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EFFECTS OF INCLUSION OF PROCESSED MUCUNA UTILIS [*Mucuna pruriens*] (L) SEED MEAL ON PERFORMANCE CHARACTERISTICS OF NOILERS

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ABSTRACT: *The experiment was conducted to ascertain the inclusion levels of cooked, decorticated and toasted Mucuna Utilis seed meal on the performance characteristics of Noilers. One hundred and forty four (144) day old Niolers chicks were raised on four experimental diets. Mucuna seed meal were incorporated at the rate of 200g/kg of feed, the diets was formulated to be isonitrogenous and isocaloric. Each diet was fed to a group of 36 birds for a period of 56days. There were significant (P<0.05) differences among the treatment groups in feed intake, body weight and feed conversion ratio. The group feed decorticated Mucuna seed meal showed significant (P<0.05) depressed feed intake, body weight and poor feed conversion ratio when compared with other treatment groups. Apparent digestibility of crude protein either extract, crude fibre and ash differed significantly (P<0.05) among the treatments. It was concluded that cooked Mucuna seed could be included in Noiler diets at 200g/kg while decortication was an ineffective processing method.*

KEY WORDS: Noiler, Performance, Nutrient, digestibility and Mucuna seed meal

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INTRODUCTION

Unconventional legumes are gaining more attention as suitable replacements for conventional protein sources in livestock feed in recent times. This may be due to the escalating cost of conventional feed stuffs. If increased production of livestock product at reasonable cost is to be achieved, greater attention should be given to exploration of lesser- known feed resources. Mucuna Utilis, commonly known as Velvet bean, is a highly productive black seeded tropical legume that is little known and used on human and animal feed. In Nigeria, it is valuable only as a green manure or cover crop for soil fertility improvement and soil water conservation (Usman *et al.,* 2021). Mucuna Utilis like other legumes is rich in protein and energy. Iyayi and Egharevba (2016) reported a value of 35.50%crude protein for raw Mucuna seeds. Despite the nutritional potential of this legume its use as human food or a component of livestock feed have been limited by the presence of diverse antinutritional factors like trypsin inhibitors, haemmagglutins, phytates, hydrogen cyanide and tannins (Afolabi *et al.*, 2018). Similar observation was reported for *M. Pruriens* from India (Ravindran and Ravindran, 2019).

However, the inclusion of raw legumes in diets of animals as the only source of protein leads to significant impairment in growth (Isa, *et al*, 2020) and other undesirable physiological and biochemical alterations (Alector and Aladetimi, 2019). The use of heat to inactivate these anti-nutritional factors could further increase the use of legumes as food components for man and his livestock. Heat treatments have been reported to improve nutrient utilization of legumes by animals (Ologhobo, Apata and Oyejide, 2019). Therefore, the objective of this study was to evaluate the performance of Noilers fed differently processed Mucuna seeds meal. The parameters of interest are feed intake, weight changes, feed conversion efficiency and nutrient digestibility.

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Teaching and Research Farm, Modibbo Adamawa University of Technology, Yola, Adamawa State. The site is located at latitude 7^{o}11N and longitude 11^{o} 14 E and at an elevation of 346m above sea level. The mean relative humidity range from 30 – 50% all year round, while the maximum temperature can reach 38^{0}C in April and a minimum temperature as low as 18^{o}C in December (Adebayo, 1990).

Seed Preparation

Mucuna seed were purchased from the University of Agriculture, Makurdi Benue State, Nigeria and processed as follows:

Cooking: The dry seeds were added to boiling water (95^{o}) in a cooking pot and heated for one hour. The cooked seed were sun-dried for two days and oven-dried at 85^{o}c for 48 hours.

Toasting: The dry seeds were toasted; a process which involved spreading of the seeds thinly in a pan and placing the pan in an oven at 120^{o}c. it was stirred from time to time to maintain uniform heating. The heating (toasting) was considered adequate when the meal changed

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from whitish to light brown and becomes crispy to touch. The process lasted for about 30minutes.

Decortication: The dry seeds were soaked in cold water for 20-24 hours and the outer coat (cuticle) removed by hand. The decorticated seeds were sundried for two days and oven dried at 85^{o}c for 48hours. The raw and processed seeds were milled to pass through a 0.5mm sieve and were stored separately in a sealed kilner jar until required for chemical analysis.

Chemical Analysis

A.O.A.C (2019) analytical methods were used for the determination of moisture, ash, crude protein, ether extract and crude fibre. The Nitrogen free extract was determined by difference.

Diet Formulations

The proximate composition of raw, cooked, decorticated and toasted Mucuna seeds is summarized in Table 1. Iso-nitrogenous and Iso-caloric diets were formulated by incorporating the processed legume seeds at the rate of 200g/kg of Noiler diets.

(Table 2 and 3) a maize-soya bean diet served as control. All diets were supplemented with 2.5g/kg synthetic Methionine and 1.5g/kg lysine to ensure that Methionine and lysine were not limiting for growth.

Table 1: Proximate Composition of raw, cooked, decorticated and toasted Mucuna seeds (%)

Parameters	Treatments			
	Raw	Cooked	Decorated	Toasted
Moisture	9.79	11.28	9.46	7.43
Dry Matter	90.21	88.72	90.54	92.55
Crude Protein	29.38	27.54	33.87	31.24
Crude Fibre	7.42	6.20	4.40	7.65
Ether Extract	5.20	4.10	5.40	2.44
Ash	3.60	3.00	3.45	4.30
NFE	54.40	59.10	52.88	54.37

Birds and Housing

A total of 144 day old noiler chicks of the Hubbard strain were used in this experiment. They were balanced for weight and randomly divided into four groups of 36 chicks per group in a completely randomized design. Each group was further sub-divided into 3 replicates of 12 birds each. Feed and water were supplied ad-libitum and light provided 24 hours daily. Feed consumption and the body weight of chicks were recorded on 0, 7, 14, 21 and 28 days for the starter phase and 28, 35, 42, 50 and 56 days for the finisher phase of the trials. Feed consumption, weight gain, and efficiency of feed utilization were used as a measure of chicks performance.

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Table 2: Gross Composition of Noiler Starter diet g/Kg

Ingredients	Dietary treatments (%)			
Materials	Control	CMSM	DMSM	TMSM
Maize	525	450	480	480
Soya bean	300	180	150	150
Mucuna	___	200	200	200
Palm meal cake	70	65	65	65
Fish meal	40	40	40	40
Blodd meal	20	20	20	20
Oyesler shell	10	10	10	10
Salt	5	5	5	5
Methionine	3	3	3	3
lysine	2.5	2.5	2.5	2.5
Premix	2.5	2.5	2.5	2.5
Calculated analysis				
Crude protein (%)	23.07	23.22	3.52	23.00
ME (KCAL/G)	30.22	30.14	30.18	30.24

CMSM:- Cooked Mucuna Seed MealSMSM:- Decorticated Mucuna Seed MealTMSM:- Toasted Mucuna Seed Meal

To provide the following kg feed: Bone meal, 20.00 Oyeseh shall 15, salt 50, methionine 3, lysine 20, premix 50, which contains vit A 10,000m, D, 2.00 i.u, B6 500 i.u, vit K 2mg, Riboflarin 3mg, chlorine 5mg, Vit B_{12} 0.08mg, folic and 4mg, Mn 8mg, 2n 0.5ng

Digestibility Trial

During the last seven days of the experiment, three chickens were randomly selected per replicate from each of the treatment and placed in metabolic cages. The chicken were allowed an adjustment period of two days, followed by facial collection period of three days. All the droppings were collected on daily basis for each chicken and weighed. Droppings were oven dried for 48hours at 65^{o}c to constant weight to determine the dry matter content. The droppings were analyzed for proximate composition according to A.O.A.C (2019). The digestibility of the nutrients was obtained as per formula e.g. for crude protein:

$$(CP) = \frac{\text{CP in feed} - \text{CP in faeces}}{\text{CP in feed}} \times 100$$

Statistical Analysis

Data collected were subjected to analysis of variance. Difference between the treatments means were separated using Duncan's New Multiple Range Test. All statistical procedure were carried out according to methods of Steel and Torrie (1980).

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Table 3: Gross composition of Noiler finisher diets (g/kg)

Ingredients	Dietary treatments (%)			
Materials	Control	CMSM	DMSM	TMSM
Maize	547	437	430	427
Soya bean	150	100	50	60
Mucuna	___	200	200	200
Wheat offal	130	80	147	140
Fish meal	30	30	30	30
Palm kernel cake	80	80	80	80
Blood meal	20	20	20	20
Fixed ingredient	43	43	43	43
Chemical composition (%)				
Dry matter	90.25	88.50	87.80	19.45
Crude protein	19.92	20.28	20.92	20.62
Crude fibre	4.8	4.20	3.80	4.65
Ether extract	7.2	6.00	4.00	3.75
Ash	8.00	6.75	7.50	8.12
NFE	60.08	63.78	63.78	62.86

To provide the following kg feed: Bone meal, 20.00 Oyeseh shall 15, salt 50, methionine 3, lysine 20, premix 50, which contains vit A 10,000m, D, 2.00 i.u, B6 500 i.u, vit K 2mg, Riboflarin 3mg, chlorine 5mg, Vit B_{12} 0.08mg, folic and 4mg, Mn 8mg, 2n 0.5ng

RESULTS AND DISCUSSION

The proximate composition of the raw, cooked, decorticated and toasted Mucuna seeds are presented in table I. The crude protein content ranged from 27.54% in cooked to 33.87% in decorticated Mucuna seeds. The highest level of crude fibre (7.65%) was obtained in toasted seeds while decorticated Mucuna seeds had the lowest value of 4.40%. Either extract was least (2.44%) in the toasted Mucuna seeds. The nitrogen free extract of the raw and decorticated seeds were relatively similar.

Feed intake of the group fed controldiet was significantly ($P<0.05$) higher than those on the cooked, decorticated and toasted Mucuna seed meals (Table 4). The lowest feed intake was recorded for the group fed decorticated Mucuna seed meal. Body weight gain of the group fed decorticated meal was significantly ($P<0.05$) depressed when compared to the groups fed the control, cooked and toasted meals. The efficiency of feed utilization as measured by feed intake per unit of weight gained was lowest ($P<0.05$) in the group fed decorticated meal.

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Table 4: Effect of inclusion of processed Mucuna in the diet on the performance of Noilers

Parameters	Dietary treatment				
	Control	CMSM	DMSM	TMSM	SEM
Initial body wt(g)	53	55	54	55	0.42
Final body wt(g)	2107	1867	1240	1775	
Body weight changes (g)	2054	1812	1186	1720	
Daily weight gain (g)	36.68^{a}	32.36^{a}	21.18^{c}	30.71^{ab}	2.83
Daily feed intake (g)	75.25^{a}	71.75^{b}	57.39^{c}	71.16^{b}	3.41
Feed conversion ratio g feed/g gain	2.05^{a}	2.22^{b}	2.71^{c}	2.32^{b}	0.14

abc: Means within rows with different superscripts are significantly different (P<0.05)

Digestibility

The effect of dietary treatments on nutrient digestibility is shown in Table 5. The digestibility of crude protein (CP), crude fibre (CF), ether extract (EE), ash and nitrogen free extract (NFE) were significantly (P<0.05) different while for the dry matter (DM) no significant difference was obtained, among the treatment groups. The highest mean value of 84.53% was recorded for dry matter in the control diet while the lowest mean value of 79.26% was obtained in the toasted Mucuna seed meal (TMSM). The CP digestibility was also highest in the control diet (72.53%) and lowest in birds fed decorticated Mucuna seed meal (DMSM)-based diet. The Ether Extract digestibility for cooked and decorticated Mucuna seed meal were similar but lower (P<0.05) than the control diet. The crude fibre and Ash digestibility in this study were lowest in the toasted meals (TMSM) and highest in the control diet respectively.

Table 5: Nutrient digestibility of Noilers chicken

Parameters	Dietary treatment				
	Control	CMSM	DMSM	TMSM	SEM
Dry matter	84.53	80.97	80.60	79.26	0.98
Crude protein	72.53^{a}	62.70^{b}	53.50^{c}	59.60^{a}	3.44
Crude fibre	90.67^{a}	48.55^{b}	80.01^{a}	36.26^{c}	11.12
Ether Extract	92.67^{a}	80.92^{b}	80.61^{b}	74.28^{c}	3.25
Ash	84.50^{a}	73.61^{b}	75.85^{b}	68.80^{b}	2.87
NPE	73.45^{a}	64.55^{b}	68.75^{b}	66.6^{a}	3.25

NFE: Nitrogen Free Extract

abc: Means within rows with different superscript are significantly different (P<0.05).

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The result of the chemical composition of raw, cooked, decorticated and toasted Mucuna seeds showed that the seeds had relatively high protein content; the CP value obtained in the raw seeds was similar to values reported by other workers for Mucuna seeds (Emananlom and Usman, 2017; Afolabi *et al.* 2018), but slightly lower than the 35.5% reported by Iyayi and Egbarevba (2016). The marked difference between the value reported in this study and that of Iyayi and Egharevba (2016) might have been caused by the difference in genetic origin, soil fertility and time of harvesting of the seeds. The reduced CP content of cooked Mucuna seeds when compared with raw seeds was in agreement with the observation of (Isa *et al*, 2020 and Nestares *et al*, 2016) that reported a decreased protein of seeds as a result of cooking and attributed this to the loss of soluble proteinaceous parts of the seeds into the cooking water. However, the enhanced CP by decortication and toasting of the seeds agreed with Buckle and Samdudi (2017).

The crude fibre content observed in raw Mucuna seeds compared to the cooked, decorticated and toasted seeds might be regarded as high when compared to the fibre content of legumes reported by Mba, Njoku and Oyenuga (2016). However, this does not render it undesirable for monogastric animals and man. There were improvements in feed intake; on the group fed cooked Mucuna seeds meal. This observation was consistent with the report (Ologhobo *et al*, 2016) that the nutritive value of the legume seeds was improved when subjected to cooking. These were attributed to better protein absorption, detoxification of the anti-nutritional factors, higher palatability and availability of the amino acid in the diet. The marked reduction in the feed intake, weight gain and feed conversion efficiency in the group fed decorticated Mucuna seed meal was due to the presence of high concentration of anti-nutritional factors. Dietary haemmagglutin was implicated in the reduced feed intake and nutrient absorption (Mbajunwa, 2016).

There was an improvement in the digestibility of CP in birds fed cooked meal. This was as a result of inactivation of trypsin inhibitor in the cooked and toasted meals. Trypsin inhibitor delays protein digestion (Bamgbose and Nwkoro, 2016) by inhibiting trypsin and chymotrypsin activities simultaneously and by forming an enzyme-inhibitor complex (Gallaher and Schneeman, 2015) to impair digestibility of crude protein as obtained in the protein digestibility in birds fed on the control and cooked diets might be due to high concentration of tannin in the Mucuna seed meal. Balogun *et al* (2016) observed that the protein digestibility was lowered in high tannin diets compared to low tannin diet of chick pea. It is evident from the result of this study that cooked Mucuna seed can be incorporated into Noiler diets since it gave better improvement in nutrient utilization compared to the other treatments.

CONCLUSION

Based on the results of the study, it was concluded that cooked Mucuna seed could be included in Noiler diets at 200g/kg while decortication was an ineffective processing method.

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REFERENCES

A.O.A.C (1980). Official Method of Analysis of the Association of Analytical Chemist (16th Edition) Washington D.C.

Adebayo, A. A. (1999). Climate II. In Adamawa State in Maps. A. A. Adebayo and A. l. Tukur (Eds.), Paracleate Publishers, Yola, Nigeria.

Afolabi, O. A., Adewusi, S. O., Bawa, T. A. and Castro, O. A. (2018). Nutritional Evaluation of Raw Seeds of Mucuna Solanica. *J. Agric* 49: 142 – 149.

Alector, T. O. and Aladetimi, O. O. (2019). Evaluation of Some Soybeans Variety and Some Underutilized Edible Legume in Nigeria. *Journal of Science of Food and Agriculture* 70: 210 – 214.

Balogun, T. F., Kankuka, F. G. and Bawa, G. S. (2016). Role of Fibrein Human Diet in: Fibrefoods. Westay Press Mysore, India

Bamgbose, I. E. and Nwokoro, C. C. (2016). Implication of Anti-Nutritional Component of Soybean Foods. *Journal of Food Science* 57; 1032 – 1035

Buckle, K. A. and Samdudi, H. (2017). Effect of Soaking and Boiling Treatments on the Quality of Winged Been Seed. *Journal of Animal Science* 95: 1320 – 1323.

Emenanlon, O. O. and Usman, T. A. (2017). Effect of Dietary Raw, Cooked and Toasting Soybeans Seed on the Performance of Broiler. *Nigeria Journal of Animal Production* 43: 121 – 125.

Gallaher, D. and Schneeman, B. O. (2015). Nutritional and Toxicological Significance of Enzyme Inhibitors in Food. *Africa Journal of Clinial Nutrition* 55: 1002 – 1006.

Isa, I. S., Mohammed, Y. M. and Anthony, O. (2020). Effect of Heat Treated Point Protein on Hatchability of Fertilized Eggs from Exotic Laying Hens in Potiskum L.G.A Yobe State, Nigeria. *Journal of Science, Food and Agriculture*. 70: 102 – 105.

Iyayi, E. A. and Egharevba, J. I. (2016). Biochemical Evaluation of Seeds of an Underutilized Legume (MucunaUtilis) *Nigerian Journal of Animal Production* 47:2. 46 – 150.

Mba, A. T., Njoku, C. M. and Oyenuga, T. O. (2016). Effects of Heat on Nutritional Quality of Soybean Cultwars. British Poultry Science 55, 327 – 330.

Mbajunwa, K. O. (2016). Effect of Processing on the Anti-Nutritional Composition of the African on Bean Seed Pataclethera MacrophyllaBenth. *African Journal of Chemical Nutrition.*

Nastares, T., Lopes-Firars, M. and Urbano, G. (2016). Nutritional Assessment of Raw and Processed Chickpea (Giver Anetinum L.) Protein in Growing Rats. *Sahel Journal of Veterinary Science* 21, 33 – 35.

Ologhobo. A. D., Apata, D. P. and Oyejide, A. A. (2019). Utilization of Raw Jack Bean. Canavalia ensiformis and Jack Bean Fractions in Diets of Brother Chicks, British Poultry Science 64: 1003 – 1007.

Ravindran, V. and Ravindran, G. (2019). Nutritional and Anti-Nutritional Characteristics of Mucuna utilis Bean Seeds. *Journal of Science, Food and Agriculture* 95: 750 – 954.

Steel, R. G. D. and Torries J. H. (1980). Principes and Procedure of Statistics. A Biometrical Approach. 2nd ed. Mc Graw Hill Book Co., New York.

Usman, M., Ali, A. and Olatunji, O. (2021). Effect of fertilizer application on soil properties and yield of sesame (*Sesamum indicum* L.) varieties in Southern Guinea and Sudan Savanna Agro-Ecological Zones of Nigeria. *African Journal of Agriculture and Food Science*, Vol. 4, Issue 1, 2021(pp. 89-108).

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