

Effects of processed *Mucuna pruriens* (var *cochinchensis*) beans on carcass characteristics of broiler chicken

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Abstract

The study was conducted to assess the carcass characteristics of broiler chicken fed with processed *Mucuna* beans at 25 % and 30 % inclusion levels. *Mucuna* beans (*Mucuna pruriens*) were processed by two methods; soaked before dehulling (SD) and dehulled before soaking (DS). Ninety six seven-week old birds comprising of 48 females and 48 males were used for the experiment.

No significances ($P > 0.05$) were found among the live weight, bled, feather, feet, head, intestines, and carcass weights on treatment diets. However, birds fed with 30 % *mucuna* beans meal had significant heavier ($P < 0.05$) gizzard. Similarly, no significant differences were found among the weights of the primal cuttings (including bone and boneless meat) of birds. The inclusion of 25 % and 30 % *mucuna* beans meal had no influence on chicken flavor, colour, juiciness and tenderness of the broiler chicken.

Processed *mucuna* beans meal can be used by farmers to substitute some percentage of fish and soybean meal without adverse effect on carcass characteristics, primal cuttings and eating quality of the broiler breast and thigh.

Key words: Carcass characteristics, primal cuttings, processed mucuna beans

Introduction

The chemical composition of feed ingredients could have a significant influence on the carcass characteristics and eating quality. *Mucuna pruriens* is a tropical legume that has a nutritional quality comparable to soybeans and other conventional legumes as it contains similar proportions of protein, lipid, minerals, and other nutrients. Although *Mucuna pruriens* contains anti-nutritional/physiological compounds such as L-Dopa, phenolics, tannins, lectins and protease inhibitors, which may reduce nutrient utilization (Pugalenthi et al 2005), processing methods such as soaking, dehulling, boiling, drying and roasting can reduce the deleterious effects of these antinutritional/physiological compounds. *Mucuna* could also help to reduce cost of animal feed by replacing the cake in poultry diet or as alternative feed during periods of scarcity (Iyayi and Taiwo 2002).

Various authors have shown that mucuna seed is a promising plant protein source in poultry diet (Del Carmen et al 1999; Udedibie et al 2001, Iyayi and Taiwo 2002; Enenalom 2004; Dei et al 2010). However, there is inadequate information on the quality of broiler carcass when fed with mucuna seeds as protein supplement. This study, therefore, was undertaken to evaluate the

carcass characteristics of broiler chicken when fed with processed mucuna beans.

Materials and methods

The experiment was conducted at the poultry section of Department of Animal Science and the Meat Limited of the University for Development Studies. A total of 96 seven-week broiler chickens comprising of 48 males and 48 females were used. Out of the 96 broiler chickens used for the experiment, 32 birds were fed with control (Diet A, no mucuna beans) while the remaining 64 birds were fed with diets containing processed mucuna beans at 25 % (Diet B) and 30 % (Diet C) inclusion levels. In diet B processed mucuna replaced 12 % maize, 2 % fish meal, 6 % soybean meal, 5 % wheat bran and in diet C mucuna replaced 12 % maize, 2 % fish meal, 8 % soybean meal and 8 % wheat bran.

Individual birds were weighed and slaughtered by ventral neck cut to sever the blood vessels to exsanguinate them. They were bled thoroughly, weighed, defeathered, eviscerated and weighed again to obtain empty carcass weight. Feathers were collected from individual slaughtered birds, dried and weighed. The weights of the gizzard, intestines, feet, head, and primal cuts were also taken. The weights of bones and boneless meat from cuttings such as wings, thigh, back, drumstick and breast of the halved carcasses were taken after they have been deboned.

The thighs and breast were used for sensory analysis to determine the effect of mucuna beans on eating quality using a five-point category scale. The thighs and breast were thawed and grilled in Turbofan, oven (Blue seal, UK) to a core temperature of 70 °C. The grilled thighs and breast were sliced into sizes of 2 cm³ and wrapped with coded aluminum foil for sensory evaluation. Nine trained panelists were served with sliced coded thigh and breast samples and a piece of bread was used as a neutralizer between tests.

The data obtained was analyzed using the General Linear Model (GLM) analysis of variance (ANOVA) of Minitab version 15.0.

Results and discussion

Effects of processed mucuna beans used as feed ingredient on broiler carcass

Inclusion levels had no significant effect ($P > 0.05$) on the live weight, bled, feather, feet, head, intestine and carcass weights of the birds (Table 1), although birds fed with 25 % mucuna beans

had slightly heavier live, bled and intestines weight than those fed on the control and 30 % mucuna diets.

Table 1. Effect of inclusion levels of processed mucuna beans used as feed ingredient on broiler carcass characteristics

Parameters	Inclusion levels of Mucuna			SEM	P
	0%	25%	30%		
Live	1.62	1.65	1.60	3.20	0.61
Bled	1.58	1.60	1.55	3.10	0.63
Feather	0.06	0.06	0.06	0.12	0.55
Feet	0.07	0.07	0.07	0.14	0.71
Head	0.05	0.05	0.05	0.10	0.88
Gizzard	0.03 ^a	0.04 ^b	0.07 ^b	0.04	0.03
Intestine	0.14	0.17	0.15	0.30	0.42
Carcass	1.15	1.13	1.12	2.24	0.85

^{a,b,c} Values on the same row with different superscripts differ at $P < 0.05$, SEM: Standard error of mean, P: Probability

Birds fed the control diets had slightly heavier carcass (1.15 kg) weights than those fed on 25 % (1.13 kg) and 30 % (1.12 %) processed mucuna beans meal. The result implies that processed mucuna beans at 25 % and 30 % inclusion levels have no negative effects on carcass characteristics; thus mucuna beans (dehulled and soaked) can be used as a substitute to replace some percentage of fish meal or soybean meal. However, birds fed with 30 % mucuna beans meal had significantly heavier ($P < 0.05$) gizzard (0.07 kg) than those fed with control (0.03 kg). This may reflect the extra muscular or secretory work required to process mucuna beans, which are higher in fibre. Carew and Lawery (1998) and Tuluen et al (2008) observed 35 % increase in gizzards of broilers fed 20 % raw velvet beans compared to 5 % and 10 % inclusion levels.

Processing methods (Dehulled Soaked (DS) and Soaked Dehulled (SD)), had no significant influence ($P > 0.05$) on the parameters recorded (Table 2), although birds fed with DS diet had slightly heavier live weight (1.66 kg), bled weight (1.62 kg) and carcass weights (1.15 kg) than those fed with SD diet (1.58 kg, 1.54 kg and 1.12 kg, respectively). In addition, no significant differences ($P > 0.05$) were found among inclusion levels and processing methods for the thighs, drumsticks, back, shanks, wings of birds and bones/boneless meat.

Table 2. Effect of processing methods of mucuna beans used as feed ingredient on broiler carcass characteristics

Parameters	Processing methods		SEM	P
	DS	SD		
Live	1.66	1.58	3.16	0.06
Bled	1.62	1.54	3.08	0.08
Feather	0.06	0.06	0.12	0.54
Feet	0.07	0.05	0.10	0.45
Head	0.05	0.05	0.10	0.50
Gizzard	0.05	0.04	0.08	0.43
Intestine	0.15	0.15	0.30	0.97

Carcass	1.15	1.12	2.24	0.50
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DS: mucuna beans dehulled before soaking, SD: mucuna beans soaked before dehulling, SEM: Standard error of mean, P: Probability

The non- significant differences observed among the primal cuts were reflections of the similar carcass weights. Also, the processing methods employed (DS and SD) had similar effects on the utilization of mucuna beans by broiler chickens.

Effects of processed mucuna beans as feed ingredient on the eating quality of the broiler breast and thigh

No significant differences ($P > 0.05$) were found in the chicken flavour, colour tenderness, juiciness, flavour liking and overall liking in the broiler breasts and thighs of birds that were fed with various levels of mucuna and the control meal (Tables 3 and 4).

Table 3. Effect of inclusion levels of processed mucuna used as feed ingredient on the eating quality of the broiler breast

Parameters	Inclusion levels of mucuna			SEM	P
	0%	25%	30%		
Weight, Kg	1.83	2.06	1.67	0.04	0.22
Chicken flavour	1.83	2.06	1.67	0.04	0.22
Colour	2.00	2.06	1.89	0.28	0.26
Tenderness	1.44	1.83	1.50	0.50	0.07
Juiciness	2.50	2.61	2.28	0.64	0.57
Flavour liking	2.28	2.22	2.00	0.52	0.54
Over liking	2.28	2.33	1.83	0.60	0.19

SEM: Standard error of mean, P: Probability

Table 4. Effect of inclusion levels of processed mucuna beans used as feed ingredient on the eating quality of the broiler thigh

Parameters	Inclusion levels of Mucuna			SEM	P
	0%	25%	30%		
Weight, Kg	1.83	1.94	1.78	0.32	0.67
Chicken flavour	1.83	1.94	1.78	0.32	0.67
Colour	1.94	2	2.06	0.26	0.68
Tenderness	1.56	1.56	1.67	0.36	0.76
Juiciness	1.78	1.72	1.89	0.4	0.86
Flavour liking	1.94	2	1.83	0.66	0.94
Over liking	1.67	2	1.65	0.54	0.47

SEM: Standard error of mean, P: Probability

Similarly, methods of processing mucuna beans had no significant influence ($P > 0.05$) on chicken flavour, colour tenderness, juiciness, flavour liking and overall liking in the broiler breasts and thighs of birds that were fed with various levels of mucuna meal (Tables 5 and 6).

Table 5. Effect of processing methods of mucuna beans used as feed ingredient on the eating quality of the broiler breast

Parameters	Processing methods		SEM	P
	DS	SD		
Weight, Kg				
Chicken flavour	1.89	1.82	3.64	0.68
Colour	1.93	2.04	4.08	0.19
Tenderness	1.56	1.63	3.26	0.61
Juiciness	2.41	2.52	5.04	0.67
Flavour liking	2.04	2.30	4.6	0.23
Over liking	1.96	2.33	4.66	0.13

DS: mucuna beans dehulled before soaking, SD: mucuna beans soaked before dehulling, SEM: Standard error of mean, P: Probability

Table 6. Effect of processing methods of mucuna beans used as feed ingredient on the eating quality of the broiler thigh

Parameters	Processing methods		SEM	P
	DS	SD		
Weight, Kg				
Chicken flavour	1.74	1.96	0.38	0.16
Colour	1.93	2.07	0.2	0.16
Tenderness	1.63	1.41	0.28	0.13
Juiciness	1.82	1.63	0.32	0.26
Flavour liking	1.93	1.96	0.54	0.89
Over liking	1.74	1.93	0.44	0.41

DS: mucuna beans dehulled before soaking, SD: mucuna beans soaked before dehulling, SEM: Standard error of mean, P: Probability

Thus the inclusion of mucuna in the diet of broiler birds and processing methods used did not change the chicken flavour, colour, juiciness, tenderness, flavour liking and the overall acceptability of the product. This may be due to the insignificant influence of the processing methods on the fatty acid composition in the diet of broiler chicken (Wood et al 1995).

Conclusion and recommendation

- Processed mucuna beans at an inclusion level of 25 % and 30 % had no effect on live weight, bled, feet, head, intestine, carcass, bones/boneless weight and primal cuttings.
- Broilers could be fed with mucuna beans at these inclusion levels without any adverse effect on eating qualities of broiler.

- The thighs and breasts of birds fed with 25 % mucuna beans meal were preferred by consumers. It is recommended that processed mucuna beans could be used by farmers to substitute some percentage of fish meal and soybean meal since it has no negative effect on the carcass characteristics, primal cuttings and eating quality of broiler thigh and breast.

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