37. A precision biotic approach improves microbiome metabolism and result to a more sustainable and profitable egg production

*M. UMAR FARUK[1], P. SEGOBOLA[1], E. AMAYA[1], B. BLOKKER[1], M. SEGURA-WANG[1] and M.I. GRACIA[2]**

*[1] DSM Nutritional Products, ANH, Kaiseraugst, Switzerland; [2] Imasde Agroalimentaria, S.L. C/ Nápoles 3, 28224, Pozuelo de Alarcón, Madrid, Spain; *e-mail: mgracia@e-imasde.com*

The efficacy of a novel precision biotic on zootechnical performance, microbiome metabolism and environmental impact in laying hens was evaluated. 210 Isa Brown laying hens were allocated into 42 enriched cages, each containing 5 hens, in an environmentally controlled room. Hens were assigned to one of two treatments, with 21 replicates per treatment. The basal diet was a corn, wheat, soybean meal and sunflower meal, containing 16% crude protein, 2767 kcal/kg AME and was fed to the control group (T1) or supplemented with novel precision biotic at 900 g/ton (T2). Experimental diets and water were offered ad-libitum from 22 to 42 weeks of hen age. Initial and terminal body weight (BW) were recorded. Every 28 days interval, feed intake (FI), hen-day egg production (EP), and egg weight (EW) were recorded. Egg mass and feed conversion ratio were calculated. At the end of the study, caecum and ileum contents were collected from one hen per cage for metagenomic sequencing to analyse the functional potential of the microbiome. Shifts in the functional profiles were assessed using a Local Fisher discriminant analysis, and pathway importance was assessed using a random forest classifier for treatment group. Animal Production System tool (APS) was used to assess environmental impact of this study according to the methodology in the FAO LEAP (2016), IPCC (2006) & EMEP/EEA (2016). Performance data was subjected to a student t-test. T2 significantly increased the terminal BW (1.879 g vs 1.825 g), increased hen-day egg production (95% vs 90.9%), egg mass (58.5 g vs 55g), and improved feed conversion ratio (2.15 vs 2.27) compared to T1. Egg size was higher with T2 resulting to an increase in the percentage of XL eggs (3.7% vs 0.2%). In the cecum, T2 modulated the pathways involved in amino acid fermentation and carbon metabolism, particularly lysine, arginine, biotin, and pyruvate. Pyruvate metabolism pathway, play a key role on the energy metabolism. In the ileum, T1 significant modulated the functional profiles associated with fatty acid degradation and several amino acid metabolism pathways. Results from APS showed an average of 2 % reduction across the different environmental impact categories with the T1 supplemented group. It is concluded that the precision biotic supplementation at the rate of 900 g/ton of feed improved egg production parameters in laying hens, induces a beneficial shift in the microbial metabolism both in the cecum and in the ileum and thus, constitutes an opportunity to increase the productivity and sustainability of egg production industry.

Keywords: precision-biotics; egg production; laying hens; environmental impact; sustainability

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