



EFFECTS OF REPLACING WHEAT OFFAL WITH SUN-DRIED CATTLE RUMEN CONTENTS ON HEMATOLOGY AND SERUM BIOCHEMISTRY OF WEANER RABBITS

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ABSTRACT

The study investigated the effects of replacing wheat offal with sun-dried cattle rumen contents (SDCRC) on the hematology and serum biochemistry of weaner rabbits. Forty-five weaner rabbits were randomly assigned to five treatments with varying levels of SDCRC (0%, 25%, 50%, 75%, and 100% replacement) in a Completely Randomize Design (CRD). The experiment lasted for eight weeks. Blood samples were collected and analyzed for hematological and biochemical parameters. Results showed no significant ($P>0.05$) effects of the treatment on hematological parameters (PCV, Hb, WBC, RBC, MCV, MCHC, platelets, and lymphocytes) except on Mean corpuscular haemoglobin (MCH). The result further revealed no significant ($P>0.05$) influence on serum biochemical parameters (total protein, glucose, albumin, urea and cholesterol) across all treatments. Based on the results obtained SDCRC can replace wheat offal up to 100% without significant adverse effects on most blood parameters, suggesting its potential as an alternative feed ingredient for weaner rabbits.

Keyword: Rabbit, Wheat Offal, Rumen Content, Hematology, Serum Biochemistry

INTRODUCTION

Rabbit production has gained significant importance in meeting the growing demand for animal protein, particularly in developing countries (Lukefahr, 2004). However, the economic viability of rabbit farming is heavily influenced by feed costs, which constitute up to 70% of total production expenses (Lebas *et al.*, 1997). This economic pressure has led to increased interest in identifying alternative feed ingredients that can reduce production costs without compromising animal health and performance (Makkar *et al.*, 2014). Wheat offal, a by-product of wheat processing, is commonly used as a fiber source in rabbit diets (De Blas and Mateos, 2010). However, its availability and cost can fluctuate due to competition with other livestock sectors and human food production (Oloruntola *et al.*, 2016). Consequently, researchers have been exploring unconventional feed ingredients as potential replacements for wheat offal in rabbit diets. Sun-dried cattle rumen contents (SDCRC) have emerged as a promising alternative feed ingredient. Rumen contents, typically considered waste from cattle slaughter, possess potential nutritional value for livestock (Adeniji and Rumak, 2017). The utilization of SDCRC in animal feed not only provides a cost-effective alternative to conventional feed ingredients but also contributes to waste reduction and environmental sustainability in the meat industry (Elghandour *et al.*, 2017). While previous studies have investigated various unconventional feed ingredients in rabbit diets (Ogunsipe *et al.*, 2014), the potential of SDCRC as a replacement for wheat offal has not been thoroughly explored, particularly regarding its effects on the hematological and biochemical parameters of weaner



rabbits. These parameters are crucial indicators of animal health and can provide insights into the physiological impact of dietary changes (Etim *et al.*, 2014).

The objective of this study was to evaluate the effects of replacing wheat offal with sun-dried cattle rumen contents at various inclusion levels (0%, 25%, 50%, 75%, and 100%) on the hematological and serum biochemical indices of weaner rabbits. By assessing these parameters, we aimed to determine the safety and potential of SDCRC as an alternative fiber source in rabbit diets. The findings of this study could have significant implications for rabbit nutrition management and contribute to more sustainable and economical rabbit production practices.

MATERIALS AND METHODS

Experimental Site

The experiment was conducted at Bauchi State College of Agriculture, Bauchi Rabbitry Unit, located at Yelwan Makaranta along Bauchi – Dass Road, Bauchi State

Collection and Processing of Cattle rumen contents

The rumen contents to be used in this research was cattle rumen contents. It was collected from Bauchi main abattoir immediately after the rumen has been incised. The cattle rumen contents were spread on plastic trays after the sunrise and were taken indoors after sunset. This was done for seven (7) days to ensure complete drying.

Experimental Diets, Animals and their Management

Forty five (45) weaner rabbits were used for the experiment which lasted for eight (8) weeks. The weaner rabbits were subjected to one-week acclimation whereby they were treated against internal and external parasites by subcutaneous injection of Ivermectin and broad-spectrum antibiotic. The experiment had five (5) treatments and three (3) replications with three (3) weaner rabbits per replication arranged in a Completely Randomized Design (CRD). The rabbits were placed on concentrate feed (grower's mash and groundnut haulms mixed together) for one week before assigning them to the experimental diets. Feed and water were provided *ad libitum*. Subsequently feed offered and left over was weighed and recorded on a daily basis.

Table 1: Composition of Experimental Diets Containing Sun-dried Cattle Rumen Contents (SDCRC) as a Replacement for Wheat Offal

Ingredients	Treatment				
	1(0%)	2(25%)	3(50%)	4(75%)	5(100%)
Maize	36.5	36.5	36.1	35.8	35.4
Soybean meal	10.8	10.8	11.2	11.5	11.9
Wheat offal	30.0	22.5	15.0	7.5	0
SDCRC	0	7.5	15.0	22.5	30.0
Bone meal	2	2	2	2	2
Groundnut haulms	20	20	20	20	20
Premix	0.25	0.25	0.25	0.25	0.25
Salt	0.25	0.25	0.25	0.25	0.25
Lysine	0.1	0.1	0.1	0.1	0.1
Methionine	0.1	0.1	0.1	0.1	0.1
Total	100	100	100	100	100
Calculated Analysis					
Crude Protein (%)	16.00	15.90	15.55	15.98	15.81
Crude Fibre (%)	9.46	11.17	14.64	14.66	16.43
Ether Extract (%)	3.49	3.47	3.47	3.46	3.46
Ash (%)	4.39	4.42	4.46	4.49	4.54
ME (Kcal/kg)	2209.95	2238.85	2261.55	2233.40	2314.60

SDCRC- Sun-dried Cattle Rumen Contents, **ME-** Metabolizable energy

Data Collection

Blood Parameters

At the end of each experiment, 2.5ml of blood was collected through the jugular vein, allowing free flow of blood into labeled sterile universal bottle and analysed for hematological, and serum biochemical parameters. Samples were screened for levels of RBC, PCV, MCV, MCH, MCHC, WBC, Total Proteins, Albumin, Globulin, Urea, Glucose and Cholesterol, as accordance with methods outlined by Bush (1991) and Baker and Silverston (1985).

Data Analysis

All data collected were subjected to Analysis of Variance (ANOVA) using the SPSS statistical package (2015), where significant difference among treatments occur, Duncan's Multiple Range Test (DMRT) was used to separate them.

RESULTS AND DISCUSSION

Hematological Parameters

The result of hematological indices as presented in Table 2 revealed no significant ($P>0.05$) difference among the treatments for most parameters, including PCV, hemoglobin, WBC, RBC, MCV, MCHC, neutrophils, and platelets. These values fell within the normal range for healthy rabbits (Amaza, *et al.*, 2020), indicating that SDCRC did not negatively impact the rabbits' health status. This is in agreement with the findings by Adeniji and Lawal (2012), who reported no adverse effects on hematological parameters when using unconventional feed ingredients in rabbit diets. However, a significant difference ($P<0.05$) was observed in the Mean Corpuscular Hemoglobin (MCH) values across treatments. The 75% SDCRC replacement group (T4) showed the highest MCH value (24.40 pg), while the 50% replacement group (T3) had the lowest (22.27 pg). Despite these differences, all MCH values remained within the normal range (18.55-25.52 pg) (Amaza, *et al.*, 2020), suggesting that the

variations may not be clinically significant. This aligns with observations by Oloruntola *et al.* (2016), who noted that dietary variations can cause minor fluctuations in MCH without compromising overall health.

Table 2: Hematological Indices of Weaner Rabbits Fed Sun-Dried Cattle Rumen Contents (SDCRC) as Dietary Source of Fibre

Parameters	Treatment					SEM	Normal range
	T1	T2	T3	T4	T5		
PCV	33.17	35.35	85.27	33.10	33.60	2.44	30-50
Haemoglobin (g/dl)	11.43	11.85	11.73	11.65	11.25	0.85	8.0 – 15
WBC ($\times 10^9/l$)	8.67	7.65	7.53	4.10	3.9	2.66	2.50 – 12.5
RBC ($\times 10^9/l$)	5.06	5.24	5.27	4.81	4.87	0.45	4.0 – 8.0
MCV (fl)	65.73	67.55	66.93	69.20	69.05	2.75	58 – 95
MCH (pg)	22.63 ^{ab}	22.65 ^{ab}	22.27 ^b	24.40 ^a	23.15 ^{ab}	0.79	18.55-25.52
MCHC (g/dl)	34.53	33.50	33.30	35.20	33.55	0.75	27 – 37
Neutrophil (%)	74.37	74.40	71.90	78.15	79.90	5.80	40-80
Platelets ($\times 10^9/dl$)	347.00	294.00	449.00	262.00	157.00	178.84	201-716

^{ab}-Means bearing different superscript within a row are significantly different ($P < 0.05$) NS= NOT significant ($p > 0.05$), **PCV**-Packed cell volume, **WBC**- White blood cell, **RBC**-Red blood cell, **MCV**-Means corpuscular volume, **MCH**-Mean corpuscular haemoglobin **MCHC**-Mean corpuscular haemoglobin Concentration

Normal range: Amaza, *et al.*, 2020

Serum Biochemical Parameters

Table 3 presented result on Serum biochemical indices. The result showed no significant ($P > 0.05$) difference among treatments for glucose, total protein, albumin, urea, and cholesterol. All values were within the normal ranges for healthy rabbits (Amaza, *et al.*, 2020), indicating that SDCRC replacement did not adversely affect the rabbits' metabolic functions. This corroborates the findings of Alagbe *et al.* (2020), who reported similar results when using alternative fiber sources diets. The consistency in glucose levels across treatments suggests that SDCRC did not impair energy metabolism. The stable total protein and albumin levels indicate that protein synthesis and utilization were not negatively affected by SDCRC inclusion, which is crucial for maintaining growth and health in weaner rabbits (De Blas and Wiseman 2010). The lack of significant differences in urea and cholesterol levels further supports the conclusion that SDCRC can replace wheat offal without compromising the rabbits' metabolic health.

Table 3: Biochemical Indices of Weaner Rabbits Fed Sun-Dried Cattle Rumen Contents (SDCRC) as Dietary Source of Fibre

Parameters	Treatment					SEM	Normal range
	1	2	3	4	5		
Glucose (mmol/l)	6.90	6.95	6.55	7.75	3.75	2.36NS	3.9-16.5
Total protein (g/dl)	6.45	5.75	5.35	5.30	5.90	1.28NS	5-7.5
Albumin (g/dl)	1.60	2.40	1.50	1.65	3.05	1.73NS	2.5-4
Urea (mmol/l)	7.80	7.60	7.40	7.50	6.75	1.15NS	1.1-2.5
Cholesterol (mmol/l)	3.79	5.16	2.71	3.57	3.60	3.21NS	1.4-5.44

NS- NOT significantly ($p > 0.05$)

Normal range: Amaza, *et al.*, 2020



CONCLUSION AND RECOMMENDATION

This study demonstrates that sun-dried cattle rumen contents (SDCRC) can effectively replace wheat offal in weaner rabbit diets up to 100% without significant adverse effects on hematological and serum biochemical parameters. The consistent results across treatments suggest that SDCRC is a viable alternative feed ingredient that maintains the health status of weaner rabbits, as indicated by normal blood values and is recommended for weaner rabbits in the study area.

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