EFFECT OF FEEDING SHEA NUT CAKE ON THE NUTRIENT UTILISATION AND BLOOD PARAMETERS OF GRADED MURRAH BUFFALO CALVES

PRASANNA KUMAR R[1], RAGHUNANDAN T[2], SAHITYARANI M[3], NAGALAKSHMI D[4]

Department of Livestock Production and Management, College of Veterinary Science, Korutla, Karimnagar Dist-505 326. Telangana. India.

1 Corresponding Author: Dr. Prasanna Kumar R, Email:repalleprasannakumar@gmail.com

ABSTRACT

A 120 day feeding trial was conducted in a Completely Randomized Design with 18 growing buffalo calves (3 x 6) in intensive system of management to determine the digestibility coefficients (%) of nutrients in experimental diets containing 0% sheanut cake or control diet (T1), 20% sheanut cake with 0.1% probiotic (T 2), 40% sheanut cake with 0.1% probiotics (T3). The blood parameters of the animals fed experimental diets were also studied. The results showed that the dry matter digestibility coefficients (%) of T2 ($66.03^{b}\pm0.58$) and T3 ($68.84^{c}\pm0.33$) were significantly ($P<0.05$) higher than control diet (T_1). Similarly, the CP, CF and EE digestibility coefficients (%) were significantly ($P < 0.05$) higher in all the diets than T_1. Significantly ($P<0.05$) higher NDF digestibility coefficient (%) was recorded in T1 ($60.23^{b}\pm0.74$) diet when compared to T2 and T3 diets. ADF digestibility coefficient (%) was found to be significantly higher in T3 diet ($61.70^{b}\pm0.63$) than T1 and T2 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. This experiment indicates that the inclusion of Sheanut cake is not influencing the blood parameters, which is a good sign.

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

Introduction

The shea tree (*Vitellaria paradoxa*), which bears shea nuts, grows naturally in the wild in the dry Savannah belt of West Africa from Senegal in the west to Sudan in the east, and onto the foothills of the Ethiopian highlands (Hatskevich *et al.*, 2011; FAO, 2014). It occurs in 19 countries across the African continent including Ghana. The tree is perennial and deciduous and occurs mainly on dry open slopes (Yidana, 2004). The tree has gained importance as an economic tree crop because of the heavy demand for its butter both locally and internationally. It has been reported that more than 2.5 million tons of shea kernel produced worldwide were used for the production of cosmetics, pharmaceuticals and confectionery and edible fats (Ghana News Agency, 2006). Recent studies suggest that the shea industry will continue expanding forever and may pick up speed over time (Moore, 2008). shea butter extracted from the nuts of the shea fruit (Mahamadi et al., 2009; Yidana, 2004). Shea nut by-products (SNPs), which are the residues after shea butter production, are obtained in Ghana through different oil extraction methods namely; solvent extraction, screw-press extraction and water based extraction (FAO, 2014; Oddoye *et al.*, 2012)

resulting in different by-products such as shea nut meal (SNM, solvent extracted), sheanut cake (SNC, mechanically extracted) and shea nut cake (SNCW, water extracted), respectively. The shea industry has been viewed to equalize the cocoa industry in the coming years as shea butter gradually becomes the best substitute for cocoa butter (De Muelenaere, 1997; Moore, 2008). Some researchers into animal feed development in West Africa have challenged the perception that the shea cake is largely a waste produced from shea butter processing centers in large quantities (Konlan, 2010; Pousga et al., 2007). A few studies conducted on (SNPs) shea nut meal/cake have shown that it contains substantial amount of nutrients (Agbo and Prah, 2014; Oddoye *et al*., 2012; Dei *et al*., 2008; Atuahene *et al*., 1998). SNPs have been used in some animal feed trials including; poultry (Zanu et al. 2012; Dei *et al*., 2008; Atuahene *et al*., 1998), pig (Rhule, 1999; Okai and Bonsi, 1989), sheep (Konlan *et al.*, 2012) and rabbit (Ansah *et al*., 2011).

Materials and methods

Eighteen graded Murrah buffalo calves were selected and divided in to three equal groups T1, T2 and T3 (Table 1). Three experimental rations were tried namely T1, T2 and T3 in growing buffalo calves to study the effect of inclusion of Shea nut cake at 20% and 40% levels with inclusion of probiotic (0.1 per cent yeast culture) was compared with the control diet. Along with concentrates all the animals were fed with chaffed APBN1 fodder crop every day. The experimental animals were maintained in individual housing system with feeding and watering arrangements throughout the experimental period. The experiment was conducted for 120days at Livestock Research Institute, Rajendranagar, Sri Venkateswara Veterinary University. The feed ingredients were purchased from the local market and the shea nut cake is procured from M/s. Foods, Fats and Fertilizers Pvt. Ltd which is Multi National Company located in West Godavari District A.P. The experimental rations were processed into mash by grinding through 8 mm sieve in a hammer mill.

The chemical composition of all the three experimental rations fed to growing buffalo calves are presented in Table 2. 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. Blood samples were drawn three times i.e at the beginning of the experiment, in the middle of the experiment and after completion of the experiment and values were compared statistically.

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

The digestibility coefficients (%) of the different experimental diets in buffalo calves are presented in Table 3. The dry matter digestibility coefficients (%) of $62.42^a \pm 0.52$, $66.03^b \pm 0.58$, and $68.84^c \pm 0.33$ were recorded for T1, T2 and T3 diets, respectively. Statistical analysis of the data revealed that the dry matter digestibility coefficients (%) of T2 and T3 were significantly ($P<0.05$) higher than control diet (T_1).The mean crude protein digestibility coefficients (%) of $65.40^a \pm 0.83$, $69.75^b \pm 0.65$, and $74.78^c \pm 0.59$ were recorded for the experimental diets T1, T2 and T3, respectively. The CP digestibility coefficients (%) were

significantly ($P < 0.05$) higher in all the diets than T_1.The mean digestibility coefficients (%) of $55.40^{a}\pm0.25$, $58.07^{b}\pm0.72$ and $63.78^{c}\pm0.60$ per cent for experimental diets were recorded in T1, T2 and T3 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 mean ether extract digestibility coefficients (%) of $72.73^{a}\pm0.45$, $77.19^{b}\pm0.96$ and $81.73^{c}\pm0.68$ per cent for experimental diets were recorded in T1, T2 and T3 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher ether extract digestibility coefficient (%) is found in T3 diets when compared o other diets.The mean digestibility coefficients (%) of $60.23^{b}\pm0.74$, $58.29^{b}\pm1.19$, and $54.47^{a}\pm0.95$, per cent for experimental diets were recorded in T1, T2 and T3 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher ether extract digestibility coefficients (%) in T3 diet when compared to T1 and T2 diets. The mean digestibility coefficients (%) of $56.62^{a}\pm 0.93$, $58.89^{a}\pm0.77$ and $61.70^{b}\pm0.63$ per cent for experimental diets were recorded in T_1, T_2 and T3 diets respectively. The statistical analysis of the data indicated significantly ($P < 0.05$) higher ADF digestibility coefficients (%) in T3 diet over T1 and T2 diets.

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 and shown in the Table 4. 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. This experiment indicates that the inclusion of Sheanut cake is not influencing the blood parameters.

Table 1: Ingredient composition experimental diets:

Feed ingredients	Experimental diet T1	Experimental diet T2	Experimental diet T3
	kg	kg	kg
Maize	48.5	37	25.5
Groundnut cake	29	27	25
Sheanut cake	0	20	40
Deoilded rice bran	13.5	7	0.5
Urea	1	1	1
Molasses	5	5	5
Salt	1	1	1
Min mix	2	2	2
Total quantity	100	100	100
Probiotic	0	0.1	0.1

Table 2: Chemical composition of experimental feeds.

Nutrient	Experimental diet T1	Experimental diet T2	Experimental diet T3
Dry matter	85.24	84.97	86.36
Crude protein	20.85	19.58	20.85
Crude fibre	5.65	6.12	6.90
Ether extract	2.33	2.54	2.7
NFE	61.06	61.67	59.26
Total Ash	10.11	10.08	10.3
Cell wall constistuents	4.24	3.96	3.83
NDF	45.51	56.04	44.15
ADF	14.94	19.32	20.85

Table 3: Digestibility coefficients of Dry matter, Crude protein, crude fiber, ether extract, NDF and ADF in buffalo calves.

	DMD	CPD	CFD	EED	NDFD	ADFD
T1	62.56	63.34	56.34	70.86	60.28	54.34
	64.28	63.13	54.68	72.24	59.86	53.28
	61.12	66.21	54.86	73.44	56.89	58.34
	63.24	68.63	55.24	72.86	62.24	56.88
	60.86	65.35	55.64	74.12	60.89	58.64
	62.45	65.74	55.64	72.84	61.24	58.22
	$62.42^{a}\pm0.52$	$65.40^{a}\pm0.83$	$55.40^{a}\pm0.25$	$72.73^{a}\pm0.45$	$60.23^{b}\pm0.74$	$56.62^{a}\pm0.93$
T2	66.12	67.15	57.86	73.64	59.86	55.67
	65.24	68.55	58.28	78.86	57.64	57.46
	67.24	70.68	58.88	75.65	55.68	59.88
	68.12	70.49	54.89	78.34	54.86	60.12
	64.24	71.48	60.26	80.12	62.84	59.98
	65.24	70.16	58.26	76.54	58.86	60.22

	66.03^{b}±0.58	69.75^{b}±0.65	58.07^{b}±0.72	77.19^{b}±0.96	58.29^{b}±1.19	58.89^{a}±0.77
T3	70.12	75.29	66.54	80.24	55.24	62.12
	68.24	75.35	62.38	82.24	52.24	62.22
	69.12	72.12	62.86	82.12	52.38	64.28
	67.86	75.48	63.36	84.56	54.12	59.88
	69.24	74.24	64.24	79.96	58.62	61.24
	68.46	76.22	63.28	81.24	54.24	60.44
	68.84^{c}±0.33	74.78^{c}±0.59	63.78^{c}±0.60	81.73^{c}±0.68	54.47^{a}±0.95	61.70^{b}±0.63

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

Table 4: Blood parameters of experimental buffalo calves

Initial	**GROUP 1**				
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	11.00	8.58	12.40	41.30	422.00
2	8.64	6.52	10.10	34.30	168.00
3	10.10	6.70	10.40	35.50	318.00
4	1.19	0.77	1.20	4.57	166.00
5	9.59	7.82	11.90	40.10	228.00
6	3.20	2.67	3.50	11.70	188.00
AVG	**7.29±1.66**	**5.51±1.26**	**8.25±1.92**	**27.91±6.41**	**248.33±41.75**
Middle			**1**		
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	8.96	7.10	9.90	33.40	251.50
2	9.10	6.24	9.50	34.55	131.50
3	8.84	5.60	8.40	30.15	187.00
4	3.85	3.71	3.20	19.84	88.00
5	8.47	5.97	8.95	31.90	165.50
6	8.12	5.66	8.00	30.00	169.70
	7.89±0.82	**5.71±0.46**	**7.99±1.00**	**29.97±2.15**	**165.53±22.39**
Final					
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	6.92	5.63	7.40	25.50	181.00
2	9.55	5.97	8.90	34.80	195.00
3	7.58	4.49	6.40	24.80	156.00
4	6.51	6.65	5.20	35.10	116.00
5	7.35	4.13	6.00	23.70	103.00
6	7.68	6.00	6.03	29.10	111.00
	7.60±0.43	**5.48±0.40**	**6.66±0.54**	**28.83±2.07**	**143.67±15.99**
Initial					
	GROUP 2				
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	7.50	5.46	9.20	32.30	191.00
2	1.67	11.90	1.70	6.24	124.00

3	15.40	10.50	12.60	44.80	198.00
4	3.20	2.67	3.50	11.70	188.00
5	3.00	1.48	2.10	7.61	127.00
6	6.40	5.80	6.00	20.10	160.00
	6.20±2.05	**6.30±1.70**	**5.85±1.77**	**20.46±6.26**	**164.67±13.47**
Middle					
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	6.33	4.03	6.50	23.50	142.00
2	5.22	9.83	5.90	23.17	163.00
3	11.41	10.25	11.90	43.45	145.00
4	8.16	8.12	10.30	22.00	148.00
5	6.65	6.63	7.70	44.00	152.00
6	7.00	4.35	7.60	24.40	144.00
	7.46±0.88	**7.20±1.09**	**8.32±0.95**	**30.09±4.32**	**149.00±3.14**

Table Contd……

Continued table…

Final					
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	5.15	2.60	3.80	14.70	194.00
2	8.76	7.76	10.10	40.10	202.00
3	7.42	10.00	11.30	42.10	181.00
4	6.88	5.80	9.60	30.00	122.00
5	8.11	9.60	5.80	33.30	145.00
6	7.24	8.10	9.40	44.20	200.00
	7.26±0.50	**7.31±1.12**	**8.33±1.18**	**34.07±4.46**	**174.00±13.48**
Initial					
	GROUP 3				
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	13.80	11.10	14.30	47.50	192.00
2	8.66	5.63	8.90	29.10	320.00
3	13.70	13.00	14.50	49.50	377.00
4	11.70	8.24	11.10	36.80	341.00
5	1.25	0.44	0.60	2.33	322.00
6	13.20	6.33	9.40	32.30	170.00
	10.39±1.99	**7.46±1.81**	**9.80±2.08**	**32.92±6.96**	**287.00±34.66**
Middle					
TAG	**WBC**	**RBC**	**HB**	**PCV**	**PLT**
1	10.15	7.80	10.20	35.30	148.00
2	7.84	7.02	9.75	36.25	197.50
3	10.61	8.39	9.80	33.40	196.00
4	9.73	4.63	6.25	20.95	196.00
5	7.58	3.48	4.85	17.22	122.00
6	9.07	6.24	8.27	29.00	188.00
	9.16±0.51	**6.26±0.77**	**8.19±0.89**	**28.69±3.24**	**174.58±13.03**

Final TAG	WBC	RBC	HB	PCV	PLT
1	6.50	4.50	6.10	23.10	222.00
2	7.01	8.41	10.60	43.40	125.00
3	7.51	3.77	5.10	17.30	156.00
4	7.76	1.01	1.40	5.09	151.00
5	13.90	6.52	9.10	32.10	179.00
6	9.10	4.80	7.10	25.20	188.00
	8.63±1.36	**4.84±1.25**	**6.57±1.61**	**24.37±6.50**	**170.17±16.29**

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Author details:

PRASANNA KUMAR[1] .R, RAGHUNANDAN.T[2], SAHITYA RANI [3]and RNAGALAKHSHMI.D[4]

1. Corresponding author & Associate Professor & Head, Department of Livestock Production and Management, College of Veterinary Science, Korutla, Karimnagar Dist,Telangana State
   Mail: repalleprasannakumar@gmail.com
   Mobile: 07658975781

2. Professor & Head, ILFC, College of veterinary Science, Rajendranagar, Hyderabad.

3. Assistant Professor,Department of Livestock Products Technology,College of Veterinary Science,Korutla,Karimnagar Dist,Telangana State

4. Professor & Head, Department of Animal Nutrition, College of Veterinary Science,Korutla,Karimnagar Dist,Telangana State