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A panoramic view of medicinal plants traditionally applied for impotence and erectile dysfunction in Persian medicine

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ABSTRACT

Erectile dysfunction (ED) and impotence are common male sexual problems, and they are highly prevalent in male adults with a history of hypertension or diabetes mellitus. This review aims to bring together the standpoints of the early Persian physicians on these disorders and to identify the respective medication in comparison with conventional contemporary medicine. The main medical and pharmaceutical manuscripts of traditional Persian medicine (TPM) are from 9th–18th century AD. Besides the medieval findings, the current knowledge on ED and impotence, and the related effects of the cited medicinal herbs were studied. In the medieval and traditional literature, male potency is called *bāh*. According to the TPM approaches, the first step in the mitigation of impotence focuses on the treatment of the main body organs including the heart, brain, and liver. The TPM approaches for diagnosis and treatment include the evaluation of the quality of semen, sexual habit, and quality of urine. The treatment strategies in TPM involve lifestyle modification and prescription of natural medicaments. Many medicinal herbs have been traditionally used for the mitigation of impotency. There could be numerous possibilities for bringing out new natural medicaments with aphrodisiac effects supported by the early medical literature.

1. Introduction

In recent years, researchers and clinicians all over the world have shown great concern regarding complementary medicine. They have noted the failure of conventional approaches in the complete cure of chronic diseases, such as diabetes mellitus, cardiovascular diseases, and different types of cancer. The acceptance of natural remedies among communities as a safe alternative to the biomedical approach has encouraged researchers to seek natural sources of medicaments. Many people in western communities use complementary medicine for numerous common diseases, such as depression, diabetes, and cardiovascular disorders.[1]

Based on humeral medicine, traditional Persian medicine (TPM) has a specific diagnostic model with more than thousands of years of history. In this approach, the diagnosis and treatment are based on defining the *mezaj* (temperament) of the patients.[2] According to TPM, for all diseases rooted in the gastrointestinal tract, observing nutritional measures is the first step for the treatment of the diseases, including erectile dysfunction (ED).[3,4]

ED is a chronic disease that is psychologically very important but is not a life-threatening disorder. This disorder is a common male sexual problem and is defined as the inability to produce or maintain effective penile erection during sexual activity.[5] ED increases with increasing age. However, maintaining a normal mental, endocrine, and vascular physiology may prevent the development of ED with age. Coronary heart disease (CHD), cardiovascular diseases, stroke, diabetes mellitus (DM), and chronic obstructive pulmonary disease (COPD) are the highly prevalent comorbidities in men affected by ED.[6] Similar risk factors for ED and coronary vascular diseases (CVDs), such as hyperlipidemia, lack of physical activity, obesity, and smoking show a common vascular and metabolic mechanism for both disorders.[5]

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The extant pharmaceutical and medical textbooks written by traditional Persian practitioners and scholars provide remarkable information on various ailments.[7] The TPM recommendations and approaches for the treatment of chronic diseases may pave simple and safe ways for physicians to use alternative intervention for the management of chronic diseases. The current study aims to compile the medieval and traditional information relating to ED, including diagnosis and common remedies, in comparison with conventional medicine.

2. Methods

The chapters related to ED and the related medicinal plants were selected and studied from *Kitāb al-ḥāwī fī al-ṭibb* (The Comprehensive Book on Medicine) by Rhazes (9th and 10th centuries), the Canon of Medicine by Avicenna (10th and 11th century), *Ikhtiyārāt-i Badī'ī* (Selections for Badī'ī) by Hājjī Zayn al-'Aṭṭār (14th century), *Tuhfat al-mu'minīn* (Present for the Faithful) by Daylamī Tunakābunī (17th century), *Makhzan al-adviyah* (The Storehouse of Medicaments) by Alavī Shīrāzī (18th century), *Tibb-i Akbari* (Akbar's Medicine) by Akbar-shāh Arzānī, and *Eksīr-e-'Azam* (The Great Exir) by Mohammad Azam Khān (18th century).[8–14]

The nomenclatures of the reported medicinal plants were confirmed using textbooks like *Matching the Old Medicinal Plant Names with Scientific Terminology*, *Dictionary of Medicinal Plants*, *Dictionary of Iranian Plant Names*, and *Indian Medicinal Plants*.[15–18] Other than the medieval findings, the current knowledge on ED and the related effects of the cited medicinal herbs were studied.

3. Results and discussion

Owing to health, cultural, and individual differences, the worldwide prevalence of ED varies in different countries. The prevalence of ED in Iranian male adults in the age range of 50–70 years and above 60 years is 19% and 47.7%, respectively.[19] About 18 million (18%) American men suffer from ED.[20] Formerly, ED was believed to be a disorder that had links with psychogenic causes and that had a rapid onset. However, recent studies have revealed that ED may have an organic origin with a slow onset in the majority of instances.[21]

ED is highly prevalent in male adults with a history of hypertension or diabetes mellitus as well as in those with psychological problems.[22] There are common risk factors, both psychogenic and vascular, for sleep disorders and ED, whereas ED resistant to treatment may be attributed to sleep disorder.[23] ED is a risk factor for CVD in men who have no previous history of cardiovascular problems.[24]

About 25% of all ED cases are related to certain medications, such as diuretics and beta-blockers.[21] ED during aging is usually attributed to the decline in androgen and testosterone levels[25];

Table 1
Medieval and traditional aspects of ED.

Condition	Etiology	Symptoms and description	Treatment
Pathologic slimness	- General weakness - Imbalance in genital temperament	- Decreased vital force and stamina, - Decreased intake - Pale skin - Decreased BMI and body weight - Anorexia	- High calorie with rich protein diet - Increase in sleeping - Reduction in intercourse
Cardiovascular dysfunction	- Imbalance in heart temperament	- Decreased potency - Weak pulse - Late and incomplete erection - Decreased libido weakness and decreased stamina after intercourse	- Heart reinforcement with Cardiotonic medicaments - Focusing on mood enhancing conditions
GI and liver dysfunction	- Maldigestion and dyspepsia	- Decreased appetite and libido	- Management of GI and liver complications
Nervous system dysfunction	- Lack of night sleep, depression and mental illnesses - Cold Dystemperament of brain	- Confused thinking - Lack of energy - Decreased libido - Decrease potency - Penile laxity	- Mezaj and temperament modification - Expulsion and purgation of morbid matters - Nerve tonic medicines
Penile laxity	- Decreased pneuma below umbilicus organs - Extreme coldness due to pouring phlegm in nerves or confronting with cold water, ice or snow - Masturbation - Extreme warmness - Penile nerve laxity		
Psychological conditions (fear or shame)		- Disability to maintain a penile erection during intercourse because	- Reassure the condition
Lack of intercourse for long times	- Lack of satisfaction - Decreased autoerotism - Penile laxity		- Foods and medicines having aphrodisiac activities - unction with lily oil
Slim male penis	- Dry dystemperament of penis - Increased semen viscosity - Decreased volume	- Improvement with increased bath time and having wet diet,	- Wet diet - Dairy products - Unctioning the genitalia with sheep milk
Decreased volume of semen and cold penis	- Cold dystemperament of penis - Increased semen viscosity and coldness - Difficult and longtime ejaculation	- Improvement with starvation - medicaments with hot temperament, and hot climate	- Ginger paste and jam, Cinnamon, - Unctioning with Sesame oil
Decreased volume and warm penis	- Warm dystemperament of penis - Increased viscosity - Easy ejaculation - Penile veins prominence - Scrotal enlargement and vein prominence	- Improvement with cold medicines	- Milk, dough, Purslane - Unctioning with violet-almonds oil - An stew of cucumber, goat meat and Spinach
Increased volume and penile laxity	- Decrease viscosity - Wet dystemperament of penis	- Aggravating with drinking water	- Meat (chicken, Beef) - Sparrow, Cinnamon, Cumin

Table 2
Medicinal plants traditionally applied for impotence and ED.

Family	Scientific name	Traditional name	Part used	Administration	Dose/day
Acoraceae	*Acorus calamus* L.	*Voj*	Root	Oral	4.2 g
Amaryllidaceae	*Allium ampeloprasum* L.	*Korrās*	Leaves	Oral, Topical	14.7 g
	Allium cepa L.	*Basal*	Bulb	Oral	4.2 g
	Allium sativum L.	*Soom*	Bulb, oil	Topical	–
	Narcissus tazetta L.	*Narjes*	Seeds	Oral	1.8 g
Anacardiaceae	*Pistacia terebinthus* L.	*Habat-ol-khazrā*	Seeds	Oral	10.8 g
	Semecarpus anacardium L.f.	*Belādor*	Seed	Oral	–
Apiaceae	*Conopodium majus* (Gouan) Loret	*Jowz-e- argham*	Root	Oral	8.4 g
	Daucus carota L.	*Jazar*	Seeds	Oral	7.2 g
	Ferula assa-foetida L.	*Anjedān*	Seeds	Oral	8.4 g
	Ferula persica Willd.	*Sakbinaj*	Gum	Oral	3.6 g
	Pimpinella anisum L.	*Anisoun*	Seeds	Oral	18 g
	Trachyspermum ammi (L.) Sprague	*Nānkhāh*	Seeds	Oral	10.8 g
Apocynaceae	*Nerium oleander* L.	*Defli*	Flower	Oral	1.8 g
Arecaceae	*Cocos nucifera* L.	*Nārjil*	Fruit	Oral	–
	Phoenix dactylifera L.	*Tamr*	Flower, Fruit	Oral	–
Aristolochiaceae	*Asarum europaeum* L.	*Asāroun*	Root	Oral	12.6 g
Asparagaceae	*Asparagus officinalis* L.	*Halioon*	Root	Oral	10.8 g
	Leopoldia comosa (L.) Parl.	*Balboos*	Bulb	Topical	–
	Polygonatum orientale Desf.	*Shaghāghol*	Root, Jams	Oral	18 g
Asteraceae	*Achillea millefolium* L.	*Hozonbol*	Root	Oral	8.4 g
	Anacyclus pyrethrum (L.) Lag.	*āghergharhā*	Root	Oral	3.6 g
	Calendula officinalis L.	*Azariyoun*	Flower	Oral, Topical	16 g
	Eclipta prostrata (L.) L.	*Bahmangrah*	Aerial parts	Oral	12.6 g
	Matricaria chamomilla L.	*Bāboonaj*	Fruit, Root	Oral	12.6 g
	Tanacetum parthenium (L.) Sch.Bip.	*Aghhvān*	Flower	Topical	8.4 g
Boraginaceae	*Echium amoenum* Fisch. & C.A.Mey.	*Lesān -olasāfir*	Leaves	Oral	10.8 g
	Myosotis palustris (L.) Nathh.	*Azān-ol-fār*	Juice	Topical	4.2 g
Brassicaceae	*Aurinia saxatilis* (L.) Desv.	*Alsan*	Aerial Parts	Oral	7.2 g
	Brassica nigra (L.) K.Koch	*Khardal*	Fruit	Oral	10.8 g
	Brassica oleracea L.	*Karanb*	Seeds	Oral	8.4 g
	Brassica rapa L.	*Shaljam*	Seeds	Topical	–
	Eruca vesicaria (L.) Cav.	*Jerjir*	Seeds	Oral	10.8 g
	Erysimum × *cheiri* (L.) Crantz	*Kheiri*	Fruit oil	Topical	–
	Lepidium latifolium L.	*Shitaraj*	Aerial parts	Oral	4.2 g
	Lepidium sativum L.	*Horf*	Seeds	Oral	14.4 g
Burseraceae	*Boswellia sacra* Flueck.	*Kondor*	Gum	Oral	1.8 g
	Commiphora mukul (Hook. ex Stocks) Engl.	*Moghl*	Gum	Oral	3.6 g
Capparaceae	*Capparis spinosa* L.	*Kabar*	Root	Oral	10.8 g
Caprifoliaceae	*Lonicera periclymenum* L.	*Soltan-oljabal*	Flower	Nasal	–
Corylaceae	*Corylus avellana* L.	*Bondogh*	Seed	Oral	72 g
Cyperaceae	*Cyperus esculentus* L.	*Hab-ol-zalm*	Seeds	Oral	29.4 g
	Cyperus longus L.	*So'ad*	Root	Oral, Topical	8.4 g
Elaeagnaceae	*Elaeagnus angustifolia* L.	*Ghobeirā*	Flower	Oral	4.2 g
Fabaceae	*Abrus precatorius* L.	*Ayn-ol-dik*	Seeds	Oral	1.8 g
	Alhagi maurorum Medik.	*Taranjabin*	Gum	Oral	28.4 g
	Phaseolus vulgaris L.	*Loobia*	Seeds	Oral	–
	Vicia ervilia (L.) Willd.	*Karasneh*	Seeds	Oral	10.8 g
Fagaceae	*Castanea sativa* Mill.	*Shāhbaloot*	Seeds	Oral	–
Iridaceae	*Crocus sativus* L.	*Zafarān*	Flower	Oral	7.2 g
Juglandaceae	*Juglans regia* L.	*Jowz*	Seeds, Jams	Oral	–
Lamiaceae	*Thymbra capitata* (L.) Cav.	*Hāshā*	Aerial parts	Oral	8.4 g
	Zataria multiflora Boiss.	*Sa'atar*	Seeds	Oral	8.4 g
Lauraceae	*Cinnamomum verum* J.Presl	*Dārsini*	Bark	Oral	7.2 g
Linaceae	*Linum usitatissimum* L.	*Katān*	Seeds	Oral	14.4 g
Malvaceae	*Abelmoschus esculentus* (L.) Moench	*Bāmieh*	Fruit	Oral	–
	Gossypium herbaceum L.	*Hab-olghatan*	Seeds	Oral	21 g
Moraceae	*Ficus carica* L.	*Tin*	Fruit	Oral	84 g
Myristicaceae	*Myristica fragrans* Houtt.	*Basbāseh*	Fruit	Oral	10.8 g
Myrtaceae	*Syzygium aromaticum* (L.) Merr. & L.M.Perry	*Gharanfol*	Buds	Oral	4.2 g
Nymphaeaceae	*Nymphaea lotus* L.	*Bashneen*	Leaf	Oral	75.6 g
Pedaliaceae	*Sesamum indicum* L.	*Samsam*	Seeds	Oral	18 g
Phyllanthaceae	*Phyllanthus emblica* L.	*Amlaj*	Fruit	Oral	18 g
Pinaceae	*Pinus pinea* L.	*Senowbar*	Seeds	Oral	7.2 g
Plumbaginaceae	*Limonium vulgare* Mill.	*Bahman*	Root	Oral	8.4 g
Portulacaceae	*Portulaca oleracea* L.	*Baghlat-ol-hamghā*	Aerial parts	Oral	18 g
Ranunculaceae	*Nigella sativa* L.	*Shooneez*	Seeds	Topical	–
Rosaceae	*Descurainia sophia* (L.) Webb ex Prantl	*Khobbeh*	Seeds	Oral	–
	Prunus dulcis (Mill.) D.A.Webb	*Lawz-olholv*	Seeds	Oral	–
Salicaceae	*Salix aegyptiaca* L.	*Khelāf-al-balkhi*	Flower distillate	Oral	–
Smilacaceae	*Smilax china* L.	*Choob-e-chini*	root	Oral	–
Sterculiaceae	*Glossostemon bruguieri* Desf.	*Moghās*	Seeds	Oral	7.2 g
Urticaceae	*Urtica dioica* L.	*Anjoreh*	Seeds, oil	Oral, Topical	10.8 g

(*continued on next page*)

Table 2 (*continued*)

Family	Scientific name	Traditional name	Part used	Administration	Dose/day
Zingiberaceae	*Alpinia galanga* (L.) Willd.	*Khoolanjān*	Root	Oral	3.6 g
	Zingiber officinale Roscoe	*Zanjebeel*	Root	Oral	7.2 g
	Zingiber zerumbet (L.) Roscoe ex Sm.	*Zaranbād*	Root	Topical	–
Zygophyllaceae	*Tribulus terrestris* L.	*Hasak*	Seeds	Oral	18 g

however, regular intercourse in men within 55–75 years may protect them from ED.[26] A decline in testicular function during aging is physiological. Diseases and lifestyle may also lead to this decline.[27] Physical activities, quitting smoking, and diet modifications in accordance with the preventive measures for CVD may have preventive impacts on the management of ED.[20] The conventional treatments for ED include phosphodiesterase 5 (PDE 5) inhibitors, such as sildenafil, vardenafil, and tadalafil.[28] Alprostadil is a topical cream that has been approved as a first line of treatment for ED in Canada.[29] In addition, papaverine, phentolamine, and prostaglandin E_1 are parenterally applied for ED.[28]

Male potency is called *bāh* in TPM manuscripts and other sources.[9] Persian scholars believed that the three primary organs—*andām-e-raīseh* (vital organs)—including the heart, brain, and liver, are responsible for the physiological conditions.[30] According to the TPM approach, the first step in the management of impotence focuses on the treatment of the weakness or malfunctioning of these vital organs.[13]

Avicenna described semen as a very thin, mature, bloody fluid. He believed that flatulent foods and vegetables affect libido and sexual force. The mechanism of developing libido comprises passion and sexual expectations, sexual movements, and the gassy fluid derived from digestion.[9] For perfect intercourse, the liver, brain, and heart, as well as the genitourinary organs should be in a healthy state. As described by early Persian practitioners, the diseases of the genitourinary tract, vital organs, pelvis, and some neighboring organs, besides changing the penile texture, tend to contribute to ED[13–14] (Table 1).

In TPM, the diagnosis and treatment includes the evaluation of the quality of semen (color, consistency, and turbidity), sexual habits, and frequency and quality of urine.[9] The heart is considered the main support system for all the processes involved in sexual intercourse including desire, erection, ejaculation, and orgasm. Patients with cardiac disorders might experience difficulty in normal erection and orgasm.[13] The recording of the patient's complete history and physical examination for ED in a traditional diagnosis consists of checking the duration of erection, penile hardness, the color of the prepuce (red, pink, dark, or red), the coldness or warmness of the penis, the time needed to achieve a complete erection, and the location and time of intercourse.[13] The amount of semen (low, average, or high), density (thin, average, or thick), color (white, milky, or yellowish white), odor (palm bloom), warmness (produce orgasm in the partner), turbidity (the normal semen should not be contaminated with blood or pus) were other parameters for the evaluation.[13,14]

The Persian scholars also remarked on the contribution of the kidneys' health in normal ejaculation.[14]

The treatment strategies in TPM involved lifestyle modifications and prescription of natural medication. By researching the pharmaceutical manuscripts of TPM, 77 different medicinal plants have been identified for treating impotence and ED. Most of the cited plants were related to Brassicaceae, followed by Apiaceae and Asteraceae. Most of the reported plants were being used via the oral route. However, topical and, interestingly, nasal applications were also reported (Table 2).

There are many mechanisms underlying the sexual stimulant properties of the reported natural medicaments. The vasoactive and vasculogenic properties, antioxidant and radical-scavenging activities, as well as lipid peroxidation and increase in nitric oxide (NO) production are the crucial mechanisms that have impacts on impotence and ED.[31–33]

Many of the reported medicinal plants can act as antioxidants

Table 3
Medicinal plants with aphrodisiac activity.

Medicinal Plant	Study	Part and Extract	Outcomes	Ref.
Allium cepa	*In vivo*	Onion fresh juice (3 cc/daily to rats)	- Increased serum total testosterone level - Increased total antioxidant capacity	74
Anacyclus pyrethrum	*In vivo*	Aqueous extract of roots (oral; 50 and 100 mg/kg in rats) petroleum ether extract (oral; 50 and 100 mg/kg)	- Pronounced anabolic and spermatogenic effect - Increased sperm count and fructose levels - Increased penile erection index as well as reduction in mount and intromission latency	70 71
Myristica fragrans	*In vivo*	50% ethanol extract of buds (oral; 500 mg/kg to mice and rats)	- Increased mounting behavior and mating performance	66,68
Phoenix dactylifera	*In vivo*	Aqueous Extract of pollens (injection; 35, 70, 105, 144 and 350 mg/kg to rats)	- increased mount, ejaculation, intromission frequencies and ejaculation latency	67
Syzygium aromaticum	*In vivo*	50% ethanol extract of buds (oral; 100, 250, and 500 mg/kg to rats) Hexane extract of buds (oral; 15 mg/kg to mice) 50% ethanol extract of buds (oral; 500 mg/kg to mice)	- Increased libido and erection, mounting frequency, intromission frequency and latency. - Increased Delta (5) 3-beta and 17-beta-hydroxysteroid dehydrogenase and testosterone - Increased mounting behavior and mating performance	72 73 66
Tribulus terrestris	*In vivo*	Fruits extract (oral; 5 mg/kg) Fruits extract (oral; 2.5, 5 and 10 mg/kg to rabbits) Fruits lyophilized aqueous extract (oral; 50 and 100 mg/kg)	- increased prostate weight and intra-cavernous pressure - Increased mount and intromission frequencies - Pro-erectile effects on corpus cavernosum - Increased mount and intromission frequency, penile erection index - Decreased mount, intromission, and ejaculatory latency - serum testosterone levels (chronic use)	76 77 78
Zingiber officinale	*In vivo*	Aqueous extract (oral; 600 mg/kg to rats)	- Increased testis relative weight - Increased serum testosterone and testicular cholesterol level	69
Ferula assa-foetida	Human study	Ethanol extract from seeds in combination with root 50% water-ethanol extracts	- Quantitative improvements of sperm counts after two months -improvements in both their libido and erectile function	75

and radical-scavenging agents. There are numerous reports on the antioxidant effects of the cited medicinal plants that may also be considered for further aphrodisiac activity studies. These plants include the following: *Calendula officinalis*, *Phyllanthus emblica*, *Urtica dioica*, *Matricaria chamomilla*, *Allium cepa*, *Portulaca oleracea*, *Semecarpus anacardium*, *Phoenix dactylifera*, *Allium sativum*, *Smilax china*, *Juglans regia*, *Pistacia terebinthus*, *Cyperus esculentus*, *Lepidium sativum*, *Achillea millefolium*, *Tribulus terrestris*, *Brassica nigra*, *Cinnamomum verum*, *Crocus sativus*, *Zingiber officinale*, *Nigella sativa*, *Zataria multiflora*, *Abrus precatorius*, *Syzygium aromaticum*, *Boswellia sacra*, *Phaseolus vulgaris*, *Commiphora mukul*, *Cocos nucifera*, *Trachyspermum ammi*, and *Acorus calamus*. The effects of these medicinal plants on lipid peroxidation have been proven by experimental studies.[34–65]

The sexual behavior-enhancing effects and the androgenic, spermatogenic, and aphrodisiac activities of *Allium cepa*, *Ferula assa-foetida*, *Myristica fragrans*, *Phoenix dactylifera*, *Tribulus terrestris*, *Zingiber officinale*, *Anacyclus pyrethrum*, *Elaeagnus angustifolia*, and *Syzygium aromaticum* have been evaluated and proved in recent studies.[34,66–79] However, many of these citations have so far remained uninvestigated (Table 3).

The PDE 5 inhibitors are considered as the first-line treatments for ED in the conventional approach.[80] The PDE 5 enzyme, besides other related key enzymes, plays a crucial role in the degree of relaxant responses of the lower urinary tract tissue.[81] The PDE 5 inhibitors like sildenafil, tadalafil, and udenafil alleviate the symptoms of ED by decreasing bladder tone and relaxing the effects on the detrusor muscle.[81] *Tribulus terrestris,* a remedy in TPM, alleviates the symptoms of ED with a mechanism similar to that of conventional medicine. Research has shown that *T. terrestris* extract can relax the corpus cavernosum endothelium of rabbits in an organ bath and increase the intracavernous pressure following one month of administration. This event is related to the nitric oxide/nitric oxide synthase pathway.[82]

4. Conclusion

The outcomes of this study revealed many medicinal herbs, which have been traditionally applied for the management of impotency. With reference to the findings from the traditional and medieval literatures as well as the documents from contemporary medicine, there could be numerous possibilities to concoct new natural medicaments with aphrodisiac effects supported by the early medieval literature.

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