EFFECTS OF AFLATOXIN B₁ (AFB₁) AND CURCUMINOIDS ON HEPATIC GENE EXPRESSION IN WEANLING PIGS

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ABSTRACT

The objective of the present study was to evaluate the efficacy of curcumin (CMN), an antioxidant supplied by turmeric (Curcuma longa) powder, to ameliorate the adverse effects of aflatoxin B₁ (AFB₁) on performance of pigs and, to identify changes in gene expression in liver of pigs fed aflatoxin (AF). Twenty crossbred weanling pigs were weighed, ear-tagged, and assigned to each of four dietary treatments, which included: 1) basal diet (BD) containing no AFB₁ or CMN; 2) BD + 1.0 mg AFB₁/kg of diet; 3) BD + 100 mg curcumin (CMN)/kg of diet, and; 4) BD + 100 mg CMN/kg of diet + 1.0 mg AFB₁/kg of diet. Aflatoxin reduced (P < 0.05) body weight gain (BWG), feed intake (FI) and feed efficiency of pigs. The addition of CMN to the diet contaminated with AFB₁ improved feed efficiency (P < 0.05) but not BWG and FI. At the end of three week treatment period, livers were collected and microarray analysis was conducted to identify pathways that control growth, development, coagulation, immune function, metabolism, detoxification, and antioxidant status in liver of pigs. Genes with an adjusted permutation Fs test (false discovery rates) values less than 5% and fold change greater than 2.0 were considered differentially expressed across samples. Changes in expression were determined using microarray technique and results were validated using quantitative real time PCR (RT-qPCR). Six genes were chosen for validation of expression using RT-qPCR, including
TNF receptor superfamily, member 6 (FAS), glutathione S-transferase theta 1 (GSTT1), cyclin G1 (CCGN1), proteasome activator subunit 1 (PSME1), proteasome activator subunit 3 (PSME3), and cytochrome P450-2A19 (CYP2A19). There were no differences in the expression of the genes among the treatments except for GSTT1 and CYP2A19 that shifted the expression (down to up, and up to down regulation, respectively) with the addition of CMN in the diet contaminated with AFB₁. Results demonstrate that pigs fed 1.0 mg AFB₁/kg feed for 21 days had reduced growth performance associated with altered hepatic gene expression, and the supplementation of 100 mg CMN/kg to diets containing AFB₁ had a protective effect of curcumin on changes in gene expression in liver of pigs.

Keywords: Pig, aflatoxin, curcumin, gene expression