

# Haematology and Serum Biochemical Characteristics of California White Rabbits Fed Varying Levels of Dietary Protein

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**Abstract:** A ninety-day feeding trial involving thirty (30) California white breed weaner rabbits was conducted to assess the haematology and serum biochemical profile of the rabbits fed varying levels of dietary protein (DP). The ages of rabbits ranged from 6-8 weeks with an average initial body weight of  $1\text{kg}\pm 4$ . Rabbits were randomly assigned to three dietary protein (DP) treatments; 13%, 18% and 14% (control diet) in a completely randomized design. The rabbits were served experimental diets daily while clean drinking water was provided *ad-libitum*. Standard management practices were strictly adhered to. Blood samples were collected fortnightly through ear vein of the individual rabbits (2mls each) for haematology and serum biochemical assay. Results from haematology and serum biochemical profile indicates that red blood cell and pack cell volume differed significantly ( $p<0.05$ ) between treatment groups of 13% DP and 18% DP compared to the control group. The results therefore, suggest that protein level in the diet of rabbits at 18% supports high synthesis of both red blood cell and pack cell volume. Similarly, increase in total protein level noticed with rabbits fed 18% dietary protein, confirms the availability of protein in the diet. The cholesterol level of rabbits fed 13% dietary protein as significantly ( $p<0.05$ ) higher than those on 18%, DP. In conclusion, diets formulated at 13% and 18% crude protein levels had no effect on the assessed haematological and serum biochemical parameters, and obtained values were within normal documented ranges, that supports the normal physiological status of California white rabbits or its crosses.

**Key words:** Haematological parameter, Serum biochemical indices, California white, dietary protein.

## I. INTRODUCTION

Commercial rabbit production has been on the increase in recent years. The observed increase have been attributed to the characteristics possessed by rabbits which include; high fecundity, rapid growth rate, small body size and high meat yield. Rabbits can convert 20% of ingested protein as against 17% and 10% for pigs and cattle respectively. (cite a reference) . The rapid increase in the world population and Nigeria in particular has aggravated the growing demand for animal protein. Poultry production which was seen as the quickest way to bridge animal protein gap is characterized by high cost of production due to high feed cost that accounts for over 80-90% of the total cost of production (Ojebeyi et al., 2006). Nutritionally, rabbit meat is high in protein (20-21%),

low in fat (10-11%), low in calories (1479kcal/kg) when compared to meat from most livestock species (USDA, 1973). Rabbits have been found to give high performance when fed with concentrate feeds (Obinne & Mmereole, 2002). Haematology and serum biochemical assay of livestock suggests the physiological disposition of animals to their nutrition. According to Esonu et al. (2001) haematological constituent reflects the physiological responsiveness of the animal to its internal and external environments which includes feed and feeding. Scientist have sort to find the effects of various feed ingredients and feed on haematology and serum biochemistry of livestock and concluded that feed ingredients of different sources as well as their levels of inclusion in diets influence the physiology of animals. Hence, the importance of this study. New Zealand rabbits are widely used in laboratory studies because of their high fertility, availability, feeding and housing features (Jurcik et al., 2007). The study is therefore, designed to assess the effect of different dietary protein levels on the haematology and serum biochemical parameters of California white rabbits at 88% purity.

## II. MATERIALS AND METHODS

The experimental site was the Nigeria Police Mounted Training Centre, Bukuru, Jos South Local Government Area of Plateau State. with co-ordinates;  $09^{\circ} 48' \text{N } 08^{\circ} 52' \text{E}$  and (4,035ft) above sea level. (Daniel, 2002). Thirty hybrid weaner rabbits of California white rabbit's origin of 6-8 weeks old were purchased from National Veterinary Research Institute (NVRI) VOM. Rabbits were of equal sex ratio, with an average initial weight of  $1\text{kg}\pm 4$ .

Prior to the commencement of the experiment, rabbits were, acclimatized for two weeks and during the acclimatization period, all necessary routine veterinary practices were carried out.

Rabbits were randomized into individual cages measuring 50 x 30 x 40 cm and well ventilated structure for protection against predators. Each experimental cage was fitted with drinker, feeder and aluminum tray for collection of faeces and urine. Rabbits were randomly assigned to three dietary

treatment groups of ten rabbits per treatment in a completely randomized layout.

### 2.1 Experimental Diets

The control diet used for the study was the conventional commercial grower's mash of vital feed. Other test diets for

the experiment were formulated at 13% and 18% crude protein levels. Ingredients used were sourced in bulk from a reputable feedmill. . Percentage composition of experimental diets is presented in Table (1).

Table 1: Ingredient Composition of Experiment Diets (g /100g diet)

Ingredient	13% *DP	18% DP	Control Diet
Maize	58.3	44.46	Crude Protein 14%
G/cake	12.45	26.29	Crude fat 8.00%
Brewer dried Grain	8.00	8.00	Crude fibre 15.00%
Bone Meal	3.00	3.00	Calcium 1.00%
W/heat offal	17.00	17.00	Phosphorus 0.35%
Vitamin Premier	0.25	0.25	Amino Acid
Methionine	0.25	0.25	Salt
Lysine	0.25	0.25	Anti-Oxidant Probiotic
Common salt	0.50	0.50	Enzymes
Total	100.00	100.00	M.E/kcal 2600 kcal/kg
<b>Calculated Values</b>			
Crude Protein	15.292	20.274	
Crude fibre	5.023	5.175	
Ether extract	6.619	7.339	
Ash	3.527	4.108	
Me/kcal	2741.11	2625.28	
<b>Analysed Values</b>			
Dry matter	91.3	92.5	91.3
Crude Protein	13.13	15.77	14.8
Crude fibre	10.95	6.70	9.30
Ether extract	7.25	15.05	8.35
Ash	6.85	6.15	8.50
NFE	62.22	56.33	50.35
Me/kcal	2600	2685	2500

#### DP = Dietary Protein

Blood samples were collected between the hours of 7:00- 8:00 am. The blood samples were obtained through marginal ear vein puncture using zylene to expose their ear veins. Blood samples were drawn into bottles using a 2mls gauge sterile needle. Samples were collected from each of the experimental rabbits into two sets of well labeled bottles. One set of the bottle containing anti-coagulant (EDTA) for hematological analysis while samples for serum biochemistry were collected into sterile tubes without anti-coagulant (EDTA), using the procedure of Bitto and Gemade (2001). All the parameters were automatically analyzed using BC (2800) haematology analyzer at the National Veterinary Research Institute (NVRI) Vom.

### 2.2 Statistical analysis

Data obtained were subjected to one-way analysis of variance (ANOVA) using SPSS (2015) and mean separation using LSD at  $\alpha$  level of 0.05 was considered significant .

## III. RESULTS AND DISCUSSION

Hematology and Serum Biochemical parameters of rabbits are presented in tables 2 and 3. White blood cells and its indices did not differ significantly ( $P > 0.05$ ) between treatment groups except neutrophil and lymphocyte that differ significantly ( $P < 0.05$ ) compared to the control. Pack cell Volume and mean corpuscular volume did not differ significantly ( $P > 0.05$ ) between treatment groups compared to the control.

Haematological components for red blood cell indices measured from the study were within the normal physiological range; Red blood cell ( $3.8 - 7.9 \times 10^6/\text{mm}^3$ ) haemoglobin concentration ( $8.0 - 17.5\text{g}/\text{dl}^{-1}$ ) ? Pack cell Volume (30-50%) reported for healthy rabbits according to (Jenkins, 1993; Hilliyer, 1994; Medi rabbit, 2007; Nuhu, 2010). The results from the study indicate that the dietary treatment were good and supported the synthesis of red blood

cells. The mean Corpuscular constants; MCV, MCH and MCHC obtained from the study were within the normal range for healthy rabbits as reported by ( ; Jenkins, 1993; Hilliyer, 1994; Jurcik et al., 2007; Medi , 2007; Nuhu, 2010).

Values obtained from current study for white blood cell indices; white blood cell, Neutrophil, lymphocyte, and monocytes were within the normal physiological range of (5.0-12.0 x 10<sup>9</sup>/dl), (30-55%), (25-50%) and (0-12%), respectively (Jenkins 1993; Hilliyer, 1994; Medi rabbits, 2007; Nuhu, 2010). Non- significant variation observed in WBC of rabbits fed 13% and 18% crude protein diets suggest that diets with higher crude protein levels supported the synthesis of white blood cells. Hence, build the immunity

of rabbits against infections. Feeding increasing crude protein levels had no significant effect (p>0.05) on the selected biochemical parameters assessed. . However, total protein and cholesterol differed significantly (P< 0.05) between treatment groups when compared to the control. Across the dietary treatments, values for Total Protein , albumin , globulin ), albumin/globulin ratio total cholesterol triglyceride and high density lipoprotein were within the normal physiological range as documented ( ; Jenkins 1993; Hilliyer, 1994; Vrecko et. al., 1998; Medi , 2007; Nuhu, 2010). The result from the study indicates that the nutrient compositions of the different treatment diets were balanced and supported the normal performance of the animals.

Table 2.Haematological Parameters of rabbits fed experimental diets

PARAMETERS	Control diet	13% *CP	18% *CP
WBC/ x10 <sup>9</sup> /l	8.92 ± 0.25	8.55 ± 0.38	8.69 ± 0.34
Neutrophil (%)	37.30 ± 1.79 <sup>b</sup>	45.32 ± 1.99 <sup>a</sup>	44.09 ± 1.63 <sup>a</sup>
Lymphocyte (%)	51.83 ± 1.91 <sup>a</sup>	41.77 ± 2.16 <sup>b</sup>	45.00 ± 1.31 <sup>b</sup>
Monocytes (%)	11.04 ± 0.54	12.09 ± 0.62	10.91 ± 0.75
HB (g/dl)	10.41 ± 0.20	10.39 ± 0.21	10.24 ± 0.26
RBC (x10 <sup>12</sup> /l)	5.58 ± 0.12 <sup>a</sup>	5.36 ± 0.11 <sup>b</sup>	5.63 ± 0.14 <sup>a</sup>
PCV (%)	30.04 ± 0.07 <sup>b</sup>	32.60 ± 0.64 <sup>b</sup>	44.57 ± 6.48 <sup>a</sup>
MVC (fl)	52.35 ± 0.35 <sup>a</sup>	51.00 ± 0.60 <sup>b</sup>	51.91 ± 0.30 <sup>ab</sup>
MCH (pg)	17.14 ± 0.16	16.50 ± 0.23	17.18 ± 0.22
MCHC (g/dl)	31.13 ± 2.98	32.00 ± 1.54	33.68 ± 2.85
Platelets	280.04 ± 21.16	274.55 ± 15.53	272.86 ± 19.79

<sup>abd</sup>Means in a row with same superscript do not differ (P>0.05)

\*CP- crude protein

Table 3. Selected Serum biochemical parameters of California white Rabbits fed experimental diets

Parameters	Control Diet	13% *CP	18% *CP
Total Protein	70.26 ± 1.04 <sup>ab</sup>	68.16 ± 1.21 <sup>b</sup>	71.21 ± 1.02 <sup>a</sup>
Albumin	28.08 ± 0.58	21.11 ± 0.58	27.51 ± 0.44
Globulin	41.83 ± 1.32	40.23 ± 1.55	43.37 ± 1.19
Alb/glo ratio	0.7 ± 0.03	0.74 ± 0.04	0.67 ± 0.03
Total cholesterol	40.82 ± 2.26 <sup>a</sup>	40.14 ± 2.49 <sup>a</sup>	34.29 ± 1.29 <sup>b</sup>
Triglyceride	70.95 ± 3.20 <sup>a</sup>	65.38 ± 2.89 <sup>b</sup>	60.37 ± 3.78 <sup>b</sup>
HDL	52.00 ± 1.93	47.28 ± 1.87	50.73 ± 2.38
LDL	34.36 ± 2.46	34.74 ± 2.50	30.22 ± 1.24

<sup>ab</sup>Means in a row with the same superscript not significantly different (P>0.05)

#### IV. CONCLUSION

From the findings of this study, diets formulated at 13% and 18% crude protein levels had no effect on the assessed haematological and serum biochemical parameters, and obtained values were within normal documented ranges, that

supports the normal physiological status of California white rabbits or its crosses.

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