ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorijps@gmail.com

International Journal of Poultry Science 8 (11): 1042-1046, 2009
ISSN 1682-8356

The Feeding Value of Toasted Mucuna Seed Meal Diets for Growing Japanese Quail (*Coturnix coturnix japonica*)

C.D. Tuleun[1], S.Y. Igyem[2] and A.Y. Adenkola[3]
[1]Department of Animal Nutrition, [2]Department of Animal Production,
College of Animal Science, University of Agriculture, Makurdi, Nigeria
[3]Department of Physiology and Pharmacology, College of Veterinary Medicine,
University of Agriculture, Makurdi, Nigeria

Abstract: A feeding trial was conducted with two hundred and twenty four one week old quail chicks to study the optimum inclusion level of toasted mucuna seed meal in a practical quail diet. Four isonitrogenous (24% crude protein) diets incorporating graded levels (0, 5, 10 and 15) of toasted mucuna seed meal were formulated and fed for 42 days in a completely randomized design. The chicks were divided into four treatment groups, each group replicated two times with 28 chicks per replicate. A group each was allotted to one of the four isonitrogenous diets. The performance, nutrient digestibility, carcass quality and visceral organs and haematological parameters were evaluated. Feed intake, weight gain, feed/gain ratio and nutrient digestibility did not differ significantly (P>0.05) across the treatments. The haematological parameters of quails fed the mucuna diets were not significantly different (P>0.05) compared to those on control diet. Likewise the inclusion of toasted mucuna seed meal in the diets did not cause significant disproportionate growth in carcass quality and visceral organs. It was concluded that toasted mucuna seed meal can be included up to 15% level in practical diets of growing Japanese quail.

Key words: Toasted mucuna seedmeal, quail growers, digestibility, carcass quality, haematology

INTRODUCTION

Feed supply has remained a major constraint in livestock production due to the ever increasing cost of conventional feedstuffs occasioned by the competition between man and livestock (Amaefule *et al*., 2004). Consequently the prices of the finished products (meat and eggs) are not affordable hence the reduced protein intake. An average Nigerian does not consume enough of protein of animal origin that nourishes the body and needed for tissue development, repairs and healthy living (FAO, 1992). Serious malnutrition has been reported especially among the vulnerable groups (e. g children and pregnant women) of the poor/low class people that form the majority in the society (Taiwo *et al*., 2006). One of the objectives of the National Agricultural Policy is improving the diet quality of Nigerians at reasonable cost. The intensification of micro livestock and short cycle animals production has been suggested (Sobayo *et al*., 2008). Therefore any attempt to substitute the conventional feedstuff in poultry feed will greatly reduce cost of production.

The Japanese quail (*Coturnix coturnix japonica*) which is now being bred for meat and eggs has the potential to serve as an excellent and cheap source of animal protein for Nigerians (Babangida and Ubosi, 2006; Edache *et al*., 2007). According to Anonymous (1991) and NRC (1991), quails are so precocious that they can lay eggs when hardly more than five weeks old, and it is said that about twenty of them are sufficient to keep an average family in eggs all year round. The quail meat is renowned for its low caloric value in addition to having high quality protein of high biological value (Haruna *et al*., 1997). Therefore research efforts should be geared towards utilization of alternative feed sources to improve cost effectiveness or gain in the finished products.

Mucuna commonly known as velvet bean is an under utilized legume. It has a crude protein content of 31.75 - 35.5 % with a good amino acid profile relative to soyabean, thus has a high potential as an ingredient for livestock (Emiola *et al*., 2003). However the seeds like other grain legumes contain anti nutritional factors (Ezeagu *et al*., 1994; Ajah and Madubuike, 1997; Oduguwa *et al*., 1999; Oboh and Ekperigin, 2003; Tuleun and Patrick, 2007) such as trypsin inhibitors, tannin, phytate, lectins, oxalate, alkaloids and cyanogens which tend to limit their use as feed resources. Different processing methods have been employed to remove the negative effects of anti nutritional factors (ANFs) present in the raw legume seeds (Apata and Ologhobo, 1997; Emenalon, 2004; Tuleun *et al*., 2008). To avert these negative effects of raw mucuna seed on productivity, heating (toasting) of mucuna seeds was employed to eliminate the ANFs.

The objectives of the study therefore were to investigate the performance, carcass characteristics and blood picture of growing quails fed dietary graded levels of toasted *Mucuna utilis* seed meal.

MATERIALS AND METHODS

Mucuna utilis seeds were purchased from International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria. The seeds were multiplied and processed by toasting as described by (Ukachukwu and Obioha, 2007). Briefly the toasting involved heating sand in an aluminium frying pan after which the seeds were added and stirred continuously until the seed became crispy, with an aroma of toasted bean. The toasted seeds were then milled in a hammer mill and included in diets (Table 1). The diets were formulated to be isonitrogenous with about 24 % crude protein (CP). There were four dietary treatments containing 0, 5, 10 and 15 % toasted mucuna seed meal respectively.

Two hundred and twenty four (224), one week old unsexed Japanese quails (*Coturnix coturnix japonica*) purchased from National Veterinary Research Institute, Vom, Nigeria were selected on the basis of fitness and relative body weight and used for the study. Twenty eight quail chicks were group weighed and randomly assigned to the four dietary treatments of two replicates each. The experimental design used was completely randomized arrangement. Feed and water were provided *ad libitum*. The mean weekly live body weights and feed intake of birds were recorded from 2 - 7 weeks of age. From the body weight and feed intake, feed conversion efficiency and protein efficiency ratio were calculated. Water intake was measure on daily basis. At the end of the feeding trial four birds were randomly selected from each dietary treatment replicate and slaughtered by the throat-cut method. They were defeathered and dressed to calculate the dressing percentage and the relative cut-up parts, according to the procedures of Oluyemi and Roberts (2000). At the point of slaughter, 2 mls of blood were collected into a bijou bottle containing ethylene tetra acetic acid (EDTA) as anticoagulant at the rate of 2 mg/ml (Adenkola and Ayo, 2009). The blood samples were immediately taken to the laboratory for haematological analysis. Packed cell volume (PCV), total erythrocyte (RBC) count and haemoglobin (Hb) concentration were determined (Schalm *et al*., 1975; Device and Lewis, 1991). Mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated (Schalm *et al*., 1975). Total protein was determined using the refractometric method (Benjamin, 1975). Data collected were subjected to analysis of variance (Steel and Torrie, 1980) differences between means were separated using Duncan's Multiple Range test as outlined by Obi (2002).

RESULTS AND DISCUSSION

Data on the performance of growing quails fed graded level of toasted mucuna seed meal is presented in Table 2. The non-significant ($P > 0.05$) effect of dietary mucuna level on feed intake, protein intake, and weight gain of the experimental quails is an interesting result. This could probably due to the hardiness and ability of quail to adjust to feed intake in the wild. Iyayi and Taiwo (2003) had reported significant decrease in feed intake and weight gain when they fed broiler starter and finisher with 12 and 18 % toasted mucuna seed meal as replacement of soyabean meal in the diets. However, Iyayi and Taiwo (2003) in another experiment reported a comparable feed consumption of layers fed 18 % toasted and autoclaved mucuna seed meal with the control diet. The diets did not have any significant effect ($P > 0.05$) on feed conversion ratio (4.35 - 5.09) and protein efficiency ratio (1.05 - 1.25) of quails. This is an indication that the dietary inclusion level of mucuna seed meal did not impair nutrient utilization in the growing quails. Generally, feed conversion ratio for quails was poor compared to reports for broilers chicken (Emiola *et al*., 2003). This poor feed conversion has been reported by Weber and Reid (1967), Haruna *et al*. (1997) and Sobamiwa and Longe (1998) as due to the quail being much less efficient in feed utilization than chicks, and the greater feed wastage characteristics of the quails. Similar observations made in this study may also be due to the fidgety nature of the quails. Remarkably no significant ($P > 0.05$) impart of the dietary level of mucuna was found on the water consumption, which remained compatible with the control diet (38.93 - 44.28 ml/bird). The water consumption observed in this study was lower than the values (56 - 60 ml/bird) reported by Musa *et al*. (2008). More so, this work was conducted during the raining season when the relative humidity ranged between 59 - 80 %. The meteorological condition at this period is not stressful to birds this could possibly lead to depressing effect on the thirst centre in the hypothalamus and also prevent increase absorption of water in the distal convoluted tubules of the kidney as a result of less secretion of anti-diuretic hormone (ADH) from the supraoptic nuclei of the hypothalamus leading to decrease water consumption, and thus maintain body homeostasis. The nutrient digestibility coefficients (Table 2) revealed that the inclusion level of mucuna seed meal had no significant ($P > 0.05$) effect on the nutrient digestibility by the quails. The values varied without following any particular trend from 0 % to 15 % inclusion levels of mucuna seed meal in the diets, meaning that the control and the mucuna diets were equally digested. This may be attributed to detoxification of the antinutritional factors in the toasted meals or better still, the inert ability of the hardy and rusty quails to thrive on a wide variety of feedstuff in the wild. Table 3 shows the result of the influence of dietary level of mucuna seed meal on the haematological parameters of the growing Japanese quail. The results showed no significant ($P > 0.05$) effect of dietary toasted mucuna seed meal on all the parameters measured. The RBC count, PCV, Hb concentration, MCH and MCHC values

Table 1: Composition of experimental diets (%)

	Inclusion level of toasted mucuna seed meal (%)			
Ingredients	Control (0)	5	10	15
Maize	38.21	37.03	35.84	34.67
Fullfat Soybean	32.96	30.41	27.87	25.32
Groundnut cake	16.48	15.21	13.94	12.66
Maize offal	8.00	8.00	8.00	8.00
Mucuna seed meal	0.00	5.00	10.00	15.00
Bonemeal	2.50	2.50	2.50	2.50
Oystershell	1.00	1.00	1.00	1.00
Salt	0.20	0.20	0.20	0.20
Methionine	0.30	0.30	0.30	0.30
Lysine	0.10	0.10	0.10	0.10
*Vit-min. premix	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00
Calculated composition				
Crude protein (%)	24.00	24.00	24.00	24.00
Metabolizable energy (Kcal/kg)	3034	3036	3038	3040
Crude fibre (%)	4.35	4.51	4.68	4.80

Premix contained the following: (Univit 15 Roche) 1500 I.U. Vit A, 1500 I.U. Vit D, 3000 I.U. Vit E, 3.0 g Vit K, 0.3 g Vit B_2, 8.0g Vit B_6, 0.3g Vit B_{12}, 3.0g Nicotinic Acid, 5.0g Ca-Panthothenate, 10.00g Fe, 0.2g Al, 3.5g Cu, 0.15g Zn, 0.02g I, 0.01g Co, 0.01g Se

Table 2: Growth performance and nutrient digestibility of growing quail chicks fed toasted mucuna seed meal diets

	Inclusion level of toasted mucuna seed meal (%)				
Parameters	Control (0)	5	10	15	SEM
Growth performance					
Average daily feed intake (g)	8.17	7.70	7.49	8.03	0.29^{NS}
Average daily weight gain (g)	1.73	1.78	1.72	1.58	0.114^{NS}
Feed/Gain ratio	4.74	4.37	4.35	5.09	0.405^{NS}
Average Protein intake (g)	1.96	1.85	1.80	1.93	0.07^{NS}
Protein efficiency ratio	1.14	1.05	1.05	1.23	0.099^{NS}
Water intake (ml)	38.93	40.44	40.61	44.28	4.018^{NS}
Nutrient digestibility (%)					
Crude protein	85.04	87.57	90.92	86.22	5.48^{NS}
Crude fibre	43.82	37.48	45.09	32.08	4.86^{NS}
Ether extract	90.52	90.32	92.52	87.83	4.12^{NS}
Nitrogen free extract	76.31	80.82	81.95	76.17	8.11^{NS}

Means on the same row with same superscripts are not significantly (p>0.05) different; SEM: Standard Error of Means

Table 3: Haematological chacteristics of quail chicks fed diets containing toasted mucuna seed meal diets

	Inclusion level of toasted mucuna seed meal (%)				
Parameters	Control (0)	5	10	15	SEM
Protein (gm/dl)	7.00	7.50	7.75	7.75	0.43^{NS}
PCV (%)	40.00	44.00	42.50	43.50	3.20^{NS}
Hb (gm/dl)	13.34	14.67	14.17	14.50	1.07^{NS}
RBC (x 10^6/ml)	6.41	5.81	5.61	4.50	0.91^{NS}
MCV (fl)	63.41	75.77	75.85	81.01	5.77^{NS}
MCH (pg)	21.14	25.26	25.28	33.67	5.25^{NS}
MCHC (gm/dl)	33.36	33.33	33.33	33.34	0.01^{NS}

SEM: Standard Error of Means; NS: No significant difference (p>0.05) between the treatment means

obtained in this study indicated that the birds were well nourished and the values fell within the ranges for mature quail as earlier reported (Woodard *et al.*, 1973; Babangida and Ubosi, 2006). The results of the present study indicates that the diets contain adequate nutrients to support the health of birds, also nutrients has been recognized as one of the factors that can compromise and cause alterations in the stability and functions of blood parameters. This finding supports the earlier work of Tuleun *et al.* (2007) in broiler chickens and that of Adenkola *et al.* (2009) in rabbits that nutrient is an important factor in haemopoesis.

Results of the carcass characteristics of quail are summarized in Table 4. The dressing percentage was not significantly (P > 0.05) affected by the varying dietary inclusion level of mucuna seed meal. The mean values

Table 4: Carcass characteristics of growing quail fed diets containing toasted mucuna seed meal diets

	Inclusion Level of Toasted Mucuna Seed Meal Diets (%)				
Parameters	Control (0)	5	10	15	SEM
Eviscerated weight (g)	98.50	113.35	93.55	83.15	1.21^{NS}
Dressing percentage (%)	69.88	71.72	70.56	68.59	2.12^{NS}
Drumstick	8.08	8.50	8.00	7.85	1.21^{NS}
Thigh	15.35	15.80	14.95	12.40	2.07^{NS}
Chest	37.75	38.75	35.30	31.15	3.83^{NS}
Wings	8.65	9.10	8.20	7.85	0.38^{NS}
Neck	8.25	14.10	7.45	6.50	2.01^{NS}
Head	7.35	7.25	7.25	6.45	0.55^{NS}
Shank	1.95	2.50	2.05	2.55	0.40^{NS}
Visceral organs					
Liver	1.90	2.15	1.75	2.00	0.24^{NS}
Pancreas	0.30	0.30	0.30	0.40	0.001^{NS}
Heart	1.45	1.85	1.55	1.45	0.267^{NS}
Full gizzard	3.15^{b}	3.30^{b}	4.40^{a}	3.40^{b}	0.25*
Empty gizzard	2.30	2.40	2.80	2.25	0.29^{NS}

ab Means on the same row with different superscripts differ significantly (P < 0.05)
SEM: Standard Error of Mean

for dressing percentage are in agreement with the range (65 -72 %) reported by Jadhav and Siddiqui (2007). Besides the eviscerated weight and the percent relative weight of neck, all the carcass cut up parts were not significantly different (P > 0.05) among the treatment means. This shows that the inclusion of mcuna seed meal in quail diet up to 15 % did not have any negative effect on the carcass cuts compared with the control in terms of proportionate growth in relation to live weight. The percent live weight of the visceral organs (liver, pancreas, heart, gizzard) were statistically comparable (P > 0.05) with the corresponding visceral organs weights in the control diet. This shows that mucuna seed meal inclusion up to 15 % investigated did not have adverse effect on most of the measured parameters. The toasted mucuna seed meal at the level of inclusion may therefore not threaten the health status of the growing Japanese quail.

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