SACUTE EFFECTS OF MONDIA WHITEI 'MUKOMBERO' ON TESTOSTERONE HORMONE IN MALE WINSTER ALBINO RATS

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Abstract. Erectile dysfunction also known as impotence continues to ravage men of today and thus lowering their self-esteem. Many people in African set up, have used Mondia Whitei as a libido booster, fertility enhancer thus terming it an aphrodisiac yet minimal and often conflicting empirical data exists to support its therapeutic value. Male sexual performance is driven by normal levels of Testosterone hormone. This study aimed at evaluating the acute effects of aqueous extract of Mondia whitei on reproductive hormone levels, in male albino rats following oral administration. The research involve experimental design where 3 sets of 9 rats each had oral administration of Mondia whitei extracts at the dosage of 100, 200 and 400mg/Kg body weight respectively, which take place in research laboratory was at University of Eldoret animal house and Moi Teaching and Referral Hospital Immunology lab. The outcome involve trend analysis indicated that within the groups, Testosterone levels were high on the first 10 days in group II(6.02ng/ml) compared to controls (4.68 ng/ml),($p < 0.05$) and on 15th and 30th day. In conclusion, this study suggests that Mondia whitei may be beneficial as an aphrodisiac if used in low doses and for a shorter duration.
Keywords: *erectile dysfunction, Mondia Whitei, testosterone, aphrodisiac*

Introduction

Erectile dysfunction also known as impotence is the inability to attain and maintain a penile erection that is significant to sustain a satisfactory sexual activity for both partners (Türk et al., 2008). In the world people continue to suffer from erectile dysfuction upto 152 million men and it is projected to rise to 322 million men as at 2025 (Rakuambo et al., 2012). The normal functioning of hypothalamic, pituitary and gonadal axis is crucial in sexual performance. To achieve erection there must be coordinated and integrated anatomical and physiological interplays which can sustain the corporal system and hence penile tumescence as well as firmness for any sexual performance (Türk et al., 2008). Many indigenous plants have been reported to be effective in male sexual functions (Ashok and Meenakshi, 2004; Kamtchouing et al., 2002). Phytochemical studies in Mondia whitei have revealed the presence of glucosides, alkaloids and 2-hydroxy-4-methoxybenzaldehyde (Noumi et al., 1998).

The genus Mondia of the Apocynaceae family is a woody, robust and vigorous aromatic perennial plant that grows from a large tuberous root stock. It has large heart-shaped opposite leaves and produces reddish, purple flowers borne in branched inflorescences (Aremu et al., 2011). It is distributed in the sub Saharan Africa and flowers in Southern part of Africa from October to March, and from May to August in the Northern part of Africa (Aremu et al., 2011). For easy harvesting, the roots spread laterally beneath the soil surface. They have a ginger-like taste and a vanilla aroma. In West Africa, it is found in Nigeria, Guinea, and Ghana; Cameroon in Central Africa;

and in East Africa, it is found in Kenya, Uganda and Tanzania (Aremu et al., 2011). While there has been skepticism on the biological effects of plant extracts, advances in scientific research have started to demonstrate the efficacy of these extracts using animal models to elucidate mechanism of action on sexual performance. However, these studies have been inconclusive thus the need for this study.

Materials and Methods

The study adopted a longitudinal experimental design and it was conducted at the animal laboratory of University of Eldoret and Immunology laboratory of Moi Teaching and Referral hospital. Thirty-six male albino rats weighing between 200-300g and of age six to seven weeks were bought from University of Nairobi's Chiromo Campus. The animals were maintained at room temperature (22-23 °C), with a reverse natural light-dark cycle in the animal house of University of Eldoret and used for the research that lasted for 60 days (*Figure 1*). University of Eldoret has a well-equipped animal laboratory. This enabled accurate and real time data collection. Thirty days were also adequate for absorption of Mondia whitei phytochemicals. The rats were housed in a conducive environment, allowed three weeks to acclimatize and their health status closely monitored before and during the experiment. They were fed with normal rat feed and portable water ad libitum.

Figure 1. *Experimental animals.*

M. whitei was purchased from Kakamega town and transported in freshly packed roots (*Figure 2*) to maintain its moisture content and enable keep proper viability of the chemical composition. Identification and verification of the plant using taxonomic key in the natural herbarium of UoE was done to establish that it is Mondiawhitei. Then 'Mukombero' roots were sliced into pieces, dried under ambient temperature (shade) for a period of 30 days and grinded using Laboratory Mill. Then 200g of the powdered roots was dissolved in 1.3 L of distilled water, then in 250 ml of 70% ethanol and kept for 72 h at 4° C, and occasionally stirred. Filtration was done by use of Whatman No.1 filter paper (model number 1001, 150mm) to get fine particles. It was done twice to ensure fine particles. Then complete evaporation was done using a rotavac control evaporator (Heidoph, Germany) at 65,100 r.p.m & 240 pascal pressure, for 30min to give 150 g of brown residue (*Figure 3*). The aqueous extract used was prepared by dissolving 1 g of the brown residue in 10 mL of distilled water. The doses used in this study arranged between 100 mg/kg b.w and 400 mg/kg b.w.

Figure 2. *Roots of Mondia Whitei.*

Figure 3. *Rotavac control evaporator.*

The thirty-two male albino rats were grouped into four of 8 rats each. Group I (control) was fed with normal rat feed and water ad libitum for 30 days. Test groups II, III, and IV were treated with 100mg, 200mg and 400mg per kilogram per day of the extract respectively in addition to normal rat feed and water ad libitum for 10 days, 15 days and 30 days, respectively, as per the test group. The extract was administered orally and daily using syringes without needles between the hours of 8.00am and 9.00 am.

Sample collection and hormonal assay

Blood samples were collected at the University of Eldoret Zoology lab on 10th, 15th and 30th day after treatment by cardiac puncture after anaesthetizing the rats with carbon dioxide narcosis and sacrificing them. Two ml of blood was collected from each rat. The samples were carefully introduced into plain vacutainers free from anticoagulant, properly labeled and transported immediately under room temperature to Moi Teaching and Referral Hospital Immunology laboratory where hormonal assay was done. The blood samples were allowed to clot, retract and then centrifuged for 5minutes at a speed of 3000 revolutions per minute. The serum was then aliquoted and, refrigerated at -20°C and assaying of the hormones was done using an immunoanalyser. The results obtained from the study were analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0 for Windows. Kruskal-Wallis test was used for

comparison between different treatments and duration. Means that were statistically significant were separated using Post hoc test. Differences were considered statistically significant at $P < 0.05$.

Results and Discussion

Table 1 shows comparison in serum testosterone concentrations in rats treated with M. whitei extract and negative control rats after 10, 15 and 30 days and between treatments of 100 (mg/kg), 200 (mg/kg) and 400 (mg/kg) and negative controls. Meanwhile, Figure 4 shows the effect of M. Whitei aqueous extracts on testosterone serum concentration after 10, 15 and 30 days and between treatments of 100 (mg/kg), 200 (mg/kg) and 400 (mg/kg) and negative controls.

Table 1. *Effect of M. Whitei aqueous extracts (100, 200 and 400 mg/kg) for 10, 15, and 30 days on seru testosterone concentration in rats..*

Treatment on rat groups (mg/kg)	Testosterone concentraion ng/ml median (IQR)			Chi-value	p-value
	10 days	15 days	30 days		
100	6.02(6.01, 6.05)	2.06(1.04, 1.09)	0.96(0.95, 0.99)	6.231	0.024
200	3.22(3.21, 3.23)	1.67(1.65, 1.72)	1.52(1.49, 1.56)	4.220	0.037
400	2.63(2.60, 2.68)	1.83(1.80, 1.84)	1.63(1.60, 1.64)	7.200	0.019
Control	4.68(4.67, 4.69)	4.65(4.64, 4.70)	4.67(4.66, 4.67)	1.747	0.417
Chi-value	10.385	9.335	10.221	-	-
p-value	0.016	0.026	0.015	-	-

Note: IQR=Interquartile range.

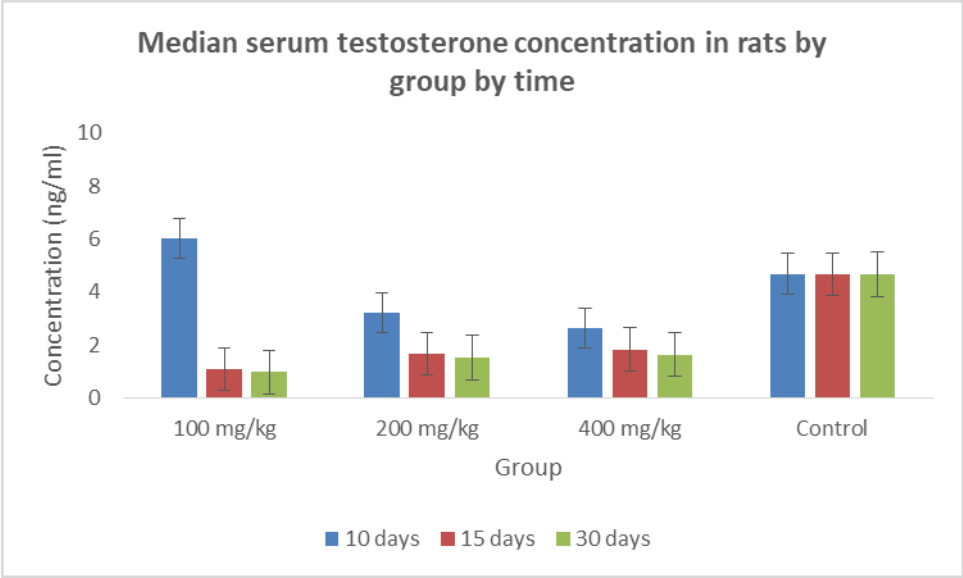

Figure 4. *Effect of M. whitei aqueous extracts (100, 200 and 400 mg/kg) for 10, 15 and 30 days on serum testosterone (ng/ml) concentration in albino rats.*

After 10 days of treatment, the median (IQR) serum testosterone in M. whitei treated rats with 100, 200, 400 mg/kg and controls were 6.02 (6.01, 6.05), 3.22 (3.21, 3.23), 2.63 (2.60, 2.68) and 4.68 (4.67, 4.69) ng/ml respectively. The Kruskal Wallis test indicated that the difference in serum testosterone concentration (ng/ml) between the groups was statistically significant (chi=10.385, p=0.016), (chi=9.335, p=0.026) and (chi=10.221, p=0.015) at 10days, 15 days and 30 days respectively. Post hoc test (LSD)

indicated that the difference existed between the rats administered with 100 mg/kg and 200mg/kg, 400 mg/kg as well as the control ($p<0.001$), between 200 mg/kg and 400 mg/kg ($p=0.001$), 200 mg/kg and the controls ($p<0.001$), between 400 mg/kg and control ($p<0.001$). A similar trend was also observed after 15 days as wells 30 days. A significant difference in serum testosterone concentration (ng/ml) was observed within the groups with respect to time interval (all $p<0.05$). Within the group administered with 100 mg/kg, the significant difference in serum testosterone was observed between 10th day and 15th day, 10thday and 30th day as well as 15th day and 30th day (all $p<0.001$). Trend analysis indicated that within the groups, testosterone concentration was significantly high on the 10th days as compared with the 15th and 30th day (all $p<0.05$).

Conclusion

This study set out to determine the effect of Mondia Whitei on erectile dysfunction. A normal hypothalamic, pituitary and gonadal axis plays a major role in production of testosterone (Ojo et al., 2016). To achieve sexual performance, craving, erection, orgasm and ejaculation are fundamental (Diaz and Close, 2010). The results of this study demonstrates that in the acute phase of 10 days testosterone levels were high as compared with negative controls (p-value<0.05).This study agrees with Watcho et al. 2006).The main reason to increase testosterone levels in the acute phase could be due to potentiating the steroidogenic cascade effects that produces it. This study differs with our earlier study which showed that in chronic phase testosterone declines at a longer duration of 30 days (Mabonga et al., 2019). High levels of testosterone promote sexual behavior thus increase libido and sexual activities. This study therefore concludes that Mondia whitei could alleviate the erectile dysfunction and recommends that more scientific research be done in humans to validate this and explores more mechanism of action.

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Conflict of interest

The authors declare that the research was conducted in absence of any conflict of interest.

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