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HAEMATOLOGICAL AND SERUM BIOCHEMICAL RESPONSES OF YANKASA RAMS SUPPLEMENTED CINNAMON POWDER

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ABSTRACT: *This experiment was conducted to evaluate the effect of cinnamon supplements on Yankasa Rams' growth performance, nutrient digestibility, haematology and serum biochemical profile. A total number of sixteen (16) Yankasa grower rams with an average live weight of 20kg each was randomly allotted into four dietary treatments comprised of four replicates consisting of four animals per treatment in a completely randomized design (CRD), where data obtained in this study were analyzed using General Linear Model of Statistical Analysis Software and Means were separated using Duncan Multiple Range Test. The haematological variables demonstrated that packed cell volume was significantly (P<0.05) affected by an increased level of cinnamon Significant (P<0.05) differences were also recorded in white blood cells, neutrophils, basophils and haemoglobin while others were not significantly (P>0.05) changed. With the exception of plasma potassium level, there were no significant (P>0.05) differences in all other serum biochemistry with the supplementation of cinnamon. Cinnamon supplementation plays a vital role in improving the haematological profile. No significant considerable changes were observed in the serum biochemical profile as a result of cinnamon supplements in Yankasa rams. It is therefore recommended that cinnamon powder can be incorporated into ruminant animal diet up to 15g/kg without detrimental effect in animal health status. However further studies were encouraged.*

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INTRODUCTION

Ruminant animals are great contributors to the human food chain due to their ability to utilize complex polysaccharides in plant cell walls (cellulose, hemicelluloses and pectin), which are otherwise non-digestible to any of the mammalian digestive enzymes and turn these into meat and milk for human consumption. Digestion of these polysaccharides in ruminant diets is attributable to the anaerobic biodegradation of these compounds into their respective monomers by microorganisms (bacteria and fungi) present in the rumen. Several attempts have been made to manipulate the rumen microorganism for better performance using different types of strategies.

It is clear that heat stress affects animal performance in different ways such as reducing feed intake, growth performance and nutrient digestibility, therefore cinnamon plays an important role in therapeutic, pharmacological, and various other properties which are useful to animals. Recently research has shown that cinnamon bark has diverse bioactivities, including anti-inflammatory, antioxidant, antimicrobial, anticancer, a as well as pharmacological properties. Feed is an important aspect of livestock production. The importance of feed supplementation in animal production has increased in the last few years (Sharifi *et al.,* 2011).). The haematological components, which consist of red blood cells, white blood cells, or leucocytes, Mean corpuscular haemoglobin and Mean corpuscular haemoglobin concentration, white blood cell counteraction, and red blood cell concentration among others are used in routine screening for health status of animals.

Cinnamon is a spice obtained from the inner bark of several tree species from the genus cinnamon. Cinnamon is used mainly as an aromatic condiment and flavouring additive (Burlando *et al.*, 2010). The volatile fatty oils obtained from the back, leaf and root of cinnamon are very significant in chemical composition which suggests that they vary in their pharmacological effects as well (Shan *et al*., 2002). The most important constituent of cinnamon is cinnamaldehyde *trans*-cinnamaldehyde, which is present in the essential oil, thus Contributing to the fragrance and the various biological activities observed with cinnamon (luo *et al*., 2013).

Cinnamon possesses antioxidant activity that can reduce lipid peroxidation in biological systems (Shobana and Naidu, 2000). Spices and medicinal plants have received rapid consideration as sources of beneficial antioxidants against various diseases (Suhaj, 2006) Antioxidants have been considered the most important drivers in the progress and existence of animals, as they respond to free radicals and damage in metabolic diseases and age-related syndromes of humans and other animals (Halliwell *et al.,* 2011). It's well known that cinnamon provides not only good flavour, aroma and pungent stimuli but also contributes to medicinal, antimicrobial and antioxidant and anti-inflammatory properties (Agarwal *et al*., 2014). Due to these several properties spices serve as an ideal feed preservative and aid in prolonging the shelf life of feeds by protecting and preventing rancidity through their antioxidant activity (Patel *et al.,* 2011). Another interesting fact is that the natural potential of spices contributes to safe feed intake products as well as improves the shelf life of feed products (Sharma *et al*., 2012). The aim of this study is to determine the response on cinnamon powder supplementation on heamatological and serum biochemical profile of Yankasa rams.

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MATERIALS AND METHODS

Experimental Site

The experiment was carried out at the Department of Animal Science Teaching and Research Farm Federal University Dutsin-Ma, Katsina State. The farm is situated within latitude 12°27'18' North and 7°29'29' East and 605 meters above sea level with an annual average rainfall of 700mm and is situated in the Northern Sudan Savannah zone.

Animal Management

A total number of sixteen Yankasa grower rams with an average live weight of 20kg were quarantined in a holding pen where they were given prophylactic doses of antibiotics (Tetracycline LA) and dewormed (Ivermectin).

Experimental Design

Experiment I: A total number of sixteen (16) Yan-kasa growers rams with an average live weight of 20kg each were randomly allotted into four dietary treatments comprising four replicates consisting of four animals per treatment in a completely randomised design (CRD). This is used for growth performance and nutrient digestibility. Feed and water were given to the animals *ad libitum.*

Cinnamon Preparation: A dry cinnamon bark was procured in Katsina central market, after then the bark was crushed using mortar and pastel to obtain the fine particles and preserved in polyethane bags for ration formulation.

Experimental Diet: Four different diets were formulated according to NRC recommendations for grower rams (2002) and four different supplements of cinnamon powdered were also included at a rate of 0g/kg, 5g/kg, 10g/kg and15g/kg diet for T1, T2, T3 and T4 respectively.

Table 1: Experimental Diet Composition

Ingredient	Percentage (%)
Maize	8.00
Maize bran	19.00
Wheat offals	30.00
Cotton seed cake	15.00
Groundnut cake	7.00
Guinea corn husk	9.00
G/nut hay	10.00
Bone meal	1.00
Salt	1.00
Total	100

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Table 2: Calculated Analysis of Experimental Diet

Calculated Analysis	%
Energy (Kcal/kg)	1960.00
Crude Protein (%)	14.00
Ether extract (%)	2.00
Organic Matter (%)	88.00
Crude Fibre (%)	18.00
Neutral Detergent Fibre (%)	30.40
Acid Detergent Fibre (%)	9.50
Ash (%)	7.00

Hematological parameters determination

At the end of the experiment (12 weeks) blood sample was collected from the jugular vein using a sterile syringe and needle. The blood was collected and stored in well-labelled sample bottles containing EDTA (ethylene diamine tetra acetic acid) as anticoagulants. Immediately after blood collection, it was then put in an ice park and transported into the laboratory for haematological parameters determination: parameters such as haemoglobin, packed cell volume, red blood cell, $_3$lymphocyte, monocyte, neutrophils, basophils, and eosinophil were determined.

Serum biochemistry determination

Blood and serum samples were collected at the end of the experiment from the jugular veins of Yankasa rams. A quantity of 5 ml of blood was collected into labelled sterile sample bottles without anticoagulant and used for the serum biochemical analysis. The sample was centrifuged at 3000 rpm for 15 minutes. Separated sera were stored frozen at -20˚C in sample bottles for analysis of Serum albumin, globulin, total protein, Alkaline phosphate (ALP), Alanine aminotransferase (ALT), Aspartate aminotransferase (AST).

RESULTS AND DISCUSSION

Proximate Composition of the Experimental Diet

The proximate composition of the experimental diet is presented in Table 3 below. The crude protein content obtained in the experimental diet falls within the crude protein content ranges of breeder rams recommended by NRC (2002) from 12 – 26%.

Table 3: The Proximate Composition of the Experimental Diet

Compositions	T1	T2	T3	T4
Dry matter (%)	97.41	95.41	95.02	94.83
Organic matter	90.09	89.56	90.55	91.36
Crude Protein (%)	18.39	21.94	16.38	14.94
Ether Extract (%)	7.93	7.02	7.28	8.00
Crude Fiber (%)	18.39	15.59	15.55	17.14
Ash (%)	13.60	9.51	9.97	9.00

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NFE (%)	45.37	52.34	52.81	55.83
NDF (%)	34.10	33.78	33.80	38.23
ADF (%)	21.02	21.81	22.31	23.36
Hemicellulose (%)	13.09	10.89	11.52	13.85

NFE = Nitrogen free extract, NDF = Neutral detergent fibre, ADF = Acid detergent fibre

Effect of Cinnamon Supplement on Hematological Profile of Yankasa Rams

The effect of the cinnamon supplement on the haematological profile of Yankasa rams is presented in Table 4 below. It is very essential to conduct blood analysis on animals after feeding traits for quick means for evaluating clinical and nutrient status (Ojebiyi *et al.*, 2007). The result revealed that there was a significant difference (P<0.005) in packed cell volume where T4 had the highest value (28.550) followed by T2, and T3 and the lowest PVC value was obtained in T1 with (27.150). The PVC values obtained in this study (27.150 – 28.850%) fall within the normal PCV range (27.0 – 45.0%) reported for healthy sheep by Tambuwal (2002). The normal value of PVC in this study indicated clearly that animals are managed under protein-adequate diets. This supports the assertion of Adejumo and Onifade, (2005) that low PCV stimulates classical protein deficiency anaemia in animals on protein-deficient diets. The white blood cell value obtained in this study indicates that there were significant (P0.005) differences in which T1 had the highest value (20.350) followed by T2, T3 and the lowest WBC value were found in T4 (16.850). The result shows that there were significant differences (P0.005) in neutrophils in which T1 had the highest value (37.500) then followed by T2, T3 and the lowest value was obtained in T4 with (31.600). The values obtained for the WBC of rams in this study (16.850-20.350g/dl) fall within the reference range of 9 – 3 reported by Rertman and Frankel (1957) for healthy sheep. It was established that decreased white blood cells below the normal range, show allergic conditions, anaphylactic shock (Flegg, 1973), and certain parasitism or presence of a foreign body in the circulating system (Ahanafale *et al.*, 2008) at The basophil value obtained from this study were significantly different (P0.005) The lymphocyte, monocyte, eosinophil, RBC values obtained in this experiment were not significantly different (P>0.05). The haematological variables were investigated; however, all values obtained were within the normal physiological range and did not have any serious health implications on the rams.

Table 4: Effect of cinnamon supplement on haematological profile of Yankasa rams

Parameters	T1	T2	T3	T4	SEM	LOS
PCV	27.15^{b}	28.70^{a}	28.55^{a}	28.85^{a}	0.33	*
WBC	20.35^{a}	18.70^{ab}	16.90^{b}	16.85^{b}	0.76	*
Neutrophils	37.50^{a}	34.61^{ab}	33.75^{ab}	31.60^{b}	1.43	*
Lymphocytes	62.35	62.45	61.55	57.85	1.73	NS
Monocytes	0.00	0.00	1.50	0.00	0.75	NS
Eosinophil's	5.50	4.50	8.50	2.50	1.80	NS
Basophils	8.05^{ab}	8.90^{ab}	9.70^{a}	9.80^{a}	0.00	*
RBC	7.36	7.55	8.35	7.35	0.59	NS
Hb	8.05^{ab}	8.90^{ab}	9.70^{a}	9.80^{a}	0.32	*

PCV= Packed cell volume, WBC= White blood cell, RBC= Red blood cell, Hb= Haemoglobin, SEM= Stan dard error means, LOS= Level of significance, *= Significant at 5%, and NS= Not significant

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Effect of cinnamon supplement on serum biochemistry profile of Yankasa rams

The result on the effect of cinnamon supplement on the serum biochemical profile of Yankasa rams was presented in Table 5 below. The liver function test variable (such as alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase, total protein, albumin and globulin) in this study were not significant (P>0.05) although considerable numerical variations exist between groups. The aspartate aminotransferase values obtained in this study contradict the aspartate aminotransferase value 9.50 – 13.50µ/L reported by Garba & Adeola (2020) for Yankasa rams.

Aspartate aminotransferase is an enzyme released into the blood when certain organs or tissues, particularly the liver and heart are injured. Usually, low levels of aspartate aminotransferase are normally found in the blood Allelo & Mays (1998). Zinkl (1986) reported that high levels of aspartate aminotransferase of more than 400 unit/L are likely to be cases such as viral hepatitis and carbon tetrachloride poisoning.

The total plasma protein obtained in this study is similar to the plasma protein reported by Garba & Adeola (2020). They reported a plasma protein range of 77.50 – 89.50 g/dl. The albumin concentration ranges from 27.00 – 54.00 g/dl in this study were higher than the albumin ranges of 29 – 33g/dl reported by Njidda et al., (2014). The total protein and albumin are indicators of the total protein reserve in an animal body (Bamgbose *et al.*, 2003). Also, albumin concentration is an indicator of liver function (Tripathi *et al.*, 2007). Therefore, the result obtained in this study suggested that cinnamon supplementation did not affect the functioning of the liver negatively, since albumin is synthesized mainly by the liver.

The result of plasma electrolytes in this study indicates that there are non-significant (P>0.05) differences with the exception of potassium. The highest potassium level was obtained in T2 (12.200nmol/L), followed by T1 (11.000nmol/L), and T3 with 9.700nmol/L while low potassium is an important electrolyte that has a major effect on the contraction of skeletal and cardiac muscles. A lower potassium causes cell excitability, leading to muscle weakness. Severe hyperkalemia can ultimately cause a lack of muscle excitability which may lead to paralysis or a fetal cardiac arrhythmia (Rose, 2011).

Table 5: Effect of cinnamon supplement on serum biochemistry profile of Yankasa rams

Parameters	T1	T2	T3	T4	SEM	LOS
Alanine aminotransferase	32.50	31.05	29.80	30.65	0.71	NS
Aspartate aminotransferase	99.55	104.40	83.10	94.30	7.42	NS
Alkaline phosphate	55.60	52.85	54.60	51.85	1.19	NS
Total protein	70.50	72.00	69.50	71.50	1.64	NS
Albumin	29.00	27.00	54.00	31.50	13.09	NS
Globulin	41.50	40.00	35.50	40.00	2.85	NS
Urea	8.55	7.45	24.20	8.65	7.90	NS
Creatinine	95.50	91.50	53.75	95.5	22.69	NS
Potassium	11.00^{a}	12.20^{a}	9.70^{c}	9.65^{c}	0.23	*
Cholesterol	3.05	3.15	6.35	0.950	1.75	NS
Chlorine	103.00	102.50	108.50	136.00	12.41	NS

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CONCLUSION

It could be concluded that supplementation of powder at both 10 and 15g/kg diet increased packed cell volume and hemoglobin considerably thereby lowering white blood cells and other differential count of Yankasa rams. With the exception of potassium all other serum biochemical profile of Yankasa rams supplemented cinnamon were not statistically affected. It is therefore recommended that cinnamon powder can be incorporated into ruminant animal diet up to 15g/kg without detrimental effect in animal health status. However further studies were encouraged.

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