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# Effect of orally administered aqueous extract of ginger and almond fruit extract on haematological and biochemical indices of weaned rabbits

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## Abstract

*This experiment was carried out to determine the haematological profile and serum biochemical indices of weaned rabbits given aqueous extract of ginger (Zingiber officinale) and almond fruits (Terminalia catappa) extract as drinking water. A total of 12 weaned mixed breed rabbits were randomly assigned to four treatments (T1 – T4). Each treatment contained three rabbits one per replicate. Treatment (T1) received water as the control, T2 received ginger extract whileT3 received almond fruits extract and T4 received the mixture of 50% ginger and 50% almond fruits extract. The experiment lasted five weeks. The rabbits were individually weighed on a weekly basis in the duration of the experiment. Water and feed were supplied ad libitum and daily voluntary feed and water intake was monitored. Blood was collected on day 1 and 35 of the experiment for haematological and serum biochemical indices. It was observed that packed cell volume in T3 was highest value of 41.00% and the white blood cell count for T2 was 12.10 at the 1st day of the experiment. At day 35of the experiment, T2(46.00%)was the highest. All the measured haematological parameters were not significantly different($p>0.05$) with the administration of aqueous extract of phytobiotics. Total protein(7.85g/dL) as well as globulin level (3.85g/dL)were significantly higher ($p<0.05$) in rabbits on control group, while those on combination of ginger and almond fruit extract had the least total protein (5.95g/dL) and globulin (1.60g/dL).The inclusion of phytobiotics (ginger extract and almond fruit extract) had no effect on the haematological indices of rabbits.*

**Keywords:** Phytobiotics, blood parameters, rabbits, water intake

# Effet de l'extrait aqueux de gingembre et d'extrait de fruit d'amandier administré par voie orale sur les indices hématologiques et biochimiques des lapins sevrés

## Résumé

*Cette expérience a été réalisée pour déterminer le profil hématologique et les indices biochimiques sériques de lapins sevrés ayant reçu de l'extrait aqueux de gingembre (Zingiber officinale) et de l'extrait de fruits d'amandier (Terminalia catappa) comme eau de boisson. traitements (T1 – T4). Chaque traitement contenait trois lapins, un par répétition. Le traitement (T1) a reçu de l'eau comme témoin, T2 a reçu de l'extrait de gingembre tandis que T3 a reçu de l'extrait d'amande et T4 a reçu le mélange de 50 % de gingembre et 50 % d'extrait d'amande. L'expérience a duré cinq semaines. Les lapins ont été pesés individuellement sur une base hebdomadaire pendant la durée de l'expérience. L'eau et les aliments ont été fournis ad libitum et la consommation volontaire quotidienne d'aliments et d'eau a été surveillée. Le sang a été prélevé aux jours 1 et 35 de l'expérience pour les indices hématologiques et biochimiques sériques. Il a été observé que l'hématocrite dans T3 était la valeur la plus élevée de 41,00 % et que le nombre de globules blancs pour T2 était de 12,10*

*au 1er jour de l'expérience. Au jour 35 de l'expérience, le T2 (46,00 %) était le plus élevé. Tous les paramètres hématologiques mesurés n'étaient pas significativement différents (p>0,05) avec l'administration d'extrait aqueux de phytobiotiques. Les protéines totales (7,85 g/dL) ainsi que le taux de globuline (3,85 g/dL) étaient significativement plus élevés (p<0,05) chez les lapins du groupe témoin, tandis que ceux sur la combinaison de gingembre et d'extrait de fruit d'amande avaient le moins de protéines totales (5,95 g /dL) et globuline (1,60g/dL). L'inclusion de phytobiotiques (extrait de gingembre et extrait d'amandier) n'a eu aucun effet sur les indices hématologiques des lapins.*

**Mots clés** : Phytobiotiques, paramètres sanguins, lapins, consommation d'eau

## Introduction

Domestic rabbits (*Oryctolagus cuniculus*) are ubiquitous which also serves as nutritional food, research models and as pets. Rabbit meat appears as a great alternative to reduce the shortage of animal protein in developing countries, where grains are mainly used for human consumption (Iribeck, 2001 and Hassan, 2012). More essentially, rabbit meat and meat products are relished by many all over the world (Idahor *et al.,* 2018). Rabbits play a vital role as source of animal protein in the human meal (Amaefule *et al*., 2005). Animal protein consumption is very essential for covering protein requirement of the organism. The average daily protein intake is still far less than the value of 35 g per adult per day recommended by FAO (FAO, 2007). They convert feed to meat efficiently and utilize up to 30% crude fibre as against 10% by most poultry species (Egbo *et al*., 2001). Rabbit production has proven to be a veritable means of alleviating animal protein deficiency (Ajala and Balogun, 2004). Rabbits are believed to be the most prolific, cost saving and economical due to their short generation interval, high litter size and require little start-pack-capital. Although rabbits can survive by consuming virtually all forage diets, performance is better enhanced by offering a mixed feeding regime including forage and formulated feeds (Harris *et a al*., 1984). The inclusion and/or supplementation of sea weed and marine sources in livestock diet have been reported to improve growth and reduce mortality from gestation till weaning. This gives rise to more animals at table, increased income and enhanced livelihood (Adeleye *et al*., 2012)**.** *Terminalia catappa* (almond) is a large tropical tree in the lead wood tree family. It is widely grown in tropical regions of the world as an ornamental tree grown for the deep shade its large leaves provide. These fruits, if collected, could be used in animal feeds. Although the fruit provides natural sources of soluble carbohydrates, phosphorus, and fibre (Jeremiah, 1992) and it contain high proportion of fibre (200 g kg- 1) in the whole fruit (Annongu *et al*., 2006). At present, the data about the effect of fruit from *T. catappa* on the performance of rabbits are limited Ginger (*Zingiber officinale*) is an aromatic herb, possessing tuberous stem root (rhizome) (Taiwo *et al*., 2005). Apart from the medicinal value it has been reported that feed intake was observed to be higher among rabbits fed higher levels of ginger root powder in diets (Omage *et al*., 2007). Ginger may act as a pro-nutrient because of the vast active ingredients it contains (Imasuen *et al*., 2014). It thus, a potential alternative to antimicrobial growth promoters (AGP). As a growth promoter, ginger was reported to promote feed intake and feed conversion (Incharoen and Yamauchi, 2009) and body weight gain (Zomrawi *et al*., 2012) in broilers. Hence, this research was therefore designed to determine the effect of aqueous extract of ginger and almond fruit in drinking water on the blood profile and serum biochemical indices of weaned rabbits.

## Materials and methods

### *Experimental site*

The study was conducted at the Teaching and Research Farm, Federal Polytechnic Ilaro, Ogun state, Nigeria.

### *Experimental sample preparation*

Fresh ginger was purchased from the market and fresh fruit of almond were collected on campus, washed and the fleshy parts extracted. Then, 5kg from each plant wasweighed, blended and soaked in different containers of 50 litres clean water for 72 hours. The solution was sieved to remove the residues. The filtrate was further sieved with muslin cloth to get fine pure extract. The pure aqueous extracts were stored in the refrigerator till usage.

### *Experimental design*

A total of 12 mixed breed weaned rabbits at seven weeks old, weighing between 0.97 and 1.0 kg were purchased from the Teaching and Research Farm, Federal Polytechnic Ilaro, Ogun state, Nigeria. They were weighed and randomlydistributed into four treatments with three replicate of one rabbit each per hutch. Treatment one received water as the control group, treatment two received ginger aqueous extract and treatment three were given almond fruit aqueous extract while treatment four received mixture of both ginger and almond fruit extract at 1:1 ratio. The experiment was designed into a complete randomized design. The feed and drinking water were offered *ad libitum* to the experimental animals. The hutches, pens, water troughs and feed troughs were thoroughly cleaned, washed as well as disinfected at regular intervals and the environment was often cleared to maintain good hygiene. The animals were kept for two weeksto adapt to the experimental environment. The experiment lasted for 35 days.

### Data collection and statistical analysis

The volume of water offered, and the leftover were measured in 500 mL volumetric flask.The differences in values were recorded as water intake on daily basis.After initial weight, weekly weights of each rabbit were taken and recorded. Atdays 1 and 34 of the experiment, 5ml blood samples were collected from the central auricular artery in bottles containing ethylene diamine tetra-acetic acid(EDTA) and plane bottles, for haemoglobin, packed cell volume, platelet, red and white blood cells were determined using improved neubaurhaemycytometer after dilution and cyanomethamoglobin methods respectively as described by Dacie and Lewis (1991)and blood collectedinside a plan sample bottles were used for Serum urea and creatinine level were determined using spectrophotometric methods described by Coles (1986). Data collected were subjected to analysis of variance (ANOVA) according to Steel and Torrie (1980) and significant differences among treatment means were separatedusing Duncan's Multiple Range test (Duncan, 1955).

## Results

### *Effect of phytobiotics on haematology of weaned rabbits*

Table 1 shows the effect of phytobiotics on the haematology of weaned rabbit.On day 1 of theexperiment, treatment three (T3) had the highest value (41.00%). The observedWBC for T2 was the lowest ($12.10\times10^9$/l). It was observed that the Lymphocyte countwere higher (69.50%) at T3 and T4 when compared with other treatments.Table 2 shows the effect of phytobiotics on the haematology of weaned rabbit at day35of the experiment. It was observed that T2 has the highest PCV (46.00%) and lowest WBC ($6.20\times10^9$/l) All haematological parameters considered at the beginning of this experiment (day 1) before phytobiotics was administered were not significantly different ($p>0.05$).

**Table 1: Effect of phytobiotics administration on haematology of weaned rabbits at day1of the experiment**

| Parameters | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Packed Cell Volume % | 38.50 | 38.00 | 41.00 | 33.00 | 1.83 |
| Haemoglobin (g/dl) | 12.85 | 12.65 | 13.75 | 11.10 | 0.63 |
| Red blood cell ($\times10^{12}$/L) | 6.00 | 6.45 | 8.15 | 6.75 | 0.52 |
| White blood cell ($\times10^{9}$/L) | 15.65 | 12.10 | 15.20 | 14.15 | 0.83 |
| Heterophils (%) | 30.00 | 31.00 | 29.50 | 29.00 | 0.61 |
| Lymphocyte (%) | 67.50 | 67.50 | 69.50 | 69.50 | 0.82 |
| Eosinophils (%) | 0.50 | 0.50 | 0.00 | 0.50 | 0.18 |
| Basophil (%) | 0.50 | 0.50 | 0.50 | 0.50 | 0.19 |
| Monocytes (%) | 1.50 | 0.50 | 0.50 | 0.50 | 0.37 |
| Mean Corpuscular Volume (fl) | 66.95 | 59.10 | 50.75 | 51.90 | 4.67 |
| Mean Corpuscular Hemoglobin (pg) | 22.30 | 19.70 | 17.00 | 17.50 | 1.55 |
| Mean Corpuscular Hemoglobin Concentration (g/dL) | 33.30 | 33.30 | 33.55 | 33.55 | 0.10 |

T1: Control, T2: Ginger extract, T3: Almond fruit extract, T4: Combination of ginger and almond fruit extract.
SEM: Standard error of mean

**Table 2: Effect of phytobiotics administration on haematology of weaned rabbits at 35$^{th}$ day of experiment**

| Parameters | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Packed Cell Volume % | 40.50 | 46.00 | 40.50 | 38.50 | 4.17 |
| Haemoglobin (g/dl) | 13.50 | 15.55 | 13.55 | 12.85 | 1.41 |
| Red blood cell ($\times10^{12}$/L) | 7.90 | 8.65 | 8.15 | 7.20 | 0.86 |
| White blood cell ($\times10^{9}$/L) | 8.95 | 6.20 | 8.70 | 6.50 | 1.90 |
| Heterophils (%) | 48.00 | 44.00 | 40.00 | 36.50 | 11.67 |
| Lymphocyte (%) | 50.50 | 55.00 | 59.00 | 51.50 | 13.96 |
| Eosinophils(%) | 0.50 | 0.00 | 1.00 | 0.50 | 0.50 |
| Basophil (%) | 0.50 | 0.00 | 0.00 | 0.50 | 0.50 |
| Monocytes (%) | 1.00 | 0.50 | 0.00 | 1.00 | 0.35 |
| Mean Corpuscular Volume (fL) | 51.30 | 53.20 | 50.40 | 53.80 | 7.47 |
| Mean Corpuscular Hemoglobin (pg) | 17.10 | 18.00 | 16.85 | 17.95 | 2.47 |
| Mean Corpuscular Hemoglobin Concentration (g/dL) | 33.35 | 33.80 | 33.50 | 33.35 | 0.23 |

T1: Control, T2: Ginger extract, T3: Almond fruit extract, T4: Combination of ginger and almond fruit extract.
SEM: Standard error of mean

***Effect of phytobiotcs administration on serum biochemical indices of weaned rabbits***

Table 3 shows the effect of phytobiotics administration on serum biochemical indices of weaned rabbit on day 1 of the experiment, while the serum biochemical indices of weaned rabbit administered aqueous extract of phytobiotics is presented in Table 4. Results of the serum biochemical indices of weaned rabbits showed significant ($P<0.05$) difference at initial stage (day 1). Total protein and globulin levels were significantly ($P<0.05$) different. At the beginning of the experiment (Day 1), total protein value as well as globulin level was significantly higher in rabbits on the control group (7.85g/dL, 3.85g/dL respectively), while rabbits fed the combination of ginger and almond fruit extract had the least value of total protein (5.95g/dL) and globulin (1.60g/dL). As the experiment proceeded to the 35$^{th}$ day, all serum biochemical indices stabilized and were all not significantly ($P>0.05$) influenced by the administration of aqueous extract of phytobiotics as presented in Table 4.

**Table 3: Effect of phytobiotics administration on serum biochemical indices of weaned rabbits on day 1 of the experiment**

| Parameters | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Total Protein (g/dL) | 5.85[b] | 7.60[a] | 6.60[ab] | 7.85[a] | 0.29 |
| Albumin (g/dL) | 4.00 | 3.70 | 3.95 | 4.35 | 0.11 |
| Globulin (g/dL) | 3.85[a] | 3.20[ab] | 2.65[ab] | 1.60[b] | 0.34 |
| AST (U/L) | 73.00 | 67.50 | 66.00 | 86.00 | 4.82 |
| ALP (U/L) | 117.00 | 103.50 | 98.50 | 90.00 | 4.17 |
| Urea (mg/dl) | 18.25 | 15.65 | 16.40 | 25.50 | 2.31 |
| Creatinine (mg/dl) | 1.40 | 1.10 | 1.05 | 0.50 | 0.15 |

[ab]*means in the same row with the different superscripts are significantly different* (*p<0.05* )
T1: Control, T2: Ginger extract, T3: Almond fruit extract, T4: Combination of ginger and almond fruit extract. SEM: Standard error of mean footnote should contain meanings to AST, ALT, ALPetc

**Table 4: Effect of phytobiotics administration on serum biochemical indices of weaned rabbits at day 35 of experiment**

| Parameters | T1 | T2 | T3 | T4 | SEM |
|---|---|---|---|---|---|
| Total Protein (g/dL) | 6.15 | 6.30 | 6.95 | 6.60 | 0.21 |
| Albumin (g/dL) | 3.30 | 3.95 | 4.75 | 3.70 | 0.24 |
| Globulin (g/dL) | 2.85 | 2.40 | 2.15 | 2.90 | 0.19 |
| AST (U/L) | 64.50 | 63.50 | 69.00 | 67.50 | 1.32 |
| ALP (U/L) | 92.50 | 94.50 | 104.00 | 99.50 | 3.20 |
| Urea (mg/dl) | 24.55 | 22.45 | 13.90 | 13.85 | 2.88 |
| Creatinine (mg/dl) | 1.50 | 1.75 | 2.70 | 1.80 | 0.28 |

T1: Control, T2: Ginger extract, T3: Almond fruit extract, T4: Combination of ginger and almond fruit extract. SEM: Standard error of meanfootnote should contain meanings to AST, ALT, ALP etc

## Discussion

The result from the haematological parameters obtained from this present study were not significantly different (P>0.05) at both stages of the experiment. This result indicated that the administration of ginger and almond fruit extract could not impair the health status of rabbit as all hematological parameters were similar and all were within the normal ranges for healthy rabbit as reported (Melillo, 2007). The present resultsalso support the findings of Omage *et al*. (2007) of a non-significant effect of phytobiotics administration on haematological parameters of rabbit. The total protein of rabbits in Treatments 4 (7.85 g/dL) and 2(7.60 g/dL) were slightly higher than the range index of5.4-7.5 g/dL reported by Melillo (2007). This can be due to dehydration or malnutrition. All other serum biochemical indices considered at the start of the experiment were all within the normal ranges reported (Melillo, 2007). Serum biochemical parameters considered at Day 5 of the experiment were not different among all treatment probably because the administration of ginger and almond fruit extract and the combination of both plant extract had no deleterious effect on the serum parameters of rabbit. Additionally, administration of ginger could help stabilize the total protein level of rabbits as it reduces the total protein level of rabbits from 7.6 and 7.85g/dL in Treatments 2 and 4, respectively, to 6.30 and 6.60g/dL. The result obtained in the present study agreed with the findings of Henry *et al*. (2017) on serum biochemical indices of rabbits when administered phytobiotics. Henry *et al*. (2017) observed that serum total protein content was 5.20 g/dL for rabbits fed fresh pawpaw leaves and 5.77 g/dL for those on wilted pawpaw leaves which were within (5.4 – 7.5 g/dL) of the normal reported range (Medirabbit, 2011).

**Conclusion**

It is concluded from this experiment that the inclusion of phytobiotics (ginger extract and almond fruit extract) did not affect the haematological indices of rabbits. The inclusion of phytobiotics (ginger extract) improved the serum biochemical indices of the rabbits. Phytobiotics (ginger extract and almond fruit extracts) did not impact negatively onthe health status of rabbits.

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