

# Androgenic effect of *Mondia whitei* roots in male rats

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## Abstract

**Aim:** To determine the effect of the aqueous extract of *Mondia whitei* (Periplocaceae) roots on testosterone production and fertility of male rats. **Methods:** Adult male Wistar rats were used. In the acute study, 20 rats were randomly divided into 5 groups of 4 animals each. Four treated groups were administered orally a single dose of *Mondia whitei* (400 mg/kg) and the controls received a similar amount of distilled water. One group of animals were sacrificed by cervical dislocation 1, 2, 4 and 6 h after treatment, respectively. The controls were sacrificed at 6 h. Testicular testosterone was determined by radioimmunoassay. In the chronic study, 28 rats were divided at random into 4 groups of 7 animals each: Groups 1, 2 and 3 were given orally the plant extract (400 mg kg<sup>-1</sup> day<sup>-1</sup>) for 2, 4 and 8 days, respectively. The animals of Groups 1 and 2 were sacrificed 24 hours after the last dosing. The controls (Group 4) received the same amount of distilled water for 8 days. The fertility was assessed only in Groups 3 and 4 and after that, the animals were sacrificed and the epididymal sperm density, the serum testosterone and the testicular testosterone and 17-estradiol were assayed. The serum, testicular and epididymal protein contents were also determined. **Results:** In the acute treatment groups, the serum and testicular concentrations of testosterone remained unchanged at all the time points. Chronic treatment for 8 days induced a significant increase in the testicular weight, the serum and testicular testosterone, the testicular protein content and the sperm density ( $P < 0.05-0.01$ ), but did not affect the accessory gland weights, the serum protein contents, the testicular concentration of 17 $\beta$ -estradiol and the fertility compared to the controls. **Conclusion:** *Mondia whitei* root extract possesses an androgenic property.

## 1 Introduction

Many indigenous plants have been reported to be effective in male fertility regulation [1-5]. *Mondia whitei* growing in the Sudano-guinean zone is a large woody liana with a pleasant vanilla smell. In the Southern and Western parts of Cameroon, it is known as "Limte", "Nkang Bongo", "Yang" or "La racine". The roots are used as spices and aphrodisiac and for the treatment of urinary tract infection, jaundice and headache, while the whole plant is used to treat diarrhoea [6, 7]. Phytochemical studies revealed the presence of glucosides, alkaloids and 2-hydroxy-4-methoxybenzaldehyde [8, 9]. Toxicity studies in mice showed a LD<sub>50</sub> of 11.9 g/kg for the aqueous extract (unpublished data), indicating a very low toxic level. The present investigation was undertaken to study the effect of *Mondia whitei* on certain reproductive parameters in male rats at an aim to evaluate its claimed ethnopharmacological usage as an aphrodisiac.

## 2 Materials and methods

### 2.1 Plant extract

Fresh roots of *Mondia whitei* were obtained from a local market in Yaounde. Botanical identification was done at the Cameroon National Herbarium (HNC), Yaounde, Cameroon. It has been deposited in the herbarium with a Herbarium Voucher Specimen No. 42920/HNC (collected by Westphal No.10050). The root bark (200 g) was grounded using an electrical grinder and the paste (193 g) obtained was dispersed in distilled water (400 mL) for 24 hours at 4 °C. After filtration and lyophilization, 12 g of product were obtained, giving an extraction yield of 6 %. The product was dissolved in distilled water at 30 mg/mL for gastric gavage to rats.

## 2.2 Animals

Adult male Wistar rats (257 - 286 g) raised in the animal house of the University of Yaounde I were used. They were housed under standard conditions (12 h light/12 h night, 26 °C), fed a standard diet (SPC Ltd, Bafoussam, Cameroon) and provided tap water *ad libitum*.

## 2.3 Acute study

20 rats were randomly divided into 5 groups of 4 animals each. Four treated groups were administered orally a single dose of *Mondia whitei* (400 mg/kg) and the controls received a similar amount of distilled water. The 4 treated Groups were sacrificed by cervical dislocation 1, 2, 4 and 6 h after dosing, respectively (controls sacrificed at 6 h). Testosterone level was then determined in the serum and the testis by radioimmunoassay after extraction with diethylether according to the procedure provided in the WHO's kit with 3H-testosterone as the radioactive marker. The within assay variation was 3 % and the sensitivity, 13.5 pg/tube.

## 2.4 Chronic study

Twenty-eight rats were divided at random into 4 groups of 7 animals each. Groups 1, 2 and 3 were given orally the plant extract (400 mg kg<sup>-1</sup> day<sup>-1</sup>) for 2, 4 and 8 days, respectively. Group 4 (controls) received a similar volume of distilled water for 8 days. After the mating test as described by Wang *et al* [10] in Groups 3 and 4, the animals of all the Groups were sacrificed and the testes, epididymis, seminal vesicle and ventral prostate were dissected, cleared of the fat and connective tissue and weighed. The serum and testicular testosterone and testicular 17-estradiol were determined by radioimmunoassay according to the procedure provided in the WHO's kit with <sup>3</sup>H-testosterone and <sup>3</sup>H-estradiol as the radioactive markers, respectively. The within assay variation was 3 % for testosterone and 2.1 % for estradiol and the sensitivity was 13.5 pg/tube for testosterone and 1.152 pg/tube for estradiol. Serum and tissue (testis and epididymis) proteins were determined by the techniques of Bradford [11] and Gornall *et al* [12], respectively. The sperm density was estimated in the cauda of the right epididymis using WHO protocol [13]. The fertility was calculated using the following formula: % success = [Pregnant females / Mated females] 100.

## 2.5 Statistical analysis

Data were expressed in mean±SEM. The significance of differences was evaluated by the Mann Whitney test with *P*<0.05 as significant.

# 3 Results

## 3.1 Acute study

The serum testosterone concentration was not significantly changed at all time points.

## 3.2 Chronic study

### 3.2.1 Organ weights

The relative testis weight was increased significantly in all treated groups as compared with the controls and the increase was more marked in the group treated for 8 days (*P*<0.01) than that in other groups (*P*<0.05). The treatment did not affect the relative weights of the epididymis, seminal vesicles and ventral prostate (Table 1).

Table 1. Effects of aqueous extract of *Mondia whitei* roots on organ weights, sperm density and fertility in rats. Data in mean±SEM.

<sup>b</sup>*P*<0.05, <sup>c</sup>*P*<0.01, compared with controls.

Group	Organ weight (mg/100g)				Sperm density (10 <sup>6</sup> /mL)	Males mated	Females pregnant	Litter size (per group)	Fertility (%)
	Testis	Epididymis	Uterine horns	Prostate					
Whitei	1852 <sup>b</sup>	217	3241	510	717				
2 days	232 <sup>b</sup>	412	2935	77	746				
4 days	913 <sup>c</sup>	810	3338	514	879 <sup>b</sup>	14	14	91	100
Control	512	511	3625	98	735	10	10	89	100

### 3.2.2 Biochemical changes

A significant increase in the serum ( $P<0.01$ ) and testis ( $P<0.05$ ) testosterone levels as well as an increase in the testis protein concentration ( $P<0.05$ ) was seen after 8 days of treatment. No significant change was seen in rats treated for 2 or 4 days. The testicular 17-estradiol, the protein contents of epididymis and serum were not significantly changed in all the treated groups (Table 2).

Table 2. Changes in hormonal levels and total protein contents in different tissues of rats. Data in mean±SEM. <sup>b</sup> $P<0.05$ , <sup>c</sup> $P<0.01$ , compared with controls.

Group	Testosterone		17β-estradiol Testis (ng/g)	Total protein		
	Serum (ng/mL)	Testis (ng/g)		Serum (mg/mL)	Testis (mg/g)	Epididymis (mg/g)
<b>Treated</b>						
<b>2 days</b>	0.45 ± 0.08	4.61 ± 0.85	0.68 ± 0.04	85.05 ± 3.63	184 ± 21.40	586 ± 92
4 days	0.52 ± 0.08	5.52 ± 0.20	0.66 ± 0.05	86.27 ± 2.98	2505 ± 327 <sup>b</sup>	627 ± 110
8 days	0.75 ± 0.06 <sup>c</sup>	9.75 ± 0.24 <sup>b</sup>	0.63 ± 0.03	91.14 ± 5.79	2781 ± 202 <sup>b</sup>	655 ± 92
<b>Control</b>	0.41 ± 0.08	4.55 ± 0.133	0.58 ± 0.05	84.29 ± 4.44	1639 ± 437	531 ± 61

### 3.2.3 Sperm density and fertility

The epididymal sperm density of rats treated for 2 days was unchanged whilst it was slightly increased at day 4 and significantly increased at day 8 ( $P < 0.05$ ). The fertility of the treated rats was unaffected (Table 1).

#### 4 Discussion

Administration of *Mondia whitei* caused an increase in serum and intratesticular testosterone levels after chronic treatment, suggesting an androgenic effect of the *Mondia whitei* aqueous extract. Kamtchouing *et al* [2] and Moundipa *et al* [14] also observed an increase in testosterone concentration by *Zingiber officinale*, *Pentadiplandra brazzeana*, *Hibiscus macranthus* and *Basella alba* treatment in rats. However, the present results disagree with our previous report that a long term treatment (55 days) of rats with the same dose of *Mondia whitei* did not change the testosterone concentration [1]. A lack of effect on testosterone level was also indicated by Casarosa *et al* [15] in men receiving a lyosterolic extract of *Serenoa repens* for 30 days. It could then be assumed that as the duration of the treatment is prolonged, the sensitivity of the steroidogenic mechanism to the bioactive molecules present in the plant extract may be decreased. The observed increase in testicular protein content and weight may be the result of testosterone action. An androgenic effect of the extract is also suggested by the increased sperm density in cauda epididymis of treated rats [14]. An increase in the testicular weight without accompanying changes in the weights of the secondary sex organs may signify a selective effect of *Mondia whitei* [16]. The main finding of this study suggests that the aqueous extract of the dried roots of *Mondia whitei* possesses sex-stimulant property.

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