STUDY OF SOME FEED ADDITIVES TO IMPROVE PHOSPHORUS UTILIZATION IN BROILER DIETS

By

ABDELRAHMAN YOUSEF MOHAMED ABDELHADY

B.Sc. Agric. Sc. (Poultry Production), Ain Shams University, 2007
M.Sc. Agric. Sc. (Poultry Nutrition), Ain Shams University, 2012

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This thesis for Ph.D. degree has been approved by:

Dr. Abdallah Ali Ghazalah ..... A. A. Ghazalah

Prof. Emeritus of Poultry Nutrition, Faculty of Agriculture, Cairo University

Dr. Alaa El-Dien Abdel-Salam Hemid ..... A. A. Hemid

Prof. Emeritus of Poultry Nutrition, Faculty of Agriculture, Ain Shams University

Dr. Hussein Abdallah El-Alaily .....

Prof. Emeritus of Poultry Nutrition, Faculty of Agriculture, Ain Shams University

Dr. Sayed Abdel-Rahman Ibrahim ..... S. A. Ibrahim

Prof. Emeritus of Poultry Nutrition, Faculty of Agriculture, Ain Shams University

Date of Examination: 04 / 05 / 2016

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Under the supervision of:

Dr. Sayed Abdel-Rahman Ibrahim

Prof. Emeritus of Poultry Nutrition, Department of Poultry Production, Faculty of Agriculture, Ain Shams University.

(Principal supervisor)

Dr. Hussein Abdallah El-Alaily

Prof. Emeritus of Poultry Nutrition, Department of Poultry Production, Faculty of Agriculture, Ain Shams University.

Dr. Mrwan Abdelaziz Mahmoud

Lecturer of Poultry Nutrition, Department of Poultry Production, Faculty of Agriculture, Ain Shams University.

ABSTRACT

AbdelRahman Yousef Mohamed Abdelhady: Study of Some Feed Additives to Improves Phosphorus Utilization in Broiler Diets. Unpublished Ph.D. Thesis, Department of Poultry Production, Faculty of Agriculture, Ain Shams University, 2016.

The present study was carried out within two identical experiments to examine several deficiency levels of dietary non-phytate phosphorus (NPP) and calcium (Ca) with three levels from sodium diformate (NDF) in broiler diets, on productive performance, NPP and Ca retention, plasma levels of Ca and P, bone measurements, ilium histomorphology and microbiota. Two hundred unsexed one day old Hubbard broiler chicks were randomly distributed into 9 dietary treatments plus the control group. Each group was divided into four replicates of five chicks each. Accordingly, 10 experimental diets are formulated.

Control diet contains 100% Ca and available phosphorus (AP) requirements without Formi NDF, and the dietary treatments were distributed as following:

(T1) Diet contains 50% of Ca and AP requirements + (100%) 1.50 Kg/ ton NDF.
(T2) Diet contains 40% of Ca and AP requirements + 1.50 Kg/ ton NDF.
(T3) Diet contains 30% of Ca and AP requirements + 1.50 Kg/ ton NDF
(T4) Diet contains 50% of Ca and AP requirements + (150%) 2.25 Kg/ ton NDF.
(T5) Diet contains 40% of Ca and AP requirements + 2.25 Kg/ ton NDF.
(T6) Diet contains 30% of Ca and AP requirements + 2.25 Kg/ ton NDF
(T7) Diet contains 50% of Ca and AP requirements + (200%) 3.00 Kg/ ton NDF.
(T8) Diet contains 40% of Ca and AP requirements + 3.00 Kg/ ton NDF.
(T9) Diet contains 30% of Ca and AP requirements + 3.00 Kg/ ton NDF.

Results of the first experiment showed that overall live body weight (LBW) values for birds fed either control diet or other diets that contained 150% and 200% of Formi NDF recommended levels, were significantly greater than that of those fed (T2) or (T3) diets. Overall body weight gains of birds fed control, 150% or 200 Formi NDF were larger than that of those fed 100 % Formi NDF (1.50 Kg/ ton NDF) diets. Birds fed (T4), (T5), (T7) or (T8) diet consumed significantly ($p<0.01$) more feed than of those fed control, (T1), (T3) or (T6) diet and the birds fed (T2) diet consumed less feed count. Feed conversion ratio (FCR) of birds fed control diet was the best FCR compared to those fed other dietary treatments.

Plasma Ca concentrations indicated that birds fed either control, diets contained 150% or 200% NDF except (T9) recorded higher values compared to those fed 100% NDF diets or (T9). Plasma P levels of birds fed either (T3), (T4) or (T6) diet were higher than of those fed control diet, and the lowest plasma P level was recorded with birds fed (T5) diet. Plasma alkaline phosphatase activity indicated that birds fed either (T3), (T6), or (T9) diet were significantly the highest value. Tibia ash percentages for birds fed either control, (T7) or (T8) diet were higher than those fed other treatments while the lowest tibia ash% was recorded with chicks fed (T6) diet. Tibia Ca and P % for birds fed control diet, was significantly higher than those fed other diets. Tibia breaking strength (TBS) values indicated that no significant differences were noticed between different treatments. Also, birds fed either control, (T5) or (T7) diet have longer tibia than of those fed diets with 100% NDF. Also, birds fed control, (T2) or (T3) diet have broader tibia than of those fed other treatments. Ca and P retention percentages of birds fed control diet was lower than chicks fed diets supplemented with 100%, 150% or 200% NDF. Villi height, crypts depth and goblet cells values showed that birds fed control diet was usually lower than other treatments. In contrast, villi width and muscle thickness values showed that birds fed control diet was higher than other treatments.

Economical efficiency values appeared that chicks fed (T2) or (T9) recorded the highest values and appeared significantly similar with control groups. On the other hand, chicks fed all diets appeared significantly similar with control diets except those fed (T2) diets.

Results of the second experiment showed that the overall BWG of birds fed control, 150% or 200% NDF diet were higher than of those fed 100% Formi NDF. Moreover, birds fed (T3) recorded significantly ($p<0.01$) the lowest BWG value. Data of overall feed consumption (FC) indicated that either birds fed control, 150% or 200% NDF diets consumed significantly higher amount of feed. With regard to FCR values, it appeared significantly similar among different dietary treatments ranged between (1.61 and 1.71). Mortality number indicated normal mortality incidences during the whole experimental period. Plasma Ca levels indicated that birds fed either control, 150% NDF, 200% NDF addition to (T1) diet were better than those fed (T2) or (T3) diet. Plasma P levels of birds fed control or (T1) diets were higher than of those fed other treatments and (T6) was

significantly the lowest value. Plasma ALP activity indicated that birds fed (T2), (T7) or (T8) diet recorded higher values and birds fed (T4) or (T5) diet showed the lowest activity value. Tibia ash, Ca and P percentages for birds fed control diet were significantly higher than those fed deficient calcium and phosphorus diets with Formi NDF level (T1: T9). Additionally, TBS values indicated that birds fed control or 200% NDF diet have stronger tibia than those fed 100% or 150% NDF diet. Tibia length, width appeared significantly similar among different dietary treatments. While Ca and P retention percentages of birds fed control diet was lower than of those fed other diets except for those of (T1) in Ca retention percentages. Villi height, and goblet cells values showed that birds fed control diet was lower than different dietary treatments. In contrast, villi width and muscle thickness values showed that birds fed control diet was higher than other treatments. Crypt depth of birds' ilium in (T2), (T3) and (T5) groups have the highest value. Ilium pH capacity of birds fed control diet was higher than of those fed any level of NDF. Also, birds fed control diet recorded significantly ($p<0.05$) higher levels of either total aerobic bacteria, E. coli, lactic acid bacteria or salmonella compared to those fed NDF levels. Economical efficiency (EE) values appeared significantly similar among chicks fed 100% NDF and control diets. On the other hand, PI of chicks fed control diets have the highest values and chicks fed (T3) diets recorded the lowest value.

In conclusion, we recommend reducing levels of Ca and NPP in broiler diets supplemented with extra levels of that Formi® NDF in order to diminish feed costs as well as to reduce P emission in the environment devoid of any unfavorable effects on productive performance, blood and bone features. Additionally, we concluded that Formi® NDF boosted Ca and AP utilization of broilers and enhanced gut health, therefore, these minerals would be fed at levels close to requirements

Key Words:

Phosphorus, Calcium, Sodium diformate, Broiler, Ilium histomorphology and Microbiota.

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