EFFECT OF DIETARY SHEA NUT CAKE ON THE NUTRIENT DIGESTIBILITIES AND BLOOD PARAMETERS OF SHEEP

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ABSTRACT

Thirty experimental lambs (3-4 months old) were procured from local sandies and distributed randomly in to 5 equal groups in complete randomized design (RBD). The control diet (T1) contained 0% SNC and 0% probiotic (yeast culture), T2 diet contained 20% SNC and 0% probiotic, T3 diet has 20% SNC and 0.1% probiotic whereas T3 and T4 diets contained 40% SNC with and without probiotics respectively. Statistical analysis of the data revealed that the dry matter digestibility coefficients (%) were comparable among test diets and significantly ($P<0.01$) higher than control diet (T_1). The mean crude protein digestibility coefficient (%) of T5 ($70.45^{e}\pm0.21$) was significantly higher than all diets. Significantly ($P < 0.01$) higher CF, EE, NDF and ADF digestibility coefficients (%) were observed in T5 ($71.76^{c}\pm0.60$, $76.52^{e}\pm0.24$, $70.23^{e}\pm0.23$ and $46.02^{d}\pm1.20$) respectively, compared to all diets. There was no significant difference observed between treatment groups and period of the experiment in all the blood biochemical parameters except for the platelet count, which were also in the normal range only.

Key words: **Blood parameters, Digestibility coefficients, Lambs, Probiotics and Sheanut cake.**

INTRODUCTION

The green fruit of Shea (*Butryospermum parkii*) tree has a pulp that covers the seed or nut. The harvest follows 3 to 5 years cycle and yields 80 kg of nuts and from these nuts, oil will be extracted and leaving the residue Abidemi *et al*., (2009); Kumar *et al*., (2010). Sheanut meal is now receiving increased attention as a potential feed ingredient due to the increased amounts that are available as a result of high demand for shea fat for cosmetics and as a cocoa butter substitute in chocolate Lipp and Anklam (1998). Shea nut cake is the residue that remains after the extraction of shea butter from the nut. It is estimated that about 500,000 tons of shea nut cake is produced annually by the shea industry in the savanna zones of Ghana Okai *et al*., (1989). It is estimated that for every metric tonne nuts processed, 450–600 kg of shea nut cake is produced and about 60,000 metric tonnes of shea kernels are consumed locally in a year Ofusu *et al.,* (2009). Thus, about 30,300,000 kg shea nut cake is generated locally in a year in Ghana. The production of Shea nut cake is approximately 18,000 tons per year from M/s. Foods, Fats and Fertilizers Pvt. Ltd which is Multi National Company located in West Godavari District A.P. It is the only industry that is importing Sheanut cake in Andhra Pradesh.

MATERIALS AND METHODS

Thirty experimental lambs (3-4 months old) were procured from local shandies and distributed randomly in to 5 equal groups in complete randomized design (RBD) as shown in Table 1. The experiment was carried for a period of 120 days. All the animals were dewormed and vaccinated against Foot and Mouth Disease and PPR Disease before start of experiment. The experimental diets were offered randomly to the five experimental groups. Hybrid Napier fodder was chaffed and offered adlibitum to five groups of animals under intensive system to meet the nutrient requirements of animals. The residues, if any, were weighed on the next day morning. Thus, the exact quantity of feed and fodder consumed by each experimental animal group was recorded throughout the experimental period. Clean, fresh and wholesome drinking water was made available throughout the experimental period. All the groups were housed in well ventilated experimental sheds under hygienic condition. At the end of the growth trial, a metabolic trial was conducted in sheep and buffaloes with a collection period of 7 days to study the digestibility of nutrients in experimental diets. All the animals were caged in metabolic cages and kept for adaptation for 5 days then the feed intake, faeces and urine voided were noted.

Hematological Studies

The hematological studies were conducted to study the effect of feeding of Sheanut cake based concentrate mixtures on hematological values in the experimental animals.

Collection of blood

The blood samples were collected from the jugular vein of the experimental animals into dry, sterile, EDTA anticoagulant vacutainers under aseptic conditions. For estimation of Hb, RBC, WBC and PCV, about 5 ml of blood was collected. These vials are labeled and brought to laboratory for further investigation.

Haematology values

All the blood parameters were measured by using blood analyser at the Department of Pathology, College of Veterinary science, Rajendranagar.

Statistical Analysis

The experimental data were subjected to least square analysis of variance (Snedecor and Cochran 1968) and the treatment means were tested for significance by Duncan's multiple range test (1955).

RESULTS AND DISCUSSION

Nutrient digestibilities

The dry matter digestibility coefficients (%) of the different experimental diets in sheep are presented in Table 2. The average daily dry matter intake recorded was $822.37^{a}\pm3.51$, $805.97^{b}\pm1.92$, $808.02^{b}\pm2.93$, $793.30^{c}\pm2.55$ and $795.63^{c}\pm5.37$ kg with the average digestibility coefficients (%) of $64.65^{a}\pm0.65$, $68.31^{bc}\pm1.13$, $70.23^{cd}\pm0.44$, $67.64^{b}\pm1.57$ and $71.55^{d}\pm0.96$ in T_1, T_2, T_3, T_4 and T_5 diets respectively. Statistical analysis of the data revealed that the drymatter digestibility coefficients (%) were comparable among test diets and significantly ($P<0.05$) higher than control diet (T_1). The crude protein digestibility coefficients (%) of the experimental diets are presented in Table 2. The mean crude protein digestibility coefficients (%) of $61.66^{a}\pm0.39$, $65.53^{b}\pm0.32$, $69.41^{c}\pm0.39$, $67.66^{d}\pm0.21$ and $70.45^{e}\pm0.21$ were recorded for the experimental diets T_1, T_2, T_3, T_4 and T_5 respectively. The CP digestibility coefficients (%) were significantly ($P < 0.05$) higher in all the diets than T_1.

The crude fibre digestibility coefficients (%) of experimental diets in sheep are presented in Table 2. The mean digestibility coefficients (%) of $64.79^{a}\pm0.97$, $67.85^{b}\pm0.48$, $68.48^{b}\pm0.17$, $68.95^{b}\pm0.17$ and $71.76^{c}\pm0.60$ per cent for experimental diets were recorded in T_1, T_2, T_3, T_4 and T_5 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher CF digestibility coefficients (%) in all the diets when compared control diet T_1. The ether extract digestibility coefficients (%) of experimental diets in sheep are presented in Table 21. The mean digestibility coefficients (%) of $68.34^{a}\pm 0.16$, $69.51^{b}\pm0.13$, $73.25^{c}\pm0.17$, $72.19^{d}\pm0.54$ and $76.52^{e}\pm0.24$ per cent for experimental diets were recorded in T_1, T_2, T_3, T_4 and T_5 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher ether extract digestibility coefficients (%) in all the diets when compared control diet T_1. The ether extract digestibility coefficients (%) of experimental diets in sheep are presented in Table 2. The mean digestibility coefficients (%) of $52.70^{a}\pm0.26$ $58.27^{b}\pm0.61$, $68.90^{c}\pm0.52$, $67.43^{d}\pm0.18$ and $70.23^{e}\pm0.23$ per cent for experimental diets were recorded in T_1, T_2, T_3, T_4 and T_5 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher ether extract digestibility coefficients (%) in all the diets when compared control diet T_1.

The ADF digestibility coefficients (%) of experimental diets in sheep are presented in Table 21. The mean digestibility coefficients (%) of $32.19^{a}\pm0.34$, 38.21b±0.26, $41.42^{c}\pm0.23$, 42.93c±0.58 and $46.02^{d}\pm1.20$ per cent for experimental diets were recorded in T_1, T_2, T_3, T_4 and T_5 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher ADF digestibility coefficients (%) in all the diets when compared control diet T_1.

Blood Parameters

The blood parameters like RBC (10^6 / cu mm), WBC (10^3 /Cu mm), Haemoglobin (%), PCV (%) and Platelet count, were determined in the animals of different treatment groups are shown in the Table 3. There was no significant difference observed between treatment groups and period of the experiment in all the blood biochemical parameters except for the platelet count, which were also in the normal range only.

Increased incorporation of sheanut cake in the diets of sheep and period of feeding did not significantly influence the WBC count and values ranged between 10.49±0.34 and 14.35±0.44 10^3 /µl. (normal range of 4-12^3 /cu mm). However the feeding of sheanut cake and period of feeding significantly ($P < 0.05$) affected the WBC values. The RBC count and values ranged between 8.98 ±0.62 and 13.15±0.62 (10^6 / cu mm). Haemoglobin per cent of experimental sheep and values ranged between 7.12 ±0.62 and 9.94±0.54%. The PCV per cent of experimental sheep and values ranged between 35.02 ±1.68 and 29.26±1.11%. Inclusion of sheanut cake in the diets of sheep, period of feeding and individually influenced the platelet count significantly ($P < 0.05$) in the experimental sheep and values ranged between 263.83 ±17.53 and 391.26±15.62 and no particular pattern was observed in the data (Table 3).

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Table 1: Ingredient Composition of Concentrate Mixtures.

Feed ingredients	Experimental diet T 1	Experimental diet T 2	Experimental diet T 3	Experimental diet T 4	Experimental diet T 5
	kg	Kg	kg	kg	kg
Maize	48.5	37	37	25.5	25.5
Groundnut cake	29	27	27	25	25
Sheanut cake	0	20	20	40	40
Deoilded rice bran	13.5	7	7	0.5	0.5
Urea	1	1	1	1	1
Molases	5	5	5	5	5
Salt	1	1	1	1	1
Min mix	2	2	2	2	2
Total quantity	100	100	100.1	100	100.1
Probiotic	0	0	0.1	0	0.1

Table 2: Digestibility coefficients Of Drymatter, Crude protein, Crude fiber, Ether extract, NDF and ADF in Sheep

	DMD	CP	CF	EE	NDF	ADF
T I	62.11	62.20	66.89	68.93	52.83	30.92
	63.99	62.61	64.33	68.56	52.99	32.48
	64.04	60.30	62.96	68.26	53.34	32.04
	65.38	61.50	61.98	68.43	53.25	32.33
	65.82	60.82	68.17	67.99	51.82	31.89
	66.54	62.54	64.43	67.86	51.99	33.48
Mean± SE	64.65^{a}±0.65	61.66^{a}±0.39	64.79^{a}±0.97	68.34^{a}± 0.16	52.70^{a}±0.26	32.19^{a}±0.34
T 2	69.89	64.37	66.14	69.88	56.75	39.01
	71.81	66.33	68.57	69.61	58.91	38.07
	68.84	64.93	69.46	69.48	56.70	38.32
	64.24	66.32	67.33	69.74	58.35	38.15
	65.85	65.79	68.38	69.42	60.70	38.60
	69.25	65.45	67.24	68.93	58.25	37.13
Mean± SE	68.31^{bc}±1.13	65.53^{b}±0.32	67.85^{b}±0.48	69.51^{b}±0.13	58.27^{b}±0.61	38.21^{b}±0.26
T3	68.89	67.70	68.12	73.14	67.70	41.69
	70.47	69.61	68.49	73.20	69.61	40.94
	71.31	70.31	68.67	73.09	70.31	41.48
	70.97	69.36	68.12	72.83	69.36	40.61
	68.89	69.24	68.24	73.18	69.42	41.63
	70.85	70.25	69.22	74.09	67.00	42.19
Mean± SE	70.23^{cd}±0.44	69.41^{c}±0.39	68.48^{b}±0.17	73.25^{c}±0.17	68.90^{c}±0.52	41.42^{c}±0.23
T4	64.91	67.03	69.43	71.24	67.03	43.58
	67.29	67.53	68.94	72.18	67.53	41.35
	69.16	68.19	68.77	72.08	68.19	43.66
	67.12	67.58	68.24	70.45	67.28	43.53
	68.78	68.35	69.11	73.04	67.03	40.99
	68.56	67.32	69.22	74.18	67.53	44.49
Mean± SE	67.64^{b}±1.57	67.66^{d}±0.21	68.95^{b}±0.17	72.19^{d}±0.54	67.43^{d}±0.18	42.93^{c}±0.58
T5	68.70	69.59	70.41	76.01	69.59	48.85
	71.47	70.35	72.16	76.86	70.35	43.86
	72.15	71.17	72.33	76.39	71.17	42.78

	70.82	70.47	71.26	76.54	70.47	48.33
	75.70	70.70	74.21	77.45	69.89	48.85
	70.46	70.46	70.22	75.86	69.96	43.47
	$71.55^{d}\pm0.96$	$70.45^{e}\pm0.21$	$71.76^{c}\pm0.60$	$76.52^{e}\pm0.24$	$70.23^{e}\pm0.23$	$46.02^{d}\pm1.20$

Means with different superscripts in a column wise differ significantly (P<0.05)

Table: 3 Blood parameters of experimental sheep

Animals	WBC 10^3 /Cu mm			RBC 10^6 / cu mm		
	INITIAL	MIDDLE	FINAL	INITIAL	MIDDLE	FINAL
1	13.32	13.17	12.75	11.24	10.11	9.27
2	14.48	12.86	10.89	10.66	9.68	8.68
3	15.20	13.32	11.12	11.34	9.45	9.12
4	12.24	14.01	12.42	12.22	10.54	10.12
5	11.92	13.56	11.62	10.24	10.25	9.35
6	12.20	12.24	13.12	12.68	11.24	8.26
AVG	13.23±0.55	13.19±0.25	11.99±0.37	11.40±0.38	10.21±0.26	9.13±0.25
7	14.45	13.75	11.26	12.47	12.17	11.22
8	15.25	15.21	11.54	10.28	12.24	10.25
9	13.38	14.24	10.89	12.24	14.32	13.36
10	12.86	14.68	9.89	13.25	12.30	14.24
11	15.75	12.84	11.68	14.24	10.64	9.68
12	14.42	12.20	11.88	13.38	11.24	9.84
AVG	14.35±0.44	13.82±0.46	11.19±0.30	12.64±0.55	12.15±0.51	11.43±0.79
13	12.47	11.27	10.32	13.47	11.70	9.58
14	13.32	10.22	9.44	14.58	10.12	8.96
15	11.24	11.08	9.86	15.24	12.24	8.98
16	10.86	11.06	11.34	11.63	10.36	11.24
17	13.34	12.04	12.12	12.32	9.89	10.23
18	13.00	11.22	10.04	11.68	13.36	8.88
AVG	12.37±0.44	11.15±0.23	10.52±0.41	13.15±0.62	11.28±0.56	9.65±0.38
19	14.50	12.73	11.43	11.28	9.79	8.54
20	15.64	13.36	10.34	10.32	8.68	8.86
21	16.12	12.84	14.24	11.24	9.68	7.24
22	14.20	10.87	11.00	11.36	9.98	7.78
23	12.84	13.12	9.86	15.25	11.24	10.24
24	12.64	13.24	10.24	10.24	10.21	11.24
AVG	14.32±0.58	12.69±0.38	11.19±0.65	11.62±0.76	9.93±0.33	8.98±0.62
25	13.60	11.51	10.24	11.69	10.91	10.06
26	14.64	11.54	9.86	11.24	13.35	9.68
27	13.32	12.25	10.02	11.25	10.23	9.56
28	12.25	10.24	10.65	10.24	9.69	9.68
29	12.24	10.36	12.12	14.24	9.86	11.24
30	13.84	11.88	10.06	9.69	12.21	10.12
AVG	13.32±0.38	11.30±0.33	10.49±0.34	11.39±0.64	11.04±0.59	10.06±0.25

Hb %			PCV %			Platelet count		
INITIAL	MIDDLE	FINAL	INITIAL	MIDDLE	FINAL	INITIAL	MIDDLE	FINAL
8.70	7.40	7.20	31.45	31.20	30.24	389.00	369.00	258.00
7.89	6.60	6.26	33.24	30.98	26.04	330.00	380.00	222.00
7.67	8.84	6.35	30.28	31.24	34.62	370.00	350.00	226.00
6.35	7.24	6.24	31.12	34.24	31.24	410.00	366.00	244.00
10.23	7.54	8.86	31.24	30.26	30.65	440.00	358.00	311.00
11.00	6.62	9.12	31.54	29.98	28.44	411.00	412.00	322.00
8.64± 0.70	7.37± 0.33	7.34± 0.54	31.48± 0.40	31.32± 0.62	30.21± 1.17	391.67± 15.62	372.50± 8.92	263.83± 17.53
9.25	8.77	7.80	34.97	33.63	30.08	368.25	389.75	388.75
7.56	6.61	6.56	33.25	24.24	24.56	426.00	440.00	440.00
10.21	7.17	7.16	28.68	41.21	35.35	413.00	374.00	365.00
10.12	8.12	8.21	34.25	36.25	30.12	386.00	356.00	386.00
10.35	11.12	10.00	38.96	33.25	33.24	320.00	322.00	344.00
8.80	10.21	7.24	40.01	33.68	27.56	311.00	422.00	388.00
9.38± 0.44	8.67± 0.71	7.83± 0.49	35.02± 1.68	33.71± 2.25	30.15± 1.57	370.71± 19.34	383.96± 17.64	385.29± 13.07
9.17	7.73	6.92	35.57	32.58	30.11	420.50	378.52	325.33
10.54	6.68	5.65	41.35	41.12	24.48	440.00	360.00	322.00
8.98	7.12	5.45	38.44	28.86	26.68	464.00	422.00	298.00
10.01	10.24	6.89	30.22	25.68	32.26	389.00	410.00	333.00
12.24	8.20	8.68	31.12	30.25	34.26	368.00	329.00	340.00
8.68	6.45	9.12	32.24	34.16	32.28	440.00	372.00	311.00
9.94± 0.54	7.74± 0.57	7.12± 0.62	34.82± 1.80	32.11± 2.16	30.01± 1.52	420.25± 14.60	378.59± 13.80	321.56± 6.20
8.10	7.48	7.10	30.12	33.91	30.25	323.50	322.16	344.50
6.68	6.68	5.65	31.26	38.64	24.48	355.00	268.00	298.00
6.54	7.24	5.98	24.26	36.56	25.38	363.00	296.00	365.00
8.68	6.78	8.80	28.86	29.65	34.46	300.00	324.00	386.00
11.12	6.98	7.12	34.26	32.26	30.26	311.00	375.00	311.00
8.98	8.98	7.24	32.29	30.87	35.26	294.00	361.00	342.00
8.35± 0.69	7.36± 0.35	6.98± 0.45	30.18± 1.40	33.65± 1.40	30.02± 1.82	324.42± 11.72	324.36± 16.22	341.08± 13.37
8.90	8.05	7.23	33.92	31.15	29.99	314.25	319.19	325.33
9.99	6.65	5.47	38.65	30.27	30.18	330.00	268.00	333.00
6.64	7.20	6.76	32.26	24.16	30.26	323.00	344.00	346.00
8.68	11.00	7.12	35.59	25.36	32.25	288.00	312.00	288.00

9.01	6.46	10.00	28.67	38.00	28.64	311.00	299.00	296.00
10.00	8.00	5.65	30.23	34.25	24.26	313.00	368.00	381.00
8.87± 0.50	7.89± 0.68	7.04± 0.67	33.22± 1.49	30.53± 2.14	29.26± 1.11	313.21± 5.82	318.37± 14.22	328.22± 13.89

Means with different superscripts in a column wise differ significantly (P<0.05)

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