SEMEN CHARACTERISTICS AND GROWTH INDICES OF MALE RABBITS FED DIETARY LEVELS OF *VERNONIA AMYGDALINA*

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ABSTRACT
The effect of dietary levels of *Vernonia amygdalina* Leaf Meal (VLM) on semen and growth indices in male rabbits was assessed in this study. Dried *Vernonia amygdalina* leaves was milled and included into the experimental diets at 0, 5, 10 and 15 %. The diets were fed to forty male rabbit with ten bucks per group for twelve weeks. Semen was collected from the bucks weekly and assessed for semen volume (ml), spermatozoa motility (%), sperm concentration ($x10^7$/ml) and live sperm cells (%). Body weight gain was monitored weekly using a sensitive weighing scale and morphometric traits were measured once every two weeks using a measuring tape. Five rabbits per group were stunted, slaughtered; the testes were harvested and weighed. Data obtained were analyzed using Analysis of Variance. The result obtained showed that dietary inclusion of VLM had a significant ($P<0.05$) effect on semen volume and live sperm cells (%). The average weekly weight gain of the rabbit bucks was significantly ($P<0.05$) influenced by VLM among the groups. Among the morphometric traits measured, only body length was significantly ($P<0.05$) influenced by the inclusion of VLM in the diets of the animals. The highest testes weight (4.57g) was recorded in bucks fed 10% VLM diets. Inclusion of VLM in the diet of male rabbits had no adverse effect on all the parameters assessed. Improved weight gain was recorded at 10kg/100kg diet. It can be inferred that *Vernonia amygdalina* can be adopted as a component of male rabbits' diet but not for boasting their semen quality.
Keywords: Bitter leaf, Body length, Morphometric Traits, Testes, Weight gain

INTRODUCTION
Rapid growth, efficient reproduction and increased productivity are essential for profitable livestock production. The use of plant for boasting reproductive efficiency in animal production has been on the increase. However, male rabbits with poor body conformation may not be efficient breeders. Changes in the different parts of the body determine the shape, conformation and body proportion of the animal at a given time (Olutogun *et al*., 2003). Morphometric traits can be used as aid to selection in rabbit genetic improvement and live weight prediction (Hassan *et al*., 2012). However, the relationship between nutrition, growth and reproductive efficiency of an animal cannot be over-emphasized. Leaf meals have been identified as suitable replacements for some conventional feedstuff (Oloruntola *et al.,* 2016), many of which may have beneficial or adverse properties. *Vernonia amygdalina* (Bitter leaf) is one of the non-conventional feed resources which are predominantly found in Africa. It is probably the most used medicinal plant in the genus vernonia (Ijeh and Ejike, 2011). It is rich in both nutritional and phytochemical components. *Vernonia amygdalina* contains90.68% dry matter, 22.81% crude protein, 18.17% crude fiber, 16.65% ash, 4.34% crude fat and 38.03% carbohydrate (Usunobun and Okolie, 2016). Bioactive compounds identified in the leaves include oxalate, phylate, tannins, saponins, flavonoid, cyanogenic glycosides, alkaloids, anthraquinone, steroid and phenol (Udochukwu *et al.,* 2015). The modulatory role of *Vernonia amygdalina* extract on spermatogenesis and steriodogenesis have been reported (Saalu *et al.,* 2013); this is attributed to the presence of bioactive substances present in the leaf. The saponin extract of *V. amygdalina* administered to male rats has potential to increase their fertility (Oyeyemi *et al.,* 2015). Olosunde (2016) reported a significantly lower average daily weight gain in West African Dwarf goats fed diets with 30 and 45% bitter leaf inclusion. Despite the various attributes of *Vernonia amygdalina* that has been reported in literature, little is known about its effect on reproductive indices of male rabbits used for breeding purpose. This study therefore aims at assessing the effect of *Vernonia amygdalina* leaf meal on semen indices, weight gain, morphometric traits and weight of testes in rabbit bucks.

MATERIALS AND METHODS
The study was conducted at the Rabbitry unit of the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria. Fresh *Vernonia amygdalina* leaves were harvested and air dried until brittle; it was milled to obtain *Vernonia amygdalina* leaf meal (VLM) which was incorporated into the

experimental diets thereafter pelletized. The experimental diets (Table 1) are designated as VLM_0 - diet without VLM (control diet), VLM_5- diet with 5% VLM, VLM_{10}- diet with 10% VLM and VLM_{15}- diet with 15% VLM. Forty rabbit bucks of heterogeneous population with an average weight of 1818.3g were used for this experiment. The rabbits were randomly allocated into four groups with 10 bucks per group in a Completely Randomized Design. The experimental diets were offered to the rabbits daily and feed intake was recorded. The experiment lasted for a period of 12 weeks. Fresh semen samples were assessed for semen volume, spermatozoa motility, sperm concentration and percentage live sperm cells as described in Adeyemi *et al*. (2014). The bucks were weighed weekly using the weighing scale and the body weight gain obtained were recorded in grams. Some morphometric traits of the animals were taken in the morning before feeding the rabbits once every two weeks using a tape rule and the values were recorded in centimeters (Ogbuewu *et al.,* 2011). Traits measured included ear length, head length, body length, abdominal circumference and tail length. Five rabbits per group were stunted, slaughtered; the testes were harvested and weighed using a sensitive scale. All data obtained were subjected to statistical Analysis of Variance procedure using Statistical Analytical System (SAS, 2009). Treatment means were compared using Duncan Multiple Range Test of the same software.

Table 1: Composition of Experimental diets

INGREDIENTS	VA_0	VA_5	VA_{10}	VA_{15}
Maize	9.00	9.00	9.00	9.00
Corn bran	22.50	22.50	22.50	22.50
Rice bran	20.80	20.80	20.80	20.80
Soybean meal	9.90	9.90	9.90	9.90
Palm kernel cake	5.25	5.25	5.25	5.25
Wheat bran	30.80	25.80	20.80	15.80
Vernonia amygdalina	0.00	5.00	10.00	15.00
Others	1.75	1.75	1.75	1.75
TOTAL	100.00	100.00	100.00	100.00
Calculated analysis:				
Crude protein (%)	16.14	16.37	16.60	16.89
Crude fiber (%)	9.04	9.19	9.35	9.30
Digestible energy (kcal/kg)	2468.7	2500	2532.4	2564.2

VLM- *Vernonia amygdalina* leaf meal; VLM_0- diet without VLM (control diet), VLM_5- diet with 5% VLM, VLM_{10}- diet with 10% VLM and VLM_{15}- diet with 15% VLM Others: Bone meal =1.10, Salt = 0.32 and Premix = 0.33

RESULTS AND DISCUSSION

The semen indices of the bucks fed dietary levels of *Vernonia amygdalina* Leaf meal (VLM) is presented in Table 2. Dietary inclusion of VLM had a significant ($P<0.05$) effect on semen volume and live sperm cells (%). The highest semen volume (0.47ml) was recorded in bucks fed 15% VLM diets which was not significantly different from that of bucks fed diet with no VLM (0.43ml). Bucks fed diets VLM_5 and VLM_{10} had lower semen volume (0.34, 0.36 ml) and sperm concentration compare to that of bucks fed VLM_{15}. Sperm motility and concentration were not significantly influenced by the inclusion of VLM in the diets of the bucks. The result from this study corroborate that of Ajala and Owoyemi (2016) who reported no significant effect of VLM levels on milt motility and liveability in African catfish. The effects observed may be attributed to the presence of bioactive substances (Tannin, Saponin) present in VLM that may not enhance spermatogenesis. This may also be influenced by the level of VLM fed and the feeding duration. The weight gained by an animal within a unit of time is an important indicator of its growth. Table 3 shows the body weight gain, testes weight and morphometric traits of male rabbits fed dietary levels of *Vernonia amygdalina* Leaf

Meal (VLM). The average weekly weight gain of the rabbit bucks was significantly different (P<0.05) among treatments. The highest average weekly weight gain (44.04g) was recorded in bucks fed the 10% VLM while the lowest (22.46g) was recorded in those fed 15% inclusion of VLM. The results obtained from this study with rabbit bucks fed diet with 10% VLM having the higher weight gain is in corroborate the findings of Olosunde (2016) who reported reduced weight gain in West African Dwarf goat fed dietary levels of VLM above 15%. However, the value obtained in this study is at variance with the finding from the use of VLM extract which resulted in increased weight gain in broiler chicks (Oleforuh-Okoleh *et. al.* 2015). Among the morphometric traits measured, only body length was significantly (P<0.05) influenced by the inclusion of VLM in the diets of the animals. Bucks on 0%VLM diet recorded the highest value for body and head length (39.88, 11.91 cm respectively). The bucks fed diets with 10% VLM had the highest average weekly weight gain and abdominal circumference. This is at variance with the findings of Ogbuewu *et al,* (2011) who reported no significant difference in body length of pre-pubertal buck rabbits fed different levels of neem leaf meal.

Testes weight was not significantly influenced by the dietary inclusion of VLM in the diets of the bucks. The highest testes weight (4.57g) was recorded in bucks fed 10% VLM diets with the highest weight gain. This corroborates the findings of Raji *et al*., (2008) who reported a linear relationship between age, body weight and the entire testicular dimension within breeds in goats. The result from this study therefore implies that dietary levels of VLM did not have similar effects across the parameters assessed in the bucks; hence its effect on semen quality may not be optimal.

Table 2 : Semen Indices of Rabbit Bucks Fed Dietary Levels of *Vernonia amygdalina*

PARAMETERS	VLM_0	VLM_5	VLM_{10}	VLM_{15}	SEM	p value
Semen Volume (ml)	0.43^a	0.34^b	0.36^b	0.47^a	0.0097	<0.0001
Spermatozoa Motility (%)	79.43	79.82	77.76	77.95	0.66	0.6197
Sperm Concentration ($x10^7$/ml)	47.77	32.42	33.74	39.25	4.80	0.6412
Live Sperm Cells (%)	95.67^{ab}	97.96^a	97.93^a	95.18^b	0.44	0.0401

VLM - *Vernonia amygdalina* Leaf Meal; a, b, c -Means in the same row with different superscript are significantly (P< 0.05) different SEM – standard error of means

Table 3 : Body Weight Gain, Morphometric Traits and Testes Weight of Rabbit Bucks Fed Dietary Levels of *Vernonia amygdalina*

Parameters	VLM_0	VLM_5	VLM_{10}	VLM_{15}	SEM	p value
Avg. Weekly Weight Gain (g)	38.82^{b}	27.29^{bc}	44.04^{a}	22.46^{c}	2.91	0.016
Morphometric Traits:						
Abdominal Circumference (cm)	28.76	28.79	29.01	27.93	0.33	0.451
Body Length (cm)	39.88^{a}	37.10^{b}	38.21^{b}	37.76^{b}	0.32	0.011
Ear Length (cm)	11.16	11.68	11.59	11.11	0.09	0.056
Head Length (cm)	11.91	11.43	11.42	11.47	0.10	0.226
Tail Length (cm)	9.85	8.49	9.72	9.97	0.24	0.106
Testes weight (g)	4.20	4.45	4.57	3.88	0.15	0.419

VLM - *Vernonia amygdalina* Leaf Meal; a, b, c -Means in the same row with different superscript are significantly ($P< 0.05$) different SEM – standard error of means

CONCLUSION

Inclusion of *Vernonia amygdalina* leaf meal (VLM) in the diet of male rabbits had no adverse effect on semen quality, weight gain, morphometric traits and testes weight. Morphometric traits cannot be used to predict weight gain in heterogeneous population of adult bucks fed VLM since the diet had no significant effect on most of the traits assessed. However, improved weight gain was recorded at 10kg VLM/100kg diet. It can be inferred that VLM can be adopted as a component of male rabbits' diet but not for boasting their reproductive efficiency in terms of semen indices.

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