

Full Length Research Paper

Aphrodisiac properties of some Zimbabwean medicinal plants formulations

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The aim of the present study was to determine the effects of formulations composed of *Mondia whitei*, *Ekebergia capensis*, aloe tincture (*Aloe exelsa*) and pumpkin seed (*Cucurbita pepo*) on sexual behaviour of inexperienced male rats. Male rats were treated orally with ethanol extracts of *M. whitei* and *E. capensis*, aloe tincture (from aloe juice) and pumpkin seed powder. The sexual behaviour of the rats treated with extracts was compared with those treated with 100 µg of testosterone as the positive control and those receiving normal rat feed as negative control. The receptivity of the females was rendered homogeneous with daily dose of estadiol benzoate. The sexual behaviour of the rats were observed over one ejaculatory phase for five consecutive days. The results showed a dose dependent increase in sexual arousability (decreased mounting latency), copulatory efficiency (decreased intercounulatory interval) and improved sexual sensation (increased in neuromotor activity) for the rats treated with *M. whitei* and *E. capensis*, aloe and pumpkin seeds showing an increase in sexual performance in terms of intromissions and ejaculatory latency which also improved sexual sensation and copulatory efficiency. The formulations of plants under investigation showed significant aphrodisiac properties.

Key words: *Mondia whitei*, *Ekebergia capensis*, aloe tincture, pumpkin seed, sexual behaviors.

INTRODUCTION

For many years people have searched for ways to achieve sexual desire, sexual health and sexual techniques. This has led to the development and use of different substances known as aphrodisiacs to attain the desired excitement. An aphrodisiac can therefore be described as any substance that enhances sex drive and/or sexual pleasure. Aphrodisiac can also be viewed as any food, drug, scent or device that can arouse or increase sexual

drive or libido (Rosen and Ashton, 1993). Substances often used as aphrodisiac cross the blood brain barrier and mimic or stimulate some area of sexual arousal in the central nervous system. Some nutritional foods improve the well being of the individual and consequently improving sexual performance and libido. These substances also act physiologically to increase blood flow to the penile area, or increase the duration of sexual activity by numbing the genital area or even mimic the burning sensation of sexual intercourse (Salmon, 1983). These substances may also limit the influence of sympathetic nervous system in order to correct erectile dysfunction.

Management of erectile dysfunction includes counselling of patient by an experienced psychiatrist or psycholo-

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Table 1. Plants used in the present study.

Plant name (Family)	Plant part used	Voucher specimen	Traditional usage
<i>Ekerbegia capensis</i>	Roots	GDZEC	Emetic, dysentery and heartburn, external for boils and acne, aphrodisiac
<i>Mondia whitei</i>	Bark	GDZMW	Aphrodisiac, appetite stimulation, stomach pain, indigestion and body pain, gastrointestinal disorders, gonorrhea, post-partum bleeding, pediatric asthma, and to stop vomiting.
<i>Aloe excelsa</i>	Leaves	GDZAT	Sexually transmitted diseases, burns, wounds, stomach ailments, spasms, ulcers, skin treatment, stomach ailments, and as a laxative.
<i>Cucurbita pepo</i> (pumpkin seed)	Seeds	GDZPS	Anthelmintic, <i>revitalize the prostate gland, treat inflamed bladder and stimulate male hormone production</i> , healing wounds.

gist to restore confidence and improve patient's ability to obtain adequate erection, the use of Vacuum Erection Devices, the use of surgical penile implants, hormonal treatments mainly with testosterone, or the use of specific drugs such as Sildenafil (Viagra) which increases firmness, maintenance of erection, frequency of orgasm and level of desire (Joe, 1990; El Taher et al., 2001). Side effects of these treatments include high cost, complications such as infections in surgical procedures, mechanical failure of devices, acceptability, side effects of drugs such as headache, flushing, dizziness, visual disturbances, nasal congestions and priapism. Several drugs have been isolated from plants including yohimbine (an alkaloid derived from the bark of yohimbe tree from West Africa). Other natural products commonly with proven potency include ginseng, ginger (soothes circulation), *Ginkgo* (*Gin biloba*) and *Eurycoma longifolia* Jack. In Africa, several plants such as *M. whitei*, *E. capensis*, aloe and pumpkin seed have been used for many years to improve sexual stimulation and improvement of sexual performance (Kamtchouing et al., 2002; Orisakwe et al., 2004).

However, few experimental studies have been performed in order to define these claims of efficacy (Lampiao et al., 2008). Most studies published on this regard have generally targeted one plant at a time (Ratnasooriya and Dharmasiri, 2000) even though in the traditional medicine, most of the plants are used in formulations of groups of two or four plants or even more. In the present study, formulations made from four different plants were tested for their aphrodisiac activities in male rats. The aims were to add scientific basis on the use of *M. whitei*, *E. capensis*, aloe tincture and pumpkin seed as an aphrodisiac combination and to determine the effects of the plant extracts on sexual behaviour of inexperienced male rat.

MATERIALS AND METHODS

Plant collection and preparation

Roots and plant sample of *M. whitei* were collected from Domboshava. The stem bark of *E. capensis* were collected from Goromonzi district. *Aloe excelsa* stem and leaves were collected from

Guruve district while pumpkin seeds (*Cucurbita pepo* L.) were bought from Mbare market place in Harare. The plant samples were authenticated using specimen vouchers at the National Botanical Gardens.

Roots of *M. whitei* bark of *E. capensis* and pumpkin seeds were shade dried and then ground into a fine powder. The plants used in the study are represented in table 1.

Extraction and preparation of plant material

The outer core of the pumpkin seed was removed by hand milling and sieving. The powder of the inner seed was used raw during the experimentations. 100 g of *M. whitei* and *E. capensis* powder was soaked in 500 ml of 80% ethanol with frequent agitation. Clarification was then carried out using vacuum filtration through filter paper watman number 2. The resultant extract was concentrated to dryness in a rotary evaporator under reduced pressure at a temperature of 40°C. The stock solutions were then diluted with distilled water to the required concentrations.

The fresh leaves of *A. excelsa* were cut transversally and the orange sap was let to drip into a bucket. The juice was placed into plastic beaker and freeze dried over night at a high pressure and low temperature (-180° using liquid nitrogen).

The freeze-dried aloe which was bright orange in color was ground into fine powder. It has a bitter taste and characteristic smell.

Animals

Ten weeks old male and female Wistar strain albino rats weighing between 170 g and 250 g were selected for the study. The rats were housed in separate cages (males and females) and maintained under conditions of natural temperature and light. The animals were allowed free access to food and fresh tap water every-day.

Experimental set up for the study of sexual behaviour

Male rats were randomly allocated into 5 groups of 5 rats each. The rats were dosed in their respective groups as illustrated below:

Group 1 (positive control: C1): The 5 rats were each given a subcutaneous dose of 100 µg testosterone for 5 consecutive days. The dosage of testosterone used as positive control and estradiol benzoate used for the homogenization of the female rats were selected based on preliminary experiments in which this concentration gave optimum results (results not shown).

Group 2 (negative control: C2): The 5 rats were each given an oral dose of pellets containing normal rat feed only for 5 consecutive days.

Group 3 (experimental group 1: E1): The 5 rats were each given an oral dose of 2.5 mg of *M. whitei* and 2.5 mg of *E. capensis* compounded into a pellets with normal rat feed.

Group 4 (experimental group 2: E2): The 5 rats were each given oral dose of 5 mg *M. whitei* and 5 mg *E. capensis* compounded into a pellet.

Group 5 (experimental group 3: E3): The 5 rats were given oral dose of 5 mg *M. Whitei*, 5 mg *E. capensis*, 2 mg *aloe excelsa* and 8 mg pumpkin seeds all compounded into a pallet.

The doses used were extrapolated from the ones used in human beings by traditional healers. During the study male rats dosed as above in the morning, were placed in the presence of receptive female. The receptivity of the female was rendered homogenous by a daily dose of 20 µg estradiol benzoate 12 h before introducing the males.

The manifestation of male sexual behaviour was recorded over a period of 12 hours and expressed as: Mount latency (ML) which is the time from introduction of the pair until the first mount with or without an intromission. The number of intermissions (NI) is a count of number of intromissions preceding ejaculation. ejaculation latency (EL) was defined as the duration between first intromission and ejaculation. The neuromotor activity (NMA) is the ratio NI /EL and the intercupsulatory interval (ICI) were defined as the ratio EL / NI.

Statistical analysis

Data were expressed as mean of 3 experiments and analyzed by a two-way ANOVA for repeated measurements for the main effects of the formulations and test day and their interaction, followed by post-hoc one-way ANOVAs on each test day if necessary. Differences in the percent of animals showing certain behavior were tested with Fisher's exact probability or χ^2 test. GraphPad Prism version 3.00 for Windows (GraphPad Software, San Diego California USA, www.graphpad.com) was used. The value of $p < 0.05$ was considered to be statistically significant.

RESULTS AND DISCUSSION

The present study was carried out to determine the effect of three formulations used traditionally to improve male sexual performance by traditional healers in Zimbabwe. Rats have been commonly used as models to test for such activity (Miegeue et al., 2007). Sexual behaviour in male rats consists of three distinct phases: mount during which the animal assumes the copulatory position, but does not insert its copulatory organ (the penis) into the vagina followed by intromission during which the copulatory organ enters the vagina during a mount and ends with the ejaculation which is the forceful expulsion of semen (Yakubu et al., 2005). In the present study, mount latency (ML), Number of intermissions (NI), ejaculation latency (EL), neuromotor activity (NMA) and the intercupsulatory interval (ICI) were used for the assessment of the sexual functions in the animal used after treatment with the formulations in comparison to the positive control

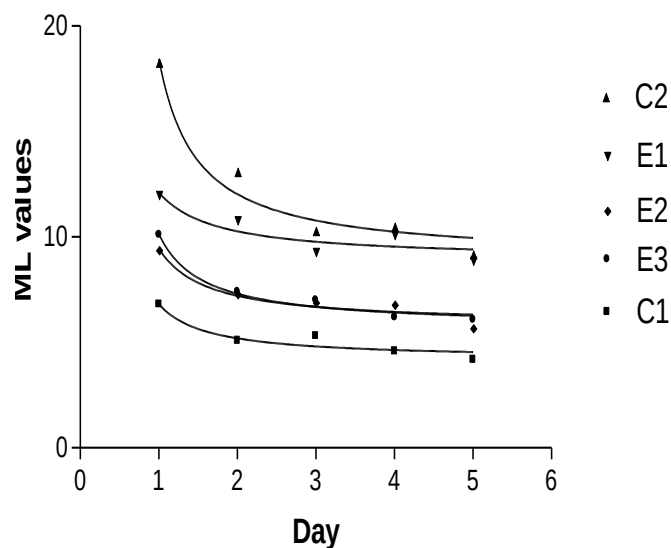


Figure 1. Effect of different treatments on mount latency among male rats. **C1** (positive control) were each rats given a subcutaneous dose of 100 µg testosterone for 5 consecutive days. **C2** (negative control) rats given an oral dose of pellets containing normal rat feed only for 5 consecutive days. **E1** (experimental group 1) were each given an oral dose of 2.5 mg of *M. whitei* and 2.5 mg of *E. capensis* compounded into a pellets with normal rat feed. **E2** (experimental group 2) rats were each given oral dose of 5 mg *M. whitei* and 5 mg *E. capensis* compounded into a pellet. **E3** (experimental group 3) rats were given oral dose of 5 mg *M. Whitei*, 5 mg *E. capensis*, 2 mg *aloe excelsa* and 8 mg pumpkin seeds all compounded into a pallet.

(testosterone) and negative control (normal feed) (Yakubu et al., 2008).

The change in mount latency during five-day period showed a similar trend for all the test groups. This progressive decrease in mount latency as days progressed may be due to males improved ability to realize the female and partners getting used to each other. However, there was a significant difference in the mount latency of the treated rats compared to the negative control (Figure 1). Treatment with E1 and E2 showed a dose dependant decrease in mount latency approaching that of the positive control. The addition of aloe tincture and pumpkin seeds to E2 (that is, E3) did not show significant decrease in mount latency within the five day period thus there is no significant difference in ML between E2 and E3 (Figure 2). There was a clear difference between the two controls with testosterone inducing shorter mount latency while the negative control induced higher mount latency ($p = 0.063$). Treatment with E1 did not decrease the mount latency. There was no difference between treatment with E1 and E2 from the 2nd day of the experiment. This further indicates that the addition of pumpkin seed and *A. excelsa* did not have a major impact on the mount latency of these rats. Previous studies have shown the antidiabetic activity of *A. excelsa* however, the androgenic activity of this plant has not been demonstrated elsewhere (Gundidza et al., 2005). The decrease in

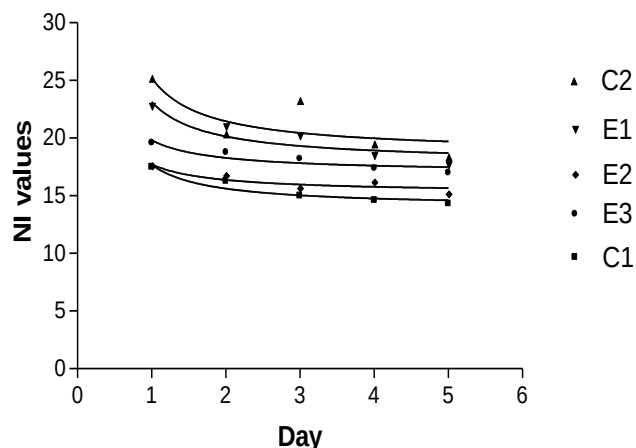


Figure 2. Effect of different treatments on number of intromission. **C1** (positive control) were each rats given a subcutaneous dose of 100 µg testosterone for 5 consecutive days. **C2** (negative control) rats given an oral dose of pellets containing normal rat feed only for 5 consecutive days. **E1** (experimental group 1) were each given an oral dose of 2.5 mg of *M. whitei* and 2.5 mg of *E. capensis* compounded into a pellets with normal rat feed. **E2** (experimental group 2) rats were each given oral dose of 5 mg *M. whitei* and 5 mg *E. capensis* compounded into a pellet. **E3** (experimental group 3) rats were given oral dose of 5 mg *M. Whitei*, 5 mg *E. capensis*, 2 mg *aloe excelsa* and 8 mg pumpkin seeds all compounded into a pallet.

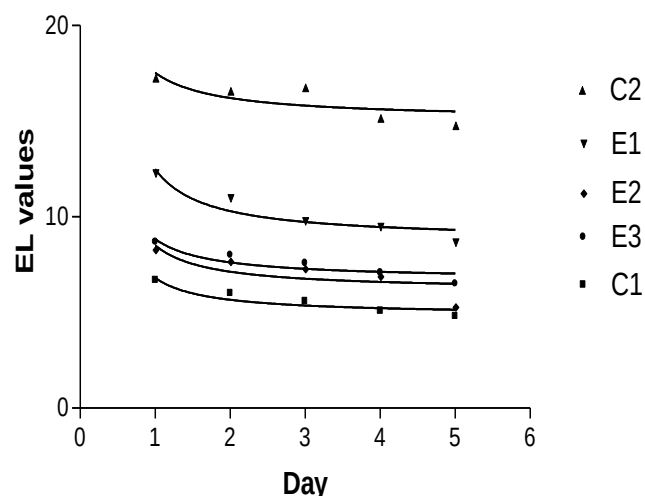


Figure 3. Effects of treatment with different medicinal plants on ejaculation latency of young male rats. **C1** (positive control) were each rats given a subcutaneous dose of 100 µg testosterone for 5 consecutive days. **C2** (negative control) rats given an oral dose of pellets containing normal rat feed only for 5 consecutive days. **E1** (experimental group 1) were each given an oral dose of 2.5 mg of *M. whitei* and 2.5 mg of *E. capensis* compounded into a pellets with normal rat feed. **E2** (experimental group 2) rats were each given oral dose of 5 mg *M. whitei* and 5 mg *E. capensis* compounded into a pellet. **E3** (experimental group 3) rats were given oral dose of 5 mg *M. Whitei*, 5 mg *E. capensis*, 2 mg *aloe excelsa* and 8 mg pumpkin seeds all compounded into a pallet.

mount latency following the treatment of the animals with *M. whitei* and *E. capensis* indicates an increase in sexual arousability of the male rats by the extracts. Studies by Watcho et al. (2004) indicated that the chronic treatment of male rats with aqueous extract of *M. whitei* 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 β -estradiol and the fertility compared to the controls.

The number of intromissions and the ejaculation latency of the negative control group showed a random variation during the five-day period. For the treated animals the numbers of intromissions decreased progressively and more uniformly during the five day period approaching that of testosterone but did not have the same values. In this case, treatment with E2 was closer to the positive control than that of E3 which contained the aloe and the pumpkin seed indicating that there is a possibility of a negative action of one or both of these two plants on this parameter. However, the decrease within each group was very significant on the second and third day of treatment with a gradual steadiness towards the fifth day. The rats treated with aloe tincture and pumpkin seeds in addition to *M. whitei* and *E. capensis* appeared to show similar results with E2 during the first and second days. However, from the third day the decrease in ejaculation latency and number of intromissions continued to be

quite significant compared to E2 (Figure 3). This resulted in smaller average in number of intermissions and ejaculation latency of E3 compared to E2. Similar results have been described with *Tribulus terrestris* which showed increase in mounting frequency (MF), intromission frequency (IF), and ejaculation latency (EL) and decrease in mounting latency (ML), intromission latency (IL), and postejaculation interval (PEI) after TT-FG treatment in castrated rats (Tyagi et al., 2008). The results of the present study showed that aloe tincture and pumpkin seeds need accumulative doses to show effect. Previous studies have indicated that products with such a trend in response are normally due to improved dietary supplements and the general state of the subject (Sandroni, 2001). Other studies showed that the number of intromission and ejaculation latency, depend more directly on the good activation phenomena in the central nervous system and ejaculatory activities on the endocrine balance within the subject (Ang et al., 1997; Arletti et al., 1999).

To provide an overall appreciation of the nervous functioning and sensitization we evaluated indices such as neuromotor activity (NMA) and intercouples interval. There was a noticeable increase in NMA for the treated rats compared to the normal (negative control) (Figure 4). A dose dependent increase in NMA from E1 and E2 and the pattern of increase during the five-day period was also observed. This could be attributed to the fact that EL decreases faster than number of intermissions (NI) fo

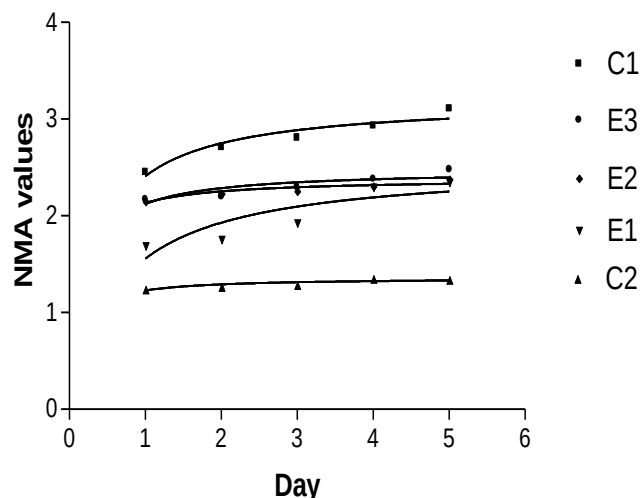


Figure 4. Effect of different treatment on neuro-motor activity among young male rats. **C1** (positive control) were each rats given a subcutaneous dose of 100 µg testosterone for 5 consecutive days. **C2** (negative control) rats given an oral dose of pellets containing normal rat feed only for 5 consecutive days. **E1** (experimental group 1) were each given an oral dose of 2.5 mg of *M. whitei* and 2.5 mg of *E. capensis* compounded into a pellets with normal rat feed. **E2** (experimental group 2) rats were each given oral dose of 5 mg *M. whitei* and 5 mg *E. capensis* compounded into a pellet. **E3** (experimental group 3) rats were given oral dose of 5 mg *M. Whitei*, 5 mg *E. capensis*, 2 mg *aloe excelsa* and 8 mg pumpkin seeds all compounded into a pallet.

the first day and slows down towards the end. For E3 the decrease in EL continued to be faster than that of NI for the complete five-day period. This then explains the differences in NMA for E2 and E3 since addition of pumpkin seeds and aloe tincture improved the number of intromissions per given ejaculatory latency of the rats hence better sexual performance. The improved NMA of E1 and E2 show that *M. whitei* and *E. capensis* improved neuro-sensory activity of the treated rats (EL and NI) with cumulative doses, which have a bearing on the sexual sensitization of the treated rats. Similarly, previous studies have observed increase in testicular protein content and weight which may be the result of testosterone action due to the action of *M. whitei* (Watcho et al., 2004; Olagbende-Dada et al., 2007). An androgenic effect of the extract is also suggested by the increased sperm density in cauda epididymis of treated rats (Moundipa et al 1999). An increase in the testicular weight without accompanying changes in the weights of the secondary sex organs may signify a selective effect of *M. whitei* (Gonzalez et al., 2001). One of the main findings of this study suggests that the aqueous extract of the dried roots of *M. whitei* possesses sex-stimulant property. Treating the rats with extracts caused a dose dependent decrease in intercopulatory interval (Figure 5). This implies that there is an increase in copulatory efficiency of the rats after treatment with extracts. During the five-day period

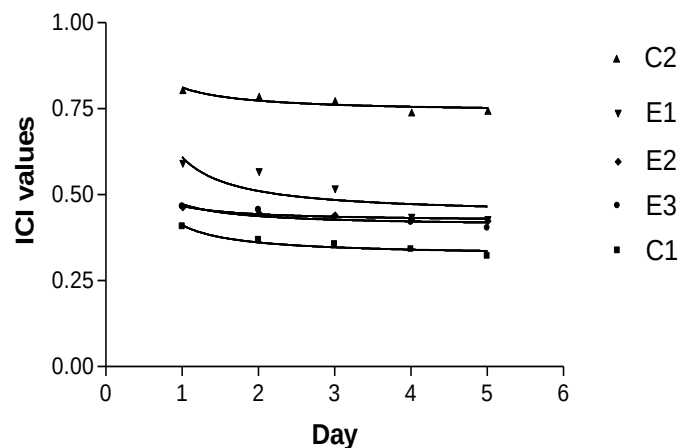


Figure 5. Effect of treatment with medicinal plants on intercopulatory interval among young male rats. **C1** (positive control) were each rats given a subcutaneous dose of 100 µg testosterone for 5 consecutive days. **C2** (negative control) rats given an oral dose of pellets containing normal rat feed only for 5 consecutive days. **E1** (experimental group 1) were each given an oral dose of 2.5 mg of *M. whitei* and 2.5 mg of *E. capensis* compounded into a pellets with normal rat feed. **E2** (experimental group 2) rats were each given oral dose of 5 mg *M. whitei* and 5 mg *E. capensis* compounded into a pellet. **E3** (experimental group 3) rats were given oral dose of 5 mg *M. Whitei*, 5 mg *E. capensis*, 2 mg *aloe excelsa* and 8 mg pumpkin seeds all compounded into a pallet.

E3 showed a continual significant decrease in intercopulatory interval compared to the other two groups, which could be due to better sexual performance explained by increase in NI per given EL and better muscular co-ordination.

From the present study, it can be observed that the study of sexual performance is a complex phenomena, which requires integration of several data to come up with a good interpretation. By integrating the values obtained from ML, NI, IL, NMA and ICI, we can evaluate sexual performance, copulatory efficiency and neuromotor sensitization of given subject. The present study further add to the scientific bases concerning the use of *M. whitei*, *E. capensis*, aloe and pumpkin seeds as aphrodisiacs. Ethanol extracts of *M. whitei* and *E. capensis* showed very direct affect in increasing sexual arousability (decreased ML), better sexual stimulation (increased NMA) and increase in copulatory efficiency (decreased ICI). Pumpkin seeds and aloe tincture did not show significant effects on sexual arousability; however, cumulative doses showed increase sexual performance (EL and NI) and improved copulatory efficiency, which hence improve sexual sensitization and stimulation of the subjects. In conclusion, *M. whitei*, *E. capensis*, pumpkin seeds and aloe are a good aphrodisiac combination, which can be used to improve the sex life of many troubled men. Further studies are warranted to confirm these physiological activities.

REFERENCES

- Ang HH, Chan KL, Gan EK, Yuen KH (1997). Enhancement of Sexual Motivation in Sexually Naive Male Mice by *Eurycoma longifolia*. *Pharmaceut. Biol.* 35(2): 144-146
- Arletti R, Benelli A, Cavazzuti E, Scarpetta G, Bertolini A (1999). Stimulating property of *Turnera diffusa* and *Pfaffia paniculata* extracts on the sexual behavior of male rats. *Psychopharmacol.* 143: 15-19
- El-Taher TS, Matalaka Z, Taha HA, Badwan AA (2001). *Ferula harmonis* 'zallouh' and enhancing erectile function in rats: Efficacy and toxicity study. *Int. J. Impot. Res.* 13: 247-251
- Gonzales GF, Ruiz A, Gonzales C, Villegas L, Cordova A (2001). Effect of *Lepidium meyenii* (maca) roots on spermatogenesis of male rats. *Asian J. Androl.* 3: 231-3.
- Gundidza M, Masuku S, Humphrey G, Magwa ML (2005). Anti-diabetic activity of *Aloe excelsa*. *Cent. Afr. J. Med.* 51(11-12): 115-20
- Joe FM (1990). Erectile Dysfunction: Sexual response in men. *Arch. Sex. Behav.* 14: 33-39.
- Kamtchouing P, Mbongue GYF, Dimo T, Watcho P, Jatsa HB, Sokeng SD (2002). Effects of *Aframomum melegueta* and *Piper guineense* on sexual behaviour of male rats. *Behav. Pharmacol.* 13: 243-247.
- Lampiao F, Krom D, du Plessis SS (2008). The *in vitro* effects of *Mondia whitei* on human sperm motility parameters *Phytother. Res.* 22(9): 1272-1273.
- Miegoue P, Mbongue FGY, Assongalem AE, Dzeufiet DPD, Dimo T, Kamtchouing P (2007). Anabolic activity of alcoholic extract of *Piper guineense* in immature castrated rats *Pharmacology online*, 1: 99-107
- Moundipa FP, Kamtchouing P, Koueta N, Tantchou J, Foyang NP, Mbiapo FT (1999). Effects of aqueous extracts of *Hibiscus macranthus* and *Basella alba* in mature rat testis function. *J. Ethnopharmacol.* 65: 133-9.
- Olagbende-Dada SO, Ezeobika EN, Duru FI (2007). Anabolic effect of *Hibiscus rosasinensis* Linn. leaf extracts in immature albino male rats. *Nig. Q. J. Hosp. Med.* 17(1): 5-7.
- Orisakwe OE, Husaini DC, Afonne OJ (2004). Testicular effects of sub-chronic administration of *Hibiscus sabdariffa* calyx aqueous extract in rats. *Reprod. Toxicol.* 18(2): 295-298.
- Ratnasooriya WD, Dharmasiri MG (2000). Effects of *Terminalia catappa* seeds on sexual behaviour and fertility of male rats. *Asian J. Androl.* 2: 213-219.
- Rosen RC, Ashton AK (1993). Empirical Status of New Aphrodisiacs. *Arch. Sex. Behav.* 22: 581-543
- Salmon PH (1983). Psychosexual dysfunction in chronic renal failure: An overview. *Proc. EDTNA.* 12: 209-212.
- Sandroni P (2001). Aphrodisiacs past and present: A historical review. *Clin. Auton. Res.* 11: 303-307.
- Tyagi RM, Urmila M, Aswar V, Mohan SL, Bodhankar GN, Zambare P, Thakurdesai A (2008). Study of Furostenol Glycoside Fraction of *Tribulus terrestris* on Male Sexual Function in Rats. *Pharmaceut. Biol.* 46(3): 191-198
- Watcho P, Kamtchouing P, Sokeng SD, Moundipa PF, Tantchou J, Essame JL, Koueta N (2004). Androgenic effect of *Mondia whitei* roots in male rats. *Asian J. Androl.* 6(3): 269-272.
- Yakubu MT, Akanji MA, Oladiji AT (2005). Aphrodisiac potentials of the aqueous extract of *Fadogia agrestis* (Schweinf. Ex Hiern) stem in male albino rats. *Asian J. Androl.* 7(4): 399-404.
- Yakubu MT, Akanji MA, Oladiji AT, Adesokan AA (2008). Androgenic potentials of aqueous extract of *Massularia acuminata* (G. Don) Bullock ex Hoyle. stem in male Wistar rats. *J. Ethnopharmacol.* 118(3): 508-513.