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Performance Characteristics and Blood Profile of West African Dwarf Goats fed diet containing graded level of Malted Sorghum Sprout Mixed with Pineapple Waste Based Diet

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Target Audience: Farmers, Animal Scientist and Feed millers.

Abstract

A twelve week trial was investigated to evaluate performance and blood profile of West African dwarf (WAD) goats fed malted sorghum sprout with pineapple waste (MSPW) based diet. The malted sorghum sprout and pineapple waste was at ratio 1:2 (weight/weight) respectively. Sixteen WAD goats with average initial weight of 6 ±1.20 kg were allotted into four dietary treatments in a Completely Randomized Design. Four diets were formulated to contain 0%, 20%, 40% and 60% of MSPW. Data were collected on growth performance and blood profile. Result revealed that there was no significant (P>0.05) differences on all the growth performance parameters measured. The highest value of average daily weight gain (19.21 g/day) was observed in goats fed 20% MSPW while the lowest value was obtained in goats fed 40% MSPW. Goats placed on 20% MSPW had the best feed conversion ratio value (17.15). No significant differences (P>0.05) were observed on all blood profile parameters measured except the albumin and creatinine. The albumin and creatinine values ranged from 2.63-3.52 g/dl and 0.90- 1.50mg/dl respectively. It can be concluded that WAD goats fed 20% MSPW based diet yielded best results in terms of performance and there was no detrimental effect on their blood profile.

Keywords: Malted Sorghum Sprout, Pineapple, Performance, Serum

Description of Problem

Inability of ruminant livestock farmers to feed their animals with high quality forages all year round remain the most widespread technical constraints facing ruminant animals productivity in the developing nation (1). The limited supply of raw materials for the livestock feed industry has resulted in a continuous increase in the cost of production, causing phenomenal rise in the unit cost of production of livestock (2). However, to mitigate this incessant problem, there is need to continuously search for various alternative feeds that are less competitive for its use by man and other livestock which could perhaps be one of the intervention areas needed to enhance the proliferation of small ruminants (3). Examples of such agro-

industrial by-products are pineapple waste (PNW) and Malted sorghum sprout (MSP). Pineapple waste is a by-product from pineapple processing industry and about 30% of the pineapples are turned into waste during the canning operation (4). It consists of residual pulp, peels, skin and contains mainly sucrose, fructose, glucose and other nutrients (5). These wastes can cause environmental pollution problems if not utilized. Malted sorghum sprout (MSP) is the dried roots and shoots left after extraction of malt from germinated sorghum (6). Malted sorghum sprout contains (g/kg); 226 crude protein, 48 crude fibre, 33 ether extract, 16 ash, 522 nitrogen free extract and 16.26 MJ/kg DM gross energy and it is also reported to contain a considerable number of amino acids with low level of methionine, lysine and threonine (7). It also reported that magnesium was the most abundant mineral while potassium was the least in MSP. Among the trace minerals, zinc is the most abundant while copper is the least.

The significance of determining haematological and serum biochemical indices of domesticated animals have been well documented (8). Ingestion of numerous dietary components has been noted to have measurable effect on the blood constituents. More so, there is a great variation in the haematological and serum biochemical parameters observed between breeds of goats (9). Nutrition, breed, sex, age, reproductive status, physiological status, environmental factors, stress and transportation are known to affect haematological and serum biochemical parameters (10). There is paucity of information on the feeding values of malted sorghum sprout mixed with pineapple waste based diet on the growth performance and blood profile of West African Dwarf (WAD) goats. This present study is therefore designed to determine the effect of different inclusion levels of malted sorghum sprout mixed with pineapple waste on growth performance and blood profile of WAD goats

Materials and Methods

Experimental site and duration

The experiment was carried out at the Teaching and Research Farm of Federal College of Animal Health and Production Technology, Moor Plantation, Ibadan and it lasted for a period of twelve weeks.

Experimental animals, diet and design

A total of sixteen (16) WAD goats were obtained from Olorunda village in Ibadan, Oyo state**,** Nigeria. The animals which weighed between 5 to 7 kg were randomly allotted into four dietary treatments in a completely randomized design. Malted sorghum sprout was thoroughly hand-mixed with Pineapple waste in the ratio 1:2 according to the procedure of (11). The mixture was then sun-dried by spreading it on the concrete floor for five days and thereafter milled. Four concentrate diets were compounded comprising 0, 20, 40 and 60% levels of inclusion of the MSP: PNW (1:2) malted sorghum sprout with pineapple waste mixture (MSPW) as indicated in Table 1.

Management of experimental animals

The animals were confined in a well-ventilated individual pens that was cleaned, washed and disinfected with

Royal Guard Lysol prior to the arrival of the animals. On arrival, the animals were quarantined for a period of two weeks during which the goats were given prophylactic treatments; consisting of intra-muscular injection of Oxytetracycline LA at 1ml/10kg live body weight and Ivomectin at 1ml/25kg live weight. They were also administered vaccine against *Pestes des petit ruminant* (PPR). Guinea grass and cassava peels were fed to the animals during the adjustment period. Fresh cool clean water was also made available throughout the experiment. After the adaptation, the animals were balanced as closely as possible for their body weights and randomly allotted into four dietary treatments.

Data Collection

Feed Intake and Live Weight Gain**:** At the beginning of the experiment, the goats were weighed and subsequently on a weekly basis prior to feeding in the morning. The initial live weight was subtracted from the final live weight to determine the weight gained by the animals. Feeds offered and remnants were weighed daily to determine the feed intake of the animals. Both values were used to determine Feed Conversion Ratio (FCR).

Collection of Blood Sample**:** 5ml of blood sample was drawn from three randomly selected goats per treatment via the jugular vein. 2.5ml of the blood sample collected was released into a sample bottle containing anticoagulant and it was rocked gently to ensure easy mixing of the blood with the anticoagulant. The remaining blood sample was poured into a plain sample bottle and allowed to clot at room temperature within 3 hours of collection.

Proximate and Statistical analysis

The Proximate analysis of the experimental diets was determined according to the official methods of analysis described by (12). Data obtained were subjected to one way analysis of variance (ANOVA) using (13). Significant means were separated using the Duncan multiple range test of the same software.

Results and Discussion

Presented in Table 1 is the percentage and chemical composition of the experimental concentrate diets. The dry matter ranged from 87.27% - 92.00%. The high dry matter values observed in this study implied that they can be stored all-year round and used as feeds for all ruminant livestock.

Table 1: Percentage and Chemical Composition of the Experimental Diets

Parameters	Inclusion levels of MSPW			
	T_1 (0%)	T_2 (20%)	T_3 (40%)	T_4 (60%)
Maize bran	60.00	40.00	20.00	-
MSPW	-	20.00	40.00	60.00
Wheat Offal	34.25	34.25	34.25	34.25
Premix	0.25	0.25	0.25	0.25
Limestone	5.00	5.00	5.00	5.000
Salt	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00
Determined Analysis (%DM)				
Dry Matter	92.00	89.22	88.82	87.27
Crude Protein	13.20	15.28	17.84	18.44
Ether Extract	7.47	5.18	4.56	2.59
Ash	10.66	10.68	10.07	10.40
NFE	36.42	40.32	42.77	44.14
NDF	71.85	65.00	51.20	46.75
ADF	45.50	35.38	24.25	33.25
ADL	12.25	10.50	11.25	9.20
Cellulose	33.25	24.88	13.00	24.05
Hemicellulose	26.35	29.63	26.95	13.50

MSPW: Malted Sorghum Sprout mixed with Pineapple Waste.

The crude protein values of the experimental diets increased as the inclusion level of MSPW increased across the dietary treatment. This might be as a result of the high crude protein of malted sorghum sprout in the diet. The crude protein values observed in this study were higher than 10 to 12% crude protein moderate level required by ruminants for minimum growth performance (14). The highest percentage of NDF, ADF and ADL was obtained in T_1 while T_4 had the lowest percentage of NDF and ADL. The lowest value of ADF was obtained in T_3. The fibre fraction NDF, ADF, ADL and Cellulose were observed to decrease with increasing levels of MSPW. This might be as a result of low fibre content of MSPW in the diet.

Table 2 shows the performance characteristics of West African Dwarf goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW). There were no significant (P>0.05) differences in all the parameters measured in this study. However the final body weights reported in this study were within the range of 7.60 – 9.05 kg reported by (15). The observed higher daily weight gain value with 20% MSPW might be as a result of the ability of the goat to properly utilize the diet for bodyweight gain when compared with other dietary treatments. This was in consonance with the result of (16). The goats placed on T_2 (20% MSPW) had the best FCR. However, the low FCR value obtained in this group might be attributed to the fact that the nutrients were better utilized.

Table 2: Performance Characteristic of West African Dwarf Goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW)

	Inclusion Levels of MSPW				
Parameters	T_1 (0%)	T_2 (20%)	T_3 (40%)	T_4 (60%)	SEM±
ADFC (g/day)					
Concentrate	187.97	200.03	168.79	182.88	6.86
Forage	131.05	125.53	126.06	147.05	11.30
Total Intake	319.02	325.56	294.85	329.93	14.51
Initial Body Weight (Kg)	5.71	6.18	5.83	6.07	0.27
Final Body Weight (Kg)	6.93	7.79	6.88	7.30	0.36
Total Weight gain (Kg)	1.22	1.61	1.05	1.23	0.16
ADWG (g/day)	14.52	19.21	12.46	14.64	1.86
Metabolic Weight (g/day$W^{0.75}$)	7.27	9.14	6.45	7.41	0.73
FCR	27.00	17.15	31.91	25.59	3.82

ADFC: Average Daily Feed Consumption ADWG: Average Daily Weight Gain FCR: Feed Conversion Ratio

Indicated in Table 3 is the Serum Biochemical Indices of West African Dwarf goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW). There were no significant differences ($P > 0.05$) in all the parameters observed in this study except for albumin and creatinine. Goats fed T_3 (40% MSPW) exhibited the highest values of albumin (3.52g/dl) while the lowest value of (2.63g/dl) was observed in those fed T_2 (20% MPSW). (17) reported that albumin is an important blood clot factor due to its ability to prevent haemorrhage, therefore the higher the value, the better it is for the animals. However the values observed in this study were within the normal range recommended for a normal healthy goat. The creatinine values obtained in this study varied significantly across the dietary treatments in which the highest value (1.50mg/dl) was obtained in goats fed T_1 (0% MSPW) while the lowest value (0.90mg/dl) was observed in goats fed T_3 (40% MSPW). The creatinine values obtained in this study fell within the normal range of values (0.7-1.5 mg/dl) reported by (18) but significantly higher than values reported by (19) for an healthy WAD goats. (20) reported that creatinine level in serum has direct correlation with muscle mass and kidney function in animals.

Table 3: Serum Biochemical Indices of West African Goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW)

		Inclusion levels of MSPW				
Parameters	*Normal Range	T_1 (0%)	T_2 (20%)	T_3 (40%)	T_4 (60%)	SEM±
Total protein (g/dl)	6.1 - 7.5	7.62	7.18	7.23	6.76	0.21
Albumin (g/dl)	2.3 - 3.6	2.92^{ab}	2.63^{b}	3.52^{a}	3.18^{ab}	0.14
Globulin (g/dl)	2.7 - 4.4	4.70	45.56	3.71	3.58	0.30
Glucose (mg/dl)	48 - 76	83.89	49.16	61.94	76.66	8.43
Cholesterol (mg/dl)	65 - 136	70.67	51.13	81.20	56.39	6.75
BUN (mg/dl)	13.26	25.45	23.21	29.46	24.74	1.11
Creatinine (mg/dl)	0.7 - 1.5	1.50^{a}	1.18^{ab}	0.90^{b}	1.23^{ab}	0.09
AST (U/L)	66 - 230	65.60	45.09	50.86	58.16	6.50
ALT (U/L)	15 -52	16.33	14.71	18.15	17.45	1.57

$^{a, ab}$ Means with different superscripts along the same row are significantly different ($P<0.05$)
BUN: Blood Urea Nitrogen, AST: Aspartate Aminotransferase, ALT: Alanine Aminotransferase
*Merck Veternary Manual, 2015

Table 4 shows the haematological parameters of West African Dwarf goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) based diet. There were no significant (P>0.05) differences in all the parameters measured. The packed cell volume (PCV), haemoglobin, red blood cell (RBC) and white blood cell values (WBC) decreased numerically across the dietary treatments as the inclusion of MSPW increased. The values observed for pack cell volume (PCV) in this study fell within the range of values (15.0 ? 30.0%) reported by (21). The variation in PCV values obtained in this study might be associated with the location, environmental and nutritional stress as being suggested by (22). The haemoglobin values of the experimental animals on 0% to 60% MSPW inclusion level were in agreement with the reports of (23), (24) and (25). Since haemoglobin function as a carrier of oxygen to target organs by forming oxyhaemoglobin hence animals on 0% to 60% MSPW inclusion are at advantage. The values of red blood cell (RBC) reported herein agreed with the values reported by (26) and (25) for similar animal. The value of the white blood cell (WBC) obtained in this study supported the reports of (23) that WAD goats possess a protective system providing a rapid and potent defense against any infectious agent and this probably form the physiological basis for the adaptation of the West African eco-zone which is characterized with high prevalence of diseases. This probably shows that animals placed on 0% to 60% MSPW inclusion levels, maintained an active immune system that defends the body against infection, allergic reactions, parasites and antigens.

Table 4: Haematological Parameter of West African Dwarf Goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) Based Diet

		Inclusion level 0f MSPW				
Parameter	*Normal Range	T_1 (0%)	T_2 (20%)	T_3 (40%)	T_4 (60%)	SEM±
PCV (%)	22-38	26.00	25.00	22.50	16.50	2.34
Haemoglobin (g/dl)	8-12	8.65	8.35	7.50	5.50	0.78
RBC ($x10^{12}$/L)	8-18	7.02	6.95	5.78	4.18	0.68
WBC (10^3/L)	4-15	14.90	10.20	8.93	8.90	1.31
Lymphocytes (%)	50-80	72.50	61.50	61.50	65.00	2.42
Neutrophil (%)	20-50	23.50	33.00	34.00	28.50	2.25
Monocytes (%)	0-4	2.00	1.50	1.50	3.00	0.33
Eosinophil (%)	3-8	2.00	4.00	3.00	3.50	0.40
Platelet ($x10^5$)	Above 100	1.30	1.41	1.28	1.73	0.92
MCV (fl)	28-40	39.34	35.76	38.86	37.96	2.10
MCH (Pg)	5.2-8.0	13.08	11.94	12.96	12.63	0.70
MCHC (g/dl)	30-36	33.27	33.39	33.35	33.24	0.06

PCV=Packed Cell Volume; RBC: Red Blood Cell; WBC: White Blood cells; MCV: Mean corpuscular volume; MCH: Mean corpuscular haemoglobin; MCHC=Mean corpuscular haemoglobin Concentration.

***Merck Veterinary Manual, 2015**

Conclusion and Application

1. Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) is a by-product derived from sorghum and pineapple products respectively. They have great potential to improve the productivity of goats.
2. Based on the result of this study, 20% Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) is recommended for better output in terms of feed intake, weight gain and feed conversion ratio.
3. The inclusion of malted sorghum sprout mixed with pineapple Waste (MSPW) in the diet of West African Dwarf (WAD) goats had no deleterious effect on their blood profile.

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