Investigating the Effect of Different Fats and Antioxidants on the Performance and Resistance of Bone in Broiler Chickens

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ABSTRACT

Hitherto a number of studies have been carried out on different mixtures of dietaries in broiler flocks in order to investigate the effect of these different materials on poultry’s improvement of efficiency and resistance factors such as bone resistance. In this study, the main focus is on investigating the effect of fat kind (presence of saturated and unsaturated fatty acids) and presence of antioxidants on the performance of flock and bone strength in broiler chicks. There were 120 broiler chicks selected from 3 treatments and 4 replicates. The treatments consisted dietary of unsaturated fatty acid 5% (O), dietary of unsaturated fatty acid 5% plus antioxidants (A) and dietary of saturated fatty acid 5% (A). At the end of experiment period investigating fat acid mixture of femoral flesh in chicks of dietary O and its comparison to the chicks of dietary A showed significant increase of eicosapentaneoic acid, docosapentaneoic acid and amount of omega 3 and omega 6. The ratio of omega 3 to omega 6 decreased significantly in dietary O while the ratio of unsaturated fatty acids to saturated one increased in the mixture of femoral flesh. At the end of experiment period investigating fat acid mixture of femoral flesh in chicks of dietary O and its comparison to the chicks of dietary A showed significant decrease of eicosapentaneoic acid, docosapentaneoic acid and amount of omega 3 and omega 6 in dietary A toward dietary O. Also, significant decrease of total unsaturated fatty acids with multi twofold bands was observed in comparison to the treatment with dietary O. This study and its comparison to previous papers show the advantage of utilizing dietary containing unsaturated fatty acid plus antioxidants.

Key words: Fat, Antioxidants, Bone Strength, Broiler Chicken

Introduction

Much more studies are done about the effect of dietary fat on bone structure and the quality of poultry meat. Bone structure and development are depended on many hormones such as semi-insulin growth factor, icozapentaneoids and IL1[1]. Various results are reported over the effect of mineral material of bone on its strength and hardness. Distribution of bone organic and mineral material on the strength and elasticity coefficient in experiments on human and animal bone has been shown.[2,3]. Unsaturated fatty acids which are of W 3 and W 6 classes cannot be synthesized in body. The most common unsaturated fat acid of nature is lineolic acid that cannot be synthesized in body and is prefabrication of arachidonic acid. Arachidonic acid is an unsaturated acid of W 6 class and is the main prefabrication of icozanoids[4]. Icozanoids are of high impact in structure and development of bone as a main prefabrication of prostaglonedines[1]. PGE is a strong kinetic for absorption of calcium from

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There is a negative interrelationship between PGE2 and bone ash. Dietary containing W3 which lacks a role of icozanoids and prostaglonedines obstacles the production of PGE2 and increases the production of osteoblast[6]. Studies on mouse show that EPA increases bone calcium and strength[7]. Although Watkins et al. carried out experiments on mouse and concluded that there is a negative relation between the ratio of W3 to W6 and bone structure and development[8].

Some antioxidants like vitamin E leads to the production of arachidonic acid and its metabolism which increases the production of prostaglonedine and locotrines [9] and decreases interlocines 1 [10]. Also Zn has a role in alkanphosphataze enzyme and increase of calcium sediment and bone strength [11]. The focus of this study is on investigating the effect of saturated and unsaturated fatty acids antioxidant presence on efficiency of flock, bone quality and presence of fatty acid on the chicks.

Materials and methods

Preparation of under Experiment Groups: In age of one week, 120 chicks were sexed, and randomly allocated to 3 treatments with 4 replicates containing 10 birds per pen.

Doing 3 Different Treatments on Each Group:

Different dietaries consisted unsaturated fat acid 5% or fish oil (O), unsaturated fat acid plus antioxidants containing 100 units of vitamin E plus 50 mg/kg Zn (A) and saturated fat acid 5% or fat (T). Dietary weighing was done weekly. After 49 days, from each treatment; 3 female chicks were selected after slaughtering and separating their great trochanter, samples were transmitted to laboratory in order to do some investigations.

Fat Acid Extraction Method:

Gas chromatography was used for separation of lipids and oligosaccharides is useful. This technique is also very successful for separation of different fatty acids on the bases of boil spot or saturation degree [12]. Here, fatty acids extractions were measured through Metcalf et al. methods [13].

Performance Evaluation:

Performance was done by Feed Conversion Ratio (FCR) formula which was measured through division of dietary quantity onto live chickens’ weight [14].

Measuring Bone Strength Parameters:

First, great trochanter samples were dried in suspension and then its length and diameter measured in Culis. Finally, its strength against fracture was measured in Instron (hard material evaluation) which was made in England.

In order to measuring ash percentage, 2 gr of sample were burned in furnace of 250°C.

Statistical Analyses:

The data were analyzed by SAS 9.1 software and ANOVA method.

Instron tester in biomechanics laboratory

Results

Performance Investigation: The effect of treatments on performance of broiler chickens’ coefficient conversion at the end of period showed no significant efficacy of fat and presence or absence of antioxidants on flock performance (table1).

Mixture and Quantity of Femoral Fatty Acids Investigation at the End of Period:

Treatment (O) cause significant increase in DHA-EPA, fat acid with several twofold bands, W3 and W6. There was a decrease in ratio of W6 to W3 (O) in comparison to (A) and (T). There was a significant decrease in W6 to W3 ratio of treatment (A) compared to other two (table2).

Bone Strength Parameters Investigation at the End of Period:

Treatment (O) cause of high resistance and bone ash (table3)

Discussion and conclusion

Results of experiment treatment on performance show no significant efficacy of fat, presence and absence of antioxidants on the performance and efficiency of broiler flock. So, the kind of fat acid
The ratio of w6 to w3 in treatment of saturated fat acid (T) was higher in comparison to treatments of unsaturated fat acid (O) and saturated fat acid (A). This ratio has no difference in comparison to treatments of unsaturated fat acid plus antioxidants.

Treatment of unsaturated fat acid and antioxidants caused significant increase in bone dry weight. Bone length, diameter, maximum bearing force and ash percentage increased significantly.

In 1996, Barja et al. showed that some antioxidants like vitamin E decreased the ratio of w6 to w3. The results of this study prove it too. Their study showed that high amount of vitamin E decreased unsaturated fatty acid in mitochondrion wall [15]. These results oppose the results of Sura et al. [11] reported that Zn of alkaline phosphates causes the sediment of calcium and bone strength [11]. In this study the treatment of antioxidant decreased the ratio of omega 6 to omega 3 which resulted in bone strength because of restructures in prostaglandinines. Results of Watkines et al. demonstrate this [8].

There observed no significant difference between the fat kind of treatments (O, T) for bone length, diameter and dry weight but, the kind of fat was efficient on ash percentage and its strength against fracture in that case that unsaturated fat which has a high level of w3 increases ash percentage and its resistance. This results assent the reports of Liu et al. whom observed that animal fat decreases bone strength and ash contrary to fish oil [5]. Dietary containing high level of omega 3 decreases prostaglandin E production and increases alkalinphenpataze enzyme[17,18] which increases collagen production and calcium sediment in bones [7].

This study confirms studies of Classen et al. [18] about the ash percentage of Tiba bone[18]. Also, Kruger et al. [19] and Liu et al. [20] measured the...
ash of Tiba bone in treatments with dietary containing unsaturated and saturated fat acid. Their measurement showed that dietary containing unsaturated fat acid has the most and dietary containing saturated fat acid has the least amount of ash. This results concordance the results of this study.

On the bases of current study and comparing it to previous studies, it is proposed to make use of unsaturated fat acids containing antioxidants in dietary of broiler flocks.

References