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Replacing Soybean with *Leucaena leucocephala* Leaf in the Diets of Growing Rabbits

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Abstract
A total of 15 New Zealand White x Californian weaner rabbits were randomly distributed into 3 treatments each with five replicates and allocated to three diets in which soybean bean meal was replaced with soaked and sun dried leucaena leaves at 0%(control, T_1), 50%(T_2) and 100% (T_3). The rabbits were fed *ad libitum* for 7 weeks. Results showed that Daily feed intake was similar ($p > 0.05$). Total feed cost reduced as soybean meal was replaced with *Leucaena leucocephala* leaf meal. The Total weight gain (g) decreased, with increased inclusion of *L. leucocephala*. Total weight gain for T_1, T_2 and T_3 were 801.50 ± 59.82, 719.67± 56.30 and 596.60 ± 68.43 respectively. Rabbits on $T_1$and T_2 had similar final body weight gain ($p > 0.05$). The eviscerated weight for rabbits on T_1, T_2 and T_3 were 626.67 ± 50.54, 664.67 ± 85.11 and 524.67 ± 69.80g, respectively and significantly differed. Rabbits fed diets in which soybean meal was completely replaced by leaves had higher kidney weights ($p < 0.05$). Based on the results of this research, it can be concluded that *L. leucocephala* can be included up to 7.0% in the diets of growing rabbits provided it is processed by soaking and sun drying

Keywords: *Leucaena leucocephala* leaf,soybean meal, rabbit, carcass characteristics

Introduction

Rabbits have preference for forages among which is *L. leucocephala* (Abu and Turner, 2017). The development of alternative cheap feed material compared with conventional feedstuffs has been advocated (Makinde *et al*., 2014). During the dry season it is difficult to get forage and production of concentrates is expensive. Inclusion of soybean for concentrate production is expensive therefore substituting soybean bean with evergreen forage could lead to provision of feed for sustainable rabbit production. *L. leucocephala* is one the highest quality and most nutritious evergreen fodder trees in the tropics. However its anti-nutritional factors, mainly mimosine has been reported to cause weight loss, ill health, organ damage and hair loss in rabbits at an inclusion level above 7.5-20% when unprocessed (Fayemi *et al*., 2011).

In this study the effects of dietary inclusion of water soaked sun-dried *Leucaena leucocephala* leaf meal as a substitute for soybean on carcass quality and growth performance of young rabbits is evaluated.

Materials and Methods

The research was conducted at the Rabbit Unit of Department of Animal Production and Health, Faculty of Agriculture, Federal University Oye-Ekiti, Ekiti State. The experimental animals comprised fifteen New Zealand White x Californian crosses of rabbits (Average body weight; 650±15.5g). The rabbits were housed in individual cages and feed and water were served *ad libitum* for 7 weeks in concrete feeders and drinkers. The feed ingredients were sourced from a reputable feed mill. *L .leucocephala* leaves were harvested in the premises of Federal University Oye-Ekiti, Ikole Campus.

L. leucocephala leaves were harvested during the dry season and fully soaked in a drum filled with water and left to stand for 48 hrs. The soaked leaves were removed, drained and spread immediately on a flat surface under a direct sunlight and turned intermittently for uniform sun drying until they were crispy. The dried leucaena leaves were then milled and mixed with the other feed ingredients accordingly. The diets were formulated as shown in Table 1. Diet 1 was the control and it contained soybean meal as source of protein, while diet 2 and 3 contained 50% and 100% replacement of soyabean with *L .leucocephala* leaf meal respectively as a protein source.

A total of 15 weaned New Zealand White x Californian rabbits were used for the experiment. Prior to the arrival of the rabbits, all necessary operations like cleaning and disinfection of the cages and pen were carried out. The weaner rabbits were fed diets; control (0%), 50% and 100% leucaena based diets. The weaner rabbits were randomly distributed into 3 treatments with five replicates per treatment. The experimental design was the completely randomized design. The rabbits were allowed one week to acclimatize to the new environment. Records of the weekly body weight and feed intake were obtained.

At the end of the 7th week, three of the experimental rabbits were selected from each of the treatment, starved overnight then slaughtered. The rabbit foreleg, hind leg, head and tail were removed and their weight accurately weighed and recorded. The pelt was also carefully removed from the rabbit skin with the use of the surgical knife and scissors and the weight noted leaving the skinned rabbit. The internal organs were removed and weighed warm. Each of the internal organs; kidneys, liver, lungs, stomach, caecum and heart were then carefully examined for abnormalities.

Table 1:Gross percentage composition of experimental diets

	Levels of leucaena leaf meal		
Ingredient	T1 (%)	T2 (50%)	T3 (100%)
Maize	20.0	20.0	20.0
Leucaena leucocephala leaf meal	0.0	7.0	14.0
Soyabean meal	14.0	7.0	0.0
Palm kernel cake	27.0	27.0	27.0
Wheat offal	28.25	28.25	28.25
Rice husk	7.0	7.0	7.0
Di-calcium phosphate	2.0	2.0	2.0
*Others	1.75	1.75	1.75
TOTAL	100	100	100

Others= Oyster shell (1.0%); Grower premix (0.25%); Table salt (0.25%); DL- Methionine (0.15%); L-lysine (1.0%).

The proximate composition of the feed was determined at University of Ibadan Animal Science Laboratory and according to AOAC (2000). All data were subjected to analysis of variance and the significance of difference of treatment means were determined by applying Duncan's multiple range test.

Results and Discussion

The proximate analyses of the diets are presented in Table 2. The performance characteristics of the rabbit are presented in table 3. Daily feed intake was similar across the treatments ($p > 0.05$). The total feed cost however reduced as soybean meal was replaced with leaf meal. The Total weight gain decreased from T_1 to T_3. The values were 801.50 ± 59.82, 719.67± 56.30 and 596.60 ± 68.43, for T_1, T_2, T_3 respectively.

Table 2: Proximate analyses of experimental diets (%)

Nutrient (%)	T1	T2	T3	Leucaena leaf
Dry matter	85.64	87.79	86.86	88.33
Crude protein	16.55	16.50	16.01	23.22
Ether extract	3.87	4.27	4.10	2.11
Crude fibre	14.03	15.64	16.45	21.2
Nitrogen-free extract	38.23	35.21	32.22	38.65
Ash	7.10	6.40	7.3	8.7

Table 3:Performance characteristics of weaner rabbits with *L. leucocephala* leaf meal

	Levels of leucaena leaf meal			
Parameters	T1 (0%)	T2 (50%)	T3 (100%)	LOS
Initial body weight (g)	650.25 ± 51.72	678.67 ± 90.55	668.00 ± 69.23	NS
Daily feed intake (g/day/rabbit)	125.99 ± 0.53	127.44 ± 0.20	126.3 ± 0.57	NS
Final body weight (g)	1451.75 ± 106.5^{a}	1398.33 ± 146.0 ^{a}	1264.60 ± 120.96 ^{b}	*
Total body weight gain	801.50 ± 59.82^{a}	719.67± 56.30^{a}	596.60 ± 68.43^{b}	*
Daily body wt gain (g/rabbit)	16.36± 1.22^{a}	14.69 ± 1.15^{a}	12.18± 1.40^{b}	*
Feed conversion ratio	7.83 ± 0.55^{c}	8.78 ± 0.68^{b}	10.91 ± 1.19^{a}	*
Total feed Intake (₦)	660.53 ± 2.76 ^{a}	598.30 ± 0.95 ^{b}	523.73 ± 2.34 ^{c}	*
Cost of wt gain/Kg (₦)	837.27 ± 58.90	841.59 ± 65.55	923.62± 101.11	

Means in the same row with different superscripts are significantly different at ($P<0.05$)
LOS= Level of significant at ($p<0.05$), NS= No significant difference, *=significant difference

Total weight gain for rabbits in T_1 and T_2 were not significantly different ($p>0.05$). Daily weight gain of rabbit were significantly different ($p>0.01$) among the treatment groups following the order 11.5 ± 0.8g, 13.77 ± 0.68g and 9.82 ±1.16g when rabbits were fed leucaena and siastro fresh leaves (Manika *et al.*, 2009). Onwudike (1995) recorded 13.5 to 14.3 g d^{-1} body weight gains in rabbits feeding more than 50% leucaena leaves.

The data for the internal organ weights relative to the body weight of the rabbit are presented in table 4. The values for the eviscerated weight for rabbits on T_1, T_2 and T_3were 626.67 ± 50.54, 664.67 ± 85.11 and 524.67 ± 69.80g, respectively but significant. It was however reported by Adekojo *et al.* (2014) that different methods of processing had significant ($p<0.05$) effects on live weight, slaughtered weight, eviscerated weight and dressing percentage of the rabbits. Also, there were no significant differences in the dressing percentage of the rabbits fed. The liver and spleen weights of the rabbits were not significantly ($p>0.05$) different among the treatments. However rabbits fed diets in which soybean meal was completely replaced by leaves had higher kidney weights ($p < 0.05$). Fayemi *et al.,* 2011 had earlier reported that rabbits fed diets containing 20% sun dried leucaena leaves had alopecia, necrotic spots, liver congestion, edema and highest percentage of mortality. Alopecia was however not noticed in the rabbits when fed 14% processed *L. leucocephala* leaf, even though reduced weight gain was recorded. Onwudike (1995) noted degeneration of kidneys and livers of rabbits offered unprocessed leucaena leaves. In addition, reddish-brown urine and serious loss of hair were observed but however not in this study.

Table 4: Carcass and internal organs of weaner rabbits with *L. leucocephala* leaf meal

Treatment	0% (T1)	50% (T2)	100% (T3)
Fasted weight(g)	1338.67 ± 65.98[a]	1385.33 ± 153.29[a]	1140.00 ± 98.08[b]
Eviscerated weight(g)	626.67 ± 50.54[a]	664.67 ± 85.11[a]	524.67 ± 69.80[c]
Dressing percentage (%)	46.67 ± 1.71	47.80 ± 0.88	45.61 ± 2.39
Ribcage (% body wt)	8.32 ± 0.49	9.49 ± 0.59	8.24 ± 0.36
Fore limbs (% body wt)	0.78 ± 0.06	0.66 ± 0.09	0.80 ± 0.09
Hind limbs (% body wt)	1.79 ± 0.21	1.65 ± 0.30	1.82 ± 0.24
Loin (% body wt)	4.16 ± 0.40	3.97 ± 0.34	4.32 ± 0.28
Heart weight (% body wt)	0.23 ± 0.01	0.29 ± 0.01	0.24 ± 0.04
Liver (% body wt)	2.62 ± 0.20	2.59 ± 0.38	3.29 ± 0.63
Kidneys (% body wt)	0.67 ± 0.08[b]	0.66 ± 0.05[b]	0.71 ± 0.08 [a]
Spleen (% body wt)	0.05 ± 0.01	0.06 ± 0.001	0.07 ± 0.01
Lung (% body wt)	0.76 ± 0.08[c]	1.05 ± 0.07 [a]	0.81 ± 0.04[b]
Back (% body wt)	11.52 ± 1.35	10.39 ± 0.52	10.49 ±0.9
Neck weight (% body wt)	1.78 ± 0.27	2.17 ± 0.52	2.09 ± 0.23
Head (% body wt)	9.38 ± 0.26	8.80 ± 0.26	9.59 ± 0.20
Pelt (% body wt)	8.04 ± 0.33[b]	9.38 ± 0.34 [a]	8.51 ± 0.63[b]

Means in the same row with different superscripts are significantly different at ($p<0.05$)

Conclusion and recommendation

In conclusion water soaked followed by sun drying of L. *leucocephala* leaves can replace 50% of soybean meal without deleterious effects on growing rabbit.

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