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THE POTENTIAL ROLE OF KONCH (*MUCUNA PRURIENS*) IN MALE INFERTILITY: A REVIEW

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ABSTRACT

Infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse. A male factor contributes to infertility in approximately 50% of couples who fail to conceive, causing significant psychosocial and marital stress. *Mucuna pruriens* is an annual and perennial legume which belongs to the family Fabaceae having different types of therapeutic activity. Conventionally, *Mucuna pruriens* seeds are used for maintaining male infertility in traditional systems of medicine and it is widely used as a potent aphrodisiac and spermatogenic agent. Google Scholar and PubMed were explored to obtain the evidences on the effect of *Mucuna pruriens* on male infertility and other pharmacological activities. The mechanisms involved in the beneficial effects of *Mucuna pruriens* in male infertility are improving semen quality, improving sperm count and motility, rejuvenating the harmonic balance of male reproductive hormones, and improving sexual behavior, libido and potency. Apart from beneficial effects of *Mucuna pruriens* on male infertility, it possesses some most common pharmacological activities including Anti-oxidant, Anti-inflammatory, Aphrodisiac, Hepatoprotective and Anti-Parkinson's activity. The plant is reported to have L-3-4 dihydroxy - phenylalanine (L-DOPA) as a major constituent mainly in seeds. Alkaloidal constituents such as Mucunadine, Mucunine, Prurienidine, Prurienine are reported from seeds. This review emphasizes the potential role of *Mucuna pruriens* in the management of male infertility systematically through literature review available to date. Some other activities of *Mucuna pruriens* are also summarized in this review.

KEYWORDS: *Konch*, *Kapikacchu*, Velvet bean, Male infertility.

INTRODUCTION

Infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse.[1] A male factor contributes to infertility in approximately 50% of couples who fail to conceive, causing significant psychosocial and marital stress.[2]

Mucuna pruriens is an annual and perennial legume which belongs to the family Fabaceae having different types of therapeutic activity.[3] Conventionally, *Mucuna pruriens* seeds are used for maintaining male infertility in traditional systems of medicine and It is widely used as a potent aphrodisiac and spermatogenic agent.[3,4,5] It has been shown that its seeds are potentially of substantial medicinal importance.[6]

OBJECTIVE

1. To review the literature on '*Mucuna pruriens'*
2. To review the recent scientific evidences of pharmacological studies of *Mucuna pruriens* on male infertility
3. To review the recent scientific evidences of other pharmacological studies of *Mucuna pruriens* systematically

METHODOLOGY

A systematic literature search was carried out to review articles and to gather the information available in the

literature regarding '*Mucuna pruriens'* in the view of description of the plant, chemical constituents, part used, therapeutic action and therapeutic uses, and recent scientific evidences of pharmacological activities. All the available information on '*Mucuna pruriens'* was compiled from Unani, Ayurveda textbooks and electronic databases such as Google scholar and PubMed.

RESULTS

Scientific classification of *Mucuna pruriens*[7]
Kingdom: Plantae
Division: Magnoliophyta
Class Magnoliopsida
Order: Fabales
Family: Fabaceae/ Leguminosae
Genus: Mucuna
Species: pruriens

Vernacular names
English: Cowhage, Velvet Bean
Tamil: *Poonaikali*
Sinhala: *Wanduru-me*

Unani Tibbi name: *Konch*
Sanskrit name: *Kapikacchu*

Fig.1: Leaves, Flowers, Pods and Seeds of *Mucuna pruriens.*

Description of the *Mucuna pruriens* plant[8]
A semi-woody twining climber with slender branches clothed with short white deflexed hairs;

Leaves: Alternate, stipulate, 3-foliate with stipels, large, rachis 7.5-12.5 cm long, sparingly deflexed hairy, leaflets 7.5-10 cm long, 5-7.5 cm broad, on short, thick, hairy stalks, terminal one smallest and rhomboid-oval, lateral ones very unequal with the lower half greatly dilated, all acute, mucronate, pubescent above, densely covered with shining silvery adpressed hairs beneath, stipules linear, setaceous, hairy.

Flowers: Irregular, bisexual, dull dark purple with a yellowish green keel, numerous, 3.7-4.3 cm long, on short pubescent pedicels, usually 2 or 3 together at intervals on a slender, pubescent raceme, 15-30 cm long, bracts 1.2 cm long, lanceolate, hairy, deciduous; sepals 5, fused into a campanulate calyx, densely silky, two upper segments completely connate, lowest much the longest; petals 5, exserted, very unequal, wings twice as long as the standard, keel rather longer than wings, curved into a stiff beak at apex; stamens 10, diadelphous; ovary superior, surrounded at base by a small crenulate disc, unilocular with marginal ovules, style beardless, stigma capitate.

Fruit: Legume 6.2-7.5 cm long, 1.2 cm broad, linear, blunt, falcately curved at both ends with a longitudinal rib along the whole length of each valve but without wings, densely covered with close rather weak orange-brown irritant bristles pointing backwards and readily detached, 4-6 seeded with partitions between them.

Seed: Ovoid, 0.6 cm long, compressed, brownish, mottled with black, hilum oblong.

Parts used: Seed, leaf and root.[9]

Chemical Constituents: The plant is reported to have L-3-4 dihydroxy – phenylalanine (L-DOPA) as a major constituent mainly in seeds. Alkaloidal constituents such as Mucunadine, Mucunine, Prurienidine, Prurienine are reported from seeds.[9]

Properties of *Mucuna pruriens* according to the Traditional Systems of Medicine
Table 01 shows the properties of the *Mucuna pruriens* according to Unani and Ayurveda systems of medicine.[10,11]

Table 01: Properties of *Mucuna pruriens* according to Unani and Ayurveda systems of medicine.

Unani	Ayurveda
Taste: Sweet ***Mizaj* (Temperament):** Hot 2^0 Dry 1^0 ***Naf 'e Khas* (Actions):** *Qabiz* (Astringent) *Mulayyin* (Laxative)	***Rasa* (taste):** Sweet and Bitter ***Guna* (attributes):** *Guru* (Heavy) and *Snigdha* (Unctous) ***Virya* (potency):** Usna (Hot)

Muqawwi-e-Bah (Aphrodisiac) *Muqawwi-e-Asab* (Nervine Tonic) *Mudir-e-Baul* (Diuretic) *Mudir-e-Tams* (Emmenagogue) *Qatil-e-Deedan* (Vermifuge)	***Vipaka* (post digestive effect):** Sweet ***Karma* (actions):** It alleviates *Vata*, *Pitta* and *Kapha*, all three dosas. It helps in nourishing all the *Dhatu* (tissue elements) in the body, especially *Sukra* (Semen) in the males.

Therapeutic uses of *Mucuna pruriens* according to the traditional systems of medicine
Table 02 shows the Therapeutic uses of the *Mucuna pruriens* according to Unani and Ayurveda systems.[10,11]

Table 02: Therapeutic uses of *Mucuna pruriens* according to Unani and Ayurveda Systems of Medicine.

Unani	Ayurveda
1. *Jiryan* (Spermatorrhoea) 2. *Sailanur Reham* (Leucorrhoea) 3. *Isterkha* (Paralysis) 4. *Kirm-e-Shikam* (Worm in the abdomen)	1. The seeds are the most commonly used ingredient in many tonics for impotency and for enhancing sexual vitality. It also works well as a restorative for conditions of debility and weakness. 2. The seeds powder of *Kapikacchu* and *Kokilaaksa* impart very potent effect, when taken with sugar and followed by milk. It augments the seminal fluid, vitality and vigour. 3. The hot infusion of the seeds is an excellent panacea for premature ejaculation in men. 4. The seeds are useful galactogouge in lactating mothers. 5. The roots of this plant are diuretic. 6. The decoction of roots is beneficial in renal problems and dysuria. 7. The roots also help regulating the menstrual cycle and enhance sexual vigour in women. 8. In *Vata* diseases like Facial palsy, Cervical spondylosis, Parkinson's disease, Paralysis etc, the decoction of *Kapikacchu* is rewarding.

Compound formulations of *Mucuna pruriens* according to the Traditional Systems of Medicine
Table 03 shows the Compound formulations of the *Mucuna pruriens* according to Unani and Ayurveda systems[10,11]

Table 03: Compound formulations of *Mucuna pruriens* according to Unani and Ayurveda systems of Medicine.

Unani	Ayurveda
1. Laboob-e-Kabeer	1. Vanari Gutika
2. Laboob-e-Sagheer	2. Masabaladi Pacana
3. Majoon-e-Konch	3. Vajikarana ghrta
4. Safoof-e-Mundi	4. Brmhana Gutika

Scientific evidences of *Mucuna pruriens* in Male infertility
1. Singh AP, et al. (2013) conducted a study to demonstrate the spermatogenic restorative efficacy of *Mucuna pruriens* and its major constituent L-DOPA (LD), and finding the possible mechanism of action thereof in a rat model. The present study simplified the complexity of mechanism involved and provided meaningful insights into MP/LD mediated correction of spermatogenic impairment caused by estrogens exposure.[12]

2. Suresh S. et al. (2012) conducted a study to analyze the efficacy of *Mucuna pruriens* on male sexual behavior and sperm parameters in long-term hyperglycemic male rats. The results of the study showed significant reduction in sexual behavior and sperm parameters in diabetic induced group. Daily sperm production (DSP) and levels of follicular stimulating hormone, luteinizing hormone, and testosterone were significantly reduced in diabetic induced group, whereas the animals with diabetes administered with seed extract of *Mucuna pruriens* showed significant improvement in sexual behavior, libido and potency, sperm parameters, DSP, and hormonal levels when compared to group diabetic induced.[13]

3. Gupta A. et al (2011) carried out a study to employ proton nuclear magnetic resonance ((1) H NMR) spectroscopy to evaluate the impact of *Mucuna pruriens* seeds on the metabolic profile of seminal plasma of infertile patients. On the basis of the observations of this study, it may be proposed that *Mucuna pruriens* seed powder not only reactivates the enzymatic activity of metabolic pathways and energy metabolism but also rejuvenates the harmonic balance of male reproductive hormones in infertile men. These findings open more opportunities for infertility treatment and management by improving semen quality.[14]

4. Shukla KK, et al (2010) carried out a study to assess the role of *Mucuna pruriens* in infertile men who were under psychological stress. Results of this study showed treatment with *Mucuna pruriens* significantly ameliorated psychological stress and seminal plasma lipid peroxide levels along with improved sperm count and motility. According to the results of the study, it may

be concluded that *Mucuna pruriens* not only reactivates the anti-oxidant defense system of infertile men but it also helps in the management of stress and improves semen quality.[15]

5. Suresh S. et al. (2010) carried out a study and found supplementation of *Mucuna pruriens* significantly reduced reactive oxygen species (ROS) and lipid peroxidation (LPO) production and significant increase in both enzymatic and non-enzymatic antioxidant levels. Present observation indicates the antioxidant enhancing property, free radical quenching ability and spermatogenic efficacy of the *Mucuna pruriens*.[16]

6. Shukla KK, et al. (2009) conducted a study to understand the mechanism of action of *Mucuna pruriens* in the treatment of male infertility. According to their study treatment with *Mucuna pruriens* significantly improved Testosterone, LH, dopamine, adrenaline, and noradrenaline levels in infertile men and reduced levels of FSH and Prolactin. Sperm count and motility were significantly recovered in infertile men after treatment. They concluded that treatment with M. *pruriens* regulates steroidogenesis and improves semen quality in infertile men.[17]

7. Ahmad MK, et al. (2008) investigated the impact of *Mucuna pruriens* seeds on semen profiles and biochemical levels in seminal plasma of infertile men. Treatment with *Mucuna pruriens* increased sperm concentration and motility in all the infertile study groups. Oligozoospermic patients recovered sperm concentration significantly, but sperm motility was not restored to normal levels in asthenozoospermic men. Furthermore, in the seminal plasma of all the infertile groups, the levels of lipids, antioxidant vitamins, and corrected fructose were recovered after a decrease in lipid peroxides after treatment. The present study is likely to open new vistas on the possible role of *Mucuna pruriens* seed powder as a restorative and invigorating agent for infertile men.[18]

Sceintific evidences of other pharmacological Activities of *Mucuna pruriens*

Mucuna pruriens also shows following pharmacological activity as mentioned in Table 4.

Table 4: Other Pharmacological Activities of *Mucuna pruriens.*

Pharmacological activities	References
Anti-Parkinson's activity[19,20,21,22,23,24,25,26,27]	Cilia R, et al. (2017) Adi YK, et al. (2018) Rai SN, et al. (2017) Yadav SK, et al. (2014) Lieu CA, et al. (2012) Lieu CA, et al. (2010) Randhir R, et al. (2009) Katzenschlager R, et al. (2004) Manyam BV, et al. (2004)
Anti-inflammatory activity[28,29]	Martínez Leo EE, et al. (2018), Rachsee A, et al. (2020)
Anti-oxidant activity[30,31,32]	Jimoh MA, et al. (2020) Martínez-Leo EE, et al. (2019) Obogwu MB, et al. (2014)
Aphrodisiac activity[18]	Ahmad MK, et al. (2008)
Hepatoprotective activity[33]	Obogwu MB, et al. (2014)

DISCUSSION AND CONCLUSION

Mucuna pruriens is an annual and perennial legume which belongs to the family Fabaceae having different types of therapeutic activity. Conventionally, *Mucuna pruriens* seeds are used for maintaining male infertility in traditional systems of medicine and it is widely used as a potent aphrodisiac and spermatogenic agent. It has been shown that its seeds are potentially of substantial medicinal importance. The plant is reported to have L-3-4 dihydroxy - phenylalanine (L-DOPA) as a major constituent mainly in seeds. Alkaloidal constituents such as Mucunadine, Mucunine, Prurienidine, Prurienine are reported from seeds.

The mechanisms involved in the beneficial effects of *Mucuna pruriens* in male infertility are improving semen quality, improving sperm count and motility, rejuvenating the harmonic balance of male reproductive hormones, and improving sexual behavior, libido and potency. Apart from beneficial effects of *Mucuna pruriens* on male infertility, it possesses some most common pharmacological activities including Anti-oxidant, Anti-inflammatory, Aphrodisiac, Hepatoprotective and Anti-Parkinson's activity. This review emphasizes the potential role of *Mucuna pruriens* in the management of male infertility systematically through literature review available to date.

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