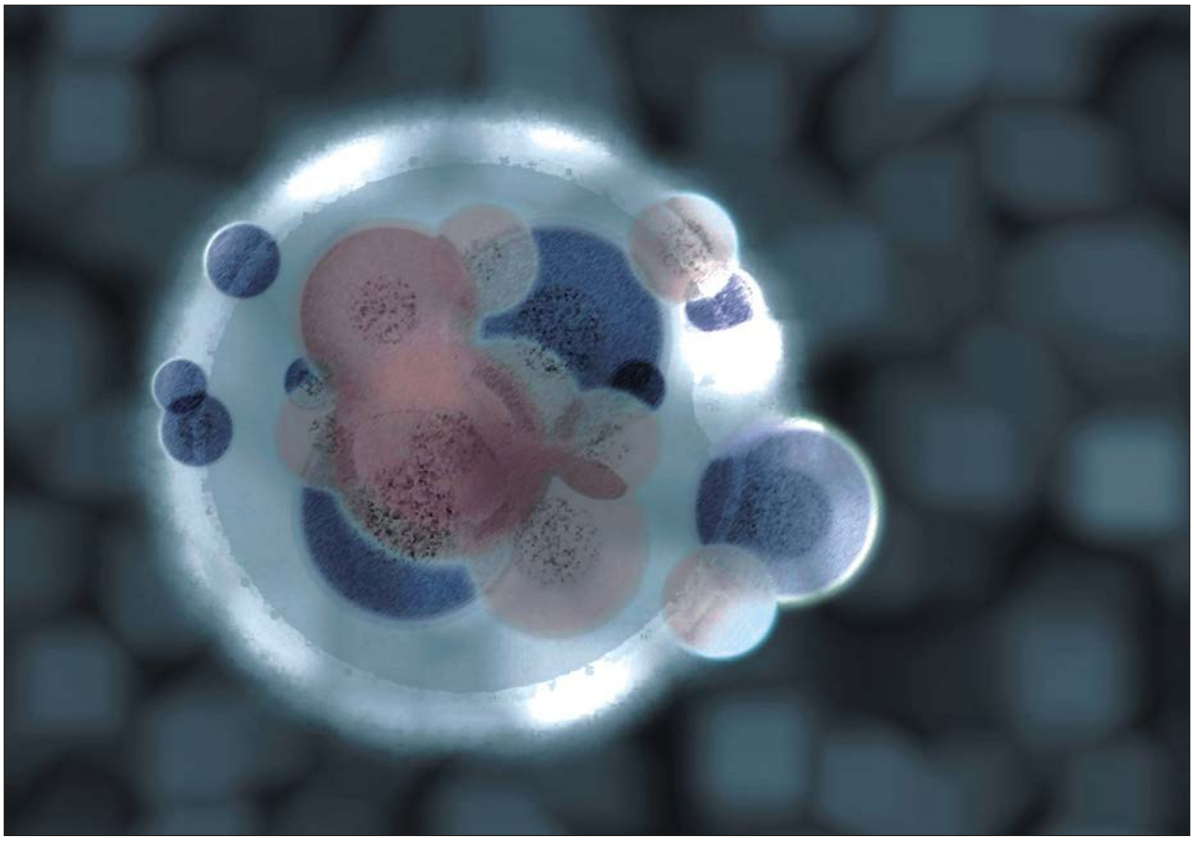

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Effect of Duration of Cooking of *Lablab purpureus* Beans on the Performance Organ Weight and Haematological Parameters of Shika-brown Pullet Chicks

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Abstract: The effect of duration of cooking of *Lablab purpureus* beans on the performance, organ weight and haematological parameters of Shika-brown pullet chicks from 0-8 weeks was investigated. Eight dietary treatments of which seven in which *Lablab purpureus* beans cooked for 0, 10, 20, 30, 40, 50 and 60 min) was included and a control (Corn-Soyacake-Groundnut-cake based diet) were formulated. These were replicated three times with 25 birds per replicate in a complete randomized design. The birds were managed under the deep litter system. Results obtained showed that cooking time had significant ($p<0.05$) improvement on performance characteristics such as final weight, weight gain, feed conversion efficiency and percent mortality. Organ weights such as the liver, the heart and the pancreas decreased as the duration of cooking increased while haematological parameters such as the Total Protein (TP), the Packed Cell Volume (PCV) and the Haemoglobin (Hb) increased slightly, (although not significantly) in the blood up to about 30 min of cooking before decreasing as the duration of cooking continued to increase. These observations are indications that higher durations of cooking up to about 30 min render the nutrients in the raw lablab seeds more available for utilization by the birds.

Key words: Lablab beans, organ weights, cooking duration, pullet chicks, haematological parameters, antinutritional factors

INTRODUCTION

Soyabean and groundnut cakes, which are the major sources of vegetable proteins for poultry rations, have become very expensive. There is therefore the need to source for alternative vegetable proteins that will be cheaper yet be nutritionally adequate as replacement for these expensive cakes so as to reduce production cost of meat and eggs. Among these alternative vegetable proteins is lablab purpureus beans. However most farmers would prefer to feed raw *Lablab purpureus* beans to chickens in order to eliminate the cost of heating and other handling costs. This has not been the case because it has been known that proteins in raw legumes have a low nutritive value due to some anti-nutritional factors, which hinder the effective breakdown and utilization of their stored protein by monogastrics (Ani and Okeke, 2003; Etuk, 2001; Balogun *et al*., 2001). Cooking improves the nutritive value and brings the value close to that of meat and milk products by destroying most of the anti-nutritional factors such as trypsin inhibitors, haemagglutinins, lectins, phytic acid, goitrogens etc which cause poor growth and other poor results obtained when raw legume seed diets are fed to monogastrics (Kaankuka *et al*., 2000; Amaefule and Obioha, 2001; Bawa *et al*., 2003a). However for how long should lablab beans be cooked before it can be properly utilized by chickens has not been determined. This is important because over cooking or under cooking can result into some problems of utilization by poultry birds. The objective of this study therefore is to determine the effect of duration of cooking of lablab purpureus beans on the performance, organ weight and haematological parameters of Shika brown pullet chicks.

MATERIALS AND METHODS

This study was carried out at the poultry research unit of the National Animal Production Research Institute (NAPRI), Ahmadu Bello University, Shika, Zaria, Nigeria, from March to May 2003. Shika is geographically located between latitude 11° 12'N and longitude 7° 33'E at an altitude of 640 M above sea level (Akpa *et al*., 2002). Shika is located about 20 km along the Zaria Sokoto road in

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Kaduna state, North Western Nigeria. It has three distinct climatic seasons. These are the cold dry season (November-February), the hot dry season (March-May) and the wet season (June-October). The total annual rainfall ranges from 617 to 1365 mm with a 50 year average of 1041 mm Most of the rains fall between July and September (Bawa *et al*., 2003b).

The *Lablab purpureus* beans used for this experiment is the Rongai variety. It is milky white in colour. They were obtained from the Sabon-gari market in Zaria, Nigeria. The heating duration to properly process lablab beans was determined. For this, 25 kg lablab bean samples were subjected to various cooking duration of 0, 10, 20, 30, 40, 50 and 60 min.

For each cooking time, 50 L of water was first brought to boiling in a 200 L metal drum container. The 25 kg bag of lablab bean was then poured into the boiling water. From this point, the specified time of cooking was taken. At the end of the period of cooking, the excess water was drained off and the cooked beans were sun dried for 3 days before milling. After sun-drying chemical evaluation of the processed lablab beans was done. Each duration of cooking represented a treatment (T 1-7).

Eight isonitrogenous (19.60% C.P) and isocaloric (aprox. 2713 kcal kg^{-1}) diets were formulated. Diets 1-7 contained lablab seed at 50% of the diets. Diet 8, which served, as the control was a standard soybean-groundnut cake-maize based chick diet. The main difference between diets one to seven is the variation in the duration of cooking of the lablab seeds used. Each of diets 1-8 constituted a treatment and each of them was replicated three times. There were 25-day-old chicks per replicate. The birds were reared under the deep litter system. The initial weights of the day-old-chicks were taken and thereafter the birds were weighed weekly for the eight weeks the experiment lasted. Feed and water were given ad libitum throughout the experimental period. Feed consumption was recorded weekly while mortality was recorded as they occurred. From the primary data collected, other data were generated for feed efficiency, feed cost, weight gain and percent mortality.

At the end of the 8th week of the feeding trial, six birds per replicate were bled for the evaluation of the blood parameters. Also three birds representing the average weight of the replicate group were selected, starved of feed but given water overnight to empty the gut contents. The birds were then weighed and slaughtered. Data collected include weights of the liver, the heart, the spleen, the kidney and the pancreas. Blood samples were collected and analysed for Packed-Cell Volume (PCV), Total Protein (TP) and Haemoglobin (Hb). All data were subjected to the analysis of variance and differences between treatment means were separated using the Duncan's Multiple Range test (Steel and Torrie, 1980).

RESULTS

The results obtained for the chemical analysis of the lablab seeds (Table 1) indicate that the seed is fairly high in crude protein (23.29%), ether extract (9.13%), calcium (1.32%) and Ash (3.85%), which can be harnessed for poultry ration formulation. Table 2 shows the composition of experimental diets.

Table 3 shows that the duration of cooking had significant ($p<0.05$) effect on average final weight (g/bird), weight gain (g/bird), feed consumption (g/bird), feed conversion efficiency, percent mortality and feed cost (#/bird) while total cost (#/bird) were not significantly ($p>0.05$) affected by the duration of cooking. However treatment 4 (lablab cooked for 30 min) gave the best result in almost all the above parameters measured.

It was observed that the duration of cooking lablab beans had significant ($p<0.05$) effects on the liver, the heart, the spleen, the pancreas and the kidney but had no significant effects ($p>0.05$) on the blood parameters such as the PCV, total protein and heamoglobin (Table 4).

The values for the PCV (%) the TP and the Hb (%) were not significantly different ($p>0.05$). However it was observed that these values were higher for the control and for the properly cooked lablab seed diets (T 3 to T 7) than the value obtained for the raw lablab seed diets (T 1).

DISCUSSION

The result obtained for the performance of the birds agrees with the work of Ogundipe *et al.* (2003) and Agbede and Aletor (2001) who reported that broiler chicks fed boiled lablab purpureus beans performed better than those fed the raw lablab beans diets. Omeje (1999) reported that cooking of legumes seeds for about 30 min results in the destruction of their antinutritional factors such as trypsin inhibitor, haemagglutinins, phytic acid, lectins and goitrogen and hence improved their nutrient availability for better performance in poultry.

Table 1: Chemical composition of *Lablab purpureus* beans

Dry matter (%)	95.97
Crude protein (%)	23.29
Crude fibre (%)	11.19
Ether extract (%)	9.13
Ash (%)	3.85
Calcium (%)	1.32
Total phosphorus (%)	0.11

These are average values of three determinations from all the cooking durations

Table 2: Composition of diets fed to determine the effect of duration of cooking *Lablab purpureus* beans on its utilization by chick (0-8 weeks)

	1	2	3	4	5	6	7	8
	(Duration of cooking of *Lablab purpureus* beans in min)							
Ingredients	0	10	20	30	40	50	60	Control
Maize	30.90	30.80	30.74	30.66	30.49	30.37	30.25	49.90
Lablab	50.00	50.00	50.00	50.00	50.00	50.00	50.00	-
Soyacake	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
Groundnut cake	4.00	4.10	4.16	4.23	4.41	4.53	4.65	22.00
Wheat offal	5.00	5.00	5.00	5.00	5.00	5.00	5.00	18.00
Limestone	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Bonemeal	2.50	2.50	2.50	2.50	2.50	2.50	2.50	2.50
Salt	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Premix	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Total	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Calculated analysis								
CP (%)	19.60	19.60	19.60	19.60	19.60	19.60	19.60	19.60
ME kcal/kg	2715	2715	2714	2714	2713	2712	2712	2712
CF (%)	5.30	5.30	5.26	5.25	5.23	5.21	5.19	5.10
Calcium (%)	1.11	1.11	1.11	1.12	1.12	1.12	1.12	1.13
Avail. P (%)	0.85	0.85	0.85	0.86	0.86	0.86	0.86	0.90
Lysine (%)	0.63	0.63	0.63	0.64	0.64	0.64	0.65	0.86
Methionine (%)	0.31	0.31	0.31	0.32	0.32	0.33	0.33	0.41
Cystine (%)	0.33	0.33	0.34	0.34	0.34	0.35	0.35	0.43
Methionine Cystine	0.64	0.64	0.65	0.66	0.66	0.68	0.68	0.84
Feed cost(N/kg feed)	28.60	28.72	28.94	29.06	29.28	29.40	29.52	30.25

Optimix chick premix supplied the following per kg diet: Vit.A, 32000 i.u, Vit.D36,000 i.u, Vit.E, 28 mg, Niacin 600 mg, Vit.B1, 8 mg, Vit.B2, 10 mg, Vit.B6, 8 mg, Vit.B12, 0.04 mg, Vit. K, 6 mg, Pantothenic acid,22 mg, Folic acid,2 mg, Choline chloride, 700 mg, Cobalt 0.8 mg, Copper 12 mg, Iodine 4 mg, Iron 84 mg, Manganese 160 mg, Selenium 0.8 mg, Zinc 124 mg

Table 3: Effect of duration of cooking of *Lablab purpureus* beans on the performance of pullet chicks (0-8 weeks)

Parameters	T1 0.0M	T2 10.0M	T3 20.0M	T4 30.0M	T5 40.0M	T6 50.0M	T7 60.0M	T8 Control	SEM
Initial weight (g/bird)	30.4	31.87	30.8	31.47	31.07	31.07	31.47	31.2	0.5416
Final weight (g/bird)	138.77^{c}	185.22^{b}	251.72^{a}	266.62^{a}	261.20^{a}	257.47^{a}	257.37^{a}	273.73^{a}	22.5778
Weight gain (g/bird)	108.37^{c}	153.35^{b}	220.92^{a}	235.15^{a}	230.13^{a}	226.40^{a}	225.9^{a}	242.53^{a}	22.6747
Feed consumption (g/bird)	726.33^{c}	833.0^{b}	1069.0^{a}	1078.67^{a}	1130.67^{a}	1044.33^{a}	1066.67^{a}	1071.67^{a}	69.69
FCE	0.15^{c}	0.18^{b}	0.21^{a}	0.22^{a}	0.21^{a}	0.21^{a}	0.21^{a}	0.23^{a}	0.0173
Mortality (%)	16^{a}	9.33^{b}	4.0^{d}	6.67^{c}	6.67^{c}	1.33^{e}	1.33e	1.33e	0.5361
Feed cost (N/bird)	32.66^{b}	32.99^{b}	33.35^{b}	33.65^{b}	35.28^{a}	35.58^{a}	35.68^{a}	36.12^{a}	0.6123
Total cost (N/bird)	138.48	141.81	149.17	149.47	151.10	148.40	149.10	147.94	20.4142

FCE: Feed conversion efficiency, SEM: Standard error of the means, M: Minutes, T = Treatment, N = Naira is Nigeria currency

Table 4: Effect of duration of cooking of *Lablab purpureus* beans on organ weights and blood parameters of chicks

	Time (min)								
Parameters	TI 0	T2 10	T3 20	T4 30	T5 40	T6 50	T7 60	T8 Control	SEM
Liver (%L.W)	3.61a	3.16b	3.11b	2.64c	2.59c	2.58c	2.58c	2.17d	0.3208
Heart (%L.W).	0.757a	0.647ab	0.657ab	0.582b	0.560b	0.597b	0.570b	0.595b	0.0814
Spleen (%L.W)	0.143b	0.137b	0.192ab	0.155b	0.230a	0.203a	0.195ab	0.198ab	0.0508
Pancreas (%LW)	0.595a	0.487ab	0.407bc	0.313c	0.370bc	0.337c	0.353c	0.307c	0.0978
Kidney (%L.W)	0.758abc	0.827ab	0.877a	0.672bc	0.658bc	0.662bc	0.735abc	0.627c	0.1344
PCV (%)	17.283	17.750	19.367	20.283	20.183	19.633	19.383	20.367	3.6946
T.P (g/dl)	4.567	4.667	4.883	5.190	5.267	4.933	4.500	5.333	0.9088
Hb (%)	5.767	6.200	6.703	6.750	6.745	6.517	6.450	6.850	1.2180

Means with different letter superscripts are significantly ($p<0.05$) different from each other; SEM: Standard error of the means. LW : Liveweight

Amaefule and Obioha (2001), reported better performance in broilers fed boiled pigeon pea seed meal based diets as compared to diets containing the raw meal. Kaankuka *et al*. (2000) reported that cooking soybean seed for about 30 min improved the performance of weaner pigs better than cooking for lesser time periods. The author also reported that moist cooking of soybeans gave better performance in broilers than other methods of processing. The author also reported that over cooking legume seed beyond 30 min might result in the destruction of their protein content. This may have been responsible for the decline in performance of the chicks observed in this study as the cooking duration increased beyond 30 min.

For the organ weights, it was observed that the raw lablab diet (T 1) resulted in enlarged liver, heart and the pancreas. The enlargement of these organs could be due to increased metabolic activities, especially for the liver and the pancreas in their attempts to make-up for reduced availability of proteins from the raw lablab beans as a result of the presence of anti-nutritional factors. These organs may also have been over tasked in their attempt to detoxify the antinutritional factors present in the raw seeds resulting in their enlargement. The pancreas tends to enlarge as its activity increases in the production of proteolytic enzymes (Omeje, 1999; Amaefule and Obioha 2001). The weights of the liver, heart and pancreas decreased with increase in the duration of cooking which suggests that lablab seeds should be well cooked for it to be properly utilized without posing any danger to the health status of chicks.

The values obtained for the PCV (%) the TP and the Hb (%) agreed with the report of Bawa *et al.* (2003b) who discovered better haematological parameters in piglets fed lablab beans cooked for 30 min as opposed to poor parameters obtained from piglets fed diets containing the raw sample. According to the results, cooking the lablab beans reduced the antinutritional factors thereby making the piglets to effectively utilize the nutrient contained in the beans. This could have been the case with the better PCV, TP and Hb obtained as the cooking duration increased. This indicates that the blood nutrient profile and hence the health status of the birds should be expected to be better for the properly cooked lablab diets.

CONCLUSIONS

It was observed from the result of this study that the optimum cooking time for lablab seeds meant for chick starter diets is about 30 min. This observation is also supported by many reports in the literature, which generally recommend about 30 min cooking for proper processing of legume seeds for monogastric ration. It can also be observed from this study that when *Lablab purpureus* beans are not properly cooked, the anti-nutritional factors, which hinder the proper digestion and utilization of the beans, are not properly destroyed. As a result, there may be increased activities of the vital organs such as the liver and the pancreas, which are involved in protein metabolism, thereby causing the hypertrophy of these organs.

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