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HISTOMORPHOLOGY OF SEMINAL VESICLE AND TESTICULAR TISSUE OF WISTAR RATS FOLLOWING ADMINISTRATION OF CARICA PAPAYA

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Abstract

Aim: This study was aimed at evaluating the effect of Carica papaya on male reproductive organs.

Methods: Twenty Wistar rats were randomly grouped into 4 of 5 rats each. They were fed with 2.5g/kg, 5g/kg and 7.5g/kg of ethanolic extract of Carica papaya once a day. The first group was given water. The rats were sacrificed on the 14th day and blood and tissues were taken for biochemical and histological analysis.

Results: There was significant increase ($P<0.05$) in serum protein (83.60±3.209, 78.80±1.483 and 72.60±3.578) and alkaline phosphatase (95.80±2.387, 62.80±2.168 and 99.60±1.817) when compared with the controls (64.40±3.286 and 55.60±4.722) respectively. The histology of the tissues was also normal**.**

Conclusion: Carica papaya leaf at various dosages in this research did not distort blood chemistry and the histo-architecture of the seminal vesicle and testicular tissue.

Key Words: Spermatogenic cells, Herbal, Reproduction, Carica papaya

INTRODUCTION

World health organisation (WHO) in 2002 defined traditional medicine as the sum total of the knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures, whether explicable or not, used in the maintenance of health as well as in the prevention, diagnosis, improvement or treatment of physical and mental illness. About 80% of African population uses traditional medicine (WHO, 2003). There have been claims by traditional medicine practitioners and others that there is no illness that has no locally made medicines, and that these herbs are wonder herbs where one cures as many illnesses as possible (Adejoro, 2013). Carica papaya (C. papaya) is a small, sparsely branched tree, usually with a single stem growing from 5 to 10 m (16 to 33 ft) tall, with spirally arranged leaves confined to the top of the trunk. The lower trunk is conspicuously scarred where leaves and fruit were borne. The leaves are large, 50–70 cm (20–28 in) in diameter, deeply palmately lobed, with seven lobes. All parts of the plant contain latex in articulated laticifers. (Heywood et al., 2007). Carica papaya (C. papaya) leaves are one of the readily available plants for herbal concoction, it is used as an alternative approach to orthodox health care delivery (Akande et al., 2012), which may have beneficial effects but may not be completely harmless (Oreagba et al., 2011). It is used in the treatment and cure of malaria, fever, diabetes, wounds and for inhibition of cancer growth (Adebayo and Kiettha, 2011). C. papaya latex has been shown to have activity against C. albicans (Giordani et al., 1996), Heligmosomoides polygyrus (Satrija et al., 1995), Ascaris suum and Ascaridia

galli (Satrija et al., 1994). Aqueous extract of C. papaya roots have shown potential activity in the management of dengue fever (Nisar et al., 2011), antitumor and immune-modulatory activities (Otsuki et al., 2010), hepatitis and jaundice in children. In reproduction, various extracts of C. papaya have been shown to have antifertility activity in male (Chinoy and Padman, 1996) and female rats (Chinoy et al., 1997). It is also reported to be an abortifacient and a lactogenic (Burkill, 1985). Aqueous extract of C. papaya leaf caused reduction in mean values of andrological parameters as a result of lesion of the seminiferous tubule epithelium (Oyekunle and Omope, 2010). The present study therefore is to determine the effects of fractions from the methanol root extract of C. papaya on some reproductive and biochemical parameters in male Wistar rats. There have been reports of adverse reactions to herbal medicines when used alone (Rajeev, 2008) or concurrently with conventional or orthodox medicines (Salah et al., 2010). Despite the wide acceptance of herbal medicines by different cultures and regions, there is no parallel advancement in international standards (Oreagba et al., 2011) as the indigenous herbal medicines have no dispensary measurements, the quantity taken is consequent upon the desire of the consumer, however several types of consumption cups ranging from glass to metal though are used, some patrons who purchase the commercially prepared concoction use plastic cups; take-away is also available (Adejoro, 2013).

METHODS

Collection and Ethanolic Extraction of C. papaya Leaves

The leaves of C. papaya collected in early march were obtained from the premises of the SHST, Port Harcourt, Rivers State, Nigeria. The leaves were dried and pulverized. The powered material was extracted in 95% ethanol for 48 hours. It was decanted, filtered and concentrated in a water bath. The extract obtained was reconstituted with water to give the required dosage of 2.5,5 and 7.5mg/kg body weight which was used in this study.

Experimental Animals

Twenty Wistar rats were obtain from the animal house of Nnamdi Azikiwe University, Nnewi Campus, Anambra State and acclimatized in SHST, Port Harcourt. The animals were housed in cages under standard laboratory conditions of 27 ± 2°C, relative humidity 50 ± 15% and normal photo period (12h dark/12h light) .

Experimental Design for in vivo study

The animals were divided into four groups of five rats each and were fed with the extract once daily for 14 days along with normal feeds and water as follows.

Control group: Received water
Group A: 2.5mg/kg of C. papaya extract
Group B: 5mg/kg of C. papaya extract
Group C: 7.5mg/kg of C. papaya extract

Serum Analysis

Blood samples collected from the rats were centrifuged for 10 minutes at room temperature to obtain serum. Serum protein and alkaline phosphatase (ALP) were determined using standard methods.

Tissue Preparation for Microscopy

The testis and seminal vesicle were dissected and fixed in 10% formal saline. They were processed by the paraffin wax method and sections were cut at 5 µm thickness. They were subsequently stained with haematoxylin and eosin (H & E) for general tissue architecture

Statistical Analysis

Data were analyzed with the one-way analysis of variance (ANOVA). The group means were compared using the Dunnett's Multiple Comparison Test using graph pad Prism® software version 5.01. P values of <0.05 were considered statistically significant.

RESULTS

There was significant increase (P<0.05) in serum protein (83.60±3.209, 78.80±1.483 and 72.60±3.578) and ALP (95.80±2.387, 62.80±2.168 and 99.60±1.817) when compared with the controls (64.40±3.286 and 55.60±4.722) respectively as seen in table 1.

Table1: Serum Protein and ALP Analysis

Parameter	Control	A (2.5mg/kg)	B (5mg/kg)	C (7.5mg/kg)
Protein	64.40±3.286	83.60±3.209	78.80±1.483	72.60±3.578
ALP	55.60±4.722	95.80±2.387	62.80±2.168	99.60±1.817

Each value represents the mean ± standard deviation, values are statistically different from control at p< 0.05*, 0.001** and 0.0001***one-way analysis of variance (ANOVA) + Dunnett's Multiple Comparison Test

There were no inflammatory or degenerative changes seen in the treatment groups (2.5mg/kg, 5mg/kg and 7.5mg/kg) of both seminal vesicle and testes when compared with the control in Figures 1 and 2.

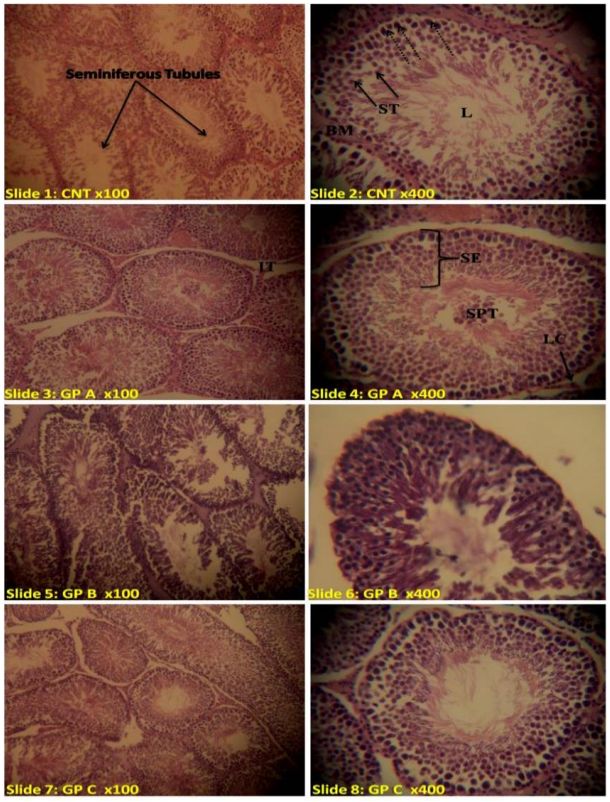

Figure 1 (Testes): Slides 1 and 2 (CNT) Convoluted Seminiferous tubules with Spermatogonia (Dash arrows), Spermatocytes (ST) and Lumen (L). The Leydig Cells (LC) and Interstitial tissues (IT). Slide 3 to 8 (treatment groups). No distortion seen in the experimental slides. H&E X100 and 400

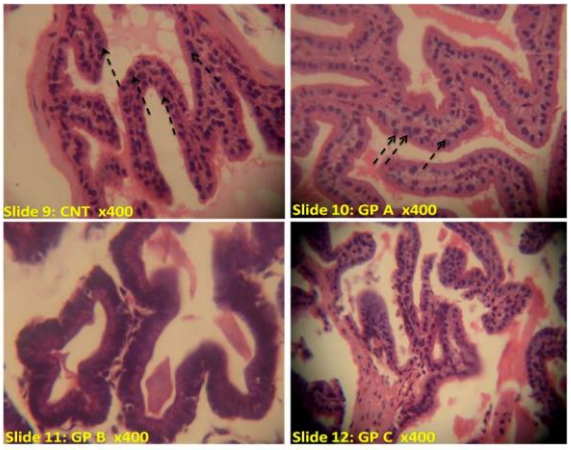

Figure 2 (Seminal vesicle): Slide 9 (CNT) and Slide10 (2.5mg/kg) with Epithelial lining (Dash arrows), slide 11 and 12 (5 and 7.5mg/kg). No distortion seen in the experimental slides. H&E X100 and 400

Discussion

The histological architecture of the reproductive organs is integral for its optimal function. The commonest cause of infertility is the obstruction by distortion of the normal anatomy of reproductive structures (Rajeev, 2008). The result of this study reveals no degenerative changes in both seminal vesicle and testes in all the treatment groups (2.5mg/kg, 5mg/kg and 7.5mg/kg) when compared with the control (figures 1 and 2) administered 400 mg/kg of the extract to rats for 4 and 13 weeks and observed degenerative changes in the seminiferous tubules. Nwaehujor et al (2014) reported severe testicular necrosis after administration 75mg/kg of C. papaya. Hasim et al (2013) administered 150mg/kg of C. papaya seed extract for 15days and observed distorted mucosal folds. The result obtained in this research may be connected to the low dosage administered when compared to the dosages of other researchers (Lilja et al.,

1984) (Delamirade and Semenoghen, 2007). Different types of serum and testis specific proteins (somatomedin C, sulfated glycoproteins 1 and 2, ceruloplasmin, transferrin, androgen-binding protein, Sertoli-derived growth factors, Müllerian-inhibiting substance, cyclic proteins-2 and inhibin) are secreted by Sertoli cells, although the functions of some of these proteins are poorly understood (National Cancer Council, 1989). Proteins appear to be one of the key nutrients affecting productive cycle and fertility in animals (Park et al., 2010). Studies have used proteins in plasma or serum in predicting endometrial function (Joshin, 1986). Generally semenogelin is the most predominant type of protein in semen(Lilja et al 1984), there are evidences that amino acids and proteins plays important role in the function and survival of sperm(Delamirande and Semenogehen 2007) and greater percentage of protein in semen is derived from the seminal vesicle(Hirsch et al.,1991). The significant increase ($P<0.05$) in serum protein groups (83.60±3.209, 78.80±1.483 and 72.60±3.578) when compared with the control (64.40±3.286) may have a link in the function and survival of the cells which includes sperm cells. Increase in seminal ALP has been one of the useful indicators of well nourished sperm in animals (Rodriguez et al., 2013), Rodriguez et al., (2013) reported that ALP level in seminal plasma was significantly correlated with semen volume and sperm concentration in animals. Similarly Alibawi concluded in one of their researches on ALP that seminal plasma and sperms correlated with the concentration of the sperms (Paris et al., 2012). Hunter (2012) reported that serum ALP corresponds with tubal and seminal ALP. The serum ALP of this research was significantly increased ($P<0.05$) in all the groups (95.80±2.387, 62.80±2.168 and 99.60±1.817) when compared with the control (64.40±3.286 and 55.60±4.722) as seen in table 1.

Conclusion

C. papaya leaf has been in use for decades and its efficacy in the treatment of diseases has been claimed by traditional medicine practitioners but the dosage and duration of administration is of great concern. Based on the result of this research C. papaya leaf at low dose in few days may not deter fertility as this may affirm to its use for decades. However, it is important to note that its abuse and combination with other herbs may be dangerous.

References

Adebayo JO, Krettlia A (2011). Medicinal plants used in Nigeria for the treatment of malaria. J Ethnopharm 88: 34-37

Adejoro L 'Agbo', Indigenous Health Solution for Millions. Daily Times NG. November 12, 2013 - 1:53pm By

Akande IS, Adewoyin OA, Njoku UF, Awosika SO (2012). Biochemical Evaluation of Some Locally Prepared Herbal Remedies (Agbo) Currently On High Demand in Lagos Metropolis, Nigeria. J Drug Metab Toxicol 3:118.

Chinoy NJ, Padman P (1996). Antifertility investigations on the benzene extract of Carica papaya seeds in male albino rats J. Med. Aromat. Plant Sci., 18 (3) 489-494

Chinoy NJ, Joshi. Harsha, Ghosh S (1997). Antifertility investigations of alcoholic papaya seed extract in female ratsJ. Med. Aromat. Plant Sci., 19 (2). 422-426

De Lamirande E (2007). Semenogelin, the main protein of the human semen coagulum, regulates sperm function. Semin Thromb Hemost 33(1):60-8.

Giordani R, Cardenas ML, Traffort J. Moulin, P. Regli (1996). Fungicidal activity of latex sap from Carica papaya and antifungal effect of D (+) - glucosamine on Candida albicans growth Mycoses, 39 (3–4) 103-110

Hasim BS, Lalithamma A, Govardhan NA, Changamma C (2013). Evaluation of antifertility efficacy of Carica papaya seed extract through histological indices in Male Albino Rats. International Journal of Chemical and Pharmaceutical Sciences4:3

Heywood VH, Brummitt RK, Culham A, Seberg O (2007). Flowering plant families of the world. Firefly Books. ISBN 9781554072064

Hirsch IH, Jeyendran RS, Sedor J, Rosecrans RR, Staas WE (1991). Biochemical analysis of electroejaculates in spinal cord injured men: comparison to normal ejaculates. J Urol. 145:73–76

Hunter RHF (2012). The fallopian tube their role in fertility and infertility. Springer Science and Business media. Page 38, 6th ed.

Joshi SG, Rao R, Henriques EE, Raikar RS and Gordon M (1986). Luteal phase concentrations of a progestagen-associated endometrial protein (PEP) in the serum of cycling women with adequate or inadequate endometrium. J Clin Endocrinol Metab 63,1247–1249.

Lilja H, Laurell CB, Jeppsson JO (1984). "Characterization of the predominant basic protein in human seminal plasma, one cleavage product of the major seminal vesicle protein.". Scand. J. Clin. Lab. Invest. 44 (5): 439–46

Nisar AF, Hina A, Muhammad HA, Bilal LF, Ijaz Mohammad (2011). Dengue fever treatment with Carica papaya leaves extracts Asian Pac. J. Trop. Biomed 330-333

Nwaehujor CO, Ode JO, Ekwere MR, Udegbunam RI (2014). Antifertilty effects of fractions from Carica papaya (Pawpaw) Linn Methanol root extract in male Wistar Rats. 10:0

National Research Council (US) Subcommittee on Reproductive and Neurodevelopmental Toxicology. Washington (DC): National Academies Press (US); 1989.

Rodríguez AL, Rijsselaere T, Beek J, Vyt P, Soom AV, Maes D (2013). "Boar seminal plasma components and their relation with semen quality," Systems Biology in Reproductive Medicine. 59:1, 5–12.

Rajeev Kumar (2008). Reproductive tract tuberculosis and male infertility. Indian J Urol. 24(3): 392–395

Satrija FP, Nansen H, Bjorn S, Murtini S (1994). Effect of Papaya latex against Ascaris suum in naturally infected pigs J. Helminthol, 68 (4) 343-346

Otsuki N, Dang NH, Kumagai E, Kondo A, Iwata S, Morimoto C (2010). Aqueous extract of Carica papaya leaves exhibits anti-tumor activity and immunomodulatory effects. J. Ethnopharmacol, 127 (3) 760-767

Oyekunle OA, Omope MM (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 (5) 252-255

Oreagba IA, OShikoya KA, Amakiri M (2011). Herbal Medicine use among residents in lagos Nigeria. Complementary and Alternative Medicine 11 :117

Park MS, Yang YX, Shinde PL, Choi JY, Jo JK, Kim JS et al (2010). Effects of dietary glucose inclusion on reproductive performance, milk compositions and blood profiles in lactating sows. Journal of Animal Physiology and Animal Nutrition 94:677-684

Paris NA. Alhady Alibawi, Sahib Y. Al-Morshidy, Ali G. Alhuweizi (2012). The alkaline phosphatase levels in the seminal plasma and sperms of sub-fertile patients and normospermic men. International Conference on Applied Life Sciences. Turkey, September 10-12, 2012

Satrija FP, Nansen S, Murtini S (1995). Anthelmintic activity of Papaya latex against patent Heligmosomoides polygyrus infections in mice J. Ethnopharm., 48 (3). 161-164

Salah AM, Halle GE, Ngeh JT, Ikhlas AK (2010). Effects of Carica papaya leaf extract in the reproductive parameters of male rats. Journal of Animal Reproduction Science 94:366-372

WHO (2002). Traditional medicine. Fact Sheet www.who.int/mediacentre/factsheets/2003/fs134/en Accessed in 2014.