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BLOOD PROFILE OF GUINEA FOWL (*Numida meleagris*) FED VAERYING LEVELS OF PROTEIN AND ENERGY

صورة الدم للدجاج الغيني *Numida meleagris* المغذى بمستويات مختلفة من البروتين والطاقة

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المستخلص

تم توزيع عدد 150 صوص من الدجاج الغينى عمر يوم عشوائيا على خمس حظائر وتجميعها في 5 مجموعات غذائية لمستويات مختلفة من البروتين والطاقة. تم جمع عينات من الدم المتجلط وغير المتجلط فى عمر 8 أسابيع عند الزبح وفحصت في نفس اليوم. تمت دراسة خصائص الدم و شملت المعلومات Hb، PCV ، WBC، ALP ، CK، AST، LDS ، السكر والكرياتينين و البروتين و الألبيومين، وأملاح الصوديوم والفسفور والكالسيوم والبوتاسيوم . وجدت زيادة معنوية (أ > 0,05) فى كل من P، الألبيومين و الكالسيوم هنالك ارتفاع معنوى فى مستويات PCV فى النظام الغذائي المنخفض البروتين ومرتفع الطاقة . ايضا هنالك ارتفاع معنوى فى الكرياتينين مرتبط بالنظام الغذائي المرتفع البروتين والطاقة وايضا زيادة فى الكالسيوم مرتبط بالنظام الغذائي المنخفضة البروتين والطاقة .

Abstract

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Blood profile of 150 day old helmeted guinea fowl (Numida meleagris galeata) keets was studied. They were grouped into 5 dietary groups of varying levels of protein and energy .Clotted and un-clotted blood samples were collected at 8 weeks on slaughter and examined on the same day. Parameters measured included Hb ,PCV ,WBC counts ALP, CK, AST, LDS, sugar creatinine ,total protein ,albumin, Na, P, Ca and K. Significant increase in P, albumin, Ca, PCV levels were detected when low protein high energy diet was fed. Significant increase in creatinine was associated with high protein high energy diet and in Ca when low protein low energy diet was fed.

Keywords: ***Guinea Fowl, Haematology , Metabolites, Electrolytes, Enzymes***

Introduction

Guinea fowl are native to the grasslands and woodlands of most of Africa, south of the Sahara . They occupy all habitats except dense forests and treeless deserts to appear to have an inherent adaptability to both heat and cold (Microlivestock 1991). According to Mareko, et. al., (2008) guinea fowls originated in Africa where they still retain many of their original traits. They are hardy birds and are opportunistic omnivores inhabiting open savannah and mixed savannah bush. Oke, et. al., (2003) found that Packed cell volume was not affected by the energy or protein content in the diet ,They obtained a maximum packed cell volume of 34.5% at a diet of 2650 kcal/kg and 18% protein . Uko and Ataja (1996) reported that the normal haematology values of male guinea fowl in North West Nigeria were 35.96 ,10.68 ,3.45 ,104.23 ,30.96 ,29.70 for PCV, Hb, RBC,MCV ,MCH, and MCHC, respectively and for female they were 33.04 ,10.51 ,3.40 ,98.35 ,30.91 and 31.45 for PCV, Hb, RBC,MCV ,MCH and MCHC respectively .These authors also found that the values the blood chemistry for male guinea fowl in Nigeria were 115.6 ,55.3 ,4.4 ,1.9 and 2.5 for cholesterol (CHL),AP, total protein(TPP),albumin (ALB) and globulin(GLB) respectively .The values of the females were 122.2 ,58.8 ,4.9 ,2.1 and 2.8 for cholesterol (CHL),AP, total protein(TPP),albumin (ALB) and globulin(GLB), respectively. Olayemi, et. al., (2002) reported that the ranges of AST and ALT were (155-171.67 and 9.17-12.50 i.u/l, respectively for adult guinea fowls. Guinea fowl has high plasma glucose level . Plasma

alkaline phosphatase in guinea fowl is (4.55 to 5.02) .Oke, et.al.,(2003)indicated that serum total protein is not affected by the differences in energy or protein among diets, and the total protein of 4.9 optimized at 2750 kcal/kg M.E and 18% protein. Mandal, et. al.,(1999) reported that plasma protein and cholesterol are higher in caged birds than keets reared on litter . Cholesterol increases with time spent in captivity or domestication (Ayorinde. 2004). Oke, et. al., (2003) obtained maximum cholesterol level 3.65 mg in diets that contained 2650 kcal/kg M.E and 18% protein and also the serum calcium was 3.33. The author found serum calcium values were highest during egg production (2.94 – 3.33 mg/100ml).

The aim of this study is to determine the normal haematological values and serum biochemistry parameters of guinea fowl keets.

Materials and Methods

One hundred and fifty day-old guinea fowl (Numida meleagris galeata) keets were divided into five dietary treatments comprising 5 groups (each group containing 30 bird) as follows : Group A(control) were given diet contain (20.5% CP , 2990 kcal ME) ,group B(high protein 26% :high energy3150 kcal) ,group C (high protein26%: low energy2800 kcal),group D (low protein 16% :high energy3150 kcal)and group E (low protein 15% :low energy2750 kcal) (Table.1). Feed and water were offered *ad libitum* . Blood samples were collected from chicks 8 week after slaughter with a 5 ml disposable syringe into clean dry bottles containing EDTA and in bottle without EDTA for serum haematological samples were done on the same day of collection according to (Schalm, (1965). Blood was analysed for haemoglobin (Hb) concentration ,packed cell volume (PCV) and white blood cells (WBC) counts. .Serum samples were analysed for concentration of metabolites ,blood sugar ,total protein ,albumin ,creatinine and enzyme activities of alkaline phosphates (ALP) , aspartate amino-transaminase(AST), alanine aminotransaminase (ALT), lactate dehydrogenase (LDH) and creatine kinase (CK).and phosphorus, Calcium ,Na, Potassium.
Spectrophotometer (E. Merck Mega Version 0.6, Merck, Darmastadt,Germany) was used . Blood glucose was determined

according to Giterson etal .(1971). Flame photometry was used for phosphorus, calcium ,sodium and potassium according to Varly (1967).

Table 1: Rates of ingredients and chemical composition of experimental diets.

Groups	**Rates%**				
*Ingredients	A	B	C	D	E
Yellow corn	59.80	39.70	33.46	61.35	58.70
Soybean meal	32.00	46.20	50.34	24.63	21.24
Fishmeal	03.0	03.20	_	_	_
Wheat(grains)	_	_	07.0	05.0	5.00
Wheat bran	_	_	_	_	11.20
Vegetable oil	01.50	06.90	05.1	04.42	_
Mineral	03.60	03.90	04.0	04.50	03.76
Vitamins	0.10	0.10	0.10	0.10	0.10
Total	100	100	100	100	100
Components *					
Dry matter	88.0	89.0	89.0	88.0	88.0
Crude protein	20.50	26.0	26.0	16.0	15.0
Crude fat	04.20	09.00	05.80	07.0	02.70
Crude fiber	02.70	02.00	02.90	02.60	03.60
Ash	06.50	07.00	10.50	06.20	05.80
Energy ME(Kcal/kg)	2990	3150	2800	3150	2750

* On dry matter bases

Results

Normal haematological values of helmeted guinea fowl are shown in Table 2. The PCV of group D (42.9±0.65) were significantly higher ($P<0.05$) compared to control group A (37.4±3.86) while the rest of the groups were non-significantly different ($P>0.05$) .

Table2: Haematological values of 5 dietary groups of guinea fowl chicks

Groups / Parameters	A ©	B	C	D	E
Hb (%)	13.28± 1.23	12.8± 0.95 ^{NS}	14.38± 0.72^{NS}	13.98± 0.47^{NS}	12.42± 1.6 ^{NS}
PCV(cm^2)	37.4± 3.86	36.2± 4.22^{NS}	40.0± 1.66^{NS}	42.9± 0.65*	38.9± 2.56 ^{NS}
WBCs (10^3)	7.1± 1.69	5.94± 1.23^{NS}	7.8± 2.86 ^{NS}	7.16± 2.54^{NS}	5.88± 2.09 ^{NS}
Heterophils %	49.4± 16.07	57.2± 4.44 ^{NS}	62.4± 11.01 ^{NS}	58.2± 8.71 ^{NS}	46.8± 7.66 ^{NS}
Lymphocytes %	49.8± 15.9	42.4± 3.9 ^{NS}	37.1± 10.49 ^{NS}	41.0± 9.6 ^{NS}	52.8± 7.56 ^{NS}
Monocytes %	0.4± 0.55	0.2± 0.45 ^{NS}	0.6± 0.89 ^{NS}	0.8± 1.03 ^{NS}	0.2± 0.45 ^{NS}
Eosinophils %	0.4± 0.55	0.6± 0.89 ^{NS}	0.2± 0.45 ^{NS}	-	0.2± 0.45 ^{NS}

© Control group
Measures are means + SD
NS= None significant difference means (P>0.05)

Table 3 shows the normal serum enzymes activities . All parameter were not significantly different (P<0.01).Although serum ALP ,ALT and AST of group D and CK of group C were higher were non-significant different from other groups .LDH value of group E was not significantly lower than other groups .

Table 3: Serum enzyme activities of five dietary groups of guinea fowl chicks

Groups	A©	B	C	D	E

Parameters					
ALP (U/L)	1716± 425.5 NS	1813.2± 438.6 NS	1472.4± 288.6 NS	2237.2± 678.2 NS	1342.8± 244.1 NS
Ck (U/L)	4994.8± 1.08NS	4947.2± 1044 NS	5319± 1227 NS	4071.8± 2652 NS	4171± 529 NS
ALT(U/L)	13.2± 1.64 NS	13.8± 1.79 NS	13.2± 1.79 NS	15.6± 2.88 NS	12.6± 3.13 NS
AST(U/L)	302.4± 37.95 NS	300.2± 43.27 NS	327.2± 30.95 NS	363.8± 75.01NS	269.2± 26.46 NS
LDH (U/L)	743.4± 107.8 NS	588.8± 139.1 NS	693± 143.1NS	684.8± 160.4NS	567.2± 150 NS

© Control group

NS= None significant difference means (P>0.05)

Table 4 shows the normal values (mean ± SD) of serum metabolites of guinea fowl chicks. All parameters were not- significantly different(P<0.01) except for total protein at group D which were significantly higher (P<0.01) .Glucose levels of all groups were not significantly different (P>0.05) .Createnine value of group B (0.46±0.11) was significantly higher (P<0.05) than control group A (0.12±0.08) . All groups were not significantly different (P>0.05) in serum protein levels except group (D) (2.52±0.22) which was higher compared to control group A (2.04±0.31). The albumin level of group (D) (0.72±0.04) was significantly higher (P<0.01) than the control group A (2.04±0.31).

Table 4: Serum biochemical activities of guinea fowl chicks

Groups	**A** ©	**B**	**C**	**D**	**E**

Parameters					
Blood sugars (mg/dl)	346.5± 40.62 NS	337.2± 23.42 NS	376.2± 18.71 NS	342.2± 27.31 NS	343.8± 34.56 NS
Creatinine (mg/dl)	0.12± 0.08 NS	0.46± 0.11*	0.28± 0.08 NS	0.14± 0.17 NS	0.12± 0.08 NS
Total protein (g/100ml)	2.04± 0.31 NS	2.04± 0.11 NS	2.2± 0.07 NS	2.52± 0.22*	2.44± 0.40 NS
Total albumin **(g/dl)**	0.56± 0.11 NS	0.62± 0.04 NS	0.66± 0.05 NS	0.72± 0.04* *	0.58± 0.04 NS

© Control group
NS= None significant difference (P>0.05)

Table 5 shows the variation of serum electrolyte values of guinea fowls fed diets containing different levels of protein and energy. Phosphorus values of groups B(5.88±1.07) and C(6.3±0.38) were significantly higher compared to the control group (5.72±1.69). While Ca values of groups D (11.78±0.98) and E (12.46±0.96) were significantly higher (P<0.05) than the control group (9.92±1.28) . Na values of all groups were non-significantly different (P>0.05). Potassium values of all groups were non-significantly lower than control group. Calcium values of group (D) (11.78±0.98) and group (E) (12.46±0.96) were significantly higher (P<0.01) compared to control group (9.92±1.28) , Also P (phosphorus) values of groups (B) (5.88±1.07) and (C) (6.3±0.38) were significantly (P<0.01) higher compared to control group A (5.72±1.69) .

Table 5: Serum electrolytes levels of guinea fowl chicks fed varying protein & energy levels

Groups / Parameters	A ©	B	C	D	E
P (m.mol/l)	5.72±1.69 NS	5.88±1.07*	6.30±0.38*	4.68±1.67 NS	4.38±0.74 NS
Ca(m.mol/l)	9.92±1.28 NS	10.14±0.63 NS	10.5±0.39 NS	11.78±0.98*	12.46±0.96*
Na (m.mol/l)	144.75±5.5 NS	145±5.2 NS	144.6±3.36 NS	149.6±1.34 NS	146.4±2.41 NS
K (m.mol/l)	3.73±0.5 NS	2.94±0.36 NS	3.04±0.53 NS	3.22±0.97 NS	3.44±0.53 NS

© Control group
NS= None significant difference means (P>0.05)

Discussion

The range of Hb values between(12.8 and 14.38) in the present study agrees with that recorded by Olayemi (2009) for guinea fowl , and is higher than (10.68) recorded by Uko and Ataja(1996 b).The Packed cell values ranging between (36.2 – 42.9) in this study were higher than (35.96) recorded by Uko and Ataja (1996) and is similar to those recorded by Olayemi (2009) (45.50±9.02 ,38.13±10.16 ,30.33±7.5, 39.75±2.87 ,43.06±4.10). The slight differences may be attributed to differences in experimental conditions.The present study showed lower WBC count ranged (5.88-7.8) than that reported by Madubike and Ekenyem (2006) .The activity of serum ALP ranging between (1342.8-2237.2 U/l) in the present study was higher than that reported by Olowookorun,, *et.al.,* (1980) for male (81.75 ± 3.03 i. u.) and female (86.75 ± 4.66 i. u.) guinea fowl .Serum ALP is not a specific test for liver diseases (Campbell, 1991).

The activity of serum ALT range (13.2- 15.6U/l) and AST (300.2-363.8U/l) in the present study is higher than that reported by Uko and

Ataja(1996) (155-171.67 i.u/l and 9.17-12.50 i.u/l respectively) for adult guinea fowl .

Blood sugar level (337.2- 376.2mg/dl) in this study is in agreement with that recorded by Olowookorun,, *et.al.*, (1980) (340.0 ± 7.1 and 315.0 ± 35.7 mg. / 100 ml.), for male and female guinea fowl respectively .

Serum total proteins in the present study were comparable to those reported for Pearl Guinea Fowls(Oke ,*et.al*.,2003).

In both mammals and birds, the quantity of sodium in the serum generally exceeds that of potassium (Dafalla and Adam, 1986). Na values (range 144.75 - 149.6 mmol/l) in the present study were agreement with those of Olayemi *et.al.*, (2002) .Na and K are essential in all animals to maintain osmotic balance in extracellular (sodium potassium) and intracellular (potassium). The present study shows that the basal level of Ca (9.92 - 12.46) is higher than that reported by Oke ,*et.al*.,(2003).

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