SERUM BIOCHEMISTRY OF COMPOSITE RABBIT DOES ADMINISTERED AQUEOUS EXTRACTS OF "HOSPITAL TOO FAR" (*Jatropha tanjorensis*) AND BITTER LEAF (*Vernonia amygdalina*)

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ABSTRACT

This study investigated the effects of aqueous extracts of Vernonia amygdalina (bitter leaf) and Jatropha tanjorensis ("Hospital Too Far") on serum biochemistry of composite doe rabbits. The experiment was conducted at the Teaching and Research Farm, Federal University of Technology Minna, Niger State, Nigeria. Thirty-six (36) composite doe rabbits aged 3-4 months were randomly divided into six treatment groups designated as T1, T2, T3, T4, T5 and T6 each comprising three replicates, with two rabbits per replicate. The extract obtained from the bitter leaf and "hospital too far" were administered weekly at 0 + 0 ml, 2.5 + 2.5 ml, 2.5 + 5.0 ml, 5.0 + 2.5 ml, 5.0 + 5.0 ml and 0.5 ml ovaprim per kilogram body weight weekly for the six treatments, respectively. The experiment was a Completely Randomized Design (CRD). Blood samples were collected for serum biochemistry analysis. Serum parameters including urea, creatinine, ALT, AST, and albumin were analyzed. Proximate and phytochemical analyses revealed the nutritional composition of the experimental diets and extracts. Results indicated significant ($p<0.05$) effects of the treatments on serum biochemistry with improved creatinine and albumin levels observed in treated groups compared to the control. The findings suggest that the combined use of Jatropha tanjorensis and Vernonia amygdalina extracts can positively influence biochemical parameters in rabbits, offering potential benefits for rabbit production and health management. Further studies are recommended to optimize dosage levels and evaluate long-term effects.

Keywords: Serum, Aqueous, Biochemistry, Rabbit, Extracts

INTRODUCTION

Rabbit breeding is a growing branch within the livestock industry due to ease of handling and rearing in addition to the quality of protein in this species (Falcone *et al*., 2020). Over the years, this branch of livestock industry has been dominated by backyard rearing. Rabbit farming has gained attention due to its lower environmental impact and efficient feed conversion compared to other livestock (Cullere and Dalle Zotte, 2018). Rabbit meat is high in protein (22 %) low in fat (4 %) and cholesterol (5 %) and thus possesses health-promoting properties (Aduku and Olukosi, 2000). Due to its low calorie, fat, and hazardous cholesterol contents, rabbit's meat has been classified as one of the healthiest meats for humans by the United State Department of Agriculture (USDA) (Dalle-Zotte, 2014). With its distinct nutritional benefits, rabbit meat is becoming more and more well-liked as a global source of functional meat (Dalle-Zotte and Cullere, 2017). Antibiotics have traditionally been used in livestock farming to enhance growth, improve feed efficiency, and prevent diseases. However, their extensive use has led to significant concerns about antibiotic resistance, which poses a major risk to both animal and human health. Antibiotic resistance can lead to the emergence of resistant strains of bacteria that are difficult to treat, potentially resulting in severe infections and complicating disease management in both livestock and humans (Smith *et al*., 2020). Given these challenges, there is a pressing need to find alternatives to antibiotics that can maintain or improve animal health and productivity without contributing to resistance issues. Phytogenic additives, derived from plant sources, have emerged as a promising solution. These natural compounds, including essential oils, extracts, and phytochemicals, are thought to offer various health benefits such as antimicrobial, anti-inflammatory, and antioxidant properties. *Jatropha tanjorensis* and bitter leaf (*Vernonia amygdalina*) are two such plant sources with documented medicinal properties. *Jatropha tanjorensis* is known for its antioxidant and anti-inflammatory effects, while bitter leaf has been recognized for its hypoglycemic and lipid-lowering properties (Smith *et al.,* 2020). Despite their traditional uses, there is lack of comprehensive scientific data on how these plant extracts impact serum biochemistry and lipid profile in rabbit, which are critical indicators of metabolic health and disease risk. Thus, this study aimed to address this gap by investigating the effects of aqueous extracts of *Jatropha tanjorensis* and bitter leaf (*Vernonia amygdalina*) on the serum biochemical parameters and lipid profiles of rabbit does.

MATERIALS AND METHODS

Study Location

The Research was conducted at the Teaching and Research Farm, Department of Animal Production, Federal University of Technology Minna (Gidan Kwano Campus), Niger State. Minna is located between latitude 9038' and 9037' North, longitude 6023' and 6033'East, which has an annual rainfall of between 1000-1500mm and an average temperature of 320c (FUTMINNA Student Handbook, 2020).

Experimental Animals and Management

Thirty-six (36) composite rabbit does, aged three to four months were used for this study. The animals were acquired from Blessed Heritage Organic (BHO) farm in Okuku, Osun State, Nigeria, and were quarantined for two (2) weeks before the start of experiment. The rabbits were paired into two and housed in wooden hutches, receiving a diet formulated with 16 % crude protein and 2581 ME/kg energy (Table 1) along with grass-legume forages. Vitalyte® plus was given orally to manage stress. Ivomec was administered subcutaneously as a preventive measure against internal and external parasites, while Neoceryl® plus was administered orally to combat gram-negative and gram-positive bacteria. Coccimix was given orally to prevent coccidiosis, and Sulphadimidine was administered orally to guard against possible gastrointestinal disorders.

Source of Experimental Materials

A large quantity of *Jatropha tanjorensis* ("Hospital too far") and *Vernonia amygdalina* (bitter leaf) were sourced within Minna metropolis, Niger state. Other feed ingredients such as maize, groundnut cake, fish meal, maize offal, salt, and vitamin premix were also obtained within Minna metropolis, Niger State.

Table 1: Experimental diet fed to the animals

Ingredient	Composition (%)
Maize	50.99
Soya bean	20.01
Rice offal	20.00
Fish meal	3.50
Bone meal	3.50
Methionine	0.50
Lysine	0.50
Premix	0.50
Salt	0.50
Total	**100.00**
Calculated value of experimental diet (%)	
Crude protein	16.00
ME (Kcal/kg)	2582.00
Crude fibre	9.90
Calcium	0.30
Phosphorus	0.37

Processing of "Hospital Too Far" and Bitter Leaf

A large quantity of *Jatropha tanjorensis* ("Hospital too far") and *Vernonia amygdalina* (bitter leaf) leaves was collected, gently washed without squeezing, and air-dried indoors for 72 hours. Afterward, they were placed in an oven at approximately 40°C for 2 hours. The leaves were then ground into powder separately. 100 g of the ground leaves were soaked in 1000 ml of distilled water in a ratio (1:10) for 72 hours in a chromatographic jar, agitated every 2 hours. The extract was concentrated by evaporation using boiling water in a water bath. The fluid extract was collected, weighed, and preserved for use as described by Ukoh *et al*., (2022).

Experimental Design

The experiment involved thirty-six (36) composite rabbit does. The rabbits were weighed and randomly divided into six treatment groups (six per treatment) and further replicated into three replicates (two per replicate) using a Completely Randomized Design (CRD). Aqueous extracts of bitter leaf and "Hospital Too Far" were administered orally weekly per kg of body weight. T1 served as negative control (0 ml of "Hospital Too Far" and 0 ml of Bitter leaf), T2 (2.5 ml of aqueous bitter leaf and 2.5 ml of "Hospital Too Far"), T3 (2.5 ml of aqueous bitter leaf and 5 ml of "Hospital Too Far"), T4 (5 ml of aqueous bitter leaf and 2.5 ml of "Hospital Too Far"), T5 (5 ml of aqueous bitter leaf and 5 ml of "Hospital Too Far") and T6 served as positive control (0.5 ml ovaprim).

Data collection

Three (3) mls of blood sample were collected from the does at slaughter from the jugular vein at the neck region, and put into ethylene diamine tetra acetic acid (EDTA) treated bottles and taken to the lab for serum biochemistry analysis, following the methods of (Doumas, 1975) and (Fletcher, 1968) respectively. The serum profile evaluated included Albumin, Urea, Creatine, Protein, Alanine Aminotransferase (ALT), Aspartate Aminotransferase (AST), Alkaline Phosphate (ALP), Total bilirubin.

Data Analysis

Data collected were subjected to one way analysis of variance (ANOVA) using Statistical Package for Social Sciences (SPSS) version 17.0. Differences among means were separated using Duncan's Multiple Range Test.

RESULTS AND DISCUSSION

The proximate composition of bitter leaf (BL), "hospital too far" (H2F) and formulated diet as presented in table 2 reveals that BL and H2F are rich in crude protein 28.20 % and 25.50 %, crude fibre 15.50 % and 18.10 % respectively and low in ether extract 5.10 % and 6.20 % respectively. Relatively, experimental diet had higher values of crude protein and crude fibre 17.50 % and 13.50 % respectively. The high values obtained in BL and H2F for crude protein and crude fibre is an indication that they are suitable component of additive in rabbits due to their ability to digest fibrous feed material as reported by Akinwumi and Omotayo, (2016). Table 3 showed results of the phytochemical composition of BL and H2F. The results reveal significant amount of phytochemical present in both leaves. High amount of flavonoid (2.05 mg/100g) and phytates (1.99 mg/100) were observed in BL. Similarly, flavonoids (1.5 mg/100g), phytates (2.58 mg/100g) and saponins (2.03 mg/100g) were observed in H2F. These unique phytochemical properties offers significant biochemical, physiological and morphological benefits (Garba *et al*., 2022). The administration of BL and H2F aqueous extracts significantly influenced serum biochemistry in rabbit does as shown in Table 4. Creatinine levels showed significant variations, with the highest level recorded in the T3 group (5.54 mg/dl) exceeding the normal range (NR) (0.5 – 2.5 mg/dl), suggesting potential renal stress. This finding aligns with Attia *et al*. (2016), who highlighted the impact of oxidative stress on renal function. Similarly, urea levels peaked in the T3 group (57.70 mg/dl), potentially indicating increased protein catabolism or reduced renal clearance, as supported by Oluwole *et al*. (2018). Total protein and albumin levels were significantly elevated in the T5 group (7.75 g/dl and 3.44 g/dl, respectively), reflecting improved protein synthesis and liver function, consistent with Egesie *et al*. (2017). Liver enzymes such as ALT and AST varied significantly, with T2 showing the highest AST level (55.20 U/L), which may indicate mild hepatic stress. However, ALP levels remained moderated across treatments, suggesting no severe liver damage, corroborating Nwanjo *et al*. (2016). Total bilirubin level was notably elevated in the T2 group (0.78 mg/dl), indicative of dose-dependent effects, as noted by Olaleye *et al*. (2015).

Table 2: Proximate Composition of Experimental Diet and Test Ingredients (%)

Parameters	FEED	BL	H2F
Dry matter	90.00	89.00	90.00
Crude protein	17.50	28.20	25.50
Crude fibre	13.50	15.50	18.10
Ether Extract	4.50	5.10	6.20
Ash	6.00	10.40	8.00
Nitrogen free Extracts	58.50	40.80	42.00

Keys: BL: Bitter leaf; H2F: "hospital too far"

Table 3: Phytochemical Composition of Bitter Leaf (*Vernonia amygdalina*) and "Hospital Too Far" (*Jatropha tanjorensis*)

Chemicals (mg/100g)	Bitter Leaf	"Hospital Too Far"
Flavonoids	2.05	1.5
Phytates	1.99	2.58
Glycosides	0.45	0.27
Tannins	0.35	0.33
Saponins	1.07	2.03
Alkaloids	1.09	0.97

Table 4. Serum Biochemistry of Composite Rabbit Doe Administered Aqueous Extracts of Bitter Leaf and "Hospital Too Far"

Parameters	T1	T2	T3	T4	T5	T6	SEM	P-value	NR
Total Protein (g/dl)	5.87^{abc}	4.79^{c}	5.36^{bc}	5.94^{abc}	7.75^{a}	7.13^{ab}	0.32	0.039	5.4 – 7.5
Albumin (g/dl)	2.81^{b}	2.37^{c}	2.41^{c}	3.06^{b}	3.44^{a}	2.47^{c}	0.10	0.000	2.7 – 5.0
Alanine Transaminase (U/L)	47.73^{bc}	44.00^{cd}	53.48^{ab}	42.97^{cd}	39.46^{d}	55.30^{a}	1.56	0.001	45 – 80
Aspartate Transaminase (U/L)	43.97^{bc}	55.20^{a}	44.80^{bc}	40.51^{c}	29.74^{d}	50.38^{ab}	2.17	0.001	35 – 130
Alkaline Phosphate (U/L)	35.31	41.97	46.03	42.17	36.33	48.82	2.29	0.545	12 – 96
Total Bilirubin (mg/dl)	0.69^{a}	0.78^{a}	0.72^{a}	0.73^{a}	0.52^{b}	0.78^{a}	0.03	0.019	0 – 0.7
Creatinine (mg/dl)	2.28^{b}	0.77^{b}	5.54^{a}	5.29^{a}	4.54^{a}	4.29^{a}	0.47	0.001	0.5 – 2.5
Urea (mg/dl)	43.50	28.28	57.70	51.34	49.59	47.78	5.44	0.786	20 – 45

Key: ^{abcd} means in the same rows not followed by the same superscript are significantly ($P < 0.05$) different. SEM: Standard Error of Mean; P-value: Probability value; NR: Normal Range (Mitruka and Rawnsley, 1977).
T1: (-ve Control),
T2: (2.5 ml BL + 2.5 ml H2F aqueous extracts),
T3: (2.5 ml BL + 5.0 ml H2F aqueous extracts),
T4: (5.0 ml BL + 2.5 ml H2F aqueous extracts),
T5: (5.0 ml BL + 5.0 ml H2F aqueous extracts) and
T6: (+ve Control 0.5 ml ovaprim)

CONCLUSION

The administration of aqueous extracts of BL and H2F significantly influenced serum biochemistry and lipid profiles in rabbit does. The observed variations in creatinine, urea, total protein, and albumin levels suggest dose-dependent effects on renal and liver functions, with higher extract doses potentially inducing mild renal and hepatic stress. Lipid metabolism was significantly modulated, with elevated cholesterol and triglyceride levels observed at higher doses, reflecting the extracts' lipid-modulating properties. Given their lipid-lowering and hepatoprotective effects, these extracts could be explored further as natural alternatives for managing hyperlipidemia and liver dysfunction.

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