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Article *in* Journal of Ethnopharmacology · July 2012

DOI: 10.1016/j.jep.2012.06.047 · Source: PubMed

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South African plants and male reproductive healthcare: Conception and contraception

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ARTICLE INFO

Article history:
Received 12 March 2012
Received in revised form
28 June 2012
Accepted 28 June 2012
Available online 6 July 2012

Keywords:
Medicinal plants
Reproductive healthcare
Sexual dysfunction
Sperm abnormality

ABSTRACT

Ethnopharmacological relevance: Traditional remedies from plants have been use to treat male reproductive related disorders for ages in South Africa.
Aim: This study reviewed the current status of medicinal plants used in male reproductive healthcare as well as their effectiveness as a mode of treatment.
Methodology: A detailed literature search was done by consulting books, peer-reviewed papers, scientific databases such as Scopus, Science direct and PubMed, and Google scholars. Keywords such as aphrodisiacs, conception, erectile dysfunction, fertility, infertility and sterility in relation to medicinal plants were used during the search. Plant species were selected based on their traditional use in different aspects of male reproductive healthcare.
Results: A total of 61 plants species were found to be used in treating male impotency or as aphrodisiacs. However, only six species have been evaluated scientifically and these plants showed significant activities either in promoting conception by improving fertility and promoting erection or in contraception by decreasing sperm motility, virility and membrane integrity.
Conclusion: The importance of herbal products in the treatment of male infertility and related sexual disorders is undeniable. Scientific evaluations of the six species have proved the empirical use of these plants in the improvement of male sexual disorders as well as validating their traditional uses.

1. Introduction

Reproductive healthcare addresses the reproductive processes, functions and systems at all stages of life. It encompasses the sexual health of both men and women, as well as maternal and child health (World Health Organization (WHO), 2011)).

1.1. Conception

Infertility can be defined as a couple's inability to become pregnant after one year of regular and unprotected intercourse (Nantia et al., 2009). For most couples, the inability to have a child is a tragedy and most of them use both or either traditional medicine and modern therapies as treatment (Nantia et al., 2009). It is estimated that 50% of affected couples have associated male factors as a cause of infertility (Shefi and Turek, 2006) and 40–90% of male infertility is due to deficient sperm production of indefinable origin (Sinclair, 2000). Infertility may be due to sexual dysfunctions or sperm abnormities or both. Sperm abnormalities include; lack of sperm, too little sperm, abnormal sperm morphology and insufficient sperm motility (Feng, 2003). Sexual dysfunction includes; disorders of desire, disorders of ejaculation and orgasm, erectile dysfunction and failure of detumescence (Porst, 2004 cited in Singh et al., 2010). In South Africa, male causal factors accounts for 40% of total infertility or failure to achieve pregnancy (Jacobson, 2010).

The high incidence of sexual inadequacy in males has led to the development of different treatment options. There are three phosphodiesterase type 5 (PDE5) inhibitors registered in South Africa; Viagra (sildenafil), Cialis (tadalafil) and Levitra (vardenafil). These are considered to be the first line of therapy in the management of ED, unless contra-indicated. Viagra is a PDE5 inhibitor and hence increases the level of cGMP which induces vascular smooth relaxation, vasodilation and increases blood flow to penile tissue (Corbin et al., 2002). However, Viagra also inhibits PDE6 which occurs in the retina and this may results in visual disturbances (Ückert et al., 2006). Some of these options are expensive, not easily available and have serious side effects. Due to these problems and the increasing number of men seeking help for the treatment of sexual dysfunction there is need for more pharmacological studies on cheaper, effective and safe natural treatment options.

List of abbreviations: cGMP, Cyclic Guanosine Monophosphate; DHS, Demographic Health Survey; ED, Erectile Dysfunction; FHS, Follicle Stimulating Hormone; LH, Luteinizing Hormone; WHO, World Health Organization

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http://dx.doi.org/10.1016/j.jep.2012.06.047

1.2. Contraception

Contraception is an essential component of reproductive health for men and women and without it, the socioeconomic progress and the future of this planet is endangered (Nieschlag, 2011). For a long time only a limited choice of certain contraceptive methods were available to men. These include condoms, periodic abstinence, vasectomy and withdrawal (coitus interruptus). Periodic abstinence has been associated with relatively high rates of unwanted pregnancies and disturbances in sexual activity (Nieschlag, 2011). With these limitations, men are still expected to participate in various efforts of fertility control (Darroch, 2008). In South Africa, contraceptive rate is moderate and unplanned pregnancies are common. Even though there is high knowledge on contraceptive use by women and men, the prevalence of unplanned pregnancy was 47% in 2003 (DHS, 2010). These may be due to a number of reasons; one of them is that the burden of contraceptive use lies with females. Since nearly half of all pregnancies are unplanned, studies to find effective and safe male contraceptives are needed.

Attempts are being made to identify reproductive processes that might be blocked by specific pharmacological agents with rapid onset of action. Most substances investigated so far have shown toxic side effects when interfering effectively with sperm functions (Nieschlag, 2011). For these reasons; there is a pressing need for product development and clinical trials of new, long-acting testosterone preparations and combinations with other agents. From a public health perspective, the importance of contraceptives has never been greater, even though the existing male-specific methods are safer and effective, increasing fertility control options for males could improve family planning. Plants may be a source of the desired pharmacological agents.

This study reviewed the current status of medicinal plants in the treatment of male infertility symptoms including libido dysfunction, erectile and ejaculatory disorders and sperm abnormalities as well as the effectiveness of these plants as a mode of treatment in South Africa. The role of plants as contraceptives was also investigated. On the basis of this study, the terms erectile dysfunction, aphrodisiacs, sterility, infertility and sexual impotence are used to mean the same thing, since these terms cannot be clearly distinguished using traditional ethnobotanical data. A detailed literature search was done by consulting books, peer-reviewed papers, scientific databases such as Scopus, Science direct and PubMed, and Google scholars. Keywords such as aphrodisiacs, conception, erectile dysfunction, fertility, infertility and sterility in relation to medicinal plants were used during the search.

2. Plants and conception

A total of 61 plants species from 36 families were found to be used traditionally to treat male sexual disorders (Table 1). Of the 61 plant species, only *Securidaca longepedunculata* is also traditionally used as a contraceptive. The common methods of application are decoctions and/or infusions in water, beer or milk taken orally. Some species are used in powder form. These plants are used as aphrodisiacs, to treat erectile dysfunction, to treat infertility and to enhance virility and general men weakness. It is however not very clear how most of these plant extracts act or exert their effects.

In vitro and *in vivo* studies, as well as clinical trials have proved the empirical use of plants in the improvement of male fertility parameters (Nantia et al., 2009). In South Africa, a large number of plant species are used in enhancing sexuality in men. However, how many of these species are effective and/or safe is a point of concern. Viagra is a major drug that is used worldwide for the treatment of impotence or to initiate an erection. It is an indole alkaloid and hence it may be useful to evaluate plants that contain similar structures such as the Apocynaceae family. A number of studies to scientifically evaluate plants that are used in South Africa to treat different aspects of male infertility such as erectile dysfunction, sexual desire and sperm abnormalities have been done (Rakuambo et al., 2004, 2006; Meyer et al., 2008; Yakubu and Afolayan, 2009). However, when you compare the number of plant species evaluated scientifically (six species) to the number of plants used in male reproductive healthcare (61 species), there is much room for improvement.

2.1. Plants and erectile function

Five pyrano-isoflavonoids have been isolated from the rootstock of *Eriosema kraussianum* N.E.Br. (Papilionaceae). The relaxation effect of Kraussianones 1 and 2 (Fig. 1) were determined

Table 1
A list of South African plants used traditionally in treating male sexual disorders.

Plant species	Plant part used	Medicinal uses	References
Annonaceae *Artabotrys brachypetalus* Benth.	Roots	Infusions used as an aphrodisiac and a stimulant	Mabogo (1990)
Apocynaceae*Carissa edulis* Vahl.	Roots	Used for virility and as an aphrodisiac	Mabogo (1990), Omino and Kokwaro (1993)
Wrightia natalensis Stapf	Bark, roots	Used as aphrodisiacs. Root bark powder and portions are mixed with beer (Mabundu) and water. The mixture is consumed immediately or within two days	Mabogo (1990)
Araceae *Acorus calamus* L.	Rhizomes	Used as aphrodisiacs	Mabogo (1990), Hutchings et al. (1996)
Asphodelaceae *Bulbine natalensis* Baker	Stem	The powder from the stem is mixed with milk and taken for the management of male sexual dysfunction.	Yakubu and Afolayan (2009)
Apiaceae *Heteromorpha arborescens*	Roots	Infusions administered for male weakness and also for impotency (1 teaspoon powdered in 500 ml milk and boiled, is drunk twice a day)	Mabogo (1990) Pujol (1990)
Asteraceae *Athrixia phylicoides* DC.	Leaves, stalks	Used as brew "bush tea" which is drunk as an aphrodisiac	Mabogo (1990), Hutchings et al. (1996), Van Wyk and Gericke (2000)
Burseraceae *Commiphora merkeri*	Gum	Used as aphrodisiacs	Mabogo (1990)
Canellaceae *Warburgia salutaris* (Bertol. f.) Chiov.	Bark	Used as an aphrodisiac	Mabogo (1990)
Capparaceae *Capparis tomentosa* Lam.	Roots	Used together with the roots of a *Cyperus* species for impotency	Hutchings et al. (1996)
Celastraceae *Salacia leptoclada* Tul.	Roots	Used as aphrodisiacs	Palmer and Pitman (1972)
Cucurbitaceae *Momordica balsamina* L	Roots	Used as aphrodisiacs	Hutchings et al. (1996)

Table 1 (*continued*)

Plant species	Plant part used	Medicinal uses	References
Clusiaceae *Garcinia livingstonei* T. Anders	Roots	Powdered roots are used as aphrodisiac	Mabogo (1990), Pooley (1993)
Euphorbiaceae *Bridelia cathartica* Bertol. f.	Roots	Taken in various preparations for sterility	Gelfand et al. (1985)
Euphorbia tirucalli L	Latex	Used for impotence	Watt and Breyer-Brandwijk (1966)
Fabaceae *Abrus precatorius* L. subsp. *africanus* Verdc.	Roots	Used as an aphrodisiac	Gelfand et al. (1985)
Acacia ataxacantha DC.	Roots	Used as an aphrodisiac	Mabogo (1990)
Cassia petersiana	Root	Used as an aphrodisiac	Watt and Breyer-Brandwijk (1966), Mabogo (1990)
Elephantorrhiza burkei Benth.	Roots	Used as an aphrodisiac	Mabogo (1990)
Elephantorrhiza elephantina (Burch.) Skeels	Roots	Used as aphrodisiacs	Gelfand et al. (1985)
E. cordatum E. Mey.	Roots	Hot milk infusions and pounded root decoctions are taken for impotency	Hulme (1954), Bryant (1966)
Eriosema kraussianum N.E.Br.	Roots	Used for treating impotency	Bryant (1966), Hutchings et al. (1996)
Eriosema salignum E. Mey.	Roots, rootbark	Hot milk infusions of roots or cold water infusions of root bark are consumed in small doses in the morning and night for impotence	Hulme (1954)
Mundulea sericea (Willd.) A. Chev.	Roots, rootbark	Fresh roots and root bark are chewed as an aphrodisiac	Kokwaro (1976), Mabogo (1990)
Peltophorum africanum Sond.	Roots, bark	Decoction used for sterility	Pooley (1993)
Hyacinthaceae *Urginea altissima* (L. f.) Bak.	Bulbs	Used as aphrodisiacs	Gelfand et al. (1985), Hutchings et al. (1996)
Hypoxidaceae *Hypoxis colchicifolia* Bak.	Corms	Used for impotency	Bryant (1966)
Icacinaceae *Pyrenacantha scandens* Planch. ex Harv.	Roots	Used for impotency	Gerstner (1941)
Liliaceae *Gloriosa superba* L.	Corms	Powdered corms taken for impotency and as aphrodisiacs	Bryant (1966), Hutchings et al. (1996)
Littonia modesta Hook.	Corms	Used as aphrodisiacs	Gerstner 1938, Hutchings et al. (1996)
Sandersonia aurantiaca Hook.	Corms, rootstocks	Used as aphrodisiacs	Gerstner 1938, Hutchings et al. (1996)
Loganiaceae *Strychnos spinosa* Lam.	Roots	Used as aphrodisiacs	Gelfand et al. (1985)
Melianthaceae *Bersama lucens* (Hochst.) Szyzyl.	Bark	Sed for impotence	Watt and Breyer-Brandwijk (1966) Bryant (1966)
Bersama stayneri Phill.	Bark	Used for impotence	Hutchings et al. (1996)
Bersama swinnyi Phill.	Bark	Used for impotence	Hutchings et al. (1996)
Bersama tysoniana Oliv.	Bark	Used for impotence	Hutchings et al. (1996)
Myrothamnaceae *Myrothamnus flabellifolius* Welw		Used as aphrodisiac	Mabogo (1990)
Myrtaceae *Heteropyxis natalensis* Harv.	Bark	Used to treat impotence and as an aphrodisiac	Hutchings et al. (1996)
Orchidaceae *Eulophia cucullata* (Afzel. ex Swartz) Steud.	Roots	A tablespoon of liquid from slightly boiled bulbous roots is used to treat impotence. Roots infusions are taken is small doses by married couple when the wife is feared barren	Hulme (1954), Bryant (1966)
Periplocaeae *Mondia whitei* (Hook. f.) Skeels	Roots	Used as aphrodisiacs	Watt and Breyer-Brandwijk (1966), Gelfand et al. (1985)
Pittosporaceae *Pittosporum viridiflorum* Sims	Bark, roots	Used as aphrodisiacs	Gelfand et al., 1985
Polygalaceae *Persicaria serrulata* (Lag.) Webb. & Moq.	Roots	Used as aphrodisiacs	Gelfand et al. (1985)
Securidaca longepedunculata Fresen	Roots	Infusions, decoctions or macerations of the roots taken orally as an aphrodisiac, for virility, impotency and as a contraceptive	Arnold and Gulumian (1984), Mabogo (1990), Van Wyk and Gericke (2000)
Rubiaceae *Catunaregam spinosa* (Thunb.) Tirvengadum subsp. *spinosa*	Unspecified	Used as an aphrodisiac	Verdcourt and Trump (1969)
Coddia rudis (E. Mey. ex Harv.) Verdc.	Roots	Pounded root decoctions are used for impotence	Hulme (1954)
Rubia cordifolia L. subsp. *conotricha* (Gand.) Verdc.	Roots	Decoctions are take at bedtime for the treatment of impotence	Bryant (1966)
Vangueria infausta Burch.	Roots	Macerated roots are used as an aphrodisiac	Arnold and Gulumian (1984), Mabogo (1990)
Rutaceae *Zanthoxylum capense* (Thunb.) Harv.	Roots	Roots are mixed with roots of a *Cyperus* species and used for impotency	Hutchings et al. (1996)
Zanthoxylum davyi (Verdoorn) Watern.	Roots	Used as an aphrodisiac	Mabogo (1990)
Sapindaceae *Pappea capensis* Eckl. & Zeyh.	Bark	Decoctions and infusions take as aphrodisiacs	Watt and Breyer-Brandwijk (1966), Mabogo (1990)
Sapotaceae *Vitellariopsis marginata* (N.E. Br.) Aubrev	Roots, leaves	Decoctions taken orally as sexual stimulants	Hutchings et al. (1996)
Thymelaceae *Synaptolepis kirkii* Oliv.	Roots	Powder from dry inner roots are used as aphrodisiacs	Chhabra et al. (1993), Hutchings et al. (1996)
Tiliaceae *Corchorus asplenifolius* Burch.	Roots	Roots are mixed with part of an *Eriosema* species, as aphrodisiacs and for impotency	Gerstner (1938), Pujol (1990)
Tiliaceae *Grewia flavescenes*	Roots	For male infertility	Mabogo (1990)
Grewia microthyrsa K. Schum. ex Burret	Roots	The root is boiled in water, removed and the water is taken to make the man's sperm stronger (enhance male fertility)	Mabogo (1990), Corrigan et al. (2011)
Triumfetta rhomboidea Jacq.	Roots	Used for impotence	Watt and Breyer-Brandwijk (1966)
Typhaceae *Typha capensis* Rohrb.) N.E.Br.	Rhizomes	To cure male infertility	Watt and Breyer-Brandwijk (1966), Hutchings et al. (1996)
Verbenaceae *Clerodendrum myricoides* (Hochst.) Vatke	Unspecified	Used for sterility and impotence	Hutchings et al. (1996)
Vitaceae *Rhoicissus tridentata* L.f. (Wild and R.B. Drumm)	Rootbark	Used to treat erectile dysfunction	Mabogo (1990), Rakuambo et al. (2006)

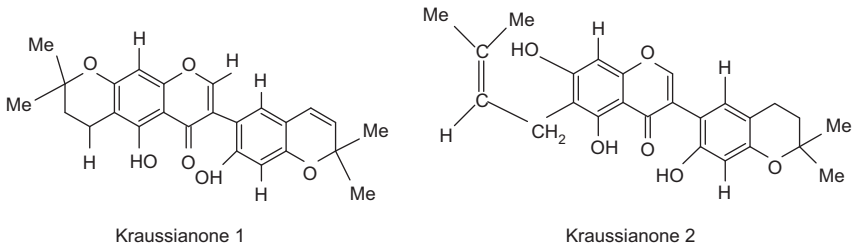

Fig. 1. Pyrano-isoflavonoids from *Eriosema kraussianum* with activity against erectile dysfunction (Drewes et al., 2002).

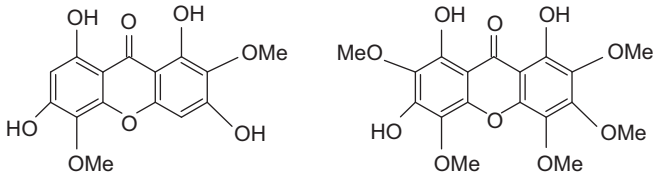

Fig. 2. Xanthones from *Securidaca longepedunculata* with activity against erectile dysfunction (Meyer et al., 2008).

in vitro using the rabbit penile smooth muscle relaxation bioassay. Both compounds and Viagra (positive control) were tested at a concentration of 78 ng/ml. At 78 ng/ml, a percentage carvenosal smooth muscle relaxation of 85 and 65 were exhibited by Kraussianone 1 and 2, respectively. Viagra gave a value of 100% at the same concentration (Drewes et al., 2002). This activity is very promising since two more species of *Eriosema* (*E. cordatum* and *E. saligna*) were recorded to be used to treat male impotence and hence, evaluating and identifying more or similar bioactive compounds from these two species will add value to their traditional uses and may be a source of bioactive compound(s).

Chloroform and ethanol extracts of root bark of *Securidaca longepedunculata* Fresen. (Polygalaceae), *Wrightia natalensis* Stapf (Apocynaceae) and *Rhoicissus tridentata* L.f. (Wild and R.B. Drumm) (Vitaceae) were subjected to a smooth muscle relaxation *in vitro* bioassay using rabbit penis. The extracts from the three species stimulated dose-dependent relaxation in the corpus carvenosum smooth muscle at final concentrations of 13 and 6.5 mg/ml. The stimulation of relaxation was between 0 and 60 s after application of the extracts (Rakuambo et al., 2006). Chloroform extract of *Securidaca longepedunculata* exhibited the highest stimulation (68%) when compared to the other two species. Further studies on *Securidaca longepedunculata* by Meyer et al., 2008 led to the isolation of two xanthones; 1,3,6,8-tetrahydroxy-2,5-dimethoxyxanthone and 1,6,8-trihydroxy-2,3,4,7-tetramethoxyanthone (Fig. 2). These xanthones stimulated the relaxation of corpus carvenosum, smooth muscle between 0 and 60 s after application. 1,3,6,8-tetrahydroxy-2,5-dimethoxyxanthone showed the highest stimulation (97%) in comparison to the positive control, Viagra (100%) at 1.8×10^{-5} mg/ml.

2.2. Plants and sexual desire (including effects on hormone level)

A number of plant extracts or compounds have been found to have effects on the levels of luteinizing hormone (LH), follicle stimulating hormone (FSH) and testosterone levels in humans. It is known that testosterone; especially its active conversion product dihydrotestosterone stimulates erection by maintaining the nitric oxide level. Plant extracts that increase blood testosterone concentrations are very useful in modifying sexual functions in animals especially those suffering from hypotestosteronemia.

The effect of aqueous stem extracts of *Bulbine natalensis* Baker (Asphodelaceae) was investigated *in vivo* on the sexual behaviour of male rats. Viagra and water were used as positive and negative control, respectively. Penile reflexes and mating behaviour test procedures were performed. The extracts were tested at a concentration of 100, 50 and 25 mg/ml. At 25 and 50 mg/kg body weight, an aqueous extract of *Bulbine natalensis* significantly increased the frequencies of mount, intromission, ejaculation and ejaculatory latency in rats. Similarly, at 25 and 50 mg/kg, the extract significantly increased the serum testosterone and LH concentrations (Yakubu and Afolayan, 2009). Total penile reflexes and its components were significantly enhanced. This extract (25 and 50 mg/kg body weight) also enhanced copulatory performance of male rats. This may be attributed to the increase in serum testosterone concentration revealed by Yakubu and Afolayan (2009). This effect is significant since testosterone is considered to contribute to the improvement in sexual function, libido and penile erection (Gauthaman et al., 2003). The plant is now commonly known as the 'testosterone booster'.

2.3. Plants and sperm abnormalities

The qualitative and quantitative parameters of sperm play an important role in fertility. These include azoospermia, oligospermia, asthenospermia and teratospermia. Plant extracts and compounds which are able to increase sperm count, sperm motility, sperm processing, membrane integrity, living percent and a decrease in encountered sperm abnormalities need to be identified. It is known that reactive oxygen species such as free radicals may reduce sperm count, quality and motility; hence plants with antioxidant activities may enhance sperm quality (Glenville, 2008). Zinc and vitamin C are powerful antioxidants and increase fertilization rates significantly, enhance sperm quality and prevent sperm agglutination thus making them more motile and with more forward progression (Glenville, 2008). So far, there are no reports on scientific evaluation of South African medicinal plants in treating sperm abnormalities. South African plants with known antioxidant activities may be investigated as infertility remedies since antioxidants improve various processes of male reproductive function such as spermatogenesis and steroidogenesis (Sheweita et al., 2005; Murugesan et al., 2007; Elumalai et al., 2009). The identification of these powerful antioxidants in medicinal plants used to treat male infertility will be a useful tool in primary healthcare and also in bioprospecting these plants for the development of fertility agents. Two South Africa species; *Securidaca longepedunculata* and *Typha capensis* exhibited negative effects against different sperm apparatus and are discussed under plants and contraception.

3. Plants and contraception

A lot of studies on anti-fertility effects of plants have been carried out since the work of Henshaw (1953) Chopra et al. (1956), Casey (1960), Farnsworth et al. (1975), Kamal et al. (2003).

The reversibility of the anti-fertility effects of plants and their active compounds are of potential clinical relevance in the development of male contraceptives. Plant extracts exhibiting reduction levels of testosterone, LH, and FSH will be potential agents in developing male contraceptives. Plants have also been reported to impair testicular steroidogenesis (Udoh et al., 1992; Malihezaman and Sara, 2007; Ogbuewu, 2009; Mathur et al., 2010).

However, in South Africa, very little has been done with respect to the potential of medicinal plants as a source of new contraceptive principles in males. A team at the Department of Medical Biosciences, University of Western Cape is currently working on a male contraceptive pill made from plant extracts. They have discovered a molecule in two varieties of olive trees (*Olea europaea* and *Olea exasperata*) and cloves which exhibit a 100% contraceptive effect on males of mice, rats and rabbits. The contraceptive effect was found to be immediate and reversible (University of Western Cape (UWC), 2009). Some plant species may also be used as contraceptives in addition to treating ED, impotence and sterility. For example *Securidaca longepedunculata* is used both to treat ED (Rakuambo et al., 2006) and as a contraceptive (Palgrave, 1977). At 2.5, 6.5 and 10 mg/ml body weight, ethanol root bark extract of *Securidaca longepedunculata* exhibited a decrease in sperm motility. Sperms were non-progressive and/or moving in random directions. Motility was greatly affected after 24 h incubation at 2.5 mg/ml and after 4 h at both 6.5 and 10 mg/ml (Rakuambo et al., 2006). The sperm vitality and membrane integrity was also inhibited. At 100 mg/ml body weight, *Bulbine natalensis* aqueous stem extract significantly increased the latency of mount, intromission latency and post-ejaculatory interval, contrasting effects to the ones produced by the same extract at 25 and 50 mg/ml (Yakubu and Afolayan, 2009). This is an indication that while a plant part may be consumed for a particular reason, the desired effect may not be achieved and thus, when evaluating these plants both effects; conception and contraception must be considered. Rhizome and leaf extracts of *Typha capensis* (Rohrb.) N.E.Br. (Typhaceae) were investigated for their effect on sperm count, motility and membrane integrity (Henkel et al., 2011). Treatment of ejaculated human sperm with 1 μg/ml of aqueous rhizome extract for 1 h decreased the values of all sperm parameters measured. These effects are in contrast to the traditional use of this plant which is to cure infertility (Hutchings et al., 1996). Even though the extracts showed significant anti-oxidative activity, a property known to improve spermatogenesis and steroidogenesis, a decrease in sperm motility, vitality and also the percentage of sperm with intact mitochondrial membrane potential decreased significantly (Henkel et al., 2011). This species may be more useful as a candidate in the search for an herbal male contraceptive.

4. Discussion and conclusions

Male sexual dysfunctions are either psychological, physical or both. Medicinal plants exert their effects by addressing one or both of these causes. Aphrodisiacs can be used to arouse sexual instinct, induce veneral desire and increase pleasure and performance (Malviya et al., 2011). Psychological action of these plant extracts include: mental stimulants to combat tiredness, psychotropic effects to produce an abnormal state of reality or sedatives to allay stress or have a calming effect (Dweck, 2009). Physical effects include induced physiological action on the corpus cavernosum. This has been demonstrated for *Securidaca longepedunculata*, *Eriosema kraussianum*, *Wrightia natalensis* and *Rhoicissus tridentata* (Drewes et al., 2002; Rakuambo et al., 2006; Meyer et al., 2008); physical stimulants by providing a tonic action; replace deficiencies such as oestrogenic, steroidal precursors, hormones and vitamins. *Bulbine natalensis* is one species that exhibited such effects by increasing the concentrations of serum testosterone and LH hormones (Yakubu and Afolayan, 2009). In this review, two species belonging to the family Apocynaceae (*Carissa edulis* and *Wrightia natalensis*) were recorded to be used traditionally to treat male impotence. These species should be evaluated for the presence of indole alkaloids. One cannot tell whether the activities exhibited by these plants could be transferrable and useful in a clinical setting, but identifying these plants and testing for activities could be a positive step towards the development of a product(s) that can be used in male reproductive healthcare. The human reproductive system is very complex and that includes the sexual functions, hence the possibility of developing a 100% contraceptive or conception drug/product from these plants is not guaranteed but again, it will only be known if proper research and efforts are put in place.

Regardless of access to modern medicine and care, a significant component of South Africans still use herbal remedies for antenatal care, fertility problems and all the other problems related to reproductive healthcare. This is clearly seen in this study, where 61 plant species are used in male reproductive healthcare and for the six that have been evaluated scientifically *in vitro*/*in vivo*, significant activities were exhibited both as agents for conception or contraception or both. This is an indication that these plants could play an important role in primary healthcare and also in bioprospecting bioactive agents for male reproductive healthcare.

The limited literature (ethnophamacopeia) on herbal male contraceptive in South Africa may be due to the availability and affordability of modern female contraceptives. Another reason for this may be due to the fact that most Africans believe in having large families with many children and fertility issues are not openly discussed by men. Hence, it may be important to conduct an ethnobotanical survey in order to document the traditional uses of herbal male contraceptives before it is too late. The documentation and development of male contraceptives will also help reduce the burden on women, who are currently playing a bigger role in fertility regulation or family planning.

Ethnobotanical inventories are usually the first phase of studies on traditional medicinal uses of plants. However, scientific evaluation and documentation of herbal remedies has proved to be more beneficial in further multidirectional research including drug development (Chitravadivu et al., 2009). This review has summarized most of the data dealing with plants used traditionally in male reproductive healthcare in South Africa including the effects of plant extracts and their compounds. However, more needs to be done in terms of evaluating these plants *in vitro*, *in vivo* and clinical trials especially with the extensive occurrence of male sexual dysfunctions. This is more evident with the increased number of clinics worldwide and in South Africa dealing with male sexual problems and the huge numbers of adverts on television, radio, and internet and also through people giving out pamphlets of herbalists treating erection and other male related problems (personal observation). It is important for physicians treating male reproductive related disorders to have some knowledge about medicinal plants, especially those that have been scientifically evaluated and learn how to combine this therapy with modern medicine.

Acknowledgements

The University of KwaZulu-Natal is thanked for financial support.

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