European Journal of Science, Innovation and Technology
ISSN 2786-4936
Vol. 2 No. 4 (2022)

Liver Functions and Electrolytes' Responses of Buck Rabbits Fed Graded Levels of *Tridax Procumbens*

Odeh, I., Johnson, N. C.*, Monsi, A., Owen, O. J., and Gunn, H. H.
Department of Animal Science, Rivers State University, Nigeria

Abstract. Experiment was carried out to measure the effects of *Tridax procumbens* on liver health status and integrity using liver-enzymes as yardsticks and electrolytes in buck rabbits. Forty-eight buck New Zealand White rabbits of 16 to 18 weeks of age and weighing 1260-1305g were used in the study. The animals were randomly allotted to their hutches consisting of 12 bucks per treatment with 3 replications of 4 bucks/replication. There were 4 dietary treatments as: Treatment 1 (T_1) contained no *Tridax procumbens* and served as the negative control diet. Treatment 2 (T_2) contained 200g of *T. procumbens*/kg of diet. Treatment 3 (T_3) contained 300g of *T. procumbens*/kg of diet and Treatment 4 (T_4) contained 400g of *T. procumbens*/kg of diet. Animals received their respective experimental diets for 8 weeks. At the end of study, blood samples were collected from all the 12 rabbits in each dietary treatment group via their ear veins for liver enzymes and electrolytes analyses. All the three liver enzymes studied exhibited similar fashions in response to dietary *T. procumbens* as the enzymes levels linearly ($P < 0.05$) decreased as dietary intake level of *T. procumbens* increased with the T_4 treatment group rabbits showing significantly ($P < 0.05$) the lowest concentrations for ALT, AST and ALP. However, *Tridax procumbens* had no effects ($P > 0.05$) on electrolytes. It was concluded that *Tridax procumbens* can be used to maintain liver health and integrity, especially at 400g/kg of diet.

Key words: *Tridax procumbens*, Liver, Liver-enzymes, Electrolytes, Buck Rabbits

Introduction

Generally, blood consists of several components that can be used to monitor health status and metabolic activities of farm animals, including humans (NRC, 2012). To this point therefore, serum contents reflect the effects of dietary treatments on the animals in terms of the type and amount of feed ingested and available for the animal to meet its physiological, biochemical and metabolic activities (Ewuola *et al.*, 2004). Furthermore, serum biochemical analysis is used to determine the level of heart, liver and kidney functions as well as to evaluate protein quality utilization and amino acid levels in animals. Clinically, alanine amino transferase (ALT) is predominantly found inside liver cells. Therefore, if the liver is inflamed or injured, ALT is released into the extracellular matrix. Accordingly, therefore, measuring ALT level in the blood gives information about the functional state of the liver in terms of liver-disease, drug or other problems-relating cases that can affect the liver. Additionally, the measurements of aspartic amino transferase (AST) and alkaline phosphatase (ALP) give further insights of the health status of the liver, since they are also liver-based enzymes (Ekhato *et al.*, 2014; Lalita *et al.*, 2016).

Ara *et al*. (2008) investigated the effects of *Tridax procumbens (T. procumbens)* on serum cholesterol, triglyceride and blood glucose levels as well as *T. procumbens* effects on heart and body weights of adrenaline induced rats in a crossover design. *Tridax procumbens* leaf extract demonstrated significant effects on cardiovascular parameters of the animals in that study. The study also revealed that the leaf extract of *T. procumbens* had profound hypolipidemic activity. Based on the fore-stated in relation to the health benefits of *T. procumbens* it can be speculated that *T. procumbens* may be beneficial to the animal in terms of maintaining liver health and normal serum levels of electrolytes, namely sodium (Na^+),

*Corresponding Author

potassium (K^+) and chloride (CL^-). To our knowledge, there are no data in the literature that have investigated the effects of *T. procumbens* on liver health and electrolytes responses to dietary intake of *T. procumbens*. Therefore, the objectives of this study are to investigate the effects of dietary intake of *T. procumbens* on liver health via serum measurements of liver enzymes and as well as electrolyte responses.

Materials and Methods

Experimental Site

This study was carried out at the rabbit section of the Teaching and Research Farm, Department of Animal Science, Rivers State University, Port Harcourt, Nigeria. The farm is located North of the University campus at latitude $4^0$48'N and longitude $6^0$58'E. The average temperature is usually between 25^0C to 28^0C in the city with average rainfall of 20 mm, respectively.

Animals and Management

Before the introduction of the experimental animals to the experimental environment, their hutches as well as their feeding and water troughs were thoroughly washed with detergent and water and allowed to dry for 7 days; primarily to insure the comfort of the animals from attack by pathogenic organisms. Forty-eight buck New Zealand White rabbits of 16 to 18 weeks of age and weighing 1260-1305g were used in the study. Animals on introduction to their new environment were allowed to properly adapt to their new environment for a period of one week before they were fed with experimental diets.

Experimental Diets

The feed used in the study was Pfizer grower mash^{TM} mixed with *Tridax procumbens*. Four levels of *Tridax procumbens* were mixed into the grower mash at four different levels thus leading to four experimental diets as: Treatment 1 (T_1) contained no *Tridax procumbens* and served as the control diet. Treatment 2 (T_2) contained 200g of *T. procumbens*/kg of diet. Treatment 3 (T_3) contained 300g of *T. procumbens*/kg of diet and Treatment 4 (T_4) contained 400g of *T. procumbens*/kg of diet. There were 12 rabbits in each dietary treatment with 3 replications of 4 rabbits per dietary treatment. Animals received their respective experimental diets for 8 weeks.

Blood Sample Collection

At the end of study, blood samples were collected from all the 12 rabbits in each dietary treatment group via their ear veins for liver enzymes and electrolytes analyses. ALT was analyzed according to the method of Reitman and Frankel (1957). AST and ALP were analyzed according to the method of Aaron (1930). Electrolytes were analyzed using the flame photometric and spectrophotometric method of AOAC (2000).

Experimental Design and Statistical Analysis

The design employed in the study was the completely randomized design (CRD).The data obtained following analyses were subjected to analysis of variance (ANOVA) using the general linear model (GLM) procedure of SAS. The experimental model is: $Y_{ij} = \mu + D_i + E_{ij}$; where Y_{ij} = the observation, μ = overall mean common to all treatments, D_i = the effect of the i^{th} diet (i= 1, 2, 3, 4) and E_{ij} = the error term. Treatment means were compared using Tukey's test and an *α-level* of *0.05* was used for all statistical comparisons to signify significance.

Results

Rabbits in all treatment groups fed normally and seen to be in sound health and wellness throughout the experimental duration as animals were constantly monitored on daily basis. The mean values of liver enzymes on the four treatments are shown in Table 1.

Table 1. Mean values of liver enzymes of buck rabbits fed graded levels of *Tridax procumbens*

Parameters	Treatments					
	T_1	**T_2**	**T_3**	**T_4**	**SEM**	***P-value***
ALT (iu/l)	70.78^{a}	69.50^{b}	67.83^{c}	66.40^{d}	0.16	0.04
AST (iu/l)	67.20^{a}	65.25^{b}	64.70^{c}	61.20^{d}	0.11	0.02
ALP (iu/l)	10.10^{a}	9.23^{b}	8.63^{c}	8.35^{d}	0.03	0.04

Note: ^{abcd}Means with different superscripts within the same row are significantly ($P < 0.05$) different

As depicted in Table 1, all the three liver enzymes studied exhibited similar fashions in response to dietary *T. procumbens* as the enzymes levels linearly ($P < 0.05$) decreased as dietary intake level of *T. procumbens* increased with the T4 treatment group rabbits showing significantly ($P < 0.05$) the lowest concentrations for ALT, AST and ALP, respectively. The results of dietary of *Tridax procumbens* on electrolytes are shown in Table 2.

Table 2. Mean values of electrolytes of buck rabbits fed graded levels of *Tridax procumbens*

Parameters	Treatments					
	T_1	**T_2**	**T_3**	**T_4**	**SEM**	***P-value***
Na^+ (mmol/l)	135.76	136.10	135.58	136.12	0.18	1.33
K^+(mmol/l)	4.27	4.25	4.25	4.21	0.10	0.64
Cl^-(mmol/l)	95.26	95.31	95.28	95.27	0.11	0.95

As shown in Table 2, dietary intake of *Tridax procumbens* had no effects on electrolytes as there were no differences ($P > 0.05$) amongst electrolytes' levels in all the treatment dietary groups.

Discussion

All animals in the four dietary treatment groups consumed their experimental diets without any sign of feed rejection. As shown in Table 1, all liver enzymes studied, namely, ALT, AST and ALP levels significantly reduced compared with the negative control values as dietary *Tridax procumbens* inclusion levels increased. ALT is usually an important enzyme linked to be involved in the conversion of amino groups to pyruvate and glutamate, suggesting that ALT is involved in protein metabolism (Shokrzedah *et al.*, 2012). High levels of ALT in the blood is always an indication that the liver is leaking or damaged. Therefore, with the significant reductions of ALT in the serum of the rabbits support the fact that *T. procumbens* is favorable to the maintenance of liver integrity.

Like ALT another liver-based enzyme used in determining liver integrity is AST. Since, AST is a liver enzyme, high levels of AST like ALT is an indication that the liver is leaking resulting to high levels of serum AST. This liver enzyme is involved in the conversion of α-ketogluterate and aspartic acid to glutamate and oxaloacetate (Ekhato *et al.*, 2014). The lowering effect of AST just like ALT is a confirmation that *T. procumbens* would be useful in ensuring liver health and integrity. The trend is also similar with ALP which further confirms the importance of *T. procumbens* in the maintenance of liver integrity. Overall, the lowering

effects of ALT, AST and ALP by *T. procumbens* found in this current study is in agreement with the data of other workers, such as those of Wildmann (1974). Wildmann (1974) posited that *T. procumbens* could positively improve the health status of animals and therefore their performances when ALT, AST and ALP levels show a decreasing trend with a good herb, such as *T. procumbens*.

Conclusions

T. procumbens reduced serum levels of ALT, AST and ALP in buck rabbits and therefore, can be used to maintain liver health and integrity, especially at 400g/kg of diet.

References

Aaron, B. (1930). Method of determining alkaline phosphatase in serum. *J. Bio. Chem., 89,* 235-247.

AOAC (2000). Association of Analytical Chemistry, Arlington, Virginia, USA.

Ara, N., Rashid, M., & Amran, M. S. (2008). Comparison of *Moringa oleifera* leaf extract with atenolol on serum Triglyceride, serum cholesterol, blood glucose, heart weight, body weight in adrenaline induced rats. *Saudi. J. Bio. Sci., 15*(2), 253-258.

Ekhato, C. N., Osifo, U. C., & Akpamu, U. (2014). Effect of oral contraceptive pills (containing low doses of synthetic hormones) on liver function in adult female rabbits. *Asian J. Biotech., 6*(1), 15-20.

Ewuola, E. O., Folayan, O. A., Gbore, F. A., Adebunmi, A. I., Akani, R. A., Ogunlade, J. T., & Adeneye, J. A. (2004). Physiological response of growing West African Dwarf goats fed groundnut shell-based diets as the concentrate supplements. *Bowen, J. Agric., 1*(1), 188-216.

Lalita, S., Amit, K. V., Anu, R., & Rajesh, N. (2016). Relationship between serum biomarkers and oxidative stress in dairy cattle and buffaloes with clinical mastitis. *Biotechnol., 15*(3-4), 96-100.

NRC (2012). *Nutrient requirement of swine* (11th ed.). Natl. Acad. Press, Washington, D. C.

Shokrzadeh, M., Shobi, S., Alfar, H., Shayegan, S., Payam, S. S., & Ghorbani, F. (2012). Effect of vitamins A, E and C on liver enzymes activity in rat exposed to organo-phosphate pesticide (Diazinon). *Pak. J. Biol. Sci., 15*(19), 936-941.

Wildmann, F. K. (1974). Clinical interpretation of laboratory tests.