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Review Article

MALE INFERTILITY- FACTS, CAUSES AND A FEW TRADITIONAL MEDICINAL PLANTS WITH POTENT APHRODISIAC, ANTI- INFERTILITY ACTIVITY-MINI REVIEW

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ABSTRACT

Infertility is the incapability of a sexually active, non-contracepting couple to accomplish pregnancy in one year. Over the past years the number of individuals suffering from infertility is increasing. Infertility is a major problem in up to 15% of the sexually active population and male factor is accountable in 50% of these cases. Male infertility is a world-wide health and social problem. In India alone, the number stands at 30 million and in half of such cases, men are responsible for the current situation. Male sexual dysfunction (MSD) could be caused by numerous factors. These include psychological illness, androgen deficit, chronic medical conditions, diabetes, hypertension, vascular insufficiency, penile disease, pelvic surgery, neurological disorders, drug side effects, life style, aging and systemic diseases. Fertility pill, better known as fertility medications are drugs which enhance reproductive fertility. Management of male infertility is always a difficult task with current modern medical treatment option. Plants have a great ability for producing new drugs for human benefit. Plants used in traditional medicine contain a vast array of medicinal ingredients that can be used to treat male infertility. Various plants and poly herbal formulations are used for the treatment of male infertility. This review provides basic information on male infertility, causes, and a few medicinal plants with potent aphrodisiac activity.

Infertility

Infertility is "a disease of the reproductive system defined by the failure to attain clinical pregnancy after 12 months or more of regular unprotected sexual intercourse and this is as per "The International Committee for Monitoring Assisted Reproductive Technology - World Health Organization, 2009". Aging and stress exposure are the unavoidable phenomena. A large body of evidence has confirmed that male sexual behaviours gradually decline with age1. Several factors including both physical and mental factors are considered as the vital aetiology for sexual dysfunction in elderly. Stress is observed as one significant factor to induce sexual dysfunction. It is reported that chronic exposure to a variety of mild stressors significantly decreases male sexual behaviour 2, 3.

Infertility is a major problem in up to 15% of the sexually active population and male factor is responsible in 50% of these cases (World Health Organization, 1999). It had been estimated that more than 152 million men worldwide subjected to sexual dysfunction, and this number might increase to approximately 322 million by the year 2025 4,5,6.

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Male infertility

Male infertility is a world-wide medical and social problem. The fact that more than 15 percent couples worldwide are affected by infertility speaks volume about the worsening reproductive health worldwide. In India alone, the figure stands at 30 million and in half of such cases, men are responsible for the situation. Excessive alcoholism, smoking, late marriage and stress are all to be blamed. Growing sperm banks and assisted reproduction centres are evident of how this is silently turning into a serious health involvement. Male infertility is certainly on the rise and the average sperm count has been decreasing. The World Health Organization (WHO) recently revised its sperm count norm from 20 million to 15 million per millilitre. Virility is sexual desire in the mind whereas fertility is the physical ability of reproducing, which can be judged on two parameters: Sperm type (sperm count and motility) and the ability to deposit the sperm into female reproductive tract during coitus 7,8.

There has long been a discussion over whether male reproductive ability is determined by environmental factors, such as those present in the workplace or area of residence 9. Among 25 male workers involved in producing the insecticide dibromo-3

-chloropropane (DBCP), 14 are diagnosed as azoospermic or oligospermic10. Previous 50 years saw a marked reduction in sperm count 11.

During the period since 1970 in Scotland, sperm counts had decreased by approximately 25% compared with the period prior to 1959, a mean annual rate of 2.1% 12. Many researchers and clinicians have proclaimed that social progress in developed countries and worsening of the natural environment has likely resulted in decreased male fertility. Long-reported risk factors include working in high temperatures 13, noise associated with manufacturing 14, exposure to radiation 15, electromagnetic waves 16, and a variety of chemical substances 17.

Many studies have compared patients with male infertility (oligospermia or azoospermia) to healthy individuals (normal sperm count). To date, projected risk factors include air temperature18, automobile driving time per day 19, air pollution20, regional differences in residential population density21, mumps22, stress23, and alcoholism24.

The primary objective of this randomized, prospective double-blind study was to compare the effectiveness of dexmedetomidine and propofol in preventing Emergence Agitation in children undergoing surgeries using sevoflurane anesthesia. We also compared the emergence time and Paediatric Anaesthesia Emergence Agitation score between the study groups as secondary objectives.

Male sexual dysfunction

Sex disorders of the male are categorised into disorders of sexual function, sexual orientation, and sexual behaviour. In general, several factors should work in agreement to maintain normal sexual function. Such factors include neural activity, vascular events, intracavernosal nitric oxide system and androgens. Thus, malfunctioning of at least one of these could lead to sexual dysfunction of any kind. Sexual dysfunction in men refers to recurrent inability to achieve normal coitus. It can also be viewed as disorders that interfere with a full sexual response cycle. These disorders make it difficult for a person to enjoy or to have sexual intercourse. While sexual dysfunction rarely threatens physical health, it can take a heavy psychological toll, bringing on depression, anxiety, and debilitating feelings of inadequacy. Unfortunately, it is a problem often neglected by the healthcare team who strive more with the technical and more medically manageable aspects of the patient's illness25. Sexual dysfunction is more prevalent in males than in females and thus, it is conventional to focus more on male sexual difficulties. It has been discovered that men between 17 and 96 years old could suffer sexual dysfunction as a result of psychological or physical health problems26. Generally, a prevalence of about 10% occurs across all ages. Because sexual dysfunction is an inevitable process of aging, the prevalence is over 50% in men between 50 and 70 years of age 27. As men age, the absolute number of Leydig cells decreases by about 40%, and the vigour of pulsatile luteinizing hormone release is dampened. In association with these events, free testosterone level also declines by approximately 1.2% per year. These have contributed in no small measure to prevalence of sexual dysfunction in the aged. Male sexual dysfunction (MSD) could be caused by several factors. These include psychological disorders (performance anxiety, strained relationship, depression, stress, guilt and fear of sexual failure), androgen deficiencies (testosterone deficiency, hyperprolactinemia), chronic medical conditions like diabetes, hypertension, vascular insufficiency (atherosclerosis and venous leakage), penile disease (Peyronie's disease, priapism, phimosis, smooth muscle dysfunction), pelvic surgery (to correct arterial or inflow disorder), neurological disorders (Parkinson's disease, stroke, cerebral trauma, Alzheimer's disease, spinal cord or nerve injury), drug side effects (anti-hypertensives, central acting agents, psychiatric medications, antiulcer, antidepressants, and anti-androgens), life style (chronic alcohol abuse, cigarette smoking), aging (decrease in hormonal level with age) and systemic diseases (cardiac, hepatic, renal, pulmonary, cancer, metabolic, and post-organ transplant)28,29.

Role of medicinal plants in male infertility

Plants have a great potential for producing new drugs for human benefit. Plants used in traditional medicine contain a vast array of substances that can be used to treat chronic and even infectious diseases. According to a report of world health organization, more than 80% of world's populations depend on traditional medicine for their primary healthcare needs. The demand for more and more drugs from plant sources is continuously increasing. It is therefore essential for systematic evaluation of plants used in traditional medicine for various ailments. Hence, there is need to screen medicinal plants for promising biological activity 30.

Medicinal plants are used from ancient times and only true natural medicines have been found useful in several ways. They can be used directly or in extracted forms for the management of various ailments due to presence of many phytochemicals. The search for natural supplement from medicinal plants is being intensified probably because of its fewer side effects, its ready availability and less cost. With more clinical data, exact mechanisms of action, safety profile, and drug interaction with other uses of aphrodisiacs plant materials treating sexual disorder can become fruitful31.

Plants Possessing Male Anti infertility and Aphrodisiac Activity

1.Botanical Name: Allium sativum (Alliaceae)

Fig 1: Allium sativum

Vernacular Names:

English: **Garlic.**

Tamil: **Puntu**

Hindi: **Lahsun**

Sanskrit: **Lasuna**

Allium sativum (garlic) belongs to the family Alliaceae and is used in flavouring soups, stew and as traditional medicine that improves sexual function32. Allium sativum has gained widespread use as chemoprotective, in curing hypertension, impotence and erectile dysfunction. The multipurpose use together with its aphrodisiac activity has resulted in the widespread use of this plant medicine both in meals and as herbal medications 33. In recent times they have been used widely to treat hypertension, erectile dysfunction, lack of libido and as an aphrodisiac[34,35,36].

1. Botanical Name: Alpinia calcarata (Zingiberaceae)

Fig 2: Alpinia calcarata

Vernacular Names:

English: **Snap Ginger**

Tamil: **Sitharathai.**

Hindi: **Kulanjan.**

Sanskrit: **Rasna**

Alpinia calcarata (Zingiberaceae) is a rhizomatous perennial herb, cultivated in tropical countries, including Sri Lanka, India, and Malaysia. Experimentally, rhizomes of Alpinia calcarata are shown to possess antibacterial, antifungal, anthelmintic, anti-nociceptive, anti-inflammatory, antioxidant, aphrodisiac, gastro-protective, and anti-diabetic activities37. Aphrodisiac action of A. calcarata rhizome is investigated in a sexual competence study. The study examined the effects of Alpinia calcarata rhizomes on male rats for fertility and sexual competence with a hot water extract. Three doses of hot water extract (150, 250 and 500 mg/kg bw) are orally administrated to male rats and 3 hours later using receptive females their sexual behaviours monitored for 15 minutes. Fertility is determined in a separate group (with the highest dose) using a non-competitive copulation test. Sexual behaviour study noted that the hot water extract of Alpinia calcarata improved the ejaculating and latency for ejaculation is prolonged markedly.

Moreover, the counts for rats mounting and intromitting, and the latencies for mounting and intromission are inhibited. These observations collectively noticed a strong aphrodisiac action of Alpinia calcarata. The other indexes remained unchanged indicating sexual arousability, non-impairment in libido, sexual performance, sexual vigour or penile erection. However, a high dose of hot water extract slightly impaired the sexual motivation in a partner preference test. In fertility test, profound oligozoospermia is induced although fertility is uninhibited. With the administration of the highest dose of hot water extract, the serum testosterone level is elevated. The number of spontaneous penile erections is also elevated rapidly and markedly. The study concluded that rhizomes of Alpinia calcarata possess a strong and safe oral aphrodisiac effects and it has been considered as a non-toxic agent. 38

3.Botanical Name: Anacyclus pyrethrum (Compositae)

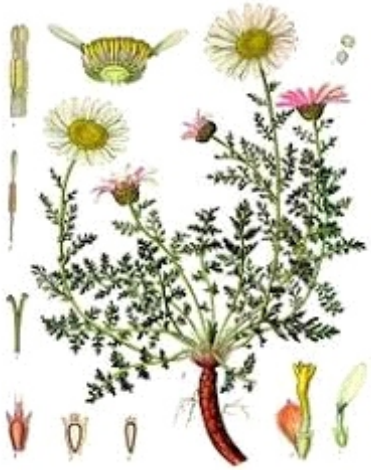

Fig 3: Anacyclus pyrethrum

Vernacular Names:

English: **Pellitory.**

Tamil: **Akraharam.**

Hindi: **Akarkara.**

Sanskrit: **Akarakarabha**

Anacyclus pyrethrum, commonly referred to as 'Akarkara', is widely recognized in Auyervedic system of Indian medicine as tonic and rejuvenator. The roots are also considered aphrodisiac and sexual stimulant. Aqueous extract of the roots is studied for its effect on sexual behaviour, spermatogenesis, and sperm count. Fructose levels in seminal vesicles of albino rats are also recorded. Two doses i.e. 50 and 100 mg/kg of aqueous extract on administration in albino rats showed pronounced anabolic and spermatogenic effect in animals of respective groups. The sperm count and fructose levels in seminal vesicle are markedly increased. Improvement in sexual behaviour of male rats is characterized by increased mount and intromission frequency and reduced mount and intromission latency. The extract had a dose dependent influence on sperm count and seminal fructose concentration which increased significantly 39.

4. Botanical Name: Asparagus racemosus (Liliaceae)

Fig 4: Asparagus racemosus

Vernacular Names:

English: **Asparagus**

Tamil: **Kilavari.**

Hindi and Sanskrit: **Shataavari**

Lyophilized aqueous extracts obtained from the roots of Asparagus racemosus, is studied for sexual behaviour effects in male albino rats and compared with untreated control group animals. The rats are evaluated for effect of treatments on anabolic effect. Seven measures of sexual behaviours are evaluated. Administration of 200 mg/kg body weight of the aqueous extracts had pronounced anabolic effect in treated animals as evidenced by weight gains in body and reproductive organs. There is a significant variation in the sexual behaviour of animals as reflected by reduction of mount latency, ejaculation latency, post ejaculatory latency, intromission latency, and an increase of mount frequency. Penile erection is also considerably enhanced. Reduced hesitation time (an indicator of attraction towards female in treated rats) also indicated an improvement in sexual behaviour of extract treated animals. The observed effects appear to be attributable to the testosterone-like effects of the extracts. Nitric oxide based intervention may also be involved as observable from the improved penile erection. The results, therefore, support the folklore claim for the usefulness of these herbs and provide a scientific basis for their purported traditional usage40.

5. Botanical Name: Caesalpinia benthamiana (Fabaceae)

Fig 5: Caesalpinia benthamiana

Caesalpinia benthamiana is an African tropical plant whose roots are used in traditional medicine as an aqueous decoction for many purposes, especially for erection impairment but its action mechanism is unknown. The action of Caesalpinia benthamiana on sexual behaviour and some assays on potential modes of action are performed. Caesalpinia benthamiana roots are rich in phenolic compounds (gallic acid, resveratrol and tannins). The results showed that aqueous extract of Caesalpinia benthamiana had significant vaso-relaxing properties. As for the aphrodisiac activity of aqueous extract of Caesalpinia benthamiana in male rats, results have shown that sexual parameters are stimulated. Furthermore, after oral administration at high dose, aqueous extract of Caesalpinia benthamiana causes no mortality or changes in rats' behaviour41

6. .Botanical Name: Curculigo orchioides (Hypoxidaceae)

Fig 6: Curculigo orchioides

Vernacular Names:

English: **Black musale.**

Tamil: **Nilappanai.**

Hindi: **Kali Musali**

Sanskrit: **Musali**

Curculigo orchioidesis an endangered rasayana herb, native of India. It possesses aphrodisiac, immune-stimulant, hepato-protective and anti-hyperglycemic activity. The plant has virility and aphrodisiac activity and is a constituent of many marketed formulations for impotence, sexual failure and falling libido as well as erectile dysfunction. The studies provide a scientific basis to support the use of plants as aphrodisiac by measuring reproductive hormone levels 42.

7.Botanical Name: Pedalium murex L.(Pedaliaceae)

Fig 7: Pedalium murex L

Vernacular Names:

English: **Large Caltrops**

Tamil: **Perunerunji**

Hindi: **Bara Gokhru**

Sanskrit: **Brihat Gokshura**

Pedalium murex L. is a diffuse, more or less succulent herb found near the sea coast of south India, Mexico, and tropical Africa43. The fruits as well as the leaves and stems produced milk mucilage when agitated, and it is recommended as a treatment for gonorrhoea 44. An infusion or extract prepared from leaves is diuretic and demulcent, useful in treating disorders of the urinary system such as ardour urine, dysuria, spermatorrhoea, and incontinence of urine. As an emmenagogue, the juice is used in puerperal diseases and also to promote lochial discharge45. The mucilage from leaves and young shoots is used as an aphrodisiac in seminal debility46. Aphrodisiac activity of petroleum ether extract of Pedalium murex plant at 200 and 400 mg/kg, orally in ethanol induced germ cell damage and infertility in male rat models depicted an increase in mating and mounting behaviour, body weight, percentage of pregnancy, litter size, sperm motility and also showed an increased levels of testosterone, germinal cells and the luminal spermatozoa in treated compared to control group47.

8. Botanical Name: Syzygium aromaticum (Myrtaceae)

Fig 8: Syzygium aromaticum

Vernacular Names:

English: **Clove**

Tamil: **Kirampu**

Hindi: **Lavang**

Sanskrit: **Lavangaha**

Effect of hexane extract of flower buds of Syzygium aromaticum at 15, 30, and 60 mg/kg, orally for 35 days are evaluated for a single spermatogenic cycle in Parkes (P) strain mice. Lower dose (15 mg/kg oral) of the extract increased the activity of serum level of testosterone48

9. .Botanical Name: Tricholepis glaberrima (Compositae)

Fig 9: Tricholepis glaberrima

Vernacular Names:

English: **Smooth Tricholepis**

Hindi: **Brahmadandi**

Sanskrit: **Ajadandi**

Treatment of methanol extract of the aerial parts of Tricholepis glaberrima at dose of 200 mg/kg, orally for 28 days in sexually active male rats has significantly increased intromission latencies and intercopulatory interval. Extract favours spermatogenesis by enhancing the proliferation of the somniferous epithelium 49.

10. Botanical Name: Zingiber officinale (Zingiberaceae)

Fig 10: Zingiber officinale

Vernacular Names:

English: **Ginger**

Tamil: **Inji**

Hindi: **Sonth**

Sanskrit: **Ardraka**

Zingiber officinale roots are commonly used as a culinary spice and medicinally used for androgenic50activity which are reported in animal models. The active ingredients of Zingiber officinale roots such as zingerone, zingiber officinalediol, zingiberene and shogaols produced antioxidant activity51. Previous study showed that natural antioxidants can protect DNA and other molecules from cell damage which induced by oxidation and can improve sperm quality and increase reproductive efficiency of men52. Zingiber officinale is also found to possess a protective effect against DNA damage induced by H_2O_2 and enhanced sperm quality in rats53.

Conclusion

Fertility medication, better known as fertility drugs were drugs which enhance reproductive fertility. Management of male infertility was always a difficult task with current allopathic medical treatment option. The treatment of men with unexplained idiopathic infertility remained a challenge in allopathic medicine. Side effects of allopathic fertility medications include libido changes, acne, nausea, headache, weight gain, visual field changes, dizziness, gynecomastia and allergic dermatitis and gastrointestinal side effects.

A phytotherapeutic approach to modern drug development can provide many invaluable drugs from traditional medicinal plants. Search for pure phytochemical as drugs were time consuming and expensive. Numerous plants and polyherbal formulations were used for the treatment of male infertility. The evaluation of plant products on the basis of medicinal and therapeutic properties forms a platform for the discovery of newer drug molecules from different plant sources.

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Conflicts of Interest

Authors have no conflict of interest regarding this article.

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