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Effects of dietary supplementation of red yeast (*Sporidiobolus pararoseus*) in mycotoxin contaminated feed on gene expression in the liver of broilers and layers

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Abstract

Mycotoxin contaminations are a global concern in feedstuffs produced by fungi during their development. Toxicities in poultry reduced their production efficiencies, and immune system. Also, histopathological changes in the liver of broilers and layers were observed. By adding mycotoxin binder to the feed to adsorb the toxins, resulted in the mycotoxin passing harmlessly through the animal. In this study, red yeast (*Sporidiobolus pararoseus*; RY) was used as a novel mycotoxin binder in contaminated feed of broilers and laying hens. Gene expression profiles were studied in liver cell by next generation sequencing (NGS) technology. In broiler, liver samples were collected at 35 days after fed with red yeast 0.5 g kg⁻¹ (RY0.5, CON), mycotoxin contaminated corn meal 50 ppb (MB50), MB50+RY0.5 and MB50+RY01.0. Five groups of gene were different expressed between RY0.5 and MB50 ($p < 0.01$). Differential expression analysis (DEGs) was found 2 up-regulation genes (TOMM5 and BORCS5) and 1 novel gene for down-regulation (LOC112533251) ($p < 0.01$). In layers, liver samples were collected after fed for 63 days with four different diets: commercial diet (CON), RY1.0, MB100, and RY1.0+MB100. Highly expressed genes were found in the comparisons between the MB100 and the CON group (1,553 genes) followed by between the MB100 vs RY1.0 (1,141 genes), RY0.1+MB100 vs CON (585 genes), respectively. The least expression of genes showed in the comparison of RY0.1 and CON groups, 8 genes. We identified a set of genes in MB100 and in RY1.0+MB100 diet, which play key roles in phase I (e.g. CYP2C23a, CYP2C23b) and phase II (e.g. UGT1A1, GSTO1) detoxification process of xenobiotics, genes involved in antioxidant mechanisms and immune response were also found. The up-regulated genes of both broiler and layer showed the effect of apoptosis, cell proliferations transcription, differentiation and morphogenesis processes in liver which likely provide more comprehensive protection against the toxicity of mycotoxins and promote positive effect on productivity in poultry.

Keywords: Broiler, gene expression, layer, mycotoxin, red yeast