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ORIGINAL RESEARCH PAPER

Clerodendron splendens leaf extract supplementation in weaner rabbits: impact on growth performance, haematology and intestinal microbial population

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Abstract: This experiment was carried out at Sumitra Research Institute, Gujarat, India to investigate the effect of supplementing *Clerodendron splendens* leaf extract on the growth performance, intestinal microbial population and some heamatological parameters. A total of fifty cross breed male rabbits (New Zealand white × Chinchilla) with initial body weight of 502 ± 0.80 g and weaned at five weeks of age was used for the experiment. On arrival, animals were quarantined for 14 days, stratified based on their body weight and randomly distributed into five groups consisting of 10 rabbits each in a completely randomized design. Experimental diet (basal) which was adequate in all nutrients; rabbits in group 1(G1) was fed basal diet only while G2, G3, G4 and G5 were fed basal diet with Clerodendron splendens leaf extract at 0.2 mL, 0.4 mL, 0.6 mL and 0.8 mL/day respectively. Average daily weight gain and average daily feed intake of rabbits fed 0 mL (control; group 1), 0.2 mL (group 2) were similar to those given 0.4 mL (group 3) and 0.6 mL (group 4) ($P > 0.05$) but significantly lower than those in group 5 (0.8 mL). Average daily feed intake also increased in rabbits fed 0.8 mL (91.11 g) in group 5 followed by 0.6 mL (89.26 g), 0.4 mL (89.26 g), 0.2 mL (89.17 g) and 0 mL (89.12 g) in group 4, 3, 2 and 1 respectively. Higher mortality of 2 % was recorded in group 1 while none was recorded in the other treatment ($P < 0.05$). *Escherichia coli* and *Lactobacillus* sp., count were significantly ($P < 0.05$) different among the group. Pack cell volume, haemoglobin, red blood cell, white blood cell, mean corpuscular volume, mean corpuscular haemoglobin, mean corpuscular volume, lymphocytes and neutrophil count were not significantly ($P > 0.05$) influenced by the treatment. However, values were within the established range for healthy rabbits. It was concluded that supplementation of *Clerodendron splendens* leaf extract up to 0.8 mL/day had no negative effect on the performance and health status of rabbits.
Keywords: Rabbits; *Clerodendron splendens*; haematology; food safety; production.

1. Introduction

The use of antibiotics in animal feed is prohibited in order to ensure the long-term sustainability of therapeutic availability. This has forced feed makers, farmers, and animal scientists to look for alternatives in order to improve the quality of their products (Veerle; Stefan, 2020). Using medicinal herbs is one of the possible substitutes. The special metabolites from medicinal plants have been found to contain a variety of biologically active compounds (Dellinger et al., 2000; Sandra, 2021). Since antiquity, a wide range of pharmaceutical products derived from plants have been used (Dorman; Deans, 2000). It has been claimed that plant extracts of leaves, stems, flowers, roots, and stem bark are harmless to the environment, effective, and do not leave any harmful residue in animal products (Dai; Mumper, 2010).

The genus *Clerodendrum* L. (f. Lamiaceae: Verbenaceae) is one of these medicinal plants that has achieved widespread recognition for its pharmacological actions against both acute and chronic illnesses (Shrivastava; Patel, 2007). The according by Okwu & Iroabuchi (2008) more than five hundred species of the genus are identified comprising small trees, shrubs and herbs. Despite being widely spread in tropical and subtropical regions of the world, the genus *Clerodendrum* contains more than 500 species (Jin et al., 2018). *Clerodendron splendens* G. Don., sometimes known as "flaming glory bower," is a woody-stemmed, evergreen vine with a variety of uses (Shrivastava; Patel, 2007; Gbedema et al., 2010). Traditionally, a variety of conditions have been treated with extracts from the roots, leaves, and bark of *C. splendens*, including uterine fibroids, skin conditions, rheumatism, coughs, malaria, and venereal illnesses including syphilis, gonorrhea (Emelia, 2008) and wound healing (Gbedema et al., 2010).

Among the phyto-constituents extracted from the leaves, roots, and stem bark extract of *C. splendens* are monoterpene, diterpenoids, sesquiterpene, triterpenoids, flavonoids, glycosides, steroids, and anthraquinones (Xu et al., 2014; Yang et al., 2000), carbohydrates and unsaturated sterols (Shehata et al., 2001). Multiple biological activities of these compounds have been reported (Wu et al., 2011; Nan et al., 2005), including anti-inflammatory, anti-nociceptive, antioxidant, anti-hypertensive, anticancer, antimicrobial, anti-diarrheal, hepato-protective, hypoglycemic, immune-stimulatory, and hypolipidemic properties (Nan et al., 2005; Wu et al., 2011; Obi et al., 2022).

Prior research has demonstrated that the presence of phytochemicals derived from medicinal plants can significantly impact the morphology of the gastrointestinal system and the body's ability to absorb nutrients, hence stimulating animal growth (Sandra, 2021). For example, weaned rabbits fed *Alchornea cordifolia* leaf extract showed improvements in growth performance, nutritional digestibility, and gut health (Oloruntola et al., 2016; Ayodele et al., 2016; Musa et al., 2020). Red blood cell, white blood cell, pack cell volume, and hemoglobin concentration of rabbits fed *Sida acuta* leaf extract were found to rise numerically (Shittu et al., 2021). On the use of leaf extract from *C. splendens* in rabbit production, however, there are few or no reports.

The purpose of this research was to determine the ideal dose for rabbit production as well as to advance food safety by using medicinal plants as an antibiotic substitute.

2. Material and Methods

2.1. Experimental site and ethical statement

The study was carried out in the Rabbit Unit of Sumitra Research Institute, Gujarat, India which is located between 23o 13' N and 72o 41' E West coast, India. Experimental procedures and management was carried out according to the guidelines of the ethic committee of Sumitra Research Institute, India (RR/00A211C).

2.2. Collection and preparation of Clerodendron splendens leaf extract and bioactive profiling

Fresh and mature *C. splendens* leaves were harvested from Sumitra Research Institute Teaching and Research Farm, Gujarat. It was sent to the Department of Crop Science of the institute where it was identified and certified by Mr. Ram Kumar with a voucher number CN/FF/2038H. Leaves were washed with running tap water and shade dried for 14 days to retain its phyto-constituents. The dried leaves of *C. splendens* were ground using an electric blending machine, packed in a labelled container before extraction.

150 g of *C. splendens* powder was immersed into conical flask containing 1000 mL ethanol and stirred intermittently after every 6 hours. The mixture was kept for 48 h and filtered. The extract was evaporated into dryness using a vacuum distillation unit. The residue was subjected to GC-MS analysis.

2.3. Characterization of compounds by GC-MS

Characterization of phyto-constituents in *C. splendens* leaf extract was carried out using Aludra gas chromatography – mass spectrometer (Quadrupole) with split/split less inlet configured at a maximum heating rate of 40 °C/min^{-1}, maximum running time (999.99 min), flow range (200 mL/min^{-1}), humidity (20-80%), emission current (10-350 µA), ionization energy (10-150 eV), turbo molecular pump (250 L/s^{-1}) and mechanical pump (180 L/min^{-1}) for proper working conditions of the gas chromatograph chamber when 2 mL *C. splendens* leaf extract was injected into the inlet unit of the machine. The mass spectrometer is concurrently adjusted at a mass range of 1.5-1024.0 amu, maximum scan rate of 10,000 amu/s and dynamic range 106 before final results were generated via MS 3200 MS software which provides standard spectra library.

2.4. Animals, experimental diet and design

A total of fifty cross breed male rabbits (New Zealand white × Chinchilla) with initial body weight of 502 ± 0.80 g and weaned at five weeks of age were purchased from a rabbit farm in Gujarat. On arrival, animals were quarantined for 14 days, feed experimental diet (Table 1)

which was adequate in all nutrients (NRC, 1977) and treated against endo and ectoparasites with Ivermectin® injection which was administered subcutaneously at the rate of 0.1 mL/kg rabbit. Thereafter, weights of the rabbits were balanced and individually housed in a metallic hutch measuring: 90 cm by 70 cm by 50 cm (length × width × height) in a semi closed pens and randomly distributed into five groups, each treatment consisted of 10 rabbits. A completely randomized design was adopted, and animal were fed twice daily (7:30 AM and 3:30 PM) and also given clean fresh water. Rabbits in group one (G1) were fed basal diet without Clerodendron splendens leaf extract, G2, G3, G4 and G5 were fed basal diet with 0.2 mL, 0.4 mL, 0.6 mL and 0.8 mL/day^{-1} respectively. Drenching of rabbits with *C. splendens* leaf extract was done very early in the morning after feeding.

Record on feed intake was estimated by subtracting the left over from feed consumed all expressed in grams. Total weight gain of rabbits was calculated by subtracting the final body weight from the initial body weight. Average daily weight gain and feed intake was estimated by dividing weight gain and feed intake by the experimental duration respectively.

Table 1: Ingredient and chemical composition of diet.

Raw materials	**Inclusion**
Corn	35.00
Wheat offal	15.00
Palm kernel meal	20.00
Soya bean meal	20.00
Oyster shell	6.00
Bone meal	3.00
Lysine	0.20
Methionine	0.20
Salt	0.35
Mineral/Vitamin Premix	0.25
Total	100.00
Determined analysis	**Results**
Energy (kcal/kg^{-1})	2600.9
Crude protein (%)	15.68
Crude fibre (%)	13.11
Ether extract (%)	4.60
Ash (%)	6.17

Note: Vitamin premix contains: Vitamin A, 5,000 I.U; vitamin E, 20.0 mg; vitamin D 3,500 I.U, vitamin K, 8.00 mg; vitamin B2, 5.0 mg; Niacin, 80 mg; vitamin B12, 21 mg per 2.5 kg; Mineral premix contains: Choline chloride, 71.6 mg; Manganese, 8.02 mg; Zinc, 38.11mg; Copper, 4.80 g; folic acid, 3.11 mg; Iron, 4.03 g; pantothenic acid, 26.1 mg; biotin, 20.8 g; antioxidant 40 mg per 2.5 kg. Source: Authors, 2023.

2.5. Proximate evaluation of experimental diet

Experimental diet was analyzed using Foss NIRSTM DA 1650 feed automatic analyzer. 50 g of feed sample was pass through the collection chamber of the machine and adjusted at a spectra resolution of 0.5 nm/data point, wavelength length and precision (0.5 nm), wave length range (1100‑1650 nm), optical bandwidth (10.44 ± 0.5 nm) and wave length temperature stability (< 0.02 nm/ ºC) before it disseminates result in less than 1 min.

2.6. Haematological analysis

At the end of the trial, 5 rabbits were randomly selected from each treatment for haematological studies. Blood samples (2 mL) was collected in the morning from the marginal ear veins for individual rabbits with a sterile 5 mL syringe and transferred into a labelled bottles containing ethylene diamine tetra acetic acid. After each collection, blood samples were placed in an ice pack before transferring them to the laboratory for further evaluation.

Haematological analysis was carried out using Sysmex – XP -300TM automated haematology analyzer which contains automatic discriminators which separate injected samples according to their cell population and based on complex algorithms.

2.7. Intestinal microbial population analysis

At the end of the trial, 5 rabbits were randomly selected from each treatment for intestinal microbial population estimation (same rabbits used during haematological studies). Rabbits were slaughtered and 2 gram of intestinal content was collected into a sterile labeled sample bottles before it was taken immediately to the laboratory for analysis.

Microbial population was analyzed using 7000 RMS Bioburden analyzer. Microbes were cultured using high nutrient media and incubated at 30-35 ºC for 120‑168 h. Colony forming unit was used to estimate the number of viable bacteria's. For proper accuracy the kit is adjusted at a sample flow rate (30 mL per min), biological detection and quantification (1 auto fluorescent units), linear range (0-700 total counts per mL) and online inlet pressure (0-7 bar) before data are generated via Windows 7 based proprietary software: RMS version 3.01.

2.8. Statistical analysis

The Statistical Program for Social Sciences (SPSS version 21.0) was used to perform a completely randomized design analysis of variance on growth performance and heamatological parameters. The same

software's Duncan multiple range test was performed to assess the significance of the mean difference at the P ≤ 0.05 level.

3. Results

As presented in Table 2, characterization of phyto-constituents in leaf extract by GC/MS. 26 bioactive chemicals *C. splendens* were found, together with their percentage concentrations, according to the results. 10-Azido-1-decanethiol which contains 12% was found as major compound followed by di-methyl urethane 10%, 5, 7, 40-trihydroxy-30-methoxyflavone 9%, 1,14-Tetradecanediol 7%, 2-dimethyl silyoxytridecane 6%), ethyl 9-decenoate 6%, α-amyrin 3-undecanotate 5%, 2-Hyroxylpropanenitrite 5%, 5-O-ethylcleroindicin 4%, 2,5-dimethoxybenzoquinone 3%, α-amyrin 3%, Clerodermic acid 2%, α-spinasterol 2%, 2,2'-Bioxirane 1%, 1-Hexanol, 2-ethyl-2-propyl 1%, 1-Fluorooctane 1%, 3,4 dimethyl 5 hexen 3-ol 1%, Difoliamenthoyleuphroside 1%, 2-propanoic acid, 2 propanyl ester 1%, Heptanoic acid 1%, β-amyrin acetate 0.93%, Isooctanol 0.92%, 7-hydroxyflavanone 7-*O*-glucosides 0.61%, Squalene 0.44%, 3-butyn-2-ol 0.06% and 2-acetoxyclerodendrin B 0.02%.

Table 2. Characterization of phyto-constituents in *Clerodendron splendens* leaf extract by GC/MS.

Phyto-constituents	**% area**	**Class**
Isooctanol	0.92	Diterpenoids
3,4 dimethyl 5 hexen 3-ol	1.77	Monoterpene
3 – butyn-2-ol	0.06	Monoterpene
2,5- dimethoxybenzoquinone	3.91	Anthraquinones
5-O-ethylcleroindicin	4.48	Monoterpenes
5, 7, 40-trihydroxy-30-methoxyflavone	9.33	Flavonoids
Squalene	0.44	Diterpenoids
α-amyrin 3-undecanotate	5.81	Monoterpenes
Difoliamenthoyleuphroside	1.39	Monoterpene
β-amyrin acetate	0.93	Triterpenoids
2-propanoic acid, 2 propanyl ester	1.12	Anthraquinones
7-hydroxyflavanone 7-*O*-glucosides	0.61	Flavonoids
Clerodermic acid	2.11	Diterpenoids
α-amyrin	3.77	Monoterpenes
Heptanoic acid	1.06	Triterpenoids
2-acetoxyclerodendrin B	0.02	Diterpenoids
2,2'-Bioxirane	1.94	Anthraquinones
α-spinasterol	2.07	Steroids
1-Hexanol, 2-ethyl -2-propyl	1.88	Alkaloids
1,14-Tetradecanediol	7.64	Flavonoids
Di-methyl urethane	10.09	Monoterpenes
Ethyl 9-decenoate	6.59	Triterpenoids
1-Fluorooctane	1.83	Anthraquinones
2-dimethyl silyoxytridecane	6.6	Anthraquinones
2-Hyroxylpropanenitrite	5.21	Triterpenoids
10-Azido-1-decanethiol	12.1	Triterpenoids
Total	93.68	

Note: R. Tm: Retention time expressed in minutes. Source: Author, 2023.

As presented in Table 3, growth performance of weaned rabbits fed different levels of *C. splendens* leaf extract. Average daily weight gain of rabbits fed 0 mL (control; group 1), 0.2 mL (group 2) were similar to those given 0.4 mL (group 3) and 0.6 mL (group 4) ($P > 0.05$) but significantly lower than those in group 5 (0.8 mL). Feed conversion ratio values which ranged from (3.56-3.97) was higher ($P < 0.05$) in group 5 relative to the other treatments. Two percentage mortality was recorded in control while none was recorded in the other groups ($P < 0.05$).

Table 3: Growth performance of weaned rabbits fed different levels of *Clerodendron splendens* leaf extract.

Groups	***ED**	**[1]IBW/g**	**[2]FBW/g**	**[3]FWG/g**	**[4]ADWG/g**	**[5]TFI/g**	**[6]ADFI/g**	**[7]FCR**	**[8]MOR**
1 (Control)	56	502.8	1752.11^{b}	1249.31^{b}	22.31^{b}	4991.1^{b}	89.126^{b}	3.97^{b}	2.00
2 (0.2 mL)	56	501.5	1760.93^{b}	1259.43^{b}	22.48^{b}	4993.4^{b}	89.167^{b}	3.96^{b}	-
3 (0.4 mL)	56	501.2	1764.09^{b}	1262.89^{b}	22.55^{b}	4995.6^{b}	89.207^{b}	3.96^{b}	-
4 (0.6 mL)	56	501.3	1781.00^{b}	1279.90^{b}	22.85^{b}	4998.7^{b}	89.262^{b}	3.96^{b}	-
5 (0.8 mL)	56	501.0	1933.85^{a}	1432.85^{a}	25.58^{a}	5102.3^{a}	91.112^{a}	3.56^{a}	-
[9]SEM	-	0.03	12.16	9.11	0.02	36.82	0.18	0.01	0.001

Note: **a, b, c Means on the same column having different superscripts are significantly different;1Initial body weight; 2 Final body weight; 3 Final weight gain; 4 Average daily weight gain;5 Total feed intake; 6 Average daily feed intakes; 7 Feed conversion ratio;8 Mortality; 9 Standard error of mean. Source: Author, 2023.

Table 4 presents the results of hematological parameters in rabbits treated with a diet containing *C. splendens* extract.

Table 4. Haematological traits of weaned rabbits fed different levels of *Clerodendron splendens* leaf extract.

Groups	**[1]Hb (g/dL)**	**[2]PCV (%)**	**[3]RBC (×10^{9}/L)**	**[4]MCV (pg)**	**[5]MCH (fl)**	**[6]MCHC (%)**	**[7]WBC (×10^{6}/L)**	**[8]NEU (%)**	**[9]LYM (%)**
1 (Control)	9.43	38.00	7.03	51.47	21.40	31.80	11.10	32.16	67.93
2 (0.2 mL)	9.50	38.08	7.11	51.56	21.13	31.44	11.27	32.68	68.11
3 (0.4 mL)	9.72	38.17	7.18	51.83	21.45	31.56	11.46	32.77	68.17
4 (0.6 mL)	9.81	38.63	7.20	51.92	21.61	31.60	11.53	32.81	68.61
5 (0.8 mL)	9.90	38.90	7.23	51.98	21.81	31.72	11.61	32.95	68.59
[10]SEM	0.04	0.17	0.02	1.62	0.12	0.14	0.03	1.03	2.10

Note: 1 Haemoglobin; 2 Pack cell volume; 3 Red blood cell; 4 Mean corpuscular volume; 5 Mean corpuscular haemoglobin; 6 Mean corpuscular haemoglobin concentration; 7 White blood cell; 8 Neutrophil; 9 Lymphocytes; 10 Standard error of mean* a, b, c Means on the same column having different superscripts are significantly different. Source: Author, 2023.

Table 5 presents the results of microbiological parameters for *Lactobacillus* and *E. coli* in rabbits on a diet containing C. splendens extract and control.

Table 5. Intestinal microbial population of weaned rabbits fed different levels of *Clerodendron splendens* leaf extract.

Groups	[1] *Lactobacillus sp* CFU/g^{-1}	[2] *Escherichia coli* CFU/g^{-1}
1 (Control)	3.72^{c}	4.81^{a}
2 (0.2 mL)	5.60^{b}	3.04^{b}
3 (0.4 mL)	5.99^{b}	3.00^{b}
4 (0.6 mL)	6.07^{a}	2.96^{c}
5 (0.8 mL)	6.11^{a}	2.90^{c}
[3]SEM	0.06	0.02

Note: a, b, c Means on the same column having different superscripts are significantly different; 3 Standard error of mean; 3 Standard error of mean. Source: Authors, 2023.

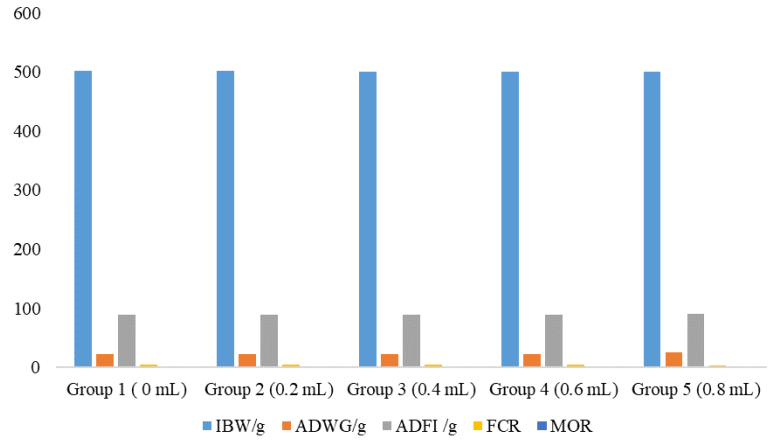

Figure 1. Chat on the growth performance of weaner rabbits fed *Clerodendron splendens* leaf extract. Source: Author, 2023.

4. Discussion

Our results demonstrated that the *C. splendens* leaf extract is rich in phytochemical compounds. Several authors consider these compounds to be potential agents in numerous biological activities (Asumang et al., 2021; Obi et al., 2022; Daouda et al., 2022). According to Singh et al. (2022) and Doughari et al. (2009), all of these bioactive compounds, also known as phyto-constituents, have a wide range of therapeutic or medicinal properties, including anti-inflammatory, antibacterial, anticancer, antidiabetic, anti-inflammatory, antimicrobial, antioxidative, immune-stimulatory, and hepato-protective effects. Alkaloids, cyanogenic glucosides, flavonoids, tannins, terpenoids, saponins, organic acids, and a remarkably large diversity of other physiologically active chemicals make up the defense chemistry of plants (Liu, 2004; Olujuyige et al., 2011).

Many special metabolites are volatile, phenylpropanoids included, but mainly mono- and sesquiterpenes. Apart from acting as deterrents against herbivory and microbial infections, these chemicals also function as signaling agents to draw in pollinators and predators (Farukh, 2015). Biologically active compounds with strong antibacterial properties include 3,4-dimethyl-5-hexen-3-ol, 3-butyn-2-ol, difoliamenthoyleuphroside, Di-methyl urethane, α-amyrin, α-amyrin 3-undecanotate, and 5-*O*-ethylcleroindicin (Sharma, 2012; Odozi et al., 2014). Strong antibacterial and insecticidal agents include 2-acetoxyclerodendrin B, squalene, clerodermic acid, and isooctanol (Lima et al., 2010). 2,5-dimethoxybenzoquinone, 2-propanoic acid, 2 propanyl ester, 2,2'-Bioxirane, 1-Fluorooctane and 2-dimethyl silyoxytridecane have been reported to have anti-inflammatory activities (Ofokansi et al., 2005; Ajayi et al., 2011). 1-Hexanol, 2-ethyl-2-propyl possess analgesic properties (Prabhu; Guruayoorappan, 2012). 7-hydroxyflavanone 7-*O*-glucosides and 5, 7, 40-trihydroxy-30-methoxyflavone is reported to have anti-inflammatory and antioxidant properties (Aworinde et al., 2016).

The results on final weight gain clearly confirmed that feeding rabbits at 0.8 mL Clerodendron splendens leaf extract has the potential to enhance the performance of animals and the efficiency of feed conversion ratio due to the presence of phytochemicals as presented in Table 3. According to Daniel & Alagbe (2023), plant extracts are capable of stimulating the bile, mucus and digestive enzymes of animals leading to a significant improvement in body weight.

Average daily feed intake also increased in rabbits fed 0.8 mL (91.11 g) in group 5 followed by 0.6 mL (89.26 g), 0.4 mL (89.26 g), 0.2 mL (89.17 g) and 0 mL (89.12 g) in group 4, 3, 2 and 1 respectively. This suggests that *C. splendens* leaf extract is capable of improving palatability of feed due to its sweet taste or aroma. Tannins are reported to increase feed palatability, protect mucous membranes and reduce the incidence of diarrhea in rabbits (Beser, 2010). The observation agreed with the findings of Oloruntola et al. (2016) who reported a significant increase in animals fed diet supplemented with *Ocimum gratissimum* leaf powder. Special metabolites in *C. splendens* leaf extract exhibits several pharmacological or medicinal properties such as: antimicrobial, antioxidant, anti-inflammatory, amongst others. This clearly explain the reasons why mortality was not recorded in group 2 to 5. These results agreed with the reports of Shittu et al. (2021) who recorded no mortality when Sida acuta leaf extract was supplemented in the diet of broilers.

As presented in Table 4, haematological traits of weaned rabbits fed different levels of Clerodendron splendens leaf extract. Red blood cell, pack cell volume, heamoglobin, mean corpuscular heamoglobin, mean corpuscular volume, mean corpuscular haemoglobin concentration, white blood cell, neutrophil and leucocytes

count were not influenced ($P > 0.05$) by the treatments. Heamatological parameters can be used for nutritional and disease diagnosis in animals (Singh et al., 2022). Red blood cell, pack cell volume and haemoglobin values were within the reference range of (7.00-15.00 ×109/L), 25.20-35.00% and (5.66-11.80 g/dL) reported by Merck Veterinary Manual (2010). This suggests that the rabbits were not anaemic and there is improved oxygen carrying capacity in the cells of animals, thus permitting the transfer of nutrients in the body (Musa et al., 2021). The observation in this study agreed with the findings of Danung et al. (2024) who reported no significant difference when herbal plant extract was fed to rabbits. Conversely, Jiwuba et al. (2016) recorded that pack cell volume, haemoglobin and red blood cell values were influenced ($P < 0.05$) when weaner rabbits were fed varying levels of *Gmelina arborea* leaf meal. These variations in results can be attributed to differences in dosage of plant extract administered, methods of extraction, specie of plant as well as geographical location (Alagbe, 2024; Alagbe, 2021).

Although, there is no significant difference ($P > 0.05$) for mean corpuscular heamoglobin, mean corpuscular volume and mean corpuscular haemoglobin concentration their values were within the normal ranges (18.0-35.0 fl), (30.0-61.00 pg) and (22.0-50.0%) cited by Burnett et al. (2016) on the normal haematological parameters of weaned rabbits. Decrease in mean corpuscular haemoglobin, mean corpuscular haemoglobin suggests deficiency in water soluble vitamins (vitamin 12 and folic acid) (Alagbe et al., 2023; Adewale et al., 2021). White blood cell, neutrophil and lymphocyte count were within the normal values for weaner rabbits: 6.50-18.00 (×106/L), 10.0-40.0 % and 40.0-75.0 % reported by Abdelnour et al. (2018) when red and black pepper was supplemented in the diet of growing rabbits. This result indicates that the animals were able to produce abundant antibodies which binds to pathogens to keep the animals alive and strengthen the immune system (Alagbe et al, 2020).

As presented in Table 5 and Figure 1, intestinal microbial population of weaned rabbits fed different levels of C. splendens leaf extract. *Lactobacillus* sp., count in group 2 (0.2 mL) and 3 (0.4 mL) were similar ($P > 0.05$). Similarly, animals fed 0.6 mL (group 4) and 0.8 mL *C. splendens* leaf extract (group 5) were also similar ($P > 0.05$) but significantly higher ($P < 0.05$) than those in control (group 1). *Escherichia coli* count which ranged from (2.90-4.81 CFU/g^{-1}) were higher in group 1, intermediate in group 2 (0.2 mL), 3 (0.4 mL) and lowest in group 4 (0.6 mL) and 5 (0.8 mL) ($P < 0.05$). The result suggests that presence of *C. splendens* leaf extract in the diets of rabbits accelerates the activities of phyto-constituents or phytochemicals (Table 3) with therapeutic properties which can perforate the lipid bilayer of pathogens, increasing cell wall permeability (Alagbe and Ushie, 2021). Once *C. splendens* leaf extract gets into the cytoplasm of animals, they damage the genetic material, preventing cell replication (Shittu et al., 2021).

Phytochemicals can also provide substantial oxidative effects, mediated through upregulation of antioxidative enzymes and direct scavenging of free radicals thus favouring the proliferation of beneficial bacteria such as *Lactobacillus* sp. (Muritala et al., 2021). This observation agreed with the findings of Elwardany et al. (2022) on effects of medicinal and aromatic plants on the caecal microbial population of growing rabbits. Similar observation was made by Elghalid et al. (2020) when newly developed mixture of herbal plants and spices enriched with special extracts and essential oils were supplemented in the diet of grower rabbits.

5. Conclusion

In conclusion, *Clerodendron splendens* leaf extract possess phytochemicals such as terpenes, alkaloids, aldehydes and glycosides, which are responsible for their biological properties: antioxidant, antimalarial, antibacterial, antifungal, antiviral properties amongst others.

They can serve as potential candidates for combating antimicrobial resistance. In weaner rabbits, it was observed that supplementation of *Clerodendron splendens* leaf extract up to 0.8 mL/day^{-1} enhanced the growth performance, the palatability of feed and also prevent the proliferation of pathogenic organism without causing a deleterious effect on its hematological indices.

6. Acknowledgement

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Alagbe Olujimi John: data collection, statistical analysis and preparation of write-up.

Ethics

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