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EFFECT OF INCORPORATION OF PALM OIL DECANTER CAKE (PODC) AT VARYING LEVELS ON HAEMATOLOGY AND SERUM BIOCHEMICAL PROFILE IN NELLORE BROWN RAM LAMBS

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Abstract: An experiment was conducted to study the effect of Palm Oil Decanter Cake (PODC) at varying levels in the diet of Nellore brown ram lambs on blood and serum biochemical profile during a growth trial for 90 days. In a completely randomized design, 18 growing Nellore brown ram lambs were divided into 3 equal groups of six each and allotted to three dietary treatments (T_1 to T_3) comprising of green fodder *viz.* Super Napier and concentrate mixture (20% CP) containing PODC at 0, 10 and 20%, respectively. Blood was collected before the start and at the end of the experiment and serum was separated. Results revealed that inclusion of PODC at 10 or 20% level in the concentrate mixtures had no effect ($P>0.05$) on Hb (g/dl), RBC (10^6/µl), WBC (10^3/µl), PCV (%) and MCV (fL) and were within the normal range. Similarly, inclusion of PODC at 10 or 20% level did not affect ($P>0.05$) serum biochemical profile *i.e.* total protein (g/dl), albumin (g/dl), globulin (g/dl), glucose (mg/dl), triglycerides (mg/dl), cholesterol (mg/dl), AST (U/L), ALT (U/L), creatinine (mg/dl), urea (mg/dl), calcium (mg/dl) and phosphorus (mg/dl) in ram lambs. It is concluded that the blood-biochemical parameters in ram lambs were within the normal range in all the treatments indicating that the diets are well balanced and did not exert any deleterious effect on the health of animals.

Keywords: Palm Oil Decanter Cake, Haematology, Serum Bio-chemical Profile, Nellore Brown ram Lambs

Introduction

The main constraint in small ruminant production systems is non-availability of grazing land throughout the year and also escalating demand for concentrate ingredients due to ever increasing cost and human competition for grains. This has led to the utilization of alternate feeds which do not compete with human food chain in which agro-industrial by-products could be an alternative as cheap and sustainable feed resources for small ruminants. Oil palm (*Elaesis guineensis*) industry produces annually large amounts of biomass available as potential animal feed such as oil palm frond (OPF), palm kernel meal/cake, (PKM/PKC), palm press fibre (PPF), palm oil mill effluent (POME) and palm oil decanter cake (PODC). The PODC is brown-blackish substance produced after passing through a process of decanting, centrifuging

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and then drying within the machine system. Basically, PODC is produced by the extraction of solids from palm oil sludge. The production rate of decanter cake amount to 4-5 % weight of fresh fruit bunch processed. The chemical composition of POME varies with method of processing. Fresh palm oil mill effluent contains mostly water (90-95%), decanted effluent contains 60-80% DM and dried decanted effluent contains more than 90% DM (Seephueak *et al*., 2011 and Abubakr *et al*., 2015). It is a valuable and potential by-product that can be utilized as an alternative energy and protein source for growing ruminants and the data on utilization of PODC is scanty. Hence, the present work has been taken up to study the effect of feeding PODC at varying levels on haematology and serum bio-chemical profile in Nellore Brown Ram Lambs.

Materials and Methods

The experiment was carried out at the Department of Animal Nutrition, NTR College of Veterinary Science, Gannavaram, Andhra Pradesh. Iso-nitrogenous experimental concentrates (T_1 to T_3) were prepared with inclusion of PODC at 0, 10 and 20 per cent, respectively. Super Napier was supplied by Livestock Farm Complex, NTR College of Veterinary Science, Gannavaram. Eighteen Nellore Brown Ram lambs (9-12 kg) of about 3 months age were randomly divided into three equal groups of six each, housed in individual pens with provision for individual feeding. Fresh, clean drinking water was provided to the animals throughout the day. All the lambs were dewormed before and at the middle of the growth trial. All ram lambs were offered respective diets (control and treatment) daily two times *i.e.* 9.00 am and 2.00 pm, so the total concentrate supplemented will be 1% of the body weight. Super Napier was provided between 9.00 am and 3.00 pm and made available all through the day in *ad libitum*, during growth trial of 90 days.

During growth trial, blood was collected at the beginning and end of the trial, aseptically from the jugular vein just prior to feeding. Whole blood was collected into EDTA vial and the clot activator vials were used to separate serum, later centrifuged at 2000 RPM for 5 min at room temperature to separate out clear serum, which was transferred into small plastic vials (1.5 ml) and stored at -20^0C for further analysis of serum biochemical constituents. Haematological parameters such as haemoglobin (g/dl), RBC ($x10^6$/µl) and WBC (10^3/µl) PCV (%) and MCV (fL) were estimated. Different biochemical parameters were estimated by employing the commercially available kits. The biochemical parameters were estimated by Multiskan GO spectrophotometer (Thermo Scientific). The samples of feed were analyzed for proximate constituents (AOAC, 2007), fibre fractions (Van Soest *et al*., 1991) and calcium and

phosphorus Talapatra *et al.* (1940). The data were collected during experiments subjected to one way analysis and for carcass traits from means (Snedecor and Cochran, 1994).

Results and Discussion

The chemical composition of Super Napier, PODC and experimental concentrate mixtures (T_1 to T_3) were presented in Table 1. The CP content of Super Napier fodder in the present study was 12.62 per cent. In line with the present findings, Madesh (2016) reported a CP content of 12.10 per cent, but a higher value of 13.50 per cent was given by Aruna (2017). The differences observed in the chemical composition of Super Napier green fodder might be attributed to the differences in type of soil, cultivation practices, climatic conditions, irrigation facilities, time of harvest, etc. The DM content (93.73 %) of PODC observed in the present study is comparable with the values reported by Seephueak *et al*. (2011). The CP content of PODC observed in the present study is 18.62%. In contrast, Bamikole and Ikhatua, (2009) and Abubakr *et al*. (2015) reported lower CP values (9.7 to 15.4 %) in PODC. Palm oil decanter cake, though it supplies both protein and energy it is looked upon more as a source of protein. The variation in the chemical composition of PODC as reported by different workers might be attributed to the oil palm variety, collection methods of fruits, maturity of fruits, employment of different oil extraction methods, oil processing methods, drying etc. The concentrate mixtures (T_1, T_2 and T_3) were iso-nitrogenous (Table 1). Increasing the levels of inclusion of PODC from 10 to 20% in the concentrate mixture resulted in decreased OM and NFE content as compared to the control (T_1) which might be due to their lower levels in PODC as compared to maize and DORB used in the preparation of concentrate mixtures.

The haematological parameters in ram lambs fed rations containing PODC at different levels in the concentrate mixture is shown in Table 2. Results indicated that inclusion of PODC at 10 or 20% in the concentrate mixtures had no effect ($P>0.05$) on Hb, RBC, WBC, PCV and MCV values in ram lambs as compared to the control. Further, the mean values obtained at the beginning and end of the trial were in the normal range. Corroborating the present findings, Onibi *et al*. (2011) reported that none of hematological parameters measured were significantly ($P>0.05$) influenced by dietary treatments with varying levels of palm oil sludge (POS) in the diet. Seephueak *et al*. (2011) and Chanjula *et al*. (2011) also reported similar findings. On the other hand, Ajaonuma *et al*. (2013) reported that Hb and PCV showed no differences ($P>0.05$), while RBC showed significant differences ($P<0.05$) across the diets containing different levels of Palm Kernel cake (PKC) in domesticated turkeys. Haemoglobin content is influenced by feed sufficiency, particularly protein in the ration and digestibility (Schalm *et al*., 1986). The

normal range of haemoglobin content in sheep is 9 to 12 g/dl. The haemoglobin values, at the beginning and end of the growth trial fell under normal range which indicated that inclusion of PODC did not create any problem in blood circulation. The average haematocrit values ranged between 30-34% in the present study. The increased body dehydration could increase haematocrit value, while poor nutrition causes decreased blood formation and decreased haematocrit value (Aikhuomobhogbe and Orheruata, 2006). However, inclusion of PODC in concentrate mixtures did not have any significant effect ($P>0.05$) on haematocrit value of ram lambs, indicating that the diets are nutritionally well balanced and hence, the lambs fed PODC did not exhibit anaemia or dehydration.

The serum biochemical profile of ram lambs fed rations containing PODC at different levels in the concentrate mixture is shown in Table 3. Data indicated that increased levels of inclusion of PODC from 10 to 20% in the concentrate mixtures had no effect ($P>0.05$) on serum levels of glucose, total protein, albumin, globulin, triglycerides, cholesterol, AST, ALT, creatinine, urea, calcium and phosphorous and were within the normal range. In line, Seephueak *et al*. (2011) reported that blood glucose values of Thai native cattle fed different levels of POS were similar ($P>0.05$) among treatments and were within the normal range. Similarly, Egenuka *et al*. (2013) reported no effect ($P>0.05$) on serum glucose, calcium, phosphorus, creatinine and cholesterol content of pullets fed on PKC diets. On the other hand, Onibi *et al*. (2011) reported an increase ($P<0.05$) in serum cholesterol levels of chickens with increasing levels of POS in diets. Similarly, Mugabe *et al*. (2017) reported increased ($P<0.05$) triglycerides with increased levels of PKC in diet of lambs.

Conclusion

It is concluded that, inclusion of PODC at different levels in the concentrate mixture had no effect on haematological parameters and serum biochemical profile of ram lambs. All the parameters were within the normal range indicating that the diets are well balanced and did not cause any deleterious effect on the health of animals.

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Table 1: Chemical composition* (% DM basis except for DM) of Super Napier and Palm Oil Decanter Cake (PODC)

Nutrient	Super Napier	PODC	T_1	T_2	T_3
Dry matter	22.18	93.73	92.82	92.84	93.13
Organic matter	89.59	87.90	89.14	89.10	89.05
Total ash	10.41	12.10	10.86	10.90	10.95
Crude protein	12.62	18.62	20.00	20.00	20.00
Ether extract	2.20	11.90	1.70	2.80	3.70
Crude fibre	42.12	20.34	12.00	13.36	14.88
Nitrogen free extract	32.65	37.04	55.44	52.94	50.47
NDF	82.65	58.20	31.42	34.66	37.86
ADF	50.12	36.09	14.93	17.94	21.02
Hemi cellulose	32.53	22.11	16.49	16.72	16.84
Cellulose	40.66	25.22	10.24	13.22	15.58
Acid detergent lignin	4.70	6.82	2.63	2.79	3.05
Silica	3.10	3.53	1.91	2.02	2.16
Calcium	0.62	0.42	1.47	1.14	1.24
Phosphorus	0.16	0.25	0.38	0.43	0.40

Table 2: Haematological parameters of Nellore brown ram lambs fed concentrate mixtures containing different levels of PODC

Parameter[NS]	T_1		T_2		T_3	
	Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**
Hb (g/dl)	9.37±0.32	9.43±0.16	9.97±0.33	10.23±0.30	10.13±0.49	10.40±0.34
RBC (10^6/µl)	8.98±0.45	9.07±0.20	9.78±0.71	10.03±0.59	10.60±0.62	9.80±0.46
WBC (10^3/ µl)	9.77±0.27	9.90±0.25	9.97±0.37	10.07±0.37	9.83±0.56	9.77±0.40
PCV (%)	31.02±2.38	34.5±0.23	31.33±2.95	32.5±3.42	32.67±1.76	33.17±2.97
MCV (fL)	34.52±2.30	32.82±0.25	34.33±2.40	35.50±2.28	36.14±1.37	37.02±1.26

Hb-Haemoglobin, RBC-Red Blood Cells, WBC-White Blood Cells, PCV-Packed Cell Volume, MCV-Mean Corpuscular Volume
NS-Non-significant

Table 3: Serum biochemical parameters of Nellore brown ram lambs fed concentrate mixtures containing different levels of PODC

Parameter [NS]	T_1		T_2		T_3	
	Initial	**Final**	**Initial**	**Final**	**Initial**	**Final**
Total protein(g/dl)	6.03 ± 0.35	6.17 ± 0.38	6.10 ± 0.37	6.28± 0.29	5.93± 0.35	7.07 ± 0.16
Albumin (g/dl)	2.98 ± 0.20	3.02 ± 0.12	2.97 ± 0.12	3.03 ± 0.14	2.52± 0.21	2.97± 0.18
Globulin (g/dl)	3.05 ± 0.29	3.17 ± 0.44	3.13 ± 0.36	3.25 ±0.37	3.42 ±0.35	4.09 ±0.26
Glucose(mg/dl)	62.97 ± 2.00	60.21 ± 3.77	62.33 ± 2.22	64.57 ±3.60	64.43± 3.38	67.73 ± 3.72
Triglycerides (mg/dl)	30.2 ± 0.56	36.3 ± 0.84	32.10 ± 0.80	42.10 ±0.92	32.5 ±0.62	48.02 ± 0.62
Cholesterol (mg/dl)	47.13 ± 5.51	54.64 ± 0.93	50.20 ± 4.90	56.10 ±2.44	50.33± 3.07	58.60 ±3.18
AST (U/L)	122.33±20.59	136.0±16.88	137.33±20.80	149.0±11.69	128.22±12.66	152.33 ±5.38
ALT (U/L)	26.69±1.19	28.12 ± 2.00	28.10 ±0.70	29.69± 1.79	25.96± 1.50	30.18± 0.65
Creatinine (mg/dl)	1.13 ± 0.24	1.31 ± 0.31	1.24± 0.31	1.37 ±0.16	1.27± 0.13	1.51± 0.13
Urea (mg/dl)	0.07 ± 0.01	0.092 ± 0.04	0.09± 0.03	0.101± 0.02	0.07±0.01	0.110 ± 0.02
Calcium(mg/dl)	10.07±0.64	11.56 ±0.26	10.88± 1.43	11.72 ±0.39	10.08± 1.36	11.80 ±0.43
Phosphorus (mg/dl)	7.07 ±0.19	6.89 ±0.16	6.99 ±0.08	7.01 ±0.32	6.37 ±0.13	7.13 ±0.26

AST – Aspartate Aminotransferase, ALT- Alanine Aminotransferase
NS- Non-significant