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Review Article

**KAKOLI (*ROSCOEIA PURPUREA*) – A WONDERFUL PANACEA
FOR DISORDERS OF REPRODUCTIVE SYSTEM**Gunpreet Kaur^{1*}, Vikas Gupta¹, Parveen Bansal¹, Richa Raturi¹, Ram Gopal Singhal²¹UCER, Baba Farid University of Health Sciences, Faridkot, India.²Shobhit University, Meerut, India.**Abstract:**

Male reproductive disorders and fertility trends are rapidly changing towards increase in reproductive disorders and decrease in fertility. A recent study reflects appreciable decrease in populations in Japan and European Union due to persistently low total fertility rates (TFR). The sexual urge is the most powerful biological drive next to the need for food, water and sleep. Sexual activity should be a healthful and pleasant experience. However many people face anxiety, humiliation, frustration and disappointment because of inadequate sexual functioning. The importance of sex in human life was duly recognized by ancient Rishies and aphrodisiac power of herbs was found out by founding fathers of Ayurveda thousands of years ago. Ancient texts also describe reproduction as one of the prime duties of an individual towards humanity and it was a matter of proud for the kings to practice polygamy. These practices gave origin to development of formulations to enhance sexual potency and reproduction. So there had been a demand for search of such formulations of herbal origin that could give a boost to satisfying sexual activities and justified reproduction. Present manuscript compiles therapeutic potentials of a wonder plant Kakoli for its use in multiple reproductive disorders. Systemized clinical studies have been conducted on a number of plants for different disorders but no plant has been reported for multiple uses. Compilation presents more than 10 ancient textual references made for use of this plant in very potent formulations however planned clinical studies/trials are needed to create scientific evidences.

Keywords: *Kakoli, Vajikaran, fertility, spermatogenesis, ejaculatory dysfunction.***Corresponding Author:****Dr. Parveen Bansal,**

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INTRODUCTION:

Ayurveda also known as the science of life, prevention and longevity is the oldest, most holistic and comprehensive medical system available in the world. Ayurveda uses the inherent principles of nature to maintain health in person by keeping the ones body, mind and spirit in perfect equilibrium with nature. Charak Samhita states that “The healthy life has three main pillars- a balanced diet, proper sleep, healthy sexual and marital life”[1].

Much therapeutics is described in various classical texts of Ayurveda for the management of different diseases however sexual and reproductive disorders have been considered of immense importance for society and human beings [2]. The sexual urge is the most powerful biological drive next to the need for food, water and sleep. Sexual activity should be a healthful and pleasant experience. However many people face anxiety, humiliation, frustration and disappointment because of inadequate or improper sexual functioning. The importance of sex in human life was duly recognized by ancient Indian *Rishies* who have assigned a complete section on sexuality in *Vedic* texts. The Aphrodisiac power of herbs was found out by founding fathers of Ayurveda thousands of years ago. These *Rishies* were interested to optimize human functioning, improve health, increase longevity and retard aging. They never believed in quick solutions when it comes to sexuality but always insisted for true sexual vitality. The ayurvedic tonics and aphrodisiac herbs have been found through the ages for safe, healthy and profound fortification of sexual functioning, intensification of the pleasure of sexuality, helping eliminate the roots of sexual dysfunction, frustration and anxiety.

Ancient texts also describe reproduction as one of the prime duties of an individual towards humanity. It was a matter of proud for the kings to practice polygamy and produce lot of heirs from their sexual partners. These practices gave origin to development of formulations to enhance sexual potency and successful reproduction. This is not a new practice. Rather it is being followed since the times of *Rishi Chaywan* and a number of legends associated with reproduction, rejuvenation are presented in literature from time to time. So there had been a demand for search of such formulations of herbal origin that could give a boost to satisfying sexual activities and justified reproduction [3].

Ayurveda is about 5000 years old whereas the age of modern medicine is about 100 years. It is certain that stressful life style has significantly increased the number of subject's suffering from one form of sexual dysfunction or the other. Male reproductive disorders and fertility trends are rapidly changing

towards increase in reproductive disorders and decrease in fertility. Reproductive capacity was found to be deficient in nearly 50% of infertile couples according to a study carried out by the World Health Organization in 1987. Today even after 30 years, according to a recent report it is predicted that Japan and European Union will soon experience appreciable decreases in their populations due to persistently low total fertility rates below replacement level [4]. Main factors that decrease the probability of conception in the female partner are congenital, immunological, iatrogenic, or endocrine causes. Oligozoospermia, sexual, and ejaculatory dysfunction are further responsible for inability to conceive in numerous cases [5]. Although many synthetic drugs are available and/or used to treat these problems, some of the drawbacks for these drugs include them being expensive and also their ability to provoke serious adverse effects, effective natural treatments are therefore still in demand[6]. Modern medicine such as Viagra (the much talked sex pill) force the patient's system to respond, whereas the Ayurvedic medicines based on traditional knowledge use plants and other natural resources to nourish and rebuild body tissue (Complete sexual health for men).

In Ayurveda this part of human behavior had been attributed to presence of Rasayana, and Vajikarna drugs. *Rasayana* is category of drugs described in Ayurveda for promotion of health and virility. Aphrodisiac group of drugs comes under both the *Vajikarana* and *Rasayana* categories. Ancient literature and records show the deep interest of human beings for substances to increase libido, potency and sexual pleasure as it takes care of the disorders of sexual desire, ejaculation, orgasm and erectile dysfunction drugs which increase the quantity of semen or stimulate the production of semen for example, *Microstylis wallichii*, *Roscoea procera*, *Polygonatum verticillatum*, *Mucuna pruriens* and *Asparagus racemosus* [7]. In *Charaka Samhita*, an oldest text of Ayurveda which was written approximately during 3000 B.C., a group of drugs are described which exhibit spermatogenic and virility activities. A drug which helps for providing nutrition to sperm and accelerates the process of spermatogenesis is known in Ayurveda as *Shukrajanana*. This group comprises medicinal plants like *Jivaka* (*Microstylis wallichi*), *Rishabhaka* (*Microstylis muscifera*), *Kakoli* (*Roscoea procera*), *Kshirakakoli* (*Roscoe aprocera* other variety), *Mudgaparni* (*Phaseolus trilobus*), *Masaparni* (*Teramus labialis*), *Meda* (*Polygonatum verticillatum*), *Vridharuha* (*Asparagus racemosus*), *Jatila* (*Nardostachys jatamansi*) and *Kulinga* (*Alpinia galanga*) [8].

Vajikaran as a concept has been defined in the *Rig Veda* and the *Yajurveda*, the first written texts of medicine, in Ayurveda. The word vajikarna is composed of 2 words i.e. Vaji and karana. Vaji means horse the symbol of sexual potency and performance and karana means “power”. Vajikarana herbs are also the basis for therapies recommended in *Kamasutra*, a treatise defining methods for appropriate sexual satisfaction amongst couples. An excerpt of the definition derived from these texts suggests that a youth in sound health taking regularly some sort of Vajikarana remedy may enjoy the pleasure of youth every night during all the seasons of the year [9]. Old men, wishing to enjoy sexual pleasure or to secure the affections of women, as well as those suffering from senile decay or sexual incapacity, and persons weakened with sexual excesses may also use Vajikaran remedies. They are highly beneficial to handsome and opulent youths and to persons who have got many wives. According to Rasendra Sara Sangrah an Ayurvedic text Vajikaran remedy makes a man sexually as strong as a horse (Vaji) and enables him to cheerfully satisfy the heat and amorous ardors of young maidens [10,11]. Though in scientific terms these claims may represent a populous outlook, the popularity of Vajikaran in Ayurvedic system of medicine is nonetheless undisputed with numerous claims and textual references made to them during the course of human history. By proper use of the vajikarana formulations, one becomes endowed with good physique, potency, strength and complexion and sexually strong as like 8 yrs old horse [12]. It has been mentioned in Charak Samhita, Ayurvedic text that if a person receives Vajikarana medicines then his erection time will be so long that he can perform sexual activity for long time and frequently. He can satisfy hundred female partners in a day [13].

Evidence based studies on plants helpful in reproductive disorders

A number of medicinal plants or plant derived active constituents have already been screened for their role in reproductive disorders through a number of established mechanisms of action.

A number of common plants like *Allium tuberosum*, *Myristica fragrans*, *Syzygium aromaticum* (L.) have been shown to increase sexual behavior [14]. Similarly Ferutinin isolated from *Ferula hermonis boiss*[15] and flavonoids present in Leaf (30% ethanol in water) of *Turnera diffusa* have been shown to stimulate sexual behavior [16]. *Crocine/crocetin* isolated from aqueous extract of *Crocus sativus* L. (Iridaceae) stigma improves sexual activity [17]. Active constituents Ginsenosides and saponin glycosides of *Panax ginseng* roots [18] and

keayanidine B and keanine from *Microdesmis keayana* roots stimulate NO production [19] and central nervous system action. Few other reports demonstrate stimulation of release of NO by some plants [20]. Increase of sexual behavior and testosterone concentration has been reported by Terpenoid or steroid compounds from *Basella alba* L. (Basellaceae) leaves [21] and aqueous extracts of *Camellia sinensis*, [22]. A number of other plants have also been shown to increase testosterone level [23-27]. *Bulbine natalensis* stem extract has also been shown to increase hormone level [28]. Similarly *Lithospermum arvense* seed extract has been shown to be androgenic [29] whereas saponins, furostenol glycoside of *Tribulus terrestris* has been shown to increase androgen property [30]. *Diodia scandeus* extract has been shown to potentiate the action of Acetyl choline and adrenaline [31]. *Anacardium occidentale* leaf extracts has been shown to increase fertility [32]. Meiconoides from root extract of *Lepidium meyenii* Walpers [33] and alkaloids in seed extract of *Mucuna pruriens* Baker [34] has been shown to induce Spermatogenesis. Varieties of other plants that increase sperm count, organ weight and enhances spermatogenesis are *Cynomorium coccineum* [35], *Withania somnifera* [36], *Psoralea corylifolia*[37], *Rubus coreanus*[38], *Garcinia cambogia* [39], *Hibiscus sabdariffa*[40] and *Psidium guajava* [41]. *Peganum harmala* [42]. *Dracaena arboreai* root extract [43] and *Allanblackia floribunda* stem bark extracts [44] has been shown to inhibit the activity of the bulbospongiosus muscles whereas Novel xanthones from root bark of *Securidaca longepedunculata*, *Wrightia natalensis* and *Rhoicissus tridentate* extract [45] relaxed the corpus cavernosal smooth muscle. Increase in blood flow to the testis and ejaculatory capacity has been reported by *Kaempferia parviflora* rhizomes [46,47] and *Senecio cardiophyllus* roots [48]. Male copulatory behavior has been found to be facilitated by roots extract of *Panax quinquefolium* L. [49].

Roscoeia purpurea also known as *Roscoeia procera* (Wall.) is a perennial herb belonging to family Zingiberaceae. The specie is locally renowned as *kakoli*, *red gukhra*, *dhawanksholika*, *karnika*, *ksheera*, *vayasoli* and *vaysasha* etc. and is native of Nepal [50]. *R. purpurea* is abundantly available in Himalayas. Tubers of *R. purpurea* exhibit immunomodulatory activity [51], antidiabetic activity [52] and is major constituent of polyherbal Ayurvedic formulation, “Ashtavarga”, which according to Nikhandu Samhita and Indian Metria Medica is having, anti-oxidant, anti ageing effect and elevates overall health status of a well being [53,54]. *Ashtavarga* is important ingredient of various Ayurvedic formulations such as *Chyawanprasha*. It is

one of the excellent combinations of herbal drugs which restores health immediately, strengthens immunity system and rectifies defects in anabolism or body growth processes and works as antioxidant in the body. That is why *Aswani Kumars* invented it for curing the frail, emaciated sick body of *Chyawan Rishi* who regained youthful condition as it is documented [55].

Traditionally, herbal drugs have played a significant role in the management of both minor and major medical illnesses. Herbal drugs means a dosage form consisting of one or more herbs or processed herb in a specified quantities to provide specific nutritional, benefits, and/or other benefit meant for use to diagnosis treat, mitigate diseases of human beings or animal and/or alter the structure or physiology of human beings or animals. In absence of clinical efficacy and safety data on these herbs, people are skeptical to use them. Hence there is an urgent need to conduct systematic clinical studies/trials to support traditional claims and to work out cellular and molecular mechanism involved. Moreover, the cross talk of various pathways involved must also be taken into account to come up with a molecular pathway to search a lead molecule of herbal origin for the various diseases related to sexual dysfunction. So, investigations in validation of the effect of these *Jivaniya* plants will go a long way in management of

many sexual dysfunctions and sexual disorders. Kakoli is the major component of various formulations used to cure diseases related to reproductive system like amenorrhea (uterine disease), seminal and menstrual diseases, promotes virility, increase fertility, female genital tract infections, improves quality of semen & ovum, procreation of male child, anti-aging, promotes male fertility and aphrodisiac (as shown in Fig.1 and Table 1).

The present compilation demonstrates the potentials of this plant in multiple sexual dysfunctions. The plant has been recommended for individual use or can be used in combination of other drugs. The compilation is supported by evidences only from Ayurvedic ancient text books/literature however clinical trial based data is lacking. There is a strong need to create database on therapeutic potentials of this plant in various sexual disorders.

CONCLUSION:

Kakoli is a wonderful plant with evidences of its use in a number of preparations mentioned in old Ayurvedic texts. This plant is being used in combination in most of the formulations, however if concerted clinical trials on single plant are conducted on various claims, it could give a wonder medicine that is useful in plethora of reproductive disorders.

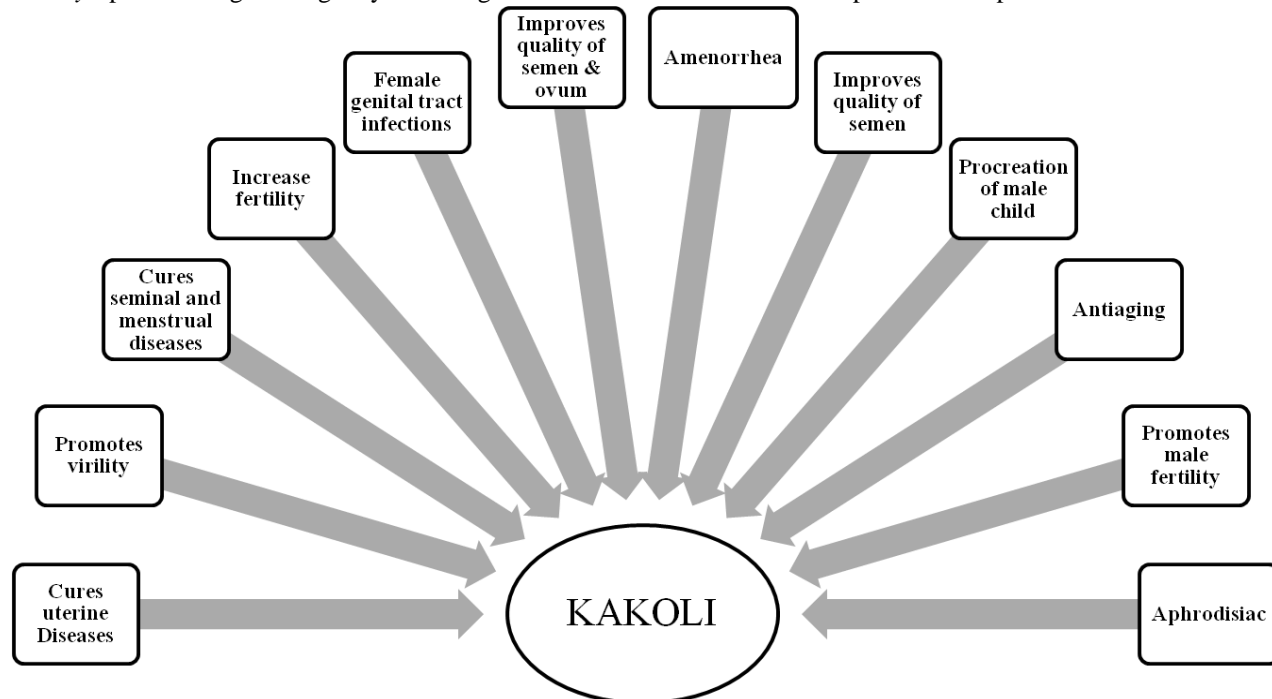


Figure 1: Use of Kakoli in different disorders related to reproductive system.

पर्यायेण प्रयोक्तव्यमिच्छता शुक्रमक्षयम्॥७॥				
Continue.....				
7.	Amruta Prasha Ghruta	It cures cough, fever, asthma, burning sensation, thirst. It also helps in the procreation of a male child also.	<p>जीवकर्षभकौ वीरां जीवन्तीं नागरं शटीम्। चतस्रः पर्णिनीर्मदे काकोल्यौ दवे निदिग्धिके॥३५॥ पुनर्नवे दवे मधुकमात्मगुप्तां शतावरीम्। ऋद्धिं परुषकं भार्गी मृदवीकां बृहतीं तथा॥३६॥ शृङ्गाटकं तामलकीं पयस्यां पिप्पलीं बलाम्। बदराक्षोट खर्जूरं वातामाभिषुकाण्यपि॥३७॥ फलानि चैवमादीनि कल्कान् कुर्वीत कार्षिकान्। धात्री रस विदारीक्षुच्छाग मांस रसं पयः॥३८॥ कुर्यात् प्रस्थोन्मितं तेन घृतप्रस्थं विपाचयेत्। प्रस्थार्धं मधुनः शीते शर्करार्धतुलां तथा॥३९॥ द्विकार्षिकाणि पत्रैलाहेमत्वङ्मरिचानि च। विनीय चूर्णितं तस्माल्लिहयान्मात्रां सदा नरः॥४०॥ अमृतप्राशमित्येतन्नराणाममृतं घृतम्। सुधामृतरसं प्राश्यं क्षीरमांसरसाशिना॥४१॥ नष्टशुक्र क्षतक्षीण दुर्बल व्याधि कर्शितान्। स्त्री प्रसक्तान् कृशान् वर्णं स्वर हीनांश्च बृंहयेत्॥४२॥ कास हिक्का ज्वर श्वास दाह तृष्णास्र पित्तनुत्। पुत्रदं वमि मूर्च्छा हृद्योनिमूत्रामयापहम्॥४३॥ इत्यमृतप्राशघृतम्।</p>	(Hebbar, 2015c) [59]
8.	Ksheerayoga (Medicated Milk and jiggery containing Kakoli)	Cures seminal and menstrual diseases, depletion of body tissue, emaciation and phthisis.	<p>स्थिरा सिता पृश्निपर्णी श्रावणी बृहती युगैः। जीवकर्षभ काकोली तामलक्यृद्धि जीवकैः॥१०१॥ शृतं पयः पिबेत् कासी ज्वरी दाही क्षतक्षयी। तज्जं वा साधयेत् सर्पिः सक्षीरेक्षुरसं भिषक्॥१०२॥ जीवकादयैर्मधुरकैः फलैश्चाभिषुकादिभिः। कल्कैस्त्रिकार्षिकैः सिद्धे पूतशीते प्रदापयेत्॥१०३॥ शर्करा पिप्पलीचूर्णं त्वक्क्षीर्या मरिचस्य च। शृङ्गाटकस्य चावाप्य क्षौद्रं गर्भान्पलोन्मितान्॥१०४॥ गुडान् गोधूमचूर्णेन कृत्वा खादेदधिताशनः। शुक्रासृग्दोष शोषेषु कासे क्षीणक्षतेषु च॥१०५॥</p>	(Hebbar, 2015d) [60]
9.	Mahamayura Ghrita	Used to cure diseases of the female genital tract and also helps in the procreation of a male offspring.	<p>एतेनैव कषायेण घृतं प्रस्थं विपाचयेत्। चतुर्गुणेन पयसा कल्कैरेभिश्च कार्षिकैः॥१६६॥ जीवन्ती त्रिफला मेदा मृदवीकर्धिं परुषकैः। समङ्गा चविका भार्गी काश्मरी सुरदारुभिः॥१६७॥ आत्मगुप्ता महामेदा ताल खर्जूर मस्तकैः। मृणाल बिस शालूक शृङ्गी जीवक पद्मकैः॥१६८॥ शतावरी विदारीक्षु बृहती सारिवा युगैः।</p>	(Hebbar, 2015e) [61]

			<p>मूर्वा श्वदंष्ट्रर्षभक शृङ्गाटक कसेरुकैः॥१६९॥ रास्ना स्थिरा तामलकी सूक्ष्मैला शटि पौष्करैः। पुनर्नवा तुगाक्षीरी काकोली धन्वयासकैः॥१७०॥ खर्जुराक्षोट वाताममुञ्जाताभिषुकेरपि । द्रव्यैरेभिर्यथालाभं पूर्वकल्पेन साधितम्॥१७१॥ नस्ये पाने तथाऽभ्यङ्गे बस्तौ चैव प्रयोजयेत्। शिरो रोगेषु सर्वेषु कासे श्वासे च दारुणे॥१७२॥ मन्यापृष्ठग्रहे शोषे स्वरभेदे तथाऽदिते। योन्यसृक्शुक्र दोषेषु शस्तं वन्ध्या सुतप्रदम्॥१७३॥ ऋतुस्नाता तथा नारी पीत्वा पुत्रं प्रसूयते। महा मायूरमित्येतद्घृतमात्रेय पूजितम्॥१७४॥ इति महामायूर घृतम्।</p>	
10.	Brihat Shatavari Ghrita	It promotes virility and helps the woman to get a male progeny. It is a curative of phthisis, ordinary jaundice, gout including other forms of arthritis and erysipelas.	<p>शतावरीमूल तुलाश्चतस्रः सम्प्रपीडयेत्॥६४॥ रसेन क्षीरतुल्येन पचेतेन घृताढकम्। जीवनीयैः शतावर्या मृदवीकाभिः परुषकैः॥६५॥ पिष्टैः प्रियालैश्चाक्षांशैर्द्वियष्टिमधुकैर्भिषक्। सिद्धे शीते च मधुनः पिप्पल्याश्च पलाष्टकम्॥६६॥ सिता दशपलोन्मिश्राल्लिहयात् पाणितलं ततः। योन्यसृक्शुक्रदोषघ्नं वृष्यं पुंसवनं च तत्॥६७॥ क्षतं क्षयं रक्तपित्तं कासं श्वासं हलीमकम्। कामलां वातरक्तं च वीसर्पं हृच्छिरोग्रहम्॥६८॥ उन्मादारत्यपस्मारान् वात पित्तात्मकाञ्जयेत्। इति बृहच्छतावरी घृतम्।</p>	(Hebbar, 2016)[62]
11.	Milk boiled with herbs belonging to Jivaniya Group	Formulation is used to cure Amenorrhea (uterine disease)	<p>मृगाजाविवराहासृग्दध्यन्त फल सर्पिषा ॥१०१॥ अरजस्का पिबेत् सिद्धं जीवनीयैः पयोऽपि वा।</p>	(Hebbar, 2016) [62]

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