JWPR
Journal of World's
Poultry Research

J. World's Poult. Res. 2(4): 81-89, 2012

Original Article

Haematological and Serum Biochemical Parameters of Local Turkey Poults Fed Diets Containing Two Varieties of Sorghum

E.B. Etuk, M.N. Opara*, N. J. Okeudo, B.O. Esonu and A.B.I. Udedibie

Department of Animal science and Technology, Federal University of Technology, PMB 1526, Owerri, Nigeria

*Corresponding author's email: oparamax@yahoo.com

ABSTRACT

These studies were conducted to determine the effects of two varieties of sorghum, Samsorg 17 and ICSV 400 on the haematological and serum biochemical parameters of local turkey breeds, reared in Nigeria. Two hundred and sixteen poults were divided into 9 treatment groups of 24 each, which were further replicated thrice and fed starter diets containing Samsorg 17 and ICSV 400. Similar ($P > 0.05$) RBC and PCV values were obtained with the two diets. Samsorg 17 fed poults produced lower, though not significantly ($P > 0.05$) serum albumin, glucose, urea, creatinine, sodium, chloride, ALP, SGPT and SGOT values than those on ICSV 400 diet. Higher RBC, MCHC, MCH, MCV and PCV values were observed with Samsorg 17 fed turkeys than those on ICSV 400 diets. Serum glucose and creatinine decreased and SGOT increased with dietary sorghum. Similar ($p > 0.05$) Hb, WBC, MCHC, MCV and PCV values were obtained in all groups. Values of serum biochemical indices assayed except urea, calcium, potassium and chloride showed no significant ($p > 0.05$) differences among the treatment groups. It was therefore concluded that Samsorg 17 and ICSV 400 sorghum varieties could sustain local turkey production without any on toward effects on their haematological and serum biochemical indices.

Key words: Haematology, Serum Biochemistry, Local Turkeys, Sorghum

INTRODUCTION

Turkey (*Meleagris gallopavo*) is an integral part of poultry. It is a very important bird usually raised for economic benefit (Haruna and Hamidu, 2004; Adene and Oguntade, 2006). The population of turkey in Nigeria had grown from 1.5 to 2.0 million (Morgan, 1991). Peters et al., (1997) reported that 51.6 % of turkeys kept in South West Nigeria were of the pure local breed while 48.4 % were cross breeds. Naidoo (2003) indicated that the potential of local breed of poultry have been underestimated by the scientific world because it has been viewed as being inferior and unproductive compared to the exotic breed. However, the potential of the local turkey cannot be overlooked considering the huge foreign exchange implication of the importation of exotic stock as well as genotype – environment interaction which leads to considerable loss of fitness by the exotic stock (Ibe, 1990; Oluyemi and Roberts, 2000). It is now widely accepted that maintaining animal diversity is crucial if productivity and food security are to be improved (Lepaideur, 2005).

In poultry farming, feeding accounts for 65 – 80 % of the production cost and the poultry industry has suffered more than any other livestock industry as a result of the problem arising from inadequate supply of feed (Hill, 1989; Mtimuni, 1995; Ikhani et al., 2001; Lepaideur, 2004). Energy and protein feedstuff, which constitute about 80% of poultry feedstuff have been the major hindrances to effective poultry production in Nigeria (Uchegbu et al., 2004). Cereal grains constitute the major sources of energy in poultry diet in the tropics (Oluyemi and Roberts, 2000), however, cassava has recently been receiving serious attention as an energy source in poultry diets (Olomu, 1995). Maize has remained the chief source of energy in compounded diet and it constitutes about 50% of poultry ration (Ajaja et al, 2002). Pressure on maize and recently cassava has been on the increase worldwide with emphasis being placed on export in Nigeria, since recent trends have seen massive exploitation of corn in ethanol production as an alternative source of fuel (Doki, 2007; Thornton, 2007). These trends require serious diversification of energy feedstuff for poultry.

Field observations and researches in Nigeria have revealed several benefits from the inclusion of sorghum and wheat in poultry and rabbit diets (Mgbenu, 2005; Obi, 2005; Ojo et al., 2005; Abubakar et al., 2006; Etuk and Ukaejiofo, 2007).

Sorghum [*Sorghum bicolour* (L) Moench] is widely grown in the semi-arid and savannah regions of Nigeria. Maunder (2002) reported that sorghum is a traditional crop of much of Africa and Asia and an introduced and hybridized crop in the western hemisphere. It benefits from an ability to tolerate drought, soil toxicities and temperature extremes more effectively than other cereals. Nigeria was currently ranked the third largest producer of sorghum in the world with about 6 million tonnes of grains produced from 5.7 million hectares of land (ICRISAT, 2000). A report by Abubakar et al (2006)

To cite this paper: Etuk E.B., Opara M.N., Okeudo N. J., Esonu B.O. and Udedibie A.B.I. 2012. Haematological and Serum Biochemical Parameters of Local Turkey Poults Fed Diets Containing Two Varieties of Sorghum. *J. World's Poult. Res.* 2(4): 81-89.
Journal homepage: http://jwpr.science-line.com/

indicated that sorghum is cheaper than maize in the northern part of Nigeria. Sorghum grains contain about 92.50 % dry matter, 3270 kcal/kg metabolisable energy for poultry, 9.5 % crude protein, 2.55 % ether extract, 2.70 % crude fibre, 1.25 % ash and 76.6 % nitrogen free extract (NFE). Its protein is slightly higher than maize but as with most cereals deficient in lysine and tryptophan. More importantly, some varieties of sorghum grain have been reported to contain anti-nutritional factors chiefly tannin which binds proteins and impair digestion (Oyenuga, 1968; Aduku, 1993; Olomu, 1995; Tacon, 1995; Ngoka, 1997; Aletor, 1999 and Etuk and Ukaejiofo, 2007). Several cultivars of sorghum have been developed and introduced to farmers in Nigeria mostly utilising the local varieties and those from the International Crop Research Institute for the Semi-Arid Tropics (ICRISAT). Some of these include, yellow coloured Samsorg 17 and the cream coloured ICSV 400 developed respectively by the Institute for Agricultural Research (IAR), Ahmadu Bello University, Zaria and International Crop Research Institute for the Semi-Arid Tropics (ICRISAT), Kano Centre (IAR, 1996; NCGRB, 2004).

Currently, reliable data on production performance of local turkey strain fed sorghum varieties developed and introduced into Nigeria is limited. Possible benefit or otherwise of combining maize and sorghum as energy source in turkey diets have also not been documented. Information on the tannin concentration and possible effect on production performance of local turkeys fed the high yielding varieties of sorghum have not also been evaluated.

There is therefore need to verify and utilise the high yielding potentials of improved sorghum varieties developed and introduced into Nigeria in turkey diet and to investigate the health and physiological implications on the birds.

Since food or feed components affect body constituents (Harper et al., 1979), haematological and biochemical analyses become highly significant in the assessment of the nutritional effects of feed stuffs on the animals. As the quest for cheap sources of feed stuffs for livestock continues, it equally becomes imperative to always investigate the health and physiological implications of such materials on the animals.

MATERIAL AND METHODS

Experimental Sites and Birds

The laboratory analyses of sorghum were carried out at the Department of Animal Production and Health Laboratory, Federal University of Technology, Akure, Ondo State. The series of feeding and digestibility trials were conducted at the Poultry Unit of the School of Agriculture and Agricultural Technology (SAAT) Teaching and Research Farm, Federal University of Technology, Owerri, Imo State. Imo state lies between latitude $4^0$4' and $6^0$3' N and longitude $6^0$15' and $8^0$15' E. Owerri, the capital of Imo State is located in the South - eastern agro-ecological zone of Nigeria. Owerri is about 91m above sea level with annual rainfall, temperature and humidity ranging from 2300 – 2700mm, 26.5 – 27.5^{0}C and 80 – 90%, respectively. Annual evapotranspiration is 1450mm and soil pH ranges from 4.9 to 5.5. Owerri has a three month dry season duration (i.e. months with less than 65mm rainfall) and this covers December – February (MLS Atlas, 1984; Ibeawuchi et al., 2005; Ibeawuchi et al., 2007).

Day old local turkeys were sourced from P. C. Onuoha Farms Limited, a local hatchery in Owerri, Imo State. The turkeys were 90% of white coloured plumage and 10% black and mixed coloured plumage.

Test Materials and other feed Ingredients

Yellow coloured Samsorg 17 and the cream coloured ICSV 400 sorghum varieties were sourced from the Institute for Agricultural Research, Ahmadu Bello University, Zaria, Kaduna State. Yellow maize, soybean meal, palm kernel cake, wheat bran, fish meal, blood meal, bone meal, oyster shell, vitamins/mineral premix, methionine, lysine and common salt used in formulating the experimental diets were sourced from Ceekings Farm and Feed Mills Ltd., Egbu and Fidelity Services Nigeria, both in Owerri, Imo State.

Chemical Analysis of test Materials

Proximate analysis: Samsorg 17 and ICSV 400 varieties of sorghum were hammer milled and samples analysed for proximate composition (crude protein, crude fibre, ether extract, ash and dry matter) according to standard procedure (AOAC, 1995). Nitrogen - free extracts were obtained by difference. The nitrogen content was determined by the Micro-kjedahl method using the Foss Tecator Kjeltec distilling system 2006 digester and crude protein taken as %N x 6.25 (Pearson, 1976).

Energy value determination: Gross energy of the test materials was determined using the Gallen Kamp Ballistic bomb calorimeter. The metabolisable energy values of sorghum were determined by the equation outlined by Janssen (1989), E (kcal/kg) = 38.55 x DM - 394.59 x tannic acid**.**

Tannin determination: The tannin content was determined by the method of Markkar and Good child (1996).

Experimental Diets and Analyses

Nine experimental turkey starter diets were formulated such that Samsorg 17(G) and ICSV 400(V) varieties of sorghum respectively replaced 0%(S_0), 25%(SG_{25}, SV_{25}), 50%(SG_{50}, SV_{50}), 75%(SG_{75}, SV_{75}) and 100%(SG_{100}, SV_{100}) of maize in the diets. Chemical compositions of the diets were calculated from standard values (Aduku, 2004) and subsequently analysed for proximate composition. The diet with 0% Samsorg 17 and ICSV 400 varieties of sorghum served as the control.

Experimental design and Management of Poults

Two hundred and sixteen unsexed day old local turkey poults were divided into nine groups of 24 poults each. Each of the nine groups was further divided into 3 replicates of 8 poults each on weight equalisation basis (Zduñczyk *et al*, 2002). Each replicate was housed in compartment measuring 3.3m x 1.7m in an open sided poultry house measuring 16.8m x 4.5m x 2.25m. The floor was cemented and covered with wood shaving as litter while heat was provided by a 200W bulb supplemented with kerosene stoves and lanterns. The nine experimental poult groups were randomly assigned to the nine experimental turkey starter diets in a completely randomised design (CRD) experiment. Feed and water were offered *ad-libitum*. Routine vaccines: (NDV (i/o), NDV (lasota) and IBD vaccine (Gumboro) were administered at appropriate times together with multi-vitamin (Biovit®) and antibiotics (Neotreat®) when required. The feeding trial lasted 6 weeks (42 days).

Blood Collection

On the 38th day of the feeding trial, between the hours of 7 and 9am, 3 male and 3 female poults were randomly selected from each dietary treatment group, giving 6 poults per treatment group for blood collection. About 3mls of blood was collected from the sub-clavicualar vein of each poult using a scalp vein needle set after swabbing with methylated spirit. The blood was quickly discharged into sample bottles already treated with the anticoagulant, ethylene diamine tetra-acetic acid (EDTA) and gently mixed by inverting the bottle repeatedly. These samples were used for haematological studies. A second set of male poults, 1 each per replicate were selected and about 6mls of blood was similarly collected from each of them. 1ml of the blood was put into fluoride treated sample bottle for determination of blood glucose while 5mls of blood were put into vials without anticoagulant for determination of serum biochemical parameters. Samples were immediately taken to the laboratory for analysis.

Haematological Assays

Red Blood Cell (RBC) count was determined using the improved Neubauer ruled chamber (WHO, 1980). Haemoglobin Estimation (Hb) by the sahli method (WHO, 1980); White Blood cell (WBC) Counts as described by Bell et al., (1972); Packed Cell Volume (PCV) was determined by the microhaematocrit method (Schalm, 1965), while the Mean Corpuscular Haemoglobin Concentration (MCHC), Mean Corpuscular Haemoglobin (MCH) and Mean Corpuscular Volume (MCV) were computed using appropriate formulae (Jain, 1986).

Serum Biochemical Assay

Serum biochemical parameters such as Total Serum Protein, Serum Albumin, Glucose, Cholesterol, Creatinine and urea were determined, using standard methods (Reinhold, 1953), while Chloride and Bicarbonate (HCO_3) values were determined using the methods earlier described by Natelson, (1951) and Skeggs and Hochestrasser (1964). Serum enzymes, Serum Glutamate Oxaloacetate Transferase (SGOT), Alkaline Phosphatase (ALP) and Serum Glutamate Phosphate Transferase (SGPT) were evaluated as reported by Henry, (1974) and Kochmar and Moss, (1976).

All data generated were analysed statistically using ANOVA, while significant means were separated using the Duncan's method (Obi, 1990).

RESULTS AND DISCUSSION

The results of haematological values of local turkey poults fed diets containing two varieties of sorghum are shown in table 1. RBC counts ranged between 1.83 – 2.84 x 10^6/L, this was close to the normal value (2.0 x 10^6/L) reported by Aiello and Mays, (1998). Turkey poults fed diet SG_{25} recorded the highest RBC count while those on diet SG_{100} recorded the lowest. RBC counts increased from diets S_0 to SG_{25} and subsequently declined with no significant ($P < 0.05$) difference up to SG_{100}. RBC counts for the groups on diets SV_{25} – Sv_{100} did not show any discernable trend but were generally higher than values obtained for corresponding dietary levels of samsorg 17 (SG_{25} – SG_{100}) except with $SG_{25,}$ (Fig. 1).

Poults on ICSV 400 recorded higher RBC value (2.3 x 10^6/L) than those on ICSV 400, whose count was 2.21 x 10^6/L as shown in Table 2. These results are at variance with Bamgbose et al (2007) who reported an increased RBC count of turkey with dietary combination of wheat and maize. The decreasing RBC count with dietary samsorg 17 could not be explained.

Haemoglobin range was 9.40 – 12.50g/dl (Table 1). Again no trend was observed relative to the dietary treatments. Diets SG_{25} and SG_{100} recorded the highest and lowest mean Hb concentration, with the lower value differing significantly ($P < 0.05$) from other treatment groups except for poults placed on SG_{50}. Poults on samsorg 17 recorded lower ($P > 0.05$) Hb concentration (11.02 g/dl) than those on ICSV 400 sorghum (11.60 g/dl), although the difference was not significant ($p>0.05$) (Table 2).

Edozien and Switzer (1977) reported that Hb value increased with increasing dietary protein but Emenalom et al (2004) observed that poor nutrient utilisation might result in variation in Hb values. It will appear also that the quality of sorghum protein was not high enough to elicit elevated Hb despite the high quantity, as shown in figure 2. However, Hb values were generally within the range of 11.0 and 11.4g/dl reported for turkeys (Aiello and Mays, 1998; Bamgbose et al, 2007) except for poults on diet SG_{100}.

WBC values of the groups were between 182.0 and 201.5 x 10^3/L. WBC count did not also follow the dietary trend. Poults on diet SG_{25} recorded the highest (201.5 x 10^3/L levels) while those on diet SG_{75} recorded the lowest (182.0 x 10^3/L) WBC value. WBC value of the poults on control diet (S_0) was however comparable ($p > 0.05$) to values obtained for other treatment groups. Poults on ICSV 400 recorded a higher (193.6 x 10^3/L) WBC value than those on samsorg 17 (187.5 x 10^3/L) (Table 2. The WBC values obtained fall above the 10 – 46 cells x 10^3/L reported for juvenile wild turkeys in the United States (Bounous et al, 2000). These values were also higher than those reported for improved strains of broilers (Talebi et al., 2005). Leucocytes values of indigenous chickens have been reported to be higher than those of exotic breeds, lending credence to their higher susceptibility to avian pathogenic agents (Uko and Ataja, 1996; Talebi et al, 2005). The non-consistent values in the WBC count of poults probably resulted from the young age of the poults (Bounous et al, 2000).

The MCHC, MCH and MCV values obtained were 25.68 – 35.71g/dl, 44.38 – 56.15Pg and 124.10 – 202.50fl, respectively (Table 1). Values for all the groups did not follow the dietary trend. Poults on ICSV 400 recorded higher though non-significant ($P > 0.05$) MCHC and MCH values, but significantly ($p<0.05$) lower MCV value than those on samsorg 17 diets (Table 2). Fluctuations in values for these parameters have also been observed in broilers (Talebi et al., 2005; Islam et al., 2004).

The PCV values obtained were between 35 and 38%. These values generally increased with dietary level of sorghum. PCV values, however, did not show any significant effect ($P > 0.05$) among all the dietary groups (Fig 3). Poults on samsorg 17 diets had lower PCV values than ICSV 400 although the difference was not-significant ($P > 0.05$) (Table 2).

The PCV values obtained in this study were well within the normal values (34 – 39%) (Aiello and Mays, 1998). There appears to be no effect of sorghum on PCV values. Wildeus et al (2003) also reported no effect of condensed tannin on PCV values.

To cite this paper: Etuk E.B., Opara M.N., Okeudo N. J., Esonu B.O. and Udedibie A.B.I. 2012. Haematological and Serum Biochemical Parameters of Local Turkey Poults Fed Diets Containing Two Varieties of Sorghum. *J. World's Poult. Res.* 2(4): 81-89.
Journal homepage: http://jwpr.science-line.com/

Table 1. Effect of dietary levels of Samsorg 17 and ICSV 400 varieties of sorghum on haematological characteristics of turkey poults

Parameters	Samsorg 17					ICSV 400				SEM
	S_0	SG_{25}	SG_{50}	SG_{75}	SG_{100}	SV_{25}	SV_{50}	SV_{75}	SV_{100}	
RBC (x 10^6/L)	2.32	2.84	2.09	1.95	1.83	2.38	2.32	2.50	2.05	0.359^{ns}
Haemoglobin (g/dl)	11.60^{ab}	12.50^{a}	10.65^{bc}	10.95^{b}	9.40^{c}	12.00^{a}	11.45^{ab}	11.50^{ab}	10.95^{b}	0.423
WBC (x 10^3/L)	193.00^{abc}	201.50^{ac}	183.50^{b}	182.00^{b}	183.00^{b}	195.00^{ac}	184.50^{b}	194.50^{ac}	199.50^{ac}	3.690
MCHC (g/dl)	33.42^{ab}	35.71^{a}	29.25^{bc}	29.59^{bc}	25.68^{c}	32.96^{a}	30.46^{b}	30.31^{b}	28.12^{bc}	1.541
MCH (Pg)	50.63^{ab}	44.38^{b}	51.60^{ac}	56.15^{a}	51.86^{ac}	50.36^{ab}	49.58^{bc}	47.75^{bc}	53.41^{ac}	2.197
MCV (fl)	152.50^{ab}	124.10^{a}	185.30^{bc}	190.80^{b}	202.50^{b}	130.00^{ac}	163.60^{ab}	156.60^{ab}	185.40^{bc}	18.600
PCV (%)	35.00	35.00	36.50	37.00	36.50	36.50	37.50	38.00	38.00	1.061^{ns}

a,b,c, Means within a row with different superscripts are significantly different ($p < 0.05$) ns = not significantly ($p>0.05$) different.
S_0 = 0% sorghum (control); SG_{25} = 25% samsorg 17, SG_{50} = 50% samsorg 17, SG_{75} = 75% samsorg 17, SG_{100} = 100% samsorg 17 sorghum replacements of maize, respectively
SV_{25} = 25% ICSV 400, SV_{50} = 50% ICSV 400, SV_{75} = 75% ICSV 400, SV_{100} = 100% ICSV 400 sorghum replacements of maize, respectively

Table 2: Effect of Samsorg 17 and ICSV 400 sorghum varieties on hematological parameters of turkey poults

Parameters	Samsorg 17	ICSV 400	SEM
RBC (x 10^6/L)	2.21	2.31	0.065^{ns}
Haemoglobin (g/dl)	11.02	11.60	0.125^{ns}
WBC (x 10^3/L)	187.5	193.6	2.900^{ns}
MCHC (g/dl)	30.38	30.93	0.339^{ns}
MCH (pg)	50.30	50.68	0.136^{ns}
MCV (fl)	167.00^{a}	163.80^{b}	0.290
PCV (%)	36.25	37.50	0.626^{ns}

ab means within row with different superscripts are significantly different ($p < 0.05$); ns = not significantly different ($p>0.05$)

Table 3. Effects of dietary levels of Samsorg 17 and ICSV 400 varieties of sorghum on serum biochemical parameters of turkey poults

Parameters	S_0	Samsorg 17				ICSV 400				SEM
		SG_{25}	SG_{50}	SG_{75}	SG_{100}	SV_{25}	SV_{50}	SV_{75}	SV_{100}	
Total serum protein (g/dl)	3.70^{ab}	3.80^{ab}	3.80^{ab}	3.80^{ab}	3.80^{ab}	3.80^{ab}	3.80^{ab}	3.90^{a}	3.60^{b}	0.095
Serum Albumin (g/dl)	1.30^{a}	1.40^{a}	1.30^{a}	1.30^{a}	1.30^{a}	1.30^{a}	1.40^{a}	1.50^{a}	1.90^{b}	0.111
Serum Globulin (g/dl)	2.40^{a}	2.50^{a}	2.60^{a}	2.50^{a}	2.50^{a}	2.50^{a}	2.40^{a}	2.40^{a}	1.70^{b}	0.146
Glucose (mg/dl)	235.00	232.00	234.00	231.00	230.00	234.00	235.00	225.00	225.00	6.052^{ns}
Urea (mg/dl)	3.60	3.90	3.70	3.60	3.70	3.80	3.90	3.80	3.50	0.297^{ns}
Cholesterol (mg/dl)	158.00^{ab}	151.00^{a}	150.00^{a}	153.00^{ab}	157.00^{ab}	159.00^{abc}	163.00^{bc}	164.00^{c}	169.00^{c}	3.562
Creatinine (mg/dl)	0.05	0.06	0.05	0.06	0.06	0.05	0.06	0.07	0.07	0.009^{ns}
Sodium (mmol/l)	115.00^{a}	116.00^{ac}	116.00^{ac}	115.00^{a}	120.00^{b}	117.00^{cd}	117.00^{cd}	118.00^{d}	120.00^{b}	0.633
Potassium (mmol/l)	5.50^{a}	5.60^{a}	5.70^{a}	5.60^{a}	5.20^{a}	5.40^{a}	4.50^{b}	5.20^{a}	5.70^{a}	0.189
Chloride (mmol/l)	80.00^{a}	76.00^{b}	76.00^{b}	80.00^{a}	75.00^{b}	75.00^{b}	82.00^{a}	75.00^{b}	78.00^{ab}	1.324
Bicarbonate (mmol/l)	27.00^{a}	27.00^{a}	28.00^{ab}	30.00^{b}	30.00^{b}	26.00^{a}	28.00^{ab}	26.00^{a}	26.00^{a}	0.793
Alkaline phosphatase (ALP) (IU/l)	24.30^{ab}	25.20^{ab}	25.80^{ab}	23.00^{a}	24.00^{ab}	23.70^{a}	24.600^{ab}	26.80^{ab}	28.50^{b}	1.540
SGPT (IU/l)	11.00^{ab}	11.00^{ab}	10.00^{a}	12.00^{ab}	11.00^{ab}	11.00^{ab}	11.00^{ab}	12.00^{ab}	13.00^{b}	0.750
SGOT (IU/l)	36.00^{a}	36.00^{a}	39.00^{ab}	43.00^{b}	44.00^{b}	40.00^{ab}	43.00^{b}	45.00^{b}	49.00^{b}	2.020

^{a,b,c,d} Means within a row with different superscripts are significantly different ($p < 0.05$). ns = not significantly different ($p > 0.05$). S_0 = 0% sorghum (control); SG_{25} = 25% samsorg 17, SG_{50} = 50% samsorg 17, SG_{75} = 75% samsorg 17, SG_{100} = 100% samsorg 17 sorghum replacements of maize, respectively/ SV_{25} = 25% ICSV 400, SV_{50} = 50% ICSV 400, SV_{75} = 75% ICSV 400, SV_{100} = 100% ICSV 400 sorghum replacements of maize, respectively

Table 4. Effects of sorghum varieties on serum biochemical parameters of poults

Parameters	Samsorg 17	ICSV 400	SEM
Total serum protein (g/dl)	3.78	3.76	0.041^{ns}
Serum Albumin (g/dl)	1.32	1.48	0.066^{ns}
Serum Globulin (g/dl)	2.46	2.28	0.094^{ns}
Glucose (mg/dl)	223.40	230.80	0.678^{ns}
Urea (mg/dl)	3.70	3.72	0.050^{ns}
Cholesterol (mg/dl)	153.80^{a}	162.60^{b}	0.985
Creatinine (mg/dl)	0.05	0.06	0.006^{ns}
Sodium (mmol/l)	116.40	117.40	0.416^{ns}
Potassium (mmol/l)	5.52^{a}	5.26^{b}	0.082
Chloride (mmol/l)	77.40	78.00	0.289^{ns}
Bicarbonate (mmol/l)	28.40	26.70	0.569^{ns}
Alkaline phosphatase (ALP) (IU/l)	24.46	25.58	0.538^{ns}
SGPT (IU/l)	11.00	11.75	0.379^{ns}
SGOT (IU/l)	40.50	45.20	2.340^{ns}

^{a,b} Means within a row with different superscripts are significantly different ($p < 0.05$). ns = not significantly different ($p > 0.05$)

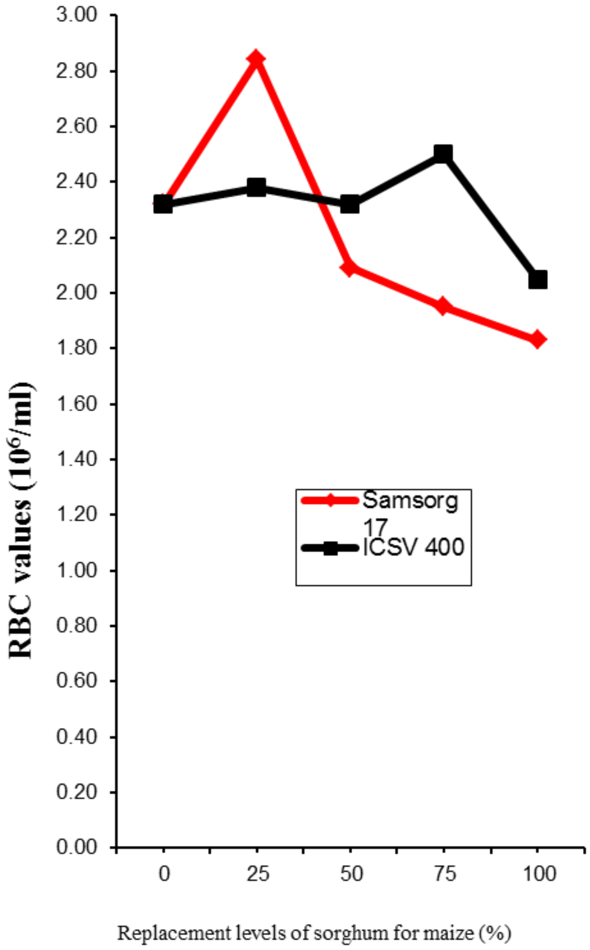

Fig. 1: Effect of dietary levels of sorghum on RBC of turkey poults

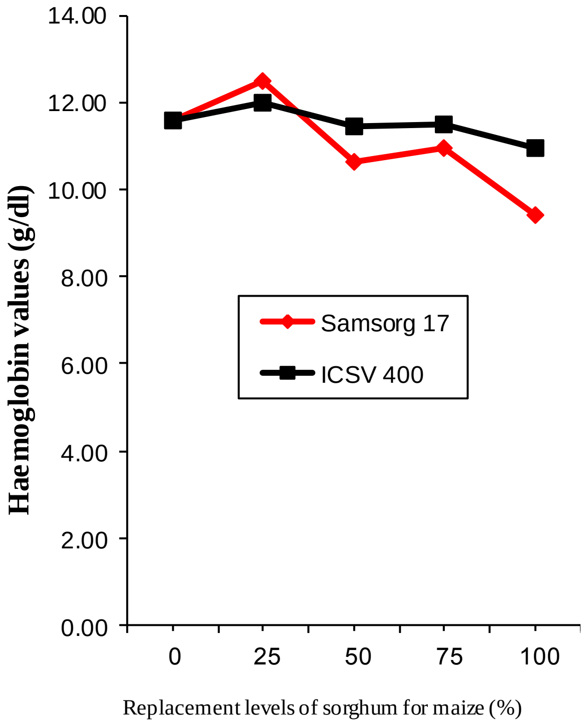

Fig. 2: Effect of dietary levels of sorghum on Haemoglobin of turkey poults

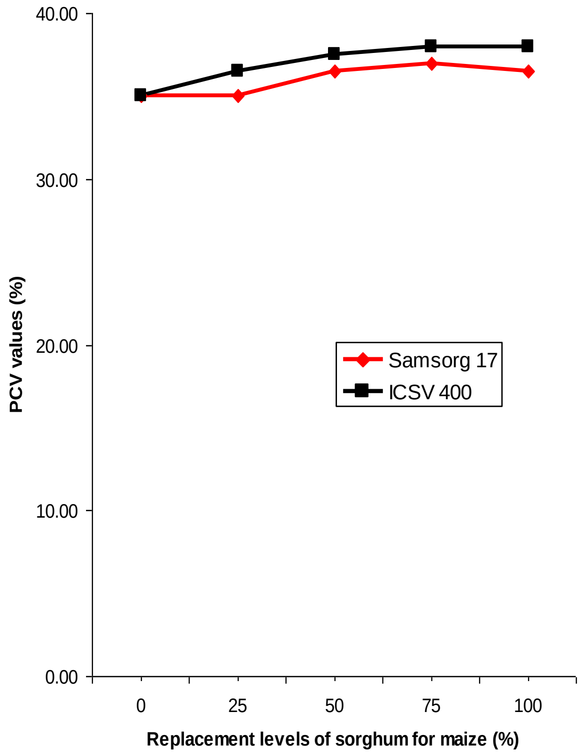

Fig. 3: Effect of dietary levels of sorghum on PCV of turkey poults

Effects of samsorg 17 and ICSV 400 sorghum varieties on the serum biochemical characteristics of poults are presented in tables 3 and 4.

Serum protein of the groups on diet S_0 was comparable ($P > 0.05$) to values obtained for all other dietary groups. Significant differences ($P < 0.05$) however, existed between poults on diets SV_{75} and SV_{100} (Table 3). Albumin and globulin levels were similar ($P > 0.05$) for all treatment groups except those on diet SV_{100}. Samsorg 17 groups recorded higher serum protein than ICSV 400 groups, with no significant ($P > 0.05$) difference between the groups (Table 4). .Serum protein values obtained were lower than the values obtained for 6 week old turkeys (Okeke, 2006). The serum protein values were also at variance with Bamgbose et al., (2007) who reported elevated total serum protein and serum albumin for exotic turkeys, raised in Nigeria. The serum protein values, however, were within 3.6 – 5.5g/dl reported for juvenile wild turkeys (Bounous et al., 2000).

Data on blood glucose indicated no significant differences ($P > 0.05$) among the poults on all the dietary sorghum levels (Table 3). ICSV 400 fed poults recorded higher blood glucose than those fed with samsorg 17 variety of sorghum, although the difference was not significant ($P > 0.05$) (Table 4). This result might have resulted from the characteristics of birds that generally appear to maintain a high and relatively constant blood glucose values even in low feed intake (Liukkonen-Anttila, 2001).

Serum urea showed no significant differences ($P > 0.05$) among the treatment groups but the group on diet SV_{100} recorded the lowest serum urea (Table 3). The group on ICSV 400, however, recorded a slightly higher serum urea than samsorg 17 (Table 4). Serum urea is assumed to indicate protein breakdown and higher urea value indicates poor dietary protein utilisation. It appears that the effect of tannin in sorghum did not significantly affect protein utilisation (Liukkonen-Anttila, 2001).

Cholesterol values ranged between 151.00 and 169. 00.mg/dl, with SV_{100} recording significantly ($P < 0.05$) higher cholesterol content than the control group (Table 3). Similarly ICSV 400 group recorded slightly ($p < 0.05$) higher cholesterol than samsorg 17 (Table 4). The surprisingly higher cholesterol content of diet ICSV 400 might probably be due to the enhanced activities of lipase enzyme due to dietary tannin (Griffiths and Moseley, 1980; Horigome et al., 1988).

Serum creatinine ranged between 0.05 and 0.07 mg/dl. There were no significant differences ($p>0.05$) between the poults on the control diet (S_0) and other treatment groups (Table 3). The poults on ICSV 400 diet recorded a higher creatinine value than those on samsorg 17 diets but with no significant ($p>0.05$) difference (Table 4). The slightly higher creatinine value with the group on ICSV 400 diets agree with Wildeus et al (2003) who reported higher creatinine value with higher dietary condensed tannin.

There were no significant ($P > 0.05$) differences in sodium values among poults fed ICSV 400 diets (Table 5). Serum potassium values did not differ ($P > 0.05$) among all the treatment groups except with diet SV_{50} (Table 3). Chloride and bicarbonate values were variable and did not reflect any dietary trend. Elevated serum chloride occurs in dehydration and hyperventilation; elevated sodium level is also found in diarrhoea and metabolic acidosis (Tietz, 1976).

Alkaline phosphatase (ALP) values did not differ significantly ($p > 0.05$) among the poults on all dietary levels of samsorg 17 and ICSV 400 except with diet SV_{100} ,which only differed with those on diet SG_{75}. SGPT followed the same trend with significant ($P < 0.05$) differences occurring between diets SG_{50} and SV_{100}. SGOT increased with dietary level of samsorg 17 and ICSV 400 (Table 3). There was no significant ($P > 0.05$) difference in ALP, SGPT, SGOT values between poults on samsorg 17 and ICSV 400 (Table 4). Kumar et al., (2007) reported that tannin content of 16 g/kg in red sorghum had no effect on SGOT and SGPT levels even at 100 %. It is probable that the lower energy level of sorghum elicited the increased SGOT. SGOT and SGPT are liver specific enzymes and increase with low energy diets up to a threshold (Babatunde et al., 1987; Oluwole-Banjo et al., 2001).

CONCLUSION

The studies reported herein indicated that Samsorg 17 and ICSV 400 sorghum varieties could completely be used to feed local turkeys without any deleterious effects on the haematological and serum biochemical parameters.

REFERENCES

Abubakar M, Doma UD, Kalla DJU, Ngele M B and Augustine CLD. 2006. Effects of Dietary Replacement of Maize With Malted and Unmalted Sorghum on Performance of Weaner Rabbits. Livestock Research and Rural Development 18(5). Article #65. Retrieved November 28, 2006, from http://www.cipav.org.co/lrrd/lrrd18/5/abub18065.htm

Adene DF and Oguntade AE. 2006. The Structure and Importance of the Commercial and Village based Poultry industry in Nigeria. FAO (Rome) Italy, pp 22 – 28.

Aduku AO. 1993. Tropical Feedstuff – Analysis Table. Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru, Zaria, Nigeria.

Aduku AO. 2004. *Animal Nutrition in the Tropics. Feeds and Feeding, Pasture Management, Monogastric and Ruminant Nutrition*, Dascon Computers and Business Bureau, Zaria, pp. 17 -18.

Aiello SE. and Mays A. 1998. (eds.). *The Merck Veterinary Manual*, 8th Edition, Merck and Company Inc., White House Station, UJ, USA, pp. 18 – 1477.

Ajaja K, Agbede JO and Aletor VA. 2002. Replacement Value of Sorghum Dust for Maize in Diets for Broiler Chicks. Proc., 27th Annual Conference of the Nigeria Society for Animal Production. March 17 – 21, Federal University of Technology, Akure, pp . 109 – 112.

Aletor VA. 1999. *Anti-Nutritional Factors as Nature's Paradox in Food and Nutrition Securities.* 15th Inaugural Lecture Delivered on August 12 at Federal University of Technology, Akure, Nigeria.

AOAC. 1995. *Official Methods of Analysis*, 7th Edition, Association of Official Analytical Chemists. Washington D.C.

Babatunde GM, Pond WO, Krook L, Dvan Vlech L, Walker ER and Chapman P. 1987. Effect of Dietary Safflower Oil or Hydrogenated Coconut Oil on Growth Rate and on Swine Blood and Tissue Components of Pigs Fed Fat-free Diets. Journal of Nutrition, 92: 1903.

Bamgbose AM, Oso AO, Omikola BG, Ayoola A and Jegede AV. 2007. Performance of Finishing Turkeys fed Wheat-Based Diets. Proceedings of 32nd Annual Conference of the Nigeria Society of Animal Production, March 18 – 21, University of Calabar, Calabar, pp. 505 – 506.

Bounous DI, Wyatt RD, Gibbs PS, Kilburn JV and Quist FC. 2000. Normal Hematologic and Serum Biochemical Reference Intervals for Juvenile Wild Turkeys. Journal of Wildlife Diseases, 36(2): 393 – 396.

Doki T. 2007. Benue Gives Land to NNPC. In: Saturday Independent, January 27, Tunde Abatan (ed). Vol. 1, No. 86, p. A4.

Edozien JC and Switzer BR. 1977. Effects of Dietary Protein, Fat and Energy on Blood Haemoglobin and Haematocrit in Rats. Journal of Nutrition, 107: 1016 – 1021.

Emenalom OO, Okoli IC and Udedibie ABI. 2004. Observations and the Pathophysiology of Weaner Pigs fed Raw and Pre-heated Nigerian *Mucuna pruriens* (Velvet beans) Seeds. Pakistan Journal of Nutrition, 3(2): 112 – 117

Etuk EB and Ukaejiofo UR. 2007. Tannin Content and Dietary Effects of Brown Coat Coloured Sorghum on the Performance of Young Local Turkey. Animal Production Research Advances, 3(2): 86 – 90.

Griffiths DW and Moseley G. 1980. The Effects of Diets Containing Field Beans of High or Low Polyphenolic Content on the Activity of Digestive Enzymes in the Intestine of Rats. Journal of Science of Food and Agriculture, 31: 225 – 231.

To cite this paper: Etuk E.B., Opara M.N., Okeudo N. J., Esonu B.O. and Udedibie A.B.I. 2012. Haematological and Serum Biochemical Parameters of Local Turkey Poults Fed Diets Containing Two Varieties of Sorghum. *J. World's Poult. Res.* 2(4): 81-89.
Journal homepage: http://jwpr.science-line.com/

Haruna U and Hamidu BM. 2004. Economic Analysis of Turkey Production in the Western Agricultural Zone of Bauchi State, Nigeria. Proceedings of the 9th Annual Conference of Animal Science Association of Nigeria, Sept. 13 – 16, Ebonyi State University, Abakiliki, pp. 166 – 168.

Harper AE, Rodwell VW and Mayes PA. 1979. Review of Physiological Chemistry, 11th Edition, Lang Medical, Los Altos, California 9422. Pp. 60 – 81, 188 – 216.

Henry RJ. 1974. *Clinical Chemistry Principles and Techniques*, 2nd Edition. Harper and Row, New York, p. 882.

Hill FW. 1989. Poultry Nutrition and Nutrient Requirements. In: Nutrition of Animals of Agricultural Importance Part 2: Assessment of and Factors Affecting Requirements of Farm Livestock. Cutbertson. D. (ed.), pp. 1137 – 1180.

Horigome T, Kumar R and Okamoto K. 1988. Effects of Condensed Tannins Prepared from the Leaves of Fodder Plants on Digestive Enzymes In Vitro and in the Intestine of Rats. British Journal of Nutrition, 60: 257 – 260.

IAR. 1999. Code and Description of Crop Varieties Released by Institute of Agricultural Research, Ahmadu Bello University, Samaru, Federal Ministry of Science and Technology, Abuja, pp. 14 – 15.

Ibe SN. 1990. Utilizing Local Poultry Genetic Resources in Nigeria. Proceedings of the 4th World Congress on Genetics as Applied to Livestock Production, Edinburgh, Scotland

Ibeawuchi II, Obiefuna JC and Ofoh MC. 2005. Effect of Row Spacing on Yield and Yield Components of Okra (*Abelmoschus esculentus*) and Mixture Groundnut (*Arachis hypogea*). Journal of Agroforestry, 4 (4): 304 – 307.

Ibeawuchi II, Dialoke SA, Ogbede KO, Ihejirika C O, Nwokeji EM, Chigbundu IN, Adikwu NC and Oyibo PO. 2007. Influence of Yam/Cassava Based Intercropping Systems with Legumes in Weed Suppression and Disease/Pest incidence reduction. Journal of American Science, 3(1): 49 – 59.

ICRISAT. 2000. *Sorghum bicolour* (L) Moench. Crop Gallery. International Crop Research Institute for the Semi-Arid Tropics. Retrieved on November 30, 2004 from http://www.icrisat.org/text/coolstuff/crops/gcrops2.html.

Ikhani EI, Dafwang IO, Chikwendu CO and Iwuanyanwu IE. 2001. Socio Economic Characteristics and Sources of Feeds for Poultry and Pig Farmers in Nigeria. Proceedings of the 26th Annual Conference of Nigeria Society of Animal Production. March, 19 – 22. Ahmadu Bello University, Zaria, pp. 250 - 253.

Islam MS, Lucky NS, Islam MR, Ahad A, Das B R, Rahnan MM and Siddini MSI. 2004. Haematological Parameters of Fayoumi, Assil and Local Chickens. Reared in Sylhet Region in Bangladesh. International Journal of Poultry Science, 3 (2): 144 – 147.

Jain NC. 1986. *Schaulm's Veterinary Haematology*. 4th Edition. Lea and Febiger, Philadelphia, USA, pp. 13 - 27.

Janssen WMMA. (ed.) 1989. European Table of Energy Values for Poultry Feedstuffs. 3rd Edition. Beckbergen, Netherland: Spelderholt Centre for Poultry Research and Information Services.

Kochmar JF and Moss DD. 1976. In *Fundamentals of Clinical Chemistry*. W. B. Saunders and Coy. Philadelphia, p. 604.

Kumar V, Elangovan AV, Mandal AB, Tyagi PK, Bhanja SK and Dash BB. 2007. Effects of Feeding Raw or Reconstituted High Tannin Red Sorghum on Nutrient Utilisation and Certain Welfare Parameters of Broiler Chickens. British Poultry Science, 48 (2) 198 – 204

Leplaideur M. (ed.) 2004. Poultry farming – A disease called competition. In: SPORE Magazine, 114: 4 – 5.

Leplaideur M. (ed.) 2005. Tradition – A path for the future. SPORE Magazine, 117: 3.

Liukkonen-Anttila J. 2001. Nutritional and Genetic Adaptation of Galliforms Birds: Implications for Hand-Rearing and Restocking. Academic Dissertation. Faculty of Science, University of Oulu, Oulu Yilopisto, Finland. Retrieved September 17, 2007 from http://herkules.oulu.fi/isbn951425990index.html.

Markkar AOS and Goodchild AV. 1996. Qualification of Tannins. A Laboratory Manual, International Centre for Agricultural Research in Dry Areas (ICARDA). Allepo, Syria IV: 25.

Maunder B. 2002. Sorghum - The Global Grain of the Future. Retrieved November 30, 2004 from http://www.sorghumgrowers.com/maunder.htm.

Mgbenu AT. 2005. Replacement Value of Sorghum for Maize in Turkey Grower Diet. B. Agric. Tech. Project. Department of Animal Science and Technology, Federal University of Technology, Owerri, pp. 34 – 39.

MLS Atlas. 1984. *Atlas of Imo State*. Ministry of Lands and Surveys, Owerri, Nigeria

Morgan D. 1991. African Farming and Food Processing, March/April, 1991.

Mtimuni JP. 1995. *Ration Formulation and Feed Guides*. Likuni Press and Publishing House, Lilongwe, Malawi, p. 1.

Naidoo M. 2003. Local Poultry Production System in Northern Kwazulu-Natal, South Africa. Tropicultura, 10th Anniversary (Special Edition), pp. 42 -46.

Natelson S. 1951. Routine Use of Ultramicro Methods in the Clinical Laboratory. American Journal of Clinical Pathology, 21: 1153.

NCGRB. 2004. Crop Varieties Released and Registered in Nigeria. National Centre for Genetic Resources and Biotechnology, Ibadan, pp. 24 – 25.

Ngoka DA. 1997. *Crop Production in the Tropics: Theory and Practice*. Alphabet Publishers, Owerri, pp. 120 -125.

Obi DC. 2005. Replacement Value of Sorghum for Maize in Turkey Finisher Diet. B. Agric. Tech. Project. Department of Animal Science and Technology, Federal University of Technology, Owerri, p. 61 – 67.

Ojo OT, Oguntona EB, Bamgbose AM and Biobaku WO. 2005. Performance Characteristics and Serum Biochemical Indices of Poults fed Enzyme – Supplemented Wheat Based Diet. Proceedings of the 30th Annual Conference of Nigeria Society of Animal Production, 20th – 24th March, University of Nigeria, Nsukka. 30: 165 – 168.

Okeke GU. 2006. Relationship between Body Parameters with Total Serum Protein and Serum Enzymes in 3 Strains of Turkey: B. Agric Tech. Project, Department of

Animal Science and Technology, Federal University of Technology, Owerri, p. 35.

Olomu JM. 1995. *Monogastric Animal Nutrition – Principles and Practice*. A Jachem Publication, Benin City, Nigeria, pp. 112 – 118.

Oluwole-Banjo AK, Olorunfunmilayo AN, Odubiyi AO and Babatunde GM. 2001. Comparative Effects of Feeding Dried Poultry Versus Dried Swine Waste on the Haematological and Serum Biochemical Parameters of Weaner Pigs in the Tropics. Tropical Animal Production Investigation 4: 91 – 98.

Oluyemi JA and Roberts RA. 2000. *Poultry Production in Warm Wet Climates*. Macmillian Press, London. 2nd Edition, p. 692.

Oyenuga VA. 1968. *Nigeria's Food and Feeding stuff – Their Chemistry and Nutritive Value*. Ibadan University Press, UI, Nigeria, pp 39 – 41.

Pearson D. 1976. *Chemical Analysis of Foods*. 7th Edition. London, Churchill, Livingstone, pp. 7 – 11.

Peters SO, Ikeobi CON and Bamikole OO. 1997. Smallholder Turkey Production in Ogun State, Nigeria. Proc., INFPD Workshop, M. Bour (ed), Senegal, Dec. 9 – 13, pp. 197 – 207.

Reinhold JC. 1953. Manual Determination of Serum Total Protein Albumin and Globulin Fractions by Burette Method. In: Standard Method of Clinical Chemistry. M. Reiner (ed). Academic Press N. Y., p. 88

Schalm OW, Jain NC and Carol EJ. 1975. Veterinary Haematology. 3rd Edition. Lea and Febiger, Philadelphia, pp. 51 – 81.

Skeggs LT and Hochstrasser HC. 1964. Thiocyanate (colorimetric) Method of Chloride Estimation. Clinical Chemistry, 10: 918 - 920.

Tacon AGJ. 1995. Fishmeal Replacers: A Review of Anti-Nutrients within Oil Seeds and Pulses – A Limiting Factor for the Aquafeed Greed Revolution. Paper presented at Feed Ingredients Symposium, Singapore, Asia, September 19 – 20, pp 153 – 181.

Talebi A, Asri-Rezaei S, Rozeh-chai R. and Sahraei R. 2005. Comparative Studies on Haematological Values of Broiler Strains (Ross, Cobb, Arbor-acres and Avian). International Journal of Poultry Science, 4 (8): 573 – 579.

Thornton K. 2007. How DDGS Looks from an American Perspective (Grow – Finish Feeding). Pig International, March Edition, 37(2): 11 – 15.

Tietz NW. 1976. *Fundamentals of Clinical Chemistry*. W. B. Saunders and Co., Philadelphia, p. 800 – 991.

Uchegbu MC, Etuk EB, Okpala CP, Okoli IC and Opara MN. 2004. Effect of Replacing Maize with Cassava Root Meal and Maize/Sorghum Brewers Dried Grains on the Performance of Starter Broilers. Proceedings of the 9th Annual Conference of Animal Science Association of Nigeria. Sept. 13 – 16, 2004, Ebonyi State University, Abakiliki, pp. 49 – 51.

Uko OJ and Ataja AM. 1996. Haematological Studies of Pure Indigenous Domestic Fowl (*Gallu domesticus*) and Guinea Fowl (*Numida meleagris*) in North Western Nigeria. Revue d'Elevage et de Med. Vet. des Pays Tropicaux, 49: 257 – 262.

WHO (1980). Manual of Basic Techniques for a Health Laboratory. World Health Organisation, Geneva, pp. 360 - 406.

Wildeus S, Zajac A, Turner K and Collins J. 2004. Effect of Quebracho Tannin Supplementation on Growth and Parasitism in Young Goats and Grazing Parasite-Infected Pasture, 2004 ASAS Southern Meeting. Journal of Animal Science, Abstract. 82 (supplement 1): 29

Zduñczyk Z, Jankowski J and Koncicki A. 2002. Growth Performance and Physiological State of Turkeys fed Diets with Higher Content of Lipids Oxidation Products Selenium, Vitamin E and Vitamin A. World's Poultry Science Journal, 58 (3): 357 – 364.