An Overview: Some Medicinal Plants as Aphrodisiac Agents

Vidhya A. Mali*, Misbah A. Chanda2, Dr. Padma L. Ladda3, Dr. Nilofar S. Naikwade4, Dr. Sanaulla A. Tamboli 5

*1, 2 M. Pharm Student, Appasaheb Birnale College of Pharmacy, Sangli, India
3 Associate Professor, Department of Pharmacology, Appasaheb Birnale College of Pharmacy, Sangli, India.
4 Professor & HOD Department of Pharmacology, Appasaheb Birnale College of Pharmacy, Sangli, India.
5 Principal, Appasaheb Birnale College of Pharmacy, Sangli, India.
*Corresponding author’s E-mail: vidyamali441@gmail.com

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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.

INTRODUCTION

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exual 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-esteem1. 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 basis2. 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 impotency2. 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 therapy5.

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 plexus5. 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 cavernosa of penis. Nitric oxide activates soluble guanylate cyclase in the vascular and neurological tissue, guanylate cyclase is an isoenzyme which produces cyclic guanylyl monophosphate as the second messenger.

Cyclic guanosine monophosphate (cGMP) stimulates cGMP-dependent protein kinase (cGKI) and to lesser extent, protein kinase A. Protein kinase A and activated cGKI phosphorylate phospholamban which inhibits 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 erection. This cGMP is degraded by Phosphodiesterase enzyme (PDE).

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.

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.

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 Ca2+ flux and finally relaxation of smooth muscle.

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 from bulb of this plant. | Antioxidant, anti-bacterial, anti-fungal, anti-diabetic. | 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 occidentale | 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, anti-diarrheal, 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 (8-amyrin), sterols (camp sterol and sitosterol), flavonoids (vicenin II, vitexin chrysosbery 7-O-8-D-glucuronic acid 6, 8-di-crammosyl 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 decarboxyrosmaniric 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, IL, increase in reproductive organ weight | 25,26     |
| No. | Plant Name                          | Part       | Secondary Metabolites                                                                 | Medicinal Activity                                                                 | Significant Increase in:                  |
|-----|------------------------------------|------------|--------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|------------------------------------------|
| 9   | Chenopodium album Amananthaceae     | seeds      | Phenolic glycoside, chenoalbuside have been reported from the root alcoholic extract of this plant | Antibacterial activity, spasmolytic, antimicrobial, anthelminthic activity, sperm immobilizing agent | MF, IF EL, LH                              |
|     |                                    |            |                                                                                     |                                                                                      |                                         |
| 10  | Chlorophyllum borivilianum Lilaceae  | Root       | Fatty acids, sterol stigmastanol and saponin                                         | Aphrodisiac activity, antistress, anti-oxidant, antimicrobial                         | MI, EL, IL, Testosterone                 |
| 11  | Crocus sativus Iridaceae            | stigma     | crocin, crocetin, safranal and picrocrocin                                            | Antimicrobial, anti-oxidant, antidepressant                                            | MF, IF, EF, MI, IL, EI                   |
| 12  | Curculigo orchoids Amaryllidaceae    | rhizome    | triterpenoids (curculicol) [60,64], glycosides (curculin 0.1 A, B, C) [61], curculigosaponin (curculigenin A, B, C) [62] and alkaloids (yuccagenin, lycorin) | Aphrodisiac activity, anti-convulsant, androgenic activity                             | MI, EL, Testosterone                     |
| 13  | Catha edulis celsebrae              | leaf       |                                                                                     | Antimicrobial, anti-oxidant                                                           | Increase in plasma testosterone levels by more than 2 folds                           |
| 14  | Casimiroa edulis Rutaceae           | seeds and leaves | Imidazolonic derivatives (dimethylhistamine, methylhistamine) and flavonoid glycoside (camisimoidine, rutin) are reported | Anti-tumor, activity, anti-inflammatory, antioxidant                                    | Increase in MF, IF, PEI                  |
| 15  | Caesalpinia benthamiana fabaceae     | root       | Phenolic compounds (gallic acid, resveratrol, tannin) and cassane diterpenoids, (benthaminin 1 and 2) | Vasoactivity, antioxidant, aphrodisiac property.                                       | Significantly increase in MF, IF, PEI                                              |
| 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               |
| 17  | Ferula harmonis Apliaceae            | seeds      | Sesquiterpenes coumarins and sesquiterpenes (ferutinone, feroline and tenuferidine)  | Anti-osteoporosis, anti-inflammatory, anti-microbial, anti-fungal                      |                                         |
| 18  | Fadogia agrestis (Rubiaceae)         | stem       | Alkaloids, saponins, anthrquinones and flavonoids                                     | Anti-bacterial, ameliorative activity agent, anti-plasmodial                           | Increases blood testosterone level       |
| 19  | Lyceum barbarum Solanaceae          | fruit      | scopoletin, beta-sitosterol, plicumaric acid, glucose, daucosterol and betaine        | Anti-oxidant, abdominal pain, infertility, headache                                    | Significantly increased tests and epididymis weight, superoxide dismutase activity and sexual hormone levels in the damaged rat testes |
| 20  | Montanoa tementosa Asteraceae        | whole plant | Sesquiterpenes lactones tokomexanthin and oxeapone diterpene                         | Antifertility activity in women                                                        | increase in sexual behavior, increase in mounting behavior                           |
| 21  | Mucuna puriens Fabaceae             | seeds      | alkaloids, glycosides, terpenoids, saponins, tannins                                 | Aphrodisiac, nerve tonic, anti-parkinson                                                | Showed significant increase in MF, IF and PE and decreased the MI, PEI and inter intromission interval |
| 22  | Panax ginseng Araliaceae            | root       | Ginsenosides, saponins                                                              | Anti-diabetic, anti-tumor, anti-oxidation                                              | Enhanced nitric oxide synthesis [110] resulting in relaxation of corpus cavernosum in penis and |

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| No. | Species                                      | Part(s)       | Chemical Constituents                                                                 | Biological Activity                                                                 |
|-----|----------------------------------------------|---------------|-------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 23  | Pedalium murex                               | whole plant   | Flavonoids (pedalidin, diosmetin, dinatin) from leaves and flowers, and \(\text{hepatic}^{\text{4}}\)-one, tetrahydropaphanol, octacosane. | Anti-microbial, insecticidal activity, antioxidant. Increased penile rigidity and grth. |
| 24  | Ruta chalepensis                             | leaves, aerial parts | Alkaloids, flavonoids, coumarins, tannins, volatile oil, sterols and triterpenes | Abortifacient, analgesic, antihelmintic. Significant improvement in weight of gonads, accessory sex organs and semen quality without affecting the metabolic functions. |
| 25  | Passiflora incarnate                         | leaves        | N-allylamides, N-isobutylamides 1, 2-methylbutylamid and 1, 2-phenylethylamide      | Anti-inflammatory, aphrodisiac effect. Positive effect on general mating pattern, penile erection and serum sex hormone levels. |
| 26  | Spilanthes acmella                           | flower        | Flavonoids (acacetin 7-O-rhamnose, 7-O-β-D-glucosyl-2-O-(3-acetylarabinoisosyl)     | Anti-inflammatory, aphrodisiac activity. Exhibit significant aphrodisiac activity. |
| 27  | Turnera aphrodisiaca                         | seeds         | Cyanoglucoside (132), flavonoid [133] and phenolic glycosides                      | Aphrodisiac, abortive, expectorant. Increasing mounting behaviour. |
| 28  | Tinospora cordifolia                         | Stem          | Alkaloids, carbohydrates, glycosides, sterols, proteins, saponins, gums and mucilages, diterpenoid lactones, glycosides, steroids, sesquiterpenoids, phenolics, aliphatic compounds and polysaccharides | Anti-diabetics, antioxidant, anti-inflammatory. Significant increase in number of mounts and mating performance. |
| 29  | Trichophyton zeylanicus                      | leaves        | Flavonoids, terpenoids, saccharides, phenolics, and cyanogenic derivatives, luteolin B-C-E-propenoic acid | Anti-microbial, antioxidant, anti-inflammatory. Significant increase in percentage of male achieving one ejaculatory series and resuming a second one, in sexually exhausted male rats. |
| 30  | Tricholepis glaberrima                       | aerial parts  | -                                                                                   | Anti-microbial, antioxidant, antifungal, aphrodisiac. Significant increase in number of mounts and mating performance. |
| 31  | Vanda tessellata orchidaceae                 | flowers       | Terpenoid (ocimene, linalool oxde, linalool, and neralol), 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. |
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,20α(R)-diol-hydroxy-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 antioxidants and improved overall semen quality. 101,102

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