

**PERFORMANCE, BLOOD CHEMISTRY AND CARCASS QUALITY
ATTRIBUTES OF RABBITS FED RAW AND PROCESSED
PUERARIA SEED MEAL**

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Target Audience: Rabbit farmers, feed producers, nutritional biochemists,
extension workers.

ABSTRACT

This study assessed the effects of inclusion of raw, toasted and cooked (boiling) *Pueraria* seed meals at 20 % in the ration of rabbits on performance, blood variables and carcass quality attributes in an eight week feeding trial. Raw *Pueraria* seed meal contained 30.63 % crude protein, 7 % crude fibre, 10 % ether extract, 6 % ash and 40.26 % nitrogen free extract. Toasting and cooking processes had no significant effect on the proximate composition except for the fact content. Feed intake, weight gain and feed : gain ratio of rabbits fed 20 % cooked *Pueraria* seed meal were similar to the control group. But they differed significantly from rabbits placed on diets with 20 % raw or toasted *Pueraria* seed meal. Lower ($P < 0.05$) serum urea and creatinine, higher ($P < 0.05$) serum total protein, red blood cell (RBC), packed cell volume (PCV), haemoglobin (Hb), dressing percentage and carcass weight obtained in rabbits fed diet with 20 % cooked (boiled) *Pueraria* seed meal confirmed the superiority of this diet over those with 20 % raw and toasted *Pueraria* seed meal. Cooking (boiling) of *Pueraria* seed improved the palatability and efficiency of nutrient utilization of the seed meal.

Key words: *Pueraria* seed meal, rabbit, performance, blood constituents, carcass quality.

DESCRIPTION OF PROBLEM

Rabbit production has a lot of potentials as one of the means of providing high quality animal protein at an affordable price in a developing country like Nigeria. Rabbit rearing is becoming very popular in Nigeria. They are known to be very prolific with rapid turn-over rate and high efficiency of transforming feeds into muscle. However, the escalating prices of pellets and concentrates for feeding rabbits in Nigeria constitute considerable constraints on the expansion of commercial rabbit production. Thus, there has been increasing research effort focused on the utilization of alternative cheap feed resources (1, 2, 3, 4).

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Of recent, agro-industrial by-products, particularly those from food processing residues have been tried as replacements for the traditional cereal grains in rabbit pellets (5, 6). But apart from by-products of conventional feeds, there is inexhaustible list of unconventional feed materials that are available in this country, some of which are yet to be exploited such as *Pueraria phaseoloides*. *Pueraria phaseoloides* is a leguminous seed that could be exploited as a protein source in livestock feed. However, there is the possibility of it containing some antinutritional factors most of which have been shown to be heat labile (7) *Pueraria* seed meal is a rich source of protein (31% crude protein). The plant has a short gestation period and thrives well in gullies, road side and in areas destroyed by sheet erosion. It can do well on land abandoned for its low fertility and requires simple and cheap agronomic practices (7). This study was therefore designed to evaluate the performance, blood constituents and carcass quality of tropical strain of rabbits fed raw and processed (toasting and boiling) *Pueraria* seed meal.

MATERIALS AND METHOD

About 30 kg of raw *Pueraria phaseoloides* seeds were collected from Teaching and Research farm, University of Ilorin. The seeds were submitted to the following processes:

Toasting 10kg raw *Pueraria* seeds were toasted at 100°C for 30 minutes by constant stirring in an open pan containing sand. At the end of toasting, samples were sieved from sand and allowed to cool.

Cooking - 10 kg raw seeds were cooked with water in a large water bath at a temperature of 100°C for one hour. The boiled seeds were oven dried at a temperature of 60°C for eighteen hours. The samples from the two processes above and the raw form were separately milled in the hammer mill before incorporation into the diets. Four experimental diets which consist of control (no *Pueraria*) and 20 % raw, toasted or cooked *Pueraria* seed meal were formulated (Table 1).

Thirty six New Zealand White rabbits (5-6 weeks, 342.5g average weight) were randomly allocated to the diets such that each diet was fed to nine rabbits (three rabbits per replicate group of 3) for a period of 8 weeks. The diets and water were supplied *ad libitum* and routine management practices were ensured.

Performance and Blood Constituents

Average feed intake as well as live weights gained were monitored weekly for each replicate and feed:gain ratio was then calculated from the data obtained. Mortality was equally monitored during the 8 week trial period.

At the end of the 8 week experimental period, duplicate blood samples were taken by jugular vein puncture of 3 rabbits selected at random from each dietary treatment: a sample for haematological test was mixed thoroughly with the anticoagulant ethylenediamine-tetraacetic acid (1.5mg ml⁻¹ blood)

and a sample was separated into serum for constituent analysis. All rabbits from which the blood had been collected were subsequently slaughtered by severing the carotid arteries and jugular veins.

Chemical Analysis

Proximate analysis were determined according to AOAC (8) methods. Red blood cell (RBC) count, haemoglobin (Hb) and packed cell volume (PVC) were determined on the fresh whole blood following standard haematological techniques (9). Serum total protein was determined using biuret reagent (10), serum urea by the diacetyl monoxime method of Crooker (11) and creatine by the procedure of Scott (12).

Table 1. Percentage composition of experimental diets and proximate composition of pueraria seed meal.

Diets	I	II	III	IV
	Control	Raw	Toasted	Cooked
Basal ingredients*	32.00	32.00	32.00	32.00
Maize	49.20	35.00	35.00	35.00
Soybean meal	18.80	13.00	13.00	13.00
Pueraria seed meal	0.00	20.00	20.00	20.00
Chemical Composition (DM basis)				
Crude protein	18.50	17.93	17.71	17.65
Crude fibre	8.20	9.00	8.90	8.60
Ether extract	3.67	4.10	3.11	2.98
Ash	9.03	8.40	8.25	7.53
Proximate Composition of Pueraria seed Meal				
Dry matter (%)		93.89	94.86	93.54
Crude Protein (%)		30.63	31.06	30.22
Crude Fibre (%)		7.00	7.50	7.50
Ether extract (%)		10.00 ^b	6.00 ^a	5.30 ^a
Ash (%)		6.00	6.00	4.50
Nitrogen free extract(%)		40.26	44.30	46.02

* Basal ingredients are made up of 30% maize milling waste 1.0% oyster shell, 0.5% bone meal, 0.25% Vit/premix and 0.25% salt (common salt)

Carcass Evaluation:

Rabbits from each diet were slaughtered through the conventional method and dressed by removing the head at the level of the atlas vertebra. The feet were cut at the carpal joint and between the tibia and calcaneous joint for the fore and hind feet respectively. The tail was removed close to the base before removing the pelt. All the external offal weights were determined and expressed as a proportion of live weight. The rabbits were then eviscerated and the internal organ weights determined individually and expressed as a

proportion of dressed carcass weight. Visible fats were removed at three different locations (inguinal, interscapular and perirenal) and the weights were determined individually. The carcass length and width of loin were determined as described by Lukefhar *et al* (13) before the rabbits were cut into primal parts. Legs, shoulder, loin and rack were determined as described by Awosanya. (14) All weights were expressed as a percentage of dressed carcass weight.

Data were analysed using the complete randomised design and the treatment means were compared using Duncan multiple range test (15).

RESULTS AND DISCUSSION

Percentage composition of experimental diets and proximate composition of *Pueraria* seed meal are shown in Table 1. *Pueraria* seed meal contained about 31 % protein. The processing techniques had no significant effect on the proximate chemical composition except the fat content.

Table 2 shows the performance and blood constituents of rabbits fed raw and processed *Pueraria* seed meal. The average daily feed intake, live weight gain, and feed: gain ratio of rabbits fed the control diet and the diet with 20 % cooked *Pueraria* seed meal were not significantly different from each other. But they were significantly different ($P < 0.05$) from those rabbits on diets with 20 % raw and toasted *Pueraria* seed meals which were not significantly different from each other. The improvement in the performance of rabbits fed diet with cooked *Pueraria* seed meal could be that boiling improved the palatability of the diet by eluting the water soluble polyphenols and possibly other antinutritional substances as observed in previous studies (2, 16). There is also an indication that wet cooking (boiling) is more effective than dry cooking (toasting) in eliminating some of the possible antinutritional substances, probably because of the eluting property of boiled water. Mortality rates observed in all the treatments were similar and normal, an indication that the *Pueraria* seed meals were not detrimental to the well being of the rabbits.

There was no significant difference between serum urea level of rabbits placed on control diet and diet with 20 % cooked *Pueraria* seed meal. There was also no significant difference between the serum urea level of rabbits placed on diets that contained 20 % raw and 20 % toasted *Pueraria* seed meal. However, there was a significant difference ($P < 0.05$) between the serum urea level of rabbits placed on control diet and the diet with 20 % cooked *Pueraria* seed meal on one hand and diets with 20 % raw and 20 % toasted *Pueraria* seed meal on the other hand. The same trend was observed for serum total protein, creatinine, and haemoglobin (Table 2). The high serum urea level observed in rabbits placed on diets with 20 % raw and 20 % toasted *Pueraria* seed meal may be attributed to poor dietary protein utilization which is corroborated by the low ($P < 0.05$) serum total protein observed in

this group of rabbits. It has been observed that the serum urea, total protein and creatinine content depend on both the quality and the quantity of the protein supplied in the diet (17, 18, 19). A very high negative correlation between the biological value (BV) of the feed and the blood urea content was observed by Eggum (17). A major source of excess creatinine in blood of animals is when muscle wasting occurs and creatinine phosphate is catabolised (20). Reduction in red blood cell, haemoglobin and packed cell volume values could possibly be due to inadequate intake of nutrients resulting from reduced feed consumption by the rabbits given these diets (21).

Carcass characteristics of experimental rabbits are shown in Table 3. There was no significant difference between rabbits placed on control diet and diet with 20 % cooked *Pueraria* seed meal in all the carcass parameters

Table 2. Performance and blood constituents of rabbits fed diets containing raw and processed pueraria seed meal.

	Treatments			
	Control	Raw	Toasted	Cooked
Average daily fed intake(g)	40.82 ^a	33.64 ^b	35.89 ^b	38.42 ^a
Average daily live weight gain (g)	10.60 ^a	7.84 ^b	8.69 ^b	9.73 ^a
Feed: Gain ratio	3.85 ^a	4.29 ^b	4.13 ^a	3.95 ^a
Mortality %	0	0	0	0
Blood Constituents:				
Serum urea (mmol L ⁻¹)	5.75 ^b	6.65 ^a	6.65 ^a	5.85 ^b
Serum total protein (g L ⁻¹)	65.00 ^a	55.00 ^b	59.00 ^b	63.00 ^a
Serum creatinine (μ mol L ⁻¹)	70.00 ^b	88.00	82.00 ^a	73.00 ^b
Red blood cell ($\times 10^{12}$ L ⁻¹)	5.66 ^a	5.09 ^b	5.22 ^b	5.64 ^a
Packed cell volume (%)	35.5 ^a	27.0 ^b	31.5 ^b	34.0 ^a
Haemoglobin/(%)	55.5 ^a	47.00 ^b	53.0 ^b	55.5 ^a

Mean swithin the same raw carrying the same superscript indicates no significant difference. (P>0.05)

evaluated. There was also no significant difference in all the parameters between rabbits placed on diets that contained 20 % raw and 20 % toasted *Pueraria* seed meal. But there were significant differences (P < 0.05) in dressing out percentage, carcass, liver, kidney, heart, inguinal fat and interscapular fat weights of rabbits placed on control diet and the diet with 20 % cooked *Pueraria* seed meal on one hand and the diet with 20 % raw and 20 % toasted *Pueraria* seed meal on the other hand. The insignificant difference observed in carcass quality attributes of rabbits fed control diet and the diet with 20 % cooked *Pueraria* seed meal further confirmed the fact that cooking (boiling) improved the efficiency of nutrient utilization of the seed meal in the diet. The increase in weight of liver and reduction in kidney and heart weights of rabbits fed diets with 20 % raw and 20 % toasted *Pueraria* seed meal indicate the presence of certain toxic substances (21) in the unprocessed or toasted *Pueraria* seed meal.

Table 3. Carcass characteristics of experimental rabbits.

Parameter	Control	Raw	Toasted	Cooked
Dressing out percentage (%)	45.87 ^a	38.47 ^b	39.28 ^b	45.15 ^a
Carcass weight (kg)	0.423 ^a	0.249 ^b	0.233 ^b	0.395 ^a
Length of Carcass (cm)	22.20	21.88	21.27	22.18
Shoulder weight (%)	24.95	25.38	25.52	25.38
Ribs weight (%)	13.18	11.74	12.07	12.33
Loin weight (%)	22.76	19.09	20.42	21.75
Legs weight (%)	39.77	41.34	41.40	40.44
Head weight (%)	10.20	11.83	12.11	10.25
Skin (pelt) weight (%)	8.20	5.34	5.87	6.71
Hind and Fore limb (%)	2.96	3.03	3.30	2.87
Lung weight (%)	7.24	8.20	7.61	8.27
Liver weight (%)	2.40 ^b	3.77 ^a	3.21 ^a	2.64 ^b
Kidney weight	0.83 ^a	0.59 ^b	0.63 ^b	0.80 ^a
Heart weight (%)	0.16 ^a	0.13 ^b	0.14 ^b	0.17 ^a
Intestine full content weight (%)	32.19	29.86	30.29	30.75
Perirenal fat weight (%)	0.30	0.23	0.26	0.22
Inguinal fat weight (%)	0.33 ^a	0.02 ^b	0.02 ^b	0.26 ^a
Interscapular fat weight (%)	0.13 ^a	0.02 ^b	0.02 ^b	0.12 ^a

CONCLUSIONS AND APPLICATIONS

1. This study has shown that cooking (boiling) of *Pueraria* seed improved the palatability and efficiency of nutrient utilization of the seed meal.
2. Considering the rabbits' performance and carcass quality results obtained in this study, it appears that up to 20 % of cooked *Pueraria* seed meal can be incorporated into rabbits diets without deleterious effect on the animals.
3. In terms of cost, the replacement of 5.80 % soyabean meal and 14.2 % maize with cooked *Pueraria* seed meal will go a long way in reducing the cost of production of rabbit ration. In any case, *Pueraria* seeds are considered as waste (a non-conventional and non competing feed source) in Nigeria.

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