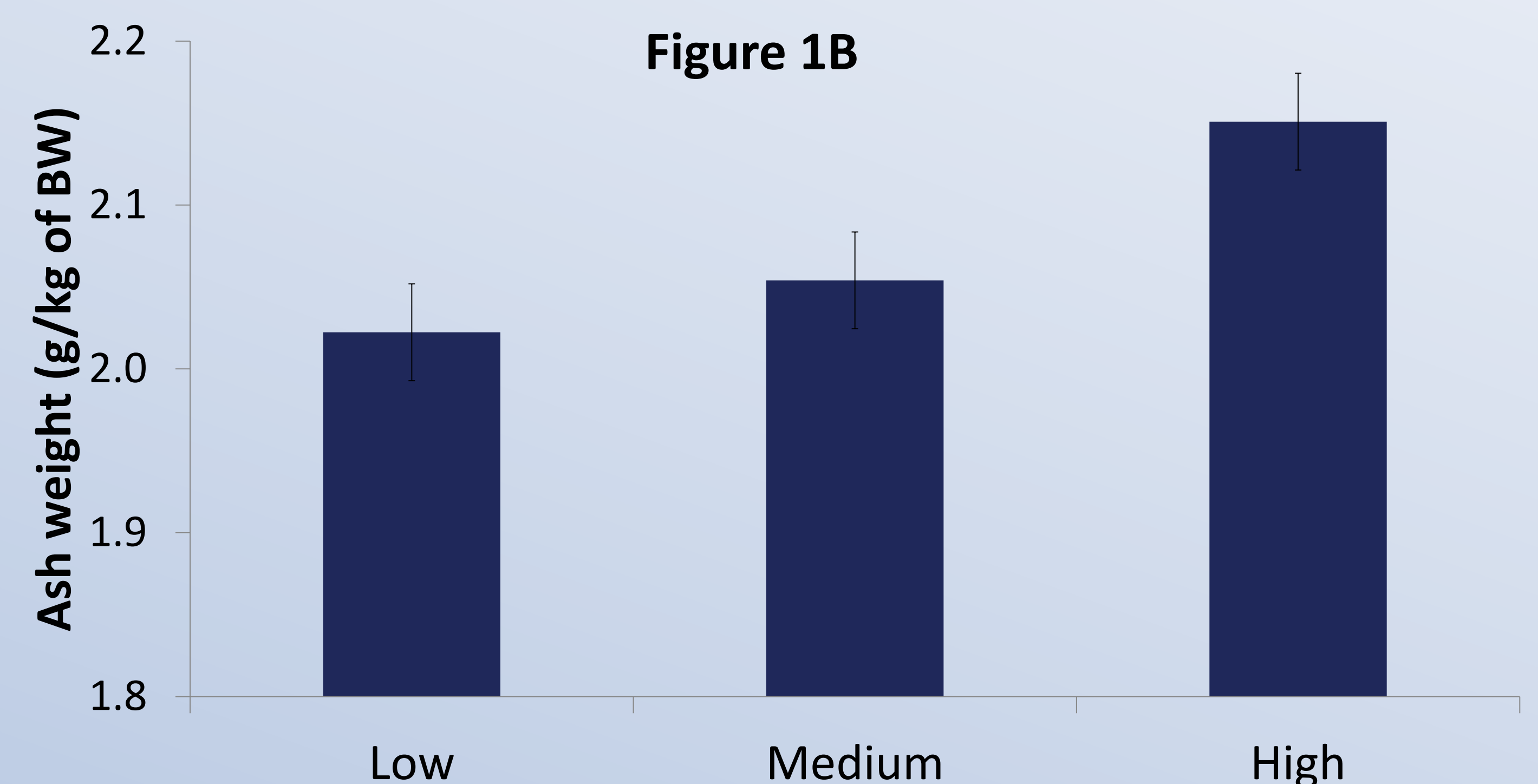


Figure 1A. Ash weight (g/kg of BW) across the 3 levels of dietary vit D supplementation

Discussion

- Vitamin D source or level of supply did not affect performance parameters other than an increased FCR in birds receiving the Low diet with D3 as the sole source of vitamin D supply.
- Mineralization increased at levels of supplementation beyond the EU limit irrespective of the source of vitamin D supply.
- Requirements for vitamin D did not differ between male and female broilers.

Conclusion

Offering diets with more than 5000 IU/kg is required for maximal bone mineralization in commercial diets adequate in Ca and P during the grower period.

PROHEALTH consortium

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The PROHEALTH project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 613574.



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