INFLUENCE OF DIETS CONTAINING GRADED LEVELS OF RAW AND FERMENTED MALTED SORGHUM SPROUT ON THE THERMO-PHYSIOLOGICAL PARAMETERS OF WEST AFRICAN DWARF GOATS

Saka, A. A., Adekunjo, R. K., Adedeji, O. Y. and Jinadu, K. B.
Federal College of Animal Health and Production Technology, P. M. B. 5029, Moor Plantation, Ibadan
Corresponding author: saka.azeez@gmail.com ***Phone number:*** *08055624725*

ABSTRACT
Malted Sorghum Sprout (MSP) is an agro-industrial by-product use as an alternative feedstuff in feeding ruminants. Hence, this study was designed to evaluate the thermo-physiological parameters of West African dwarf (WAD) goats fed diets containing graded levels of raw and fermented MSP (RMSP and FMSP) incorporated into the concentrate diet at 0%, 25% and 50% respectively to formulate six experimental diets using 2×3 factorial layout in a completely randomized design. A total of twenty four (24) WAD goats were randomly allotted to six dietary treatments for 12 weeks with four animals per treatment. Data were collected on thermo-physiological parameters. Results showed that main effect of processing methods and the inclusion levels of MSP significantly ($p<0.05$) influenced the respiratory rate of the experimental goats. Goats fed FMSP based diet recorded lower respiratory rate (40.03 breaths/min) when compared with those fed RMSP (40.38 breaths/min) based diet. The respiratory rate of the experimental animals reduces as MSP inclusion level increased across the dietary treatments. No significant ($p>0.05$) interaction effect were observed on the thermo-physiological parameters of WAD goats except the rectal temperature. The study concluded that fermented malted sorghum sprout could be used up to 50% in WAD goats' diet as it reduced the rectal temperature and respiratory rate of the animals.

Keywords: Malted sorghum sprout, rectal temperature, respiratory rate, pulse rate, anti-nutrient

INTRODUCTION
The availability of good quality forages round the year has been a major constraint affecting the *small ruminant production in Nigeria*. Even the few available ones gradually become low in nutritive value during the dry season period (Njoya *et al.*, 2005). Arigbede *et al.* (2005) noted that inadequate feed supply in both quantity and quality is responsible for low ruminant animal productivity in the tropics. The easiest way to mitigate these problems is to look for how the production can be sustained in the tropics such that ruminants can be fed with non-conventional feedstuffs, which may probably serve as alternative feed resources in the dry seasons. Malted sorghum sprout (MSP), a non-conventional feedstuff with a high nutritive profile; separated root and shoots left after malt extractions from the young germinating seedlings (Aletor *et al.*, 1998) but reportedly found to possess anti-nutritional factors (Mohammed *et al.*, 2011). Fermentation reduces the anti-nutritional factors in feed ingredients by enhancing the nutrient digestibility (Pranoto *et al.*, 2013). However, the thermoregulatory indices of animals that are often measured as rectal temperature, pulse rate and respiratory rate have been found to be a useful means of determining the health status of livestock. Sanusi *et al*. (2011) reported that rectal temperature increases, whenever, the physiological mechanism of animal fails to negate the excessive heat load emanated from metabolism. Hence, the present study was undertaken to assess the influence of diet containing graded levels of raw and fermented malted sorghum sprout on the thermo-physiological response of West African dwarf goats.

MATERIAL 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 number of twenty four (24) West African dwarf goats with an average live weight of 5.73 ± 0.20kg were used for this study. The animals were acclimatized for four weeks, during the period; dried cassava peel, guinea grass (*Panicum maximum)* and fresh cool clean water were served *ad libitum*. After adaptation period, the experimental animals were balanced on weight equalization into six dietary treatments in a completely randomized design. Malted

Sorghum Sprout (MSP) was purchased in dried form from Taibod Nigeria Limited, Agro-allied industry at Ijoko Otta in Ogun state, Nigeria. MSP purchased was divided into two equal parts such that the first part was not treated and simply referred to as raw, while the second part was naturally fermented according to the procedure of Fanimo and Akinola (2006). The raw and fermented MSP prepared were mixed with concentrate at varying levels of 0, 25 and 50% respectively to formulate six diets as indicated in Table 1. Other ingredients in the diets included limestone, maize bran, wheat offal, salt and premix. Experimental Animals were fed 5% of their body weight on dry matter basis everyday such that 60% of it was fed using a basal diet of *Panicum maximum* while the remaining 40% was fed with the formulated diet. The concentrates were served in the morning while *Panicum maximum* was served in the afternoon.

Table 1: Gross Composition of the experimental diet

Ingredients %	RMSP			FMSP		
	0%	25%	50%	0%	25%	50%
Maize bran	40.00	40.00	40.00	40.00	40.00	40.00
Wheat offal	54.25	29.25	4.25	54.25	29.25	4.25
MSP	-	25.00	50.00	-	25.00	50.00
Premix	0.25	0.25	0.25	0.25	0.25	0.25
Limestone	5.00	5.00	5.00	5.00	5.00	5.00
Salt	0.50	0.50	0.50	0.50	0.50	0.50
Total	100.00	100.00	100.00	100.00	100.00	100.00
Determined Analysis (%)						
Dry matter	88.20	90.08	91.86	88.20	90.69	92.65
Crude Protein	15.78	17.06	17.21	15.78	16.22	16.93
NFE	54.26	54.47	55.81	54.26	55.43	55.83
EE	3.60	3.63	3.75	3.60	3.90	4.05
Ash	7.91	8.19	8.32	7.91	7.97	8.10
NFC	30.01	44.45	26.91	30.01	27.51	26.32
NDF	42.70	43.05	43.81	42.70	44.40	44.60
ADF	26.96	27.90	28.77	26.96	29.44	29.66
ADL	8.96	9.06	9.40	8.96	11.11	11.16
Cellulose	17.90	18.56	18.94	18.56	18.64	19.37
Hemicellulose	15.04	15.16	15.74	15.04	14.74	14.80

RMSP: Raw Malted Sorghum Sprout, FMSP: Fermented Malted Sorghum Sprout, MSP**:** Malted Sorghum Sprout, NFE: Nitrogen free extract, EE: Ether extract, NFC: Non fibre carbohydrate, NDF: Neutral Detergent fibre, ADF: Acid detergent fibre, ADL: Acid detergent lignin

Data Collection

The thermo-physiological parameters such as rectal temperature (RT), respiratory rate (RR) and pulse rate (PR) of each goat were determined in the morning (7:30 am) and afternoon (1:00 pm) twice per week during the feeding trial. The rectal temperature was measured using digital thermometer. The sensory tip of the thermometer was disinfected before being inserted into the rectum of another animal at every point in time. The display of L^{o}C by the thermometer indicated that the thermometer is set for reading and this was removed after the sound of alarm signal. The displayed rectal temperature was then recorded. Respiratory rate was determined by counting the number of abdominal movement per 20 seconds and later calculated as breaths /min. The pulse rate was determined as beats per seconds by placing the stethoscope on the chest of the goats to determine the rhythmic beats of the heart which was later calculated as beats /min (Thwaites *et al.,* 1990).

RESULTS AND DISCUSSION

Presented in Table 2 is the main effect of processing methods and malted sorghum sprout inclusion levels on the thermo-physiological parameters of West African dwarf goats. Main effect of processing methods and MSP inclusion levels did not significantly ($p>0.05$) influence the thermo-physiological parameters of the experimental goats except the respiratory rate. Animals fed FMSP based diet recorded lower respiratory rates. The respiratory rate of the experimental goats decreased across the

dietary treatments as the inclusion of MSP increased. The respiratory rate values observed were slightly higher than the stipulated range of values (12 to 20 breaths/min) reported by Takuji and Kazuo (2004) for sheep and goats. The higher respiratory rate observed in this study was clearly an indication of environmental temperature response in goats in order to maintain their homeostasis.

Table 2: **Main effect of the processing methods and malted sorghum sprout inclusion levels on the thermo-physiological parameters of West African dwarf goats**

Parameters	Processing Methods			Inclusion levels of MSP			
	RMSP	FMSP	SEM	0%	25%	50%	SEM
Rectal Temperature (^{0}C)	38.41	38.44	0.06	38.43	38.43	38.41	0.07
Respiratory Rate (breaths/min)	40.38^a	40.03^b	1.81	41.77^a	40.73^a	38.12^b	1.22
Pulse Rate (beats/min)	78.85	77.77	0.55	78.61	78.55	77.77	0.67

RMSP: Raw Malted Sorghum Sprout, FMSP: Fermented Malted Sorghum Sprout, MSP**:** Malted Sorghum Sprout,

Indicated in Table 3 is the interactive effect of processing methods and malted sorghum sprout inclusion levels on thermo-physiological parameters of West African dwarf goats. No significant ($p>0.05$) interaction effect were observed on the thermo-physiological parameters of WAD goats except the rectal temperature. Animal fed 25 and 50% FMSP based diet recorded similar values but statistically lower than those fed 0% RMSP (38.45^{o}C), 25% RMSP (38.41 ^{o}C), 50% RMSP (38.44 ^{o}C) and 0% FMSP (38.44 ^{o}C). The disparity observed in animals' response to changes in rectal temperature in terms of the experimental diets could probably be due to the environmental temperature and evolution of heat in the fermentation process. This is consistent with the earlier reports by Hicks *et al* (2001) who reported that the rumen temperature is a function of body temperature and may be used to predict diseases and heat stress in animals. The rectal temperature values obtained in this study were within the normal range of values (38.40 to 39.30^{o}C) earlier reported by Sanusi *et al.* (2011) for West African dwarf goats and sheep.

Table 3: **Interactive effect of processing methods and malted sorghum sprout inclusion levels on thermo-physiological parameters of West African dwarf goats**

Parameters	RMSP			FMSP			
	0%	25%	50%	0%	25%	50%	SEM
Rectal Temperature (^{0}C)	38.45^a	38.41^a	38.46^a	38.44^a	38.39^b	38.37^b	0.10
Respiratory Rate (breaths/min)	40.73	41.91	38.50	42.82	39.55	37.73	3.13
Pulse Rate (beats/min)	78.50	79.73	78.73	78.73	77.36	77.23	0.94

RMSP: Raw Malted Sorghum Sprout, FMSP: Fermented Malted Sorghum Sprout, MSP**:** Malted Sorghum Sprout,

CONCLUSION

It can be concluded that fermented malted sorghum sprout could be used up to 50% in West African dwarf goats' diet as it reduced the rectal temperature and respiratory rate of the experimental animals

REFERENCES

Arigbede, O. M., Olatunji, J. E. N., Phillips, O. B. and Shofunde, K. (2005). Performance of West African Dwarf sheep fed pigeon pea (*Cajanus cajan*) basal diets. *Proc. of 10th Animal Conf. Anim. Sci. Ass. of Nig., Univ. of Ado-Ekiti, Nigeria*. Pg. 197–200.

Aletor, V. A., Hamid, I. I., Nieb, E. and Pfeffer. E. (1998). Low-protein amino acids supplemented diets in Broilers. 1. Effects on growth performance, relative organ weight and carcass characteristics. In: Proceedings of silver Anniversary Conference Nigerian Society of Animal Production Pp. 153-154**.**

Fanimo, A. O. and Akinola. S. O. (2006). Response of broiler Chicken to raw and processed malted sorghum sprout. *World's Poultry Science Journal*. XII European Poultry Conference: 10-14.

Hicks, L.C., Hicks, R. A., Bucklin, J. K. Shearer, D. R., Bray, P. S. and Carvalho, V. (2001). Comparison of methods of measuring deep body temperature of diary cows. 6th International Symposium. *Am. Soc. Agric. Eng. Louis Ville, Ky*. Pg. 432–438.

Sanusi, A. O., Peter, S. O., Sonibere, A. O. and Ozojie, M. O. (2011). Effect of coat colour on heat stress among West African Dwarf sheep. *Nig. J. Anim. Prod.* 38(1): 28-36.

Takuji, H. and Kazuo, K. (2004). Effect of heat exposure and restricted feeding on behaviour, digestibility and growth hormone secretion in goats. *Asian-Aust. J. Anim. Sci*. 17(5): 655–658.

Thwaites, C. J., Baillie, N. B. and Kasa, W. (1990). Effects of dehydration on the heat tolerance of male and female New Zealand white rabbits. *J. Agri. Sci.* (Cambridge), 115: 437- 440.

Mohammed, N. A., I. E. Mohammed. and E. F. Barbiker. 2011. Nutritional Evaluation of sorghum flour (Sorghum bicolour L. Moench) during processing of injera. International *Journal of Biological, Biomolecular, Agricultural, Food and Biotechnological Engineering*, 5: 99–103.

Njoya, A., Awa, D. N. and Chupamom, J. (2005). The effects of a strategic supplementation and prophilaxis on the reproductive performance of primiparous Fulbe ewes in the semi-arid zone of Cameroon. Small Ruminant Resources: 56(1-3), 21-29.

Pranoto, Y., Anggrahini, S. and Efendi, Z. (2013). Effect of natural and *Lactobacillus plantarum* fermentation on *in vitro* protein and starch digestibility of sorghum flour. *Food Biosci.*, 2: 46-56