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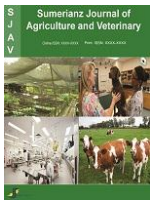

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Efficacy of *Albizia Lebbeck* Seed Oil on the Growth Performance and Carcass Characteristics of Weaner Rabbits

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Abstract

The efficacy of *Albizia lebbeck* seed oil (ALO) on the growth performance and carcass characteristics of weaner rabbits. Fifty (50) weaned rabbits of mixed breed and sexes, aged between 6-7 weeks with an average initial body weight of 460 ± 1.30 were randomly divided into five experimental groups. Each group was further subdivided into five replicates consisting of two rabbits each in a completely randomized design. The first group (T1) fed on basal diets without ALO (control diet). The other groups (T2), (T3), (T4) and (T5) were fed on basal diets supplemented with ALO at levels of 0.1 %, 0.2 %, 0.3 % and 0.4 % respectively. The experimental diets were fed for 10-weeks duration on which performance and carcass parameters were recorded. The result showed that rabbits in T5 given 0.4 % ALO had the highest weight gain (1472.0 g) followed by T4 (1418.1 g), T3 (1403.6), T2 (1400.8 g) and T1 (1192.3 g). Significant differences were also observed ($P<0.05$) among the treatment for feed intake and feed conversion ratio (FCR). Dressing percentage and organ weights of the animals were significantly ($P<0.05$) influenced by the dietary inclusion of ALO. The rabbits fed with the 0.4 % diet recorded significantly ($P<0.05$) highest dressing percentage (66.08 %), abdominal fat, kidney, thigh, loin and shoulder followed by 0.3% with 65.31 %, 0.2% (62.22 %), 0.1 % (59.60 %) and 0% with (57.30 %) dressing percentage respectively. The morality rate was significantly ($P<0.05$) affected by the dietary supplementation of ALO in rabbits diet. It was concluded that supplementation of ALO at 0.4% enhanced the overall performance and carcass quality of weaner rabbits.

Keywords: Rabbits; Performance; Carcass; Dressing percentage; *Albizia lebbeck.*

1. Introduction

Concern about the extensive and indiscriminate use of antibiotics in animal production has led to the lunch of a new research project designed to improve the health of the nation's framed meat production using alternative feed additives to antibiotics. One of such alternatives is the use of essential oil which are found to be cheap, safe and loaded with various bioactive chemicals. They also play a vital role in appetite stimulation, stimulating growth, improving feed efficiency and immune response activation [1, 2]. According to Viuda-Martos, *et al.* [3] essential oil have antibacterial activity and also exhibit antioxidant, anti-inflammatory, anticarcinogenic and hypolipidemic activities.

Albizia lebbeck is a large deciduous tree belonging to the family Leguminosae (Fabaceae). The plant is found in West Africa and some parts of Asia including India. The tree range from medium to large of multi -stemmed spreading habit. The leaves are traditionally used for feeding ruminant animals and are also used for the treatment of asthma, malaria, conjunctivitis and diarrhea [4] and its seeds are easily extracted by hand from the pods by hand or by crushing the pods and winnowing to obtain the oil [4].

Albizia lebbeck seed oil have been previously reported [5], it also contains fats, protein, vitamins, minerals, fatty acids with high oleic and linoleic acids [6] with high saponin content [7]. The plant contains alkaloids, saponins, tannins and flavonoids which have a high therapeutic value and can also be used as growth promoters in animal production [8].

Previous report has shown that the inclusion of toasted *Albizia lebbeck* seed meal at 5% can significantly ($P<0.05$) improve the overall performance and carcass of broiler chickens [9]. Oral administration of saponins isolated from *Albizia lebbeck* bark at the dose level of 50 mg/kg/body weight per day for 60 days to male rats brought about a significant decrease in the weights of testes, epididymides, seminal vesicle and ventral prostate [10]. But there is a dearth of information on the supplementation of *Albizia lebbeck* oil on the performance and carcass characteristics of rabbits. A timely evaluation of the oil will give a clue phytochemical components in the oil as well as its tolerable level in the animal.

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2. Materials and Methods

2.1. Site of the Experiment

The experiment was carried out at Division of Animal Nutrition, Sumitra Research Farm, Gujarat, India during the month of January to March, 2019.

2.2. Collection of Test Material and Preparation

Healthy seeds of *Albizia lebbeck* were harvested within the farm premises in India, it was later authenticated at the Herbarium unit of Department of Biological Sciences on the farm and assigned a voucher specimen number MM- 1256 AL. The seeds were separated manually from their seed coats and sundried for one (1) week. The dried seeds were granulated into coarse particles using a grinder in the laboratory. *Albizia lebbeck* oil (ALO) was extracted from the coarse particles using soxhlet extraction method. It was later poured into air tight labelled container and subjected to further analysis.

2.3. Experimental Animals and their Management

Fifty (50) weaned rabbits of mixed breed and sexes, aged between 6-7 weeks with an average initial body weight of 460 ± 1.3 were obtained from a commercial farm in India and used in the experiment. Before the commencement of the experiments, animals were given prophylactic treatment of Ivermectin injection at the rate of 0.2 ml/rabbit administered subcutaneously and broad spectrum antibiotics (Oxytrox L.A®), multivitamins (Biovit super®) were given intramuscularly at the rate of 0.2 ml and 0.1ml/ rabbit respectively. The rabbits were housed individually in a special all wired cages of dimension 60cm × 60 cm (length and width) equipped with concentrate drinkers and feeders. Five dietary treatments of ten rabbits per group were used for this experiment. The animals were allowed one week adjustment period during which they were fed with basal diet. Feed and water were given *ad libitum* by 7:00 am and 17:00 pm and and all management practices will be strictly observed throughout the experimental period which will last for 10 weeks.

2.4. Experimental Set-Up

Experimental diet was formulated to meet the nutritional requirements of rabbits according to National Research Council [11] as presented in Table 1

Treatment 1: Basal diet + 0.0 % ALO
Treatment 2: Basal diet + 0.1 % ALO
Treatment 3: Basal diet + 0.2 % ALO
Treatment 4: Basal diet + 0.3 % ALO
Treatment 5: Basal diet + 0.4 % ALO

2.5. Data Collected

Daily feed intake (g) was calculated by difference between feed offered and the left over, feed conversion ratio will determined as feed intake divided by body weight gain and mortality will be recorded daily throughout the experimental period.

2.6. Chemical Analysis

Phytochemical analysis was carried out on the test material (ALO) using standard methods [12]. Percentage composition of flavonoids, saponin, phytate, alkaloids, tannin and oxalate were carried out according to procedures outlined by Harbone [13] and Boham and Kocipai [14]. Mineral analysis was carried out using Atomic Absorption Spectrophotometer (AAS). Proximate analysis of crude protein, ash, ether extract and crude fibre in the experimental diet were carried out in accordance with the Association of Official Analytical Chemists [15]. Amino acid were analysed using commercial diagonistic kits (Humburg, Braunschweig, Germany (Model 3401-UI-OF45). Vitamin content (ascorbic acid, riboflavin, niacin and β-carotene) in *Albizia lebbeck* seeds were analyzed using method reported by [16].

2.7. Statistical Analysis

All data collected was subjected to one way analysis of variance (ANOVA) using SPSS (23.0) and significant means will be separated using Duncan multiple range tests [17] significant will be declared if $P \leq 0.05$.

Table-1. Ingredient composition of experimental diets

Ingredient	Quantity
Maize	36.00
Wheat offal	25.00
Palm kernel meal	20.20
Groundnut cake	10.00
Soya meal	5.10
Limestone	1.00
Bone meal	2.00
Lysine	0.10

Methionine	0.10
*Premix	0.25
Salt	0.25
Calculated analysis (% DM)	
Crude protein	16.44
Crude fibre	8.82
Ether extract	2.46
Calcium	1.34
Phosphorus	0.50
Energy (Kcal /kg)	2500.8
***** Premix supplied per kg diet :- Vit A, 7,000 I.U; Vit E, 8mg; Vit D3, 3000I.U, Vit K, 3mg; Vit B2, 5.5mg; Niacin, 25mg ; Vit B12, 16mg ; Choline chloride, 120mg ; Mn, 5.2mg ; Zn, 25mg ; Cu, 2.6g ; Folic acid, 2mg ; Fe, 5g ; Pantothenic acid, 10mg ; Biotin, 30.5g ; Antioxidant, 56mg	

Table-2. Proximate composition of *Albizia lebbeck* seed

Parameters	**% Composition**
Dry matter	81.33
Crude protein	26.51
Crude fibre	33.32
Ether extract	6.85
Ash	7.52

Table-3. Mineral composition of *Albizia lebbeck* seed

Parameters	**Composition (mg/100g)**
Calcium	322.7
Magnesium	6.88
Potassium	403.1
Phosphorus	273.8
Zinc	1.78
Sodium	59.71
Iron	3.11
Manganese	0.18
Copper	0.51

Table-4. Amino acid composition of *Albizia lebbeck* seed

Amino acids	**Composition (g/100g)**
Essential amino acid	
Threonine	2.11
Leucine	0.90
Lysine	0.33
Valine	1.00
Tryptophan	0.01
Glycine	0.90
Phenylalanine	0.89
Histidine	0.31
Methionine	0.81
Non-essential amino acid	
Alanine	0.94
Serine	1.71
Proline	1.63
Aspartic acid	6.12
Glutamic acid	4.78
Tyrosine	1.71
Cysteine	0.18

Table-5. Vitamin composition of *Albizia lebbeck* seed

Vitamins	**Composition (mg /100 g)**
Ascorbic acid	54.44
β –carotene	11.20
Niacin	1.41
Thiamine	1.10
Riboflavin	1.01

Table-6. Phytochemical analysis of *Albizia lebbeck* seed

Parameters	% Composition	*Safe recommended level
Tannins	2.11	11.20
Saponin	6.33	7.02
Alkaloids	0.11	0.55
Oxalate	0.12	1.30
Glycosides	0.10	0.50

Table-7. Performance characteristics of weaner rabbits given diets supplemented with ALO

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
No of animals	10	10	10	10	10	
Initial body wgt (g)	461.1	460.8	460.0	461.3	461.2	0.33
Final body wgt (g)	1192.3^b	1400.8^a	1403.6^a	1418.1^a	1472.0^a	3.18
Av weight gain (g)	731.2^a	940.0^a	943.0^a	956.0^a	1010.8^a	4.21
Average feed intake (g)	3188.7^a	3147.8^a	3109.6^b	3100.2^b	3100.0^c	0.37
Feed conversion ratio	4.36^a	3.35^a	3.30^b	3.24^b	3.07^c	0.22
Mortality	3	-	-	-	-	

^{a,b,c} means with same superscript are significantly different ($p<0.05$)

Figure-1. Performance traits of weaner rabbits fed diets supplemented with ALO

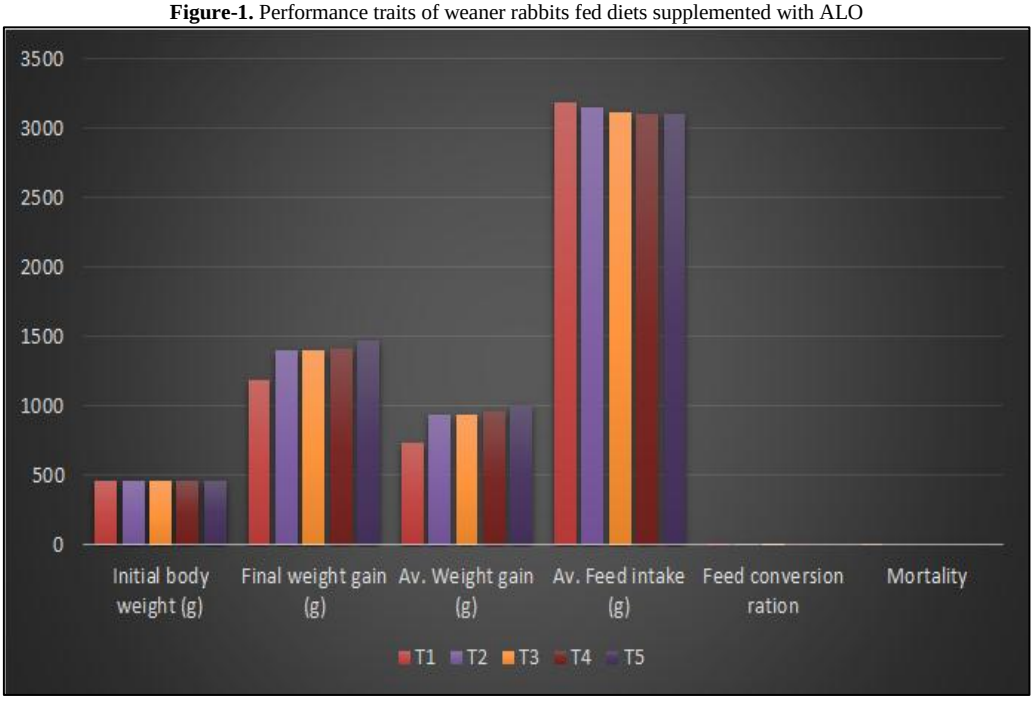

Table-8. Carcass characteristics of weaner rabbits given diet supplemented with ALO

Parameters	T_1	T_2	T_3	T_4	T_5	SEM
Dressing weight (%)	57.30^c	59.60^c	61.22^b	65.31^a	66.08^a	0.44
Shoulder	12.95^c	13.05^c	14.51^b	14.80^b	15.33^a	0.52
Thigh	18.30	23.42^a	23.89^a	24.05^a	26.71^a	0.40
Loin	9.44^c	10.10^b	10.73^b	11.33^a	11.50^a	5.43
Heart	0.20^b	0.41^a	0.43^a	0.40^a	0.42^a	0.02
Lungs	1.00^b	1.30^a	1.33^a	1.35^a	1.32^a	0.03
Spleen	0.07^b	0.12^a	0.11^a	0.13^a	0.12^a	0.16
Kidney	0.90^b	1.21^a	1.22^a	1.20^a	1.21^a	0.01
Abdominal fat	1.88^b	2.34^a	2.32^a	2.31^a	2.33^a	0.15
Testes	0.28^a	0.24^a	0.19^b	0.30^a	0.27^a	0.02

^{a,b,c} means with same superscript are significantly different ($p<0.05$)
SEM: standard error of mean

3. Results and Discussion

Table 1 reveals the proximate composition of the experimental diet the proximate component contained crude protein (16.44%), crude fibre (8.82 %), ether extract (2.46 %), calcium (1.34 %), phosphorus (0.50 %) and metabolizable energy (2500.6 Kcal/kg). However, all the values are within the nutritional requirement for rabbits as recommended by National Research Council [11].

Proximate composition of test material is presented in Table 2. The proximate component of *Albizia lebbeck* seed used in this experiment are 81.33 %, 26.51 %, 33.32 %, 6.85 % and 7.52 % for dry matter, crude protein, crude fibre, ether extract and ash respectively. The result is in agreement with the report of Mohammad *et al.* (2010),

though they recorded a higher crude fibre of 38.50 % when compared with 33.32 % recorded in this study. This result may be attributed to variety or environmental factors. *Albizia lebbeck* seed can also be considered as an alternative source of protein for livestock. According to Atteh [18] protein supplements used in livestock should be above 20% crude protein.

The result of the mineral and amino acid profile of *Albizia lebbeck* seed are as presented in Tables 3 and 4 respectively. The sample contained calcium, potassium, phosphorus, sodium, zinc, iron, magnesium, manganese and copper at 322.7, 403.1, 273.8, 59.71, 1.78, 3.11, 6.88, 0.18 and 0.51 (mg /100 g) while the seed revealed the presence of threonine, leucine, lysine, valine, tryptophan, glycine, phenylalanine, histidine, alanine, serine, proline, aspartic acid, glutamic acid, tyrosine and cysteine at 2.11, 0.90, 0.33, 1.00, 0.01, 0.90, 0.89, 0.31, 0.94, 1.71, 1.63, 6.12, 4.78, 1.71 and 0.18 (g/100g) respectively.

The mineral composition and amino acid profile of Albizia *lebbeck* seed is in line with those reported by Mukhan and Ajani [19]; El-Hawary, *et al.* [20] respectively. Calcium provides rigidity and support to an animal [21]. Sodium is a vital in acid –base balance, regulation of plasma volume and muscle contraction. Zinc helps in protecting the structure of the genetic material or the DNA chromatin in the sperm nucleus, a structure important for successful fertilization [22]. Low level of tyrosine could lead to a deficiency of non-epinephrine in the brain which causes depression. It suppresses the appetite and helps to reduce body fat (Elango *et al.*, 2009).

Table 5 showed the result of vitamin composition of *Albizia lebbeck* seed as a good source of ascorbic acid (54.44 mg/100 g), β –carotene (11.20 mg/100 g), niacin (1.41 mg/100 g), thiamine (1.10 mg/100g) and riboflavin (1.01 mg/100 g) in their order of abundance. According to Bakare, *et al.* [23] vitamins are a diverse group of inorganic molecules required in small quantities in the diet for health, growth and survival. Vitamin C maintains blood vessel flexibility and improves arteries circulation in the arteries of smokers and also helps the body to absorb iron and to breakdown histamine, the inflammatory components of many allergic reactions and anti-stress [24]. Yeum, *et al.* [25], also reported some synergistic effects among ascorbic acid, α-tocopherol, and ß-carotene have been against oxidation.

The phytochemical components of *Albizia lebbeck* seed revealed the presence of tannins (2.11 %), saponins (6.33 %), alkaloids (0.11 %), oxalate (0.12 %) and glycosides (0.10 %). However all values were within the safe recommended level reported by Kumar and Amit [26]; Alagbe [27]. Flavonoids have been reported to have anti-inflammatory, antioxidant, antiviral and ant carcinogenic effects [28], tannins possess antibacterial and antiviral activity [29]. Furthermore, Andjelkovic, *et al.* [30] submitted that phenolic compounds have a high antioxidant activity through three mechanisms: free-radical scavenging activity, transition-metal-chelating activity.), and/or singlet oxygen quenching capacity.

The result on the Performance characteristics of weaner rabbits given diets supplemented with ALO is presented in Table 7. The rabbit final live weight ranges between 1192.3 and 1472.0 g. There was a significant difference ($P<0.05$) among the treatment in term of the final live weight. Birds in T_5 had the highest final body weight (1472.0 g), followed by T_4 (1418.1g), T_3 (1403.6g), T_2 (1400.8g) and T_1 (1192.3g) respectively. The average final body weight recorded in this study among the experimental diets were within the range reported by Gbore and Akele [31]; Ayodeji, *et al.* [32] when rabbits were fed fumonisin fed and fermented Cowpea Husk respectively but contrary to the reports of Alagbe and Oluwafemi [33] who reported a non-significant differences in the growth performance of weaner rabbits fed Noni (*Morinda citrifolia*) and *Moringa olifera* leaf meal mixture as partial replacement for soya bean meal. Rabbits on T1 (control) diet consumed higher feed than the birds on T_2, T_3, T_4 and T_5 respectively. Though a higher feed intake recorded in rabbits in T_1 (control) over the other treatment group but T_5, T_4, T_3 and T_2 had a better feed conversion ratio, this may be as a result of the bioactive chemicals in ALO which enhances the maintenance and protection intestinal walls allowing better conversion of feed who confirms earlier report by Giannenas and Kyriazakis [34]. Animals in T_1 also recorded a higher mortality and none was recorded in T_2, T_3, T_4 and T_5 respectively, this could be as a result of tannin in ALO. According to Santos-Buelga and Scalbert [35], tannin performs multiple biological activities, including antiviral and antibacterial properties attributed mainly to their antioxidant and antiradical activity.

Result on carcass and organ characteristics is presented in Table 8. All the parameters considered determined were significantly influenced ($P<0.05$) by the dietary inclusion of ALO. Rabbits in T5, T4, T3 and T2 performed better than those in T1, their organs were not affected by the anti-nutrients in *Albizia lebbeck* seed because they are within the safe recommended level for rabbits. According to Madhusadha, *et al.* [36] anti-nutrients play a pivotal role in organ enlargements. This result also conforms to the earlier findings by Ogunwole, *et al.* [37] on the effect of serial withdrawal on the dietary vitamin mineral premixes on the carcass characteristics and organ weights of broiler chickens. Similar, recommendation was made by Salisu, *et al.* [38] when carrot leaf meal was included in the diets of rabbits but contrary to the reports of Okah, *et al.* [39] on the performance and economic evaluation of single and two phase diets in animal production.

4. Conclusion

Essential oil have been reported to be organic feed additives due to their ability to increase palatability, non-toxicity effect and food safety. The feeding of ALO to weaner rabbits at levels up to 0.4 ml is beneficial to the animals because it resulted to improved weight gain, feed conversion ratio and higher dressing percentage

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