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EFFECT OF FEEDING COARSE OR EXTRUDED OAT HULLS ON GROWTH PERFORMANCE AND GUT HEALTH IN BROILER CHICKENS – Dr. Deborah Adewole

Introduction: To preserve the potency of clinically important antibiotics, there has been a gradual reduction and an anticipated elimination of the use of preventative antibiotics in food-producing animals. An alternate strategy to prevent disease in broiler chickens is to promote gut health through the feeding of high fiber ingredients, such as oat hulls (OH). Dietary fibers fuel the activities of beneficial bacteria resulting in the production of short-chain fatty acids (SCFA) which lower the gut pH and inhibit the growth of pathogenic bacteria (Cherrington et.al. 1991). As well, the type of fiber has an impact on blood chemistry with soluble fiber being shown to reduce the concentrations of sugars, lipids and cholesterol in the blood (Brown et al., 1999). Coarse OH are very high in lignin and insoluble fiber. Extrusion is a processing technique combining high pressure with high temperatures and can modify the fiber fractions in feed ingredients. A previous study by Dr. Adewole et al. (2020) showed that the inclusion of 3% fine particle-sized OH had the potential to enhance growth performance and carcass weight of broiler chickens while free choice feeding of OH did not.

Objective: To determine the effect of dietary supplementation with coarse and extruded OH on growth performance, blood biochemistry and gut health in broiler chickens.

Industry Impact: This research demonstrates that coarse or extruded oat hulls may improve gut health with no negative impact on production performance. This could be a low-cost tool for producers to incorporate into their management practices as they move towards the removal of preventative use antibiotics.

Trial: Groups of 26 mixed sex Ross 308 broiler chickens were assigned to 24 pens. There were four dietary treatments randomly assigned to each pen. The dietary treatments consisted of a corn-soybean meal-wheat based diet (Basal), Basal diet + Bacitracin methylene disalicylate (BMD), an anti-bacterial indicated for the prevention and control of enteritis, increased rate of weight gain, and improved feed efficiency, Basal + 3% coarse OH (COH), and Basal + 3% extruded OH (EOH). The birds were fed using a phase-feeding program that consisted of starter phase (d 0 to 14), grower phase (d 14 to 24) and finisher (d 24 to 39). Diets were fed in pelleted and crumbled form during the starter phase and in pelleted form during the grower and finisher phases. Body weight and feed intake were determined on a pen basis on d 8, 15, 22, 28 and 36. On d 36, one chicken was randomly selected from each pen and euthanized. Blood samples were collected, weights of the empty gizzard and ceca, the bursa of Fabricius and spleen were determined, and digesta from the ceca was collected. The following parameters were determined: feed intake, body weight, body weight gain, feed conversion ratio, organ

weights, concentration of SCFAs, blood chemistry and identification of gut microbiota.

Results:

- Supplementation of broiler chickens' diets with 3% coarse or extruded OH (to replace corn) had no adverse effect on feed conversion ratio, showing that farmers could save money due to OH addition in their nutrition program. In poultry production, feed cost represents a major portion of about 70% of the total cost. Dietary energy sources such as corn occupy the greatest portion of the diets (Van der Klis et al., 2010).

- Birds fed the coarse OH diet also had higher gizzard weight compared to those fed the other diets. It has been shown that a well-developed gizzard improves feed efficiency and overall bird performance (Sacranie, 2017).

- There was no effect of coarse or extruded OH on blood biochemistry or SCFA production. However, analysis of the gut microbiota demonstrates that supplementation of diets with COH or EOH may encourage the establishment of a few beneficial bacteria recognized for their ability to maintain the integrity of the gut.

- It was also recognized that there was a difference between birds fed coarse and extruded OH in the bacterial populations within the gut. This could be associated with the modification that occurred to the OH fiber during the extrusion process.

Table 1. Effect of coarse or extruded oat hulls on growth performance of broiler chickens

	Treatment [1]				*p* Value
	Basal	BMD	COH	EOH	
Feed intake, g/bird					
D1–14	542 [a]	548 [a]	489 [b]	515 [ab]	0.0052
D14–28	1890	1857	1818	1821	0.3644
D28–36	1165	1153	1206	1185	0.3439
D1–36	3585	3587	3397	3522	0.2819
Body weight gain, g/bird					
D1–14	447 [a]	455 [a]	408 [b]	413 [b]	<0.0001
D14–28	1168 [ab]	1177 [a]	1106 [bc]	1104 [c]	0.0038
D28–36	817	828	794	815	0.5042
D1–36	2449 [ab]	2460 [a]	2308 [b]	2332[b]	0.0008
Feed conversion ratio					
D1–14	1.21	1.21	1.19	1.25	0.2207
D14–28	1.62	1.58	1.65	1.65	0.1198
D28–36	1.44	1.40	1.53	1.45	0.0956
D1–36	1.50	1.46	1.47	1.51	0.1881

[1] Basal = basal diet; BMD = antibiotic diet; COH = diet supplemented with 3% coarse oat hulls; and EOH = diet supplemented with 3% extruded oat hulls. In a row, means assigned different lowercase letters are significantly different, $p < 0.05$ (Tukey's procedure).

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