

## Short Communication

# Sperm quality of male rats treated with aqueous extract of *Enantia chlorantha* stem bark

Toyin M. Salman<sup>1\*</sup> and Ayoade A. Adesokan<sup>2</sup>

<sup>1</sup>Department of Physiology, College of Health Sciences, University of Ilorin, Ilorin, Nigeria.

<sup>2</sup>Medical Biochemistry Unit, College of Health Sciences, University of Ilorin, Ilorin, Nigeria.

Accepted 26 October, 2007

The effects of aqueous extract of *Enantia chlorantha* were studied on sperm motility, viability and counts in adult albino rats. Oral administration of 50 and 100 mg/kg body weight of the extract daily for a week caused dose-dependent changes in the sperm motility and viability without a significant change in the sperm counts. There was a significant increase in sperm motility and viability ( $P < 0.05$ ) and an insignificant increase in sperm counts at 50 mg/kg body weight. However, an insignificant increase ( $P > 0.05$ ) in sperm motility, and viability was observed at 100 mg/kg body weight. The results suggest that low doses of *E. chlorantha* could improve sperm quality.

**Key words:** *Enantia chlorantha*, Aqueous extract, sperm quality, albino rats.

## INTRODUCTION

The global 'Roll Back Malaria' initiative that set up medicines for malaria venture (MMV) to foster and to accelerate research into innovative drugs with antimalarial properties (WHO, 1984) has motivated the search for plants with potential pharmacological and therapeutic uses. Various parts of plants have been used over the ages for therapeutic purposes (Lambo et al., 1979) and one of such plants is *Enantia chlorantha*.

*E. Chlorantha* (Annonaceae) is an ornamental tree of up to 30 m high, with dense foliage and spreading crown. The stem is fluted, the outer bark is thin, dark brown while the inner bark is light brown above and pale green beneath. The leaves display up to 20 pairs of prominent lateral veins and parallel secondary nerves. It is commonly called "Dokita igbo" in Nigeria (Iwu et al., 1993). Phytochemical studies had revealed the presence of alkaloids in *E. chlorantha*. The alkaloids include palmatine, columbamine and pseudocolumbamine. Also present are simple sugars and saponins. The alkaloids are thought to be the active components (Vennerstrom and Klayman, 1988).

*E. chlorantha* is used traditionally in the treatment of malaria and other ailments of the body such as cough

and wounds (Gill and Akinwumi, 1986). When administered, both aqueous and ethanolic extracts of *E. chlorantha* were found effective as schizonticides in mice infected with *plasmodium yoeli*, although the extracts were more slowly acting than known antimalarial drugs (WHO, 1984). The antiviral, antibacterial and antipyretic properties of *E. chlorantha* had also been documented (Wafo et al., 1999). It has been shown to confer cytoprotection on the mucosa lining of the gastrointestinal tract through its antiulcerative effect (Siminialayi, 2004).

Moreover, it had been reported to cause alterations in the activities of the liver enzymes such as inactivation or inhibition of alkaline phosphatase and lactate dehydrogenase with an induction of glutamate pyruvate transaminase, all of which adversely affect the liver enzymatic functions (Akanji and Adesokan, 2005).

The induction of reversible male infertility in experimental animals and humans resulting from treatment with medicinal plants and their products had drawn the attention of researchers over the years.

The antisteroidogenic and antifertility activities of extracts from *Carica papaya*, *Quassia amara*, *Azadirachta indica*, *Alstonia boonei* and *Morinda Lucida*, all of which have documented antimalarial properties had been reported (Lohiya et al., 1994; Raji and Bolarinwa, 1997; Raji et al., 2003). With the increased efforts in the development of more potent antimalarial agents as a result of the challenge posed by the resistant strains of

\*Corresponding author. E-mail: [drsalman111@yahoo.com](mailto:drsalman111@yahoo.com). Tel: +2348032337422

**Table 1.** Effects of aqueous extract of *Enantia chlorantha* on sperm motility, viability and counts in rats.

Groups	Motility (%)	Viability (%)	Counts Million/ml.
Control	52.17 ± 6.03	39.66 ± 3.33	55.83 ± 8.35
50 mg/kg	77.50 ± 4.31*	60.00 ± 3.64*	63.00 ± 5.66
100 mg / kg	67.50 ± 4.71	46.00 ± 9.30	56.67 ± 8.51

Values in asterisk are significantly different from the control at P <0.05.

the malarial parasite, the evaluation of these antimalarial agents for possible antifertility actions becomes worthwhile.

In the absence of information on the reproductive toxicity of *E. chlorantha*, a potent antimalarial plant, the present investigations were therefore undertaken to determine the male reproductive effects of the aqueous extract of *E. chlorantha* stem bark in rats.

## MATERIALS AND METHODS

### Animal model

Wister strain albino rats (150-230 g) obtained from the Central Animal House, College of Medicine, University of Ibadan, were used for the study. The rats were housed in wire mesh cages under standard conditions (25-29°C, 12 h light and 12 h darkness cycles) and fed with standard rat pellet diet and water *ad libitum*. The study was conducted in accordance with the recommendations from the declaration of Helsinki on guiding principles in the care and use of animals.

### Plant material

The stem bark of *E. chlorantha* was obtained from the tree and authenticated at the herbarium of the Department of Plant Biology, University of Ilorin, where voucher specimens were deposited. The sun-dried stem bark was ground into powder and exhaustively extracted with water. The filtrate obtained was evaporated to dryness. The solid extract was then stored in the refrigerator for the study.

### Experimental design

A total of 18 male rats were divided into 3 groups of six (6) rats each. Group I served as the control while groups II and III were treated with 50 mg and 100 mg/kg body weight respectively for 7 days. Administration was by oral route.

### Sperm motility, viability and counts

The rats were anaesthetized with 25% urethane at a dose of 0.6 ml/100 g intraperitoneally. The caudal epididymis was then dissected. An incision (about 1 mm) was made in the caudal epididymis and drops of sperm fluid were squeezed onto the microscope slide and 2 drops of normal saline were added to mobilize the sperm cells. Epididymal sperm motility was then assessed by calculating motile spermatozoa per unit area and was expressed in percentage. Epididymal sperm counts were also done by homogenizing the epididymis in 5 ml of normal saline. Counting was then done

using the counting chamber in the haemocytometer (Adeeko and Dada, 1998). The sperm viability was also determined using Eosin/Nigrosin stain as earlier described (Raji et al., 2003).

### Statistical analysis

Data were expressed as mean ± SEM. Statistical significance was determined using Duncan's test and student's t-test where necessary.

## RESULTS AND DISCUSSION

The results showed that there were dose-dependent changes in the sperm motility and viability while there was no significant change in sperm counts (Table 1). The sperm motility significantly increased (P <0.05) from 52.17 ± 6.03 percent in the control rats to 77.50 ± 4.31 percent in the rats treated with 50 mg/kg of the extract (Table 1). Although there was an apparent increase in the sperm motility in the group treated with 100 mg/kg of the extract, this was not significant (P >0.05). Moreover, there was also a significant increase in sperm viability from 39.66 ± 3.64 percent in the control rats to 60.00 ± 3.64 percent in those treated with 50 mg/kg. Again, an apparent but insignificant increase in sperm viability was observed in those treated with 100 mg/kg (Table 1).

The present study established the effects of aqueous extract of *E. chlorantha* on sperm quality. The extract significantly increased sperm motility and viability dose-dependently without a significant increase in the sperm counts.

These findings are in contrast with the reported antifertility effects of many antimalarial agents including quinine, chloroquine and the extracts of *Morinda lucida* (Sairam, 1978; Adeeko and Dada, 1998; Raji et al., 2003; Lohiya et al., 1994). These observations may not be unconnected with the chemical composition of the plant. Phytochemical analysis indicated the presence of simple sugars, saponins and alkaloids in the extract. Out of these active ingredients, the simple sugars are most likely involved in the observed increase in sperm motility and viability. This is because simple sugars are not present in the above mentioned antimalarial agents with proven spermatotoxic effects. Again, the metabolism of simple sugars such as glucose will lead to the production of pyruvate. Pyruvate is known to be the preferred substrate essential for the activity and survival of sperm

cells. (Egbunike et al., 1986). In addition, other antimalarial agents which reduce sperm motility and viability such as quinine, chloroquine and *Morinda lucida* are known to have hypoglycemic property (Abu-Sharka, 1994; Olajide et al., 1999), a property which explains at least in part, the impairment of the activity and survival of the sperm cells induced by these agents.

This study suggests that *E. chlorantha* does not have spermatotoxic effects but rather, it could improve sperm performance, especially at a low dose. In view of these findings, further investigations into the effects of *E. chlorantha* on male reproductive hormones and fertility will be required.

## REFERENCES

- Abu-Sharka MN (1994). Hypoglycemia. Clin. Exp. Pharmacol. 12: 19-25.
- Adeeko AO, Dada OA (1998). Chloroquine reduces the fertilizing capacity of epididymal sperm in rats. Afr. J. Med. Sci. 27: 63-68.
- Akanji MA, Adesokan AA (2005). Effects of repeated administration of aqueous extract of *Enantia chlorantha* stem bark on some selected enzyme activities of rat liver. Biokemistri, 17(1): 13-18.
- Egbunike GN, Branscheid W, Pfisterer J, Holtz W (1986). Changes in porcine sperm lactate dehydrogenase isoenzymes during sperm maturation. Andrologia, 18: 108-113.
- Gill LS, Akinwumi C (1986). Nigerian folk medicine: Practices and beliefs of the Ondo people. J. Ethnopharmacol. 18: 23-29.
- Iwu MM (1993). Handbook of African medicinal plants. CRS Press, L.L.C. USA. pp. 1-13.
- Lambo JO (1979). The healing powers of herbs with special reference to obstetrics and gynaecology. Afri. Med. Plants (ed, Sofowora E.A). University of Ife Press, Ife Nigeria. p. 23.
- Lohiya NK, Goyal RB, Jayaprakash D, Ansari AS, Shaourma S (1994). Antifertility effects of aqueous extract of *Carica papaya* seeds in male rats. Planta. Med. 60: 400-404.
- Olajide OA, Awe SO, Makinde JM, Morebise O (1999). Evaluation of the anti-diabetic property of *Morinda lucida* leaves in streptozotocin-diabetic rats. J. Pharm. Pharmacol. 51: 1321-1324.
- Raji Y, Udoh US, Mewoyeka OO, Onoye FC, Bolarinwa AF (2003). Implication of reproductive endocrine malfunction in male antifertility efficacy of *Azadirachta Indica* extract in rats. Afr. J. Med. Sci. 32: 159-165.
- Sairam MR (1978). In: structure and function of gonadotrophins. Mkeras KW (ed). Plenum, New York, 275-274
- Siminialayi IM (2004). Gastroprotective effects of the ethanolic extract of *Enantia chlorantha* in rats. W/A J. Pharmacol. Drug Res., 20(1): 35-38.
- Vennerstrom JL, Klayman DL (1988). Protoberberine alkaloids as antimalarials. J. Med. Chem. 31: 1084-1087.
- Wafo P, Nyasse B, Fontaine C (1999). 7, 8-dihydro-8- hydroxypalmitine from *Enantia chlorantha*; Phytochemistry, 50: 279-281.
- World Health Organization (WHO) (1984). Tropical Disease Research. 7<sup>th</sup> Programme Report; Jan. 1983 to Dec. 1984.