EFFECT OF PLANTAIN LEAF (*MUSA PARADISIACA)* ETHANOLIC EXTRACT ON SERUM METABOLITES AND HAEMATOLOGY OF STRESSED RABBIT

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ABSTRACT
The haematological and biochemical evaluations serve as markers of the impact of nutrition or dietary components on the performance of the animal in terms of anti-stress. The search for non-pharmaceutical methods to reduce stress in animals, including rabbits, as opposed to utilizing pharmaceutical medications is the purpose of this study, hence to determine the impact of plantain leaves (Musa paradisiaca) ethanol extract on some serum metabolites and haematology of stressed rabbits. A total of 48 mixed breed weaner rabbits of average weight of 0.5 ± 0.1kg were randomly assigned into six treatments in a completely randomized design. T1, T2 and T3 were subjected to both social and physical stressors, after which plantain leaf ethanolic extract at dosages 500, 750 and 1000mg/kg, respectively, were administered. T4 and T5 were also subjected to same type of stressors. T4 was given 2mL of water and T5 was given vitamin C at the dosage of 500mg/kg. T6 was the control group for the experiment. Hematological and some serum parameters were measured. The result of the study revealed that the treatment was able to ameliorate the stress, such that the haematology of the stressed animal was the same as the control. The result also revealed that the treatment exerted various effect on the serum biochemical parameters studied. It was concluded that the treatment used in the experiment did not adversely affect the haematology, but ameliorated the effect of the stress, and had some impact on the serum parameters of the stressed animals.
Key words: Plantain leaf, Haematology, Serum metabolites, Stressed rabbits, Ethanolic extract.

INTRODUCTION

According to Baiyeri and Ajayi (2000), plantains are not only a cheap source of dietary energy but also a useful source of carotene, vitamin A, potassium, and iron, all of which are necessary for maintaining good health. The fact that Plantain leaf is so plenty throughout Nigeria suggests that, rather than going to waste, the plant can be successfully incorporated, to be used by micro-livestock (Baiyeri and Ajayi, 2000).

Nigeria has a severe lack of animal protein, so raising rabbits is a guaranteed way to address this problem (Mailafia *et al.*, 2010). Rabbits that have recently undergone genetic improvement have higher metabolic rates and production capacities, making them more susceptible to environmental stressors including high temperatures, transportation, changes in the composition of their feed, and intensive farming (Enenebe *et al*., 2016). Due to their thick villi and lack of sweat glands, rabbits are more susceptible to stressors (such as social stress, and physical stress), which have a negative effect on their health. When faced with a high ambient temperature, rabbits will stretch out to lose heat through radiation and convection and raise the temperature of their ears. They will also spread their ear pinnae out far from the body to expose the surface to the environment (Abdelnour *et al.*, 2018).

African small-holder livestock producers are increasingly turning to herbal remedies due to the rising cost, incidence of counterfeit and adulterated medications, and lack of conventional drug options. As a result of Nigeria's abundance of ethno veterinary plants, more research is required to determine their practical applications. Hence the need to assess the effect of Plantain leaf (*Musa paradisiaca*) ethanolic extract on the haematology and serum metabolites of rabbits, stressed with both social and physical stressors.

MATERIALS AND METHODS

Experimental Site

This research was carried out at the rabbit facility of the Obafemi Awolowo University Teaching & Research Farm (OAU T&R Farms), Obafemi Awolowo University, Ile-Ife, Osun State.

Experimental Animal and Management

A total of 48 mixed breed weaner rabbits which was purchased from a reputable farm in Ile-Ife was used for the experiment. The animals were fed with pelletized concentrate, supplemented with forages (sunflower) and water; and all these were administered *ad libitum*. The animals were made to acclimatize for two (2) weeks, after which the 48 rabbits were randomly divided into six groups of treatment. The experimental rabbits were housed at a distance away from the control group due to the nature of the experiment to be carried out. The rabbits were raised for 11 weeks under an intensive management system.

Experimental Layout

Table 1: Layout of Experimental Animal

Animal Group	Treatment Administered	Stress Status
Group I (T1)	500mg/kg of plantain leaf ethanol extract	Stressed
Group II (T2)	750mg/kg of plantain leaf ethanol extract	Stressed
Group III (T3)	1000mg/kg of plantain leaf ethanol extract	Stressed
Group IV (T4)	500mg/kg of Vitamin C	Stressed
Group V (T5)	2mls of water	Stressed
Control Group (T6)	_____	No Stress

Table 2: Stress Layout for Experimental Animal

Weeks	Stress Administered	Number of Hours Administered Each Day						
		Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
3,6 &9	Social Stress	4 hours	4 hours	4 hours	4 hours	4 hours	4 hours	4 hours
	Physical Stress: Overnight Illumination	12 hours	_	_	_	_	_	_
	White Noise at 80db	_	2 hours	_	_	_	_	_
4,7 &10	Social Stress	4 hours	_	_	_	_	_	_
	Physical Stress: Overnight Illumination	12 hours	12 hours	12 hours	12 hours	12 hours	12 hours	12 hours
	White Noise at 80db	_	2 hours	_	_	_	_	_
5,8 &11	Social Stress	4 hours	_	_	_	_	_	_
	Physical Stress: Overnight Illumination	12 hours	_	_	_	_	_	_
	White Noise at 80db	2 hours	2 hours	2 hours	2 hours	2 hours	2 hours	2 hours

Adapted from Yu et al. (2018)

RESULTS AND DISCUSSION

Welfare Indices (Stress Indicators)

The Table 3 shows the result of welfare indices taken during the course of subjecting the experimental animals to stress. The result reveals that the stressors used were effective on the experimental animals, causing them to exhibit symptoms of stress, which is in line with studies of Kumar et al. (2012).

Table 3: Welfare Indices/Stress Result of Experimental Animals

Treatment	Behavioral Score	Fur Score
T1	L, G	2, 3, 4
T2	L, G, D	2, 3
T3	L, G, D	2, 3
T4	L, G, D	2, 3
T5	L, G	2, 3, 4
T6	I, D	1

Treatment – T1: Treatment 1; T2: Treatment 2; T3: Treatment 3; T4: Treatment 4; T1: Treatment 5; T6: Treatment 6 (control group); Behavioral Score – L: Locomotors; G: Grooming; I: Inactivity; D: Drinking; Fur Score – 1: clean, tidy and shiny fur; 2: dull and irregular fur; 3: less hair fur, with a few minor wounds; and 4: lack of hair, ruffled fur, with several minor wounds.

Haematological and Serum Profile of the Experimental Animals

Table 4: Haematological Parameters of Experimental Animals

Parameters	Treatments						SEM	PROB
	T1	T2	T3	T4	T5	T6		
PCV (%)	25.67	37.33	24.00	29.33	35.67	36.33	1.86	0.1243
Hb (g/dL)	14.70	12.67	8.60	9.87	11.97	12.20	2.39	0.5664
RBC ($\times 10^{6\mu l}$)	5.70	6.77	6.07	6.83	5.70	6.97	0.25	0.5115
WBC ($\times 10^{3\mu l}$)	4.73	5.53	8.30	7.07	6.87	8.13	0.72	0.7244
NEUT (%)	1.43	1.81	2.56	2.14	1.87	2.36	0.21	0.7337
LYM (%)	3.17	3.58	5.54	4.64	4.59	5.64	0.50	0.7143
EOS (%)	0.03	0.05	0.08	0.10	0.10	0.03	0.01	0.5268
BAS (%)	0.03	0.08	0.08	0.10	0.10	0.03	0.02	0.7528
MONO (%)	0.05	0.04	0.04	0.11	0.10	0.03	0.01	0.2651
MCV (fl)	45.10	55.55	39.46	43.82	63.03	52.75	2.94	0.1793
MCH (pg)	15.17	18.89	14.18	14.71	21.11	17.65	0.92	0.1735
MCHC (%)	33.78	34.00	36.10	33.88	33.54	33.51	0.33	0.1645

[a,b,c,d:] Means within each row with different superscript are significantly different (P< 0.05). SEM (±): Standard error of mean; PROB: Probability level; Hb: hemoglobin; PCV: Packed Cell Volume; RBC: Red Blood Cell; WBC: White Blood Cell; NEUT: Neutrophils; LYM: Lymphocytes; EOS: Eosinophil; BAS: Basophil; MONO: Monocytes; MCV: Mean Corpuscular Volume; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean Corpuscular Hemoglobin Concentration.

Table 4 shows the haematological parameters of the experimental animals. Findings from this study aligns with Togun *et al.* (2007) who claimed that when haematological values are within the normal range reported for rabbits, it indicates that the treatment had no negative effects on the haematological parameters during the experimental period, but when the values are below the normal range, it generally indicates anemia. White blood cell (WBC) counts that are below the normal range in particular signal that the immune system of rabbits is facing a larger struggle (Mbanasor *et al.*, 2003), as it shows a decrease in the generation of defensive mechanisms to fight infection (Eheba *et al.*, 2008). Despite the stress – social and physical stressors, the animals were subjected to during the experimental period, their haematological values still fell within the same range, as with the control group which were neither subjected to stress nor given any treatment. This further implies that the extract administered to the animals was able to ameliorate the effect of the stress, such that the haematological values still fell within the normal range as though they were not stressed at all.

The serum biochemical parameters are shown in Table 5. There was no significant difference (P>0.05) for Albumin, serum protein concentration, myeloperoxidase [0 SEC], and coagulation factor, across all the treatments. This implies that the treatment administered had to significant impact on albumin, serum protein concentration, myeloperoxidase [0 SEC], and coagulation factor. Parameters such as

Table 5: Serum Biochemical Responses of the Experimental Animals

Parameters	Treatments						SEM	PROB
	T1	T2	T3	T4	T5	T6		
ALBUMIN (g/dL)	1.31	1.51	1.38	1.39	1.30	1.38	0.03	0.3471
CONC (g/dL)	36.29	41.98	38.25	38.49	36.10	38.39	0.81	0.3471
MPO (0 SEC) (pmol/L)	0.29	0.31	0.47	0.25	0.42	0.28	0.03	0.1043
MPO (60 SEC) (pmol/L)	0.40	0.57	0.94	0.34	0.57	0.40	0.04	<0.0001
ACTIVITY (mg)	29.65	72.41	124.90	24.25	31.97	32.56	6.75	<0.0001
CATALASE (MU/g)	0.52	0.59	0.93	0.33	0.69	0.32	0.04	<0.0001
ACTIVITY1 (mg)	226.19	280.11	520.80	92.61	347.53	88.34	28.52	<0.0001
NITRIC OXIDE (µmol/L)	0.68	0.71	0.40	0.62	0.37	0.32	0.04	<0.0001
CONC 1 (g/dL)	5.20	5.44	2.87	4.70	2.65	2.23	0.29	<0.0001
SOD (0 SEC) (U/mL)	0.65	0.72	0.87	0.86	1.22	0.60	0.06	0.0218
SOD (180 SEC) (U/mL)	0.84	0.92	1.02	1.05	1.39	0.83	0.05	0.0180
F13 (%)	0.07	0.06	0.05	0.06	0.06	0.08	0.00	0.2187
GSH (µM)	0.51	0.52	0.53	0.49	0.69	0.50	0.01	<0.0001

[a,b,c,d:] Means within each row with different superscript are significantly different (p< 0.05). SEM (±): Standard error of mean; PROB: Probability level; ALBUMIN; CONC: Serum protein concentration; MPO: Myeloperoxidase; ACTIVITY: Enzyme activity in the serum; CATALASE; NITRIC OXIDE; CONC 1: Serum Syndecan; SOD: Superoxide dismutase; F13: Coagulation Factor XIII; GSH: Glutathione.

myeloperoxidase (60 SEC), Catalase, Activity 1, Nitric oxide, serum syndecan, and glutathione, were highly significant (P<0.05) across all the treatments. This implies that the treatment administered had a significant impact on these parameters (myeloperoxidase (60 SEC), Catalase, Activity 1, Nitric oxide, serum syndecan, and glutathione) in the experimental animals. While myeloperoxidase (60 SEC), enzyme activity in the serum, Catalase, and Activity 1, was significantly (P<0.05) higher for the animals in treatment 3 than for the animals in other treatments, these four serum parameters were significantly (P<0.05) lower for the animals in treatment 4 than in all other treatments. This implies that treatment 4 have a mitigating effect on these parameters in the stressed animals, indicating reduced oxidative stress or inflammation, compared to other treatment.

CONCLUSION

In conclusion, the treatment used in the experiment did not adversely affect the haematology, but ameliorated the effect of the stress, and made the haematological parameters similar to the control group animals; and also had significant impact on some of the serum parameters of the stressed animals.

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