

A triple-strain probiotic approach in laying hens

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Introduction

Probiotic supplementation can improve intestinal health, increase the stability of the gut microbiota, and reduce the gut colonization by pathogenic bacteria. In laying hens, probiotic supplementation has been associated with improved egg production, egg quality and intestinal morphology^(1, 2).

Objectives

To evaluate the effect of the dietary supplementation with a **triple-strain probiotic** (*Bacillus* spp. ATCC PTA-6737, PTA-127113 and PTA-127114) in laying hens on their laying performance, egg quality, and intestinal morphology.

Materials and Methods

Animals: 128 HiSex laying hens (22 weeks old).

Duration: 12 weeks; divided in three phases, *i.e.* phase 1 (22-26 weeks of age), phase 2 (27-30 weeks of age) and phase 3 (31-34 weeks of age).

Design: 4 experimental groups, 16 replicates/group and 2 hens/replicate.

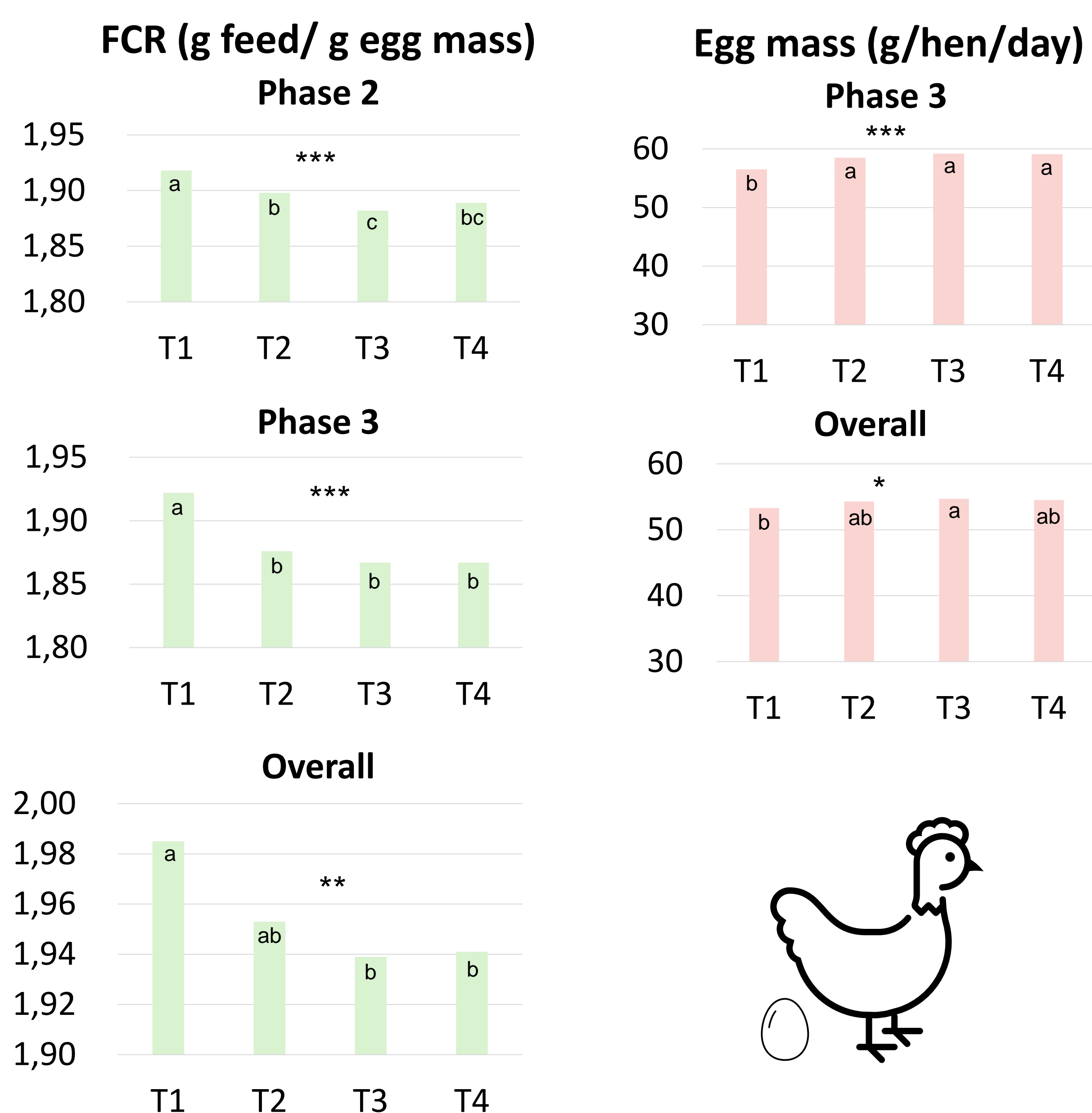
Experimental groups: triple-strain probiotic supplemented at:

- T1 = 0 CFU/kg (control)
- T2 = 3×10^8 CFU/kg (recommended dose)
- T3 = 3×10^9 CFU/kg (10x the recommended dose)
- T4 = 3×10^{11} CFU/kg (1000x the recommended dose)

Results

Performance

The triple strain probiotic improved the performance of laying hens from the 2nd phase of the study.



Endpoints:

Performance (BW, FI, laying rate, egg mass, egg weight, FCR; per replicate)

Egg quality (second grade eggs, Haugh units, yolk color, yolk height, yolk index, eggshell thickness; measured in the last 32 eggs laid/replicate at the end of weeks 1, 4, 8 and 12 of the study).

Histology (distal ileum, one hen/replicate from 8 replicates/group (excluding T4 group)).

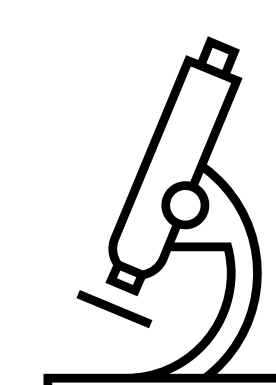
Statistical analysis: One-way ANOVA, GLM, and Tukey test to separate means. PROC FREQ and Chi-Square test for egg classification and proportion of dirty and cracked eggs. Significant differences declared at $P < 0.05$. Statistical software: SAS (v 9.1.3).

Egg quality

The supplementation with the triple strain probiotic improved several egg quality parameters, especially on the eggs collected on weeks 8 and 12 of the study.

- Albumin height (**)
- Haugh units (*)
- Yolk color (*)
- Yolk height (*)
- Eggshell thickness (**)
- Eggshell breaking strength (*)

Histology (Distal ileum)



- Villus height | Increased with the probiotic supplementation (***)
- Villus width
- Villus surface area
- Crypt depth | Higher in T3 group vs. T1 (*)



Conclusions

The dietary supplementation with the triple strain probiotic improved the animal performance (especially FCR and egg mass) as well as several egg quality parameters. The recommended dose (3×10^8 CFU/kg) showed significant improvements on the performance. The supplementation at 3×10^9 CFU/kg (10x) showed further enhancements. No adverse effects were observed for any of the parameters measured with the 3×10^{11} CFU/kg (1000x) dose. These positive effects were accompanied by an improvement of the ileum morphology.

References

- Anas Abdelqader *et al.* 2013. <https://doi.org/10.1016/j.anifeedsci.2012.11.003>.
- Mikulski, D. *et al.* 2012. <http://dx.doi.org/10.3382/ps.2012-02370>

During phase 3, the supplementation with the triple strain probiotic also increased:

Laying Rate (up to 2.0%; T3 and T4 > than T1; **) and, **Egg weight** (up to 2.5%; T2, T3 and T4 > than T1; ***).

* $P \leq 0.05$; ** $P \leq 0.01$; *** $P \leq 0.001$