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Full Length Research Paper

Performance Characteristics of Rabbits fed with Leucaena leaf meal based diet in Natural Housing System

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Abstract

Twenty (20) male rabbits were used numbered according to the treatments (Leucaena Fresh (LF10%); and Leucaena Fresh (LF20%); Leucaena Cured (LD10%); Leucaena Cured (LD20%); and control, [zero leucaena (L0%)] . Each treatment was replicated four times. The animal weights were recorded with electronic balance (± 0.001g accurate) on weekly basis. Semen were collected after six weeks of experiment on weekly basis for three times with the aid of artificial vagina and were subjected to microscopic analysis. Other parameters evaluated includes motility (%), sperm concentration (×10^6), sperm alive (%), sperm dead (%), sperm abnormality and semen volume. There was statistical difference between LD20% and other treatments for weight gain and between LD10% and other treatments for feed intakes. The results revealed that volume of ejaculates for the control was higher than ejaculates of rabbits under the leucaena treatment. Motility decreases significantly as levels of leucaena leaf meal inclusion increases from 0% to 10% and from 10% to 20%. Sperm concentration of leucaena fresh leaf meal at 10% and 20%, and leucaena cured leaf meal at 10% were higher than leucaena cured leaf meal at 20%. It is recommended that for good performance of rabbits, doe or buck, 10% leucaena leaves' may be blended with their feed.

Keywords: leucaena leaf meal, semen, sperm concentration, sperm motility.

INTRODUCTION

The need for rabbits and attention given to rabbit production in the agricultural sector in Nigeria is growing high with respect to the increase in demand for animal protein. Rabbits have the ability to thrive on forages, which are abundant and available all the year round in high rainfall area, (Pasture Research Information Booklet, 2001). Also, they can be fed with kitchen wastes besides forages that are not competed for by man (Agunbiade, 1997). Rabbits require essential minerals like calcium, phosphorus and magnesium for bone formation, they need moderate protein (too much protein put strain on their kidney). These are got from alfafa, grass hay, pellets, grains and fibres like wild sunflower, (Tithonia diverifolia) tridax procumbens, leucoena leucocephala cassava leaves and others (National Academy of Science (Leucaena Network, 2012; Kanani et al., 2006; Nieves et al., 2004 and NAS 1984).

Leucaena leucocephala, a deep rooted legume which has its origin in Mexico (NAS, 1984) has become naturalized in Nigeria (Babayemi et al., 2006 and Ngaiza, 1988), thrives throughout the year and readily comes to mind as an unconventional protein source with lots of potentials to be exploited in rabbit feeding. Leucaena leaves, flower, seeds and shoots are good sources of nutrients for livestock. Young leaves of leucaena leucocephala contain more protein than the mature ones, (Heuzé and Tran, 2012). Its ash content increases from 52g/kg Dry-matter (Dm) in semi open leaves to 90g/kg Dry-matter, Dm for fresh leaves and 93.3g/kg Dm for sun cured leaves when at the same batch.

However, leucaena leucocephala contains high ash and fibre contents, one of the striking results of Jones (1979) and Veterinary Research Institute (2003) was that it contains mimosine, a non-protein amino-acid that limit its

usage. They concluded that animals that consume large quantities of leucaena may suffer weight loss, thyroid dysfunction, loss of hair/wool (alopecia) and low semen quantity and quality that can reduce reproductive performance (Ly et al., 2007). Furthermore, Mtenga and Laswai (1994) reported that when rabbits feed on 30% of leucaena leaf blended meal, there were low growth rate and feed utilisation was inefficient. At 20% of leucaena blended meal, rabbits experience severe alopecia (Lefroy, 2002). Ngaiza (1988), found out that fibre digestibility of rabbits was unaffected by leucaena, whereas NRC (1998) opined that it was affected if added to their diets.

Therefore semen assessment, both qualitatively and quantitatively, their physical and biochemical characteristics need to be determined; to be sure it is not adversely affected by this feed. Physical characteristics of semen in live animals and specially, for identical animals with high sperm production capacity and good quality semen are essential for successful breeding programme. All physical characteristics contributing to high quality semen are positively and highly correlated while other physical characteristics, which adversely affect the semen quality, are negatively correlated with them (Anel et al., 2003). Evaluation of physical characteristics of semen often involves the determination of volume, sperm concentration, sperm output as well as sperm motility, colour, ratio of live-dead spermatozoa and incidences of abnormal and foreign materials.

It was hypothesized, therefore, that leucaena leucocephala would impose an impact on the performance and welfare of rabbits, where rabbits in the tropical climate will express more pronounced responses to either fresh or cured or dried leucaena and may probably reduce the costs of feeding them with high cost formulated concentrates. Accordingly, the objectives of the study were to evaluate the response of rabbits to graded level meal diets blended with leucaena leaves and determining the good level of inclusion of Leucaena leaf meal into rabbits' diet with or without deleterious effects on rabbits' fertility.

Materials and Method

Twenty (20) male rabbits were used in this study at the rabbitary section of Ladoke Akintola University of Technology (LAUTECH), Ogbomoso, south Western Nigeria of latitude 7^0, longitude 14^o 33', at matured age (about 5 months). All ethical regulations concerning the use of animals for experiment were fully observed. The rabbits were of non-homogenous standard breeds. They were administered with Ivomec (R) for both endo and ecto parasites control as well as long acting antibiotics. The rabbits were randomly allotted to four replicates per diet (fresh and dried) with 4 rabbits serving as replicates and control.

Rabbitary was prepared with cages (0.74×1.10 m^2), with spacing for water and feed troughs that were fully cleaned and disinfected. The cages were arranged and numbered according to the replicates of the feed treatments (Leucaena Fresh (LF10%); $LF_{10}1$, $LF_{10}2$, $LF_{10}3$, $LF_{10}4$; and Leucaena Fresh (LF20%); $LF_{20}1$, $LF_{20}2$, $LF_{20}3$, $LF_{20}4$; Leucaena Cured (LD10%) $LD_{10}1$, $LD_{10}2$, $LD_{10}3$, $LD_{10}4$; Leucaena Cured (LD20%); $LD_{20}1$, $LD_{20}2$, $LD_{20}3$, $LD_{20}4$; and control 1,2,3,4. Daily/routine operations were carefully carried out. The animals were housed and fed for nine weeks.

The Leucaena leucocephala (its forage contains sodium and iodine, high in β-carotene, its stems and leaves contain tannins) used was a fresh cut at matured stage from the pasture introduction plots on the LAUTECH farm. They were air-dried, that is, cured and then ground before incorporating into the diet at 10% and 20%. The fresh Leucaena leucocephala leaves were harvested from the same plot on a daily basis and a day prior to use; so that it was in wilted form on the day of use. An inclusion level of the wilted Leucaena leaves was calculated from the dry matter. The cured parts were air-dried and grounded before inclusion in the meal.

Five different diets were formulated. The control diet contained 0% of Leucaena leucocephala while four dietary treatments were each formulated to contain 10% and 20% , each of wilted and air-dried Leucaena leaf meals. The rabbits were initially fed with rabbit pellets that they were used to for 7 days, after which the experimental diets were introduced gradually at 25% for 3 days, 50% for the next 3 days, then 75% for another 3 days, then 100% for 7 days before data collection begun.

150g of the experimental feed was served per rabbit per day. Water was given *ad-libitum*. The feed remnants were weighed and the weights were subtracted from the initial feed given. This gives the feed intake per day. The animal weight was taken with electronic balance (± 0.001g) on weekly basis. Animal weights were measured to evaluate the response of rabbits to graded level meal diets blended with leucaena leaves. Also semen was collected after six weeks of experiment on weekly basis for three times with the aid of artificial vagina and individual semen was subjected to microscopic analysis (Lebouef et al., 2000). Parameters evaluated includes sperm motility (%), sperm concentration ($\times 10^6$), sperm alive (%) sperm dead (%) and sperm abnormality. Semen volume was also measured using volumetric tube and semen colour was appraised visually directly from collection tube.

Semen Collection by Artificial Vagina

Artificial vagina (AV) was constructed with locally available materials as simple as unit not exceeding 4cm in length (excluding the removable and adjustable collection tube). A reinforced polyvinyl chloride (PVC)

tube (50cm thick) was cut to a length of 2.5cm. Furthermore, a one-inch plumbing hole (with an outer diameter of 2.7cm and an inner diameter of 1.7cm) was cut to the same length. The upper 1cm of one end of this smaller tube was scrapped off a little end to make it fit tightly into the inner diameter of the larger PVC tube thus achieving the 4cm (2.5cm + 1.5cm) length of the main part of the AV. The junction between the tubes was sealed with superglue in other to make it permanent (Leboeuf, 2000).

The cut third or fourth finger of a disposable rubber hand glove measuring 8-10 cm was used for a liner. The tip was cut off in other to create room to overturn the smaller end of the improvised liner. The larger end of liner was overturned into the larger end of the AV, i.e. the free end of the PVC tube. This was then held in place by a thin rubber band measuring 5cm in diameter, but folded 4 times over in order to ensure a tight grip on the liner. Subsequently, the other end of the liner was grabbed from within the hole and pulled to the other end of the AV. Then, some glycerol (about 2-3 ml) was poured into the space surrounding the pulled liner till it was two-third full. The held end of liner was then turned over the other end of the AV and similarly tied with a rubber band (Anel et al., 2003).

For a collection to, the end of 15ml graduated plastic centrifuge tube with or without tapering bottom cut to a length of 3.0cm from the bottom was used. The upper part of this tube (0.5cm from the cutting) was scrapped off a little to enable it to enter the smaller end of the AV without causing damage to the inner liner.

The whole AV unit was warmed by placing it in hot water at 60 ^{0}C for 10-15 minutes in a container that allow a complete a immersion of the whole AV (including the collection tube) inside it there was a need to warm the collection tube as well in order to avoid the incident of cold shock in the freshly collected semen.

For a teaser, mature doe rabbit was used. At the time when the buck was making thrust prior to a successful intromission into the doe, the operator quickly introduces the pre-warmed AV from the inside, a little anterior to the buck's knee, having contact with erect penis of buck. When the contact was made, the buck felt the warm slimy pore of AV and took it for vaginal pore of doe and so, makes a deep thrust (intromission) into the AV and ejaculate within a matter of seconds.

Semen Evaluation

Semen characteristics (physical) were evaluated to access the quality and quantity of sperm cells. They are ejaculate volume, motility, sperm concentration, percentage live-dead sperm, and incidence of abnormal cells. The ejaculate volumes were measured directly with the aids of the graduated collection tube attached to the artificial vagina. The volume read off immediately to the nearest 0.01ml and recoded.

Motility of spermatozoa was determined by putting a drop of semen collected on slide and a drop of sodium citrate was mixed with it to observe distinct movement under the microscope (×40). Progressive movement (normal movement), reserve movement (cold shock), circular movement (improper preservation) or rocky movement (ageing).

Each type of movement was calculated on percentage.

$$\frac{\text{Number of spermatozoa /movement}}{\text{Total number of spermatozoa}} \times 100$$

Sperm concentration was done using improved Neubeur haemocytometer method. Red blood cell pipette was used to take 0.5ml of semen and formasaline was also taken in up to 1.0ml. The mixture of the two in the red blood cell pipette was dropped on haemocytometer counting chamber. Number of spermatozoa presented in the diagonal boxes were counted and multiple by 10^6. This showed the average number of spermatozoa present in 1 ml of semen.

Percentage live-dead sperm is the ratio of live spermatozoa to dead spermatozoa and presented in percentage. Determining this, a drop of semen was dropped on slide and two drop of eosin-nigrosin stain was mixed properly with it. The dead spermatozoa absorbed colour through the head while living ones did not when observed under the microscope (×40). The proportion of abnormal spermatozoa was microscopically evaluated by random observation of at least 200 spermatozoa on the slide prepared for the live-dead estimation.

Statistical Analysis

Data on dry matter intake (g/kgw 0.75), body weights and semen characteristics were subjected to one-way analysis of variance- ANOVA. Treatment means were compared using Duncan's multiple range tests.

RESULTS

Performance Characteristics of Rabbits fed with varying levels of Leucaena Leaf meal

Feed intake at leucaena cured leaf meal treatment at 10% was lower than the treatment 0%, leucaena inclusion, leucaena fresh leaf meal at 20%, leucaena fresh leaf meal at 10% and leucaena cured leaf meal at 20%. There was statistical difference between LD20% and other treatments for weight gain and between LD10% and other treatments for feed intakes as shown by their mean values in Table 1.

The higher inclusion level of leucaena leaf meal that was

Table 1. Performance Characteristics of rabbits fed varying levels of Leucaena diets

Parameters	Treatments				
	0%	LD10	LD20	LF10	LF20
Weight gain, g/rabbit	1.25±24.0[a]	2.50±17.7[a]	10.0±31.2[b]	1.25±22.6[a]	10.0±23.0[b]
Feed Intakes, g/rabbit	641.1±26.8[a]	515.3±44.1[b]	587.3±18.1[a]	591.6±22.2[a]	600.7±21.2[a]
Feed Conversion Ratio, FCR	512.88	206.12	58.73	473.28	60.07

[a,b]Mean values with the same letter along the same row are not significant at P< 0.05

Table 2a. Performance characteristics of rabbits: Weekly body weight gains/losses in Fresh Leucaena leaf (LF) treatments, g

Weeks	Treatments							
	LF10-1	LF10-2	LF10-3	LF10-4	LF20-1	LF20-2	LF20-3	LF20-4
1	-4.0±0.1	-5.0±0.0	-4.0±0.1	-7.0±0.0	-2.0±0.1	-2.4±0.1	-1.0±0.0	-3.0±0.1
2	0.0±0.0	3.3±0.0	1.0±0.1	0.0±0.0	5.1±0.1	4.4±0.1	5.0±0.0	6.0±0.1
3	8.0±0.1	9.3±0.0	10.0±0.1	9.0±0.1	-2.1±0.1	-3.0±0.1	-10.0±0.0	3.0±0.1
4	5.0±0.1	4.0±0.0	-3.0±0.1	8.0±0.0	-10.0±0.1	-9.2±0.1	-10.0±0.0	-11.0±0.1
5	0.0±0.1	0.0±0.0	0.0±0.1	0.0±0.1	-10.0±0.1	-11.1±0.1	-15.0±0.0	-16.0±0.1
6	5.0±0.1	5.0±0.0	4.0±0.1	6.0±0.0	-15.0±0.1	-14.0±0.1	-15.0±0.0	-16.0±0.1
7	2.0±0.0	3.1±0.1	2.0±0.1	5.0±0.0	-18.0±0.1	-21.0±0.1	-22.0±0.0	-19.0±0.1
8	2.0±0.1	2.0±0.0	1.0±0.1	3.0±0.1	-22.1±0.1	-23.1±0.0	-20.0±0.4	-27.2±0.1
TOTAL	18.0±0.3	21.9±0.0	17.2±0.4	24.0±0.2	-74.2±0.6	-79.0±0.4	-81.2±0.4	-83.2±0.2
RANK	3RD	2ND	4TH	1ST	10TH	11TH	13TH	14TH

LF =fresh leucaena leaf

Table 2b. Performance characteristics of rabbits: Weekly body weight gains/losses in Cured Leucaena leaf (LD) treatments, g

Weeks	Treatments							
	LD10-1	LD10-2	LD10-3	LD10-4	LD20-1	LD20-2	LD20-3	LD20-4
1	-9.0±0.0	-10.2±0.1	-8.0±0.1	-13.0±0.0	-3.0±0.1	-4.0±0.0	-5.0±0.1	-4.1±0.0
2	-3.0±0.0	-4.2±0.1	-5.0±0.1	-8.1±0.0	-3.0±0.1	-1.0±0.0	-2.0±0.1	-2.1±0.0
3	-2.0±0.0	-1.1±0.1	-3.0±0.1	-2.1±0.2	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
4	-4.0±0.0	-5.1±0.1	-5.0±0.1	-6.0±0.0	-1.0±0.1	-2.0±0.1	0.0±0.1	-1.0±0.0
5	-12.0±0.0	-12.2±0.1	-14.0±0.1	-14.2±0.0	0.0±0.1	0.0±0.0	0.0±0.0	0.0±0.0
6	-12.0±0.0	-12.2±0.1	-14.0±0.1	-14.0±0.0	0.0±0.1	0.0±0.0	0.0±0.0	0.0±0.0
7	-15.0±0.0	-17.1±0.1	-12.0±0.1	-16.1±0.0	0.0±0.0	0.0±0.0	0.0±0.0	0.0±0.0
8	-20.0±0.0	-22.1±0.1	-18.4±0.1	-20.1±0.2	-2.0±0.1	-2.0±0.0	-3.1±0.2	-1.0±0.0
TOTAL	-75.0±0.3	-84.6±0.4	-79.1±0.4	-93.6±0.2	-11.0±0.3	-9.0±0.0	-10.1±0.4	-8.2±0.2
RANK	9TH	15TH	12TH	16TH	8TH	6TH	7TH	5TH

LD = cured leucaena leaf

consumed more by rabbits resulted in similar weight gains with the control and lower inclusion level of leucaena leaf meal at lower consumption. Weekly body weights were positive (gains) in the 0% treatments, the ranking were higher in all the replicates, followed by LD_{20} experiment, with negative (losses). Others were losses in their cumulative weights at the end of the experimental period, Tables 2a and b combined.

Table 1 shows the feed conversion ratios. Leucaena fresh leaf meal LF10%, had highest FCR of 473.28 than other treatments in the experiment, followed by leucaena fresh leaf meal LF10%. Thus rabbits fed with 10% inclusion of leucaena whether cured or fresh will increase weights in the animals.

No mortality was recorded throughout the experimental period but the animals exhibited different manifestations

Table 3. Mean values of semen characteristics of rabbits fed leucaena diets

Parameters	Treatments				
0%		LD10	LD20	LF10	LF20
Volume, ml	1.33±0.03^{a}	0.67±0.0^{b}	0.73±0.10^{b}	0.84±0.10^{c}	0.94±0.20^{ab}
Motility, %	94.0±3.00^{a}	77.5±6.00^{ab}	43.8±2.40^{c}	68.8±4.30^{b}	42.8±10.9^{c}
Sperm Conc.	70.5±1.20^{a}	54.5±1.40^{b}	36.3±3.00^{c}	61.0±6.90^{b}	58.0±3.5^{b}
Live sperm, %	94.5±0.60^{a}	93.3±1.40^{a}	70.0±0.80^{b}	90.3±1.00^{a}	63.3±7.8^{b}
Dead sperm, %	5.50±0.60^{b}	6.50±1.30^{b}	30.0±0.80^{a}	9.75±1.00^{b}	36.8±7.8^{a}
No.observation	12	12	12	12	12

Sperm Conc. = sperm concentration; No. Observation = numbering observation
^{a,b}Mean values with the same letter along the same row are significantly different at P<0.05

Table 4. Natures of sperm motility of rabbits according to treatments

Treatments	Types of sperm motion, %			
	PROGRESSIVE	RESERVE	GRANULAR	ROCKY
LD10	NA	43.2	NA	NA
LD20	NA	NA	NA	43.78
LF10	94	NA	NA	NA
LF20	NA	NA	43.2	NA
0%	94	NA	NA	NA

NA- no motion available

of the effect of the leucaena leaf meal. The symptoms noticed were alopecia and anorexia in the animals though few animals that expressed the symptoms recovered after about five weeks of experiment. Bucks that were fed with 20% inclusion also manifested intermittent clinical signs like diarrhoea for two to three days. Although no mortality was recorded indicating that the dietary treatments did not have lethal effect on the animals at the inclusion levels. The symptoms exhibited by animals during the experiment like anorexia and diarrhoea disappeared after some time because rabbits show relative high tolerance towards mimosine. Figure 1 shows that protein, crude fibre and ash contents of all the treatments were higher and nearly uniform, but fresh leucaena feed meal at 20% had more protein, ash and crude fibre compare to others in the study.

Semen characteristics of rabbits fed with varying levels of leucaena leaf meal

Total number of 60 successful ejaculations was recorded after nine weeks of treatment. Colour of ejaculated ranged from creamy of milky to watery milky to watery. The colour ranged with density of ejaculates. Nine of ejaculates of control were creamy and three were milky. Animals fed leucaena cured leaf meal at 10% recorded milky colour in all ejaculates. Animals fed leucaena cured leaf meal at 20% contained three milky and nine were watery. Leucaena fresh leaf meal at 10% had three creamy and nine were milky. Leucaena fresh leaf meal at 20% contained six watery milky, three watery and milky. Control treatment had mean volume of ejaculates greater than the mean volumes of ejaculates of rabbits under the leucaena treatment of 10%, 20% of LD and LF, Table 3. Large volumes imply increased seminal fluid with nutritive substances for sperm motility and viability.

Motility of males' sperm under all treatments was at significant variance to one another, 0% (non-inclusion of leucaena) was also higher. In contrast with volume of ejaculate that increases with increase level of inclusion of leucaena leaf meal in feed of rabbit. Motility decreases significantly as levels of leucaena leaf meal inclusion increased across the treatment (Table 2a and b), the ranking revealed. 0% and LF_{10} had 94% motility and progressive type of movement LF_{20} had granular type with 43.2% motility, LD_{10} and LD_{20} respectively had reserve (77.8% movement) and rocky (43.78% movement), Table 4.

Sperm concentration of leucaena fresh leaf meal at 10%, leucaena fresh leaf meal at 20% and leucaena cured leaf meal at 10% were greater than leucaena cured leaf meal at 20% while 0% control treatment was greater than all other treatments (LF 10%, LF 20%, LD 20% and LD 20%).

Live sperm percentages at 0% control and leucaena fresh leaf meal at 10% were higher than live sperm percentages of rabbits fed with leucaena fresh leaf meal at 20%,leucaena cured leaf meal at 10% and leucaena

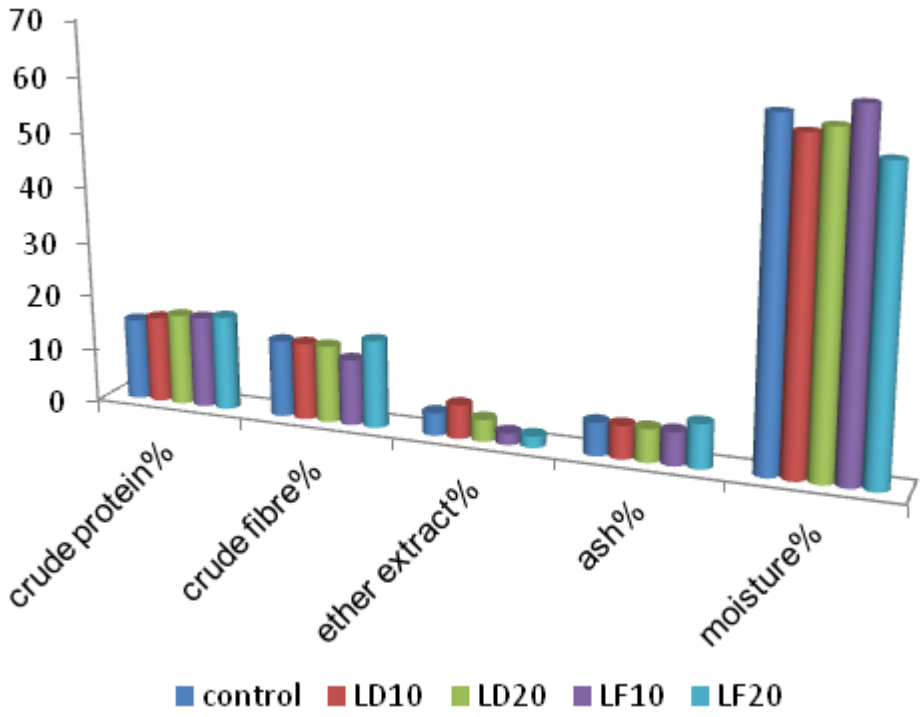

Figure 1. Proximate analysis of the experimental diets

cured leaf meal at 20%. Dead sperm percentage of 0% control, leucaena cured leaf meal at 10% and leucaena cur leaf meal at 10% were significantly lower than dead sperm percentage of rabbits fed with leucaena fresh leaf meal at 20% and leucaena cured leaf meal at 20%.

In Table 3, there was higher sperm concentration in leucaena fresh leaf meal at 10% inclusion, 61.00; live sperm were higher in LD10% and LF10% of 93.3 and 90.3 respectively. Also, there was low dead sperm in LF10%, 9.75 with higher sperm motility at LD10% and LF10%, 77.5 and 68.6 respectively.

Abnormal sperm of bucks under treatment varied from one another while control was lower than them. Leucaena cured leaf meal treatment at 20% was greater than leucaena fresh leaf at 10%, leucaena fresh leaf meal at 20% and leucaena cured leaf meal at 10% in the treatment while leucaena fresh leaf meal at 10% was similar. In all, there were statistical differences among the mean values for all the parameters considered as per each treatment.

Crude protein and fibres were higher as revealed in the proximate analysis, Figure 1 with range between 14.88 and 17.25% for crude protein and between 14.00 and 16.00% for crude fibre. The high content of protein was good for the overall welfare of the rabbit's performances. Ash and ether contents also range respectively from 6.0 - 8.0% and from 4.0 - 6.1%. The protein, fibre and ash were highest in LF_{20} feed formulation been respectively 17.25, 16.00 and 8.00%; these and others provide needed roughages for the animal, while only protein, fibre and ash contents in the concentrates were in the control. Thus, leucaena leaves are capable of adding more food substances to feed for the rabbits.

DISCUSSIONS

Treatments 0% and 10% leucaena cured leaf inclusion being greater as in the feed intake recorded between 0% and leucaena cured leaf at 10% inclusion diets is in agreement with the report of Jones, (1979) with its improved feed intake at the highest level of supplementation, Table 1.

The higher consumption of leucaena leaf meal 20% fresh, $LF_{20,}$ Table 1, 600.667± 21.2, inclusion by rabbits resulted in similar weight gains with the control experiment could be attributed to higher inclusion level of leucaena leaf meal with higher dry matter contents, though with negative average weight gain, 10.00 ± 23.00. The higher standard deviation noted show that the discrepancies between values were so much. This level of feed consumption and weight gain did not agree with high leucaena leaf meal consumption reported by Mtenga and Laswai (1994) that it led to low growth rate, and inefficient feed utilization. LF_{10} had lower feed intakes,

515.32±14.1 but with positive weight gain, Table 1. The ranking was higher in the LF_{10} experiment, this could be attributed to the level of freshness of the leaf and the meal, fresh leaves, although plugged but still have a lot of minerals (Veterinary Research Institute, 2003). For the fact that inclusion of leucaena leaf meal did not increase average weight gain (Tables 1, 2a and 2b) in some replicates like those of fresh leaves show the essence of dry matter contents in feed. This could be the reason for low FCR (Table 1) in LD20% and LF20%. Also, it could have been attributed to reasons for the symptoms in the animal's alopecia and anorexia diseases that surfaced during the period. Though, the animals later recovered but with reduced weight gains. There were more weight losses in LD_{10}, LF_{10} and LF_{20} as shown by ranking, Table 2, it may be surmised that mimosine content of the leucaena leaf meal affect the animal weights especially as mimosine is an anti-nutrient part of leucaena.

Management of the rabbits in term of feed, water and housing did not allow mortality to be recorded throughout the experimental period; no mortality recorded also indicated that the dietary treatments did not have lethal effect on the animals at the inclusion levels. The symptoms exhibited by animals during the experiment like anorexia and diarrhoea disappeared after some time because rabbits show relative high tolerance towards mimosine, this was also observed by Szyska et al., (1984).

Variations of the formulated feed due to experimental set up led to various semen's colours. Leucaena fresh leaf meal at 10% had three creamy and nine were milky. Leucaena fresh leaf meal at 20% contained six watery milky, three watery and milky, this variation in colour is in agreement with report of Vallecillo et al., (2004) while studying semen motility and colour in goats; the report also linked fertilizing capacity with colour. Higher sperm concentration in leucaena fresh leaf meal at 10% inclusion, live sperm higher in LD10% and LF10% and low dead sperm in LF10% with higher sperm motility at LD10% and LF10%, all these revealed that LD10% and FD10% inclusions will have higher production performance in rabbits.

Mean volume of ejaculates of the control was higher than mean volumes of ejaculates of rabbits under the leucaena treatment of 10, 20% of LD and LF, Table 3. The variations in volume could be attributed to the effect of leucaena leaf meal in the diet of rabbits under the treatment. It may also be attributed to the different live weights gain/loss, Table 2. Volume of semen collected might also be attributed to the method of collection. Large volumes imply increased seminal fluid with nutritive substances for sperm motility and viability, LF_{20} with 0.928 ± 0.200 will prove to have high sperm motility and viability than others in the experiment, Table 3. Their mean values were statistically different as shown in Table 3 for volume of sperm, its motility, its concentration, percent live and dead sperm and the number of abnormal sperm. All these indicate the level of performances of the rabbits under varying inclusion of leucaena leaves and the level of dry matter.

Motility decreases as levels of leucaena leaf meal inclusion increased across the treatment (Table 3), this decreases in motility as leucaena levels increase could be easily linked to the effect to anti-nutrient-mimosine present in large amount at higher inclusion levels. Positive correlation between volume of ejaculates and progressive motility was needed and for leucaena leaves not to hinder different cell physiology was observed by Vallecillo et al., (2004). These various types of motion of the mobile sperm and their high percentage were due to the activeness added into them by the leucaena leaves.

The significance of high sperm concentration of leucaena fresh leaf meal at 10%- LF_{10} (61.00 ± 6.90), leucaena fresh leaf meal at 20%- LF_{20} (58.00 ± 3.50) and leucaena cured leaf meal at 10%, (54.50 ± 1.40), Table 3, when compared could be attributed to the effect of their high inclusion of leaf meal. The higher dead sperm percentage in LF_{20}, LD_{20} leucaena fresh and cured leaf meal at 20% was due to higher inclusion of leucaena leaves, interestingly, both also had lower live sperm, implying the some motile spermatozoa cells have been killed by probably the mimosine content of the leucaena leaves. High live sperm percentage and low dead sperm percentages found in control is within normal range reported by Egbunike and Oluyemi (1979). Thus high sperm abnormalities present in bucks fed with leucaena-based diets could be attributed to the mimosine (an anti-nutrient content of leucaena leucocephala) present in leucaena. Mimosine (anti-nutrient content) might have affected the sperm quality of the rabbits.

High protein, fibres and ash contents from the proximate analysis showed how leucaena leaves can be used to supplement animal feeds as it added in the experiment 2.37% to protein, 2% to fibres and 2% to ash contents. However, the ether extract and the moisture contents were reduced in contents, the added amounts in other parameters will allow the animals to do well especially as water will be provided separately for drinking.

CONCLUSION AND RECOMMENDATIONS

The following conclusions were arrived at:

- Live sperm percentage of 0% control, leucaena fresh leaf meal at 10% were higher than live sperm percentage of rabbits fed with leucaena fresh leaf meal at 20% and leucaena cured leaf meal at 10% and leucaena cured leaf meal at 20%.
- There was a positive correlation between volume of ejaculates and motility of semen.
- Also, there were deviations in weights of bucks fed with leucaena based diet.
- The protein content, fibre and ash in the leucaena supplemented feed had 2.37%, 2% and 2% increment

- respectively over the same substances in non-supplemented feeds/concentrate.

It is recommended that for good performance of rabbits, doe or buck, 10% leucaena leaves' blended with their feed.

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