

## GROWTH PERFORMANCE OF RABBITS ADMINISTERED GMELINA ARBOREA LEAF EXTRACT

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### ABSTRACTS

An 8-week study was carried out using a total of 36 rabbits; 24 females and 12 males, to evaluate the growth performance of rabbits administered *Gmelina arborea* leaf extract (GALE). The rabbits were randomly assigned to 4 treatment groups in 2x4 factorial arrangements in a completely randomized design (CRD). Each treatment for the rabbit bucks was replicated three times with each treatment containing 3 rabbit bucks and to each replicate, one buck was assigned each. The treatment for the female rabbits contained 6 does, replicated three times with 2 does per replicate. GALE was prepared following standard protocol. The extract was given to the rabbits at concentrations of 0, 300, 600 and 900ml for every one liter of drinking water measured representing T1, T2, T3 and T4 groups respectively. Results showed high significant ( $P<0.01$ ) differences on the effects of sex on final body weight, total feed intake, average daily feed intake, total weight gain, average daily weight gain, average daily water intake, total water intake and feed conversion ratio of rabbits. There were no significant ( $P>0.05$ ) variation among the treatment groups, and the interaction between sex and GALE on growth parameters measured except for average water intake and total water intake. It was concluded that GALE improved growth of rabbits.

**Keywords:** *Gmelina arborea*; Leaf Extract; Rabbits; Antibiotic resistance, Growth promoters

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### INTRODUCTION

Antimicrobial resistance (AMR) is one of the topmost global public health and development threats. It is estimated that bacterial AMR caused 4.95 million deaths worldwide in 2019 and was directly responsible for 1.27 million deaths (Antimicrobial Resistance Collaborators, 2022). The misuse and overuse of antimicrobials in humans, animals and plant, has resulted in the development of drug-resistant pathogens, that impact the health of animals and plants, reduce productivity in farms, and threaten food security (Arif, 2022). These emerging issues highlight the need for alternative approaches to improve feed efficiency and reduce cost of feed in the absence of Antibiotic Growth Promoters (AGPs). There are numbers of AGPs alternatives, one of which is the use of herb plant. Herbs plant such as *Gmelina arborea*, are natural growth promoters that contains chemical compounds that are beneficial to livestock and are safe for consumption by humans and livestock. It is due to the high phytochemical constituents and its low utilization to man, that *Gmelina arborea* leaf extract (GALE) was proposed for this work. As nutritionists evolve alternatives to synthetic and semi-synthetic antibiotics as growth promoters, that are readily available and of little or no nutritional value to man, it becomes imperative to always investigate the physiological implications of such materials on the animals. This study, therefore, was designed to evaluate the growth performance of rabbits administered *Gmelina arborea* leaf extract.

### MATERIALS AND METHODS

#### Experimental Site

The experiment was carried out at the Rabbit Unit Department of Animal Science, Teaching and Research Farm, University of Nigeria, Nsukka in Enugu State, South Eastern Nigeria. Nsukka is located at the latitude 6°51'28.19" N and longitude 7°23'44.77" E. The average temperature is 24.9°C/ 76.8 °F. and annual rainfall is 1579mm/ 62.2 inch (Ihinegbu, 2019).

#### Experimental animals, diet and management

A total of thirty- six (36) weaner rabbits (12 males and 24 females) of mixed breed weighing between 1100 g and 1137g were used for the study. The rabbits were bought from local farmers from within and around Nsukka. They were allowed a period of two weeks to acclimatize after which the bucks were weighed and randomly grouped into four treatments groups, three replicates with one animal per

replicate. The does were grouped into four treatment groups, having 6 does per treatment, replicated three times with two does per replicate. The rabbit hutch floor was made of wire screened that allowed faeces and urine to pass through. The dimensions of the cages were 121.92cm x 60.96cm x 152.40cm and were equipped with feeders and drinkers. Feed and water were provided *ad-libitum* and mixed forages (*Centrosema pubescens*, *Panicum maximum*, *Tridax procumbens* and *Cajanus cajan*) were also provided for the rabbits alongside the experimental extract. The *Gmelina arborea* leaves sourced from different locations in Nsukka environment were rinsed in clean water to remove dirt and sand, air dried under room temperature of 28°C for 9 hours each day, until crisp, milled and Two hundred grams (200g) of ground leaves were weighed with sensitive scale and dissolve in 1500ml of warm water and made to stay for 30 minutes. For every 1 litre of drinking water measured, GALE was supplemented as indicated Treatment 1 (T<sub>1</sub>), rabbits on water only; Treatment 2 (T<sub>2</sub>), rabbits on 300mL of extract ; Treatment 3 (T<sub>3</sub>), rabbits on 600mL of extract; Treatment 4 (T<sub>4</sub>), rabbits on 900mL of extract

### Data Collection and Statistical Analysis

Data was collected on growth performance. All data collected were analyzed using Analysis of Variance (ANOVA) in a Completely Randomized Design (CRD) in 2x4 factorial arrangements using statistical package (SPSS, version 20). The significant differences in means were separated using Duncan's New Multiple Range Text (Duncan, 1955).

## RESULTS

### Growth performance of rabbits administered *Gmelina arborea* leaves extract (GALE)

The results of the growth performance of rabbits administered GALE is presented in Table 1. Results showed high significant ( $P < 0.01$ ) differences on the main effects of sex on FBW, TFI, ADFI, TWG, ADWG, ADWI, TWI and FCR of rabbits. There were no significant ( $P > 0.05$ ) variation among the treatment groups and interaction effect between sex and GALE on growth parameters measured except for average water intake and total water intake.

The results of the effect of *Gmelina arborea* leaves extract on the growth performance of rabbits is presented in the table below.

**Table 1: Growth Performance of Rabbits administered aqueous extract of *Gmelina arborea* leaves (Mean  $\pm$  SE)**

| SEX         | IBW (g)              | FBW (g)                          | TWG (g)                         | ADWG (g)                      | TFI (g)                           | ADFI (g)                       | FCR                           | TWI (ml)                            | ADWI (ml)                       |
|-------------|----------------------|----------------------------------|---------------------------------|-------------------------------|-----------------------------------|--------------------------------|-------------------------------|-------------------------------------|---------------------------------|
| M           | 1100.00 $\pm$ 52.22  | 1666.67 $\pm$ 43.22 <sup>a</sup> | 566.67 $\pm$ 49.75 <sup>a</sup> | 11.56 $\pm$ 1.02 <sup>a</sup> | 6259.00 $\pm$ 162.05 <sup>a</sup> | 127.73 $\pm$ 3.31 <sup>a</sup> | 11.05 $\pm$ 1.02 <sup>a</sup> | 14192.67 $\pm$ 625.86 <sup>a</sup>  | 289.65 $\pm$ 12.77 <sup>a</sup> |
| F           | 1137 $\pm$ 35.00     | 1515.58 $\pm$ 26.63 <sup>b</sup> | 378.58 $\pm$ 16.62 <sup>b</sup> | 7.73 $\pm$ 0.59 <sup>b</sup>  | 5332.96 $\pm$ 22.73 <sup>b</sup>  | 108.84 $\pm$ 0.81 <sup>b</sup> | 14.09 $\pm$ 1.36 <sup>b</sup> | 5182.17 $\pm$ 160.89 <sup>b</sup>   | 105.76 $\pm$ 5.75 <sup>b</sup>  |
| P-value     | 0.553 <sup>NS</sup>  | 0.02 <sup>*</sup>                | 0.00 <sup>**</sup>              | 0.00 <sup>**</sup>            | 0.05 <sup>*</sup>                 | 0.00 <sup>**</sup>             | 0.05 <sup>*</sup>             | 0.00 <sup>**</sup>                  | 0.00 <sup>**</sup>              |
| TREATMENT   |                      |                                  |                                 |                               |                                   |                                |                               |                                     |                                 |
| T1          | 1122.22 $\pm$ 49.38  | 1399.33 $\pm$ 79.16              | 277.11 $\pm$ 82.77              | 5.66 $\pm$ 1.42               | 3663.11 $\pm$ 679.25              | 74.76 $\pm$ 8.07               | 13.21 $\pm$ 2.1               | 9531.67 $\pm$ 1785.27 <sup>a</sup>  | 194.52 $\pm$ 21.69 <sup>a</sup> |
| T2          | 1133.33 $\pm$ 62.36  | 1430.00 $\pm$ 64.23              | 296.67 $\pm$ 55.65              | 6.05 $\pm$ 1.10               | 3617.00 $\pm$ 635.52              | 73.82 $\pm$ 7.10               | 12.20 $\pm$ 1.90              | 8547.78 $\pm$ 1733.63 <sup>b</sup>  | 174.44 $\pm$ 22.67 <sup>b</sup> |
| T3          | 1188.89 $\pm$ 69.61  | 1511.11 $\pm$ 75.36              | 322.22 $\pm$ 89.41              | 6.58 $\pm$ 1.60               | 3625.67 $\pm$ 705.66              | 73.99 $\pm$ 8.98               | 11.24 $\pm$ 2.19              | 7942.22 $\pm$ 1257.31 <sup>b</sup>  | 162.09 $\pm$ 12.55 <sup>b</sup> |
| T4          | 1055.56 $\pm$ 47.46  | 1390.00 $\pm$ 73.14              | 334.44 $\pm$ 72.40              | 6.83 $\pm$ 1.23               | 3630.78 $\pm$ 633.49              | 74.08 $\pm$ 6.91               | 10.85 $\pm$ 1.81              | 6721.00 $\pm$ 1282.84 <sup>c</sup>  | 137.16 $\pm$ 15.98 <sup>c</sup> |
| P-value     | 0.739 <sup>NS</sup>  | 0.462 <sup>NS</sup>              | 0.704 <sup>NS</sup>             | 0.726 <sup>NS</sup>           | 0.097 <sup>NS</sup>               | 0.978 <sup>NS</sup>            | 0.689 <sup>NS</sup>           | 0.00 <sup>**</sup>                  | 0.00 <sup>**</sup>              |
| INTERACTION |                      |                                  |                                 |                               |                                   |                                |                               |                                     |                                 |
| T1 M        | 1066.67 $\pm$ 33.33  | 1666.67 $\pm$ 33.33              | 600.00 $\pm$ 57.74              | 12.24 $\pm$ 1.18              | 6371.33 $\pm$ 143.83              | 130.03 $\pm$ 2.93              | 10.62 $\pm$ 0.81              | 16552.33 $\pm$ 1084.53 <sup>a</sup> | 337.80 $\pm$ 22.13 <sup>a</sup> |
| T1 F        | 1150.00 $\pm$ 71.88  | 1265.67 $\pm$ 64.01              | 115.67 $\pm$ 11.77              | 2.36 $\pm$ 0.42               | 2309.00 $\pm$ 54.90               | 47.12 $\pm$ 1.96               | 19.97 $\pm$ 1.89              | 6021.33 $\pm$ 143.39 <sup>b</sup>   | 122.88 $\pm$ 5.12 <sup>b</sup>  |
| T2 M        | 1166.67 $\pm$ 176.38 | 1633.33 $\pm$ 120.19             | 466.66 $\pm$ 88.19              | 9.52 $\pm$ 1.82               | 6133.67 $\pm$ 299.12              | 125.18 $\pm$ 6.11              | 13.14 $\pm$ 2.48              | 15465.33 $\pm$ 189.24 <sup>a</sup>  | 315.62 $\pm$ 3.86 <sup>a</sup>  |
| T2 F        | 1116.67 $\pm$ 54.26  | 1328.33 $\pm$ 28.45              | 211.66 $\pm$ 55.65              | 4.32 $\pm$ 1.40               | 2358.67 $\pm$ 37.33               | 48.14 $\pm$ 1.33               | 11.14 $\pm$ 2.73              | 5089.00 $\pm$ 167.55 <sup>b</sup>   | 103.86 $\pm$ 5.98 <sup>b</sup>  |
| T3 M        | 1066.67 $\pm$ 120.19 | 1700.00 $\pm$ 152.75             | 633.33 $\pm$ 133.33             | 12.93 $\pm$ 2.72              | 6353.67 $\pm$ 620.52              | 129.67 $\pm$ 12.66             | 10.03 $\pm$ 1.13              | 12935.00 $\pm$ 285.68 <sup>a</sup>  | 263.98 $\pm$ 5.83 <sup>a</sup>  |
| T3 F        | 1250.00 $\pm$ 80.62  | 1416.67 $\pm$ 60.09              | 166.67 $\pm$ 33.33              | 3.40 $\pm$ 1.19               | 2261.67 $\pm$ 42.45               | 46.16 $\pm$ 1.52               | 13.58 $\pm$ 2.98              | 5445.83 $\pm$ 196.22 <sup>b</sup>   | 111.14 $\pm$ 7.01 <sup>b</sup>  |
| T4 M        | 1100.00 $\pm$ 52.22  | 1666.67 $\pm$ 33.33              | 566.67 $\pm$ 133.33             | 11.56 $\pm$ 2.72              | 6177.33 $\pm$ 246.03              | 126.07 $\pm$ 5.02              | 10.91 $\pm$ 3.28              | 11818.00 $\pm$ 345.86 <sup>a</sup>  | 241.18 $\pm$ 7.06 <sup>a</sup>  |
| T4 F        | 1137.50 $\pm$ 35.00  | 1251.67 $\pm$ 33.71              | 114.17 $\pm$ 30.60              | 2.33 $\pm$ 1.09               | 2402.50 $\pm$ 32.66               | 49.03 $\pm$ 1.17               | 21.04 $\pm$ 2.39              | 4172.50 $\pm$ 169.70 <sup>b</sup>   | 85.15 $\pm$ 6.06 <sup>b</sup>   |
| P-value     | 0.455 <sup>NS</sup>  | 0.707 <sup>NS</sup>              | 0.199 <sup>NS</sup>             | 0.180 <sup>NS</sup>           | 0.697 <sup>NS</sup>               | 0.582 <sup>NS</sup>            | 0.209 <sup>NS</sup>           | 0.00 <sup>**</sup>                  | 0.003 <sup>**</sup>             |

abc. Means on the same column with different superscripts are significantly different (\*=  $P < 0.05$  or \*\*=  $P < 0.01$ )

SE= Standard error; IBW; Initial body weight, FBW; Final body weight, TFI; Total feed intake, ADFI; Average daily feed intake, TWG; Total weight gain, ADWG; Average daily weight gain, FCR; Feed conversion ratio, ADWI; Average daily water intake, TWI; Total water intake

## DISCUSSION

The improvement in feed intake, weight gain and feed conversion ratio observed in rabbits administered GALE could be attributed to the positive effects of the extract expressed through enhanced appetite, improved feed conversion, increased pancreatic and digestive enzymes secretion, and improved intestinal digestibility (Arif *et al.*, 2022). *Gmelina arborea* leaf is an herb which acts as growth promoter and reduces the degradation of amino acids thereby causing improved weight gain due to availability of more amino acids (Imoleayo *et al.*, 2023). This study is in line with Sapsuha *et al.* (2021), who reported increase in live weight gain of bucks as the level of inclusion of dried *Gmelina arborea* leaves increased. The best FCR observed among rabbits administered 900mL/L (T4)

GALE indicated that the feeds were better utilized due to the synergetic effects of the bioactive components of the GALE (Adu *et al.*, 2020; Sapsuha *et al.*, 2021). This indicates that there were no adverse effects on the feeding and ability of the rabbits to convert feeds efficiently up to the level of 900mL/L. It was observed that the rabbit bucks fed more than the females. This could be attributed to the higher basal metabolic rate of the male rabbits and its ability to convert more feed into muscle and expendable circulating energy reserves. Since the male rabbits consumed more feed than the female rabbits group, it is apparent that they consume more water than the female rabbits as rabbit fed on dry feed require more water because dry feed absorbs more water increasing the need for them to drink more (Tschudin *et al.*, 2011). A significant decrease in water consumption was observed across treatments as the level of GALE inclusion increased. The lowest intake of water by the rabbits was observed in T<sub>4</sub>, even though it recorded the highest body weight gain and the best FCR. This might be due to the presence of tannin which has sour- bitter taste. The significant ( $P<0.01$ ) interaction of sex and GALE, indicates that the male rabbits and the female rabbits responded differently to the treatments administered. The same pattern observed across the treatment was also seen in the interaction- as the level of administration of GALE increased, the consumption rate decreased. The difference could be due to the higher inclusion rates used in this study which may have affected the acceptability and consequently the rate of intake of the water.

## CONCLUSION

From the study, administration of GALE to rabbits enhanced growth performance without any negative impact on the health status of the rabbits.

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