

EFFECT OF DIETARY GARLIC POWDER ON THE HAEMATOLOGY AND CHOLESTEROL LEVEL OF JAPANESE QUAIL

*¹Udeh, F. U., ¹Onah, C. C., ²Oyeagu, C. E., ¹Onodugo, M. O., ¹Okonkwo, C. O. and ¹Ozoke, R. U.

¹Department of Animal Science, University of Nigeria, Nsukka

²Department of Livestock and Pasture Science, University of Fort Hare, Alice, South Africa.

*Correspondence Email: fredrickudeh11@gmail.com

Abstract

A sixteen (16) weeks feeding trial was conducted to assess the response of Japanese Quails to dietary supplementation of garlic on haematology and cholesterol levels. One hundred and forty-four (144) day old quail chicks were used for the experiment. The birds were randomly assigned to four experimental treatment groups in a completely randomized design (CRD). Each treatment contained 36 birds and was replicated three times with 12 birds per replicate. Supreme feed fortified with different inclusion levels of garlic were throughout the experiment periods to formulate the diets. The four dietary treatments were represented as T₁ (the control, without garlic powder), whereas T₂, T₃ and T₄ were supplemented with varying levels of garlic powder as 5g, 10g and 15g/kg, respectively. Feed and water were supplied *ad libitum* and other management practices were employed as at when due. At the end of the experimental period, three birds from each replicate were randomly selected. Blood samples were collected from the selected for haematology and serum cholesterol analysis. The result shows that haemoglobin concentration and red blood cells count were significantly ($P < 0.05$) affected among treatments, whereas, other haematology parameters were not ($P > 0.05$). In the cholesterol profile, total cholesterol and high density lipoprotein were significant ($P < 0.05$) among treatments. It was concluded that 5, 10 and 15g/kg of garlic could be included in the diets of Japanese quails without any adverse effect.

Key words: Garlic powder, haematology, cholesterol and Japanese quail.

Introduction

The nutritional and therapeutic importance of quail egg and meat cannot be overemphasized. The benefits of consuming these products (egg and meat) include but not limited to: they are remedy against digestive tract disorders such as ulcer and gastritis (Alder and Holub, 1997); they help to cure anemia by increasing hemoglobin levels and removing toxins and heavy metals from the blood; they help in the treatment of tuberculosis, bronchial asthma, diabetes, etc. (Chi *et al.*, 1982); they have anticancer effects and help inhibit cancerous growth; they help eliminate and remove stones from liver, kidneys and gall bladder; they accelerate recuperation after blood stroke and help strengthen the heart muscles; they are powerful stimulants against sexual potency (Jain *et al.*, 1993); they promote good memory, enhance brain activity and regulate the nervous system; etc. (Chi *et al.*, 1982; Amagase *et al.*, 2001).

Use of the antibiotics in feed has shown several side effects like resistance towards the drug, residue in the meat and thereby the user getting resistance to the drug etc. hence several countries have banned the use of antibiotic based growth promoters in the feed animal sector and appearance of resistant strains in human beings (Hassan *et al.* 2011). Alternative plant extracts and essential oils have been known to be used for many kinds of diseases by Egyptians, Chinese, Indians and Greeks (Hassan *et al.* 2011). Garlic is known to contain an array of substances with beneficial health-related biological properties (Agarwal, 1996).

In the past years, hematological analysis has been used as a guide in the diagnosis of many diseases and in evaluating the responses to the therapy in both animals and human beings (Taleb *et al.*, 2005). In similar vein, hematological changes have been used to assess the level of stress due to environmental and nutritional factors (Mmereole, 2004). It has been established that hematological parameters are associated with production traits in chickens. For example, high PCV and high Hb are indicators of high feed conversion efficiency (Mitraka and Rawnsley, 1997). High level of circulating lymphocytes indicates the ability of the birds to survive within stressful

conditions. Thus, this study was aimed to evaluate the effect of garlic powder on the haematology and cholesterol levels of Japanese quails

Materials and Methods

3.1 Location of study

The study was carried out at the Poultry unit of the Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka lies in the derived savannah region. Average diurnal minimum temperature ranges from 22 - 24.7°C while the average maximum temperature ranges from 33 - 37°C. Annual rainfall ranges from 168 - 1700 mm. Nsukka lies within latitude 6° 25' N and longitude 7° 24' E and its altitude is 430m above the sea level (Energy Research Centre, UNN, 2011).

Management of the experimental birds and Experimental design

A sixteen (16) weeks feeding trial was conducted to assess the response of Japanese Quails to dietary supplementation of garlic on haematology and cholesterol levels. One hundred and forty-four (144) day old quail chicks were used for the experiment. The birds were randomly assigned to four experimental treatment groups in a completely randomized design (CRD). Each treatment contained 36 birds and was replicated three times with 12 birds per replicate. Supreme feed fortified with different inclusion levels of garlic were throughout the experiment periods to formulate the diets. The four dietary treatments were represented as T₁ (the control, without garlic powder), whereas T₂, T₃ and T₄ were supplemented with varying levels of garlic powder as 5g, 10g and 15g/kg, respectively. The birds were brooded for two weeks on deep litter during which adequate heat, feed and water was provided. After the brooding period, the birds were transferred to cages according to their treatments and replicates. Feed and water were supplied *ad libitum* and other management practices were employed as at when due. At the end of the experimental period, three birds from each replicate were randomly selected. Blood samples were collected from the selected into EDTA anticoagulant containers for haematology and into plain containers for serum cholesterol analysis.

Experimental diets

Supreme feed commercially prepared was obtained from the distributor at Ogige market in Nsukka and garlic powder was included at 0, 5, 10 and 15g/kg. The mixture was thoroughly homogenized at Feed mill. The proximate analysis of the diets is as follows:

Table 1: Proximate Analysis of the Experimental Diet.

Parameter	T ₁ (0g/kg)	T ₂ (5g/kg)	T ₃ (10g/kg)	T ₄ (15g/kg)
Moisture (%)	9.50	9.50	11.00	12.50
Ash (%)	4.00	3.50	4.50	4.70
Crude Protein (%)	15.32	17.13	18.06	18.30
Crude Fibre (%)	4.50	4.50	7.50	12.50
Ether Extract (%)	6.00	6.50	6.45	5.50
Nitrogen Free Extract (%)	60.68	58.87	51.39	45.50

Statistical Analysis

Data collected were subjected to analysis of variance (ANOVA) for completely randomized design (CRD) as described by Steel and Torrie (1980) and Akindele (2004) using a Stat Graphic Computer Package (SPSS, 2007) model. Significantly different means were separated using Duncan's New Multiple Range Test (Duncan, 1955).

Results and Discussion

The effect of garlic inclusion on haematological parameters of Japanese quails is as shown in Table 2. The result shows that there were no significant difference (P>0.05) on most of the haematological parameters considered among treatment groups, except haemoglobin concentration and red blood cells count which were significantly (P<0.05) affected.

Table 2: Effect of garlic inclusion on haematology parameters of Japanese quails

Parameters	T ₁ (0g/kg)	T ₂ (5g/kg)	T ₃ (10g/kg)	T ₄ (15g/kg)	Sig
PCV (%)	43.33±3.09	44.16±3.16	43.83±2.70	40.16±2.21	NS
Hb (g/dl)	14.20±1.14 ^a	14.68±1.06 ^a	14.46±0.96 ^a	13.26±0.78 ^b	*
WBC (1000mm ³)	10500.00±1152.96	10766.66±675.11	10400.00±699.52	9666.66±515.53	NS
RBC (X10 ⁶ /mm ³)	166.00±7.55 ^a	162.16±9.24	152.00±9.02 ^a	150.33±4.97 ^b	*
MCV (fl)	2.60±0.10	2.89±0.08	2.07±0.07	2.66±0.07	NS

MCH (Pg)	0.85±0.04	0.96±0.02	0.89±0.02	0.87±0.02	NS
MCHC(g/dl)	3.26±0.03	3.32±0.00	3.29±0.03	3.30±0.02	NS
Neutrophils (%)	72.33±2.41	70.33±3.27	73.66±2.07	72.00±2.97	NS
Lymphocytes (%)	25.16±2.56	25.83±1.79	24.66±3.26	22.66±2.47	NS
Monocytes (%)	3.83±0.40	3.50±0.22	3.66±0.33	4.16±0.30	NS
Eosinophils (%)	0.83±0.40	1.50±0.34	0.66±0.42	1.00±0.36	NS
Basophils (%)	0.00±0.00	0.33±0.21	0.00±0.00	0.16±0.16	NS

a,b-means in the same row with different superscripts are significant (P<0.05). PCV= Packed cell volume; Hb= Haemoglobin conc; WBC= White blood cell; RBC= Red blood cell; MCV= Mean cell volume; MCH= Mean corpuscular haemoglobin; MCHC= Mean corpuscular haemoglobin concentration.

This result agreed with Omonoma and Jarikre (2012) who also recorded no significant differences in haematological parameters of Japanese quails fed garlic supplemented diets. Treatment two (T₂ – 5g/kg) compared favourably with the control group. Birds on treatment two showed marked slight increase in values on some of the parameters. This is in contrast to the results obtained by Ademola *et al.* (2009) and Fadlalla *et al.* (2010), who reported decrease in Hb concentration and ascribed it to the presence of some haemolytic bioactive constituents in quail or their metabolites and garlic. There was no significant effect (P>0.05) of the different treatments on packed cell volume (PCV), white blood cells, mean cell volume, mean cell haemoglobin, mean cell haemoglobin concentration, neutrophile, lymphocytes, monocytes, eosinophile and basophile (Omonoma and Jarikre 2012). Haematological parameters in birds had been shown to be influenced by various factors including physiological (age, sex), environmental conditions (as season), diet contents and age (Seiser *et al.* 2010; Alodan and Mashlay, 1999). There were no significant difference (P>0.05) on the differential leucocytes count including neutrophile, eosinophile, monocytes, lymphocytes and basophile among the treatments. This is in agreement with the results obtained by Yang *et al.* (2007) who recorded no significant difference in differential leucocyte count of quails. This may be due to the antimicrobial and immune-reactive properties of garlic (Cowan, 1999; Guo *et al.*, 2003), which suppressed the activities of microorganisms that would have inflamed the differential leucocyte count. Somasundaram *et al.* (2002) and Khan *et al.* (2003), have independently reported that garlic is widely used to cure and prevent diseases in animals and humans.

Table 3: Effect of Garlic powder inclusion on the cholesterol level of Japanese Quails

Parameters	T ₁ (0g/kg)	T ₂ (5g/kg)	T ₃ (10g/kg)	T ₄ (15g/kg)	Sig
Total Cholesterol (mg/dl)	9.58±0.82 ^a	10.63±0.68 ^a	8.65±1.0 ^b	7.30±0.41 ^b	*
Triglyceride (mg/dl)	2.78±0.21	2.68±0.05	2.47±0.19	2.98±0.18	NS
Low density lipoprotein	10.33±0.51	9.20±1.18	11.93±0.61	10.07±0.68	NS
High density lipoprotein	10.23±1.26 ^a	10.35±1.49 ^a	8.88±0.95 ^b	10.14±0.92 ^a	*
Very low density lipoprotein	1.39±0.10	1.34±0.02	1.23±0.09	1.49±0.09	NS

a,b-means in the same row with different superscripts are significant (P<0.05).

Table 3 shows the serum cholesterol profile of 16 weeks post treatment of quails with garlic powder. The result shows that there were significant difference (P<0.5) among treatments on total cholesterol and high density lipoprotein, but triglyceride, low density lipoprotein and very low density lipoprotein were not affected (P>0.05). The cholesterol level in this study was lower than 127.40±7.90 and 138.20±15.70mg/dl in Japanese laying quail reported by Hassan *et al.* (2011). The decrease in total cholesterol (TC) of the quails in treatment 4 could be attributed to high level of fibres in the diet. According to Akiba and Matsumoto (1982), high level of fibres can increase the excretion of bile and thus, decreases the cholesterol level of blood. The decrease in blood cholesterol of the quails may also, be attributed to substances like carvacrol and thymol which are present in herbs such as garlic and thyme (Zargari, 2001). These substances have effect on cholesterol and triglyceride and decreases harmful cholesterol in blood (Zargari, 2001). Furthermore, it has been reported that garlic constituents can prevent the biosynthesis of cholesterol in the liver by inhibiting HMG CoA reductase which is the rate limiting enzyme in cholesterol biosynthesis and other lipogenic enzyme (Lin and Yen, 2002). Also, garlic powder preparation has been reported to reduce lipoprotein oxidation susceptibility in vitro and vivo (Kourounakis and Rezza, 1991). The observed increase in HDL is one of the most important criteria of an anti-hypercholesterolemic agent. Several studies have demonstrated that high levels of HDL are associated with a lower incidence of cardiovascular disease (CVD) (Catherine *et al.* 2004, Yusuf *et al.* 2004). Therefore, it means that HDL may play a protective role through reversing cholesterol transport by inhibiting the oxidation of LDL and thus neutralizing the atherogenesis effect of oxidized LDL.

Conclusion

It was therefore, concluded that 5, 10 and 15g/kg of garlic could be included in the diets of Japanese quails without any adverse effect.

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