SRYAHWA PUBLICATIONS

Journal of Animal Husbandry and Dairy Science
ISSN: 2637-5354 | Volume 7, Issue 1, 2023
https://doi.org/10.22259/2637-5354.0701001

RESEARCH ARTICLE

Effects of *Acacia Albida* leaf Supplementation on Post-Weaning Growth Performance and Carcass Characteristics of Young Arab Lambs

MIEGOUE E[1], Oumar MK[1,2], Fokom WD[1,5], Mouchili M[1], Azoutane J[3], Djomtchaigue BH[4], Nakour N[4], Tendonkeng F[1]

[1]*Animal nutrition laboratory, department of Animal Sciences, FAAS, University of Dschang, PO Box 222 Dschang Cameroon.*
[2]*Biology Laboratory of the Faculty of Exact and Apply Sciences (FEAS) N'Djamena University, PO Box 1027 Chad*
[3]*Sciences and Technology University of Ati(STUA) PO Box 22 Chad*
[4]*Higher National Institute of Science and Technics of Abeche (HNIST, PO Box 130 Abeche*
[5]*Multipurpose Research Station, Institute of Agricultural Research for Development, Bangangté, Cameroon.*

Received: 12 September 2023 Accepted: 25 September 2023 Published: 14 October 2023

Corresponding Author: MIEGOUE E. Animal nutrition laboratory, department of Animal Sciences, FAAS, University of Dschang, PO Box 222 Dschang Cameroon.

Abstract

Acacia Albida leaf supplementation on post-weaning growth performance and carcass characteristics of Arabian lambs was conducted from May 2020 to August 2021 at the small ruminant station of the Institut de Recherche en Élevage pour le Développement (IRED) in N'Djaména, Chad. Thirty-six Arabian lambs (36) aged 3 months were divided into groups 3 of 13 lambs each. The supplemented group received 400g and 600g of *Acacia Albida* leaves/animal/d in addition to the dominant forage, while the control group received only the dominant forage. Lamb weight growth was assessed every 7 days. The results of this study showed that from weaning to 24 weeks, the weight of animals fed a ration containing 600g of *Acacia Albida* leaves was significantly higher than that of animals fed other levels of supplementation. On the other hand, supplementing rations with 400g of *Acacia Albida* leaves significantly increased Daily weight gain (DWG) and total weight gain (TWG). Supplementation had no significant effect on meat weight, bone weight, commercial and conventional carcass yield. On the other hand, the slaughter weight of animals from supplemented groups was significantly higher than that of animals from unsupplemented group. Lambs fed 400g of *Acacia Albida* leaves had significantly higher conventional and commercial carcasses than those fed the other supplementation levels (11.65±0.42 and 9.10±0.41). 400g and 600g of *Acacia Albida* leaves can be used with good results as a protein supplement in post-weaning lambs.

Key words: *Acacia Albida*, Carcass, Lamb, Meat, Post-Weaning Growth, Supplementation.

1. Introduction

Livestock production accounts for 53% of gross domestic product (GDP), and provides a livelihood for some 76.2% of the Chadian population (FAO, 2009; MERA, 2009). The livestock population, which used to number over 94 million herds, now stands at 113.56 million herds of cattle, and 35.63 million herds of poultry (MEPA, 2021). This includes over 84 million small ruminants. In Chad, however, low rainfall has led to a drastic drop in livestock production, resulting in nutritional deficiencies that are the main handicap to sheep farming. In fact, long periods of drought often lead to the lignification of existing grasses, making it necessary to supplement them with protein supplements. However, the use of agricultural by-products (tops, peelings, etc.) and agro-industrial by-products (oilcake, spent grain, etc.) has often been

Citation: MIEGOUE E, Oumar MK, Fokom WD, *et al*. Effects of *Acacia Albida* leaf Supplementation on Post-Weaning Growth Performance and Carcass Characteristics of Young Arab Lambs. Journal of Animal Husbandry and Dairy Science. 2023;7(1): 01-06.

encouraged, but generally seems very costly. The use of existing, less costly non-conventional resources, such as *Acacia Albida*, which is very leafy during this long period of drought, could solve the problem for ruminants in general and ewes in particular. In Algeria, the work of Djellal et al (2021) showed that supplementing natural grazing land with 0.4 kg barley grain, 1 kg vetch-oat hay and cereal straw ad libitum enabled lambs in the "Chétif" batch to record significantly better average daily gains than those in the "Normal" group (139±8 g/d and 102±11g/d respectively). While studies have been carried out on the feeding of different breeds of sheep, those on the use of *Acacia Albida* leaves as a feed supplement in Arab ewes have not yet been the subject of any particular study. Hence the need to assess the effect of *Acacia Albida* leaf supplementation on post-weaning growth performance and carcass characteristics of Arab lambs.

2. Materials and Methods

2.1 Study Area

The study was conducted between May 2020 and August 2021 at the small ruminant station of the Livestock Research Intitute for Development (IRED) in N'Djaména, Chad. The IRED is located at the 1st district of N'Djaména, between 15°02 East and 12°08 North, at the confluence of the Chari and Logone rivers. The city of N'Djamena lies in the Sahelo-Sahelian zone, with a dry tropical climate. The year comprises two seasons: the dry season and the rainy season.

The rainy season extends from June to September, with average rainfall ranging from 400 to 800 mm along the north-south gradient. The dry season, which lasts 8 to 9 months, is marked by the harmattan, a hot, dry wind that sweeps across the region along a north-east to south-west axis. Temperatures fluctuate between 20°C and 40°C.

2.2 Animal Material and Health Protection

Thirty-six lambs (36) were used in this trial. These animals were housed in a (3m x 2.5 m) building on stilts built of planks. The animals were taken out to pasture every morning from 9 am and returned to their pens at 5 pm. Lambs were 90 days (3 months) old. The animals were identified by a neck collar. They bore the letters for the groups and the numbers within each group, respectively. The animals were treated with long-acting oxytetracycline (1ml/10 kg live weight per animal, intramuscularly) and levamisole 10% (1ml/10 kg live weight per animal per month), active against adult gastrointestinal and pulmonary parasites.

2.3 Plant Material

The plant material consisted of the basic forage grasses most abundant on the range (*Dactyloctenium aegyptium, Cenchrus ciliaris, Panicum maximum*) and *Acacia Albida* leaves.

2.4 Ration Formulation

Three rations were created or formulated. The control ration (R0) consisted solely of basic forages (300g *Dactyloctenium aegyptium* + 300g *Cenchrus ciliaris* + 600g *Panicum maximum*). From the control ration, three other rations were created (R1, R2 and R3), to which were added 400g and 600g of *Acacia Albida* leaves respectively. The rations were as follows:

R0: 300g of *Dactyloctenium aegyptium* + 300g of *Cenchrus ciliaris* + 600g of *Panicum maximum*;

R1: R0 + 400g of *Acacia Albida* leaves;

R2: R0 + 600g *Acacia Albida* leaves;

In the evening, when the animals returned from the grazing area, the animals in the control group received no supplement, while those in the supplemented groups received 400g and 600g of *Acacia Albida* leaves respectively.

2.5 Data Collection and Studied Parameters

The parameters studied and calculated from the data collected were as follows:

2.5.1 Weight Growth

After weaning, each lamb was identified, weighed and then every two weeks until slaughter (24 weeks). All weighing were carried out using an electric scale with a capacity of 60 kg and a sensitivity of 10g. Total gains (TG) were calculated as the difference between the average weight at the end of each trial period and the average weight at the start of the trial period. daily weight gains (ADG) were calculated as the ratio of Total weight gain (TG) to the duration of the trial. The following growth characteristics were studied:

Feed consumption of post-weaning pups;

Feed consumption of fertilized pups;

Weight evolution of pups from weaning to slaughter;

Total weight gain = average weight at start of trial - average weight at end of trial.

ADG (g/d) = (Weight of animal at end of trial period-Weight at start)/ (duration of trial period)

2.5.2 Carcass Parameters

At 24 weeks of age, five lambs were taken at random from each group, then transported to IRED's animal production laboratory, and weighed individually before being slaughtered to assess their carcass weight. They were then skinned and eviscerated to assess carcass characteristics. Organs (skin, head, heart, lung, liver, kidney, intestine, rumen) were removed and weighed.

Carcass yield (CY) was calculated using the following formula:

CY (%) = (Carcass weight (g))/ (live weight at slaughter (g)) x 100

The relative weight or proportion of skin, head, digestive tract, liver and rumen in relation to live weight at slaughter was calculated according to the following formula:

Proportion of organ or part (%) = (Weight of intestine (g))/ (live weight at slaughter (g)) x100

The length of the small intestine was measured using a tape measure, and the density of the small intestine was calculated using the following formula:

Intestine density (g/cm) = (Intestine weight (g))/ (Intestine length (cm))

2.5.3 Carcass and Digestive Tract Organ Characteristics

The following parameters were evaluated and calculated:

Ready-to-cook carcass or commercial carcass yield (CY Cco) was calculated according to the following formula:

CYCco (%) = (Ready-to-cook carcass weight (g))/ (slaughter live weight (g)) x 100

Commercial carcass weight = live weight at slaughter - (blood + head + legs + viscera)

Classical carcass yield (CYCcl) was calculated according to the following formula:

CYcCl (%) = (ready-to-cook weight (g) + (legs + liver + head + skin))/ (slaughter live weight (g)) x 100

The relative weight or proportion of skin, head, digestive tract and liver in relation to live weight at slaughter was calculated according to the following formula:

Proportion of organ or part (%) = (Weight of intestine (g))/ (live weight at slaughter (g)) x100

2.6 Data Analysis

Data on lambs' post-weaning weight growth and carcass characteristics were subjected to one-factor analysis of variance (feed intake) using the general linear model (GLM). Where there were significant differences between treatments, Duncan's test was used to separate means at the 5% significance level (Steel and Torrie, 1980). SPSS 20.0 (Statistical Package for Social Sciences) was used for these analyses.

3. Results

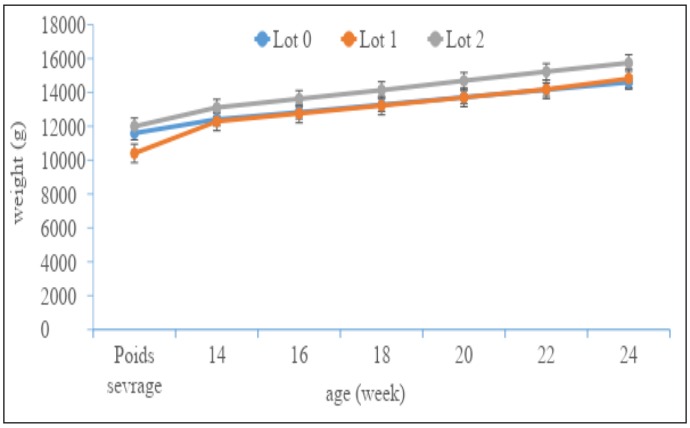
3.1 Effects of *Acacia Albida* Leaf Supplementation on Post-Weaning Growth Performance of Lambs

3.1.1 Weight Gain from Weaning to 24 Weeks

The weight evolution of lambs from weaning to 24 weeks of age according to the different levels of *Acacia Albida* leaf supplementation is illustrated in Figure 1. This figure shows that the weight of all animals increased whatever the group. Animal weights increased from 10.40 kg to 14.58 kg; from 11.59 kg to 14.82 kg and from 12.20 kg to 15.73 kg for groups supplemented with 0g, 400g and 600g of *Acacia Albida* leaves respectively. At week 14, the weight of animals given 400g of supplements remained comparable ($p>0.05$) to that of animals in unsupplemented groups, but significantly ($p<0.05$) lower than that of animals supplemented with 600g of *Acacia Albida* leaves. The same trend was observed at 24 weeks of age. Furthermore, from weaning to 24 weeks of age, the weight of animals supplemented with 600g of *Acacia Albida* leaves was significantly ($p<0.05$) higher than that of animals from other groups.

3.1.2 Total Weight Gain and Average Daily Weight Gain from Weaning to Week 24

Weaning weight, weight gain at 24 weeks, total weight gain and average daily gain according to the different levels of *Acacia Albida* leaf supplementation in the groups are shown in Table 1. The table shows that average weaning weights were comparable ($p>0.05$) across all batches. The average weight at 24 weeks, total weight gain and average daily gain of lambs in the control lot were comparable to those in the lot supplemented with 400g of *Acacia Albida* leaves, but significantly lower ($p<0.05$) than those in the lot supplemented with 600g of *Acacia Albida* leaves.



Group 0 (control) = dominant pasture forage without Acacia Albida Group 1= dominant pasture forage + 400g Acacia Albida; Batch 2= dominant pasture forage + 600g Acacia Albida ; P = Probability

Figure 1. *Weight evolution of lambs at weaning at 24 weeks.*

Table 1. *Effect of Acacia Albida leaf supplementation on weight and weight gains of lambs from weaning to 24 weeks, according to the level of Acacia Albida leaf supplementation in the rations.*

Parameters	Groups			
	0	1	2	p
Average weaning weight (kg)	11.62±0.28[a]	11.36±0.26[a]	11.86±0.39[a]	0.306
Average weight 24th week (kg)	14.56±0.26[b]	14.56±0.30[b]	15.50±0.36[a]	0.001
Total weight gain (kg)	2.56±0.05[b]	2.77±0.06[b]	3.13±0.30[a]	0.001
ADG (g)	28.54±0.61[b]	30.83±0.72[b]	34.87±3.40[a]	0.001

[a], and [b] : Values with the same letter in the same row are not significantly different (p>0.05). Means with the same letters in the same column are not different at the threshold of p<0.05; p group 0 (control) = dominant rangeland forage without *Acacia Albida* group 1= dominant rangeland forage + 400g *Acacia Albida*; group 2= dominant rangeland forage + 600g *Acacia Albida*; P = Probability, ADG: Average daily gain.

3.2 Effects of *Acacia Albida* Leaf Supplementation on Carcass Characteristics of Young Sheep

The effect of *Acacia Albida* leaf supplementation on carcass characteristics in lambs at 24 weeks of age is shown in Table 2. It shows that supplementation had no significant effect (p>0.05) on meat weight, bone weight, commercial and conventional carcass yield. However, there was a significant influence (p<0.05) of supplementation on slaughter weight, conventional and commercial carcass. Indeed, the slaughter weights of animals in supplemented batches were comparable (p>0.05) and significantly higher (p<0.05) than those of animals in non-supplemented batches. Lambs fed 400g of *Acacia Albida* leaves in the ration lambs had a classic carcass significantly higher (p<0.05) than that of animals receiving 600g of supplement, which was also significantly higher (p<0.05) than that of animals in the control batch. Similarly, lambs fed 400g of *Acacia Albida* leaves had a significantly higher commercial carcass (p<0.05) than animals fed 600g of supplement and animals in the control lot, which were otherwise comparable (p>0.05).

Table 2. *Effect of Acacia Albida leaf supplementation on carcass characteristics in lambs at 24 weeks of age*

Carcass features	Lots			p
	Lot 1	Lot 2	Lot 3	
Slaughter weight (kg)	13.10±0.36[b]	76. 14.53±0,58[a]	56. 13.90±0,47[a]	0.002
Meat weight (kg)	3.33±0.22[a]	3.67±0.27[a]	3.49±0.19[a]	0.104
Bone weight (kg)	2.28±0.15[a]	2.22±0.20[a]	2.26±0.20[a]	0.859
Classic carcass (kg)	10.54±0.25[c]	76. 11.65±0.42[a]	56. 11.12±0,35[b]	0.001
Commercial carcass (kg)	8.21±0.25[b]	76, 9.10±0.41[a]	56. 8.61±0.35[b]	0.006
RdtCco (%)	45.75±1.34[a]	76. 45.35±0.90[a]	56. 45.86±2.84[a]	0.907
RdtCcl (%)	80.47±0.88[a]	76. 80.23±1.37[a]	56. 80.07±3.29[a]	0.955

a, b and c: Values assigned the same letter in the same column do not differ significantly (p>0.05). Group 1 = dominant forage without Acacia Albida; Group 2= dominant forage + 400g Acacia Albida; Group 3= dominant forage + 600g Acacia Albida

3.3 Effects of *Acacia Albida* Leaf Supplementation on The Weight and Length of Organs Involved in Digestion in Young Lambs

The effects of *Acacia Albida* leaf supplementation on the weight, length and density of digestive tract components in 24-week-old lambs is shown in Table 3. It shows that supplementation had no significant effect (p>0.05) on weight, length and density of digestive tract components in 24-week-old lambs. However, animals fed a ration supplemented with 400g of *Acacia Albida* leaves had significantly (p<0.05) higher spleen weights than those of the other two groups, which remained comparable.

Table 3. *Effects of Acacia Albida leaf supplementation on weight and length of digestive tract components in young sheep (6 months).*

Digestive organs		Groups 0	1	2	p
Liver	Weight (g)	540±0.10	610±0.05	670±0.11	0.107
Kidney	Weight (g)	120±0.03	150±0.06	130±0.03	0.389
Rate	Weight (g)	80±0.02[b]	120±0.01[a]	90±0.03[b]	0.010
Lung	Weight (g)	420±0.12	490±0.08	480±0.06	0.383
Heart	Weight (g)	110±0.03	150±0.02	130±0.03	0.092
Panse	Weight (g)	330±0.09	370±0.01	390±0.10	0.494
Network	Weight (g)	100±0.01	120±0.01	130±0.04	0.296
Leaflet	Weight (g)	50±0.03	70±0.00	70±0.00	0.112
Abomasum	Weight (g)	80±0.01	100±0.00	90±0.03	0.143
Small intestine	Length (m)	22.99±3.00	23.66±1.01	22.23±2.43	0.629

a, b, c: Means bearing the same letters on the same line are not significantly different at the 5% threshold; p : Probability; CYco: Commercial carcass yield; CYcl : Conventional carcass yield group 0 (temoin)= dominant rangeland forage without Acacia Albida Group 1= dominant rangeland forage + 400g Acacia Albida ; Group 2= dominant rangeland forage + 600g Acacia Albida ; P = Probability

4. Discussion

The weight of all animals increased, irrespective of group. Animal weights increased from 10404.32 to 14586.60g; from 11591.05 to 14820.66g and from 12209.66 to 15737.54g for animals supplemented with 0g, 400g and 600g of Acacia Albida leaves respectively. The weight of animals fed 600g of *Acacia Albida* leaves was significantly higher than that of animals fed the other supplement levels. Supplementing sheep with 600g of *Acacia Albida* leaves had a positive influence on their growth. This trend is in line with that of several authors, particularly in tropical Sahelian countries, who have shown that supplementing animals with Moringa oleifera-based rations improves animal growth (Dimon *et al*., 2020). The highest weight (15737.54g) at 24 weeks observed in animals receiving 600g of *Acacia Albida* leaves in the ration could be explained by the fact that this rate of supplementation would have ensured a good energy/protein and even mineral balance to stimulate growth, which incidentally is very rapid in young lambs.

Supplementation had no significant effect on meat weight, bone weight, commercial and conventional carcass yield. However, supplementation did have a significant influence on slaughter weight, conventional and commercial carcass. This weight superiority can be attributed to the protein quality of *Acacia Albida* leaves. Indeed, according to Baeza et al (1999), carcass characteristics can be improved by increasing the level and quality of protein in the feed ration. The results thus obtained are similar to the observations of Gebremeskel and Kefelegen (2011) and Yirga *et al*. (2011) in sheep supplemented with protein concentrate.

Supplementation had no significant effect on the weight, length and density of digestive tract components in 24-week-old lambs. Although there was no significant difference, liver weight increased with the addition of the supplement to the ration (0.54±0.10; 0.61±0.05 and 0.67±0.11kg respectively for the control batch and those containing 400g and 600g of *Acacia Albida* leaves). This result is probably due to the intense activity of this organ, which is involved in detoxifying the anti-nutritional factors contained in *Acacia Albida* leaves. In fact, metabolically active internal organs such as the liver, heart, kidneys and gastrointestinal tract, although representing less than 10% of the animals' body weight, account for almost 50% of the energy expended under normal conditions. The values obtained in the present study are higher than those obtained by dos Santos et al. (2017) on carcass characteristics and meat quality of lambs fed palm kernel meal-based diets (0.43; 0.43; 0.42; 0.36 and 0.34kg respectively). The difference thus observed could be explained by the fact that animals can gain weight even during periods of feed restriction; this can occur in situations where body weight gain does not represent the genetic potential of the animals, as evidenced by the study by Santos *et al*. (2017) where high-energy feeds such as corn and soybean meal were replaced by palm kernel meal, altering nutrient availability while reducing animal body weight gain. This while considering that the inclusion of palm kernel meal in the diet resulted in some degree of feed restriction. As a result, weights of major metabolic organs such as liver, heart, small and large intestine were lower.

5. Conclusion

The effects of *Acacia Albida* leaf supplementation on post-weaning growth performance and carcass characteristics of Arabian lambs showed that from weaning to 24 weeks, the weight of animals supplemented with 600g of *Acacia Albida* leaves was significantly higher than that of animals subjected to the other supplementation levels. On the other hand, supplementation with 400g of *Acacia Albida* leaves significantly increased ADG and weight gains. Supplementation had no significant effect on meat weight, bone weight, commercial and conventional carcass yield. On the other hand, the slaughter weight of animals from supplemented groups was significantly higher than that of animals from unsupplemented groups. Lambs fed 400g of *Acacia Albida* leaves had a classic carcass and a commercial carcass significantly higher than those fed the other levels of supplementation.

6. References

1. Baeza E., Salichon M.R., Marche G., Wacrenier N., Dominguez B.and Culioli J. 1999. “Effet du sexe et de l’âge sur les caractéristiques biochimiques et technologiques de la viande de canard mulard”, 3ème Journées de la Recherche Avicole, Saint-Malo, 23-25/3/99, pp 451-454.
2. Dimon E., Toukourou Y., Seidou AA., Worogo H S., Soule A H and Traore I A. 2020. Zoo-economic performance of Djallonké sheep supplemented with Moringa oleifera leaf in Central Benin. Afrique SCIENCE 16(5) (2020) 189 - 202 ISSN 1813-548X, http://www.afriquescience.net
3. Djellal F., Mouhous A., Guermah H and Kadi S.A. 2021. Post-weaning growth of Ouled Djellal male lambs reared extensively in Algeria. *Livestock Research for Rural Development* 33 (5) 2021
4. FAO (Food and Agriculture Organization of the United Nations). 2009. Nutritional Profile of Chad. Nutrition and Consumer Protection Division. FIVIMS, 61 p.
5. Gebremeskel G. and Kefelegn K. 2011. Feed utilization, digestibility and carcass parameters of Tigray highland sheep fed urea treated wheat straw supplemented with mixtures of wheat bran and noug seed cake, in Southern Tigray, Ethiopia. *Livestock Research for Rural Development* 23 (9): 11-20.
6. Ministry of Livestock and Animal Resources (MERA), 2009. Plan National de Développement de l’Elevage (PNDE) au Tchad (2009-2016). N’Djamena, 86.
7. Ministry of Livestock and Animal Production (MEPA), 2021. Recensement General de l’Elevage. Rapport sur estimation du cheptel Tchadien. 35p.
8. Santos R., Gomes D., Alves K., Mezzomo R., Oliveira L., Cutrim D., Sacramento S., Lima E. et Carvalho F. 2017. Caractéristiques de la carcasse et qualité de la viande des agneaux qui sont nourris avec des régimes avec du gâteau de palmiste. *Asian-Australas J Anim Sci* Vol. 30, No. 6:865-871 June 2017 https://doi.org/10.5713/ajas.16.0424
9. Steel et Torrie (1980). Principes et procédures de statistiques. Une approche biométrique, 2e édition, McGraw-Hill Company New York.
10. Yirga H., Melaku S. et Urge M. 2011. Effet de la supplémentation en concentrés sur la variation du poids vif et les caractéristiques de la carcasse des moutons Hararghe Highland nourris avec un régime de base composé de canne de maïs traitée à l’urée. *Livestock Research for Rural Development* 23 (12): 1-7.