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Response of albino rats fed graded levels of raw sickle pod (*Senna obtusifolia*) seed meal

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Abstract

A feeding trial was conducted to investigate the effects of feeding raw Senna obtusifolia seed meal (RSOSM) on the productive performance, carcass characteristics and organ weights of albino rats. Five experimental diets were compounded to contain RSOSM at graded levels of 0, 5, 10, 15 and 20% designated asT1, T2, T3, T4 and T5, respectively. Sixty albino rats with an average body weight of 70.52 to 81.05 g were allotted to the five dietary treatments in a randomized complete block design with three replicates of four rats each. The chemical composition and the anti-nutritional factors were determined. Parameters measured were feed intake, weight gain, feed conversion ratio, live weight, dressed weight, dressing percentage and organ weights (heart, liver, kidney and lungs). Data obtained were subjected to analysis of variance. The productive performance, carcass characteristics and organ weights were observed to be significantly (P<0.05) depressed as the level of RSOSM increased in the experimental diets. Albino rats fed 15 and 20% RSOSM significantly (P<0.05) recorded the lowest feed intake, weight gain and dressing percentage of 241.60 g, 60.10 g and 78.84%, 74.46 and 212.82 g, 51.78 g and 75.38%, respectively. The weight of organs revealed a declining trend as the level of RSOSM increased except for the liver and intestine which indicated progressive increase in sizes as the level of RSOSM increased in the diets. Albino rats fed 15 and 20% RSOSM recorded the highest liver weight of 4.21 and 4.29 g. It can be concluded that inclusion of RSOSM beyond 5% in the diets of albino rats had adverse effects on their productive performance, carcass characteristics and organ weights.

Keywords: Response, *Sennaobtusifolia*, albino rats, performance, graded levels.

Introduction

The scarcity and high cost of conventional feed ingredients is one of the major challenges confronting the Nigerian livestock industry.Durunna*et al*. (1999) reported the progressive increase in the cost and scarcity of conventional feedstuffs. Therefore, there is an urgent need for animal nutritionists to intensify research on the utilization of under-exploited wild legumes in Nigeria. This was further buttressed by Adegbenro*et al*. (2011) who similarly pointed out the need to exploit under-utilized seeds which could be possible replacers for the costly conventional feed ingredients. Oyebiye*et al*. (2007) encourages the utilization of unconventional feed ingredients which are readily available and have comparable cost advantage and are not utilized by humans.

Seeds of *Sennaobtusifolia* have been recently identified as a possible alternative feed resource for poultry (Augustine, 2016). *Sennaobtusifolia* is a pantropical weed that belongs to the family *leguminosaecaesapinioideae*. It is an erect bushy annual shrub that grows up to 90 cm tall and propagates through seed. The leaves are obovate and the flowers are yellow in colour (Akobundun and Agyakwa, 1998).The choice of albino rats was due to their tractable nature and sensitivity to

diverse diets (Akande*et al*., 2012) and base on their digestive physiology, rats are good representative of other monogastric animals such as rabbits, guinea pigs and pig. It has become important to generate baseline information on the effects of feeding raw *Sennaobtusifolia* seed meal to albino rats and otherdomestic animals. Information on effect of RSOSM on the performance of albino rats seems very scanty hence, the need to bridge such information gap. This study was conducted to evaluate the effects of feeding RSOSM on the productive performance, carcass attributes and organ weights of albino rats.

Materials and Methods

Location of the study area

The study was conducted at the Animal House in the Department of Biological Sciences, Adamawa State University, Mubi. The area lies between latitude 9^0 30' and 11^0 North of the equator and longitude 13^0 45' East of the Greenwich meridian. The area has minimum and maximum temperatures of 12.7^0 and 37^0 and a minimum and maximum of 37.3 mm and 238.7 mm of mean monthly rainfall (Adebayo, 2004).

Chemical analysis

The proximate composition and levels of anti-nutritional factors (tannins and total phenols) of the *Sennaobtusifolia* seeds and the experimental diets were conducted according to the procedure of AOAC (2004). The chromatographic method specifically the high power liquid chromatography (HPLC 10/11model) was used to determine the levels of the anti-nutritional factors

Experimental diets and treatments

The five experimental diets were compounded and RSOSM was incorporated at 0, 5, 10, 15 and 20% levels making five experimental diets designated as T1, T2, T3, T4 and T5, respectively (Table 1).

Experimental animals and their management

A total of 60 albino rats were managed in constructed metal cages. The rats were adapted for one week before the commencement of the experiment.Feed and water were given to the rats *adlibitum* and the experiment lasted for 28 days.

Experimental Design

The 60 albino rats were randomly allotted to the five dietary treatments in a randomized complete block design with three replicates of four rats each.

Parameters measured and statistical analysis

Data were collected on feed intake, weight gain, feed conversion ratio, and mortality. Data were also collected on live weight, dressing percentage, weight of organs (heart, liver, kidney, lungs, and intestine). Data obtained were subjected to the analysis of variance (ANOVA) and where significant differences occurred, Least Significant Difference (LSD) was used to separate the treatment means.

Results and Discussion

The results of the proximate composition and level of anti-nutritional factors of *Sennaobtusifolia* seed meal is presented in Table 2. The result indicated that *Sennaobtusifolia* seed meal has a good nutritional property but also contained anti-nutritional factors such as tannins and total phenols. The diet also indicated adequacy in meeting the nutritional requirements of albino rats in the tropics.

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

Inclusion levels of raw *Sennaobtusifolia* seed meal (%)					
Ingredient (%)	**T1 (0)**	**T2 (5)**	**T3 (10)**	**T4 (15)**	**T5 (20)**
Maize	49.00	48.00	48.00	48.00	48.00
Maize offal	13.85	13.85	12.90	11.90	7.65
Soya bean	17.80	13.80	9.75	5.75	5.00
Groundnut cake	16.00	16.00	16.00	16.00	16.00
RSOSM	0.00	5.00	10.00	15.00	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**
Calculated analysis (%)					
Crude protein	19.67	19.39	19.45	18.57	18.95
Crude fibre	4.08	4.35	4.65	4.88	4.95
*Energy(kcal/kg)	2957.73	2936.63	2913.45	2906.67	2904.90

*****Metabolizable energy (ME) calculated according to the formula of Pauzenga (1985), ME = 37 x %CP + 81 x EE + 35.5 x NFE.

Table 2: Proximate Composition of Raw *Sennaobtusifolia* Seed Meal and Experimental Diets

	Inclusion levels of raw *Sennaobtusifolia* seed meal (%)					
Parameters (%)	**RSOSM**	**T1 (0)**	**T2 (5)**	**T3 (10)**	**T4 (15)**	**T5 (20)**
Dry matter	90.72	90.50	91.75	92.09	90.12	18.72
Crude protein	24.09	18.85	18.77	18.67	18.45	5.71
Crude fiber	13.17	4.88	4.98	5.08	5.18	5.93
Ether extract	7.21	6.21	5.33	6.01	5.72	5.71
Ash	4.50	5.32	4.95	4.95	5.76	5.31
NFE	40.39	38.11	38.95	37.20	36.07	37.10
Energy (kcal/kg)	2792.39	2553.37	2508.95	2524.83	2498.20	2472.20
Tannins	5.16	0.008	0.48	0.56	0.62	0.85
Total phenols	8.43	0.019	1.05	1.45	1.63	1.87

*****Metabolizable energy (ME) calculated according to the formula of Pauzenga (1985), ME = 37 x %CP + 81 x EE + 35.5 x NFE, RSOSM = Raw *Sennaobtusifolia* seed meal, NFE = Nitrogen free extract.

The productive performance of albino rats fed the experimental diet were significantly ($P<0.05$) affected by the dietary treatments. The feed intake weight gain and feed conversion ratio of the experimental rats were depressed as the level of RSOSM increased in the diets. The productive performance of albino rats fed 15 and 20% RSOSM were more depressed. This may be attributed to the high concentration of anti-nutritional factors such as tannins present in diets T4 and T5. Similar observation was made by Vadivel and Pugalenthi (2007) who fed rats with raw and processed *Mucuna pruriens* seed meal and reported significantly lower feed intake, weight gain and protein efficiency ratio in the rats fed raw mucuna seed. They similarly attributed such adverse effects to the impact of anti-nutritional factors and poor quality of proteins of the raw mucuna seed meal.

Table 3: Productive Performance of Albino Rats Fed Graded Levels of RSOSM

Inclusion levels of raw *Sennaobtusifolia* seed meal (%)						
Parameters	**T1(0)**	**T2(5)**	**T3(10)**	**T4(15)**	**T5(20)**	**SEM**
Initial wt.	81.05	72.48	74.28	70.52	72.91	10.70^{NS}
Final wt.	184.49^{a}	148.94^{b}	138.29^{b}	130.62^{c}	96.69	15.41*
Overall wt. gain	103.44^{a}	76.46^{b}	64.01^{c}	60.10^{c}	51.78^{d}	17.64*
Feed intake	308.25^{a}	268.38^{b}	243.87^{bc}	241.60^{c}	212.82^{d}	8.28*
FCR	2.98^{c}	3.51^{b}	3.89^{ab}	4.02^{a}	4.11^{a}	1.03*
Mortality (no)	2.00	1.00	0.00	1.00	2.00	-

a,b,c, d = M eans in the same row with different superscripts are significantly different (P< 0.05) * = Significant at 0.05 NS = Not significant (P>0.05); SEM = Standard error of the means; RSO SM= Raw *Sennaobtusifolia* meal; wt. = weight, FCR = Feed conversion ratio.

The results of carcass characteristics and organ weights of the albino rats fed RSOSM were significantly (P<0.05) influenced by the dietary treatments except for the kidney and lungs. The dressed weight and dressing percentage linearly declined as the concentration of RSOSM increases in the diets. This might be attributed to the increase in the concentration of the anti-nutritional factors as the level of RSOSM increased in the diets. This finding was in agreement with the report of Uchegbu*et al*. (2004) who similarly observed same for broiler chickens fed raw *Napoleonaimperialis* seed meal.The diets had significant (P<0.05) impact on the heart and liver of the albino rats. Albino rats fed 10 and 20% RSOSM recorded the highest liver sizes which was attributed to the adverse effects of the toxic components present in RSOSM. This finding was in conformity with the report of Soetan and Oyewale (2009) who reported that anti-nutritional factors can cause hypertrophy of heart and liver.Uchegbu*et al*. (2004), observed same for broiler chickens fed raw *Napoleonaimperialis* seed meal and attributed such effects to the increase physiological activities of the liver in a bid to reduce the toxic effects of the raw seed meal in the broiler chickens.

Table 4: Carcass Characteristics and Organ Weights of Albino Rats Fed Graded Level of RSOSM

Inclusion levels of raw *Sennaobtusifolia* seed meal (%)						
Parameters	**T1(0)**	**T2(5)**	**T3(10)**	**T4(15)**	**T5(20)**	**SEM**
Live wt.	180.21^{a}	139.69^{b}	125.55^{c}	118.18^{b}	113.61^{d}	14.92*
Dressed wt.	152.71^{a}	115.69^{b}	100.04^{c}	93.17^{c}	85.64^{d}	12.15*
Dressing %	84.74^{a}	82.81^{a}	79.68^{b}	74.46^{b}	75.38^{b}	9.07*
Organ weights as percentage of live body weight						
Heart	3.14^{a}	1.86^{b}	1.50^{b}	1.75^{b}	1.93^{b}	0.56*
Liver	2.95^{c}	3.38^{b}	4.53^{a}	4.29^{a}	4.21^{a}	0.39*
Kidney	1.11^{b}	2.83	1.83	1.07	1.51	0.09*
Lungs	1.52	3.20	2.47	1.30	1.98	0.17*
Intestine	8.68^{d}	16.86^{b}	14.60^{c}	17.81^{a}	18.07^{a}	3.23*

a,b,c,d = Means in the same row with different superscripts are significantly different (P<0.05) * = Significant at 5% level of probability; SEM = Standard error of the means; RSOSM= Raw *Sennaobtusifolia* meal.

Conclusion

The outcome of this study revealed that albino rats fed RSOSM beyond 5% indicated a decline in productive performance, carcass attributes and organ weights. It is therefore recommended that RSOSM be processed before incorporation in the diets of albino rats and other similarmonogastric animals such as rabbits, guinea pigs and pigs.

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