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EFFECT OF SEASON ON OXIDATIVE STRESS MARKER OF WAD SHEEP FED GRADED LEVELS OF DIETARY TAURINE

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ABSTRACT

A study was conducted to evaluate the effect of season on oxidative stress marker of West African Dwarf (WAD) sheep fed graded levels of dietary taurine. Thirty-two (32) WAD sheep involving both sexes with an average weight of 12kg were fed taurine supplemented diets and evaluated in a Completely Randomized Design involving four dietary treatments with four replicates of two animals each containing 0, 0.5, 1 and 1.5% levels of inclusion of taurine. The study was carried out during the wet season (July - October) and dry season (January - April). Blood samples were taken for determination of the following oxidative stress marker; catalase, Superoxide dismutase, Glutathione S-transferases and Glutathione peroxidase. Means were separated using pair wise-difference. The study revealed that there was no significant (P>0.05) concentration. However, Catalase was107.89U/ml during the wet season and 108.6U/ml during the dry season. The concentration of SOD was similar (P>0.05) in both seasons. The SOD activity was 7.88U/ml during the wet season and 6.97U/ml during the dry season. GSTs concentration was 4.25U/ml during the wet season and 3.66U/ml during the dry season. GPX activity was similar (P>0.05) in both wet season (1.99U/ml) and dry season (2.42U/ml). It was concluded that taurine is a good antioxidant that has the potential of masking the effect of stress cumulating from seasonal variations and imbalances.

Key words: season, oxidative stress marker, graded levels, dietary and taurine.

INTRODUCTION

Ruminants are useful livestock assets in that they depend to a greater extent on plant materials that are of less value to humans as nutrient sources. However, their low efficiencies is a major challenge to ruminant production in the tropics (Alokan, 2008).The harsh environmental conditions of the tropics in which the animals are exposed to are further aggravated by the seasonal fluctuations in quantity and quality of these grasses, legumes, herbs and shrubs which they rely on (Jimoh *et al.*, 2018). The effect of these imbalances may impose negative consequences on the overall welfare of the animal and cause an additional discomfort, thus aggravating the stress level which in turn resulted in depression of the physiological and metabolic activities of these animals (Silanikove *et al*., 1997). This is due to a condition known as oxidative stress (OS) as a result of excessive reactive oxygen metabolites. Reactive oxygen metabolites (ROM) are free radicals of an organism that constitute approximately 1-2% of the body and have essential functions such as protein phosphorylation, cell maturation, apoptosis, oocyte maturation, cell immunity, ovulation and fertilization (Celi *et al.*, 2012). However, their levels increase at certain pathological conditions, which can also cause damage of biological macromolecules, disruption of body metabolism and physiology (Meghri *et al*., 2019). Antioxidant systems regulate the levels of free radicals and maintain proper physiological function. Taurine (IUPAC name: 2-amino-ethanesulfonic acid; synonyms: beta-aminoethylsulfonic acid, tauric acid), It is an amino sulfonic acid that is sometimes referred to as sulfur containing beta-amino acid due to its structure, although technically not an amino acid due to structural issues (EFSA, 2012). It is an antioxidant that has the ability to scavenge excess ROM and attenuate lipid peroxidation thus, stabilizing biological membranes (Wang *et al.*, 2014). The antioxidant effect of taurine is attributed with its sulfur component and is critical in the cellular defense

against oxidative stress (Ghosh *et al* 2013). The objective of the study was to determine the effect of season on oxidative stress marker of West African Dwarf (WAD) sheep fed

MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Small Ruminant Unit of Kogi State Ministry of Agriculture, Kabba. Kabba is located within the Southern Guinea Savannah Zone on latitude $7^05^{'}$N, longitude $6^04^{'}$E and altitude of 640m above sea level. It has an annual rainfall of 1500mm and rain starts between late April and early May to October. The dry season begins around the middle of November, with cool weather that ends in February. This is followed by relatively hot-dry weather between March and April just before the rain begins. The minimum daily temperature is from 14^oC - 20^oC during the cool season, while the maximum daily temperature is from 19^0C- 40^0C during the hot season. The mean relative humidity during dry and wet seasons is 21% and 72%, respectively (Kabba College of Agriculture Metrological Section, 2018).

Experimental Diets

Diets were formulated with graded levels of supplemental taurine at 0, 0.5, 1.0 and 1.5 levels respectively (Table1). Diets were formulated to meet the nutrient requirements for sheep. They were fed at 3% of the animal's body weight. Drinking water was provided daily *ad libitum*.

Experimental Design and Management of Animals

A total of 32 WAD sheep were purchased from the open market within Kabba and used for this experiment. The sheep were 6 – 8 months old with an average body weight of 12kg. On arrival they were given prophylactic treatment and quarantined for two weeks during which they were treated against ecto-parasite using Diasentol and dewormed with Albendazole (2.5% oral suspension) per kg body weight. Experimental diets were fed immediately after acclimatization and were divided into four treatments groups with four replicates, consisting of a ram and a ewe per replicate in a 4 X 2 factorial arrangement in a Completly Randomized Design. The trial was conducted during the rainy season from July - October and during the dry season from January – April.

Determination of Oxidative Stress Marker

Catalase (CAT) was estimated by the method of Beers and Sizer (1952).The superoxide dismutase (SOD) was estimated by the method of Marklund and Marklund (1974) adopted by Soon and Tan (2002).Glutathione S-transferases (GSTs) was estimated by the method of Habig *et al.* (1974) and Glutathione peroxidase (GPX) activity was determined by the method of Rotruck *et al*. (1973).

Statistical Analysis

All data obtained were statistically analyzed using the Analysis of Variance (ANOVA) procedure of SAS (2002) while the significant differences in means were separated using pair wise-difference and level of significance was taken at $P<0.05$.

RESULTS AND DISCUSSION

The result of oxidative stress marker of WAD sheep fed graded levels of dietary taurine as influenced by season is presented in Table 2. The result showed that season had no significant effect ($P>0.05$) on all the variables considered in this study. The concentration of catalase was 107.89U/ml during the wet season and 108.6U/ml during the dry season. There were no significant seasonal effect ($P>0.05$) between the wet and dry season value but there was numerical differences. This observation is in contrast with the result of Jack *et al*. (2016), they reported significantly higher serum catalase activity in WAD rams during the dry season compared to wet season. The concentration of SOD was 7.88U/ml during the wet season and 6.97U/ml during the dry season. This was converse to Rathward *et al.* (2017) observation; they reported higher level of SOD during the dry season and lower concentration in wet season.

The result of this present study reveals that concentration of GSTs was 4.25U/ml during the wet season and 3.66U/ml during the dry season. However, this is contrary to the observation of Chaudhary and colleagues who reported higher concentration of GSTs during summer season compared to winter (Chaudhary *et al*., 2015). GPX activity was similar ($P>0.05$) in both wet season (1.99U/ml) and dry

season (2.42U/ml). However, Chaudhary *et al*. (2015) reported higher concentration of GPX during summer season compared to winter. Previous study revealed that higher concentration of SOD, CAT, and GPX during the summer season compared to winter may be due to heat stress conditions since heat stress is responsible for increased production of free radicals, which cause oxidative stress (Chaudhary *et al*.. 2015). Antioxidant might indirectly increase the concentration of enzymes by controlling the level of oxygenated radical scavenging systems and there by depressing oxidant enzyme activities through homeostatic compensation. Therefore, the differences in previous reports and this present study may be as a result of the antioxidant nature of the dietary treatment, thus masking the effect of stress cumulating from seasonal variations and imbalances.

Table 1: Experimental Diets

Ingredients	**Levels of inclusion (%)**
Maize offal	78.0
Soya bean cake	6.5
Groundnut cake	8.6
Oil	5.0
Limestone	1.5
Salt	0.4
Metabolizable Energy (Kcal/kg)	2800

Table 2: Effect of Season on Oxidative Stress Marker of WAD Sheep Fed Graded Levels of Dietary Taurine

Parameters	Season		SEM	P- value
	Wet	Dry		
Catalase (U/ml)	107.89	108.60	1.36	0.06
Superoxide dismutase((U/ml)	7.88	6.97	0.93	0.08
Glutathione-S-transferase (U/ml)	4.25	3.66	1.01	0.04
Glutathione peroxidase (U/ml)	1.99	2.42	0.54	0.12

CONCLUSION

It may be concluded that taurine is a good antioxidant that can be supplemented as dietary treatment
As it exhibit the potential of masking the effect of stress cumulating from seasonal variations and imbalances.

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