

Full Length Research Paper

Aqueous ethanolic extract of *Cochlospermum planchonii* rhizome enhances spermatogenesis in male albino rats

A. H. Abu^{1*}, D. O. Ochalefu² and A. Ibrahim³

¹Department of Veterinary Physiology, Pharmacology and Biochemistry, College of Veterinary Medicine, University of Agriculture, P. M. B. 2373, Makurdi, Nigeria.

²Department of Biochemistry, College of Health Sciences, Benue State University, Makurdi, Nigeria.

³Department of Medicine, Faculty of Veterinary Medicine, University of Maiduguri, Maiduguri, Nigeria.

Accepted 15 June, 2012

***Cochlospermum planchonii* has numerous therapeutic benefits and is widely used in folklore medicine of many African countries. This study was designed to investigate the effects of aqueous ethanolic extract of *Cochlospermum planchonii* root on sperm characteristics of albino rats. Animals were assigned into four groups comprising a control, which received only distilled water and treatment groups at the doses of 100, 200 and 400 mg/kg body weight daily for 30 days, respectively. The aqueous ethanolic extract of *C. planchonii* did significantly increase ($P<0.05$) the weights of the testes and accessory sex organs. Sperm count and sperm motility of rats given the extract increased ($P<0.05$) relative to the control. Percentages of abnormal sperm cells remained unchanged. The results of this study indicate that aqueous ethanolic extract of *Cochlospermum planchonii* increased spermatogenesis in the male rats.**

Key words: *Cochlospermum planchonii*, sperm characteristics, reproduction, Wistar rats.

INTRODUCTION

Cochlospermum planchonii (Cochlospermaceae) is a bushy plant with bright yellow flowers of about 2.5 m in height and is widespread in the savannah and shrub land of West Africa. The plant is a common traditional medicine in Burkina Faso, Cameroon, Gambia, Ghana, Guinea, Ivory Coast, Nigeria and Senegal (Burkill, 1985). In Nigeria, it is called “N’ Dribala” (Fulani), “Rawaya” or “Kyamba” (Hausa), “Abanzi” (Igbo) and “Gbehutu or Feru” (Yoruba). The root decoction is the most frequently used part of the plant in the treatment of infertility, premenstrual pain, gonorrhoea (Burkill, 1985) and diabetes mellitus (Igoli et al., 2005). The leaves are used to treat jaundice, malaria and diarrhoea (Anthony et al.,

2005). The leaf, stem bark and root bark of *C. planchonii* have been shown to have strong antifungal effect against *Colletotrichum capsici* (Nduagu et al., 2008). In Northern Sierra Leone, the root decoction has been reported to be effective in the treatment of gonorrhoea, whereas the stem decoction is used in the treatment of menstrual disorders.

Some studies have shown that the decoctions of *C. planchonii* root extract are as effective as chloroquine for the treatment of uncomplicated malaria caused by *Plasmodium falciparum* (Benoit-Vical et al., 2003). The trypanocidal activity of chloroform extract of the stem bark of *C. planchonii* had been reported (Atawodi, 2005). The traditional use (in form of decoction) of this plant as an alternative therapy for diarrhoea (Magaji et al., 2010), gonorrhoea, jaundice and gastrointestinal disease (Mann et al., 2003) have been validated. Bioactive compounds of the methanolic root extract of *C. planchonii* are

*Corresponding author. E-mail: adakoleabu@yahoo.co.uk. Tel: +2348060396898.

reported to have central nervous system (CNS) depressing, analgesic, anti-inflammatory and anti-diabetic activities (Anaga and Oparah, 2009). However, there is no wealth of information on the effects of *C. planchonii* on male reproductive functions. The present study was designed to evaluate the effect of aqueous ethanolic extract of *C. planchonii* root on sperm characteristics of albino rats.

MATERIALS AND METHODS

Collection and preparation of the extract

C. planchonii roots were collected within the premises of University of Agriculture, Makurdi, identified and authenticated. Voucher specimen (No. 210) was deposited at the herbarium. The roots were washed, air dried under shade for one week, pulverized and stored in air-tight container until required. The powdered root material (500 g) was extracted as previously described (Abu and Uchendu, 2010) to give a yield of 16.5%. The dark-brown dried extract was stored in air-tight container at 4°C until needed.

Animals and treatment

Albino rats (Wistar strain) weighing 150 to 180 g were obtained from the College of Health Sciences, Benue State University, Makurdi, Nigeria. The animals were kept in polypropylene cages under room temperature, with 12 h light and 12 h dark cycle and were allowed to acclimatize for two weeks. The animals were fed with grower's mash (Grand Cereals and Oil Mills Ltd, Jos, Nigeria) and provided clean water freely. A protocol for this experiment was in accordance with the guidelines on the care and well-being of research animals (N.I.H, 1985) and approved by the Departmental Ethics Committee. The animals were randomly assigned into four groups of five rats each consisting of a control which received only distilled water and treatment groups at the doses of 100, 200 and 400 mg/kg body weight daily for 30 days, respectively. After the last day of administration, the animals were sacrificed under high ether anaesthesia.

Measurement of sperm parameters

The rats were anaesthetized with diethyl ether. A scrotal incision was made to exteriorize the testis and epididymides. The caudal epididymis was carefully removed, blotted free of blood and then placed in a prewarmed Petri dish containing 1.0 ml of physiological saline solution (maintained at 37°C). Several incisions were made on it to allow sperm swim out. Semen analysis was carried out immediately using the new improved Neubauer's haemocytometer counting chamber for determination of the concentration of spermatozoa. Sperm motility was also assessed immediately by counting both motile and immotile spermatozoa per unit area at the magnification of 40x. Sperm viability was assessed using eosin-nigrosin test. The percentages of unstained (live) and stained (dead) spermatozoa were calculated by counting 200 spermatozoa per sample. Morphological appearance of normal and abnormal spermatozoa was determined by examining stained smears under the oil immersion (100x) and their percentages were calculated.

Statistical analysis

Statistical evaluation of data was done using one-way analysis of

variance (ANOVA). The results were expressed as mean \pm S.E.M. using Graph Pad Prism Version 3.0 for Windows (Graph Pad Software, San Diego, California).

RESULTS

The absolute and relative body and organ weights of the control and extract treated rats are shown in Table 1. Administration of the extract for 30 days significantly ($P < 0.05$) increased the absolute and relative weights of the reproductive organs. There were also linear increases in the body weights of both the control and treatment groups. The extract caused significant ($P < 0.05$) increases in sperm motility and sperm count of extract treated rats (Table 2). Furthermore, the percentages of abnormal sperm cells (morphology) in treatment groups were not significantly different from the control.

DISCUSSION

The present study examined the effect of aqueous ethanolic extract of *C. planchonii* roots on sperm characteristics of male Wistar rats. The weights of reproductive organs were markedly increased (Table 1). Androgens regulate the weight, size and secretory function of testes, epididymes and accessory organs (Choudhary and Steinberger, 1975). The extract of *C. planchonii* roots caused an increase in sperm characteristics (Table 2). There was dose-dependent increase in sperm count following the administration of aqueous extract of *Lophira lanceolata* stem bark in male rats (Etuk and Muhammad, 2009). The researchers however, did not observe increases in sperm motility and abnormal morphology. They concluded that the plant had fertility enhancing effects. Similar observations suggestive of enhanced sperm motility, sperm count and decreased spermatozoa abnormality were made following oral administration of *Curcuma longa* and *Garcinia kola* (Farombi et al., 2007; Adimoeja et al., 1995).

Asparagus racemosus and *Withania senticosus* are plants also proven to improve spermatogenesis, sperm motility and morphology (Nantia et al., 2009). Extracts obtained from these medicinal plants alter reproductive functions in male and affect the quality and quantity of spermatozoa. Sperm count, motility, viability and morphology are parameters considered as the determinants of the fertilizing capacity of sperm cells (Raji et al., 2005). Results of this study, which revealed significant increases ($P < 0.05$) in sperm parameters in the treatment groups, might lend credence to the potential of the plant to enhance the fertilizing ability of sperm cells. A reduction in the fertility of male rats treated with the extracts of *Hymenocardia acida* (Abu and Uchendu, 2010) and *Alstonia boonei* (Raji et al., 2005) was due to decrease in sperm motility, viability and counts. It is conceivable that immotile or sluggishly motile

Table 1. Effect of aqueous ethanolic extract of *Cochlospermum planchonii* root on body and reproductive organ weights of male albino rats.

Parameter	Control	100 (mg/kg)	200 (mg/kg)	400 (mg/kg)
Initial Body Weight (g)	166.20 ± 1.88	164.20 ± 2.06	168.60 ± 1.86	165.80 ± 1.50
Final Body Weight (g)	185.80 ± 1.91	188.60 ± 1.33	183.60 ± 2.64	186.40 ± 1.60
Testes				
Absolute weight (g)	1.94 ± 0.02	2.20 ± 0.01	2.33 ± 0.02	2.44 ± 0.03
Epididymis				
Absolute weight (g)	0.33 ± 0.01	0.42 ± 0.01	0.49 ± 0.01	0.55 ± 0.02
Ventral prostate				
Absolute weight (g)	0.27 ± 0.02	0.36 ± 0.05	0.42 ± 0.01	0.49 ± 0.01
Seminal vesicle				
Absolute weight (g)	0.48 ± 0.01	0.53 ± 0.01	0.60 ± 0.01	0.61 ± 0.02
Vas deferens				
Absolute weight (g)	0.13 ± 0.01	0.12 ± 0.01	0.14 ± 0.01	0.14 ± 0.02

Data are expressed as mean ± S.E.M; n = 5.

Table 2. Effect of aqueous ethanolic extract of *Cochlospermum planchonii* rhizome on sperm characteristics of albino rats.

Group	Sperm motility (%)	Sperm count	Viability (%)	Morphology (%)	
				Normal	Abnormal
Control	63.20 ± 1.32	55.60 ± 1.47	57.60 ± 0.93	75.50 ± 1.09	25.50 ± 1.00
100 (mg/kg)	66.50 ± 0.60	66.40 ± 0.51	59.00 ± 1.07	73.80 ± 1.02	26.20 ± 1.02
250 (mg/kg)	71.00 ± 1.18	68.50 ± 0.75	60.50 ± 0.98	73.20 ± 1.63	26.80 ± 1.63
500 (mg/kg)	74.00 ± 1.30	70.80 ± 1.24	63.00 ± 1.27	77.25 ± 1.10	22.75 ± 1.10

Data are expressed as mean ± S.E.M; n = 5.

spermatozoa might not penetrate the cervical mucus and thus fail to fertilize the ova.

Conclusion

The increase in the sperm parameters as observed in the present study seems to justify the folkloric use of the extract in treating male infertility. However, further investigations on hormonal milieu as it relates to the hypothalamus-pituitary-gonadal axis and its aphrodisiac properties are required.

REFERENCES

- Abu AH, Uchendu CN (2010). Antispermatic effects of aqueous ethanolic extract of *Hymenocardia acida* stem bark in Wistar rats. *J. Med. Plants Res.*, 4(23): 2495-2502.
- Adimoeja A, Setiawan L, Djojotnanjo T (1995). First International

- Conference of Medicinal Plants for Reproductive Medicine in Taipei, China. 1(2): 4368-4380.
- Anaga AO, Oparah NO (2009). Investigation of the methanol root extract of *Cochlospermum planchonii* for pharmacological activities *in vitro* and *in vivo*. *Pharm. Biol.*, 47(11): 1027-1034.
- Anthony JP, Fyfe L, Smith H (2005). Plant active components, a resource for antiparasitic agents. *Trends Parasitol.*, 21: 462-468.
- Atawodi SE (2005). Comparative *in vitro* trypanocidal activities of petroleum ether, chloroform, methanol and aqueous extracts of some Nigerian savannah plants. *Afr. J. Biotechnol.*, 4(2): 177-182.
- Benoit-Vical F, Valentin A, Da B, Dakuyo Z, Descamps L, Mallié M (2003). N'Dribala (*Cochlospermum planchonii*) versus chloroquine for treatment of uncomplicated *Plasmodium falciparum* malaria. *J. Ethnopharmacol.*, 89(1): 111-114.
- Burkill HM (1985). The useful plants of West Africa, Vol. (1). Royal Botanical Gardens, pp. 386-387.
- Choudhary A, Steinberger E (1975). Effect of 5 α -Reduced Androgens on Sex Accessory Organs. Initiation and Maintenance of Spermatogenesis in the Rat. *Biol. Reprod.*, 12: 609-617.
- Etuk EU, Muhammad AA (2009). Fertility enhancing effects of aqueous stem bark extract of *Lophira lanceolata* in male Spargue Dawley rats. *Intern. J. Plant Physiol. Biochem.*, 1(1): 1-4.
- Farombi EO, Abarikwu SO, Adedara IA, Oyeyemi MO (2007). Curcumin

- and Kolaviron ameliorate Di-n-Butylphthalate-induced testicular damage in rats. *Basic Clin. Pharmacol. Toxicol.*, 100: 43-48.
- Igoli SO, Ogeji OG, Tor-Anyiin TA, Igoli NP (2005). Traditional medical practice amongst the Igede people of Nigeria. *Afr. J. Trad. Compl. Altern. Med.*, 2(2): 134-152.
- Magaji MG, Shehu A, Musa AM, Sani MB, Yaro AH (2010). Pharmacological evidence on the folklore use of *Cochlospermum tinctorium* A. Rich in the management of diarrhoea. *Int. J. Pure Appl. Sci.*, 4(1): 14-20.
- Mann A, Gbate M, Umar AN (2003). Medicinal and Economic plants of Nupeland. Jube-Evans Books and Publications, Bida, Nigeria, p. 64.
- Nantia EA, Moundipa FP, Monsees KT, Carreau S (2009). Medicinal plants as potential male antiinfertility agents: A review. *Andrologie*, 19: 148 -158.
- Nduagu C, Ekefan EJ, Nwankiti AO (2008). Effect of crude plant extracts on growth of *Colletotrichum capsici* (Synd) Butler & Bisby, causal agent of pepper anthracnose. *J. Appl. Biosci.*, 6(2): 184-190.
- National Institute of Health (N.I.H) (1985). Guide for the care and use of laboratory animals. DHEW Publication. Office of Science and Health Reports, Bethesda, U.S.A.
- Raji Y, Salman TM, Akinsomisoye OS (2005). Reproductive function in male rats treated with methanolic extract of *Alstonia boonei* stem bark. *Afr. J. Biomed. Res.*, 8(2): 105-111.