EFFECT OF VARYING LEVELS OF VITAMIN 'D' AND CALCIUM-PHOSPHORUS RATIO ON THE BLOOD COMPOSITION OF BROILERS

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The effect of varying levels of vitamin D with different calcium phosphorus ratios on the blood composition of broilers was studied. The results showed significant differences in cholesterol and haemoglobin contents of the blood. However, the differences were found to be statistically non-significant when the values for plasma total protein and globulin were compared. Different levels of Vitamin D significantly varied the blood glucose content, but it was not much different in case of different calcium phosphorus ratios. The plasma albumin content did not vary significantly when observed with different calcium phophorus ratios. On the basis of the experimental results, it may be suggested that 300 ICU per Kg. of vitamin D with calcium phosphorus ratio of 2 : 1 in the ration of broiler chicks have the most favourable influence on the blood components.

INTRODUCTION

Vitamin 'D' is an important nutrient in poultry rations particularly when they are raised under confinement (Maynard and Loosli, 1964). The requirements of vitamin 'D' in relation to calcium and phosphorus ratio is subject to much variation. The assimilation and fixation of calcium and phosphorus are influenced by several dietary and environmental factors, including vitamin D, calcium and phosphorus level and calcium-phosphrus ratio (Mussehl and Ackerson, 1935). The primary function of vitamin D is to promote calcium absorption and increased phosphorus absorption is secondary to it (Keane, Collins and Gillis, 1956).

The optimum ratio varies somewhat according to the levels of the elements. With plenty of vitamin D in the ration, the ratio becomes less

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important and the utilization of the elements present is more efficient (Maynard and Loosli, 1964). Vitamin D masks the true biological action of the minerals as such. Keeping in view the importance and inter-ralationship of vitamin D with different minerals, the effect of varying levels of vitamin D with different calcium phophorus ratios on the blood compositon of broiler chicks was investigated.

MATERIALS AND METHODS

Two hundred and seventy day old Vanacre broiler chicks were used as experimental birds. The experiment was designed on completely randomized design with 3x3 factorial arrangement. The chicks were randomly distributed in twenty seven experimental units. Nine experimental rations were prepared containing 150, 300 and 600 I.C.U. of Vitamin D per Kg of feed. Each level comprised three calcium phosphorus ratios, 1.5:1, 2.0:1 and 2.5:1. The basal ration was the same in all the cases. Three experimental units were alloted to each ration at random. The birds were provided with feed and water *ad-libitum* for a period of 8 weeks. At the end of the experimental period three randomly selected birds from each replicate were slaughtered and blood samples were collected, The blood samples were analysed for glucose (Nelson, 1944), cholesterol (Zlatkis, Zak and Boyle, 1953), haemoglobin (Oser, 1965) and total protein, albumin and globulin (Gornall, Bardawill and David, 1949) contents.

RESULTS AND DISCUSSION

The results of the study are summarized in Table 1. The data were subjected to analysis of variance and the comparison of mean differences was made by Duncan's Multiple Range Test (Snedecor and Cochran, 1967).

Blood Glucose

Statistically significant differences ($P < 0.01$) were observed among the blood glucose level of chicks fed on different levels of vitamin D. However, non-significant differences were observed with respect to various calcium-phosphorus ratios. The results indicated that calcium phosphorus ratio between 1.5:1 to 2.5:1 becomes in-effective or unimportant when high levels of vitamin D (150 and 300 I.C.U./Kg.) are used. This was probably due to the fact that high calcium-phosphorus ratio when fed required high levels of vitamin D (Waldroup, Ammerman and Harms, 1964; Neagle, Blaylock and Goihl, 1968). A vitamin D level of 300 I.C.U. per Kg. affected highest blood

glucose in chicks. This indicated that high levels of Vitamin D may be useful in the utilization of calcium and phosphorus by providing more favourable environment (citric acid) during deposition in the bone or remobalization for other vital functions.

Blood Cholesterol

Significant ($P < 0.01$) differences were observed among plasma cholesterol level with the increase in vitamin D level at differ calcium-phophorus ratios. There was an increase in cholestrol level with the increase in vitamin D as well as with the change in calcium-phosphorus ratio from 2.5:1 and 1.5:1 to 2.0:1. In spite of the significant variation in the blood cholesterol levels, the values remained within the normal limits. Estep, Fanguy and Ferguson (1969) obtained cholesterol level of chicks at 8 weeks of age between 126 to 139 mg per cent.

TABLE 1: *Blood Glucose, Plasma Cholesterol, Haemoglobin and Plasma Protein Values of Broiler Chicks*

Vitamin D ICU/Kg	150			300			600		
Ca : P	1.5:1	2.0:1	2.5:1	1.5:1	2.0:1	2.5:1	1.5:1	2.0:1	2.5:1
Glucose mg/100 ml	178.4	187.1	188.0	195.5	217.9	212.5	191.7	207.5	189.6
Plasma cholesterol mg/100 ml	110.7	113.3	107.0	119.3	126.3	123.7	132.7	141.7	130.3
Haemoglobin gm/100 ml	10.4	9.7	9.6	10.9	11.4	9.9	10.6	10.2	9.8
Total plasma protein gm/100 ml	4.7	4.7	4.6	4.8	4.8	4.7	4.8	4.8	4.7
Albumin gm/100 ml	2.6	2.6	2.4	2.7	2.7	2.4	2.6	2.5	2.5
Globulin gm/100 ml	2.1	2.1	2.2	2.1	2.1	2.3	2.2	2.3	2.2
Albumin/globulin	1.2	1 2	1.1	1.3	1.3	1.0	1.2	1.1	1.0

Haemoglobin

The results showed significant ($P < 0.01$) differences among the blood haemoglobin content of chicks fed on different levels of vitamin D and calcium phosphorus ratios. The haemoglobin level decreased with the change in calcium-phosphorus ratios from 1.5:1 to 2.5:1. Sturkie (1965) also suggested

that the amount of haemoglobin in the chicken blood may be influenced by certain minerals and vitamins.

Total plasma Protein, Albumin and Globulin

The total plasma protein albumin and globulin contents did not vary significantly when the birds were fed rations containing various levels of vitamin D. The variations in the plasma protein and globulin contents with regard to the calcium-phosphorus ratio were also non-significant. However, the albumin contents of plasma has significant differences ($P<0.01$) in respect of calcium-phosphorus ratios. The factors which regulate the concentration of plasma protein are not clearly understood. There is evidence that various physiological, pathological, environmental and nutritional factors are involved. Numerous studies have shown that the concentration of plasma protein in children is influenced both by the quality and quantity of protein consumed. Flodin (1953) and Keyser, Waldroup and Harris (1968) stated that the level of plasma protein are related to the quality and quantity of dietary protein. The dietary protein level in the present study was the same in all the rations hence the plasma protein contents did not vary significantly.

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