EFFECTS OF GARLIC (*ALLIUM SATIVUM*) MEAL ON HAEMATOLOGICAL AND SERUMBIOCHEMICAL PARAMETERS OF JAPANESE QUAIL (*COTURNIX COTURNIX JAPONICA*)

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ABSTRACT
This study was carried out to investigate the haematological and serum biochemical indices of Japanese quails fed graded levels of garlic meal. A total of 372 (three hundred and seventy-two) two weeks old Japanese quails of mixed sexes (*Coturnix coturnix japonica*) were randomly allocated to four dietary treatments of ninety three (93) birds each, and were replicated three times in a completely randomized design with thirty-one (31) birds per replicate. They were fed four experimental diets containing 0g, 250g, 500g and 750g garlic meal. Feed and water were provided *ad libitum*. Blood samples were collected at six weeks old of growth phase into two sets of labelled sterile bottles and used for blood analyses. The results showed that birds fed 750g of garlic in the diet had significantly ($p<0.05$) higher values for all the haematological parameters. Birds fed 750g garlic meal had significantly ($p<0.05$) higher values for albumin, globulin and lower glucose and cholesterol values. However, it was observed that the values for both haematological and blood serum biochemical indices fell within the normal values. It was concluded that at 750g garlic inclusion there were no adverse effect on haematological and blood serum biochemical indices.
Keywords: Japanese quail, garlic meal, haematological parameters, biochemical indices, dietary levels.

INTRODUCTION
Garlic has potential hypolipidemic, hypotensive, hypoglycemic, hypothrombotic and hypoatherogenic properties (Warshafsky et al 1993).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 for sexual potency (Jain *et al* 1993) they promote good memory, enhance brain activity and regulate the nervous system (Amagase *et al* 2001). In the past years, haematological 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 humans (Teleb 2004). In similar vein, haematological changes have been used to assess the level of stress due to environmental and nutritional factors (Mmereole 2004). It has been established that haematological parameters are associated with production traits in chickens. For example, high PCV and high Hb are indicators of high feed conversion efficiency (Mitruka 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 meal on the haematological and serum biochemical parameters of Japanese quails.

MATERIALS AND METHODS
Experimental Site
The experiment was conducted at the Poultry Unit, Kabba College of Agriculture, Division of Agricultural Colleges, Ahmadu Bello University, Zaria, Kaduna State. Kabba is located in the

Southern Guinea Savannah Ecological Zone of Nigeria on the Latitude 7°53' N, Longitude 6 °02 E with an average rainfall of about and 1500mm per annum with an average temperature ranges from 18°C -32°C . It is 427m above sea level.

Source and Processing of Garlic bulb

Garlic bulb was purchased from a local market in Kabba, Kogi State. The garlic bulbs were sliced, sundried for 7 days and milled before being incorporated into the experimental diets.

Experimental Diets

Four experimental diets were formulated for the experiment:
Treatment 1- 0% inclusion of experimental diet (Control)
Treatment 2 –0.25% inclusion of garlic meal
Treatment 3 –0.5% inclusion of garlic meal
Treatment 4 –0.75% inclusion of garlic meal

Haematological and Biochemical analysis

At the 4th week of the experiment, blood samples were collected from the brachial vein of ten randomly selected birds per group. The blood samples were analyzed for some hematological and serum biochemical parameters; blood samples for heamatology were collected into bottles containing Ethylene Diamine Tetra Acetate (EDTA) and the other set of bottles without anti-coagulant were used to determine the biochemical indices such as Albumin, Globulin, Glucose, Cholesterol, Creatinine, Urea and Uric acid, according to (Schalms *et al* 1986). The heamatological parameters such as packed cell volume (PCV), red blood cell (RBC), white blood cell (WBC), haemoglobin concentration (Hb) and absolute counts of lymphocytes, monocytes and eosinophil were studied.

Statistical Analysis

All data obtained from the two experiments were subjected to analysis of variance (ANOVA) using the General Linear Model Procedures (GLM) of the Statistical Analysis Software package. Significant difference between treatments means were separated using Duncan Multiple Range Test (SAS, 2002).

RESULTS AND DISCUSSION

Table 1 shows the dietary composition of the experimental diet. The effect of garlic meal inclusion on haematological parameters of Japanese quails for the growth phase is as shown in Table 2. The result shows that dietary treatments had significant ($P<0.05$) difference on all the haematological parameters However, it was observed that birds fed diets containing 750g garlic had the highest values for all the observed parameters in this study. A linear increase in the values for packed cell volume (PCV), haemoglobin count (Hb), white blood cell (WBC), red blood cell (RBC), monocytes, and eosinophil increased as the levels of garlic increased. These results contradict the reports of (Seiser *et al* 2010) who recorded no significant differences in haematological parameters of Japanese quails fed garlic supplemented diets. This difference may be as a result of differences in location, season and levels of garlic replacement. 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 (Yang *et al* 2007). The effect of garlic inclusion on serum biochemical parameters of Japanese quails for the growth phase is as shown in Table 3. The result shows that there were significant differences ($P<0.05$) in values obtained among treatments for albumin, globulin, glucose, cholesterol and creatinine but urea and uric acid were not affected ($P>0.05$) for the growth phase. The cholesterol level in this study was lower for Japanese laying quail as reported by (Akiba and Matsumoto 1980). The decrease in cholesterol of the quails fed 750g garlic meal could be attributed to the antioxidant property of garlic (Aletor 1998). High values of creatinine and urea suggests kidney disease and renal failure due to damage to the glomerulus and hence poor glomerular filtration and excretion. .

The value obtained in birds fed 750g garlic meal having low value of urea is in support of (Roberts *et al* 2003) reported low values of urea implies better protein utilization. These findings are in agreement with the present results of this study.

CONCLUSION AND APPLICATION

It could therefore be concluded that 750g of garlic meal could be included in the diets of Japanese quails with increased performance.

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Table 1: Composition of Experimental Diets for Japanese Quails Containing Different Inclusion level of garlic meal (2-6 weeks)

Diets	Ingredients											Calculated Analyses								
	Maize	SBC	GNC	BM	Li	GM	CS	Ly	Me	VP	Total	ME-Kcal/kg	E: Prot. Ratio	CP	EE	CF	Ca	AP	Ly	Me + Cy	Ca:P ratio
											%			%							
0	51.70	30.00	15.00	0.07	2.00	0	0.15	0.10	0.10	0.25	100	2847	116	25.00	4.87	4.53	1.00	0.23	1.27	0.83	4.00
250	51.45	30.00	15.00	0.07	2.00	0.25	0.15	0.10	0.10	0.25	100	2838	116	25.00	4.87	4.52	1.00	0.23	1.27	0.82	4.00
500	51.20	30.00	15.00	0.07	2.00	0.5	0.15	0.10	0.10	0.25	100	2829	116	25.00	4.86	4.52	1.00	0.23	1.27	0.82	4.00
750	50.95	30.00	15.00	0.07	2.00	0.75	0.15	0.10	0.10	0.25	100	2821	116	25.00	4.85	4.51	1.00	0.23	1.27	0.82	4.00

GM= Garlic Meal, SBC= Soya bean cake, GNC = Groundnut cake, BM= Bone meal, Li= Limestone, CS= Common salt, Ly= Lysine, Me= Methionine, VP= Vitamin premix, ME = Metabolisable Energy, CP=Crude Protein, CF= Crude Fibre, EE = Ether Extract, AP = Available Phosphorus in percentage, Cy= Cycsteine, Ca: P ratio = Calcium: Phosphorus ratio

Table 2: Heamatological Parameters Of Quails Fed Graded Levels Of Garlic Meal (2 - 6 weeks)

Parameters	0g	250g	500g	750g	SEM
Packed Cell Volume (%)	40.03^{d}	42.84^{c}	43.80^{b}	45.25^{a}	0.49
Heamoglobin (g/dl)	13.16^{d}	13.83^{c}	14.51^{b}	15.13^{a}	0.19
Red Blood Cell ($10^{6}mm^{3}$)	3.85^{d}	4.49^{c}	4.54^{b}	4.63^{a}	0.02
White Blood Cell($10^{6}mm^{3}$)	6.64^{d}	7.13^{b}	6.91^{c}	9.33^{a}	0.19
Lymphocyte (%)	26.67^{d}	30.52^{c}	31.79^{b}	34.26^{a}	0.19
Monocyte(%)	0.33^{d}	0.67^{c}	1.00^{b}	1.33^{a}	0.29
Eosinophil (%)	1.00^{c}	1.00^{c}	1.33^{b}	1.67^{a}	0.24

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

Table 3: Biochemical Parameters of Quails Fed Graded Levels Of Garlic Meal (2 – 6 weeks)

PARAMETERS	0g	250g	500g	750g	SEM
Albumin (g/dl)	3.70^{c}	4.44^{b}	4.41^{b}	4.87^{a}	0.023
Globumin (g/dl)	2.30^{c}	2.82^{b}	3.35^{a}	3.42^{a}	0.005
Glucose (g/mol)	5.36^{d}	5.74^{c}	6.37^{b}	7.16^{a}	0.104
Cholesterol (µ/mol)	216.40^{a}	205.87^{b}	188.05^{c}	184.59^{d}	0.081
Creatinine (g/mol)	42.81^{d}	44.01^{c}	47.19^{b}	51.31^{a}	0.11
Urea (g/dl)	1.87^{b}	1.92^{a}	1.66^{c}	1.39^{d}	0.005
Uric acid (µ/mol)	5.15^{b}	6.20^{a}	6.20^{a}	5.09^{c}	0.008

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