

# Effect of Methanol Extract of *Carica papaya* Seed on Some Hormone Function in Male Albino Rats

Reuben A.<sup>1</sup>, Wurochekke A. U.<sup>2,3</sup>, Mahmoud S. J.<sup>3</sup>

Department of Biochemistry, Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria

**Abstract:** In this study, the anti-fertility activity of the methanolic seed extract of *Carica papaya* was investigated. Phytochemical screening of crude extract revealed the presence of alkaloids, flavonoids, glycosides, saponins and tannins while anthraquinone and phlobatannins were found to be absent. The study was conducted on 25 healthy male albino rats following oral administration of 100 mg/kg body weight, 200 mg/kg body weight, 400 mg/kg body weight and 800mg/kg body weight methanolic seed extract for the period of 7days. Epididymidal sperm count, total motility and viability, serum testosterone, luteinizing hormone, follicle stimulating hormone and prolactin were studied. There was a significant  $p < 0.05$  reduction in sperm counts and viability, testosterone and luteinizing hormone as compared to the control group. While there was elevated serum level of follicle stimulating hormone and Prolactin as compared to the control group. These results suggest that methanolic seed extract of *Carica papaya* possesses anti-fertility activities which could impair spermatogenesis, hormonal synthesis and other functions which might lead to infertility.

**Keywords:** *Carica papaya*, Phytochemical screening, Anti-fertility activity, Hormones, Male rats.

## 1. Introduction

Fertility is the ability to become pregnant and generate offspring. Anti-fertility agents induce inability to conceive and produce offspring. Several plant products inhibit male fertility and may be developed into contraceptive. Even though, many indigenous plants have shown to prevent the birth, only few plants have so far been investigated for anti-fertility (Chowdhury *et al.*, 2001, Kamal, 2003).

The importance of plants as a source of anti-fertility drugs has been emphasized by many researchers (Oderinde *et al.*, 2002, McNeil *et al.*, 2003, Olabiyi *et al.*, 2006). Anti-fertility agents obtained from indigenous medicinal plants would be of immense benefit especially to inhabitants of developing countries, since the cost of these drugs would be within their means.

Therefore, this study was to investigate the anti-fertility activity of the seed extract on some functions in male rats.

## 2. Materials and Method

### Plant

*Cariaca papaya* seed was bought from Jimeta Modern Market, Yola, Adamawa State and was authenticated by a Botanist at the Department of Plant Science Modibbo Adama University of Technology, Yola.

### Experimental Animals.

A total number of 25 male wister rats weighing between 90-110g were purchased from National Veterinary Research Institute, Vom, Nigeria. The animals were housed in a plastic cage and allowed to acclimatize and feed with standard diet and water *ad-libitum*.

### Plant Extraction

Fresh seeds of *Carica papaya* was allowed to dry at room temperature under shed, dried seed was made into powder using mortar and pestle where 200g of the dried sample was extracted with 80% aqueous methanol over 24 hours period. The extract was then filtered using a filter paper (Whatmann

No.1) and concentrated using water bath at 40°C (Lohiya *et al.*, 2006).

### Treatment

Twenty five adult male albino rats weighing between 120-150 g were divided into 5 groups, (n=5). Group 1 received normal diet which served as control group, group 2, 3, 4 and 5 were administered daily with doses of 100, 200, 400 and 800 mg/kg body weight for 7days respectively following the method of Udoh, (2007). The rats were anaesthetized at the time of sacrifice by placing them in inhalation Jar soaked with chloroform in sealed cotton wool. Epididymal spermatozoa were collected and blood sera were prepared for hormonal assays.

### Hormonal Assays

Serum sample were assayed for testosterone, luteinizing hormone, Follicle stimulating hormones and prolactin. The method used was Microwell enzymes-linked immunoassay (ELISA) using analytical grade reagent (Syntron bioresearch Inc. following the instructions provided by manual).

### Statistical Analysis

Values obtained were expressed as mean  $\pm$  SEM and data were analysed using ANOVA with multiple comparison versus control group with the help of SPSS version 20. The values  $P < 0.05$  was considered significant (Duncan *et al.*, 1997).

## 3. Results and Discussion

The results in table 1 shows the phytochemical components detected in the seed sample of *Carica papaya*, alkaloids, saponins, phenols, flavoroids and glycosides were present while anthraquinone and phlobatannins were absent.

**Table1:** Some phytochemical components of *Carica papaya* seed extract.

Phytochemical components	Seed
Alkaloids	+
Anthraquinone	-
Flavonoids	+
Phlobatannins	-
Phenols	+
Glycosides	+
Saponins	+
Tannins	+

Key: + present of phytochemical components  
 - Absent of phytochemical components

Table 2 revealed a significant decrease  $p < 0.05$  in sperm count and viability in all groups treated with various doses of *Carica papaya* seed extract. However, the total motility remains significantly increased  $p < 0.05$  in 400 mg/kg body weight and 800 mg/kg body weight compared to the normal control group

**Table 2:** Effects of *Carica papaya* seed extract on sperm parameters.

Treatments	Sperm count( $\times 10^6$ )	Total motility (%)	Viability(%)
Normal control	14.05 $\pm$ 0.35	32.50 $\pm$ 0.5	61.00 $\pm$ 2.00
100mg/kg bwt	13.30 $\pm$ 0.10*	29.00 $\pm$ 0.8	54.00 $\pm$ 4.00
200mg/kg bwt	11.20 $\pm$ 0.10*	44.50 $\pm$ 11.5	28.55 $\pm$ 1.55*
400mg/kg bwt	10.20 $\pm$ 0.90*	60.50 $\pm$ 0.5 <sup>#</sup>	13.15 $\pm$ 0.15*
800mg/kg bwt	8.35 $\pm$ 1.05*	60.00 $\pm$ 0.50 <sup>#</sup>	49.00 $\pm$ 1.90*

Values are expressed as mean  $\pm$  SEM (n=5), bwt - body weight.

Key: \* significantly decreased as compared with normal control group  $p < 0.05$

<sup>#</sup> significantly increased as compared with normal control group  $p < 0.05$

The results from table 3 shows that there is significant decrease  $p < 0.05$  in serum testosterone (T) and luteinizing hormone (L) in treated groups as compared to control group but there is significant  $p < 0.05$  increase in serum follicle

stimulating hormone (FSH) and prolactin (PRL) in treated groups as compared to control group.

**Table3:** effects of *Carica papaya* seed on some hormones.

Treatment	T(ng/kg)	LH(N/ml)	FSH(N/ml)	PRL(ng/ml)
Normal control	3.5 $\pm$ 0.37	1.60 $\pm$ 0.13	1.034 $\pm$ 0.03	0.81 $\pm$ 0.05
100mg/kg bwt	2.80 $\pm$ 0.13	0.97 $\pm$ 0.05 <sup>a</sup>	1.64 $\pm$ 0.08 <sup>b</sup>	9.40 $\pm$ 0.16
200mg/kg bwt	1.63 $\pm$ 0.19 <sup>a</sup>	0.74 $\pm$ 0.03 <sup>a</sup>	1.98 $\pm$ 0.08 <sup>b</sup>	11.90 $\pm$ 0.22 <sup>b</sup>
400mg/kg bwt	0.52 $\pm$ 0.90 <sup>a</sup>	0.51 $\pm$ 0.07 <sup>a</sup>	2.24 $\pm$ 0.15 <sup>b</sup>	12.50 $\pm$ 0.03 <sup>b</sup>
800mg/kg bwt	0.25 $\pm$ 0.01 <sup>a</sup>	0.23 $\pm$ 0.0	2.00 $\pm$ 0.08 <sup>b</sup>	14.21 $\pm$ 0.03 <sup>b</sup>

Values are expressed as mean  $\pm$  SEM (n=5), bwt - body weight.

Key: <sup>a</sup> significantly decreased as compared to control group  $p < 0.05$

<sup>b</sup> significantly increased as compare to control group  $P < 0.05$

#### 4. Discussion

The presence of alkaloids, flavonoids, tannins, saponins, glycosides and phenols has been revealed by the study as the phytochemical components in the *Carica papaya* seed. These various phytochemicals detected in *Carica papaya* seeds are known to have beneficial uses and exhibit physiological activity (Adeneye *et al.*, 2006).

The study has demonstrated a significant decrease in sperm count and viability of the treated rats with methanolic extract. This decrease in sperm count and viability could be attributed to the action of the extract which could target the internal milieu of the epididymis (Hucynh *et al.*, 2006)

The exert mechanism by which *Carica papaya* seed reduced sperm count and viability is not known, but it has been suggested that the compound papain may cross the blood testis barrier to exert harmful effects on control of the seminiferous tubules of the testes (Oyekunle and Omope, 2010).

The study has demonstrated a significant decrease in the serum level of testosterone of the treated groups as compared to the control group. This observation was similar to the earlier findings of Udoh *et al.*, 2005, Udoh and Ekpenyong, 2001. The reduction in the serum level of testosterone could be probably be due to the decrease of serum levels of LH observed in this study.

Leydig cells secrete testosterone by the stimulation effect of luteining hormone (Udoh and Udoh, 2005, Udoh *et al.*, 2005, Udoh *et al.*, 2005) and follicle stimulating hormone induces spermatogenesis in the seminiferous tubules (Sharpe, 1994). In males, reduction of testosterone level might impair spermatogenesis and cause male infertility.

This study further observed an increase in serum prolactin level in treated groups as compared to the control group. Prolactin also associated primarily with male infertility. Acute hyperprolactinemia is known to suppress testosterone

synthesis and male fertility through prolactin induced hypersecretion of gonadotropin releasing hormone (GnRH) through prolactin receptors on hypothalamic dopaminergic neurons (Albertson *et al.*, 1987., Bartke *et al.*, 1986). However, prolactin has also been reported to play role in the synthesis of testosterone (Gill-sharma, 2009).

## 5. Conclusion

It is therefore reasonable to suggest that the results clearly demonstrate that short term administration of *Carica papaya* seed extract which provides beneficial anti-fertility effects on male albino rats and have inhibited the hormonal regulation of spermatogenesis indicating infertility.

In this regard, this *Carica papaya* seed extract have shown great promise in the quest for safer, cheaper and alternative method of regulating fertility in male which might be useful to the health professionals, scientists, and scholars working the field of pharmacology and therapeutics to develop evidence based male contraceptive in man and animal model. However, knowledge on the specific modes of action of the seed extract to exerts anti-fertility effects is not fully understood, but studies have shown that most of the seed plant have been found to contain substances like alkaloids, glycosides, tannins, flavonoids and saponins that are frequently implicated as having anti-fertility effects.

## References

- [1] Adeyeye, A. A., Ajagbonna, O. P., Adeleke, T. I., and Bello, S. O. (2006). Preliminary toxicity and phytochemical studies of the seed extracts of *Carica papaya* in rats. *Ethnopharmacology* 105:374-379.
- [2] Albertson, B. D., Siekiewicz, M. L., Kimball, D., Munabi, A. K., Cassoria, F., and Loriaux, D. L. (1987). New evidence for a direct effect of prolactin on rat adrenal steroidogenesis. *Endocrine Research* 13(3) : 317-333
- [3] Bartke, A., Paulsen, J. D., Negro-vilar, A., Lucina, E., and Martinez- Garcia, C. (1986). Hyperprolactinemia and male reproduction, in andrology. Male fertility and sterility. Eds., Academic press, New York, NY, USA. 101-123.
- [4] Chowdhury, S. R., Gupta, C. M., and Kamboj, V. P. (2001). Current status in fertility regulation: indigenous and modern approaches. *Asian Journal of Andrology*. Pp 99-119.
- [5] Duncan, R. C., Knapp, R. G. and Miller, M. C. (1977). Test of hypothesis in population: introductory biostatistics for the health sciences. John wiley and sons Inc. NYPP 71-96.
- [6] Gill-Sharma, M. K. (2009). Prolactin and male fertility: The long short feedback Regulation. *Internal Journal of Endocrinology*.13.
- [7] Huynh, P. N., Sinha-Hikim, A. P., Wang, C., Stetonovic, K., Lue, Y. H., Leung, A., *et al.*, (2000) Long term effects of triptolide on spermatogenesis, epididymal sperm function, and fertility in male rats. *Journal of Andrology*. 21: 689-99
- [8] Kamal, R., Gupta, R., S., Lohiya, N. K. (2003). Plants for male fertility regulation phytotherapy Research 17:579-90
- [9] Lohiya, N. K., Man, Vannan, B., and Garg, S. (2006). Toxicological investigation on the methanol subfraction of seed of *Caricapapaya* as a male contraction in albino rats. *Reproductive Toxicology*, 22:461-468.
- [10] McNeil, R. I., Noronha, C. C., Kasemija, I. O., OKanlawon, A. O. (2003). The anti-ovulatory effect of a seed extracts of *RicinascomminusL.* Nigerian postgraduate medical journal. 2:31-34.
- [11] Oderinde, O., Noroba, C., Oremosu, O. A. (2002). Abortifacient properties of aqueous extract of *Caricapapaya* seeds on female Sprague-Dawley rats. *Nigerian postgraduate medical Journal* 9:95-98.
- [12] Olabiyi, O. A., Oremosu, A. A., Noronha, C.O., Okanlawon, A. A. (2006). Effects of cotton seed oil (Gossypol spp) and cotton seed meal on estrous cycle, ovulation and histoarchitecture of female cycle, ovulation and histoarchitecture of female reproductive organs of adult cyclic sprague-Dewley rats. *Nigerian postgraduate medical Journal* 5:21-26.
- [13] Oyekunle, O. A. and Omope, M. M. (2010). Evaluation of andrological induces and testicular histology following chronic administration of methanol extract of *Carica papaya* seed in rats. *African Journal of pharmaceutical pharmacology*, Volume 4 issues, PP.252-255.
- [14] Sharpe, R. M. (1994). Regulation of spermatogenesis., in physiology of reproduction (eds., Knobil and J. D. Neil), NY: Ravenpress, New York, 1363-1434.
- [15] Udoh, P., Essien, I. and Udoh, F. (2005a). Effects of *Caricapapaya* seeds extract of the morphology of pituitary-gonadal axis of male albino rats. *Phytotherapy Research* 19:1065-1068.
- [16] Udoh, F. V and Udoh, P. B. (2005b). Hepatotoxicity of the methanol extracts of *Carica papaya* seeds in wistar rats. *Pharmaceutical Biology* 43(40):349-352
- [17] Udoh, F. V., Udoh, P. B. and Umoh, E. E. (2005c). Activity of alkaloids extract of *Carica papaya* seeds on reproductive functions in male wistar rats. *Pharmaceutical Biology*. 43(6) : 563-367.
- [18] Udoh, F. V. (2007). The effects of *Gnetum africanum* leaf extracts on some biochemical induces and endocrine functions in albino rats. A Ph.D. Thesis, university of Calabar, Calabar Nigera.
- [19] Udoh, P. and Ekpeyong, J. (2001) Effects of *Mucunaurens* (horse eye bean) on the gonads of male Guinea Pigs. *Phytotherapy Research* 15:99-102.
- [20] Vongtau, H. O., Abbah, J., Chindo, B. A., Mosugu, S., Salawa, A. O. and Kwanashie, H. O. (2005). General inhibitory effects of the methanol extract of *Neorautaniamitis* root in rats and mice. *Journal of pharmacology and Biology* 43:113-120.