

**EFFECT OF PROCESSING ON METABOLIZABILITY OF
ENERGY AND PROTEIN CONTENT OF
SWORDBEAN (*Canavalia gladiata*) USING MUSCOVY
DUCKS (*Carina muschata*)**

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Target Audience: Feed millers, duck farmers and researchers

ABSTRACT

Effect of processing on nutrient metabolizability of swordbean using muscovy ducks was evaluated using mature muscovy ducks of average weight 1.74 ± 0.19 kg. The birds were subjected to nine (9) treatments involving force-feeding of raw swordbeans and those variously treated as follows; cooked, toasted, soaked in 5% potassium hydroxide solution for 5 days before cooking, soaked in 5% potassium hydroxide solution for 5 days, soaked in 5% potassium hydroxide solution for 5 days before toasting, soaked in 5% Urea for five days before cooking, soaked in 5% Urea solution for 5 days. Birds were assigned to a feedstuff in a completely randomised design (C. R. D.). Each of the birds was force fed with 20g of assigned feedstuff and allowed to stay for 24 hours for faeces collection. Another set of 3 birds was starved for an additional 24 hours for collection of faeces of endogenous origin.

The raw swordbean had True Metabolizable energy value of 2.036 kcal/g that was significantly ($P < 0.05$) higher than those of other forms of processed beans. For True metabolizable protein, value for raw swordbean (89.81 ± 0.020 mg/g) was significantly ($p < 0.01$) lower than those of the processed beans which ranged between 112.23 ± 0.025 and 189.42 ± 0.01 mg/g. For True metabolizable energy corrected to nitrogen, value for raw seed (2.021 ± 0.013 kcal/g) was significantly ($P < 0.05$) lower than those of most of the treated forms. Toasting does not only show best results but it requires shortest time and is very familiar to farmers. It is therefore very applicable at farm site and recommended.

Key words: Processing, metabolizability of energy and protein, swordbean and muscovy ducks.

DESCRIPTION OF PROBLEM

Shortage in supply of edible animal protein has resulted in their high cost and low intake by Nigerians (1). This situation may as well be due to the high population of Nigeria and the low level production of animals particularly those

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neglected species like the muscovy ducks.

Muscovy ducks, are more hardy than chickens (2) and utilize better many non conventional feed resources (3). This then makes it expedient to explore possibilities of feeding to muscovy ducks lesser known feedstuffs like the sword beans that is cheap and less competed for by man.

Swordbean grows well in the tropics and yields 4600kg of seeds per ha (4). Twenty two to twenty nine percent of its dry matter is crude protein and also contains good amount of energy (5,6). It has good aminoacid profile and becomes a feedstuff of high potentials for feeding of farm animals including ducks. Swordbeans, however, contains some thermostable antinutritional factors which are known to reduce utilization of its nutrients (7). This discourages extensive use of the feedstuff in the nutrition of farm animals including the muscovy ducks. Processing has been reported to detoxify and improve the nutritional value and utilization of sword beans (8,9, 10,11,12,13). This then necessitates this trial to evaluate bioutilization of raw and processed swordbeans by the muscovy ducks.

MATERIALS AND METHODS

The dried raw swordbean seeds were collected from farmers in Idanre, ondo State and subjected to the following processing treatments: seeds were toasted to brownness for 30 mins., cooked in water for 90 min.; soaked in 5% potassium hydroxide solution for 5 days before cooking for 90 minutes, soaked in 5% potassium hydroxide solution for 5 days before toasting for 30 minutes, soaked in 5% potassium hydroxide solution for 5 days, soaked in 5% urea solution for 5 days, soaked in 5% urea solution for 5 days before cooking for 90 mins and soaked in 5% urea solution for 5 days before toasting for 30 mins.

The raw and processed forms of the seeds were finally oven-dried at 60^oc to constant weight, milled to pass through 1 mm sieve and stored in sealed containers prior to analysis and animal trials.

Nitrogen content of the raw and the eight (8) processed swordbeans samples together with their associated faecal samples were determined using micro Kjeldahl procedure as described by A. O. A. C. (14). The energy content of the feedstuffs and faeces voided by the birds were determined using adiabatic bomb calorimeter.

Mature muscovy ducks of 1.74 - 0.19kg average live weight were used for this experiment. Three (3) birds were randomly assigned to each of the nine (9) test feedstuffs.

During the trial, each bird was kept in individual metabolic cage, starved for 24 hours after which, they were force-fed with 20g of the assigned feedstuff prepared in a slurry form by mixing with small quantity of water. This was passed into the

crop of the ducks with the aid of rubber tube. After each force-feeding, the birds were kept in their metabolic cages and tray placed under for faecal collection. They were allowed to stay the next 24 hours for quantitative collection of faeces. Additional 3 birds were simultaneously starved for 48 hours to collect faeces for endogenous energy and nitrogen. Drinking water was provided for all birds ad-libitum throughout the trial period. Faecal collections were immediately dried in force draught oven at the temperature of 60°C.

The true metabolizable energy (TME) was calculated as given by Sibbald, (15). Equation for nitrogen corrected true metabolizable energy (TMEn) is as given by Parson et al, (16). True metabolizable protein was calculated with the equation adopted from Sibbald (15). The birds were assigned to test feedstuff in a completely randomised design (C.R.D.). Each treatment was arranged in three replicates and a replicate had 1 bird. Data collected were subjected to analysis of variance and means were separated using the multiple range test (17).

RESULTS AND DISCUSSION

Table 1 shows energy and protein contents of swordbean in its raw and processed forms. Highest gross energy value of 3.341 kcal/g was shown by the raw form while the lowest value (2.411 kcal/g) was shown by swordbean soaked in potassium hydroxide and cooked. For crude protein, highest value of 222.5mg/g was obtained for raw swordbean while lowest value was shown by that soaked in potassium hydroxide solution and cooked.

Energy content was lower for integrated methods, probably because they were twice exposed to processes that enhanced degradation. Protein content followed a similar trend except that whenever seeds were soaked in urea higher values were obtained. This is perhaps, because Nitrogen was absorbed by seeds during the urea treatment.

The mean TME for raw swordbean (2.036 ± 0.006 kcal/g) is significantly ($P < 0.05$) lower than values for all forms of processed beans as indicated in Table 2. TMEn followed a similar pattern. This may be because processing increases utilizable energy of feedstuff. For true Metabolizable protein (Table 2), values for treated forms increased significantly ($P < 0.05$). Thus toasted swordbean showed the highest value (189.41 ± 0.012 mg/g) while the raw had the lowest value (98.81 ± 0.020 mg/g). This is in agreement with report of Aletor and Fetuga (18) which indicated that feeding of raw Limabean decreased protein digestibility. Overall, therefore, processing improved metabolizability of energy and protein of swordbeans. When evaluating only the processed forms which are often fed to animals, their TMEn values ranged from 2.164 ± 0.001 to 2.967 ± 0.006 kcal/g.

Thus, swordbean soaked in potassium hydroxide and cooked had the lowest

value while that simply toasted had the highest (2.967 ± 0.006 kcal/g). For protein, the True metabolizable values of processed beans ranged from 112.23 ± 0.025 to 189.41 ± 0.01 mg/g with swordbean toasted having the highest while that soaked in potassium hydroxide before cooking had the lowest value (table 2). Application of integrated methods to treat the beans did not ensure best values of metabolizability of energy and protein and did not warrant the additional cost and labour involved. Treatment of the beans with chemicals did not only fail to produce the best results but it requires high level expertise to avoid disastrous application. This may be rarely available at farm sites and limits adoption by farmers. Opposed to this, toasting is simple, takes a short time to accomplish and requires no special technical knowhow. It is a conventional method and is more applicable at farm site.

Table 1: Gross Energy and Crude protein Content of Swardbeans

Feedstuff	Gross Energy(kcal/g)	Crude Protein(mg/g)
Swordbean Raw	3.341a	225.5a
Swordbean soaked in 5% urea solution for five(5) days before cooking.	2.641 ^d	195.0 ^c
Swordbean toasted	3.131 ^b	200.0 ^c
Swordbean soaked in 5% potassium hydroxide solution for (5) days before cooking.	2.411 ^e	135.6 ^f
Swordbean cooked	2.843 ^c	183.8 ^c
Swordbean soaked in 5% potassium hydroxide solution for five (5) days.	3.032 ^b	173.8 ^d
Swordbean soaked in 5% urea solution for five (5) days.	3.084 ^b	216.8 ^b
Swordbean soaked in 5% potassium hydroxide solution for five (5) days before toasting.	2.590 ^d	163.1 ^e
Swordbean soaked in 5% urea solution for five (5) days before toasting.	2.780 ^c	181.3 ^c

Row means with different superscript are significantly ($P < 0.05$) different.

Table 2: True Metabolizable energy (TME), True metabolizable energy corrected to nitrogen (TMEn) and True metabolizable protein (TMP) of Swardbean fed to ducks

Feedstuff	TME(kcal/kg)	TMEn(kcal/kg)	TMP(mg/g)
Swardbean Raw	2.036 ^h	2.021 ^h	89.81 ^f
Swardbean soaked in 5% urea solution for five (5) days before cooking.	2.593 ^e	2.358 ^f	142.66 ^c
Swardbean toasted.	3.076 ^a	2.967 ^a	189.41 ^a
Swardbean soaked in 5% potassium hydroxide solution for five (5) days before cooking.	2.338 ^g	2.160 ^g	112.23 ^e
Swardbean cooked.	2.707 ^c	2.641 ^o	125.13 ^d
Swardbean soaked in 5% potassium hydroxide solution for five (5) days.	2.925 ^b	2.843 ^b	115.90 ^e
Swardbean soaked in 5% urea solution for five (5) days.	2.541 ^e	2.482 ^e	142.43 ^c
Swardbean soaked in 5% potassium hydroxide solution for five (5) days before toasting.	2.459 ^f	2.386 ^f	141.87 ^c
Swardbean soaked in 5% urea solution for five (5) days before toasting.	2.607 ^d	2.588 ^d	153.68 ^b

Row means with different superscripts are significantly ($P < 0.05$) different.

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