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NUTRITIONAL EVALUATIONOF TWO DIFFERENTLY PROCESSED *Lablab purpureus* BEANS ON THE PERFORMANCE OF JAPANESE QUAILS

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ABSTRACT

The study was conducted to evaluate the nutritional effect of two processing methods for *Lablab purpureus* beans on the performance of Japanese quail chicks. The two processing methods include the boiling and toasting which serves as the treatment diets. The two treatments diets were included into the compounded ration of the quails at 10 and 20% levels while a control diet was compounded which was free of *Lablab purpureus* beans. Seventy five (75) birds per treatment with three replicate in a 2 X 2 factorial design was used. The birds were between 2 – 6 weeks of age. Data were collected and analyzed for growth performance and haematological indices. The results obtained for performance on processing showed that all the parameters were significant affected ($p<0.05$) with only total feed intake and mortality which had no significant ($p>0.05$) difference. Dietary treatment had significant effect ($p<0.05$) on the performance response with the boiling at 10% doing better when compared to toasting. The haematological indices on processing gave significant ($p<0.05$) effect for Packed cell volume (boiling 37.75%; toasting 30.33%). Total protein(boiling 2.4 g/dl; toasting 1.52 g/dl) and Red blood cell (boiling $7.00x10^6$/dl; toasting 5.08 $x10^6$/dl) for processing methods while for level of inclusion, all the parameters were not significant ($p>0.05$). Result on the dietary treatment on the haematological indices had all the parameters significantly ($p<0.05$) different. It can therefore be concluded that processing of *Lablab purpureus* beans enhanced the utilization especially when boiled and included at 10% on the growth performance and better health status of Japanese quail chicks.

Key words: Boiling, toasting, blood, *Lablab purpureus* beans

INTRODUCTION

Over the last decade, man has being in relative competition with animal for both energy and protein feed resources of high nutritive value. It is therefore of important that for protein alternative feed stuffs especially seeds from leguminous plants that have little or no competition for human consumption be incorporated into the diets of poultry to shift attention from the costly, highly competitive and conventional protein feed stuffs such as soybean, groundnut, cotton seed and palm kernel cake. One of such non-conventional plant protein source is *Lablab purpureus* beans which has low preference as human food and can be feed to monogastric animals (Bawa *et al*., 2003b).

This non-conventional plant protein is not only an alternative protein feed stuff but it is considered a suitable source of functional protein, due to its good balance of high bio-available amino acids (Arinathan *et al*., 2003; Ragab *et al.*, 2010). Despite the usefulness of this feed stuff, it contains anti nutritional factors that can limit its use in animal feeding just like other tropical legumes (Ramakrishma, 2008).

For better utilization and improvement in the nutrient availability of such feed stuff to animals, it is paramount that processing by application of heat through boiling and toasting, to reduce or eliminate anti nutritional factors present in the seed be carried out (Shaahu *et al*., 2014). Also, to enhance the nutritional quality and organoleptic acceptability of such legume seeds, processing methods are employed to decrease or destroy the anti-nutritional factors (Christiana and Marcel, 2008). This study was therefore carried out to evaluate the nutritional effect of two processing methods of *Lablab Purpureus* beans on performance of Japanese quail's chicks.

MATERIALS AND METHODS

Experimental site

The experiment was conducted at the Quail Unit, Department of Animal Science Teaching and Research Farm, Ahmadu Bello, University, Zaria. Zaria is within the Northern Guinea Savannah zone of Nigeria with latitude, $11^0$14' 44' N and longitude $7^0$38' 65' E, at an altitude of 610mm above sea level. The climate is relatively dry, with a mean annual rainfall of 700-1400mm, occurring between the months of April and September (Ovimaps, 2014).

Source of Experimental Material and Processing

The test material was the Rongai variety (milky white) *lablab purpureus* which was purchased from a local market in Sabon Gari area of Zaria, Kaduna State while the quails for the experiment was one week old unsexed Japanese quails purchased from National Veterinary Research Institute, Vom, Jos, Plateau State, Nigeria.The test material was thoroughly cleaned by winnowing and sieving before subjecting into two processing methods of boiling and toasting for 40 minutes for each processing methods. For the boiling method, 25kg of the *Lablab purpureus* was poured into a 100 litre capacity aluminium pot containing about 50 litres of water before subjecting to boiling for 40 minutes. After boiling, samples of the *Lablab purpureus* was taken to the laboratory analysis of proximate composition as described by A.O.A.C. (2005) and formulation of the experimental diets. While for the toasting method, 25kg of the *lablab purpureus* beans was toasted in a 50 litres capacity pot to be toasted for 40 minutes. After which samples of the *lablab purpureus* beans was taken samples to the laboratory to test for proximate composition as described by A.O.A.C. (2005) and formulation of the experimental diets.

Formulation of experimental diets

Five iso-nitrogenous (24%) experimental diets were formulated as shown in table 1.

Treatment 1: Control diet 0% *Lablab purpureus*.

Treatment 2: 10% boiled *Lablab purpureus*.

Treatment 3: 20% boiled *Lablab purpureus*.

Treatment 4: 10 toasted *Lablab purpureus*.

Treatment 5: 20% toasted *Lablab purpureus*.

Experimental Birds and Management

Three hundred and seventy five (375) unsexed Japanese quail birds were used in a factorial arrangement plus one control in a completely randomized design (CRD) for growth and laying performance. The birds were allotted to five dietary treatments which were iso-nitrogenous (24%) with 75 birds per treatment having three replicates each with 10 and 20% inclusion levels and a control containing 0% of the test material.

Table 1: Gross composition of Experimental diets (2-6 weeks)

	Control	Boiled		Toasted	
Ingredients	**0%**	**10%**	**20%**	**10%**	**20%**
Maize	51.56	46.08	40.59	46.97	42.37
Lablab	0	10	20	10	20
Groundnut cake	33.99	29.47	24.96	28.58	23.18
Soy bean cake	10.00	10.00	10.00	10.00	10.00
Limestone	0.5	0.5	0.5	0.5	0.5
Bone meal	3.00	3.00	3.00	3.00	3.00
Salt	0.30	0.30	0.30	0.30	0.30
Vit. premix*	0.25	0.25	0.25	0.25	0.25
Lysine	0.15	0.15	0.15	0.15	0.15
Methionine	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00
Calculated analysis					
Crude Protein (%)	24.00	24.00	24.00	24.00	24.00
Energy (kcal/kg)	2833	2848	2873	2852	2881
Crude Fibre (%)	4.00	4.32	4.73	4.22	4.54
Ether Extract (%)	4.67	3.79	3.50	3.71	3.33
Ca (%)	1.05	1.07	1.08	1.06	1.06
Available P (%)	0.52	0.56	0.57	0.55	0.56
Lysine (%)	1.10	1.61	2.12	1.61	2.11
Meth + Cyst (%)	0.95	0.95	0.97	0.96	0.97
Cost/Kg (₦)	74.02	78.70	83.38	59.67	65.92

*****Biomix premix provide per Kg of diet: Vit. A,10,000i.u; Vit. D3, 2000i.u; Vit E,23mg;Vit.K_3,2mg;Vit B_1,1.8mg; Vit B_2,5mg; Niacin,275mg; Pantothenic acid 7.5mg; Vit.B_{12}, 0.015mg; Folic acid, 0.75mg; Biotin H_2,0.06mg;Cholin Chloride, 300mg; Vit. B_6,3mg; Manganese,40mg;Iron,20mg; Zinc,30mg; Copper,3mg; iodine,1mg; Cobalt, 0.2mg; Selenium,0.2mg, T1-T9 represents treatment1

STATISTICAL ANALYSIS

The data generated from the study was analyzed using the General Linear Model procedure of SAS 9.0, (2002). Means were separated using the Duncan's Multiple Range Test of the same statistical package.

RESULTS AND DISCUSSION

Results of the proximate composition of the two processing methods is shown in Table 2. The boiling method shows lower values for crude protein (CP), crude fibre (CF), ether extract (EE) and ash for lablab beans seeds compared to toasted seeds which may be attributed to processing method. This loss in nutrient perhaps may be due to leaching of nutrients into the boiling water which was also reported by Iorgyer *et al.* (2009). Similar results were reported by Bawa *et al.* (2003a), Ogundipe *et al.* (2003) and Abeke *et al.* (2008b). The increase in nitrogen free extract in boiled when compared with the toasted indicates that cooking improves energy release and availability. This is in consonance with the reports of Abeke *et al.* (2008b). Loss in ash content

observed in the boiled seeds when compared with the toasted seeds may be due to leaching of soluble inorganic salts into the processing water as explained by Christiana and Marcel (2008) for African locust bean and Osman (2007) for lablab beans. Increase in ash content of the toasted compared with the boiled beans may be attributed to conversion of other nutrients to ash (minerals) due to charring.

Table 2: Proximate composition of differently processed lablab beans

Parameters	**Boiled**	**Toasted**
Crude Protein (%)	25.39	25.52
Crude Fibre (g)	2.68	3.57
Ether Extract (%)	4.86	5.25
Ash (%)	6.96	7.58
NFE (%)	60.11	58.08
Dry Matter (%)	94.82	94.56

NFE= Nitrogen free extract

Results obtained on the proximate composition of quail starter diet containing varying levels of processed lablab beans is shown in Table 3. The result shows a slight increase of crude protein (CP) in the boiled diet at 10% and in the toasted at 20%.The finding on boiled lablab seed is in accordance with the report of Diarra *et al.* (2011) who subjected sorrel seed to moist-heating and reported slight increase in crude protein (CP) levels of the feed. Similarly the higher levels of protein and ash in the 10% boiled inclusion confirm the loss of more soluble components of the seeds in favour of the protein and ash.

Table 3: Proximate composition of quail starter diet containing varying levels of processed lablab seed

	Control	**Boiled**		**Toasted**	
Parameters	**0**	**10%**	**20%**	**10%**	**20%**
Crude Protein (%)	25.39	25.52	24.88	24.76	25.50
Crude Fibre (g)	2.68	3.57	4.23	3.38	3.04
Ether Extract (%)	4.86	5.25	4.33	5.19	6.01
Ash (%)	6.96	7.58	6.62	7.17	7.17
NFE (%)	60.11	58.08	59.94	59.50	58.28
Dry Matter (%)	94.82	94.56	93.88	93.87	94.80

NFE: Nitrogen free extract

Table 4: Effect of processing method and level of inclusion of lablab beans on Performance of Japanese quails (2-6weeks)

		Processes method				Levels of inclusion (%)			
Parameters	**Control**	**Boiled**	**Toasted**	**SEM**	**LOS**	**10**	**20**	**SEM**	**LOS**
Initial weight (g)	32.00	32.00	32.00	0	NS	32.00	32.00	0	NS
Final weight (g)	141.33^{a}	135.33^{ab}	128.67^{b}	2.62	*	132.33	126.33	3.74	NS
Total Feed intake (g/bird)	434.00	440.67	454.33	12.16	NS	455.50	455.50	17.36	NS
Weight gain (g/bird)	109.33^{a}	103.33^{b}	96.67^{c}	2.62	*	100.33	94.33	3.74	NS
FCR	4.01^{a}	4.27^{b}	4.71^{c}	0.19	*	4.55	4.86	0.27	NS
Feed cost/kg gain	18.75^{ab}	19.17^{b}	13.26^{a}	0.66	*	16.17	16.19	0.94	NS
Age at first egg (days)	39.67^{b}	38.17^{a}	40.17^{b}	0.83	*	39.00	39.67	1.18	NS
weight of first egg (g)	7.55	6.96	7.28	0.52	NS	6.90	6.48	0.74	NS
Mortality	0.00	0.00	0.00	0.00	NS	0.00	0.00	0.00	NS

$^{abc:}$ Means with different superscript within the same row, SEM: standard error mean, LOS: level of significance, *: significant, NS: not significant, FCR: feed conversion ratio, wt: weight

Table 5: Effect of dietary treatments on the growth performance of Japanese quails (2-6weeks)

	Dietary levels (%)						
	Control	**Boiled**		**Toasted**		**SEM**	**LOS**
Parameters	**0**	**10%**	**20%**	**10%**	**20%**		
Initial weight (g)	32.00	32.00	32.00	32.00	32.00	0	NS
Final weight (g)	141.33^{a}	136.00^{a}	134.67^{ab}	132.00^{ab}	125.33^{ab}	2.31	*
Total Feed intake (g/bird)	434.00^{b}	434.00^{b}	447.33^{ab}	453.33^{a}	455.33^{a}	8.16	*
Weight gain (g/bird)	109.33^{a}	104.00^{b}	102.67^{b}	100.00^{b}	93.33^{c}	2.31	*
FCR	4.01^{a}	4.17^{ab}	4.37^{bc}	4.54^{c}	4.88^{d}	0.14	*
Feed cost/kg gain	18.75^{b}	18.89^{b}	19.46^{b}	13.13^{a}	13.40^{a}	0.52	*
Age at first egg (days)	39.67^{bc}	38.67^{ab}	37.67^{a}	40.00^{c}	40.33^{c}	0.60	*
First egg weight (g)	7.55^{a}	7.30^{ab}	6.62^{b}	7.27^{ab}	7.30^{ab}	0.35	*
Mortality	0.00	0.00	0.00	0.00	0.00	0.00	NS

^{abcd} Means with different superscripts within the same row are significantly($P<0.05$) different. SEM: standard error mean, LOS: level of significance, *: significant, NS: not significant, FCR: feed conversion ratio

Table 4 and 5 shows the effect of processing method, level of inclusion and dietary treatments of lablab bean on growth performance of Japanese quails. The result shows that quails fed the controlled diet performed better in most parameters although boiled lablab based diets

particularly at 10% inclusion level performed better in final weight, feed conversion ratio and first egg weight (7.30 g) when compared to the 20% dietary inclusion. These results agree with Ogundipe *et al.* (2003) who reported best result in terms of growth and feed efficiency for pullets fed diet with cooked lablab. Abeke *et al.* (2008b) reported better final weight, weight gain and feed efficiency for broilers fed cooked lablab. Ragab *et al.* (2012) reported significantly high feed conversion ratio and weight gains for birds fed cooked lablab based diet at 10% inclusion level. These authors suggested that the application of heat especially by cooking assists in the reduction of anti-nutritional effects and the release of nutrients in such leguminous seeds. However, Shaahu *et al*. (2014) obtained a better cost effective diet for boiled lablab than toasted lablab for rabbits which is contrary to this report. Also, birds fed the boiled lablab attained age of egg production earlier than the toasted which may be attributed to better utilization of the boiled lablab diet.

Table 6: Interaction effect of processing methods and inclusion levels of lablab beans on growth performance of Japanese quails

	Processes method		**Levels of inclusion (%)**		**LOS**	
Parameters	**Boiled**	**Toasted**	**10**	**20**	**processes**	**levels**
Final weight (g)	135.33[a]	128.67[b]	132.33	126.33	*	NS
Total Feed intake (g/bird)	440.67	454.33	455.50	455.50	NS	NS
Weight gain (g/bird)	103.33[a]	96.67[b]	100.33	94.33	*	NS
FCR	4.27[b]	4.71[a]	4.55	4.86	*	NS
Feed cost/kg gain	19.17[b]	13.26[a]	16.17	16.19	*	NS
Age at first egg (days)	38.17[a]	40.17[b]	39.00	39.67	*	NS
First egg weight (g)	6.96[b]	7.28[a]	6.90	6.48	NS	NS

SEM: Standard error mean, LOS: level of significance, *: significant, NS: not significant, FCR: feed conversion ratio.

The interaction effect of processing methods and inclusion levels is shown in Table 6. Total feed intake and first egg weight for the processing method showed no significant ($p>0.05$) interaction effect. While for the level of inclusion, all parameter considered gave no significant ($p>0.05$). Reports by Ogundipe *et al*. (2003); Abeke *et al.* (2008b) and Ragab *et al.* (2012) have shown that the processing of lablab by cooking is advantageous as the authors argue that it assist in the enhancement of better body performance in terms of bodyweight gain and feed conversion. Also, the authors suggested that as a result of cooking, most anti-nutritional factors like tannin and trypsin inhibitors must have been reduced which is in agreement with El-Adawy (2002) who reported about 48 – 50.1% reduction of tannin during different boiling methods in chick pea.

Table 7: Effect of processing method and levels of lablab beans on haematological indices of Japanese quails (2-6weeks)

	Processes				Levels (%)			
Parameters	**Boiled**	**Toasted**	**SEM**	**LOS**	**10**	**20**	**SEM**	**LOS**
Packed cell volume (%)	37.75	30.33	1.29	*	34.08	32.29	3.71	NS
Haemoglobin (%)	12.55	10.08	1.33	NS	12.26	10.73	1.89	NS
Total protein (g/dl)	2.4	1.52	0.28	*	2.14	1.65	0.39	NS
WBC×10^9/dl	5.28	4.52	0.89	NS	5.32	5.63	1.27	NS
RBC×10^6/dl	7.00	5.08	0.72	*	6.14	5.63	1.03	NS

SEM: standard error of mean, LOS: level of significance, *: significant, NS: not significant, WBC: white blood cell, RBC: red blood cell

Table 8: Effect of dietary treatments on the haematological indices of Japanese quails (2-6weeks)

	Dietary levels (%)						
	Control	**Boiled**		**Toasted**		**SEM**	**LOS**
Parameters	0	10	20	10	20		
Packed cell volume (%)	35.33^{b}	37.83^{a}	37.67^{a}	30.50^{c}	30.17^{c}	1.94	*
Haemoglobin (%)	11.73^{ab}	12.57^{a}	12.53^{a}	10.13^{b}	10.03^{b}	0.93	*
Total Protein (g/dl)	2.73^{a}	2.67^{a}	2.13^{b}	1.67^{c}	1.37^{c}	0.19	*
WBC×10^9/dl	4.00^{c}	4.17^{bc}	6.40^{a}	5.23^{ab}	3.80^{c}	0.59	*
RBC×10^6/dl	5.70^{bc}	6.27^{b}	7.73^{a}	5.10^{c}	5.07^{c}	0.50	*

SEM: standard error of mean, LOS: level of significance, *: significant, NS: not significant, WBC: white blood cell, RBC: red blood cell

Tables 7 and 8 shows the effect of processing method, levels of inclusion and dietary treatments on the haematological indices of Japanese quails. There was significant ($p<0.05$) difference in most of the parameters however, haemoglobin and WBC were not significantly affected ($p>0.05$) by processing methods while all the parameters in the level inclusion were also not significant. The values obtained in this study shows that quails fed boiled lablab gave better results when compared to the controlled diet and toasted. This is in agreement with the report of Abeke *et al*. (2008) who reported better haematological values for Total Protein, Packed Cell Volume, and Haemoglobin for broiler finisher fed varying levels of cooked lablab. Consequently, the boiling of lablab will have probably destroyed or reduced the presence of anti-nutritional factors which resulted in no mortality. Also, the boiling supported growth performance through feed intake and

nutrient absorption and better health status although toasting performed better for feed intake but not well utilized for growth performance. This agrees with Oladele (2000) who reported PCV, TP and Hb content of the blood of chickens are factor of their health status and nutrient intake.

CONCLUSION

Processing of *Lablab Purpureus* beans by application of heat through boiling resulted in a better performance, feed intake and better health status for quails between 2-6 weeks of age when compared to toasting. Also, 10% inclusion of boiled *Lablab Purpureus* beans into the diet of young quails is advanced for better weight, FCR and first egg weight.

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