

Haematological and serum biochemical response of rabbit to varying inclusion levels of clove (*Syzygium aromaticum*)

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Target Audience: Rabbit Farmers, Animal Scientists and feed millers

Abstract

Cloves come from a group of aromatic plants that are used widely due to its positive effect on growth and health of rabbits probably as a result of their immune stimulatory properties. An experiment was conducted on twelve rabbits of 5 months of age. The experiment was carried out at the rabbitary unit of Animal Production Technology at The Oke-Ogun Polytechnic Saki (TOPS). The animals were fed diets containing clove powder to determine the effect on the biochemical response of the rabbits. The twelve rabbits were divided into three treatments with four replicates in a completely randomized design. Dietary levels of 0.0g, 0.5g and 1.0g of clove powder were given orally to the rabbits, the experiment lasted for 8 weeks. Blood samples were collected from the lateral saphenous vein at the end of the experiment to evaluate haematological and biochemical parameters. Data collected on haematological and biochemical parameters were subjected to one way analysis of variance. Haematological parameters evaluated were: Packed Cell Volume, Red Blood Cell, White Blood Cell and Haemoglobin Count while biochemical parameters evaluated were: Total protein, Globulin, Aspartate aminotransferase, Alanine aminotransferase, Blood urea nitrogen, Creatinine and trimethylglycine shows significant ($P < 0.05$) difference while parameters such as Albumin, Alkaline phosphatase, Cholesterol, high density lipoprotein, Low density lipoprotein and Albumin: Globulin shows no significant difference. It was concluded that up to 1.0g of clove can be included in rabbit's diet without any detrimental effect on their health status.

Key words: Albumin, blood urea nitrogen, aspartate aminotransferase, high density lipoprotein, cholesterol

Description of Problem

The rabbit (*Oryctolagus Cuniculus*) is a non-ruminant herbivore which utilizes much cellulose, unabsorbed feed materials, primarily cellulose as a source of nutrient for maintenance and production. They are known to have the ability to thrive on non-conventional feed stuffs and forages which cannot be consumed directly by man (1).

Such forage is cheap, abundant and available all the year round in many parts of Nigeria (2, 3). Although rabbit can survive on all forage diets, optimum performance can only be ensured in a mixed feeding regime involving forage and formulated feed (4). The profitability of rabbit production as an enterprise depends on the number of rabbits kindled per doe per year and postnatal

survival of the kittens. Cloves comes from a group of aromatic plants that are used widely due to its positive effect on growth and health of rabbits probably as a result of their immune stimulatory properties (5, 6). Cloves *Syzygium aromaticum* are considered one of the most versatile spices. They contain a large number of biologically active compounds such as eugenol, eugenol acetate, and β -caryophyllene (7). Eugenol is the most biologically active compound in cloves and makes up 70 - 80% of clove oil (8). Many studies have evaluated the effects of clove powder (CLP) on performance, immune response, blood parameters and lymphoid organs of different farm animals (9, 10). Biochemical indices are helpful tools in animal production, they are used in determining health status, metabolic diseases, nutritional deficiencies and welfare of animal (11). Incidence of disease and malnutrition are diagnosed from the normal reference value of various serum biochemical indices. Haematological parameters are used in routine screening for health and physiological status of livestock. This study intends to evaluate the effect of clove on health and physiological status of rabbits.

Materials and Methods

Experimental site: The study was carried out at the rabbitary unit of Animal Production Technology Department, Oke-Ogun Polytechnic, Saki, Oyo state, Nigeria.

Experimental Animal: Twelve mature 5 months rabbit bucks were procured from a reputable farm in Oyo state, Nigeria. The

PCV value observed from this study ranged between 34.50 and 41.16% the reported normal range for PCV in rabbit is 33 – 50% (14), the result suggests that, the experimental animals were not anemic. (15)

rabbits were acclimatized for two weeks before the commencement of the experiment.

Experimental Material/Ingredient: Clove *S. aromaticum* was obtained from Sango market in Saki and ground into a fine powder. 0.0g, 0.5g and 1.0 g was administered to the rabbits orally for 8 weeks before daily feeding. The experiment lasted for 8 weeks.

Experimental Design: Complete randomized design was employed. The rabbits were randomly assigned into three treatments of 4 replicates per treatment. Forage and water were supplied to the rabbits *ad-libitum*.

Data Collection: After the 8th week of the experiment, blood for serum biochemistry were collected from lateral saphenous vein into plain bottle for further laboratory analysis using standard procedure as described by (12) to determine different parameters such as Total protein, Cholesterol, Alkaline phosphatase (ALP), Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Creatinine, Albumin, Globulin, Blood urea nitrogen etc. Blood samples for haematology was collected into EDTA bottle (ethylene diamine tetra-acetate, an anticoagulant) for laboratory analysis. PCV (packed cell volume), RBC (Red blood cell), WBC (white blood cell) and haemoglobin were evaluated.

Statistical Analysis: All data collected were analyzed using one-way analysis of variance (ANOVA) technique using SAS (13) and means were separated with Duncan Multiple range of the same software.

Results and discussion

reported a normal PCV range of 31 – 50%. Result from table 1 shows that red blood cell of the experimental animals is not negatively affected because of the observed (5.39 – 6.67 x 10⁶) value falls within the normal range for

rabbits $3.8 - 7.9 \times 10^6$ (15). RBC is involved in transportation of oxygen within the body. WBC showed no significant difference ($P > 0.05$) the value for this work falls within the normal range for rabbit $5 - 13 \times 10^9$ (14). WBC indicated that the animals were healthy because decrease in number of WBC below the normal range is an indication of allergy. The result from table1 shows that haemoglobin shows significant difference ($P < 0.05$) among the treatment (11.15 -

13.35g/dl), the values from this work falls within the normal range for rabbits 9.4 - 17.4 (15). Haemoglobin is the iron containing protein in the blood of many animals. It releases the oxygen to permit aerobic respiration to provide energy to power the functions of an organism in the process called metabolism. Haemoglobin value (11.15 - 13.35g/dl) indicated that the vital physiological function is not corrupted.

Table 1: Effect of varying levels of clove (*syzygium aromaticum*) on haematological parameters of rabbit

| Parameters | 0.0g | 0.5g | 1.0g | SEM | Range |
|----------------------------|---------------------|--------------------|--------------------|--------|------------------------|
| PCV (%) | 37.00 ^{ab} | 34.50 ^b | 41.16 ^a | 2.82 | 33-50 |
| RBC ($10^6/\mu\text{L}$) | 6.00 ^{ab} | 5.39 ^b | 6.67 ^a | 0.52 | 38 - 7.9×10^6 |
| WBC ($10^6/\mu\text{L}$) | 3975.0 | 3516.7 | 3791.7 | 367.09 | 5 - 13×10^9 |
| Haemoglobin (g/dl) | 12.06 ^{ab} | 11.15 ^b | 13.35 ^a | 0.92 | 9.4-17.4 |

a,b,c,d mean having different superscript letters in the same row differ significantly ($p < 0.05$)
 PCV: Packed Cell Volume, HB; Hemoglobin, RBC; Red Blood Cell, WBC; White Blood Cell

Table 2: Effect of varying levels of clove on rabbit biochemical parameters

| PARAMETERS | 0.00g | 0.50g | 1.00g | SEM | RANGE |
|--------------|---------------------|--------------------|--------------------|------|----------|
| T/P(g/dl) | 6.70 ^{ab} | 6.45 ^b | 7.20 ^a | 0.28 | 50-75 |
| ALB(g/dl) | 2.63 | 2.73 | 3.01 | 0.17 | 25-40 |
| GLO(g/dl) | 4.06 ^{ab} | 3.71 ^b | 4.33 ^a | 0.14 | 1.5-3.3 |
| AST(ul) | 38.66 ^{ab} | 37.00 ^b | 42.33 ^a | 1.91 | 10-98 |
| ALT(ul) | 27.83 ^b | 26.33 ^b | 29.50 ^a | 1.81 | 55-260 |
| ALP(ul) | 81.00 | 81.66 | 84.33 | 4.48 | 10-96 |
| BUN(mg/dl) | 15.45 ^b | 15.15 ^b | 16.26 ^a | 0.37 | 13-30 |
| CREAT(mg/dl) | 0.55 ^{ab} | 0.51 ^b | 0.58 ^a | 0 | 0.5-2.6 |
| CHOL(mg/dl) | 63.00 | 60.33 | 67.00 | 3.38 | 10-80 |
| TM(mg/dl) | 41.33 ^{ab} | 39.83 ^b | 44.16 ^a | 1.93 | |
| HDL(mg/dl) | 32.33 | 30.33 | 33.33 | 2.67 | |
| LDL(mg/dl) | 22.40 | 22.03 | 24.83 | 1.52 | |
| A:G | 0.64 | 0.72 | 0.68 | 0 | 0.7-1.89 |

a,b,c,d mean having different superscript letters in the same row differ significantly ($p < 0.05$)
 TP = TOTAL PROTEIN, ALB = ALBUMIN, GLO = GLOBULIN, AST = ASPARTATE AMINO TRANSFERASE, ALT = ALANINE AMINOTRANSFERASE, ALP = ALKALINE PHOSPHATASE, BUN = BLOOD UREA NITROGEN, CREAT = CREATININE, CHOL = CHOLESTEROL, TMG = TRIMETHYLGLYCINE, HDL = HIGH DENSITY LIPOPROTEIN, LDL = LOW DENSITY LIPOPROTEIN, A:G=ALBUMINGLOBULINRATIO.

Table 2 shows the effect of varying levels of clove on rabbit biochemical parameters. Total protein showed significant difference ($P < 0.05$) among the treatments with values

ranging between 6.70 - 7.20g/dl. Rabbits fed 0.0g of clove had the lowest value while rabbits fed with 1.0g of clove had the highest level of Total protein. According to (15) total

protein in rabbits should range between 50 - 57g/l, the observed values fall below the range which implies that, the protein in the diet is deficient. This result agrees with the work of (16) who also reported lower total protein than the established values. Albumin showed no significant ($p>0.05$) difference among the treatments, the values recorded were far below the recommended values of 25 - 40g/dl (15). This result agrees with (17) as the albumin in the researched work also falls below the recommended range. This result reveals that the animals were malnourished (18) reported that albumin is produced in the liver and helps maintain osmotic pressure with the intravascular compartments. Observed globulin value ranged between 4.06 - 4.33 g/dl, the result shows significant difference ($p<0.05$) among the treatments. Rabbits fed 0.5g of clove have the lowest value while rabbits fed 1.0g of clove have the highest value. According to (15) globulin ranges between 1.5-3.3g/dl which means that this result was above the established range, which implies that the animals might be experiencing hemolytic anemia. Observed AST value ranged between 37.00 - 42.33ul and it shows significant difference ($P<0.05$) among the treatments. Rabbits fed 0.0g of clove have the lowest value while rabbits fed 1.0g of clove have the highest value. According to (15) AST range between 10 – 98ul which means that this result falls within the range of 10 – 98ul, this implies that clove does not have negative effect on the heart and liver function of the animals. According to (18) AST is found in the heart, liver and muscles. ALT ranged between 26.33 - 29.50ul, the result shows significant difference ($p<0.05$) among the treatments. Rabbits fed 0.5g of clove have the lowest value while rabbits fed with 1.0g of clove have the highest value. According to (18) ALT is found in the liver,

kidney, skeletal muscles, pancreas, spleen and the lungs. Established ALT value ranges from 55-60ul (15) which means the result of this study falls below the recommended range and an indication of vitamin B6 deficiency. ALP shows no significant difference ($p>0.05$) among the treatments, the clove has no adverse effect on the ALP level of the animals. Recommended ALP value ranges between 10 – 96ul (15) observed ALP values ranges from 81.00 - 84.33ul which means the result falls within the range of (15). ALP higher concentration is found in the liver and bone while lower concentration is found in the kidney tubules, intestinal epithelium, lung and placenta (18). Blood Urea Nitrogen value shows significant ($p<0.05$) difference (15.15 - 16.26mg/dl). Rabbits fed 0.5g of clove have the lowest value while rabbits fed with 1.0g of clove have the highest value of BUN. Published BUN value ranges from 13 - 30mg/dl (15), this result of this study agrees with (15) Blood Urea Nitrogen value falls within the referenced range which shows that the clove does not have negative effect on the animals. Creatinine shows significant difference ($p<0.05$) among the treatments, it ranges between 0.5 -0.58mg/dl. Creatinine established value ranges between 0.5 - 2.6mg/dl which means this work agrees with (15) and the clove does not have negative effect on the kidney of the animals. Creatinine is found as isoenzymes with greatest activity in muscle, heart and brain (19). Cholesterol, shows no significant difference ($p>0.05$) among the treatments. Cholesterol is an essential component of cell membranes and an important precursor for the synthesis of bile acids, steroid hormones and some fat soluble vitamins (20). Cholesterol is produced in the liver; the administration of clove does not have any adverse effect on the production of bile acids

in the animals. Recommended cholesterol value ranges from 10 - 80mg/dl. The result of this research ranges from 60.33 - 67.00 which falls with the normal limits established by (15). Trimthlglycine, shows significant difference ($p < 0.05$) among the treatments (39.83 - 44.16%). Rabbits fed 0.5g of clove have the lowest value while rabbits fed with 1.0g of clove have the highest value. Trimthlglycine, helps in cellular reproduction. HDL shows no significant difference ($p > 0.05$) among the treatments (30.33 - 33.33mg/L). HDL is one of the lipoproteins that have complex particles composed of multiple protein which transport all fat molecules (lipids) around the body (21). High Density Lipoprotein shows no significant difference ($p > 0.05$) among the treatments, it ranges from 22.03 -24.8mg/L. Low Density Lipoprotein delivers fat molecules to cell and it involved in atherosclerosis (a process in which LDL oxidized within the walls of arteries) (20). Albumin globulin ratio shows no significant difference ($p > 0.05$) among the treatments (0.64 - 0.72), this is within the established range 0.7 - 1.89 (15).

Conclusion and Application

- 1) Administration of clove up to 1.00g in adult rabbit has no adverse effect on the red blood cell count, white blood cell count, kidney and liver which are vital organs of the animals.
- 2) Further research is required on the administration of clove above 1.00g in rabbit's diet.

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