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The Efficacy of Feed Restriction Program on Broiler Production: A Review

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Abstract

Poultry often intake energy to meet their energy needs, which is associated with both more fat and protein deposition, which is also conditioned by the presence of adequate other nutritional nutrients. The most significant supplement in creature sustenance or diets is protein, with exceptional thought given to the proportion among energy and protein in consumes less calories (energy: protein ratio EPR). This implies that a specific protein level relates with the fundamental measure of energy in the eating regimen. The article evaluated the manipulation of energy to protein ratio and its effect on broiler performance and carcass lipid profile. The author's methodology depends on analyzing and comparing other scientists' studies and work to evaluate the impact of protein-to-energy ratio on broiler performance and carcass fat deposition and found that high-energy or high-protein diets and widening the energy-to-protein ratio significantly increased fat deposition. Also, a low-energy diet increased broiler total cholesterol.

Keywords: Broiler, Protein ratio, Carcass, Fat.

1. Introduction

Most carcass fat and saturated ones in particular have a great effect on raising consumer blood cholesterol concentration, which contributes to the process of coronary atherosclerosis, the main cause of coronary heart disease, which results in narrowing arteries and inclusion, which block the coronary artery and cause ischemia. Also, [1] stated that fat deposition in broilers leads to many metabolic disorders such as Ascites, lameness, and Sudden Death Syndrome, and [2] mentions a reduction in broiler growth rate. In the last few decades, broiler production has rapidly increased all over the world, especially in developing countries associated with rare genetic broilers with high growth rates, feed efficiency, and performance, which require high energy (nutrients) diets [3], [4] stated that high-energy diets lead to high-fat accumulation in the abdominal cavity, which results in economic losses. Additional energy in diets comes from two main sources: One is animal

fat (tallow, lard, etc.), and the second is vegetable or plant oils (sunflower, soybean, etc.) [5]. The other most important nutrient in animal nutrition or diets is protein, with special consideration given to the ratio between energy and protein in diets (energy:protein ratio EPR). This means that a certain protein level corresponds with the essential amount of energy in the diet [6]. Energy-to-protein ratio variation affects broiler performance by either widening or narrowing the amount of protein or energy included in the diet. [7] mentioned that fat widening increases the energy in the diet at the expense of dietary protein content and will increase energy intake with high fat deposition. This led to a conflict between two important production aspects. The first one is to widen the energy: protein balance, by providing as much energy as possible to the bird so that it utilizes all the protein and grows fast. The second one is reducing the amount of energy to produce leaner carcasses, which is not the ideal amount of energy and protein in the diet. When fat is included in the diet, protein content should also be increased to maintain the ratio. This gives more energy to protein ratios, which contributes to the use of diet nutrients and increases poultry performance [8].

2. The effect of EPR on broiler performance and fat deposition

[9] mentioned that diets with protein levels slightly above or below maintenance requirements did not affect growth rate, but the inclusion of a high protein amount in diets brought better feed-to-body gain ratios in all treatments. Therefore, produced lean carcasses, thus the degree of fatness, respectively, affected by an increase or decrease in protein levels in finisher diets. Also, [3] reported that in constant energy-to-protein ratios, the inclusion of dietary oil in diets did not affect the amount of carcass fat deposit, but if there existed any consistent trend at all, it decreased carcass fat deposition. [10] showed that higher dietary energy and lower dietary protein levels improve broiler protein utilization.

[11] noted that a widening energy-to-protein ratio in a diet increased broiler fat accretion. [12] stated that there were significant differences in broiler final live body weight, protein intake, energy intake, crude protein: body gain, and metabolizable energy: body gain, with no difference in weight gain, feed intake, or feed conversion ratio. [13] reported that weight gain decreased, whereas feed intake and feed conversion ratio increased as dietary protein and energy decreased during grower, finisher, and overall experimental periods; therefore, protein and energy ratio efficiency decreased with low-protein and low-energy diets among all experimental periods. However, carcass yield, breast meat yield, thigh yield, abdominal fat, and relative liver and heart weights were not affected. Low-protein diets with a constant energy-to-protein ratio adversely affected performance, but carcass parameters and abdominal fat were unaffected.

[14] stated that different energy-to-protein ratios did not affect either abdominal fat or total carcass fat contents but resulted in slight differences in energy utilization efficiency. [15] observed that, overall, feed consumption, body weight, and body weight gain were higher and lower feed conversion ratios in birds on high-energy and protein diets than in other dietary treatments. Lower-protein diets exhibited lower feed conversion ratios than in other dietary treatments. [16] stated that the various degrees of fatness were obtained by varying the energy-to-protein (E:P) ratios in conventional diets. Increasing the E:P ratio caused increased fat deposition with increases in the proportions of palmitic and oleic acids and a decrease in linoleic acid, whereas highly significant negative correlations were obtained between the degree of fatness and unsaturation of abdominal

fat, while the same negative correlations were obtained for individuals within the same dietary treatment, especially those producing lean birds.

[17] reported that lowering the energy-to-protein ratio of the finishing diet significantly improved feed-to-gain ratios and tended to reduce fat pad size. [18] found that energy restriction significantly reduced the abdominal fat ratio and the subcutaneous fat thickness, increased the muscle stomach weight, and increased the pancreas and spleen. There was no significant difference in leg muscle ratio or breast muscle ratio between the experimental groups. Energy restriction (low) significantly decreased serum total cholesterol. [19] stated that high energy significantly increased body weight, body weight gain, carcass weight, carcass yield, abdominal fat, thighs, and decreased feed intake and feed conversion ratio. while high protein significantly increased body weight, body weight gain, carcass weight, and drumsticks but decreased abdominal fat pad, whereas it had no effect on feed intake, feed conversion ratio, carcass yield, thighs, or drumsticks. [20] stated that there was no significant effect on carcass composition or carcass parts except female heart, gizzard, liver, and heart weight, and that abdominal fat significantly affected [21] showed that carcass yield and breast meat yield were not significantly affected by different EPRs, while abdominal fat pad yield was significantly affected by increasing EPR. [22] stated that there was no significant difference in carcass, liver, or abdominal fat. [23] reported that carcass protein and ash decreased linearly as energy levels increased. Ether extract was not significantly affected by treatment. [24] stated that body and liver composition changed markedly in response to changes in the dietary calorie/protein ratio. However, dietary amino acids resulted in a decrease in the percentage of body fat and an inverse increase in the percentage of body protein and water. [25] reported that dietary treatments did not significantly influence the weight of the thigh, breast, bile, gizzard, and abdominal fat, but the weight of the liver and heart increased significantly when fed a diet with a higher ratio of EPR. [26] showed that carcass muscle increased when protein increased. Inconsistently, breast muscle is not increased by the inclusion of protein. [27] stated that there were insignificant differences in carcass moisture and ether extract of muscle. [28] proved that the ether extract content of the carcasses of growing birds is directly related to the percentage between energy and protein. [29] in chickens that were fed with higher protein and fat levels resulted in an increase in serum triglycerides, while feeding different levels of energy and protein did not affect carcass, pancreas, intestine, or proventriculus weights. [30] stated that carcass characteristics, carcass composition, and internal organs of the broiler were significantly affected by different calorie-to-protein ratios.

3. Results

There were two main aspects: widening and narrowing the ratio between calories and protein. Higher dietary energy and lower dietary protein levels (widening) improve protein utilization and increase fat accretion. The high energy-to-protein ratio positively affected the broiler performance, fat deposition, and fat concentration. However, high protein significantly increased body weight, body weight gain, carcass weight, and drumstick but decreased abdominal fat pad carcass protein and ash. Lowering (narrowing) the energy-to-protein ratio of the finishing diet significantly improved feed-to-gain ratios and reduced fat pad size. Different EPR induced no significant effect on broiler internal organs. Different EPRs affect the degree of broiler fatness. Different energy to protein rations significantly affected final live weight, protein intake, energy intake with no difference in weight gain, feed intake, or feed conversion ratio. Low-energy broiler diets are

associated with high total cholesterol. Narrowing energy to protein ratio deposits less fat in broiler carcasses (lean meat) with improved feed to gain ration.

4. Conclusions

In general, we can conclude that the production of broiler lean meat can be achieved through genetics and nutrition practices where special consideration should be given to the amount of energy intake and energy-to-protein ratio, especially narrowing the energy-to-protein ratio.

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Conflict of Interest

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