

PERFORMANCE CHARACTERISTICS AND SERUM BIOCHEMICAL INDICES OF WEST AFRICAN DWARF GOATS FED MALTED SORGHUM SPROUT MIXED WITH PINEAPPLE WASTE

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Abstract

A twelve-week trial was carried out to determine the performance characteristics and serum biochemical indices of West African dwarf (WAD) goats fed malted sorghum sprout mixed with pineapple waste (MSPW). The malted sorghum sprout and pineapple waste was mixed at ratio 1:2 (weight/weight) to obtain the MSPW mixture. A total of sixteen WAD goats with an average initial weight of 6 ± 1.20 kg were randomly allotted into four (4) dietary treatments in a completely randomized design. Each treatment group was replicated four times. Four (4) dietary treatments (T_1 , T_2 , T_3 and T_4) were formulated to contain 0%, 20%, 40% and 60% of MSPW respectively. Data were collected on the growth performance and serum biochemistry. Results revealed that there was no significant ($P > 0.05$) differences on all the performance parameters measured. The highest value of Final Body Weight (7.79 kg), Average daily weight gain (19.21 g/day), Metabolic weight ($9.14 \text{ g/day } W^{0.75}$) and Concentrate Dry Matter Intake (200.03 g/day) were observed in T_2 while the lowest values were obtained in T_3 . Moreover goats on T_2 had the best feed conversion ratio (17.15). No significant differences ($P > 0.05$) among treatments were observed on all the serum biochemical indices in this study except the albumin and creatinine which ranged from 2.63-3.52 g/dl and 0.90 - 1.50 mg/dl respectively. It can be concluded that WAD goats fed 20% MSPW yielded the best results in terms of performance and there was no detrimental effect on their serum biochemical indices.

Keywords: Malted Sorghum Sprout, Pineapple waste, Performance and Serum Biochemical Indices

Introduction

Period of dry season is always a stressful period for livestock as the environment is characterised by insufficient feeds, occasioned by scarcity of forage and fibrous standing hay of low qualities (Iyayi *et al.*, 2003). Nutrition is one of the most important factor that determines the development and expansion of livestock sector in the tropics. Therefore the inability of ruminant livestock farmers to feed their animals with high quality forages all year round remain the most widespread technical constraints facing ruminant animal productivity in the developing nations (Bawala and Akinsoyinu, 2002).

Malted sorghum sprout (MS) is a non-conventional feedstuff in the feed industry and it is a by-product of the sorghum malting process while pineapple waste is a by-product of the pineapple processing industry which consists of residual pulp, peels and skin. These wastes can cause environmental pollution problems if not utilized because it still contains high content of carbohydrates as well as high fiber and low protein contents (Nadzirah *et al.*, 2013).

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 WAD goats were obtained from Olorunda village in Ibadan, Oyo state. The animals which weighed between 5 to 7 kg were randomly allotted into four dietary treatments in a completely randomized design. Pineapple waste was thoroughly hand-mixed with malted sorghum sprout in the ratio 1:2 according to the procedure of Makinde and Sonaiya (2010). 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 1:2 (MSP: PW) Malted sorghum sprout with pineapple waste mixture (MSPW).

Management of experimental animals

The animals were confined in 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 Ivermectin 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.

Blood collection

3ml of blood sample was drawn from three randomly selected goats per treatment via the jugular vein into anticoagulant free sample tube and allowed to clot at room temperature within 3 hours of collection. The blood samples were assayed for Creatinine, Serum Albumin, Cholesterol, Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT) and Blood Urea Nitrogen etc.

Proximate and Statistical analysis

The Proximate analysis of the experimental diets was determined according to the official methods of analysis described by (AOAC, 1995). Data obtained were subjected to one way analysis of variance (ANOVA) using (SAS, 2001). Significant means were separated using the Duncan multiple range test of the same software.

Results and Discussion

Presented in Table 1 is the 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.. 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 (Gatembay, 2002). The highest percentage of NDF, ADF and ADL was obtained in T₁ while T₄ had the lowest percentage of NDF and ADL. The lowest value of ADF was obtained in T₃. 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 (7.60 – 9.05 kg) reported by Lawan *et al.* (2008). 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 report of Njidda (2008). Goat on 20% MSPW had the best FCR and this might be attributed to better feed utilization exhibited.

Indicated in Table 3 is the Serum Biochemical Indices of West African 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 40% MSPW exhibited the highest values of albumin (3.52g/dl) while the lowest value of (2.63g/dl) was observed in those fed 20% MPSW. Dairo (2005) 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 value obtained in this study ranged from 0.90mg/dl in 40% MSPW to 1.50mg/dl in 0% MSPW. The value of creatinine obtained in this study fell within the normal range for Sahel goat as reported by Waziri *et al.* (2010) but significantly higher than values reported by Ikhimiya and Imasuen (2007) for WAD goats. Prvulovic *et al.* (2012) reported that creatinine level in serum has direct correlation with muscle mass and kidney function in animals.

Conclusion

It can be concluded that West African Dwarf goats fed Malted Sorghum Sprout mixed with Pineapple Waste (MSPW) at 20% inclusion level had the best results in term of performance with no detrimental effect on their serum biochemical indices.

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Table 1: Chemical Composition of the Experimental Diets

Parameters	Inclusion levels of MSPW			
	T ₁ (0%)	T ₂ (20%)	T ₃ (40%)	T ₄ (60%)
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

NFE: Nitrogen Free Extract NDF: Neutral Detergent Fibre ADF: Acid Detergent Fibre, ADL: Acid Detergent Lignin

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

Parameters	Inclusion Levels of MSPW				SEM±
	T ₁ (0%)	T ₂ (20%)	T ₃ (40%)	T ₄ (60%)	
ADFC (g/day)	187.97	200.03	168.79	182.88	6.86
Concentrate	131.05	125.53	126.06	147.05	11.30
Forage	319.02	325.56	294.85	329.93	14.51
Total Intake	5.71	6.18	5.83	6.07	0.27
Initial Body Weight (Kg)	6.93	7.79	6.88	7.30	0.36
Final Body Weight (Kg)	1.22	1.61	1.05	1.23	0.16
Total Weight gain (Kg)	14.52	19.21	12.46	14.64	1.86
ADWG (g/day)	7.27	9.14	6.45	7.41	0.73
Metabolic Weight (g/day W ^{0.75})	27.00	17.15	31.91	25.59	3.82
FCR					

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

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

Parameters	*Normal Range	Inclusion levels of MSPW				SEM±
		T ₁ (0%)	T ₂ (20%)	T ₃ (40%)	T ₄ (60%)	
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 Veterinary Manual, 2015