SEMEN QUALITY AND TESTOSTERONE CONCENTRATION IN MALE RABBITS FED *CARICA PAPAYA* LEAF MEAL

***Adeyemi A.A., Haastrup A.M., Alake O.O., Aramide I. L. and Oguntola O.**
Department of Animal Sciences, Obafemi Awolowo University, Ile-Ife, Nigeria.
**Correspondence: hadenikeyemi@gmail.com*

ABSTRACT
Unconventional feedstuff such as Carica papaya leaf remains a relatively cheap alternate ingredient in animal feed. However, its impact on reproductive indices in farm animals have not been extensively documented. This study was therefore conducted to assess the effect of Carica papaya leaf meal on libido, semen quality and testosterone concentration in rabbit bucks. Twenty- four mature male rabbits were used for this study. The bucks were randomly allotted into four groups (CLM0, CLM5, CLM10 and CLM15) with six rabbits each and fed diets containing 0, 50, 100 and 150g of Carica papaya per kg of diet respectively for eight weeks. Libido score and semen quality was assessed weekly while serum levels of testosterone were measured at the end of the experiment using standard procedures. Data were subjected to one-way analysis of variance. Result showed that Carica papaya leaf meal had no significant effect on libido score, semen quality indices and testosterone concentration in the rabbit bucks. However, semen volume and sperm concentration were lower in bucks fed CLM diets. The highest libido score and testosterone concentration were recorded in rabbits fed 10% CLM while rabbits fed diets with no CLM had the highest semen volume and sperm concentration. Sperm concentration decreased with increasing CLM level. This implies that feeding adult male rabbits diets containing Carica papaya leaf meal may depress spermatogenic activities over a period as the dietary level increases.
Keywords: Libido; Pawpaw leaf; Testes; Spermatozoa; Hormone

INTRODUCTION

Efficient reproductive performance can be linked to adequate nutrition among other factors. Rabbits are highly prolific micro-livestock but poor nutrition can hinder the expression of their numerous good qualities. Rabbits supplied poor diets are prone to poor growth, late maturity, poor reproductive performance. Nutrition impacts the growth of reproductive organs, performance and efficiency of testosterone secretion in farm animals (Cheah and Yang, 2011; Cordova-Izquierdo, 2016; Ewuola *et al*., 2019, Kujoana *et al.,* 2024). Fertility in male animals may be altered by toxicity of phytochemicals which may lead reduced spermatogenesis, low epididymal sperm maturation and decrease sperm quality (Kuete, 2014; Ajuogu, 2020). Some leaf meals have been reported to influence reproductive traits in farm animals (Ajuogu, 2019; Adeyemi *et al.,* 2022). *Carica papaya* leaf has been identified has one of the readily available leaves that are not competed for by man and animals. Incorporating feedstuffs with phytogenic properties improved performance of rabbits (Jiwuba, 2018; Agbonghae and Nwokoro, 2023). Ethanolic extract of Carica papaya depressed reproductive indices in rats (Airaodion *et al*., 2019). Fresh or wilted Pawpaw leaves has no negative impact on reproductive parameters and testosterone concentration in rabbits (Henry *et al*., 2018). A wide number of plant-derived pharmaceutical products are adopted in traditional medicine because of their beneficial properties in handling infertility (Yama *et al*., 2011). Bitto and Gemade (2001) also observed non-significant effect of pawpaw peel meal up to 20% on the testicular morphometry of male rabbits. Despite the numerous medicinal and therapeutic properties of *Carica papaya* leaf, its impact on reproduction in livestock has not been fully established. Since there is limited information on the effect of *Carica papaya* on reproductive indices in rabbit bucks, this study aimed to evaluate libido score, semen quality and testosterone concentration in male rabbits fed *Carica papaya* (pawpaw) leaf meal.

MATERIALS AND METHODS

The study was carried out at the Rabbitry unit of the Teaching and Research Farm and Animal Physiology laboratory at Obafemi Awolowo University, Ile-Ife, Nigeria. Fresh *Carica papaya* leaves were harvested, oven-dried at 40°C for 3 days, ground and incorporated into the diets of twenty-four

rabbits as *Carica papaya* leaf meal (CLM) at 0, 5, 10 and 15 % levels (Table 1). The animals were assigned to dietary groups (CLM0, CLM5, CLM10 and CLM15) adopting a Completely Randomized Design (CRD). The experimental diets were supplied to the animals at 120g/rabbit/day and clean water was provided ad-libitum for 8 weeks. Libido and semen indices were assessed as described by Adeyemi *et al*. (2014). Blood samples from the rabbits and serum testosterone concentration was measured using a commercial Enzyme-Linked Immunosorbent Assay (ELISA) kit. Data collected were analyzed by SAS using One Way ANOVA while means were separated using Duncan Multiple Range test at a probability of $p<0.05$.

Table 1: Gross Composition of Experimental Diet (%)

INGREDIENTS	**Diets with CLM levels**			
	CLM0	**CLM5**	**CLM10**	**CLM15**
Maize	9	9	9	9
Corn bran	20	18	16	14
Soya bean	10	10	10	10
Rice bran	30	30	30	30
Wheat offal	28	25	22	19
Carica papaya leaf meal	0	5	10	15
Others	3.0	3.0	3.0	3.0
Total	100	100	100	100

CLM - *Carica papaya* leaf meal, CLM0 - diet with no CLM; CLM5 - diet with 5% CLM; CLM10 - diet with 10% CLM; CLM15 - diet with 15% CLM Others; Bone Meal =1.5, Salt = 0.5, Lysine = 0.25 and Methionine = 0.25

RESULTS AND DISCUSSION

The impact of nutrition on reproductive performance is expressed in the development of the reproductive organ, semen quality and sexual characteristics (Cordova-Izquierdo, 2016). The semen characteristics of the male rabbits fed levels of *Carica papaya* leaf meal is shown in Table 2. *Carica papaya* leaf meal (CLM) had no significant ($p>0.05$) effect on libido score, semen parameters (semen volume, sperm motility, live sperm cells and sperm concentration) and testosterone concentration in the rabbits fed the experimental diets. The highest libido score (16.48mounts/min) and testosterone concentration (1.23ng/dL) were recorded in rabbits fed 10% CLM while rabbits fed diets with no CLM had the highest semen volume (0.69mL) and sperm concentration (188.14 x 10^6/mL). Antifertility potential of Methanolic extract of *Carica papaya* leaf was reported in wistar rats (Udeh and Nwaechujor, 2013). Ethanolic leaf extract of *Carica papaya* decreased sperm count, sperm motility and seminal pH while sperm mortality and abnormality of spermatozoa increased significantly ($p<0.05$) after 10 to 30 days of administration in rats (Airaodion *et al*., 2019). Result obtained for testosterone concentration in this study corroborates that of Henry *et al*. (2018) who reported that pawpaw leaf meal had no adverse effects on the testosterone level in male rabbits. The non-significant decrease in sperm concentration with increase in CLM as observed in this study shows the potentials of *Carica papaya* leaf meal in depressing spermatogenesis depending on the dose administered. It has been suggested that papain present in *Carica papaya* may cross the blood-testis barrier to depress the function of the seminiferous tubules (Akinloye and Morayo, 2010).

TABLE 2: Semen characteristics and libido score of male rabbits fed Carica papaya Leaf Meal

PARAMETERS	Diets with CLM levels				SEM	P-value
	CLM0	CLM5	CLM10	CLM15		
Libido score (mounts/min)	15.79	15.15	16.48	12.75	1.79	0.922
Semen Volume (mL)	0.69	0.48	0.63	0.55	0.07	0.758
Sperm Motility (%)	77.81	87.63	83.81	83.81	1.78	0.202
Sperm Concentration (X106/mL)	188.14	162.15	145.18	132.88	21.5	0.428
Live Sperm Cells (%)	86.23	85.40	85.90	87.21	0.41	0.486

CLM - Carica papaya leaf meal, CLM0 - diet with no CLM; CLM5 - diet with 5% CLM; CLM10 - diet with 10% CLM; CLM15 - diet with 15% CLM

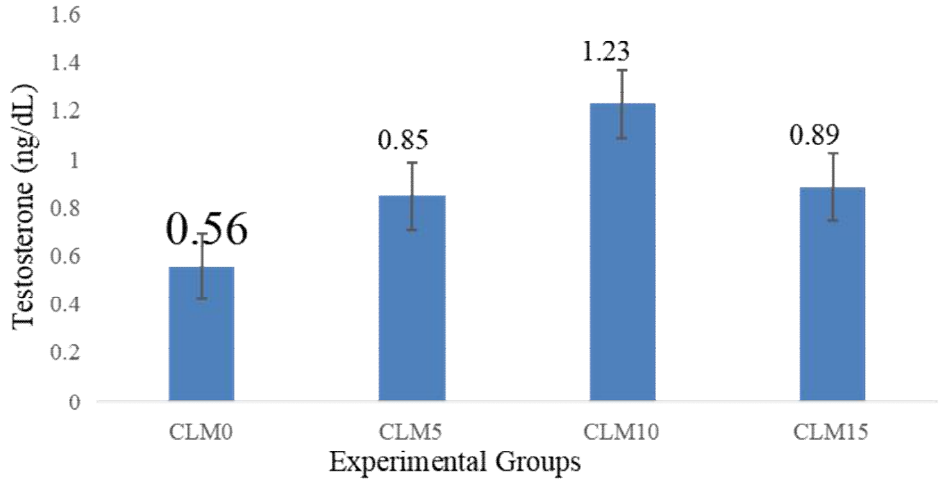

Figure 1: Testosterone Concentration of male rabbit fed di…

CONCLUSION

Based on the findings from this study, adult male rabbits can tolerate pawpaw leaves as feed supplement without adverse effects libido score, semen quality and testosterone concentration. Decrease in sperm concentration recorded shows that diets containing *Carica papaya* leaf meal may depress spermatogenic activities over a period of time. However, further research could be carried out on the impact of *Carica papaya* leaf meal on reproductive performance of rabbits over a long period before any specific level can be adopted as an unconventional feed ingredient.

REFERENCES

Adeyemi A.A., Ewuola E.O., Tewe O.O., (2014). Testosterone, Libido Assessment and Semen Characteristics of Rabbits Fed Supplemental *Moringa oleifera* Leaf Meal. *Nigerian Journal of Animal Science.* 16 (1): 13-19.

Adeyemi, A.A., Oloyede. C., and Adedotun. A., (2022). Effect of *Vernonia amygadalina* leaf meal on the reproductive indices of male rabbits. *Journal of Archiva Zootechnica* 25 (2): 63-74.

Agbonghae O.W. and Nwokoro S.O. (2023) Growth performance and nutrient digestibility of growing rabbits fed diets containing pawpaw (*Carica papaya* L.) leaf protein concentrate. Trop Anim Health Prod. 55(5):332. doi: 10.1007/s11250-023-03730-0. PMID: 37768437

Airaodion A.I., Okoroukwu V.N., Ogbuagu E. O., Ekenjoku J.A., Ogbuagu U. and Airaodion E.O. (2019) Antifertility Effect of Ethanolic Leaf Extract of *Carica papaya* in Male Wistar Rats. Merit *Res. J. Med. and Med. Sc.* 7(10) pp. 374-381

Ajuogu P. K., Mgbere O. O., Bila D. S., and McFarlane J. R.. 2019. Hormonal changes, semen quality and variance in reproductive activity outcomes of post pubertal rabbits fed *Moringa oleifera* Lam. leaf powder. *J. Ethnopharmacol.* 233:80–86. doi: 10.1016/j.jep.2018.12.036

Ajuogu P.K., Ere R., Nodu M. B., Nwachukwu C.U. and Mgbere O. O. (2020) The influence of graded levels of Cyathula prostrata (Linn.) Blume on semen quality characteristics of adult New Zealand white bucks. *Transl. Anim. Sci.* 4(2): 1134-1139 doi: 10.1093/tas/txaa060

Akinloye, O.O. and O.M. Morayo, 2010. Evaluation of andrological indices and testicular histology following chronic administration of aqueous extract of Carica papaya leaf in Wistar rat. *Afr. J. Pharm. Pharmacol.*, 4: 252-255.

Bitto I. I. and Gemade M. (2001) Preliminary investigation on the effects of pawpaw peel meal on growth visceral organ. *Global Journal of Pure and Applied Sciences.* 7(4), 621 -625

Cordova-Izquierdo A. (2016). Best Practices in Animal Reproduction: Impact of Nutrition on Reproductive Performance Livestock. *J. Adv. Dairy Res*. 4(1): 152. doi:10.4172/2329-888X.1000152

Cheah, Y. and Yang, W. (2011) Functions of essential nutrition for high quality spermatogenesis. *Advances in Bioscience and Biotechnology*, 2, 182-197. doi: 10.4236/abb.2011.24029.

Ewuola E. O, Adeyemi A. A., Adeyinka A. D and Akabuike C. F (2019) Potential of Moringa oleifera leaf meal in improving reproductive efficiency of rabbit bucks in hot climate. *Nigerian Journal of Animal Science* 21 (1): 80-86

Henry A. J., Udie G. U., Ozung P. O. and Anya M. I. (2018) Hormonal Assay and Reproductive Performance of Rabbits Fed Pawpaw (*Carica papaya*) Leaves as Feed Supplement. *Annual Research & Review in Biology* 25(3): 1-9 ISSN: 2347-565X, NLM ID: 101632869

Kujoana T.C., Mabelebele M. and Sebola N.A. (2024) Role of dietary fats in reproductive, health, and nutritional benefits in farm animals: *A review" Open Agriculture*, 9 (1) pp. 20220244. https://doi.org/10.1515/opag-2022-0244

Kuete V. 2014. Toxicological survey of African medicinal plants. 1st ed. Amsterdam (Netherlands): Elsevier Publishers; p. 744.

Jiwuba, P. C., (2018). Effect of Carica papaya leaf meal on productive parameters of growing rabbits. *An International Journal of Agricultural Science and Technology,* 10 (2): 102 - 106, 2018. DOI: 10.15547/ast. 02. 022.

Udeh E. Nkeiruka and Nwaehujor O. Chinaka, 2013. Anti-fertility Effects of Carica papaya Linn: Methanol Leaf Extracts in Male Wistar Rats. *Journal of Pharmacology and Toxicology,* 8: 35-41. DOI: 10.3923/jpt.2013.35.41