Original Article

Aphrodisiac Properties of *Mutimba Vula* and *Mwana Apeluke* Herbs sold in Lusaka, Zambia

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ABSTRACT

***Background*:** Male potency has been a talk of many years since humanity existed and the use of various kinds of substances to stimulate sexual desire has been done for many years. Many plant-based concoctions have been released on the Zambian market for consumption without scientifically proven results or effects.

Herbalists, Traditional health practitioners (THPs) have put up many advertisements to spread their market base but all the same without any proven results to show to would-be customers to use a particular product. Two local herbal extracts, Mutimba vula (MTV) and Mwana apeluke (MWN) were studied for the presence of medicinally active components and for their sexual behaviour effects in male rats.

***Aim of the study*:** The main objective of this research work was to determine aphrodisiac properties of MTV and MWN aqueous herbal extracts.

***Methodology*:** Phytochemical screening to determine presence of medicinally active components was performed following standard guidelines. Thereafter, 3 g each of dried powder of MTV and MWN were soaked in 250 mL of distilled water for 3 hours for extraction of active ingredients. Two concentrations, high and low doses of the herbal extracts were administered orally to the treatment groups for 21 days followed by sexual behaviour analysis. Concentration of testosterone in blood samples was determined using a Testosterone Enzyme-Linked Immunosorbent Assay (ELISA) test.

***Results*:** Herbal extracts showed varying amounts of saponins, tannins, flavonoids, alkaloids and glycosides. The mounting frequency (p= 0.039), intromission frequency (p= 0.032) and penile erections increased (p= 0.001) significantly indicating enhanced sexual activity in animals treated with the plant extracts. The results indicated that there was no dose-dependent relationship between serum Testosterone levels and the treatment groups (p= 0.061).

***Conclusion*:** It was established that oral administration of Mutimba vula and Mwana apeluke caused increased sexual performance in rats. However, more studies are needed to exploit the possible mode of action.

INTRODUCTION

Traditional Herbal Aphrodisiacs are medicinal plants that are used to arouse sexual instinct, induce desire and increases pleasure and sexual performance[1]. In Africa, several plants have been used for many years to improve sexual stimulation and performance[2]. In Zambia, Ndubani (1999) reported an increasing interest regarding the practice of traditional healers and their use of indigenous plants to treat illness[3].

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One reason why many people seek aphrodisiacs apart from sexual pleasure is male infertility, a world-wide medical and social problem. According to Kamatenesi and others (2005), reproductive health care is the second most prevalent health care problem on the African continent[4]. The fact that more than 12 percent couples worldwide are affected by infertility causes for a global reproductive health concern[5].

The rise in research work related to natural aphrodisiacs during the last decade is the proof about the curiosity and the significance of this subject. Though several such substances are known, natural aphrodisiacs which have undergone rigorous research and could be recommended for human use are only few[6]. In Zambia, the use of herbal preparations purported to be aphrodisiacs on the streets and in various markets have been on the rise as men from various walks of life purchase these substances. The purpose of this study was to determine the aphrodisiac properties of Mutimba vula and Mwana apeluke herbs sold at various markets in Lusaka.

MATERIALS AND METHODS

The study was conducted at the University of Zambia, Biological Sciences Department Animal Care Unit, in Lusaka, Zambia.

Animals and treatment: An Interventional, single-centre studyinvolving only adult sexually active male albino rats weighing between 200-300g and females weighing 250 ± 5 g were used in the study with data collected retrospectively. The rats were maintained at a temperature of 25 ± 2°C. A reversed twelve-hour light-dark cycle was employed with fluorescent ceiling light with a dim red light provided during the dark cycle. The experiments were then carried out on day 21 after two weeks of conditioning between 9:00 AM-12:00AM.

Mating behavior test : - The tests were carried out by the methods used by [7], with slight modifications. Thirty-six (36) sexually active male rats were selected for the study and were divided into 6 groups with each group having six rats. Group 1 rats each received 1 mL of distilled water orally as vehicle and served as control group.

Group 2 rats each received Sildenafil citrate at a dose of 25mg/kg body weight orally and served as the standard reference group.

Two different herbal preparations were used for treatment.

Group 3 and Group 4 rats each received 2 mL of *Mutimba vula 100 %* (MTV high dosage) and 2 mL of Mutimba vula 50 % (MTV Low dosage) herbal extracts respectively.

The Group 5 and Group 6 rats were each treated with 2 mL of Mwana apeluke 100 % (MWN High dosage) and 2 mL of Mwana apeluke 50 % (MWN Low dosage) herbal extracts respectively.

The herbal preparations were administered orally in form of aqueous suspensions for a period of 21 days [8].

Herbal preparation

All Phytochemical screening tests were carried out at the University of Zambia, Department of Chemistry, Second Floor, Biochemistry Laboratory number 212.

i. Sample extraction for Phytochemical screening tests

The sample extraction was done using a Soxhlet assembly apparatus. A minimum of 15 Soxhlet strain cycles was done for each herbal preparation using a 70% ethanol-water mixture as the solvent samples then kept refrigerated at -4°C.

ii. Sample extraction for treatment groups

Three grams of the plant material was placed in 250 ml of luke warm water and left to strain for 3 hours before being administered. The herbal preparation was then decanted through a filter paper to obtain a filtrate out of which 125 mL was diluted in a volumetric flask to yield 250mL of the diluted extract. The other 125 mL undiluted filtrate was taken as the 100% concentration while the diluted filtrate was labelled 50% concentration. These

concentrations were then administered to the treatment groups orally for a period of 21 days. Everyday this procedure was repeated in order to prepare a fresh sample for administering. Two herbal materials used for treatment were *Mutimba-vula* and *Mwana apeluke*.

Data Collection

1. Phytochemical Screening Tests

Phytochemical examinations were carried out for all the extracts as per the standard methods outlined in *Phytochemical Screening and Extraction: A review*[9].

2. Sexual behavior

Male rats were placed in an observation glass individually in order to acclimatize them with the cage environment. Then a sexually receptive female rat was allowed to enter the test cage silently from a slide door inside the cage. The behavioural observations were then carried out taking into account the parameters below[10,11].

a) Mounting behaviour

The parameter of mounting observed was Mounting Frequency (MF) defined as average number of mount during 15 min observation.

b) Intromission behaviour

The parameter of intromission that was analysed was Intromission Frequency (IF) defined as average number of intromission during a 15 min observation.

c) Penile erection (PE)

This was determined when the rats bent down to lick their erect penis during the observation period. The number of PE was recorded during the observation period.

3. Sex organ parts

After treatment the testis, seminal vesicles, epididymis and prostate glands were carefully removed and immediately weighed on an electronic beam balance.

4. Blood samples

About 3-5 mL of blood samples were collected from the Jugular vein of each male rat and placed in 10 mL vacutainers (red tops) labelled for identification. The Testosterone Assay procedure was then performed according to the MaxSignal Testosterone ELISA Kit Manual-1080-01.

5. Statistical tests

A paired t-test was carried out to test for any significant difference in the mean body weight of the rats at the start and at the end of the treatment period followed by an independent t-test to test for equality of means among groups within the same period. One-way Analysis of variance (ANOVA) was carried out to test for significant variance in the weight of the sex organ parts in the control and treatment groups.

One-way ANOVA and Dunnett's multiple comparison test were used to analyze serum Testosterone results. Linear regression was then used to determine the correlation that existed between the concentration of the herbal extracts and the serum testosterone levels.

All statistical calculations were carried out using the Statistical Package for Social Sciences (SPSS), version 23 and a Confidence Interval was set at 95% (p d" 0.05).

RESULTS

*1. **Phytochemical screening results***

Herbal preparations of MTV and MWN were analyzed for the presence of secondary metabolites through phytochemical screening tests. The results obtained are shown in Table 1.

Table Phytochemical screening results

Test	Samples	
	Mutimba vula	Mwana apeluke
Tannins	+++	---
Saponins	+++	---
Sterols and Triterpens	+++	+++
Flavonoids	+++	---
Alkaloids	+++	+++
Glycosides	++	+

Key

High concentration +++
Moderate concentration ++
Low concentration +
Absent —

Results obtained showed that *MTV* sample hadall phytochemicals studied in varying amounts. There were no tannins, saponins or flavonoids in the *MWN* sample. Sterols and alkaloids were however in high concentration while glycosides were in low concentration.

1. Sexual behaviour

Mounting frequency

There was a significant increase in MF across all the groups as shown in Figure 1, p= 0.039.

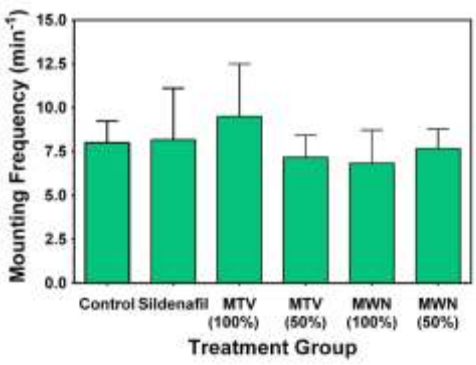

Figure 1 Mounting frequency results

Values are means ± S.E.M (n=6). The plots were generated by Graph Pad Prism plotting software version 6.05 with positive error bars

Intromission frequency

Figure 2 shows the average number of intromissions in a 15 min period.

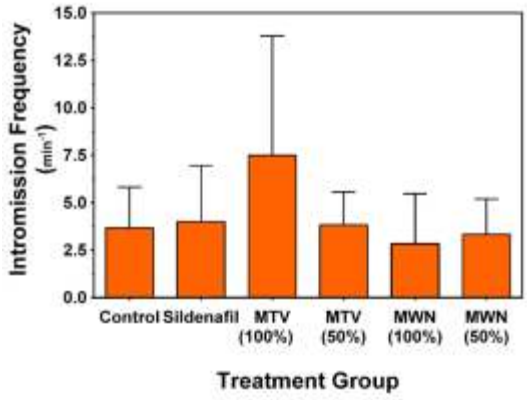

Figure 2 Showing results for Intromission frequency

Values are means ± S.E.M (n=6). The plots were generated by Graph Pad Prism plotting software version 6.05 with positive error bars.

Results obtained (p=0.032), revealed that there was a significant variation in the rate of intromissions in the treatment groups compared to the control.

Penile erections

Figure 3 shows the average number of PE in a 15 minutes' observation period in the groups.

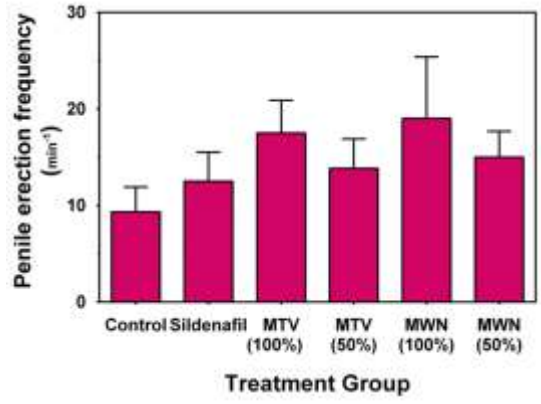

Figure 3 Showing results for Penile erection

Values are means ± S.E.M (n=6). The plots were generated by Graph Pad Prism plotting software version 6.05 with positive error bars.

The obtained results indicated that oral administration of MTV and MWN increased PE.

3. Sex organ parts

Table 2 shows results for the ANOVA analysis for the testis, seminal vesicles, epididymis and prostate glands.

Sex organ part	p-value, 0.05 % CI
Testis	0.259
Seminal vesicles	0.635
Epididymis	0.756
Prostate gland	0.248

Table 2 ANOVA results for sex organ parts

Results obtained indicated that herbal administration of MTV and MWN had no effect on the weight of the sex organ parts in the treatment groups.

4. Blood samples

Table 3 shows the R^2 value of 23.9%, p= 0.069 which showed that the strength of association between dosage administered in the groups and the measured Testosterone in blood samples was very weak.

Table 3 Linear regression analysis results

Model	R^2 (%)	F	P value
Regression	23.9	2.43	0.069

DISCUSSION

The animal model used in this study has been used by other researchers to assess effects obtained from medicinal plants on reproductive functions in male[12]. The traditional claims attributed to *MTV* and MWN for their use as aphrodisiacs have generated immense commercial activity on these drugs in Lusaka. One of the drugs that have in the past decades drawn public attention to aphrodisiacs is Viagra (sildenafil). Various substances of animal and plant origin have been used in traditional medicine of different cultures[13]. In this study we wanted to investigate the aphrodisiac properties of *Mutimba vula* and *Mwana apeluke* herbs sold in Lusaka Zambia. Our findings indicated thepresence of phytochemicals in both aqueous extracts of MTV and MWN herbs in varying amounts.Phytochemical screening revealed the presence of tannins, saponins, flavonoids, alkaloids, glycosides, sterols and triterpenes in MTV while only tannins, saponins and flavonoids were absent in MWN herbal extract. The phytochemical analysis results obtained in this study for MTV are consistent with results obtained by Teke and others[14] from qualitative analysis of methanol extract and fractions of *E. abyssinica* which revealed the presence of alkaloids, flavonoids, tannins, saponins and cardiac glycosides. The presence of these phytochemicals in the herbal extracts which show medicinal activity was an indication of the herbal extracts' ability to exhibit physiological activity[15]. These phytochemical results led us to conclude that the observed aphrodisiac activity of MTV and MWN extracts was due to the presence of saponins, sterols, tannins, alkaloids, flavonoids and glycosides because some compounds belonging to these phytochemical groups isolated or found to be present in other plant species had been previously reported to possess aphrodisiac properties at different extents [16, 17.]

Results also indicated that oral administration of the aqueous extracts at both 100 % and 50 % doses produced significant increase on MF and IF in the herbal extracts groups compared to the sildenafil group demonstrating the extract's potency effect in treated animals[18]. Penile erection is important for evaluating the effect of administered sample on erectile function. Results obtained indicated that oral administration of the extracts produced significant increase of the sexual parameter suggesting a better sexual performance [19].

Many medicinal plants are reported to be effective as aphrodisiac agents through mechanisms such as vasodilation, generation of nitric oxide, gonadotropins and elevation of androgens [20]. The results obtained from analysis of T data indicated that there was no significant difference in T concentration in the herbal groups compared to the standard reference group sildenafil. The observed results are similar to results reported by De Andrade and others[21] who reported that there was no significant difference in testosterone levels in the control and the treated groups. However, they recorded a significant increase in sexual performances in the groups

treated with Korean Ginseng. Because there was no statistically significant difference in the testosterone levels between the placebo and the treated groups, this suggests that the beneficial effects of MTV and MWN on erectile function were not related to testosterone levels.

This observation suggests that the mode of action of the aphrodisiacs under study could be through another biological pathway that enhanced sexual performance and not through increased T levels. To our knowledge, this study is the first to be conducted to assess the aphrodisiac properties of MTV and MWNusing male rats as an animal model. Results from this study demonstrate scientifically the aphrodisiac potential of MTV and MWN as being potent to increase sexual action.

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