NUTRIENT DIGESTIBILITY AND PRODUCTIVE PERFORMANCE OF WISTAR ALBINO RATS FED PROCESSED SICKLE POD (*Senna obtusifolia*) LEAF MEAL-BASED DIETS

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ABSTRACT

A feeding trial was conducted for 28 days to evaluate the nutrient digestibility and productive performance of wistar albino rats fed processed sickle pod (*Senna obtusifolia*) leaf meal (SOLM) –based diets. Five experimental diets were compounded to contain 0 and 20% each of the sun-dried, boiled, fermented fresh and boiled and fermented SOLM designated as T_1, T_2, T_3, T_4 and T_5, respectively. A total of 90 growing albino rats with an initial average weight of 13.52 – 14.48 g were randomly allocated to the dietary treatments in a completely randomized design replicated 3 times with 6 rats each. The apparent nutrient digestibility indicated significant ($P<0.05$) variation except the nitrogen-free extract and energy. The apparent nutrient digestibility in the rats fed the processed SOLM based-diets indicated similar trend.The dry matter, crude protein and crude fibre digestibility in rats fed the processed SOLM-based diets range from 66.75 to 68.15%, 64.45 to 66.71% and 30.22 to 34.61%. The productive performance was not significantly ($P>0.05$) different except for the feed intake which indicated significant ($P<0.05$) variation. The highest total feed intake was recorded in albino rats fed the control diet 0% SOLM (365.40 g) and 20% boiled and fermented SOLM (334.32 g). The overall weight gain among the albino rats fed the processed SOLM-based diets were not significantly ($P>0.05$) different. It was concluded that, the different processed SOLM-based diets were better digested and had enhanced the productive performance of the albino rats. However, the boiled and fermented SOLM-based diet indicated better nutrient digestibility and growth performanceand is therefore the most recommended for feeding albino rats.

Key words: Nutrient digestibility, productive performance, *Senna obtusifolia*.

INTRODUCTION

The use of alternative feed ingredients to augment the conventional feed resources has become very paramount in the Nigerian livestock industry. This will go a long way to make available affordable protein to many Nigerians especially the North-eastern part of Nigeria were insecurity challenges had consequently led to protein malnutrition. Ardo *et al.* (2019) and Shaahu *et al.* (2010) advocated the use of alternative feed resources to be integrated into sustainable livestock feeding systems.

It was documented that green vegetables are the most abundant and cheapest source of protein which is due to their ability to synthesize amino acids from wide range of primary sources (Fasuyi, 2016). *Senna obtusiolia* leaves have good protein content (20.40%) but also contain some anti-nutritional factors such as tannins which necessitates some forms of processing before incorporation into livestock feed. It is in view of the above that this study was conducted to evaluate the effects of feeding differently processed *Senna obtusifolia* leaf meal-based diets on nutrient digestibility and productive performance of wistar albino rats.

MATERIALS AND METHODS

Location of the study area

The study was conducted at the Animal House of the Department of Biological Sciences, Adamawa State University, Mubi. The area is located between latitudes 9^o 30' and 11^o north of the equator and longitudes 13^o and 9^o 45' east of Greenwich meridian (Adebayo, 2004).

Experimental diets and treatments

Five experimental diets were compounded to contain 0% and 20% each of the sun-dried, boiled, fresh fermented and boiled and fermented *Senna obtusifolia* leaf meal designated as T_1, T_2, T_3, T_4, and T_5, respectively as presented in Table 1.

Table 1: Ingredient Composition and Calculated Analysis of the Experimental Diets

Ingredients	T_1 0% SOLM	T_2 20%SDSOLM	T_3 20%BSOLM	T_4 20%FFSOLM	T_5 20%BFSOLM
Maize	49.00	49.00	49.00	49.00	49.00
Maize offal	15.00	7.15	7.15	7.15	7.18
Roasted soya bean meal	25.65	13.50	13.50	13.50	13.50
Fish meal	7.00	7.00	7.00	7.00	7.00
PSOLM	0.00	20.00	20.00	20.00	20.00
Salt	0.30	0.30	0.30	0.30	0.30
Bone meal	2.50	2.50	2.50	2.50	2.50
Methionine	0.20	0.20	0.20	0.20	0.20
Lysine	0.15	0.15	0.15	0.15	0.15
Premix	0.20	0.20	0.20	0.20	0.20
Total	**100.00**	**100.00**	**100.00**	**100.00**	**100.00**
Crude protein (%)	20.61	19.13	19.06	19.39	19.48
Crude fibre (%)	4.70	5.64	4.80	3.75	3.25
Calcium (%)	2.43	3.13	3.08	3.41	3.47
Phosphorus (%)	2.75	3.21	3.03	3.22	3.25
*Energy kcal/kg	2877.61	2877.58	2849.83	2851.75	2861.50

PSOLM = Processed *Senna obtusifolia* leaf meal; SOLM = *Senna obtusifolia* leaf meal; SDSOLM = Sun-dried *Senna obtusifolia* leaf meal; BSOLM = Boiled *Senna obtusifolia* leaf meal; FFSOLM = Fresh fermented *Senna obtusifolia* leaf meal; BFSOLM = Boiled and fermented *Senna obtusifolia* leaf meal; *Energy calculated according to the formula of Pauzenga (1985) ME (kcal/kg) = 37 x %CP + 81 x %EE + 35.5 x %NFE, CP = crude protein; EE = Ether extract; NFE = Nitrogen-free extract

Experimental animals and their management

A total of 90 young albino rats with initial average weight of 13.52 to 14.48 g were managed inside constructed metal cages. The rats were acclimatized to the cages and the experimental diets for one week. Thereafter they were fed with measured quantity of feed which was supplied at *ad libitum*. Clean drinking water was regularly supplied. The rats were managed using standard management practice of handling experimental animals as described by Ochei and Kolhatkar (2007) and also in accordance with the Animal Care and Ethics Committee of the Adamawa State University, Mubi. The experiment lasted for 28 days.

Parameters measured

The feed intake was determined by the difference between daily feed offered and feed leftover. Total fed intake was obtained by cumulative addition of the daily feed intake.

Weight gain: The rats were weighed at the commencement of the experiment and the initial weight was recorded. Final weights of the rats were recorded at the end of the experiment and overall weight gain was obtained by subtracting the initial weight from the final weight.

Feed conversion ratio: This was determined by dividing the weight gain by feed intake.

Mortality: The mortality was recorded as they occur.

Determination of nutrient digestibility

At the end of the experiment, 4 rats were randomly selected from each treatment and placed in small cages with perforations underneath. A metal tray was placed beneath each cage for feacal collection.Faecal samples were collected and feed intake was also measured. The feacal samples were bulk, properly oven-dried and analysed for their proximate composition. Nutrient digestibility (ND) was computed using the formula

$$ND = \frac{\text{(nutrient in diet x feed intake)} - \text{(nutrient in faeces x feacal output)}}{\text{Nutrient in diet x feed intake}}$$

RESULTS AND DISCUSSION

The result of apparent nutrient digestibility of wistar albino rats fed processed SOLM-based diets is presented in Table 1.Theresult revealed significant ($P<0.05$) variation among the treatment groups except digestibility for nitrogen-free extracts and energy. The nutrient digestibility among the rats fed the process SOLM-based diets indicated similar digestibility trend. This is an indication that all the processing methods were effective in reducing the levels of the anti-nutritional factors and fibre content thereby enhancing digestibility and utilization of nutrients. This finding corroborates the report of Ardo *et al.* (2019) who reported similar findings for albino rats fed processed *Senna obtusifolia* seed meal-based diets. Sun-drying was reported to be effective in reducing anti-nutritional factors of leafy vegetables thereby enhancing their utilization (Udofia and Obizoba, 2005; Patricia *et al.* 2015). Tuleum *et al.* (2011) reported that boiling and fermentation are effective in neutralizing anti-nutritional factors in feedstuffs.

The albino rats fed the control diet (0% SOLM) indicated higher feed intake followed by those fed the boiled and fermented SOLM-based diet. This observed effects might be due to the flavour of the processed SOLM in the diet which is in line with the report of Takashi *et al*. (2013) who reported that, flavour have sedative effect, decrease the motivation to eat feed, feed intake and weight gain

Table 1: Nutrient Digestibility and Productive Performance of Wistar Albino Rats Fed Processed *Senna obtusifolia* leaf meal Based-Diets

Parameters	**T_1** **0%SOLM**	**T_2** **20%SDSOLM**	**T_3** **20%BSOLM**	**T_4** **20%FFSOLM**	**T_5** **20%BFSOLM**	**SEM**
Dry matter (%)	74.57[a]	66.75[b]	66.02[b]	67.49[b]	68.15[b]	1.02*
Crude protein (%)	69.09[a]	64.45[b]	66.53[b]	65.24[b]	66.71[b]	0.70*
Crude fibre (%)	37.45[a]	30.22[b]	31.95[b]	33.68[b]	34.61[b]	2.02*
Ether extract (%)	64.18[a]	61.09[b]	66.70[b]	65.48[b]	65.10[a]	1.87*
NFE (%)	63.28	62.36	62.75	62.65	63.07	1.47[NS]
Energy Kcal/kg	64.08	61.33	64.00	66.19	65.31	1.62[NS]
Total feed intake (g)	365.40[a]	295.12[c]	287.56[c]	285.04[c]	334.32[b]	1.35*
Initial weight (g)	14.06	13.52	13.79	14.02	14.48	0.25[NS]
Final weight (g)	137.50	116.61	129.00	127.81	132.82	9.20[NS]
Weight gain (g)	123.74[a]	103.09[b]	115.21[b]	113.79[b]	118.34[b]	5.53*
Feed conversion ratio	123.74[a]	103.09[b]	115.21[b]	113.79[b]	118.34[b]	5.53*
Mortality (number)	0.00	0.00	0.00	0.00	0.00	-

abc = means in the same raw with different superscript are significantly different; SEM = standard error of means; SOLM = *Senna obtusifolia* leaf meal; SDSOLM = Sun-dried *Senna obtusifolia* leaf meal; BSOLM = Boiled *Senna obtusifolia* leaf meal; FFSOLM = Fresh fermented *Senna obtusifolia* leaf meal; BFSOLM = Boiled and fermented *Senna obtusifolia* leaf meal; NFE = Nitrogen-free extract

CONCLUSION

It was concluded from this study that the different processing methods (sun-drying, boiling and fermentation) were effective in detoxifying *Senna obtusifolia* leaves which positively enhances nutrient digestibility and productive performance.

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