

REVIEW

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The action of herbal medicine on the libido: aspects of nutritional intervention in increasing sexual desire

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Abstract

Introduction: The libido is considered to be a sexual drive in individuals that can be determined and influenced by several factors, such as social, psychological, and hormonal factors. It is known that nutritional aspects are important hormone regulators and that sexual dysfunction may, in many cases, be reversed with simple lifestyle changes.

Aims: The aim of the study is to describe the actions of herbal medicine on the libido with an appropriate level of scientific evidence.

Methodology: A systematic review of the PUBMED, Scielo, and EMBASE databases was conducted, using the keywords “libido, food, and nutrient.”

Results: This study identified 2798 articles, 34 of which were selected, as they discussed exclusive studies involving herbal medicine. Some herbal medicines stood out, including *Tribulus terrestris*, used to increase testosterone serum levels; *Eurycoma longifolia*, which, in addition to the increased testosterone serum levels, also leads to an increased biosynthesis of several androgens; *ginseng*, which increases energy levels and stimulates smooth muscle relaxation with nitrous oxide; *Maca (Lepidium meyenii)*, which improves sexual performance, in addition to having androgenic effects; and *Mondia whitei* (ginger), which improves the libido and erection. In addition to these, one study has demonstrated the effective impact of a hypocaloric, hyperproteic, and hypolipidemic diet on the libido, both improving sexual and erectile functions and increasing testosterone levels.

Conclusion: Herbal medicine analyzed in this study demonstrate positive effects on the libido, thus proving that, along with nutritional intervention, it is also a promising field in nutrition actions that provide support to combat sexual dysfunctions.

Keywords: Libido, Herbal medicine, Nutrient, Food, Hormones

Background

Sexuality is an essential human experience involving pleasure; sexual identity; affection; sociocultural, emotional, and cognitive factors; intimacy; and physical experiences. Sexual sensations may be aroused by several types of stimuli: fantasies, erotic thoughts, fondling,

masturbation, and coitus. Sexual response is expressed by a succession of phases that manifest themselves physiologically in a sequential manner, with interconnected stages that complete the cycle of human sexual response [1]. The word libido is usually used to refer to sexuality. Libido is a Latin term, considered the word to be equivalent to designating one's sexual drive. Psychoanalysts brought this scientific meaning closer to our daily experience, defining libido not only as a sexual desire but also as something concrete in the human experience: sex [2].

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As the knowledge about human sexuality advances, differences between specifically masculine and feminine characteristics of response to sexual stimuli become better identified [3]. These differences are associated with biopsychosocial factors, particularly, sexual hormones (estrogens vs. androgens), sexual education (repressing vs. permissive), and environment (controlling vs. stimulating). In this context, for sexual desire to settle in a positive manner within the individual, his/her health should be in good condition. Sexual health is not only limited to the absence of disease or dysfunction but also involves a permanent balance of different sides involved in the sexual act and a wide range of factors, including the physical, mental, and emotional characteristics, as well as social wellbeing in all sexual behaviors. This can also be described as the integration and coordination among mind, emotions, and body, which control the social aspect of life [4].

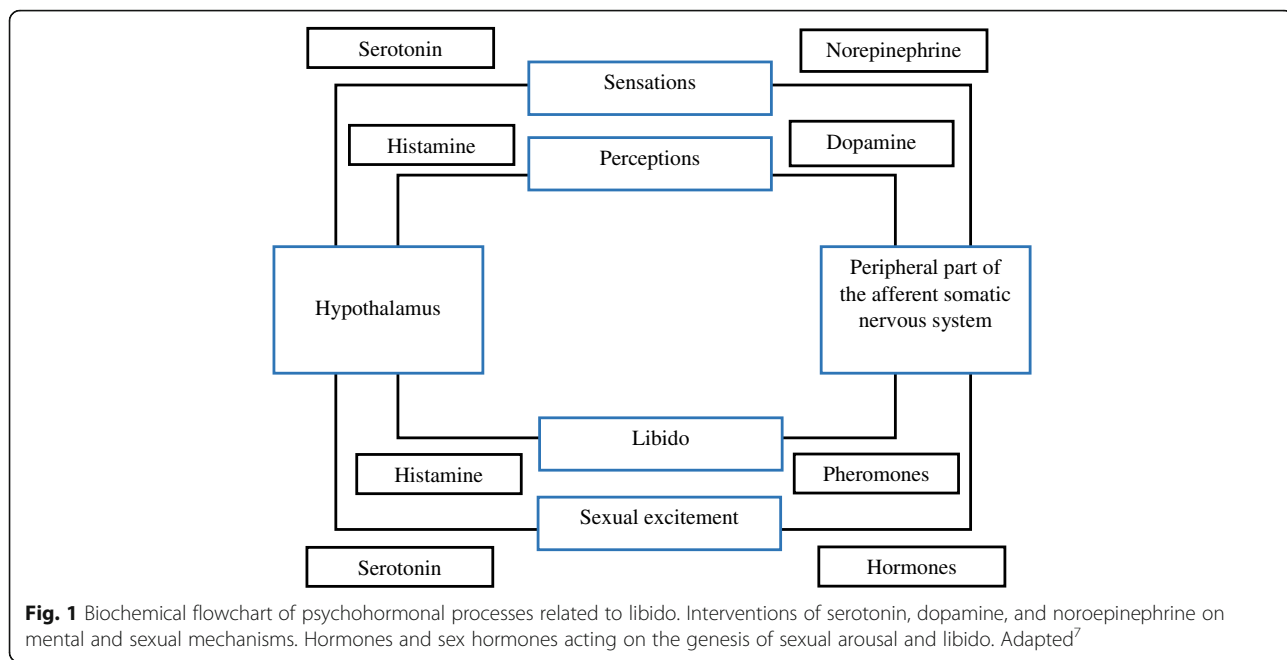
The physiology of human sexual response consists of four phases that take place in both genders and may display some distinct specificities among them. This begins with (1) excitement, which corresponds to vaginal lubrication for women and penile erection for men. This is characterized by two phenomena, vasocongestion (increased blood flow in organs and body areas) and myotonia (local or general muscular contractions); (2) plateau, which corresponds to continuous excitement; (3) orgasm, which corresponds to maximum excitement, with extensive vasocongestion and myotonia, and is perceived by the number of movements in the pelvic muscles, represented in males by ejaculation; and (4) resolution, the phase in which relaxation and the involution of phenomena take place, which is more "evident" in men [5, 6]. Sexual desire would be the first phase of human sexual response, involving physiological modifications that take place after a positive sexual stimulus. This phase is associated with (1) central nervous system (CNS) areas, such as the limbic system, hypothalamus, and neocortex; (2) hormones, such as gonadotrophin releasing hormone (GnRH), follicle-stimulating hormone (FSH), luteinizing hormone (LH), testosterone, and estrogen; (3) neurotransmitters, such as serotonin, dopamine, norepinephrine, and oxytocin; and (4) sexual stimuli [6]. Any disturbance resulting from the imbalance caused by a dissatisfaction can lead to sexual dysfunction [4].

The sexual response cycle may be negatively influenced by different factors. The etiology of sexual dysfunctions is multifactorial and may be related to (1) organic causes diseases such as diabetes, high blood pressure, atherosclerosis, obesity, neurological diseases, menopause, andropause, erectile dysfunction, cancer, endocrine alterations, surgical treatment, and use of drugs, and (2) psychological causes: individual factors (personality, low self-esteem, history, religious beliefs, depression, fatigue, anxiety, stress, fears, frustration); interpersonal factors (poor communication, low

confidence, fear of intimacy with others), and psychosocial factors (performance anxiety, sexual traumas, surreal response expectations, among others) [5].

Sexuality and cognition share characteristics from the peripheral area of the afferent somatic nervous system, in such a way that the understanding of sexual mechanisms also requires a good knowledge of psychological/neuromodulation mechanisms [7]. Therefore, the study of sexual functions requires the knowledge of the co-existing mental activity, as the mental process largely influences sexual response. Studies have demonstrated that, in the relationship between brain control and sexual response, the limbic system plays a key role in initiating and conducting sexual behavior, triggering the cascade of neurovascular elements, including somatic and genital responses and appropriate behavior [8]. The limbic system modulates the perception of desire and excitement, as any physical damage and/or chemical may result in desire, excitement, and behavioral dysfunctions. Therefore, the physiology of sexual excitement involves activity in the autonomic nervous system, which may prevent or facilitate the response of peripheral sexual organs, which will aid in preparing the body for sexual activity [6]. Sexual stimulation is generated differently by men and women. For men, desire is focused mainly in the final goal, that is, sexual intercourse according to the need-reward mechanism [8]. Meanwhile, for women, sexual desire is characterized as being multifactorial and is strongly associated with emotional factors [9]. Cells communicate among themselves through a flow of molecules that consistently influence their behavior and activity. Two distinct classes of communicating molecules are recognized and classified according to their origin and destination: hormones and neurotransmitters. Hormones, many times, originate in endocrine glands, which reach the target cells through the blood stream, whereas neurotransmitters are usually generated locally and are bioactive in the synaptic fissure. Any interference in this communication may result in pathological conditions, given that the disorders may affect the brain field (sexual desire) and the body (excitement and erection) [10]. In the psychological/physiological plan, mental stimuli are present in the form of sensation and perception. Serotonin, dopamine, and norepinephrine are neuromodulators that intervene in mental and sexual mechanisms. Serotonin and norepinephrine intervene in the origin of mental sensations, while dopamine intervenes in the origin of perceptions. Sexual hormones and pheromones, by contrast, intervene in the origin of sexual excitement and the libido, as shown in Fig. 1 [7].

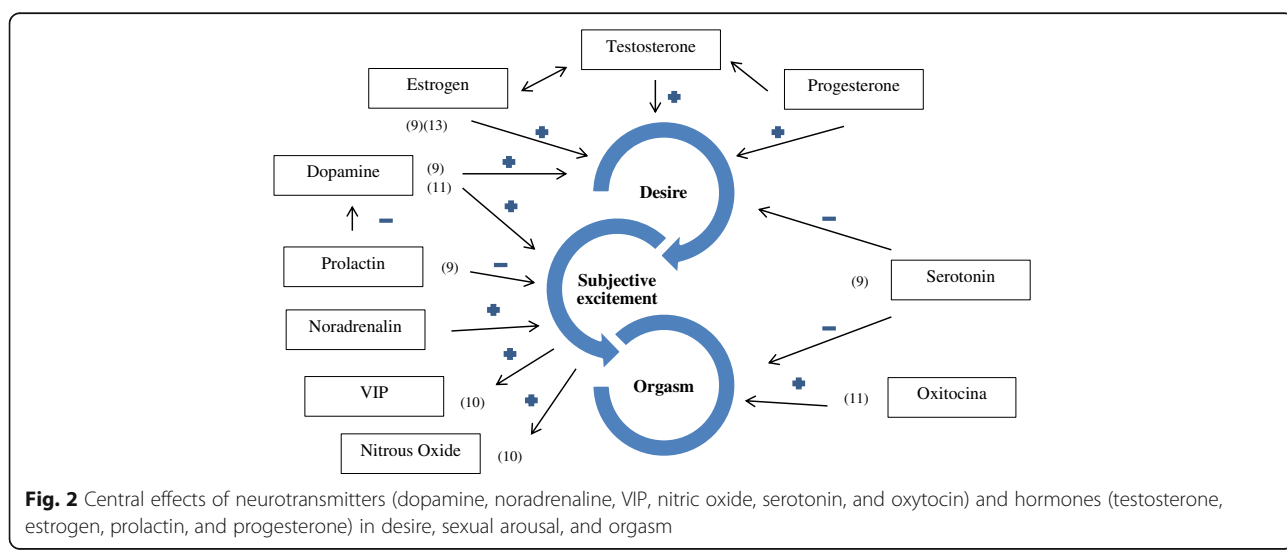
Hormones (androgens in men and estrogen in women) influence sexual behavior and response capabilities, which may act by means of central and peripheral mechanisms [11, 12]. Studies referring to neurotransmitters in the sexual response for both genders have demonstrated that they are released by autonomic nervous terminations,



such as acetylcholine, dopamine, noradrenalin, melano-cortin (VIP), and nitrous oxide (NO) [8, 9]. Serotonin is a neurotransmitter synthesized based on tryptophan and is involved in mood regulation, as well as in the phenomena of anxiety and depression. In the limbic region, serotonin is involved in the control of pleasure and motivation. Increased serotonin in the central nervous system reduces overall sexual activity, as well as sexual desire, inhibiting orgasm [8]. General mechanisms are summarized in Fig. 2. Sexual behavior may be due to androgenic and gonadotropic activities, assigning to the components flavonoids and/or saponin present in plants, as they have been reported as capable of altering androgen levels [12].

Currently, for remission of the symptoms of sexual disorders and consequent decrease of libido, the main choice is medication. Drugs such as Flibanserin—a drug approved by the US Food and Drug Administration in August 2015 for the treatment of hypoactive sexual desire disorder [13], according to studies, is being widely used to ameliorate the symptoms of these disorders [13–16].

However, in spite of the high rate of people who choose to use drugs, in describing the physiological processes of the sexual response cycle, it is known that nutritional aspects are important in this process, as there are hormonal regulators that can, most times, reverse sexual dysfunctions with simple lifestyle changes. Therefore, eating appropriately and including specific nutrients may contribute to



improving one's quality of life, promoting sexual health. Herbal medicines may aid in this process, in turn promoting an increased libido. Thus, considering that nutrition has a significant impact on physiological processes and that sexual dysfunction can be reversed, the present article describes scientifically proven actions on the libido brought about by the use of herbal medicine and evaluates the use of nutritional interventions associated with herbal medicine treatment in patients with libido related complaints.

Methodology

A systematic review of the PUBMED, Scielo, and EMBASE databases was conducted, using the keywords "libido, food, and nutrient." The search identified 2.798 articles. The inclusion criteria included describing the use of some supplement, herbal medicine, or food that helped in improving the libido. By contrast, the exclusion criteria were hormone replacement therapy, surgical procedures, and therapy with drugs, that is, methods that are not within the nutrition professional's competency.

Results and discussion

After applying the inclusion and exclusion criteria, 91 articles were selected, based on their titles and abstracts. However, after analysis and discussion by the group, 19 of these articles met the previously mentioned exclusion criteria. Thus, 72 articles were selected to be read in their entirety. After having read all of the articles, 38 of these still met the exclusion criteria and were removed from this study. Therefore, 34 articles were used in the review and construction of this work, as shown in Fig. 3.

Herbal medicine has been identified for having an effect upon the hypothalamic-pituitary-testicular axis, thus increasing the libido. This occurs through the increase in the number of several hormone and serum testosterone

concentrations, which, in turn, stimulated the dopamine receptor, through mechanisms, such as vasodilation, the generation of nitrous oxide, increased androgen, and gonadotropin [12]. Several herbal medicines have been reported as capable of affecting penile erection through different mechanisms. Alkaloids, for instance, have demonstrated ergogenic properties, which lead to vasodilation in blood vessels, resulting in erection. Meanwhile, the saponin content acts to form nitrous oxide and may lead to the relaxation of the smooth muscle by means of L-arginine/nitrous oxide [12]. In addition, the presence of flavonoids in plant extracts implies its role played in the change of androgen levels (Fig. 4).

Herbal medicines

After reviewing studies that used different herbal medicines, those used more frequently and with positive results regarding the human libido were selected (Table 1).

Tribulus terrestris

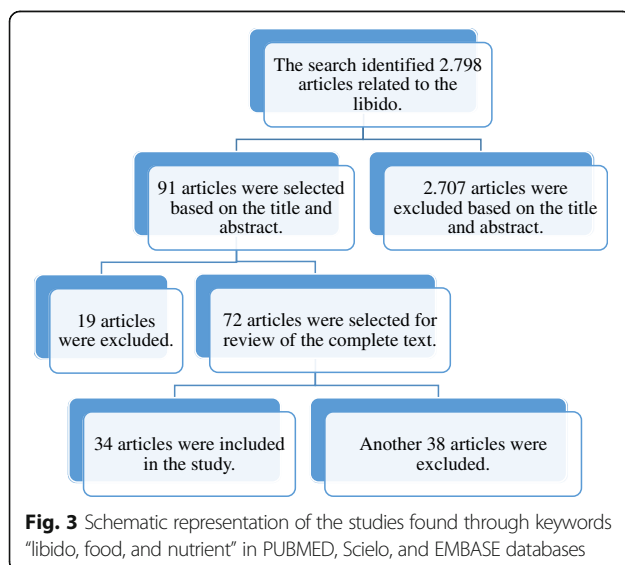
This plant may be a safe alternative to improve the domains of sexual desire. Its probable action mechanism involves serum levels of free and bioavailable testosterone [17]. A study performed with 96 women who underwent treatment with *Tribullus terrestris* for 4 weeks revealed increased testosterone levels, in addition to synergy with FSH-LH hormones, when compared with the placebo [18]. The plant also leads to increased testosterone levels in men [19]. A systematic review showed that *T. terrestris* acts on the androgen metabolism, helping protodioscin - saponin that acts on erectile dysfunction, when converted into dehydroepiandrosterone (DHEA) to convert into such a hormone inside the body, improving the sexual function and increasing the activity of the superoxide dismutase enzyme [20].

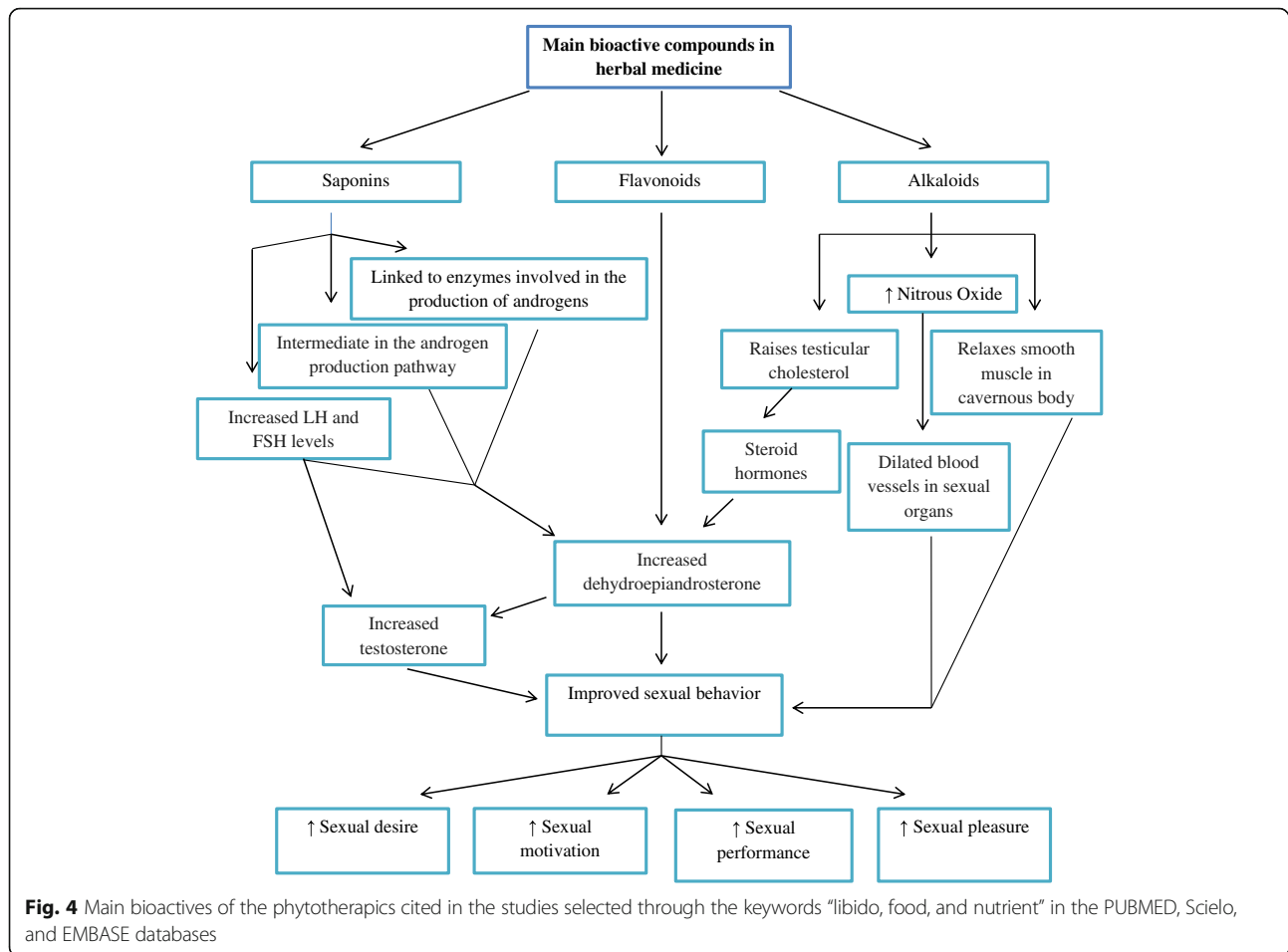
Eurycoma longifolia

Belonging to the Simaroubaceae family, it is known locally as "Tongkat Ali", a small perennial arboreal tree commonly found in tropical forests in Southeast Asia. Phytochemical studies on this plant revealed the presence of several quassinoids, derived from squalene, biphenyl neolignans, and triterpenes. *E. longifolia* is capable of significantly increasing testosterone serum levels [20]. An experimental study lasting 12 weeks has identified that the plant improved the quality of sexual life [21].

Ginseng

Ginseng is traditionally used as a tonic to help the body deal with many types of stress. In addition, it is often used to improve energy levels and increase blood circulation [22]. Use of ginseng has a relaxation effect that modulates the relation between nitrous oxide and the cavernous smooth muscle [23]. In this reaction, nitrous





oxide is released through the vasomolecular endothelium, which leads to the relaxation of the cavernous smooth muscle through the metabolism of calcium and potassium. Both reactions are mediated via nitrous oxide-cyclic guanosine monophosphate (NO-GMPc), and the hyperpolarizing action takes place through the K channels activated by Ca^{2+} . Ginseng plays a role in brain synaptosomes, inhibiting the absorption of γ -aminobutyric acid, glutamate, dopamine, noradrenalin, and serotonin, as well as aiding in the increase in the estrogen receptor expression. The central effect of ginseng, through these multiple mechanisms is postulated as one of the possible explanations for increased sexual arousal [23]. In a work in which natural aphrodisiacs were separated, dealing with their meanings and benefits, ginseng was pointed out as having active constituents, such as ginsenosides - saponin glycosides. Some studies report that ginsenosides may lead to an increased release of nitrous oxide from the cavernous tissue smooth muscles, thus increasing sexual desire [20].

Maca (*Lepidium meyenii*)

Maca is the edible root of *L. meyenii*, a crucifer (Brassicaceae family) grown exclusively in the Central Peruvian Andes.

This plant is suspected to have a compound with a portion similar to the human testosterone molecule, which may have exercised its androgenic effects through actions performed on the testosterone receptor in target organs, not affecting the level of testosterone or gonadotropin [24]. The plant contains arginine, a constituent that improves male sexual performance. Steroids, such as campesterol, stigmasterol, and sitosterol, are described in a study that lasted 21 days, proving its role in improved sexual performance. The maca root may lead to a relief in sexual dysfunction induced by serotonin re-absorption, including a beneficial effect on the libido. There may also be a dose-related effect, but no specific action mechanism has been studied. However, it has been noted that the plant has no effect on the gonadal hormone serum levels or on the serum levels of LH, FSH, prolactin (PRL), 17- α hydroxyprogesterone, thyroid stimulating hormone (TST), and 17- β -estradiol.

Ginger (*Mondia whitei*)

Extracts from the plant root may potentiate androgenic effects and the action of norepinephrine on the different channels. Ginger modulates physiological activities involved in penile erectile dysfunction, aiding in erection

Table 1 Herbal medicines used for study results

Intervention	Gender (n)	Action mechanism	Reference
<i>T. terrestris</i>	F (45)	↑ Serum levels of free and bioavailable testosterone.	[17]
<i>Trigonella foenum-graecum</i>	F (80)	↑ Free testosterone and estradiol → Stimulates vaginal lubrication and blood flow, improving capability of sexual arousal and orgasm.	[27]
<i>T. terrestris</i>	F (96)	↑ Testosterone levels; synergy with FSH-LH.	[18]
<i>T. terrestris</i>	M (30)	A saponin that acts in the erectile function, when converted into Dehydroepiandrosterone (DHEA), which acts on ↑ intracavernous pressure.	[28]
<i>E. longifolia</i>	M (109)	↑ Testosterone → range of bioactive phenolic compounds: polypeptides, diterpenoids, alkaloids, quassinoids, and others.	[21]
<i>Pycnogenol</i>	F (38)	↓ Oxidative stress levels.	[29]
Red clover	F (113)	↑ Estrogen levels and benefits to specific organs or systems.	[30]
Low-energy diet and low-fat, high-protein diet	M (31)	Diet ↑ testosterone and improves sexual function.	[26]
<i>T. foenum-graecum</i>	F (60)	Maintains normal and healthy testosterone levels. Saponins are likely to be responsible for physiological effects.	[31]
Magnolia bark extract, Isoflavones (soy) plus <i>Lactobacillus sporogenes</i> , associated or not with a natural anxiolytic agent (calcium and vitamin D3)	F (634)	↑ Estrogen levels. Isoflavones present in soy are phytoestrogens, with affinity to connect to the beta-estrogen receptor.	[32]
Korean red ginseng (KRG)	F (32)	Leads to relaxation of the cavernous smooth muscle, by metabolizing calcium and potassium; inhibits absorption of α -aminobutyric acid, glutamate, dopamine, noradrenalin and serotonin; ↑ expression of estrogen receptor.	[23]
Maca root	F (17) M (3)	Effect on serum levels of gonadal hormone, LH, FSH, PRL, 17- α hydroxyprogesterone, TST, and 17- β -estradiol.	[33]
<i>Ginkgo biloba</i> extract (GBE)	F (99)	↑ Relaxation of the vascular Smooth muscle, ↑ vascular flow to the genitalia, acts on prostaglandin, nitrous oxide acts on the guanylate cyclase enzyme.	[34]
Vigodana supplement consisting of <i>Rhodiola rosea</i> combined with vitamins and minerals	F (83) M (37)	Influences the metabolism of neurotransmitters, such as serotonin, dopamine, noradrenalin, acetylcholine; ↑ permeability of the hematoencephalic barrier.	[35]
Herbal teal soaked with <i>Mentha spicata labiatae</i>	F (21)	Prevents absorption of non-heme iron, ↓ free and plasmatic testosterone levels, ↑ plasmatic levels of LH and FSH, affects spermatogenic levels, alters the germinal epithelium, has benefits for digestion, induces the action of CYP3A4 enzyme, alters the concentrations of androgenic endogenous and steroid hormones, ↓ triglyceride levels significantly.	[36]
Red clover extract (MF11RCE)	F (60)	Action mechanism has not been specified, results have been associated with improved karyokinetic maturation, cornification, and basal cell rates.	[37]
<i>ArginMax</i> supplement consisting of L-arginine, <i>Panax ginseng</i> , <i>G. biloba</i> and Damiana leaves, vitamins A, C, E, B6, B12, biotin, folate, niacin, pantothenic acid, riboflavin, thiamine and minerals, calcium, iron, and zinc	F (108)	Acts on the smooth muscle relaxation, in vascular dilation and in regulating circulation, improves microvascular circulation, affects hormonal receptors.	[38]
Tryptophan depletion	F (19)	The action mechanism has not been specified, but ↓ total plasmatic and free tryptophan levels were shown; ↓ levels of central serotonin; acts on transportation through the hematoencephalic barrier.	[39]
<i>G. biloba</i>	F (202)	↑ Peripheral blood flow, including female genitalia. Shows good effects on the treatment of sexual dysfunction in men and women.	[40]
Essential phospholipids	M (23)	↓ Number of patients with erectile dysfunction and loss of libido. ↑ Number and motility of spermatozooids and ↑ activity of enzymes involved in lipidic metabolism.	[41]
Pyridoxine hydrochloride (vitamin B6)	F (22)	Positive effect on depression symptoms.	[42]
Alcohol	F/M (17000)	↑ Sexual excitement; ↓ sexual function, reproduction, performance, ejaculatory capacity, insemination, masculine hormones, and spermatogenesis. May also cause infertility.	[43]
Zinc sulfate	M (8)	Important in biosynthesis of RNA and DNA. Improves testicular function ↑ plasmatic testosterone, and ↑ FSH.	[44]

F female, M male

and increased libido [22]. Studies have indicated that the plant's aphrodisiac properties may be measured by means of several mechanisms—one of which by increased testosterone levels that cause increased libido. Another mechanism consists of decreasing the stimulation of the α -adrenergic enzyme on the cavernous tissue, consequently maintaining penile erection. Lastly, it has shown the capability to increase the amount of sperm as well as its motility. Although further clinical trials on the plant are required, it has the potential to be a supplement designed to increase general and sexual well-being [25].

Low-energy, low-fat, high-protein diet

A study involving 31 men, subjected to a modified meal replacement program and to a diet including high nutritional quality, whole foods, reported an improved sexual function. Over half of the patients with severely compromised erectile dysfunction reported an improvement of 5 to 10% in sexual desire, due to weight loss. Weight loss, in the short run, induced by caloric restriction, influenced the increase in testosterone. As visceral adiposity and insulin resistance are associated with the production of inflammatory cytokines and with the aromatization of testosterone into estradiol in the adipose tissue, weight loss leads to the release of pituitary gonadotropin and to the production of testicular androgens, in turn improving the sexual function. The strong points in the study are the comprehensive evaluations, parallel dietetic approaches, and relatively long duration [26].

Conclusion

As noted, sexual stimulation is caused differently in different genders since men focus on the necessity-reward mechanism, while women are more often associated with emotional factors. Herbal medicine, in general, has revealed properties that contribute to increasing the activity of specific hormones that act on the libido. Some herbal medicines stood out, including *T. terrestris*, for increasing testosterone serum levels, and *E. longifolia*, which also leads to an increased biosynthesis of several androgens; ginseng, which increases energy levels and stimulates smooth muscle relaxation with nitrous oxide; Maca (*L. meyenii*), which improves sexual performance, in addition to having androgenic effects; and *Mondia whitei* (ginger), which improves the libido and erection. In addition to these, one study demonstrated the effectiveness of a hypocaloric, hyperproteic, and hypolipidemic diet on the libido, improving sexual and erectile functions, as well as increasing testosterone levels. Although studies in literature that investigate the action of herbal medicine are still being performed on animals, the need for more studies performed on human are evident. Herbal medicine previously studied in human beings have demonstrated positive effects on the libido, indicating a promising field of action for nutrition as a support in treating sexual dysfunctions.

Abbreviations

Ca: Calcium; CNS: Central nervous system; DHEA: Dehydroepiandrosterone; FSH: Follicle-stimulating hormone; GnRH: Gonadotrophin releasing hormone; K: Potassium; LH: Luteinizing hormone; NO: Nitrous oxide; NO-GMPc: Nitrous oxide-cyclic guanosine monophosphate; PRL: Prolactin; TST: Thyroid stimulating hormone; VIP: Vasoactive intestinal polypeptide

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Availability of data and materials

Data sharing not applicable to this article as no datasets were generated or analyzed during the current study.

Authors' contributions

ACC, NCG, and KEBPS performed the bibliographic research and writing. ICE, LCS, and EGO performed bibliographic research. MRAA and WCBR made the general supervision and text revision. The authors read and approved the final manuscript.

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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References

1. Ferreira ALCG, et al. Disfunções Sexuais Femininas. *Femina*. 2007;35:11–6.
2. Lopes AJ. Breve introdução a uma história da libido: Poetas Latinos, Santo Agostinho e Freud (via Foucault). *Estudos da Psicanálise*. 2011;35:17–23.
3. Abdo CHN, Fleury HJ. Aspectos diagnósticos e terapêuticos das disfunções sexuais femininas. *Revista de Psiquiatria Clínica*. 2006;33:3–5.
4. Carteiro DMH, Sousa LMR, Caldeira SMA. Clinical indicators of sexual dysfunction in pregnant women: integrative literature review. *Revista Brasileira de Enfermagem*. 2016;69:1–9.
5. Marques FZC, Chedid SB, Eizerik GC. Resposta Sexual Humana. *Rev Ciênc Méd*. 2008;17:3–8.
6. Silva SLFG. Neuropsicofisiologia do Desejo Sexual: alguns aspectos da regulação funcional da motivação sexual. Monografia UFMG. 2011. http://www.bibliotecadigital.ufmg.br/dspace/bitstream/handle/1843/BUBD-9G4GUB/monografia_neuropsicofisiologia_de_desejo_sexual___symone_silva.pdf?sequence=1. Accessed 15 Feb 2017.
7. Motofei IG. A dual physiological character for cerebral mechanisms of sexuality and cognition: common somatic peripheral afferents. *BJU Int*. 2011;10:108–5.
8. Cour F, et al. Anatomie et physiologie de la sexualité. *Prog Urol* 2013;9: 23–15.
9. Basson R. Pharmacotherapy for women's sexual dysfunction. *Pharmacotherapy*. 2009;10:10–7.

10. Corona G, et al. Endocrinologic control of men's sexual desire and arousal/ erection. *J Sex Med.* 2016;13:3-20.
11. Santoro N, et al. Role of estrogens and estrogen-like compounds in female sexual function and dysfunction. *J Sex Med.* 2016;3(3):305-16.
12. Yakubu MT, Akanji MA. Effect of aqueous extract of *Massularia acuminata* stem on sexual behaviour of male Wistar rats. *Evid Based Complement Alternat Med* 2010; 2011:2011-10.
13. Gelman F, Atrio J. Flibanserin for hypoactive sexual desire disorder: place in therapy. *Ther Adv Chronic Dis.* 2017;8:1-10.
14. Aftab A, Chen C, McBride J. Flibanserin and its discontents. *Arch Womens Ment Health.* 2016; doi:10.1007/s00737-016-0693-6.
15. Terrier C, Terrier JE. Efficacité et sécurité de la flibansérine «nouveau Viagra® féminin ?»: revue de littérature. *Progrès em urologie.* 2016; doi: 10.1016/j.purol.2016.08.016
16. Fantasia HC. Flibanserin and female sexual desire. *Nursing for Women's Health.* 2016;10:3-6.
17. Souza KZD, Vale FBC, Geber S. Efficacy of *Tribulus terrestris* for the treatment of hypoactive sexual desire disorder in postmenopausal women: a randomized, double-blinded, placebo-controlled trial. *Menopause.* 2016;23: 1-4.
18. Akhtaril E, et al. *Tribulus terrestris* for treatment of sexual dysfunction in women: randomized double-blind placebo-controlled study. *DARU- Journal of Pharmaceutical Sciences.* 2014;22:40.
19. Bella AJ, Shamloul R. Traditional plant aphrodisiacs and male sexual dysfunction. *Phytother Res.* 2014;28:6-5.
20. Zanolli P, et al. Influence of *Eurycoma longifolia* on the copulatory activity of sexually sluggish and impotent male rats. *J Ethnopharmacol.* 2009;126:2-6.
21. Ismail SB, et al. Randomized clinical trial on the use of PHYSTA freeze-dried water extract of *Eurycoma longifolia* for the improvement of quality of life and sexual well-being in men. *Evid Based Complement Alternat Med.* 2012; 2012:2012-0.
22. Debusk RM, Phd ED. *Medicina Integrativa e Fitoterapia.* In: MAHAM, L. Kathleen; STUMP, Sylvia Escott. Krause: Alimentos, Nutrição & Dietoterapia. São Paulo: Roca, 2005. p. 464-7.
23. Oh KJ, et al. Effects of Korean red ginseng on sexual arousal in menopausal women: placebo-controlled, double-blind crossover clinical study. *J Sex Med.* 2010;7:4-9.
24. Srikugan L, Sankaralingam A, MCGOWAN B. First case report of testosterone assay-interference in a female taking maca (*Lepidium meyenii*). *BMJ Case Reports.* 2011; doi:10.1136/bcr.01.2011.3781.
25. Oketch-Rabah HA. *Mondia whitei*, a medicinal plant from Africa with aphrodisiac and antidepressant properties: a review. *J Diet Suppl.* 2012;9: 272-84.
26. Khoo J, et al. Comparing effects of a low-energy diet and a high-protein low-fat diet on sexual and endothelial function, urinary tract symptoms, and inflammation in obese diabetic men. *J Sex Med.* 2011;8:10-8.
27. Rao A, et al. Influence of a specialized *Trigonella foenum-graecum* seed extract (Libifem), on testosterone, Estradiol and sexual function in healthy menstruating women, a randomised placebo controlled study. *Phytother Res.* 2015;29:8-7.
28. Santos CAJR, et al. *Tribulus terrestris* versus placebo in the treatment of erectile dysfunction: a prospective, randomized, double blind study. *Actas Urol Esp.* 2014;38:4-4.
29. Errichi S, et al. Supplementation with Pycnogenol® improves signs and symptoms of menopausal transition. *Panminerva Med.* 2011;53:3-5.
30. Lipovac M, et al. Effect of red clover Isoflavones over skin, appendages, and mucosal status in postmenopausal women. *Obstet Gynecol Int.* 2011;2011: 2011-6.
31. Steels E, Rao A, Vitetta L. Physiological aspects of male libido enhanced by standardized *Trigonella foenum-graecum* extract and mineral formulation. *Phytother Res.* 2011;25:9-7.
32. Agosta C, Atlante M, Benvenuti C. Randomized controlled study on clinical efficacy of isoflavones plus *Lactobacillus sporogenes*, associated or not with a natural anxiolytic agent in menopause. *Minerva Ginecol.* 2011;63:1-7.
33. Dording CM, et al. A double-blind, randomized, pilot dose-finding study of maca root (*L. meyenii*) for the management of SSRI-induced sexual dysfunction. *CNS Neurosci Ther.* 2008;14:3-10.
34. Meston CM, Rellini AH, Telch MJ. Short- and long-term effects of *Ginkgo biloba* extract on sexual dysfunction in women. *Arch Sex Behav.* 2008;37:4-18.
35. Fintelmann V, Gruenwald J. Efficacy and tolerability of a *Rhodiola rosea* extract in adults with physical and cognitive deficiencies. *Adv Ther.* 2007;24:4-10.
36. Akdogan M, et al. Effect of spearmint (*Mentha spicata* Labiatae) teas on androgen levels in women with hirsutism. *Phytother Res.* 2007;21:5-4.
37. Chedraui P, et al. Red clover extract (MF11RCE) supplementation and postmenopausal vaginal and sexual health. *Int J Gynaecol Obstet.* 2006;95:3-2.
38. Ito T, et al. The enhancement of female sexual function with ArginMax, a nutritional supplement, among women differing in menopausal status. *J Sex Marital Ther.* 2006;32:5-10.
39. Epperson CN, et al. The resistance to depressive relapse in menopausal women undergoing tryptophan depletion: preliminary findings. *J Psychopharmacol.* 2007;21:4-7.
40. Waynberg J, Brewer S. Effects of herbal vX on libido and sexual activity in premenopausal and postmenopausal women. *Adv Ther.* 2000;17:5-8.
41. Kiriakova N, et al. Therapeutic effect of essential phospholipids on functional sexual disorders in males. *J Eur Acad Dermatol Venereol.* 1998;11:2-3.
42. Adams PW, et al. Effect of pyridoxine hydrochloride (vitamin B6) upon depression associated with oral contraception. *Lancet.* 1973;1:7809-6.
43. Abel EL. A review of alcohol's effects on sex and reproduction. *Drug Alcohol Depend.* 1980;5:5-11.
44. Antoniou LD, et al. Reversal of uraemic by zinc. *Lancet* 1977;895;8044-8.

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