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Xylanase Impact beyond Performance: A Prebiotic Approach in Laying Hens

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Abstract : Anti-nutritional factors such as non-starch polysaccharides (NSP) are present in viscous cereals used to feed poultry. Therefore, exogenous carbohydrases are commonly added to monogastric feed to degrade these NSP. Our hypothesis is that xylanase not only improves laying hen performance and digestibility but also induces a significant shift in microbial composition within the intestinal tract and, thereby, can cause a prebiotic effect. In this context, a better understanding of whether and how the chicken gut flora can be modulated by xylanase is needed. To do so, in the herein laying hen study, the effects of dietary supplementation of xylanase on performance, digestibility, and cecal microbiome were evaluated. A total of 96 HiSex laying hens was used in this experiment (3 diets and 16 replicates of 2 hens). Xylanase was added to the diets at concentrations of 0, 45,000 (15 g/t XygestTM HT) and 90,000 U/kg (30 g/t Xygest HT). The diets were based on wheat (~55 %), soybean, and sunflower meal. The lowest dosage, 45,000 U/kg, significantly increased average egg weight and improved feed efficiency compared to the control treatment ($p < 0.05$). Egg quality parameters were significantly improved in the experiment in response to the xylanase addition. For example, during the last 28 days of the trial, the 45,000 U/kg and the 90,000 U/kg treatments exhibited an increase in Haugh units and albumin heights ($p < 0.05$). Compared with the control, organic matter digestibility and N retention were drastically improved in the 45,000 U/kg treatment group, which implies better nutrient digestibility at this lowest recommended dosage compared to the control ($p < 0.05$). Furthermore, gross energy and crude fat digestibility were improved significantly for birds fed 90,000 U/kg group compared to the control. Importantly, 16S rRNA gene analysis revealed that xylanase at 45,000 U/kg dosages can exert a prebiotic effect. This conclusion was drawn based on studying the sequence variation in the 16S rRNA gene in order to characterize diverse microbial communities of the cecal content. A significant increase in beneficial bacteria (Lactobacilli spp and Enterococcus casseliflavus) was documented when adding 45,000 U/kg xylanase to the diet of laying hens. In conclusion, dietary supplementation of xylanase, even at the lowest dose of (45,000 U/kg), significantly improved laying hen performance and digestibility. Furthermore, it is generally accepted that a proper bacterial balance between the number of beneficial bacteria and pathogenic bacteria in the intestine is vital for the host. It seems that the xylanase enzyme is able to modulate the laying hen microbiome beneficially and thus exerts a prebiotic effect. This microbiome plasticity in response to the xylanase provides an attractive target for stimulating intestinal health.

Keywords : laying hen, prebiotic, XygestTM HT, xylanase
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