International Journal of Applied and Scientific Research (IJASR)
Vol. 2, No. 9, 2024 : 767-778

Effect of Dietary Supplementation of Date Palm (*Phoenix Dactylifera*) Seed Powder on the Growth Performance and Carcass Characteristics of Weaned Rabbits

Olujimi John Alagbe
Sumitra Research Institute, Gujarat, India
Corresponding Author: Olujimi John Alagbe dralagbe@outlook.com

ARTICLE INFO

Keywords: Carcass, Date Palm, Seed, Therapeutic, Rabbit

Received : 20, July
Revised : 27, August
Accepted: 26, September

ABSTRACT

Finding out how date palm (*Phoenix dactylifera*) seed powder supplementation affects the growth performance and carcass characteristics of weaned rabbits will help to address the increasing cases of antimicrobial resistance and provide natural alternatives to antibiotics. A total of 80 - 5 weeks weaned male crossbred rabbits with an initial body weight of 630.3 ± 2.80 g were grouped into five treatments (A, B, C, D and E) consisting of twenty rabbits each and each rabbit served as a replicate . Phytochemical evaluation of date palm seed powder showed that it contained phenol, flavonoids, terpenoids, tannins, saponins, alkaloids and steroids. Average daily weight gain, average daily feed intake, feed conversion ratio were significantly ($P<0.05$) influenced by the treatments. Rabbits fed date palm seed powder at 80 g/kg diet (E) had a higher average body weight and best feed conversion ratio, intermediate in B, C and D, lowest in A. Higher average daily feed intake was recorded among rabbits fed date palm seed powder relative to the control ($P<0.05$). Dressed weight values varied from 791.81 - 1000.7 g, dressing percentage (49.02 - 65.80 %) and weights of organs were significantly ($P<0.05$) different among the treatments.

DOI: https://doi.org/10.59890/ijasr.v2i9.2345
https://journal.multitechpublisher.com/index.php/ijasr/

INTRODUCTION

There has been increasing statutory pressure to phase out the regular feeding of antibiotics as feed additives in several nations around the world due to the presence of drug residues in edible animal products and the environment, as well as antimicrobial resistance, which has become a major global issue endangering the health and well-being of all people (Peter, 2020; Carranza et al. 2015). Traditional plant-based herbal medicines are one promising method for preventing antimicrobial resistance (Matu and Van Staden 2003; Mandal et al., 2005; Ojediran et al., 2024a). Herbal plants contain phytochemicals or phyto-constituents that have therapeutic or medicinal properties including, anti-inflammatory, antioxidant, immunostimulatory, cardio-protective, gastro-protective, antifungal, antiviral, antihelminthic, hepato-protective, antimicrobial, cytotoxic, anti-diarrheal amongst others (Lagnika et al., 2011; Ojediran et al., 2024b).

Date palm (*Phoenix dactylifera*) is widely cultivated in tropical and subtropical regions, notably in the Middle East, North Africa and most part in Asia including India (Brouk et al., 2016). The plant is drought resistance and can grow under high temperature (Brouk et al., 2016). The plant belongs to palm family, Arecaceae which is cultivated for its sweet edible fruits (dates). Date tree can grow up to 30 m in height depending on its variety and it consists of oval - cylindrical seeds which is about 1-3 inch long with varying colour (Tafti et al., 2017). The leaves of date palm leaves or fonds are green with gray tones, have long petioles covered with spike on the base (Anbarshahi, 2022).Date seeds are rich in essential minerals including, potassium, phosphorus, magnesium, manganese, zinc, calcium, cobalt amongst others which are needed for normal metabolic process in the body (Habib et al., 2013).

According to (Juhaimi et al., 2012; Salomón-Torres et al., 2019) date seeds contains wide range of phytoconstituents including, phenolic compounds, flavonoids, tannins, terpenoids, saponins and steroids which have tremendous medicinal properties (antioxidant, anti-inflammatory, antiviral, antifungal, antibacterial, anti-ulcer, anti-tumor, anti-diabetic, immune-modulatory, anti-hypertensive and analgesics). These compounds have been considered to be responsible for the plant's diverse pharmacological activities. Boiled aqueous palm leaves have been used for the treatment of common cold, back and stomach ache while the seeds can be used to combat heart disease, diarrhea, cough and body pain (Hilary et al., 2021). Furthermore, it was shown that methanolic and ethanolic extracts from the leaves and stem bark have been reported to inhibit the activities of *Salmonella aureus*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, and *Enterococcus faecalis* (Bentrad et al., 2020; Alkhoori et al., 2022).

Results from Notable researchers have shown that dietary supplementation of phytogenics in the diet of rabbits promotes growth (Hosseini and Meimandipour, 2018), stimulate the activities of endogenous enzymes and palatability of feed (Büyükkılıç et al., 2020; Elnaggar et al., 2021), inhibit the activities of pathogenic organisms in the gastro-intestinal tract (Fawaz et al., 2022; Gumus et al., 2017), scavenge the activities of free radicals and improve the

antibodies in the blood (Abdelnour et al., 2022). However, there is a dearth of information on the effect of date palm seed powder on the performance of rabbits. This research is vital especially with the recent upsurge in the use of herbal remedies, there is a need for a thorough scientific evaluation to validate or disprove the supposedly therapeutic effects of some of these medicinal plants. This study will further help to establish an optimum level for growing rabbits.

The purpose of this experiment was to evaluate how date palm seed powder affected the growth and carcass characteristics of weaned rabbits.

METHODOLOGY

The study involved 80-55 week-old male crossbred rabbits from a reputable breeding farm in Gujarat, India, who were placed on a basal diet formulated to meet their nutrient requirements. The rabbits were grouped into five treatments (A, B, C, D, and E) and fed varying amounts of date palm seed powder. The experiment lasted for 90 days, with each rabbit serving as a replicate. The animals were given a basal diet without date palm seed powder, while those in treatment B, C, D, and E received the same diet with date palm seed powder. The study used a completely randomized design experimental arrangement and collected data on growth performance estimation, carcass traits, and qualitative phytochemical analysis. The study found that date palm seed powder significantly increased the weight gain of the rabbits, while the diet without date palm seed powder resulted in a significant weight gain. The study highlights the potential of date palm seed powder in improving rabbit health and performance.

RESEARCH RESULT AND DISCUSSIONS

Table 1: Ingredient and Chemical Profile of Basal Diet

Ingredients	Inclusion (%)
Corn	45.65
Rice bran	25.00
Soya bean meal	20.00
Groundnut meal	5.00
Limestone	1.50
Di-calcium phosphate	2.00
Lysine (essential amino acid)	0.20
Methionine (DL)	0.20
Vitamin-mineral premix	0.25
Common salt	0.20
Total	100.00
Determined analysis	
Metabolisable energy (kcal/kg)	2500.6
Crude protein	15.88

Crude fibre	13.06
Ether extract	4.52
Calcium	1.40
Phosphorus	0.55

2.5 kg Mineral/Vitamins contains: Retinol 10 000 000 IU, Cholecalciferol 3 000 000 UI, Tocopherol 2500 IU, Phylloquinon 4000 mg, Thiamin 5000 mg, Riboflavin 500 mg, Pyridoxin 2500 mg, Cyanocobalamin 5 mg, Folic acid 10 000 mg, Niacin 2000 mg, Mn, 60000 mg; Zn, 50000 mg; Fe, 30000 mg; Cu, 10000 mg; I, 1000 mg; Se, 100mg; Co, 100m

The phytochemical composition of date palm seed powder in Table 2 reveals that phenolic, terpenoids and flavonoids are the major compounds followed by saponins, steroids, tannins and alkaloids. Medicinal plants are the richest source of natural antimicrobial agents because they contain numerous bioactive compounds or phytochemicals that are non-toxic, eco-friendly and requires no withdrawal period (Alagbe et al., 2019; Adewale et al., 2021). These phytochemicals are found at various concentrations on the seeds, leaves, stem bark, root, buds and flowers with therapeutic properties (Alagbe, 2019; Musa et al., 2020). According to Singh et al. (2022); Chua (2013), plants used as traditional medicine possess phytochemicals such as oxygenated terpenes, tannins, alkaloids, aldehydes and cardiac glycosides, which are responsible for the plant's biological properties. The result obtained in the qualitative analysis of date seed palm powder is in agreement with the reports of Alkhoori et al. (2022); Ghafoor et al. (2022). Higher concentrations of phenolic compounds suggests that date palm seed powder are strong antioxidants capable of preventing immune suppression (Alagbe and Grace, 2019). They can also capable of inhibiting the activities of pathogens in the gastrointestinal (Hilary et al., 2021), anti-inflammatory, hepato-protective (Alagbe et al., 2019) and cytotoxic properties (Brouk and Fishman, 2016). Alkaloids can function as analgesics for the treatment of headache, toothache and general body pain and malaria (Alagbe et al., 2019). Flavonoids and terpenoids have been suggested to perform gastro-protective and cardio-protective activities (Tafti et al., 2017; Ayanwuyi et al., 2010), antimicrobial, antiviral, immune-stimulatory and anti-diarrheal properties (Shittu et al., 2021). According to Awouafack et al. (2013); Badakhshan et al. (2009), tannins have anti-bacterial, antifungal and anti-helminthic properties. Anti-gonadotropic effect of medicinal plants have been attributed to the presence of steroids (Chukwujekwu et al., 2006; Alagbe, 2017).

Table 2: Phytochemical Composition of Date Palm Seed Powder

Phytochemicals	Concentrations
Phenols	+++
Flavonoids	+++
Terpenoids	+++
Saponins	+
Steroids	+
Tannins	+
Alkaloids	+

In Table 2, average daily weight gain, average daily feed intake and feed conversion ratio were significantly ($p<0.05$) influenced by the dietary supplementation of date palm seed powder in weaned rabbits. Average daily weight gain in treatment B (20 g date palm seed powder per kg diet) and treatment C (40 g date palm seed powder per kg diet) which was 13.10 g and 13.09 g respectively was similar ($p>0.05$) to those which received treatment D (60 g date palm seed powder per kg diet) which later increased ($p<0.05$) to 16.34 g among rabbits fed diet E (80 g date palm seed powder per kg diet). Average daily feed intake were lower in treatment A (control) relative to the other treatments ($p<0.05$). Increasing the supplementation of date palm seed powder to 80 g/kg diet significantly ($p<0.05$) reduced the feed conversion ratio. Values were higher in treatment A, intermediate in treatment B, C, D and lower in treatment E ($p<0.05$). Body weight gain recorded in this experiment (972.6 - 1470.6 g) were similar ($p>0.05$) to the results of a study by Omokore and Alagbe (2019) who observed a total body weight (871.22 - 1500.6 g) in growing rabbits fed diet supplemented with *Phyllantus amarus* leaf meal. The outcome was significantly lower ($p<0.05$) than those presented by Adewale et al. (2021) (1008.3 - 1700.1 g) when rabbits were fed *Rauvolfia Vomitoria* root extract. The variation in body weight gain observed in treatment A-E suggest that date palm seed powder has the ability to stabilize the intestinal flora due to the presence of phytochemicals of rabbits this process activate the activities of enzymes in the gastro-intestinal tract thus promoting feed utilization among rabbits fed date palm seed powder relative to the control (treatment A). Total feed intake observed in this study with the dietary supplementation of date palm seed powder (6879.4 - 7011.1 g) was similar ($p>0.05$) to the reports by Alagbe et al. (2019); Alagbe et al. (2017) who recorded (6008.7 - 7111.5 g) and (6500.2 - 7206.1 g) when *Albizia lebbeck* and *Polyalthia longifolia* seed oil was supplemented in the diet of weaned rabbits and growing grass-cutters respectively. This result was significantly higher ($p<0.05$) than those presented by John (2024) who found out that weaned rabbits fed diet supplemented with *Clerodendron splendens* leaf extract body weight gain ranged from (5200.4 - 5966.8 g). This result indicates that date seed palm powder has the advantage of stimulating appetite of animals since increased supplementation lead to a significant increase in feed consumption compared to the control. This activities reduces the retention time of feed in the gastro intestinal tract and

translates to a better weight gain and feed conversion ratio. According to Alagbe (2019); (2023), addition of phytogenics in the diets of animals could enhance their flavor, thus improving feed consumption. Feed conversion ratio observed in this study (4.77 - 7.07) was similar to those observed by Abdu et al. (2012) who found out that feed conversion ratio of growing rabbits fed different levels of carrot leaf meals varied from (4.02 - 6.55). This result is also similar to the results obtained by Bitto et al. (2006), who recorded a feed conversion ratio of 5.04 - 7.00 in female rabbits fed pawpaw peel meal based diets.

Table 3. Effect of Date Palm Seed Powder On The Growth Performance of Weaned Rabbits

Parameters	A	B	C	D	E	SEM
Number of rabbits	20	20	20	20	20	-
Duration of experiment in days	65	65	65	65	65	-
Initial body weight (g)	632.1	630.9	633.1	630.5	630.3	0.01
Final body weight (g)	1604.7^{c}	1809.6^{b}	1811.5^{b}	1810.1^{b}	2100.9^{a}	71.82
Body weight gain (g)	972.6^{c}	1178.7^{b}	1178.4^{b}	1179.6^{b}	1470.6^{a}	49.93
Daily body weight gain (g)	10.81^{c}	13.10^{b}	13.09^{b}	13.11^{b}	16.34^{a}	0.06
Total feed intake (g)	6879.4^{b}	7010.6^{a}	7010.8^{a}	7010.9^{a}	7011.1^{a}	123.7
Daily feed intake (g)	76.43^{b}	77.89^{a}	77.89^{a}	77.89^{a}	77.90^{a}	0.56
Feed conversion ratio	7.07^{a}	5.95^{b}	5.95^{b}	5.95^{b}	4.77^{c}	0.02

Different letters in the same column ($^{a, b, c}$) indicate significant differences ($p<0.05$); SEM, standard error of means; each value represents the mean of five replicates (20 rabbits per replicate); A: basal diet without date palm seed powder (control); B: basal diet with 20 g date palm seed powder per kg diet; C: basal diet with 40 g date palm seed powder per kg diet; D: basal diet with 60 g date palm seed powder per kg diet; E: basal diet with 80 g date palm seed powder per kg diet

Carcass characteristics of weaned rabbits fed diet supplemented with date palm seed powder (Table 4) revealed that fasted weight, dressed weight and relative weights of head, neck, rib, fore limb, hind limb and loin were influenced ($p<0.05$) by the treatments. Dressing percentage in treatment A (control) was 49.02 % which increased to 65.80 % in rabbits fed treatment E (80 g date palm seed powder per kg diet) ($p<0.05$). The dressed weight range (791.81 - 1007.9 g) observed in this experiment with the dietary supplementation of date palm seed powder was similar to the result of a study by Alagbe et al. (2018) who recorded an average dressed weight of 800.2 - 1200.7 g in growing rabbits fed different levels of *Delonix regia* seed meal. This findings was lower than those presented by Oluwabiyi et al. (2020) who recorded a range of 766 - 900 g in growing rabbits fed biodegraded sweet orange (*Citrus sinensis*) fruit peel. The increase in dressed weight could be attributed to higher weight gain recorded among birds fed diet supplemented with date palm seed powder due to the influence of phytochemicals in the feed (Nuhu, 2010). Dressing percentage values which

varied from 49.02 - 65.80 % is in agreement with the findings of Nuhu (2010) when Moringa leaf meal was fed to weaner rabbits. Weights of heart, liver and other cut parts were higher in treatment E, intermediate in treatment B, C, D and lowest in the control (treatment A). According to Ahamefule et al. (2006), high liver weight is an indication of higher metabolic rate of the liver to reduce or eliminate toxins in the body system. The result obtained in this study suggests that the phytochemicals in date palm seed powder were not toxic to rabbits.

Table 4: Effect of Date Palm Seed Powder On The Carcass Characteristics of Weaned Rabbits

Variables	A	B	C	D	E	SEM
Fasted weight (g)	1631.2^{c}	1602.8^{b}	1612.4^{b}	1610.1^{b}	1706.7^{a}	69.31
Dressed weight (g)	791.81^{c}	990.23^{b}	991.47^{b}	992.62^{b}	1007.9^{a}	32.91
Dressing percentage	49.02^{c}	56.04^{b}	56.88^{b}	56.00^{b}	65.80^{a}	8.44
Head (%)	6.72^{c}	9.11^{b}	9.06^{b}	9.01^{b}	11.99^{a}	0.03
Neck (%)	3.05^{c}	5.11^{b}	5.03b	5.05^{b}	7.02^{a}	0.02
Rib (%)	8.67^{c}	11.02^{b}	11.44^{b}	11.03^{b}	13.05^{a}	0.15
Fore limb (%)	7.05^{c}	9.65^{b}	9.11^{b}	9.98^{b}	12.01^{a}	0.1
Hind limb (%)	9.52^{c}	11.04^{b}	11.16^{b}	11.02^{b}	14.56^{a}	0.12
Loin (%)	10.84^{c}	13.06^{b}	13.24^{b}	13.04^{b}	15.25^{a}	0.11
Liver (%)	0.92^{b}	1.56^{a}	1.60^{a}	1.72a	1.83a	0.02
Heart (%)	0.22^{b}	0.72^{a}	0.88^{a}	0.92a	0.96a	0.01

Different letters in the same column ($^{a, b, c}$) indicate significant differences ($p<0.05$); SEM, standard error of means; each value represents the mean of five replicates (20 rabbits per replicate); A: basal diet without date palm seed powder (control); B: basal diet with 20 g date palm seed powder per kg diet; C: basal diet with 40 g date palm seed powder per kg diet; D: basal diet with 60 g date palm seed powder per kg diet; E: basal diet with 80 g date palm seed powder per kg diet

CONCLUSIONS AND RECOMMENDATIONS

In conclusion, date palm seed powder is rich in several phyo-consituents with medicinal properties. Dietary supplementation of date palm seed powder at 80 g per kilgram gave the best result suggestng that at that level was efficient and it didn't compromise the performance and health status of rabbits.

REFERENCES

Büyükkılıç Beyzi, S., Konca, Y., Kaliber, M., Sarıözkan, S., Kocaoğlu Güçlü, B., Aktuğ, E., & Şentürk, M. (2020). Effects of thyme essential oil and A, C, and E vitamin combinations to diets on performance, egg quality, MDA, and 8-OHdG of laying hens under heat stress. Journal of Applied Animal Research, 48(1), 126-132. Elnaggar, S. A., Ali, R., & El-Said, E. (2021). Complementary effect of black pepper and turmeric on productive performance and physiological responses of Japanese quail. Egyptian Poultry Science Journal, 41(1), 77-91.

Fawaz, M. A., Südekum, K. H., Hassan, H. A., & Abdel-Wareth, A. A. (2022). Productive, physiological and nutritional responses of laying hens fed different dietary levels of turmeric powder. Journal of Animal Physiology and Animal Nutrition, 10, 1–8.

Gumus, R., Ercan, N. A. Z. L. I., & Imik, H. (2017). The effect of thyme essential oil (Thymus vulgaris) added to quail diets on performance, some blood parameters, and the antioxidative metabolism of the serum and liver tissues. Brazilian Journal of Poultry Science, 19, 297-304.

Hosseini, S. A., & Meimandipour, A. (2018). Feeding broilers with thyme essential oil loaded in chitosan nanoparticles: an efficient strategy for successful delivery. British Poultry Science, 59(6), 669-678.

Abdelnour, S. A., El-Ratel, I. T., Peris, S. I., El-Raghi, A. A., & Fouda, S. F. (2022). Effects of dietary thyme essential oil on blood haematobiochemical, redox status, immunological and reproductive variables of rabbit does exposed to high environmental temperature. Italian Journal of Animal Science, 21(1), 51-61.

Alkhoori, M.A.; Kong, A.S.-Y.; Aljaafari, M.N.; Abushelaibi, A.; Erin Lim, S.-H.; Cheng, W.-H.; Chong, C.-M.; Lai, K.-S. Biochemical Composition and Biological Activities of Date Palm (Phoenix dactylifera L.) Seeds: A Review. Biomolecules 2022, 12, 1626. https://doi.org/10.3390/biom12111626

Ghafoor, K.; Sarker, M.Z.I.; Al-Juhaimi, F.Y.; Babiker, E.E.; Alkaltham, M.S.; Almubarak, A.K. Extraction and Evaluation of Bioactive Compounds from Date (Phoenix dactylifera) Seed Using Supercritical and Subcritical CO2 Techniques. Foods 2022, 11, 1806.

Hilary, S.; Kizhakkayil, J.; Souka, U.; Al-Meqbaali, F.; Ibrahim, W.; Platat, C. In-vitro Investigation of Polyphenol-Rich Date (Phoenix dactylifera L.) Seed Extract Bioactivity. Front. Nutr. 2021, 8, 667514

Brouk, M.; Fishman, A. Antioxidant Properties and Health Benefits of Date Seeds. In Functional Properties of Traditional Foods; Kristbergsson, K., Ötles, S., Eds.; Springer: Boston, MA, USA, 2016; pp. 233–240.

Tafti, A.G. Solaimani Dahdivan, N. Yasini Ardakani, S.A. Physicochemical properties and applications of date seed and its oil. Int. Food Res. J. 2017, 24, 1399–1406.

Habib, H.M.; Kamal, H.; Ibrahim, W.H.; Dhaheri, A.S.A. Carotenoids, fat soluble vitamins and fatty acid profiles of 18 varieties of date seed oil. Ind. Crops Prod. 2013, 42, 567–572.

Juhaimi, F.A.; Ghafoor, K.; Özcan, M.M. Physical and chemical properties, antioxidant activity, total phenol and mineral profile of seeds of seven different date fruit (Phoenix dactylifera L.) varieties. Int. J. Food Sci. Nutr. 2012, 63, 84–89.

Anbarshahi, R. The Amazing Health Benefit of Date Seed Powder. Available online: https://date-seed.com/the-amazing-health benefit-of-date-seed-powder/ (accessed on 11 July 2022).

Bentrad, N.; Gaceb-Terrak, R. Evaluation of the level of biomolecules isolated from date palm seeds (Phoenix dactylifera) and in vitro Antioxidant property. BioMedicine 2020, 10, 23–29

Salomón-Torres, R.; Ortiz-Uribe, N.; Valdez-Salas, B.; Rosas-González, N.; García-González, C.; Chávez, D.; Córdova-Guerrero, I.; Díaz-Rubio, L.; Haro-Vázquez, M.D.P.; Mijangos-Montiel, J.L.; et al. Nutritional assessment, phytochemical composition and antioxidant analysis of the pulp and seed of medjool date grown in Mexico. PeerJ 2019, 7, e6821.

Alagbe, J.O (2018). Effect of different levels of *Delonix regia* seed meal on the performance of growing grasscutters. Agricultural Research and Technology Open Access Journal, 18(4): 556064.

Alagbe, J.O., Sadiq, M.R., Anaso, E.U and Grace, F.R. (2019). Efficacy of *Albizia lebbeck* seed oil on the growth performance and carcass characteristics of weaner rabbits. *Sumerianz Journal of Agriculture and Veterinary*. 2(12): 116-122.

Omokore, E.O and Alagbe, J.O. (2019). Efficacy of dried *Phyllantus amarus* leaf meal as an herbal feed additive on the growth performance, haematology and serum biochemistry of growing rabbits. *International Journal of Academic Research and Development*. 4(3): 97-104.

Alagbe, J.O and Omokore, E.A. (2019). Effect of replacing soya bean meal with *Indigofera zollingeriana* leaf meal on the performance and carcass characteristics of growing rabbits. *International Journal of Multidisciplinary Research and Development*. 6(5): 74-77.

Alagbe, J.O. (2019). Performance and haemato-biochemical parameters of weaner rabbits fed diets supplemented with dried water melon (rind) meal. *Journal of Dairy and Veterinary Sciences*, 8(4):001-007.

Abdu S. B., Jokthan G. E, Hassan M. R., Adamu H. Y., Yashim S. M and Ikani E. (2012) Effects of Inclusion Levels of Carrot (Daucus carota) Leaf Meal on Performance of growing Rabbits. World J Life Sci. and Medical Research, 2 (2): 65-70.

Oluwabiyi, O, Janet, S., Motselisi, M and Adesina, A. (2020). Utilisation of Biodegraded Sweet Orange (Citrus sinensis) Fruit Peel as a Replacement for Maize in Grower Rabbit Diet. East African Scholars Journal of Agriculture and Life Sciences, 3(10): 311-317

Ahamefule, K. U., Obua, B. E., Oguike, S.A. (2006). Blood Chemistry and haematology of weaner Rabbits fed sundried, ensiled and fermented cassava peel based diets, Pakistan Journal of Nutrition, 5, 248 – 253.

John AO. Clerodendron splendens leaf extract supplementation in weaner rabbits: impact on growth performance, haematology and intestinal microbial population. Cerrado: Agric. Biolog. Res. 2024; 1(1): 21-31

Alagbe, J.O., Eimoga, A.A and Alagbe, O.O. (2017). Growth response and carcass characteristics of weaner grass cutters fed diets supplemented with *Polyalthia longifolia* seed oil as a natural growth promoter. *Greener Journal of Agricultural Sciences*. 7(5): 112-119.

Alagbe, J.O. (2017). Effect of Miadasan as a dietary supplement on performance, carcass characteristic and blood profile of broiler chicken. *Scholarly Journal of Agricultural Science*. 7(2):27-33.

Alagbe JO. Investigating the effects of dietary supplementation of Eucalyptus camaldulensis essential oil on the growth performance, nutrient digestibility and caecal fermentation of weaned rabbits. Research in: Agricultural Veterinary Science. 2023; 7(3): 139 - 148.

Bitto I. I., Arubi J. A. and Gumel A. A. (2006). Reproductive Tract Morphometry and Some Haematological Characteristics of Female Rabbits Fed Pawpaw Peel Meal Based Diets African Journal of Biomedical Research, 9(2): 199 – 204.

Alagbe, J.O and Adegbite Motunrade Betty (2019). Haematological and serum biochemical indices of starter broiler chicks fed aqueous extract of *Balanites aegyptiaca* and *Alchornea cordifolia* bark mixture. *International Journal of Biological, Physical and Chemical Studies*. 1(1): 8-15

Alagbe, J.O (2019). Proximate, mineral and phytochemical analysis of *Piliostigma thonningii* stems bark and roots. *International Journal of Biological, Physical and Chemical Studies,* 1(1): 1-7.

Alagbe, J.O and Grace, F.R. (2019). Effect of *Albizia lebbeck* seed oil dietary supplementation on the haematological and serum biochemical parameters of weaner rabbits. *Sumerianz Journal of Agriculture and Veterinary*. 2(10): 96 -100.

Alagbe, J.O., Sharma, D and Xing Liu (2019). Effect of aqueous *Piliostigma thonningii* leaf extracts on the haematological and serum biochemical indices of broiler chicken. *Noble International Journal of Agriculture and Food Technology*. 1(2): 62-69.

Alagbe, J.O., Olanrewaju, A., Adewemimo, A and Tanimomo, B.K. (2019). Carcass, caecal microbial population and immune parameters of broilers given different levels of mixed lemon grass ((*Cymbopogon citratus*) and garlic (*Allium sativum*) extract. *Academic Journal of Life Sciences*. 5(11): 107-111.

Musa, B., Alagbe, J.O., Adegbite Motunrade Betty, Omokore, E.A. (2020). Growth performance, caeca microbial population and immune response of broiler chicks fed aqueous extract of *Balanites aegyptiaca* and *Alchornea cordifolia* stem bark mixture. *United Journal for Research and Technology*, 2(2):13-21.

Adewale, A.O., Alagbe, J.O., Adeoye, Adekemi. O. (2021). Dietary Supplementation of *Rauvolfia Vomitoria* Root Extract as A Phytogenic Feed Additive in Growing Rabbit Diets: Haematology and serum biochemical indices. *International Journal of Orange Technologies*, 3(3): 1-12.

Singh Sharma., Alagbe Olujimi John., Liu Xing., Sharma Ram and Kumar Amita (2022). Comparative analysis of ethanolic *Juniperus thurifera* leaf, stem bark and root extract using gas chromatography and mass spectroemetry. *International Journal of Agriculture and Animal Production*, 2(6): 18-27.

Chua, L. S. (2013) 'A Review on Plant-Based Rutin Extraction Methods and its Pharmacological Activities'. Journal of Ethnopharmacology 150 (3), 805-817

Shittu, M.D., Alagbe, J.O., Adejumo, D.O., Ademola, S.G., Abiola, A.O., Samson, B.O and Ushie, F.T. (2021). Productive Performance, Caeca Microbial Population and Immune-Modulatory Activity of Broiler Chicks Fed Different Levels *Sida Acuta* Leaf Extract in Replacement of Antibiotics. *Bioinformatics and Proteomics Open Access Journal* 5(1): 000143.

Chukwujekwu, J., Coombes, P., Mulholland, D., and Van Staden, J. (2006) 'Emodin, an Antibacterial Anthraquinone from the Roots of Cassia Occidentalis'. South African Journal of Botany 72 (2), 295-297.

Badakhshan, M. P., Sasidharan, S., Rameshwar, N. J., and Ramanathan, S. (2009) 'A Comparative Study: Antimicrobial Activity of Methanol Extracts of Lantana Camara various Parts'. Pharmacognosy Research 1 (6):348-355

Awouafack, M. D., McGaw, L. J., Gottfried, S., Mbouangouere, R., Tane, P., Spiteller, M., and Eloff, J. N. (2013) 'Antimicrobial Activity and Cytotoxicity of the Ethanol Extract, Fractions and Eight Compounds Isolated from Eriosema Robustum (Fabaceae)'. BMC Complementary and Alternative Medicine 13 (1): 289-292.

Nuhu F. (2010). Effect of Moringa leaf meal (molm) on nutrient digestibility, growth, carcass and blood indices of weaner rabbits M.Sc Dissertation. Department of Animal Science, Kwame Nkrumah University of Science and Technology, Kumasi.

Ayanwuyi, L. O., Yaro, A. H., and Abodunde, O. M. (2010) 'Analgesic and Anti-Inflammatory Effects of the Methanol Stem Bark Extract of Prosopis Africana'. Pharmaceutical Biology 48 (3), 296-299

Mandal, P., Babu, S. S., and Mandal, N. (2005) 'Antimicrobial Activity of Saponins from Acacia Auriculiformis'. Fitoterapia 76 (5), 462-465

Matu, E. N. and Van Staden, J. (2003) 'Antibacterial and Anti-Inflammatory Activities of some Plants used for Medicinal Purposes in Kenya'. Journal of Ethnopharmacology 87 (1), 35-41

Carranza, M. G., Sevigny, M. B., Banerjee, D., and Fox-Cubley, L. (2015) 'Antibacterial Activity of Native California Medicinal Plant Extracts Isolated from Rhamnus Californica and Umbellularia Californica'. Annals of Clinical Microbiology and Antimicrobials 14 (1), 29

Lagnika, L., Anago, E., and Sanni, A. (2011) 'Screening for Antibacterial, Antioxidant Activity and Toxicity of some Medicinal Plants used in Benin Folkloric Medicine'. Journal of Medicinal Plants Research 5 (5), 773-777

Ojediran, T.K., Emiola, I.A., Durojaye, V and John Alagbe (2024a). Proximate, vitamin and GC-MS profiling of Kigella africana powder. *Cerrado: Agricultural and Biological Research,* 1(1): 13-20.

Ojediran, T.K., Emiola, I.A., Durojaye, V and John Alagbe (2024b). Analysis of Kigellia africana fruit's powder antioxidant and phytochemical properties. *Brazilian Journal of Science*, 3(7): 38-49