Review Article

An Overview: Some Medicinal Plants as Aphrodisiac Agents

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ABSTRACT

Aphrodisiacs are foods or beverages that increase sexual arousal in those who consume them. Substances that improve libido (i.e., sexual desire, arousal), substances that promote sexual potency (i.e., erection effectiveness), and substances that increase sexual pleasure are the three types of aphrodisiacs. Quality of life is influenced by sexual health and function. Various natural aphrodisiac plants potentials are favoured to overcome the problem of male sexual (or) erectile dysfunction. This overview discusses the aphrodisiac potential of plants, including their botanical names, families, parts used, and isolated substances, as well as the mechanisms of aphrodisiac activity and references was tabulated to aid researchers in the production of new herbal products.

Keywords: Aphrodisiac, Sexual dysfunction, Medicinal plants, penile erection.

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INTRODUCTION

Sexual activity is widely acknowledged as an essential component of a balanced and healthy lifestyle and well-being in humans, improved sexual conduct may lead to improved relationships, contentment and self - esteem [1]. Apart from that, they've signified a man's desire, as sexual potency has long been regarded as an important part of the male ego in all cultures, worry and humiliation are commonly linked to deteriorating sexual aptitude. sexual dysfunction, in particular erectile dysfunction is a serious medical condition.

Erectile dysfunction is characterised as the inability to obtain and retain sufficient erection for naturally satisfying intercourse on a regular basis[2]. Psychological, neurological, hormonal, and vascular pathologies, as well as some diseases, disorders, and their treatment through medication induction, are all causes of this form of impotency[3]. The growth in human life expectancy has increased the need for drugs that can provide this quality of longevity. Sexual Dysfunction can be treated in a variety of ways. Products that improve sexual performance, alleviate impotence, or treat Erectile Dysfunction are among them. The Ayurvedic school of medicine treats sexual inefficiencies and deficits with a particular therapy called Rasayana therapy. In debility, especially as people get older, a class of Rasayana medications known as 'Vrishya' or 'Vajikaran Rasayana' has been recommended4. Aphrodisiacs for ED, infertility causts, spermatogenesis, semenogenesis, and reproduction procedures for rectifying faulty semen are a sexual satisfaction are all included in Vajikarna therapy[2].

PATHOPHYSIOLOGY

Sexual stimuli like auditory, olfactory, visual, tactile pathways, dreams and emotions like psychogenic stimuli influences penile erection [4]. Penile innervations are autonomic and somatic. In autonomic nervous system, penile innervation is mediated by cavernous nerves that originate from pelvic plexus [5]. Cavernous nerves are unique because they neither release acetylcholine not the nor epinephrine. Non-adrenergic non-cholinergic fibers (NANC) have Nitric oxide as neurotransmitter [3]. Triggering of cavernous nerves causes penile erection while adrenergic and somatic nerves are responsible for ejaculation.

For normal rigid erection: a) Sympathetic nerves inhibit nor epinephrine release, b) Parasympathetic nerves release nitric oxide and acetylcholine, c) Somatic nerves release acetylcholine. Central and peripheral mechanism of action of erectile function: cyclic guanosine monophosphate, cyclic adenosine monophosphate, protein kinases and potassium channels.

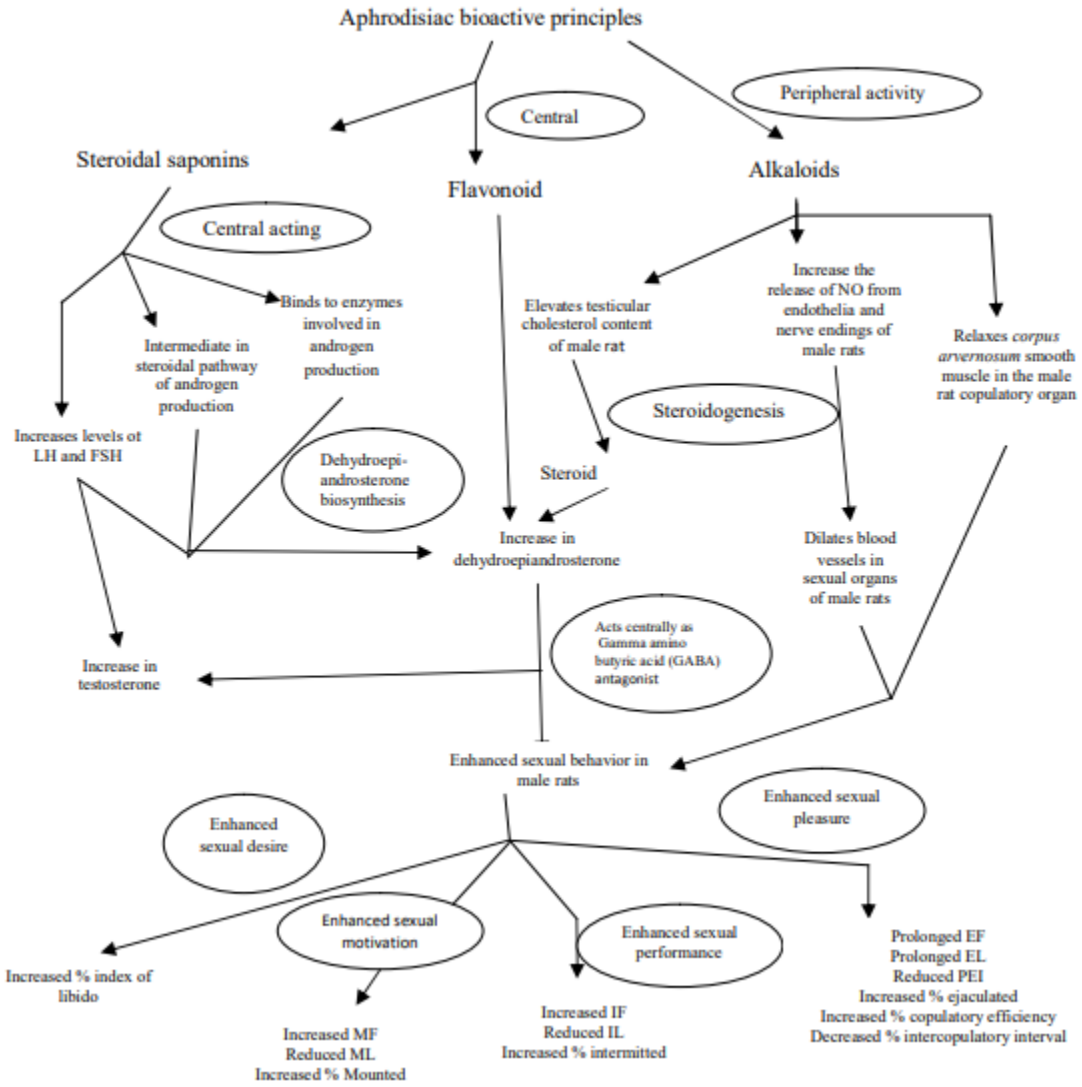

Figure 1: Possible mode of action of aphrodisiac bioactive principles in male rats.

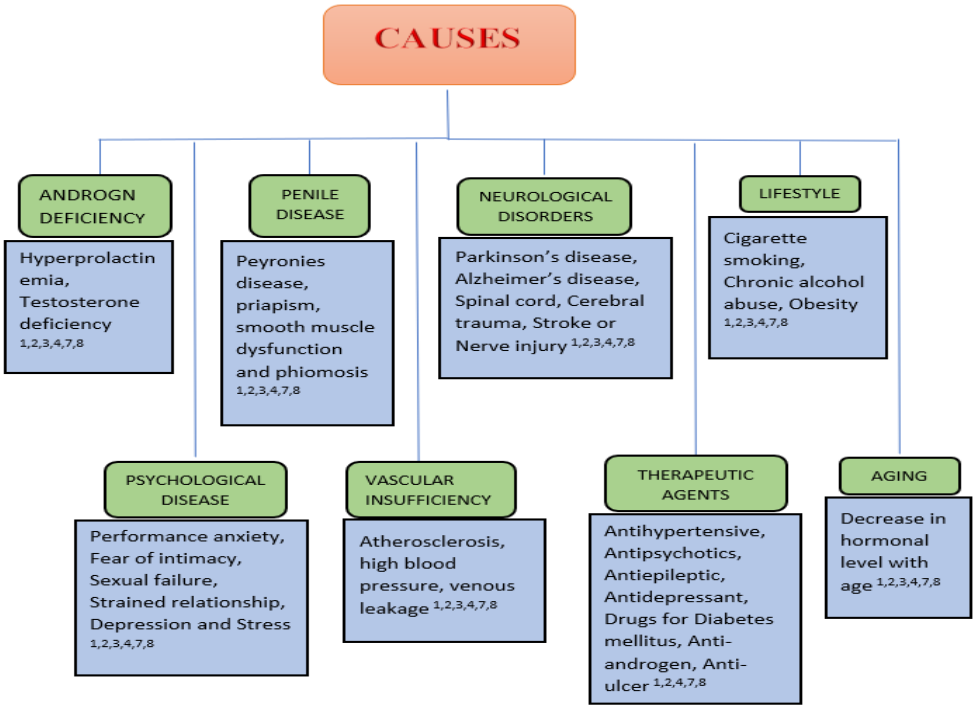

Figure 2: Causes of sexual dysfunction

a) Cyclic guanosine monophosphate (cGMP):

The nitric oxide synthase enzyme is triggered in response to sexual stimulation allowing nitric oxide to be released from parasympathetic nerve endings.in the smooth muscle cells of the corpora cavernosum of penis, Nitric oxide activates soluble guanylate cyclase [6]. In the vascular and neurological tissue, guanylate cyclase is an isoenzyme which produces cyclic guanylyl monophosphate as the second messenger.

cGMP stimulates cGMP- dependent protein kinase (cGKI) and to lesser extent, protein kinase A. Protein kinase A and activated cGKI phosphorylate phospholamban which inhibit calcium pump as result level of free cytoplasmic calcium is reduced, resulting in relaxation of smooth muscle cells around penis, increased flux of blood into penile tissue, results in penile errection. This cGMP is degraded by Phosphodiesterase enzyme (PDE) [2].

b) Cyclic Adenosine monophosphate (cAMP):

Cyclic Adenosine monophosphate has role in corporal smooth muscle relaxation in body. The activated membrane bound Adenyl cyclase, generates cAMP, activates calcium pump, consequently level of free cytoplasmic calcium is reduced resulting in relaxation of smooth muscle[1].

c) Protein kinase:

Protein kinase stimulates cell membrane calcium pump, resulting in fall Protein kinase in sarcoplasmic calcium concentration, which causes loss of penile smooth muscle contractile tone and increase in blood flow in cavernous body, causes erection [1].

d) Potassium channels:

Opening of potassium channels through cyclic nucleotides induces relaxation of smooth muscle cells. Opening of potassium channels leads to efflux of K+ from smooth muscle cell, results in hyperpolarization and inhibitory effect on trans membrane Ca+2 flux and finally relaxation of smooth muscle [1,7].

Table 1: List of plants having aphrodisiac potential activity

Sr. No.	Plant Name and Family	Part Used	Chemical constituents	Uses /Activity	Probable mechanism of action	Reference
1	Allium sativum Amaryllidaceae	Bulb	Sulfur compounds, peptides, steroids, terpenoids, flavonoids, and phenols are the main phytochemicals isolated form bulb of this plant.	Antioxidant, anti-bacterial, antifungal, antidiabetic.	Increase in sexual behavior.	9,10.
2	Allium tuberosum Alliaceae	seed	Steroidal saponins, alkaloids, amides and sulphur containing compounds have been reported from the seeds of this plant.	Antibacterial, anti-emetic.	Improvement in sexual performance in sexually active and inactive rats.	11,12
3	Anacardium occidental	Seed oil	Saponins, alkaloids, flavonoids, steroids, phenols, glycosides, volatile oils and terpenoids have been reported from seed oil	Antioxidant, anti-bacterial, anticancer, anti-inflammatory.	Increase in MF and IF, and decrease in ML. The oil showed no toxicity at given doses	13,14
4	Algeria nervosa Convolvulaceae	root, flower and leaf	Alkaloids, glycosides, flavonoid glycosides and steroids are reported from flowers of this plant	Aphrodisiac, nerve tonic	Stimulation in mounting behaviour in concentration dependent manner	15,16
5	Asparagus racemases Asparagaceae	Roots	Saponins, carbohydrates, glycosides and mucilage's have been reported from root	Antidiabetic immunomodulatory activities, antidiarrheal, antiulcer	Increase in number of mounts and mating performance Showed increase in weight of reproductive organs, PE and MF indicating improvement in sexual behaviour	17,18,19
6	Butea frondose Fabaceae	Bark	hydrocarbons (eicosane), triterpenes (ß-amyrin), sterols (camp sterol and sitosterol), flavonoids (vicenin II, vitexin chrysoberyl 7-O-ß-Dglucuronic acid 6, 8-di-crhamnosyl apigenin and luteolin,) and lauric, myristic, palmitic. linoleic and linolenic acids	Diuretic, anthelmintic rubefacient, aphrodisiac	Improvement in sexual performance in sexually active and inactive male rats.	20,21
7	Blepharis edulis	Root	Hydroxamate and benoxazolone, 4'-Odiglycoside of decarboxyrosmarinic form root	Anti-diabetic, anti-hyperlipidemic	Significant and sustained increase in level of testosterone.	22,23,24
8	Bryonia laciniosa	seeds	-	Constipation, anti-diabetes,	Significant improvement in MF, IF, ML, IL, increase in reproductive organ weight	25,26

				antioxidant, antitumor,	(testis, prostate, seminal vesicle, and epididymis), epididymal sperm density, sperm count, significant increase in serum testosterone and LH levels	
9	Chenopodium album Amaranthaceae	seeds	Phenolic glycoside, chenoalbuside have been reported from the root alcoholic extract of this plant	Antibacterial activity, spasmolytic, antimicrobial, anthelmintic activity, sperm immobilizing agent	Showed significant increase in the MF, IF, IL and PE, enhanced aggregate penile reflexes and caused significant reduction in ML and PE	27,28,29
10	Chlorophytum borivilianum Liliaceae	Root	Fatty acids, sterol stigmasterol and saponin	Aphrodisiac activity, antistress, anti-oxidant, anti-microbial	Significant reduction in MI, EL, IL, hesitation time, Testosterone like effects	30,31,32
11	Crocus sativus Iridaceae	stigma	crocin, crocetin, safranal and picrocrocin	Antimicrobial, anti-oxidant, antidepressant.	Increase in MF, IF, EF and reduction in MI, IL and EI	33,34,35,36, 37
12	Curculigo orchioids Amaryllidaceae	rhizome	triterpenoides (curculigol) [60,64], glycosides (curculignin A, B, C) [61], curculigosaponin (curculigenin A, B, C, corchicoside A, curculigoside B) [62,63] and alkaloids (yuccagenin, lycorin).	Aphrodisiac activity, anti-convulsant, androgenic activity	Showed increase in sexual behavior, sperm count, penile erection index and seminal fructose content, decrease in EF, EL, hesitation time and increase in testosterone	38,39,40,41, 42, 43,44,45,46.
13	Catha edulis celastraceae	leaf		Antibacterial, anti-oxidant	Increase in plasma testosterone levels by more than 2 folds	47,48
14	Casimiroa edulis Rutaceae	Seeds and leaves	Imidazolic derivatives (dimethylhistamine, methylhistamine) and flavonoid glycoside (casimiroedine, rutin) are reported	Anti-tumor, activity, anti-inflammatory, antioxidant.	Significantly increase in MF, IF EL. Whereas decrease in MI, IL and PEI	49,50
15	Caesalpinia benthamiana fabaceae	root	Phenolic compounds (gallic acid, resveratrol, tannins) and cassane diterpenoids, (benthaminin 1 and 2)	Vasoactivity, antioxidant, aphrodisiac property.	Showed Enhancement in the sexual activity	51,52,53
16	Dactylorhiza hatagirea Orchidaceae	root	Dactylorhins A, B, C, D, E and dactyloses (A and B) are reported	Anti-septic, antioxidant, anticancer, antimicrobial	Highly significant increase in seminal fructose levels and sperm count	54,55
17	Ferula harmonis Apiaceae	seeds	Sesquiterpene coumarins and sesquiterpene (ferutinine, feroline and tenuferidine)	Anti-osteoporosis, anti-inflammatory, anti-microbial, anti-fungal	Reported to have aphrodisiac activity and enhanced sexual behavior	56,57
18	Fadogia agrestis (Rubiaceae)	Stem	Alkaloids, saponins, anthrquinones and flavonoids	Anti-bacterial, ameliorative activity agent, anti-plasmodial	Increases blood testosterone level	58
19	Lyceum barbarum Solanaceae	Fruit	scopoletin, beta-sitosterol, pcoumaric acid, glucose, daucosterol and betaine	Anti-oxidant, abdominal pain, infertility, headache	Significantly increased testes and epididymis weight, superoxide dismutase activity and sexual hormone levels in the damaged rat testes	59,60
20	Montanoa tementosa Asteraceae	whole plant	Sesquiterpene lactones tomexanthin and oxepane diterpene	Antifertility activity in women	provement in sexual behavior, increase in mounting behavior	61,62,63
21	Mucuna puriens Fabaceae	seeds	alkaloids, glycosides, terpenoids, saponins, tannins	Aphrodisiac, nerve tonic, anti-parkinson.	Showed significant increase in MF, IF and EL and decreased the ML, IL, PEI and inter intromission interval	64,65,66
22	Panax ginseng Araliaceae	Root	Ginsenosides, saponins	Anti-diabetic,anti-tumor,anti-oxidation	It enhanced nitric oxide synthesis [110] resulting in relaxation of corpus carenosum in penis and	67,68,69

					increase in penile rigidity and grith	
23	Pedalium murex Pedaliaceae	whole plant	Flavonoids pedalitin, diosmetin, dinatin [114] from leaves and flowers and heptatriacontan-4-one, tetratriacontanyl octacosanoa [115] have been isolated from fruits.	Anti-microbial, insecticidal activity, antioxidant.	Showed increase in mating and mounting behavior, body weight, sperm motility, testosterone and germinal cells	70,71,72
24	Peganum harmala Nitrariaceae	seeds	Flavonoids, acacetin 7-O-rhamnoside, 7-O- [6-O-glucosyl-2-O-(3- acetylrhamnosyl) glucoside, 7- O-(2-O-rhamnosyl-2-O-glucosylglucoside), glycoflavone 2-O-rhamnosyl-2”-O-glucosylcytisoside[117] and carboline alkaloid, l-thioformyl-8-β-D-glucopyranoside-bis-2, 3-dihydro-isopyridinopyrrol	Abortifacient, analgesic, anthelmintic	Significant improvement in weight of gonads, accessory sex organs and semen quality without affecting the metabolic functions	73,74,75.
25	Passiflora incarnate	leaves	Passicol, flavonoid, compounds C-glycosidic flavonoids (schaftoside, isoschaftoside, isovetexin-2''- O-glucopyranoside and isoorientin-2''-O-glucopyranoside)	Anxity, antioxidant, anti-inflammatory.	Exhibit significant aphrodisiac activity	76,77,78.
26	Ruta chalepensis	leaves, aerial parts	Alkaloids, flavonoids, coumarins, tannins, volatile oil, sterols and triterpenes	Abortifacient, anthelmintic.	Increasing sexual activity	79,80,81.
27	Spilanthes acmella	flower	N-alkylamides, N-isobutylamides 1, 2- methylbutylamide and 1, 2-phenylethylamide	Anti-inflammatory, aphrodisiac effect.	positive effect on general mating pattern, penile erection and serum sex hormone levels.	82.
28	Syzygium aromaticum	flower buds	p-cymene, 5-hexene-2-one, thymol, eugenol, eugenyl acetate, caryophyllene oxide, guaiol 8, benzene-1- butylheptyl, nootkatin, isolongifolanone (trans, hexadecanoic acid 9,17-octadeca-dienal, vitamin E acetate	Antimicrobial, antioxidant, anticancer.	increased the activities of delta 53 beta-HSD and 17 beta-HSD enzymes and enhanced serum testosterone level	83,84
29	Turnera aphrodisiaca	seeds	Cyanoglycoside [132], flavonoid [133] and phenolic glycosides	Aphrodisiac, abortive, expectorant.	Increasing mounting behaviour	85,86,87,88, 89.
30	Tinospora cordifolia	Stem	alkaloids, carbohydrates, glycosides, steroids, proteins, saponins, gums and mucilages, diterpenoid lactones, glycosides, steroids, sesquiterpenoid, phenolics, aliphatic compounds and polysaccharides	Anti-diabetics, antioxidant, anti-inflammatory.	significant increase in number of mounts and mating performance	90,91,92,93.
31	Turnera diffusa	leaves.	Flavonoids, terpenoids, saccharides, phenolics, and cyanogenic derivatives, luteolin 8-C-E-propenoic acid	Antioxidant, aphrodisiac.	Significant increase in percentage of male achieving one ejaculatory series and resuming a second one, in sexually exhausted male rats.	94,95,96.
32	Tricholepis glaberrima	aerial parts	-	Antioxidant, aphrodisiac, antibacterial.	Showed increase in ML, IL and significant decrease in PEI. The extract enhanced spermatogenesis.	97
33	Trichopus zeylanicus	leaves	Flavonoid glycosides, glycolipids, non-steroidal compounds, polyphenols and sulfhydryl	Anti-fungal, anti-oxidant, aphrodisiac	Showed increase in number of mounts and mating performance	98,99
34	Vanda tessellates orchidaceae	flowers	Terpenoid (ocimene, linalool oxide, linalool, and nerolidol), benzenoid, phenylpropanoid, methylbenzoate, benzyl acetate, phenylethanol, and phenylethyl acetate	Anti-inflammatory, aphrodisiac	Increase mating performance, and showed increase in male-female ratio of resulting offspring	100

35	Withania somnifera solanaceae	Root	Seven new withanolide glycosides called withanosides I, II, III, IV, V, VI, and VII were isolated from an Indian natural medicine, Ashwagandha, the roots of Indian Withania somnifera, together with four known compounds, withaferin A, 5α,20αF(R)-dihydroxy-6α,7αepoxy-1-oxowitha-2,24-dienolide, physagulin D, and coagulin Q	Antioxidant, anti-stress, anti-tumor.	Resulted in a decrease in stress, improved the level of anti-oxidants and improved overall semen quality.	101,102

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