

GROWTH PERFORMANCE, CARCASS CHARACTERISTICS, PHYSIOLOGICAL AND GUT HEALTH EFFECTS OF FEEDING DIETS CONTAINING BMD TO HEAT STRESSED FINISHING PIGS

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Heat stress negatively affects pig growth performance, carcass composition, and immune status. The present study was conducted to evaluate the effects of heat stress and adding bacitracin methylene disalicylate (BMD, 30 g/ton) to a 10% DDGS commercial diet on growth performance, carcass characteristics, physiological parameters, small intestine morphology, and hindgut volatile fatty acid (VFA) production of finishing pigs. Four groups of 32 terminal crossbred finishing pigs ($n = 128$) of sows (Landrace \times Yorkshire) from Genetically Advanced Pigs sired by Duroc boars from Compart's Boar Store (Nicollet, MN), with initial BW between 80 to 90 kg, were used in this study. Pigs were randomly assigned to diets and environmental temperature treatments in a 2 \times 2 factorial arrangement. Pigs were fed a control (CON) or BMD (with 30 g/ton BMD) diet and exposed to a constant thermal neutral temperature (23°C) or cyclical heat stress conditions (37°C from 10:00 to 19:00 and 27°C from 19:00 to 10:00) in environmental chambers for a 28-d experimental period. Saliva samples from each pig were collected on d -1 (initial baseline), d 1, d 13, and d 27 for cortisol analysis. Blood samples were collected from one randomly selected barrow per pen on the same day after saliva sample collection, and used for analyzing serum concentration of haptoglobin, IL-1 β and TNF- α . Over the entire experimental period, pigs housed under heat stress conditions had 31% lower ADG ($P < 0.0001$), 23% lower ADFI ($P < 0.0001$), 9% lower G:F ($P < 0.001$), and 34% higher average daily water intake (ADWI; $P = 0.03$), compared with pigs housed in the thermal neutral environment. Supplementation of BMD in the diet did not improve growth performance of pigs. Average daily gain tended ($P = 0.07$) to be lower for pigs fed the BMD diet (0.66 vs. 0.73 kg/d), while ADFI, G:F, and ADWI were not affected by dietary treatments. Carcass characteristics did not differ between dietary treatments. However, pigs housed in the heat stress environment had lower ($P < 0.0001$) live BW and lower ($P < 0.0001$) hot carcass weight than pigs housed in the thermal neutral environment. Dressing percentage, 10th rib back fat depth, loin eye area, and % lean were not affected by temperature treatment. Saliva cortisol concentration did not differ between dietary treatments during the experimental period, but the initial level was lower ($P < 0.05$) for pigs fed the BMD diet than those fed a CON (4.00 vs. 5.09 ng/ml). Heat stress led to a 71% increase ($P < 0.05$) of saliva cortisol in treated pigs on d 1 compared with non-heat stressed pigs (6.65 vs. 3.72 ng/ml), but no effects were observed on the following days of sampling. Serum haptoglobin concentration was not different between dietary treatments, while heat stressed pigs showed a significantly higher ($P < 0.05$) level of haptoglobin on d 1 (1.26 vs. 0.86 mg/ml), and levels tended to remain higher ($P < 0.1$) on d 13 of heat stress. Cytokines IL-1 β and TNF- α were not affected by heat stress, but pigs fed the BMD diet had a lower ($P < 0.0001$) level of serum IL-1 β initially at d-1 (15.5 vs. 180.5 pg/ml), and tended to be lower ($P < 0.1$) on d 13 of heat stress compared to pigs fed CON. Small intestine morphology was not affected by temperature treatment, but pigs fed the BMD diet tended to have greater ($P = 0.07$) villi height and crypt depth ($P = 0.09$) in the duodenum, and greater crypt depth in the jejunum ($P = 0.07$). Dietary treatment did not affect VFA production in the cecum, while pigs housed under heat stress conditions tended to have less molar proportion of propionate ($P = 0.08$), greater A:P ratio ($P = 0.08$), and significantly less valerate proportion ($P = 0.02$) in the cecum compared with pigs under the thermal neutral environment. These results suggest that heat stress reduces pig growth performance and impacts the pig's immune system and gut health. Take-home message: Supplementation of 30 g/ton BMD in the finishing diet appeared to have positive effects on pig immune status and gut health, but it did not alleviate the negative effects of heat stress on pig growth performance. Implementation of best management practices to minimize heat stress in commercial pig production facilities is essential to minimize the negative effects on pig performance.