EFFECTS OF FEEDING AGRO-INDUSTRIAL BY PRODUCTS BASED CONCENTRATE DIETS TO WAD GOATS USING *Pennisetum purpureum* HAY AS BASAL DIET

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ABSTRACT

Effects of feeding agro-industrial by products (cassava peels, dried poultry waste, molasses and saw dust ash) on blood indices (haematological parameters and serum metabolites) was investigated using sixteen West African dwarf (WAD) goats of about 8 – 10 months of age and average weight of 7.33 kg of about 12 months of age in a completely randomized design experiment. There were no significant ($p>0.05$) differences at period 2 between treatments for the haematological parameters except for white blood cell while at period 3 there were significant differences among the measured parameters except the white blood cell. The mean values of packed cell volume (PVC), haemoglobin (Hb), White Blood Cell (WBC) and Red Blood Cell (RBC) at period 3 ranges from 31.75 to36.25%, 10.13 to 12.10, 6.80 to 8.23 x $10^{9/l}$ and 15.30 to 18.10 x$10^{12/l}$ respectively. The study also revealed that there were significant ($P<0.05$) differences for serum metabolites except albumin between dietary treatments. At period 3 Total protein, serum glucose, uric acid, globulin and albumin mean values ranges (75.00-81.00g/L) (27.25-103.00mg/dL), (6.40-7.88mg/dL), (27.25-31.25g/L) and (47.75-49.75g/L) respectively. These results revealed that the feeding of agro-industrial by- products had significant effect on the blood indices of WAD goats.

Keywords: Haematological parameters, serum metabolites, WAD goats, Agro-industrial by- product.

INTRODUCTION

High cost and unavailability of conventional energy and protein sources such as maize, groundnut cake, fish meal and soybean meal coupled with competition for the same ingredients by man, poultry and swine has prompted animal nutritionist to search for alternative feed resources such as Agro-industrial by products for small ruminants (Ukpabi and, Abdu, 2009). Blood contains dissolved nutrients whose component (haematological and biochemical) are influenced by diets. Through studies, normal ranges of these components for most healthy livestock species have been determined. Therefore, the health status of an animal can be determined from its blood constituents (Ahamefule and Okoye, 2010).

This study was carried out to evaluate the effects of feeding experimental diets made from agro-industrial by-products (Cassava peel as a source of energy, poultry waste to be use as a source of protein, molasses as a source of energy and as a sweetener and sawdust ash to be used as a source of minerals at varying levels) on haematological parameters and serum metabolites of West African dwarf goats.

MATERIALS AND METHODS

Experimental location

The study was carried out at sheep unit of small ruminant section of the Directorate of University Farms (DUFARMS). Federal University of Agriculture, Abeokuta, South Western Nigeria. The location, which is 76m above the sea level and it falls within latitude 7^0 5.5^1 – 78.0^1N and longitude $3^0 11.2^1$ - $3^0 2.5^1$E.

Animals and their management

Sixteen (16) West African dwarf (WAD) goats between 8-10 months of age and weighing between 7.33 - 7.78 kg were used for the experiment. Experimental animals were divided into four groups of four animals each, balanced for body weight; each group of animals was randomly assigned to one of four experimental diets with *Pennisetum purpureum* served as basal diet. Animals were fed at 50 g/kg BW during a 120-day feeding trial and were allowed an adaptation period of 14days prior to data collection.

Blood collection and analysis

5mls blood samples were collected via jugular vein from individual animals prior to commencement, at the middle and at the end of the feeding trial. 2ml of the sample were put into sample bottles containing EDTA. The remaining 3ml was left in the syringe to clot for serum harvest. Blood serum was used for determination of serum glucose, uric acid, total protein, globulin and albumin. The packed cell volume (PCV), haemoglobin (Hb), white cell (WBC) and red blood cell (RBC) were measured using the samples collected in EDTA. The serum total protein was determined by the biuret method using procedures previously determined by the biuret method and albumin by the bromocresol method using procedures previously described by others (Singh 2004; Cheesbrough, 2004). The globulin level was determined from the difference between total protein and albumin. The haemoglobin concentration (Cyanmethaemoglobin method), packed cell volume (Micro haematrocrit method), white, blood cell count differential were also determined using standard procedures previously used by others (Jain, 1986; Chees brough, 2004; Rastogi, 2008). Data collected in this study were subjected to one way analysis of variance (ANOVA) using SAS (1990) procedure. Differences between means were separated by Duncan multiple range test (Duncan 1955).

RESULT AND DISCUSSION

Table 3 shows the haematological values of goats fed experimental diets. The observed haematological values at period 3 showed that except for WBC all other haematological parameters measured differed significantly ($P < 0.05$) between the four diets. The PCV value of animals fed with control diet was highest (36.25%) while the least value (31.75%) was recorded in animals fed with diet 4 (30% DPW inclusion). However these values were higher than the range of 21.35% reported by Daramola *et al.* (2005). While these values were similar to the values of 36.9% and 35.5% for clinically healthy, WAD goats and sheep respectively except for those fed with diet four going by the reports of Dorgie and Allonby (1975) all the goats except those on diet 4 have the high tendency for a return of PCV to normal level following an infection. The haemoglobin concentration in the blood of the studied goats showed a similar pattern of variation like that of PCV. Mean Hb concentration at period 2 differ significantly ($P < 0.05$) among the dietary treatments with goats fed with diet 1 (control) recording the highest value (12.10 g/dL) while those on diet 4 (30% DPW) recording the lowest value (10.13 g/dL). Nevertheless, the Hb range in this study was similar to the mean value for goats fed *Panicum maximum* supplemented with *Afzelia Africana* and *Newbouldia laevis* (8-11g/dL) reported by Ikhimioya and Imasuen (2007) and also fell within the range of 7.15g/dL reported by Daramola *et al.* (2005) The relatively higher Hb concentration observed is an indication that the dietary treatments generally seemed to be capable of supporting high oxygen carrying capacity blood in goats. The RBC counts observed in this study differed significantly ($P < 0.05$) between dietary treatments they however, were much higher than (2.70-3.65 $X10^{12}$/L) reported by Ikhimioya and Imasuen (2007) and fell within the range of 9.9 and 18.7 $X10^{12}$/L (Taiwo and Ogunsanmi, 2003) for goats and sheep respectively. According to Merck's Veterinary Manual (1979), the red blood cell indices aid in the characterization of anemia. Therefore, the high RBC counts recorded for the goats in the different diets is an indication of low susceptibility to anemia-related conditions by these goats.WBC counts in all the diets was much lower than (20.95 – 29.98 x $10^3$1) those reported by Ikhmioya and Imasuen (2007) for goats. But similar to the value (8.37 – 9.30x10^6/L) reported by Konla *et al.* (2012). At the expiration of the study, all the parameters measured showed significant increases among the treatments. This is an indication that the level of toxic substances were not increasing with the increase in intakes of the diets, this can be seen in the values of WBC which should have been increased so as to be able to cope with the level of toxicity. Table 4 shows the variations in the biochemical indices of the WAD goats placed on the different dietary treatments. Serum biochemistry is a generalized medium of assessing the health status of animals. Apart from albumin at period 3, all the other serum metabolites differ significantly ($P < 0.05$) among the dietary treatment. The diets in this study affect the total protein significantly ($P < 0.05$). Animals on diet 2 (20% DPW inclusion) had the highest

values for blood glucose and uric acid while those on diet 1 (control) recorded the highest values for other parameters. Blood glucose is an indicator of energy status of the animal and is capable of improving the nutritional status of the animal (Aderinboye *et al.*, 2009) which implies that there is an adequate supply of energy for goats fed all the experimental dies.However, the higher values for total protein, albumin and globulin in this study compared favourably with the reports of Ikhiomoya and Imasuen (2007) and is an indication of high absorption of nutrients in the alimentary canal.

CONCLUSION

Concentrate made from agro-industrial by-products had a positive effect on the haematological and biochemical constituents of goats. Apart from the control diet the experimental diets with dried protein waste (DPW) inclusion could be used to feed goats when kept intensively and during the dry season in particular.

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Table 1: Percentage composition of experimental diets

Ingredient	Formulated Diets			
	1	2	3	4
Cassava waste	62.00	72.00	67.00	62.00
Brewer's dried waste	30.00	0.000	0.00	0.00
Poultry waste	0.00	20.00	25.00	30.00
Molasses	5.00	2.00	5.00	5.00
Sawdust ash	2.00	2.00	2.00	2.00
Salt	1.00	1.00	1.00	1.00
Total	100.00	100.00	100.00	100.00

Table 2: Proximate composition (%) of dried poultry waste, *P. purpureum* and the formulated diets

Components	Dried Poultry waste	*P. purpureun* hay	D1	D2	D3	D4
Dry matter	96.00	93.50	95.5	95.00	94.50	93.50
Crude protein	22.00	4.00	15.40	14.20	14.60	15.00
Crude fiber	17.70	40.90	12.20	12.20	11.20	11.20
Ash	27.10	10.20	7.40	10.00	10.00	13.80
Ether extract	2.00	7.50	5.50	5.50	5.50	6.50
Nitrogen free extract	31.20	37.40	59.50	58.10	58.60	53.50
Organic matter	72.90	89.20	92.60	90.00	89.90	86.20

D1= 0% poultry waste, D2=20% poultry waste, D3=25% poultry waste and D4=30% poultry waste

Table 3: Haematological parameters of WAD goats fed experimental diets

Parameters	Diets				
Period 1 (day 0)	1	2	3	4	SEM
Packed cell volume (%)	22.25	24.00	27.00	23.00	2.085
Haemoglobin (g/L)	7.58	8.02	9.05	8.10	0.682
White blood cell x $10^{9/L}$	5.25	5.55	5.55	5.45	0.252
Red blood cell x $10^{12/L}$	2.58	2.73	3.08	2.73	0.235
Period 2 (day 60)					
Packed cell volume (%)	28.75	28.00	26.25	25.25	2.219
Haemoglobin (g/L)	9.78	8.53	9.03	8.73	0.751
White blood cell x $10^{9/L}$	6.00^{b}	5.10^{b}	5.93^{b}	8.70^{a}	0.740
Red blood cell x $10^{12/L}$	5.20	6.23	5.58	4.93	0.418
Period 3 (day 120)					
Packed cell volume (%)	36.25^{a}	34.75^{a}	32.00^{b}	31.75^{b}	1.102
Haemoglobin (g/L)	12.10^{a}	11.13^{a}	10.40^{b}	10.13^{b}	0.415
White blood cell x $10^{9/L}$	7.10	8.23	6.95	6.80	0.434
Red blood cell x $10^{12/L}$	16.08^{d}	13.40^{b}	15.30^{a}	15.53^{a}	0.641

a,b,c- means on the same row with different superscript are significantly (P< 0.05) different.

Table 4: Serum metabolites of WAD goats fed experimental diets

Parameters	Diet				
Period 1 (day 0)	1	2	3	4	SEM
Glucose(mg/dL)	43.75	47.50	51.25	46.25	4.034
Uric Acid (mg/dL)	2.68	2.90	3.20	2.88	0.243
Total protein (g/L)	35.75	38.75	43.00	39.00	3.328
Globulin (g/L)	14.25	15.25	17.25	15.75	1.346
Albumin (g/L)	21.50	23.50	25.75	23.25	3.990
Period 2 (day 60)					
Glucose(mg/dL)	85.25^{b}	92.75^{a}	78.75^{c}	83.25^{b}	1.714
Uric Acid (mg/dL)	6.33^{b}	6.40^{b}	7.00^{a}	6.63^{a}	0.141
Total protein (g/L)	61.75^{b}	72.7^{a}	69.25^{a}	66.00^{a}	2.709
Globulin (g/L)	21.00^{c}	33.25^{a}	28.25^{b}	22.75^{c}	2.740
Albumin (g/L)	40.75^{b}	39.50^{b}	41.00^{b}	43.25^{a}	0.468
Period 3 (day 120)					
Glucose(mg/dL)	95.00^{b}	103.00^{a}	87.25^{c}	96.75^{b}	1.510
Uric Acid (mg/dL)	7.03^{c}	7.88^{b}	7.40^{b}	6.40^{c}	0.250
Total protein (g/L)	81.00^{a}	75.00^{b}	78.75^{a}	79.00^{a}	1.546
Globulin (g/L)	31.25^{a}	27.25^{b}	30.75^{b}	30.00^{a}	1.023
Albumin (g/L)	49.75	47.75	48.00	49.00	0.907

a,b,c- means on the same row with different superscript are significantly ($P< 0.05$) different.