

BIOCHEMICAL RESPONSE OF RABBIT TO VARYING INCLUSION LEVELS OF CLOVE (*SYZYGIUM AROMATICUM*)

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ABSTRACT

Cloves come from a group of aromatic plants that are used widely due to its positive effect on growth and health of livestock 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 biochemical parameters. Data collected on biochemical parameters were subjected to one way analysis of variance. Some of the parameters of biochemical response evaluated are: 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 ($p > 0.05$) 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 undigested, 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 (Iyabode *et al.*, 2014). Such forage is cheap, abundant and available all the year round in many parts of Nigeria (Odeyinka and Ijiyemi 1997, Shiwoya and Musa 2006). Although rabbit can survive on many forage diets, optimum performance can only be ensured in a mixed feeding regime involving forage and formulated feed (Arijenwa *et al.*, 2000). 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 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 (Chowdhury *et al.*, 2018, Kunnumakkara *et al.*, 2018). 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 (Jimoh *et al.*, 2017). Eugenol is the most biologically active compound in cloves and makes up 70 - 80% of clove oil (Al-shaikh and Perveen, 2017). Many studies have evaluated the effects of clove powder (CLP) on performance, immune response, blood parameters and lymphoid organs (Mustafa, 2016; Mahrous *et al.*, 2017). Biochemical indices are helpful tools in animal production. They are used in determining health status, metabolic diseases, nutritional deficiencies and welfare of animal (Menon *et al.*, 2013). Incidence of disease and malnutrition are diagnosed from the normal reference value of various serum biochemical indices and haematological parameters measured depending on the case being investigated. Serum biochemical parameters of blood include albumin (Alb), globulin (Glb), creatinine, cholesterol, alkaline phosphatase (Alp) and alanine aminotransferase (Alt).

MATERIALS AND METHODS

Experimental site: The study was carried out at the rabbitry unit of Animal Production Technology Department, Oke-Ogun Polytechnic, Saki, Oyo state, Nigeria. Saki is located on latitude $8^{\circ}40'03''N$ and longitude $3^{\circ}23'38''E$ and 472m (1546ft) above sea level.

Experimental Animal: Twelve mature rabbits age 5 months were obtained from a reputable farm in Oyo state, Nigeria. The rabbits were acclimatized for two weeks before the commencement of the experiment.

Experimental Material/Ingredient: *Syzygium aromaticum* (clove) was obtained from Sango market in Saki and ground into a fine state. 0.0g, 0.5g and 1.0 g was administered to the rabbits orally for 8 weeks before daily feeding. The animals were placed on forage (*Aspilia africana*) throughout the 8 weeks of the experiment.

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 samples for serum biochemistry were collected from lateral saphenous vein into sterile plain bottle for further laboratory analysis to determine different parameters such as Total protein, Cholesterol, Alkaline phosphatase (ALP), Alanine aminotransferase (ALT), Aspartate aminotransferase (AST), Creatinine, Albumin, Globulin, Blood urea nitrogen, Creatinine, Cholesterol and Trimethylglycine.

Statistical Analysis: All data collected were analyzed using one-way analysis of variance (ANOVA) technique using SAS (2003) and means were separated with Duncan Multiple range of the same software at $P = 0.05$.

RESULT AND DISCUSSION

The Effect of Varying Levels of Clove on Rabbit Biochemical Parameters

The result in Table 1 shows that 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 Medirabbit (2003). Total protein in rabbits should range between 50 - 57g/l, these values falls below the range which implies that, the protein in the diet is deficient. This result agrees with the work of Iwuji *et al.*, (2015) 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 (Medirabbit, 2003). This result agrees with Al-mufarrej *et al.*, (2019) as the albumin in the researched work also falls below the recommended same range. This result reveals that the animals were malnourished Evans (2009) reported that albumin is produced in the liver and helps maintain osmotic pressure with the intravascular compartments. Globulin ranged between 4.06 - 4.33g/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 Medirabbit (2003) 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. AST 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 Medirabbit (2003) AST range between 10 - 98ul which means that this result falls within the range, this implies that clove does not have negative effect on the heart and liver of the animals. According to Evans (2009) 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 Evans (2009) ALT is found in the liver, kidney, skeletal muscles, pancreas, spleen and the lungs. According to Medirabbit (2003) ALT ranges from 55-60ul 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. According to Medirabbit (2003) ALP ranges between 10 - 96ul and this report ranges from 81.00 - 84.33ul which means the report falls within the range. Evans (2009) reported that ALP higher concentration is found in the liver and bone while lower concentration is found in the kidney tubules, intestinal epithelium, lung and placenta. BUN shows significant difference ($p < 0.05$) in the value and ranges between 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. According to Medirabbit (2003) BUN ranges from 13 - 30mg/dl. This report agrees with Medirabbit (2003) as it falls within the range which shows that the clove does not have negative effect on the animals.

CREAT shows significant difference ($p < 0.05$) among the treatments, it ranges between 0.5 - 0.58mg/dl. According to Medirabbit (2003) CREAT ranges between 0.5 - 2.6mg/dl which means this work agrees with Medirabbit (2003) and the clove does not have negative effect on the kidney of the animals. According to Lang (1981) creatinine is found as isoenzymes with greatest activity in muscle, heart and brain. CHOL shows no significant difference ($p > 0.05$) among the treatments. According to Richmond (1992) 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. 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. Medirabbit (2003) recorded that cholesterol ranges from between 10 - 80mg/dl. The report of this research ranges between 60.33-67.00 which falls with the normal limits established by Medirabbit (2003). TMG shows significant difference ($p < 0.05$) among the treatments, it ranges between 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. TMG helps in cellular reproduction. HDL shows no significant difference ($p > 0.05$) among the treatments, the value ranges from 30.33 - 33.33mg/L. HDL is one of the lipoprotein that have complex particles composed of multiple protein which transport all fat molecules (lipids) around the body (Kyung 2022). LDL shows no significant difference ($p > 0.05$) among the treatments, it ranges from 22.03 -24.8mg/L. LDL delivers fat molecules to cell and it involved in atherosclerosis (a process in which it is oxidized within the walls of arteries) (Okeefa *et al.*, 2004). A:G shows no significant difference ($p > 0.05$) among the treatments and it ranges between 0.64 - 0.72. Medirabbit (2003) recorded that it ranges between 0.7 - 1.89 which means this result agrees with Medirabbit (2003).

Table 1: 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	37-46
HDL(mg/dl)	32.33	30.33	33.33	2.67	28.3-37.0
LDL(mg/dl)	22.40	22.03	24.83	1.52	20-31
A:G	0.64	0.72	0.68	0	0.7-1.89

TP = TOTAL PROTEIN, ALB = ALBUMIN, GLO = GLOBULIN, AST = ASPARTATE AMINOTRANSFERASE, 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=ALBUMIN/GLOBULIN RATIO

CONCLUSION AND RECOMMENDATION

The biochemical result revealed that *Syzygium aromaticum* (clove) administration up to 1.00g in adult rabbit has no adverse effect on their kidney and liver which are vital organs. Further research is recommended above 1.00g administration.

REFERENCES

Al-Mufarrej, S. I. (2019). Effect of level of inclusion of clove (*syzygium aromaticum*) powder in the diet on growth and histological changes in the intestine and livers of broiler chicken. South African Journal of Animal science vol 49 (1) Pp 12-16.

- Al-Shaikh, N. & Perveen, K., (2017). Anti-candidal activity and chemical composition of essential oil of clove (*Syzygium aromaticum*). J. Essent. Oil Bear. Pl. 20, 951-958.
- Arijeniwa, A., Otaikhian, S.O. and Maseun, J.A. (2000). Performance of weaner rabbits fed grower supplemented with different grass legume rations. In: Proc. 5th Annual conference of Animal Science Association of Nigeria (ASAN). 2000 September, 103-105.
- Chowdhury, S., Mandal, G.P., Patra, A.K., Kumar, P., Samanta, I., Pradhan, S. & Samanta, A.K., 2018. Different essential oils in diets of broiler chickens: 2. Gut microbes and morphology, immune response, and some blood profile and antioxidant enzymes. Anim. Feed Sci. Tech. 236, 39-47
- Evans (2009). Trease and Evans Pharmacognosy. Elsevier Health Science, London. 614.
- Iyabode Comfort Alemede., Ayo Aremu, Isaac Oriade and Abdulmojeed Tunji Ijaiya (2014). Reproductive Performance of Rabbits (*Oryctolagus cuniculus*) fed Diets Containing Varying Levels of Dried Bovine Rumen Digesta. Department of Animal Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna. vol. 23.
- Jimoh, S.O., Arowolo, L.A. & Alabi, K.A., 2017. Phytochemical screening and antimicrobial evaluation of *Syzygium aromaticum* extract and essential oil. I.J.C.M.A.S. 6, 4557-4567.
- Kunnumakkara, A.B., Sailo, B.L., Banik, K., Harsha, C., Prasad, S., Gupta, S.C. & Aggarwal, B.B., 2018. Chronic diseases, inflammation, and spices: How are they linked. J. Transl. Med. 16, 1-14.
- Kyung-Hyun Cho (2022). The current status of research on high density lipoprotein: A paradigm shift from HDL quantity to HDL quality and HDL functionality. International journal of molecular science. Vol 4 (2) pp 23 -27
- Mahrous, H.S., El-Far, A.H., Sadek, K.M. & Abdel-Latif, M.A., (2017). Effects of different levels of clove bud (*Syzygium aromaticum*) dietary supplementation on immunity, antioxidant status, and performance in broiler chickens. A.J.V.S. 54, 29-39.
- Medirabbit.com (2003). Complete blood count and biochemistry reference values in rabbits.
- Menon, D., Bennett, D., Schaefer, A. and Cheng, K. (2013). Hematological and Serum biochemical profile of farm emus (*Dromaius novaehollandiae*) at the onset of their breeding season. Poultry Science. 92(4):935-944.
- Mustafa, D.B.M., 2016. Effect of mixture of three herbal essential oils on performance, carcass yield and blood serum constituents of broiler chicks. Sudan Univer. Sci. Tech. 5, 63-72.
- Odeyinka, S.M., Oyedele, O.J., Adeleke, T.O., Odedire, J.A. (2008). Reproductive performance of rabbits fed *Moringa oleifera* as replacement for *Centrosema pubescens*. 9th World Rabbits Congress, June 10th – 13th, 2008; Verona- Italy.
- SAS (2003). Statistical Analytical System. SAS Release 9.1 for windows, SAS institute Inc Cary, NC, USA.
- Shiawoya, E.L. and Musa, J.A.O. (2006). Evaluation of the feeding potentials of mango (*Mangifera indica*) leaves, banana (*Musa spp*) foliage and *Tridax procumbens* as supplemented to conventional feeds for growing rabbits. Journal of Agricultural Research and Development, 5 (1):1- 6.