

Influence of Steam-Pelleting Temperatures and Grain Variety of Finely-Ground, Sorghum-Based Broiler Diets on Small Intestinal Starch and Nitrogen Digestion Dynamics in Broiler Chickens

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Abstract :

The effects of sorghum grain variety and conditioning temperature at which broiler diets were steam-pelleted on small intestinal digestion dynamics of starch and nitrogen were assessed. A 2x3 factorial array of treatments comprised two sorghum varieties, with white (Liberty) and red (Venture) pericarps and three conditioning temperatures (70, 80, 90°C). Both sorghums were finely-ground through a 2.0 mm hammer-mill screen prior to incorporation into the diets. Each of the dietary treatments was offered to six replicate cages (6 birds per cage) from 7 to 28 days post-hatch. Digesta samples were collected at day 28 for determination of starch and nitrogen digestibilities and mean retention time in the proximal jejunum, distal jejunum, proximal ileum and distal ileum. The digestion dynamics of starch and nitrogen were determined using an exponential mathematical model to relate digestion coefficients with mean retention times in each small intestinal segment. Increasing conditioning temperatures generated a 'concave response' in starch digestion rates in white sorghum diets; whereas, there was a 'convex response' in red sorghum diets. Thus, at the intermediate 80°C conditioning temperature, starch digestion rates were at a minimum value for white, but at a maximum value for red sorghum-based diets, which is consistent with the significant sorghum type x temperature interaction ($p < 0.05$). Conditioning temperatures increased potential digestible starch ($r = 0.336$, $p < 0.05$), predicted glucose absorption ($r = 0.468$, $p < 0.01$), retention time in the distal ileum ($r = 0.362$, $p < 0.05$) and the entire small intestine ($r = 0.371$, $p < 0.05$). There was a quadratic relationship between potential digestible starch ($p < 0.05$) and Feed Conversion Ratio (FCR), which indicated that the optimal FCR was attained with a potential digestible starch value of 0.862. These results suggested that starch and protein digestion may influence feed conversion efficiency

Key Word :

Digestion rates, dynamics, feed efficiency, protein, retention time, starch

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