Libyan Agriculture Research Center Journal International 1 (1): 33-36, 2010
ISSN 2219-4304

Growth Performance, Haematology and Blood Chemistry of WAD Doe-Kids on Groundnut Cake Diets Replaced With Soybean Chaff

A.A. Akingbade, F.G. Sodehinde, O.A. Aderinola O.R. Fadare and A.O. Rabiu

Department of Animal Production & Health,
Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Nigeria

Abstract: Four West African dwarf (WAD) doe-kids (growing female) were used for the study that lasted 16 weeks. The body weights of the goats at the start of the study ranged between 6 and 7 kg. In the four experimental diets soybean chaff was made to replace groundnut cake and were: a) Diet A (0%); b) Diet B (15%); c) Diet C (20%) and d) Diet D (25%) Soybean chaff (SC). The experimental design was a 4 x 4 change over Latin Square design. The parameters examined include: Feed intake, water intake, live weight, heart girth, haematology and blood chemistry. Differences between treatments for growth parameters (live weight and heart girth), feed and water intakes were not significant. However, goats on 20 and 25%SC inclusion recorded the highest body weight gain. The differences between treatments for all blood parameters (except for the RBC and Glutamate oxaloacetate transaminase (GOT)) were not significant. Though not statistically significant, the 15%SC diet that had the highest body weight gain (60.7gdG^{1}) and least feed intake (1.20 kg dG^{1}) seemed to be the appropriate level of SC replacement in GNC diet.

Key words: Hematology % Heart girth % GOT

INTRODUCTION

The ruminant animals are of two main types; the small ruminants (goats and sheep) and large ruminants (cattle). The lowest establishment cost and shorter gestation length of small ruminants (goats and sheep) when compared with large ruminants (cattle) favour their domestication. However, goats adapt better to inclement weather conditions do well in tropical and subtropical regions. Indigenous breeds are widely acknowledge to adapt better to prevailing local nutritional and environmental constrains when compared with the exotic breeds The predominant indigenous breeds of goats in Nigeria are the West African dwarf (WAD) and Red Sokoto (RS) breeds [1]. The cost of feeding in livestock enterprise accounts for over 60% of the production cost. The consequence of this is high market price of animal products. An attempt to reduce the cost of feeding will bring down the market price of live animal and their products. The most economic feed of ruminant animals are forage plants that comprise: pasture grasses and legumes, browse plants and leguminous trees and their availability vary within and between geographical and ecological zones [2]. Of the nutrients in animal feeds, protein is the most limiting [3]. Protein can be sourced either from animals or plants. Proteins of animal origin comprise blood, meat and feather meals while plant proteins can be sourced from soybean (*Glycine max*) meal, groundnut, cotton seed and palm kernel cakes [4]. The by-product obtained when oil is extracted from soybean seeds is soybean cake. The highest price of milk of animal origin resulted in search for alternative source of milk and this was found in soybean. The byproduct after milk extraction from soybean is soybean chaff which is relished by goats. The increase in demand for soybean milk will result in an increase in the production soybean chaff that will serve feeds for goats. From the search of literature there were no reports on replacement of groundnut cake (GNC) diet with soybean chaff (SC) in derived savannah zone of Nigeria. The main objectives of the study were to:

- Determine growth performance of WAD doe-kids on GNC diets replaced with SC;
- Determine water and feed intakes of WAD doe-kids on GNC diets replaced with SC;

Corresponding Author: Dr. A.A. Akingbade, Department of Animal Production & Health,
Ladoke Akintola University of Technology, P.M.B. 4000, Ogbomoso, Nigeria.

- Examine the blood chemistry and hematology of WAD doe-kids on GNC diets replaced with SC.

MATERIALS AND METHODS

The study was carried out at the Teaching and Research Farm of Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, Oyo State. Four growing WAD doe-kids (growing females) used for the study were acclimatized over a four week period. The animals were offered *Gliricidia sepium*, *Pennisetum purpureum*, maize chaff and clean drinkable water during acclimatization period. The live weights and heart girths of the goats at the onset of the study were: 6.0, 7.0, 7.0 and 6.5 kg and 17.0, 17.2, 18.0 and 18.0 cm, respectively. The acclimatization was followed by 12 weeks of data collection. The diets used for the study (Table 1) were: Diet A (0% SC); Diet B (15% SC); Diet C (20% SC) and Diet D (25% SC). The SC was made to replace groundnut cake (GNC).

Each goat was fed at 07:30 h with fresh feed and water after emptying and measuring the feed and water refused (refusal) from the feed and water that were offered the previous day. The daily feed and water intakes were recorded on a daily basis. The experimental design was a 4 x 4 change over Latin Square design that comprised eight periods shared equally between control and trial. Each control period was one week while each trial period lasted two weeks. At the end of acclimatization period and at the each of each trial period, the blood samples of all the goats were collected as described by Van Niekerk *et al*. [5] between 07.00 and 08.00 h into 5 ml pre-cooled heparinized and un-heparinized vacuum tubes (Becton Dickinson Vacutainer Systems, Europe) and analysed at the Pathology Laboratory, University Teaching Hospital, Ilorin. The blood chemistry considered were: Na^+, K, ClG, Total protein, albumin, globulin, Alkaline phosphatase (ALKP), Glutamate-pyruvate transaminase (GPT) and Glutamate oxaloacetate transaminase (GOT), while the heamatological parameters examined include: haemoglobin, packed cell volume (PCV), red blood cells (RBC), MCH, MCHC, white blood cells, (WBC), neutrophyls and lymphocytes The proximate and mineral elements analysis, were carried out at the Animal Production & Health and Central Research Laboratories, respectively. The experimental diets were subjected to proximate analysis (dry matter (DM), crude protein (CP; N x 6.25), ether extract (EE) and ash [6]. Crude fibre (CF) content was determined according to the procedures of Van Soest *et al.* [7]. The feed and water intakes were deduced using the following expressions:

Table 1: Feed ingredients contained in the experimental diets

Feed ingredients	0% SC	15% SC	20% SC	25% SC
Cassava peel	20.00	20.00	20.00	20.00
GNC	4.00	3.40	3.20	3.00
Soybean	-	0.60	0.80	1.00
PKC 8.00	8.00	8.00	8.00	
Maize bran	18.00	18.00	18.00	18.00
NaCl	0.05	0.05	0.05	0.05
Oyster shell	0.10	0.10	0.10	0.10
Bone meal	0.20	0.20	0.20	0.20
Premix	0.05	0.05	0.05	0.05
Methionine	0.05	0.05	0.05	0.05

Nb: SC implies soybean chaff

Table 2: Proximate and mineral elements composition of the experimental diets

	Diet A	Diet B	Diet C	Diet D
Proximate composition				
Crude protein	11.03	11.13	11.28	11.38
Crude fibre	12.00	10.00	12.00	10.00
Ether extract	4.00	4.00	4.00	4.00
Ash	6.00	6.00	6.00	8.00
Mineral elements				
Magnesium (Mg)	28.40	30.31	31.85	29.30
Zinc (Zn)	0.57	0.52	0.53	0.50
Iron (Fe)	11.88	5.47	6.86	14.33
Copper (Cu)	3.18	3.03	2.98	2.98

Diets A, B, C and D contained 0, 15, 20 and 25% soybean chaff, respectively

Feed intake = Feed offered - Feed refused;

Water intake = Water offered - Water refused

The hematological and blood chemistry data were subjected to analysis of variance (ANOVA) and least square difference (LSD) which enabled comparisons of the means for significance ($p<0.05$).

RESULTS AND DISCUSSION

The animals used for the study did not show any deficiency symptoms of nutrients or mineral elements and were in good state of health throughout the study. The diets proximate and mineral elements composition (Table 2) revealed that their protein contents differed marginally. Differences between treatments for live weight, heart girth, feed and water intakes were not significant (Table 3). However, goats on 20 and 25% SC inclusion recorded the highest live weight gain. The responses to the diet for heart girth and water intake did

Table 3: Least square difference (LSD) data of gains in live weight, heart girth, feed and water intakes of WAD doe-kids on GNC diets replaced with SC

Treatment Diets	Treatment means
Gains in live weight (kg) over a 14 day period	
Diet A	0.35
Diet B	0.85
Diet C	0.85
Diet D	0.45
LSD	0.71
Gains in heart girth (cm) over a 14 day period	
Diet A	0.62
Diet B	0.95
Diet C	0.50
Diet D	0.62
LSD	0.60
Feed intake (kg) over a 14 day period	
Diet A	17.12
Diet B	16.79
Diet C	18.32
Diet D	18.04
LSD	1.06
Water intake (litres) over a 14 day period	
Diet A	28.05
Diet B	48.57
Diet C	42.20
Diet D	26.76
LSD	37.73

Means are not significantly different (p>0.05). Diets A, B, C and D contained 0, 15, 20 and 25% soybean chaff, respectively

not follow a definite trend. Feed intake was increased with increasing in level of SC inclusion, but feed intakes recorded on 20 and 25% SC diets were almost similar. Though not statistically significant, the 15% SC diet that recorded 60.7 gdG^{1} body weight gain and 1.20 kg dG^{1} as feed intake seemed to be the best diet in the study. The differences between treatments for the blood constituents (except for RBC and GOT) considered, were not significant (Table 4). Though not in a significant trend, the total blood protein in goats on diet containing SC was lower relative to value recorded on 0% SC diet. However, the reduction in total blood protein from the use of SC diet did not result in protein deficiency symptoms. The absence of any blood deficiency symptoms perhaps was an indication that the values of all the blood constituents in the study were above the critical level below which disease can manifest [8, 9]. Besides, it shows that SC can be made to replace GNC in a diet with no adverse consequence on the blood profile of WAD doe-kids. The absence of any significant difference in the growth parameters perhaps was an indication of similar contents of bypass protein in the experimental diets [2]. Diet B (15% SC) that recorded the highest body weight and least feed intake seemed to be the best diet. This implies that 15% replacement of GNC with SC in combination with other ingredients used in this study will give optimum performance in terms of gains in live weight and blood constituents.

Table 4: Blood chemistry and haematology of WAD doe-kids on soybean chaff diets

Blood chemistry	Pre-trial period	Diet A	Diet B	Diet C	Diet D	S.E.D.	P-value
Na^{+} (mmol/l)	140.75	140.50	138.00	143.50	136.25	2.43	0.077
K (mmol/l)	4.38	4.18	4.28	4.20	4.15	0.42	0.983
ClG (mmol/l)	101.50	98.25	99.25	102.50	97.25	5.09	0.823
Total protein (g/l)	30.25	36.00	31.50	34.75	33.25	2.66	0.242
Albumin (g/l)	15.75	16.75	14.75	15.75	17.00	1.72	0.704
Globulin (g/l)	14.50	19.25	16.75	19.00	16.25	1.99	0.148
Glutamate-Pyruvate Transaminase (GPT) (IU/L)	10.25	10.75	10.25	13.50	11.00	1.50	0.217
Glutamate Oxaloacetate Transaminase (GOT) (IU/L)	28.00^{a}	31.75^{a}	35.50^{b}	29.50^{a}	30.00^{a}	2.23	0.038
Alkaline Phosphatase (ALKP) (IU/L)	23.00	72.25	77.75	71.75	79.00	35.02	0.486
Haematology							
Haemoglobin (g/dl)	9.35	10.80	11.18	10.98	9.78	0.73	0.095
Packed cell volume (PCV; %)	31.25	41.25	46.00	41.75	35.00	5.11	0.075
Red blood cells (10^{12}/l)	2.55^{a}	3.91^{b}	4.27^{b}	4.08^{b}	3.50^{a}	0.54	0.047
MCH (%)	37.25	28.75	27.75	28.25	29.50	4.10	1.172
MCHC (%)	30.50	26.25	24.00	26.75	25.75	3.81	0.552
White blood cells (WBC; (10^{3}/mm^{3})	16.35	15.72	15.75	14.90	14.88	3.34	0.990
Neutrophils (%)	36.25	38.75	45.50	35.50	38.25	7.55	0.702
Lymphocytes (%)	64.50	63.75	50.25	64.50	61.75	9.22	0.504

Diets A, B, C and D contained 0, 15, 20 and 25% soybean chaff, respectively

ACKNOWLEDGEMENT

The authors acknowledge the support and wish to thank the following farm staff: Mr. Ajibade, Mr. Onyioha and Mr. Sola for their on-farm assistance throughout the study.

REFERENCES

1. Hadley, R.J. and R.J. Soffe, 1988. The Agricultural Notebook 18th Edn. Butter Worths and Co. Ltd., London, pp: 426.
2. Akingbade, A.A., O.A. Aderinola, J.A. Akinlade, S.A. Ameen and F.O. Ogunsola, 2006. Growth and haematological parameters of growing female West African dwarf goats fed *Ficus religiosa* and *Blighia sapida* supplements. Bowen Journal of Agriculture, 3(2): 200-208.
3. Preston, T.R. and R.A. Leng, 1987. Control of Feed Intake in Ruminant: In T.R. Preston and R.A. Leng (Eds) Matching Ruminant Production System with available resources in the tropic and sub-tropics penambul Books Armidale, Australia, pp: 93-100.
4. Peter, R.C., 1999. Applied Animal Nutrition, feed and Feeding 2nd Edn. Introduction to Nutrient, Digestive Physiology and Feed Analysis, pp: 3-25.
5. Van Niekerk, F.E., S.W.P. Cloete and S.A. Barnard, 1990. Plasma Copper, Zinc and blood selenium concentration of Sheep, goats and cattle. South Africa J. Animal Sci., 20(3): 144-147.
6. Association of Analytical Chemists(AOAC)., 1990. Official Method of Analysis 15th Edition Washington DC., USA.
7. Van Soest, P.J., J.B. Robertson and B.A. Lewis, 1991. Methods for dietary fibre, neutral detergent fibre and non-starch polysaccharides in relation to animal nutrition. J. Dairy Sci., 74: 3583-3597.
8. Mitruka, B.M. and H.M. Rawnsely, 1977. Clinical Biochemical and Haematological Valves in Normal Experimental Animals. Mason Publishing, USA. Inc. N.Y., pp: 164-167.
9. Puls, R., 1994. Diagnostic Data. In R. Puls (Eds) mineral level in animal health 2nd Edn. Sherpa International P. O. Box 2256 Clear book British Columbia V274X2 Canada 1994.