

## Short Communication

# Evaluation of the Reproductive Endocrine and Andrological Effects of *Trichilia monadelpha* Extract in Male Albino Rats

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Accepted 10 October, 2025

A lot of anti-malarial drugs are known to have serious detrimental effects on the sperm indices in experimental animals as well as in man; although recently, some drugs have been shown to have no adverse effects on testicular functions. The dearth of information on the reproductive toxicity of *Trichilia monadelpha*, a potent antimalarial plant in West Africa, especially in the South Western part of Nigeria, makes this study important. The effects of the aqueous extract of *T. monadelpha* were studied on sperm motility, viability and counts and serum concentration of testosterone in male albino rats. Oral administration of 400 mg/kg/day of *T. monadelpha* stem extract was administered for 4 weeks. The control rats received the vehicle, and all treated rats had corresponding recovery groups. There was a significant increase in sperm motility and viability ( $P < 0.01$ ) as well as an insignificant difference in the sperm counts ( $P > 0.05$ ) and there was a decrease in the serum testosterone level at  $P < 0.01$ . The results suggested that the administration of *T. monadelpha* at a dose of 400 mg/kg/day that was employed in this study had no adverse effects on testicular functions in the rat.

**Key words:** Anti-malarial drugs, aqueous extract, sperm quality, testosterone, male rat.

## INTRODUCTION

*Trichilia monadelpha* (Rutaceae) is a medium-sized tree of about 20 m, often low-branching, up to 40 to 60 cm in diameter and is widely used as a medicinal plant in West Africa, especially in Nigeria. The bark is used as an ingredient of fever teas in folklore medicines in the treatment of malaria. The plant serves as an alcoholic as well as an aphrodisiac, while the stem bark of *T. monadelpha* is used as an analgesic; it is also used in the treatment of intestinal problems, malnutrition, abortifacients, arthritis, rheumatism, parasitic infections and a host of others (Atindehou et al., 2004).

The major constituents of *T. monadelpha* bark extract are alkaloids, tannins and sugars. The bark extracts of *T. monadelpha* have been shown to possess potent antiplasmodial activity against chloroquine and pyrimethamine-resistant *Plasmodium falciparum* strains.

Many antimalarial agents have been shown to possess various degrees of anti-fertility activities (Raji and Bolarinwa, 1997); although recently, some drugs have been shown to have no adverse effects on testicular functions, an example being the Artemether-lumefantrine combination, although this occurs at a dose-dependent manner (Akinlolu et al., 2007; Morakinyo et al., 2009). With the dearth of information on the reproductive toxicity of *T. monadelpha*, a potent antimalarial plant, the present study was to investigate the effects of the aqueous extract of *T. monadelpha* stem bark extract on male rat reproductive indices like the sperm characteristics and testosterone secretion.

## MATERIALS AND METHODS

### Plant

The stem bark of *T. monadelpha* was obtained from Osun State, Nigeria and the plant specimen was authenticated at the herbarium of the Forestry Research Institute of Nigeria, with a voucher, FHI

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**Table 1.** Effect of aqueous extract of *T. monadelphpha* on sperm motility, viability and counts in rats.

| Groups                  | Motility (%)  | Viability (%) | Counts (Million/ml) |
|-------------------------|---------------|---------------|---------------------|
| Control                 | 5.75 ± 0.38   | 13.3 ± 1.16   | 47.32 ± 10.28       |
| 400 mg/kg/day           | 11.86 ± 0.70* | 19.9 ± 2.45*  | 52.04 ± 0.86**      |
| 400 mg/kg/day(recovery) | 8.77 ± 0.73   | 9.09 ± 0.72   | 54.92 ± 0.45        |

n = 7; values with asterisk are significantly different from the control at \*P < 0.01 and \*\*P < 0.05.

**Table 2.** Effect of aqueous extract of *T. monadelphpha* on testosterone level in rats.

| Groups               | Control    | 400 mg/kg/day | 400 mg/kg/day [Recovery] |
|----------------------|------------|---------------|--------------------------|
| Testosterone (ng/ml) | 7.00 ± 0.1 | 5.00 ± 0.3*   | 7.00 ± 0.1               |

n= 7; values with asterisk are significantly different from the control at \*P < 0.01.

Number: 108844. The air-dried stem bark was ground into fine powder and was extracted with water. The solvent was then distilled off to give the solid extract which was stored at 4°C.

### Animals

Adult male albino rats (200 to 300 g) were used for the experiment. The rats were housed in wire mesh cages under standard environmental conditions with the provision of 12 h light and 12 h darkness. Rat cubes (Bendel Feeds LTD, Ilorin) and water was provided *ad libitum*. Ethical approval was received from the College of Health Sciences University of Ilorin animal house committee.

### Experimental protocol

21 male albino rats were divided into 3 groups of seven rats each. The animals received intragastric (i.g) administration of 400 mg/kg/day for 4 weeks and allowed to recover for 4 weeks. The choice of duration of extract administration for 4 weeks was to mimic the use of the plant in traditional treatment of malaria while the administration of 400 mg/kg/day was according to this study (Raji et al., 2005a).

The 3 groups are as follows:

- Group 1: The control, which was administered, distilled water which was the vehicle for the extract.
- Group 2: Rats administered 400 mg/kg/day of the extract.
- Group 3: Rats administered 400 mg/kg/day of the extract and allowed to recover.

### Blood sample collection

Blood was collected from each rat via the left ventricular cardiac puncture. Serum for the estimation of testosterone levels was obtained from the blood.

### Hormonal assay

Serum samples were assayed for testosterone using the enzyme linked immunoassay (EIA) technique.

### Sperm indices

The testes from each rat were carefully exposed and one of them was removed together with its epididymis. The epididymis was separated and the epididymal fluid was collected from the caudal part. The progressive sperm motility, sperm count and sperm viability were determined (WHO, 1987).

### Statistical analysis

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

## RESULTS

The results showed significant increase in the sperm motility and viability of the rats while there was no significant change in sperm counts (Table 1). The sperm motility significantly increased (P < 0.01) from 5.75 ± 0.38% in the control rats to 11.86 ± 0.70% in the treated rats and there was a reduction in the recovery groups afterwards (8.77 ± 0.73%). Also, there was a significant increase in the sperm viability from 13.3 ± 1.16% to 19.9 ± 2.45% in the treated rats which was reduced in the recovery groups as well (9.09 ± 0.72%). There was no significant difference in the sperm counts (Table 1).

There was a significant reduction in serum testosterone levels in the treated group when compared with the control, while there was no significant difference in the recovery group when compared with the control (Table 2).

## DISCUSSION

The present study examined the effect of the aqueous extract of *T. monadelphpha* on sperm indices. The extract

significantly increased both the sperm motility and viability with no significant difference in the sperm counts. These findings are in contrast with the reported anti-fertility effects of many antimalarial agents like *Morinda lucida* (Raji et al., 2005a), *Alstonia boonei* (Raji et al., 2005b) and *Carica papaya* leaf (Oyekunle et al., 2010). These observations may not be far fetched from the chemical composition of the plant. Phytochemical analysis of *T. monadelpha* has indicated the presence of alkaloids, tannins and simple sugars in the plant. The alkaloids have been implicated in abnormal sperm morphology even in human adults (Ejebe et al., 2008), but on the other hand, the simple sugars seem to be involved in the observed increase in sperm motility and viability. This is due to the fact that the metabolism of simple sugars like glucose will lead to the production of pyruvate. Pyruvate is a substrate necessary for the activity and survival of sperm cells (Egbunike et al., 1986). Antimalarial substances, such as quinine, chloroquine, *M. lucida* which reduce sperm motility and viability are known to have hypoglycaemic property (Olajide et al., 1999), a property which explains in part the impairment of the activity and survival of the sperm cells induced by these agents.

There was a decrease in serum testosterone level in rats treated with *T. monadelpha*. Similar changes have been reported in male rats treated with the extracts of *Azadirachta indica* (Raji et al., 2003), *Quassia amara* (Raji and Bolarinwa, 1997) and *C. papaya* leaf (Oyekunle et al., 2010). Testosterone is required for the growth, development and maintenance of male reproductive organs (Mooradan et al., 1987) and in association with follicle-stimulating hormone, acts on the seminiferous tubules to initiate and maintain spermatogenesis (Christensen et al., 1975). A high dose of 400 mg/kg/day of *T. monadelpha* extract used in this study showed a significant decrease in the serum level of testosterone. It is probable that steroidogenic potentiation was responsible for the use of *T. monadelpha* as an aphrodisiac in traditional medicine.

The study suggests that *T. monadelpha* may not have spermatotoxic effect, but rather it could improve sperm performance. Further studies aimed at elucidating the fertility activities of *T. monadelpha* extract are worthwhile.

## ACKNOWLEDGEMENT

Authors thank Mr Olorunniyi Jola for collecting the plants used in the study from Osun State.

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