

Hematological Parameters and Serum Biochemical Indices of Weaner Rabbits Fed Diets with Threshed Rice Head Supplemented with and without Enzyme as Replacement for Maize

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ABSTRACT

The study was conducted to investigate the effect of replacing maize with threshed rice head (TRH) supplemented with and without enzyme on the hematological parameters and serum biochemical indices of weaner rabbits. Fifty four rabbits were randomly allotted to six dietary treatments of three replicates. There were three rabbits per replicate in a 2×3 factorial arrangement in a completely randomized design. There were three inclusion levels (0, 7.5 and 15%) supplemented with and without enzyme in the diets. Replacing threshed rice head for maize showed no significant ($P < 0.05$) effect on the hemoglobin concentration (14.55-15.32 g/dl) and percentage red blood cell (7.59-7.65%) of the animals but had significant influence ($P < 0.05$) on the packed cell volume (44.75-47.35%), white blood cell ($8.29-8.66 \times 10^3/\text{mm}^3$), neutrophils ($35.17-41.10 \times 10^6/\text{mm}^3$) and lymphocytes (44.64-55.60%) while enzyme supplementation only had significant effect ($P < 0.05$) on white blood cell ($8.24-8.73 \times 10^3/\text{mm}^3$) and neutrophils ($36.61-38.83 \times 10^6/\text{mm}^3$). The values for all blood profile parameters fell within the normal ranges for healthy rabbits. The replacement of maize with threshed rice head in the diet of weaner rabbit appeared not to compromise the health status of the animals.

Keywords: Rabbit, Hematology, Threshed rice head, Serum, Neutrophils

INTRODUCTION

An animal's physiology is affected by several factors, one of which is nutrition. The nutritional status of an animal is dependent on so many factors which include; the effectiveness of metabolic processes and dietary intake. According to Etim and Oguike [1], proper nutrition and inclusion of feed ingredients at required levels are some of the important ways to increase meat production in Nigeria. Due to the competitiveness between humans, animals and industries, the high cost of maize has resulted to high cost of livestock production. This situation has compelled animal science researchers to gear researches into the use of alternative feed sources to reduce cost of animal protein. One of such alternative energy sources is threshed rice head. For improvement of threshed rice head utilization in rabbit diet, exogenous enzymes have been put into consideration. Since blood profile parameters are good indicators of nutrient adequacy, this study therefore seeks to investigate the effect of threshed rice head based diet on the blood profile of the experimental animals.

MATERIALS AND METHODS

Experimental animals, design and management

54 healthy five weeks old weaner rabbits were used in this experiment. They were randomly selected and allotted to six experimental diets in a 2×3 factorial arrangement in a completely randomized design. There were three replicates per treatment and each replicate had three rabbits, comprising of nine animals per treatment. The rabbits were housed in wire meshed hutches. The cage was raised above the ground in a well-ventilated pen. Feed and water were supplied *ad libitum*.

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Sources and processing of threshed rice head (TRH)

Threshed rice heads were collected from rice farms in Gwagwalada, Abuja. The threshed rice head were crushed in a feed mill after drying and sample was taken to the laboratory for proximate analysis before inclusion into the diets.

Experimental diets

Six experimental diets were formulated with the threshed rice head (TRH) with and without enzyme supplementation at different levels of replacement. Diets 1, 3 and 5 contained 0, 7.5 and 15% TRH without enzyme while diets 2, 4 and 6 contained 0, 7.5 and 15% TRH with enzyme supplementation. Maxi grain enzyme was used for this study.

Blood evaluation

At the end of the feeding trial, 2 ml of blood was collected from one rabbit per replicate (three rabbit per treatment) into sterile tubes containing ethylene di-amine tetra acetic acid (EDTA) as anticoagulant for hematological assay. Hematological indices measured include; packed cell volume, hemoglobin concentration, red blood cell, white blood cell, neutrophils and lymphocytes. 2 ml of blood was also collected into properly labeled sterilized tubes without anticoagulant for serum analyses. Indices measured included; total protein, albumin, globulin, total cholesterol, creatinine and blood glucose.

Data analysis

Data collected were subjected to statistical analysis using general linear model according to SAS [2]. Significant differences were separated using Duncan's multiple range tests [3].

RESULTS AND DISCUSSION

Blood profiles have been used to ascertain the health status of farm animals especially when these animals are subjected to dietary treatments that could be detrimental to their growth and development. Aro et al. [4] identified hematological and serum parameters as useful criteria to monitor and assess feed toxicity and feed quality. **Table 1** presents the hematological parameters of rabbits fed diets containing threshed rice head with and without enzyme supplementation as partial replacement for maize. The values obtained for hemoglobin concentration and also values obtained for percentage red blood cell across all levels of threshed rice head replacement were within the normal ranges of 9.3-19.3 g/dl and 4.00-8.60%, respectively as indicated by Mitruka and Rawnsley [5]. These values obtained were similar to those reported by Alade et al. [6]. Normal hemoglobin values indicate normal physiological relationship between hemoglobin and oxygen in the transport of gasses around body tissues [7]. There was an increase in the white blood cell of the animals as the crude

fibre level in the feed increased. These values (8.30%-8.66%) obtained for white blood cell were similar to those (6.05-9.30%) reported by Egbunike [8] for rabbits fed neem leaf meal. However, the values were within the range ($5.50-12.5 \times 10^3/\text{mm}^3$) for normal rabbit by Mitruka and Rawnsley [5]. Normal white blood cell values indicate that the diet may have provided adequate level of immunity in the animal. There was also an observable increase in packed cell volume (PCV) with increase in the levels of threshed rice head in the feed; although, these values were also within the normal ranges of 30-35% for healthy rabbits. According to Oyawoye and Ogunkunle [9], normal PCV values suggest the absence of toxic factors such as hemagglutinin which could have adverse effect on blood formation. The hematological parameters reported for threshed rice head replacement in this study are however comparable with the ranges for rabbits reported by Latimer et al. [10], Ahamefule et al. [11] and Ibrahim et al. [12]. The hematological results also shows that enzyme supplementation had no significant effect on hemoglobin concentration, packed cell volume, percentage lymphocyte and percentage red blood cell. These parameters had comparable values both in animals fed diets with enzyme supplementation and also in animals fed diets without enzyme supplementation.

The result for serum biochemical indices presented in **Table 2** shows no significant differences ($P>0.05$) in creatinine, glucose, total protein, albumin and globulin among all the experimental treatments but there were significant differences ($P>0.05$) in total cholesterol. According to Agbede et al. [13], increase in enzyme activities in the serum may lead to problems in the cell population from which endogenous enzymes are derived. The total protein values (5.70-6.25 mg/dl) in this study were within the normal ranges 5.81-6.75 g/dl reported by Tewe [14]. The normal values for total protein, globulin and albumin recorded in this study indicate nutritional adequacy of the dietary proteins for the experimental animals. The serum creatinine levels (67.30-73.30 mmol/l) which were within the normal ranges of 0.50-2.65 mg/dl as submitted by Mitruka and Rawnsley [5] suggest that the animals were not utilizing their body reserves and their muscular tissues were not also wasted. Values for blood glucose levels were also similar across all levels of threshed rice head replacement. Some researchers reported that glucose is very important as a source of energy especially for erythrocytes and the nervous system of the animal. Njidda et al. [7] concluded that normal ranges of blood glucose as observed in this study indicate that the animals were not surviving at the expense of their body tissues. The observed normal range values for serum indices after enzyme supplementation in this study could be attributed to the efficacy of the enzyme in enhancing overall feed utilization by causing the degradation of the fibre components of the threshed rice head based diet into soluble metabolizable energy.

Table 1. Hematological parameters of weaner rabbits fed diets containing graded levels of threshed rice head with and without enzyme supplementation as partial replacement for maize.

	Hemoglobin con. (g/dl)	Packed cell vol. (%)	Red blood cell (%)	White blood cell ($\times 10^3/\text{mm}^3$)	Neutrophils ($\times 10^6/\text{mm}^3$)	Lymphocyte (%)
TRH Levels						
0%	14.87 ^a	44.75 ^c	7.62 ^a	8.50 ^a	41.10 ^a	44.64 ^c
7.5%	14.55 ^a	45.68 ^b	7.65 ^a	8.29 ^b	36.90 ^b	49.63 ^b
15%	15.32 ^a	47.37 ^a	7.59 ^a	8.66 ^a	35.17 ^c	55.60 ^a
SEM	0.7	0.4	1.2	0.2	0.07	1.8
LOS	NS	*	NS	*	*	*
Enzyme Levels						
No enzyme	14.82 ^a	45.55 ^a	7.43 ^a	8.24 ^b	36.61 ^b	50.83 ^a
Enzyme	15.01 ^a	46.51 ^a	7.81 ^a	8.73 ^a	38.83 ^a	49.09 ^a
SEM	0.5	1.3	0.6	0.1	0.5	1.8
LOS	NS	NS	NS	*	*	NS

^{a, b, c}: means with different superscripts within the same column differ significantly ($P < 0.05$)

TRH: Threshed Rice Head; SEM: Standard Error of Means; LOS: Level of Significance; NS: Not Significant

*: significant

Table 2. Serum biochemical indices of weaner rabbits fed diets containing graded levels of threshed rice head with and without enzyme supplementation as partial replacement for maize.

	Creatinine (mmol/l)	Glucose (mmol/l)	Cholesterol (%)	Total Protein (mg/dl)	Albumin (g/dl)	Globulin (g/dl)
TRH Levels						
0%	67.53	4.80	38.80 ^a	5.85 ^a	3.45 ^a	2.25 ^a
7.5%	67.30	4.72	35.46 ^b	6.25 ^a	3.95 ^a	2.60 ^a
15%	73.30	4.32	32.22 ^c	5.70 ^a	3.70 ^a	2.46 ^a
SEM	7.37	1.08	2.3	1.1	0.8	0.6
LOS	NS	NS	*	NS	NS	NS
Enzyme Levels						
No enzyme	66.20	4.84	36.61 ^a	5.86 ^a	3.53 ^a	2.40 ^a
Enzyme	63.51	4.82	34.37 ^b	6.00 ^a	3.86 ^a	2.47 ^a
SEM	5.3	0.56	1.8	0.9	0.6	0.4
LOS	NS	NS	*	NS	NS	NS

^{a, b, c}: means with different superscripts within the same column differ significantly ($P < 0.05$)

TRH: Threshed Rice Head; SEM: Standard Error of Means; LOS: Level of Significance; NS: Not Significant

*: significant

CONCLUSION

Since the hematological and serum biochemical indices of the rabbits in this study falls within the normal literature values for healthy rabbits as submitted by Mitruka and Rawnsley [5], it can therefore be concluded that up to 15% replacement level of threshed rice head for maize can be tolerated by rabbits without a deleterious effect on their health status.

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