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Hematological and Biochemical Parameters of West African Dwarf (WAD) Goats Fed Wheat Offal-Carried Pineapple Waste (WCPW)

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Abstract

This study evaluates the hematological and biochemical parameters of West African Dwarf (WAD) goats fed wheat offal-carried pineapple waste (WCPW). Twenty WAD goats (initial weight 6.16 – 6.68kg) were randomly allotted to four experimental treatments in a completely randomized design. Four concentrate diets were compounded comprising 0, 20, 30 and 40% levels of inclusion of WCPW. The animals were fed at 3% of their body weight. On the last day of the experiment, two sets of blood samples were taken from the goats via jugular venipuncture using a 5 ml syringe. The PCV and Hb concentration value decreased significantly ($P<0.05$) as the inclusion level of WCPW increased in the diets. The RBC counts were significantly highest ($p<0.05$) in animals fed 30%WCPW (12.16), followed by 20%WCPW (10.83), 0%WCPW (10.20) and 40%WCPW (9.16) diets. Also animal fed 30%WCPW diet had significantly highest WBC counts compared to animals fed 20%WCPW, 40%WCPW and 0%WCPW diets. The RBC, WBC, neutrophil and lymphocyte of the goats fed 30%WCPW and 20%WCPW were significantly higher than animals fed other diets. The total protein, albumin and globulin contents of goats fed 40%WCPW were significantly higher ($p<0.05$) than other diets while there was no significant difference ($p>0.05$) in the AST, ALP and creatinine contents of the experimental goats across the treatments. It could be concluded that inclusion of WCPW in diet up to 30% had no deleterious effect on blood parameters of the goats while care should be taken at higher inclusion level due to tendency to induce aenamia.

Introduction

Goats constitute very important part of ruminant livestock sub-sector in the Nigerian agricultural economy. They are one of the most important domesticated small ruminants with a population of 29.2 million in Nigeria [1]. Goats also play significant role in the nutrition of most Nigerian, as they offer the cheapest sources of domestically provided meat in Nigeria. Thus, the potential of goat production in alleviating low animal protein intake by man in developing nation need no emphasis [2]. Forages being the primary and most economically source of nutrient for goats, decline rapidly in quality during dry season and result to poor performance and nutritional stress. Thus the development of alternative feedstuffs in goat nutrition will continue to receive attention in Nigeria as long as the feed sources continue to be scarce and expensive [3]. Hence, it has become imperative to turn attention to the exploitation of locally available agro-industrial by products such as pineapple waste. Feeding non-conventional feeds to animals may affect animal's health status and ability to withstand diseases [4]. One of the fastest means of ascertaining toxicity of ingested feed in animals is by the assessment of their blood because blood serves as an indicator of the health status of animals [5]. Blood contains diagnostically relevant parameters which act as a pathological reflector of the status of animals exposed to toxicants [6]. Therefore this study was carried out to examine the haematological and biochemical parameters of West African Dwarf (WAD) goats fed wheat-offal carried pineapple waste (WCPW).

Materials and Methods

This study was carried out at the Sheep and Goat Unit of the Teaching and Research Farm, Obafemi Awolowo University, Ile Ife. Osun State. Nigeria. Located between latitude 7° 28′ 0N and longitude 4° 34′ 0E and at an altitude of 941 feet. It has a tropical humid climate with a mean annual temperature of about 29°C and relative humidity of about 61 percent. Twenty West African Dwarf goats (initial weight 6.16 – 6.68kg) were randomly allotted into four experimental diets in a completely randomized design. The animals were given prophylactic treatments consisting of administration of antibiotics (Oxytetracycline), were dewormed with albendazole and also treated for ectoparasites with ivomectin. Four concentrate diets were compounded comprising 0, 20, 30 and 40% levels of inclusion of wheat offal-carried pineapple waste meal (WCPW) (Table 1). The diets were fed to WAD weaner goats as supplements to a basal ration of guinea grass (*Panicum maximum*). The goats were fed based on 3% of their body weights. On the last day of the experiment, two sets of blood

Table 1: Gross composition of the experimental diets.

Ingredients	0%WCPW	20%WCPW	30%WCPW	40%WCPW
Corn bran	40	30	10	-
WCPW	-	10	30	40
Palm kernel cake	53	53	53	53
Groundnut cake	4.5	4.5	4.5	4.5
Bone meal	1.5	1.5	1.5	1.5
Salt	0.5	0.5	0.5	0.5
Vitamin premix	0.5	0.5	0.5	0.5

0%WCPW: control (without wheat offal-carried pineapple waste)
20%WCPW: 20% inclusion of wheat offal-carried pineapple waste
30%WCPW: 30% inclusion of wheat offal-carried pineapple waste
40%WCPW: 40% inclusion of wheat offal-carried pineapple waste

samples were taken from the goats via jugular venipuncture using a 5 ml syringe. One ml blood sample was collected into labeled sterile bottles containing anticoagulant for determination of hematological parameters. Blood samples for serum analysis were collected into coagulant free bottles, allowed to coagulate at room temperature and centrifuged at 3000rpm for 10 minutes. The supernatant sera were then collected and stored in a freezer for subsequent biochemical analysis. The serum concentrations for creatinine, albumin and the liver enzymes such as alanine aminotransferase (ALT), aspartate aminotransferase (AST) and alkaline phosphatase (ALP) were determined using commercial laboratory kits (Randox Laboratories Ltd, U.K). The Red blood cell (RBC), white blood cell (WBC), hemoglobin concentration (Hb) and packed cell volume (PCV) were determined using the methods of [7]. Data were analyzed as completely randomized design using the General Linear Models procedure of [8] for analysis of variance (ANOVA) while differences between means were resolved by Duncan's multiple range tests. Statistical significance was established when probability was less than 5% level of significance.

Results

Proximate composition of the experimental diets is presented in Table 2. The dry matter and the organic matter contents of the experimental diets were relatively similar across the treatments while the crude protein of diets containing inclusion of WCPW was higher than the control diet (0%WCPW). There was significant difference ($p<0.05$) in the performance characteristic of the experimental goats (Table 3) wherein animals fed 20%WCPW had significantly higher ($p<0.05$) feed intake, feed efficiency and daily weight gain compared to animals fed other diets. There was significant different ($p<0.05$) in the hematological parameters of the experimental animals (Table 4). The PCV and Hb concentration value decreased significantly ($P<0.05$) as the inclusion level of WCPW increased in the diets from 20%WCPW, 30%WCPW and 40%WCPW. The RBC counts were significantly highest in animals fed 30%WCPW, followed by 20%WCPW, 0%WCPW and 40%WCPW diets. Also animal fed 30%WCPW diet had significantly highest WBC counts compared to animals fed 20%WCPW, 40%WCPW and 0%WCPW diets. The RBC, WBC, neutrophil and lymphocyte of the goats fed 30%WCPW and 20%WCPW were significantly higher ($p<0.05$) than animals fed other diets. There was no significant difference ($p>0.05$) among the means of monocyte and eosinophil of the experimental animal across the treatments. Table 5 shows the biochemical indices of WAD goats. The total protein, albumin and globulin contents of goats fed 40%WCPW were significantly higher ($p<0.05$) than other diets while there was no significant difference ($p>0.05$) in the AST, ALP and creatinine contents of the experimental goats across the treatments.

Table 2: The proximate composition of the experimental diets.

Parameter (%)	0%WCPW	20%WCPW	30%WCPW	40%WCPW
Dry matter	92.78	92.95	92.78	93.23
Organic matter	92.99	92.73	92.53	92.03
Crude protein	16.38	18.2	17.75	17.75
Crude fibre	10.77	9.12	9.62	8.44
Ether extract	11.87	9.59	10.05	9.88
Ash	7.01	7.27	7.47	7.97
Nitrogen free extract	46.75	45.77	47.89	46.19

0%WCPW: control (without wheat offal-carried pineapple waste)
20%WCPW: 20% inclusion of wheat offal-carried pineapple waste
30%WCPW: 30% inclusion of wheat offal-carried pineapple waste
40%WCPW: 40% inclusion of wheat offal-carried pineapple waste

Table 3: Performance characteristics of the experimental goats.

Parameters	0%WCPW	20%WCPW	30%WCPW	40%WCPW	SEM
Feed intake	421.55^{b}	462.43^{a}	402.49^{c}	399.90^{d}	0.66
Feed efficiency	9.66^{b}	9.90^{a}	8.60^{b}	8.82^{c}	0.05
Initial weight	6.68^{a}	6.61^{b}	6.43^{c}	6.18^{d}	0.02
Final weight	10.51^{b}	11.06^{b}	9.85^{c}	9.63^{d}	0.02
Live weight gain	8.59^{b}	8.83^{a}	8.15^{c}	7.92^{d}	0.08
Daily weight gain	39.21^{b}	45.54^{a}	35.00^{c}	35.24^{c}	0.1

0%WCPW: control (without wheat offal-carried pineapple waste)
20%WCPW: 20% inclusion of wheat offal-carried pineapple waste
30%WCPW: 30% inclusion of wheat offal-carried pineapple waste
40%WCPW: 40% inclusion of wheat offal-carried pineapple waste

Table 4: Hematological parameters of WAD goats fed WCPW.

Parameter	0%WCPW	20%WCPW	30%WCPW	40%WCPW	SEM
Packed Cell Volume (%)	32.00^{ab}	34.00^{a}	30.80^{b}	26.00^{c}	1.71
Hemoglobin (g/dl)	10.62^{ab}	11.78^{a}	10.12^{b}	8.64^{c}	0.59
RBC (10^{6}/ml)	10.20^{c}	10.83^{b}	12.16^{a}	9.61^{d}	0.34
WBC (10^{3}/ml)	8.08^{d}	14.26^{b}	19.66^{a}	13.27^{c}	0.83
Neutrophil (10^{3}/ml)	3.22^{c}	4.30^{b}	5.79^{a}	2.90^{c}	0.5
Lymphocyte (10^{3}/ml)	4.35^{c}	9.29^{b}	12.52^{a}	9.90^{b}	0.75
Monocyte (10^{3}/ml)	0.29	0.4	0.27	0.29	0.08
Eosinophil (10^{3}/ml)	0.75	0.77	0.7	0.68	0.07

^{abc} Means with different letters on the same row differ significantly
0%WCPW: control (without wheat offal-carried pineapple waste)
20%WCPW: 20% inclusion of wheat offal-carried pineapple waste
30%WCPW: 30% inclusion of wheat offal-carried pineapple waste
40%WCPW: 40% inclusion of wheat offal-carried pineapple waste

Table 5: Biochemical indices of WAD goats fed WCPW.

Parameter (mg/dl)	0%WCPW	20%WCPW	30%WCPW	40%WCPW	SEM
Total protein	6.49^{b}	6.03^{c}	6.93^{b}	7.47^{a}	0.25
Albumin	4.62^{a}	4.43^{a}	4.63^{a}	3.68^{b}	0.22
Globulin	1.88^{c}	1.60^{c}	2.30^{b}	3.79^{a}	0.31
AST	9.69	10.03	8.62	10.03	0.43
ALP	78.72	75.07	87.19	94.33	23.29
Creatinine	0.87	0.84	0.8	0.85	0.09

^{abc} Means with different letters on the same row differ significantly
AST: Aspartate aminotransferase
ALP: Alkaline phosphatase
0%WCPW: control (without wheat offal-carried pineapple waste)
20%WCPW: 20% inclusion of wheat offal-carried pineapple waste
30%WCPW: 30% inclusion of wheat offal-carried pineapple waste
40%WCPW: 40% inclusion of wheat offal-carried pineapple waste

Discussion

Crude protein content of the experimental diets fell within the crude protein requirement of 15-18% for growing lambs as reported by [9] which is more than the 8% minimum crude protein requirement for optimum rumen microbial activity [10]. The feed intakes of all animals fed experimental diets were in agreement with the values reported by [11]. The average daily weight gains range in this study were higher than that reported by [12] but similar to the results of studies by [13]. Blood is a good indicator the health status of an organism. It contains a myriad of metabolites and other constituents that provide a valuable medium for clinical investigation and nutritional status of animals. Hence, the importance of blood chemistry profiles in relation to nutrient intake has been reported [14]. The inclusion of 40%WCPW in the diets of the goats led to a significant decreased PCV, RBC and Hb values which indicated that high level of WCPW inclusion could lead to anaemia and hence reduce the oxygen carrying capacity of animal's body [15]. The inclusion of WCPW in the diets considerably increased the WBC, neutrophils and lymphocytes counts compared to the control diets. The principal function of phagocytes is to defend the body against the body invading microorganisms by ingesting and destroying them thus contributing to cellular inflammatory processes [16]. Hence the increased neurophils and lymphocytes counts reported led enhanced immunity of the animals. The observed increase in neutrophil proliferation in animals fed 30%WCPW might be related to the chemical composition of pineapple peels such as vitamin A, C and *bromelain*, whose effect were later countered causing a gradual suppressing effect in the animals fed 40%WCPW. This is agreed with [17] who reported that neutrophil proliferation in animals on low *Dennettia tripetala* and suppression in animals on high doses of the same compound. Therefore, WCPW has an immune-stimulatory activity which could be due to high content of vitamins, especially vitamins A and C and *bromelain* which are reputed to have immune-stimulatory activities [18]. Serum alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatise (ALP), albumin and total protein levels are known to be useful in assessing the functional integrity of the liver [19]. The albumin is the main constituent of total protein; the remaining fraction is globulin. Albumins levels are decreased in chronic liver disease such as cirrhosis. The decrease in the albumin value at 40%WCPW inclusion might be due to poor state of protein catabolism as a result of anti-nutritive factors present in higher quantity at this level [20]. There was no significant difference in the ALT and ALP values among the experimental animals. Therefore the inclusion of WCPW up to 40% did not interfere with the functional integrity of the liver. Creatinine measurement is used almost exclusively in the assessment of kidney function [21]. The level of serum creatinine on the experimental animals in this study showed no significant difference hence the inclusion of WCPW in the diets of WAD goats had no adverse effect on the kidney of the animals.

Conclusion

It could be concluded that inclusion of WCPW in diet up to 30% had no deleterious effect on blood parameters of the goats while care should be taken at higher inclusion level due to tendency to induce anaemia.

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