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Phytochemistry of some Brazilian Plants with Aphrodisiac Activity

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1. Introduction

Since time immemorial man has used various parts of plants in the treatment and prevention of many ailments, including sexual impotence (Ayyanar & Ignacimuthu, 2009 as cited in Chah et al., 2006). Ancient people knew about herbal and animal aphrodisiacs, used in combinations like potions to mystical rites to infertility, to increase sexual performance, desire and pleasure (Malviya et al., 2011).

One of the first mentions of aphrodisiacs is in the Egyptian papyruses from 2300 to 1700 B.C. In the papyrus of Ebers, mandragora, garlic, onion and blue lotus were found as plants with aphrodisiac activity (Zanolari, 2003).

The tomb of Tutankhamon contain a gold plated shrine decorated with a bas-relief of a pharaoh holding a blue lotus and two mandragoras in his left hand, since the Egyptians believed in sexual life after death (Bertol et al., 2004).

Hindu poems dating from 2000 to 1000 B.C. and the Kama Sutra had already reported to the use of some products to enhance the sex (Zanolari, 2003). The traditional Chinese Medicine uses with aphrodisiac purpose, among others, ginseng, Chinese chive and parts of animals for example: dogs, rhino, bear and tiger penis and testicles (Still, 2003).

On this basis, the legendary love potions, such as Spanish fly, glandular products from musk deer and civet cats, varieties of natural oats (*Avena sativa*), ginseng, belladonna, and erotic foods like fish and oysters, are known aphrodisiacs (Drewes et al., 2003 as cited in Choudhary & Ur-Rahman, 1997).

The word aphrodisiac has its origin in Greek Mythology, most precisely from the goddess of love, Aphrodite. It has been used to define the products applied with proposal of increasing desire and drive associated with sexual instinct. Besides they have represented a passion of man, since historically, in all cultures, the sexual potency is considered as a significant part of the male ego and the anxiety and humiliation is frequently associated with a declining sexual ability (Malviya et al., 2011; Zanolari, 2003).

An aphrodisiac includes any food or drug that arouses the sexual instinct, induces venereal desire and increases pleasure and performance. There are two main types of aphrodisiacs: psychophysiological stimuli (visual, tactile, olfactory and aural) preparations and internal preparations (food, alcoholic drinks and love potion) (Malviya et al., 2011).

Currently, the increase in life expectancy of human beings has increased the demand for substances capable of improving quality of this longevity. Among these are products that enhance sexual performance, treat impotence or erectile dysfunction.

Brazil is the country with around 55,000 species of higher plants about a quarter of all known and greatest biodiversity in the world (Velozo et al., 2002). Many of these plants are used in folk medicine to aphrodisiac purposes in the form of teas, mixed with alcohol and other beverages. Some of them are belonging to the families like Anacardiaceae, Fabaceae, Sapindaceae, Amarantaceae, Amaryllidaceae, Aristolochiaceae, Bignoniaceae, Erythroxylaceae, Oleaceae, Asteraceae, Sapindaceae, Annonaceae and Dilleniaceae.

Several phytochemical studies, with species from these families above cited, have enabled the isolation of secondary metabolites possibly related to its pharmacological activity, such as alkaloids, flavonoids and saponins.

This chapter is a review on the chemical composition of Brazilian plants most used by the population for aphrodisiac purpose, searching rationalization between the chemical structure and biological activity (SAR).

2. Erectile dysfunction and aphrodisiac products

Erectile dysfunction (ED) is experienced at least some of the time by the most of men who have reached 45 years of age, and it is projected to affect 322 million men worldwide by 2025. This prevalence is high in men of all ages but increases greatly in the elderly (Seftel et al., 2002).

Sexual dysfunction, erectile dysfunction or male impotence is characterized by the inability to develop or maintain an erection of the penis and can be caused by psychological disorders like anxiety, stress and depression, physical disorders like chronic diseases: diabetes and hypertension; hormonal problems or sedentary life-style, alcohol and smoking abuses (Malviya et al., 2011; Sumalatha et al., 2010).

Drugs play a significant role in the pathogenesis of ED, altering hormonal or vascular mechanics needed for erection. Alterations in penile vessels can be observed in the elderly and in particular, lack of androgens may lead to a reduction of smooth muscle cells content in the penis and an increase in the caliber of vascular spaces (Vignera et al., 2011 as cited in Galiano et al., 2010).

An erection is a hemodynamic balance between inflow and outflow of blood within two chambers named corpus cavernosum and it starts with sensory and mental stimulation. There is a relaxation of the smooth muscles and arterioles which allows blood supply to flow in the sinusoidal space. The increased flow of blood, compress venules between sinusoids and the tunica albuginea of the corpus cavernosum. The lack of the distension of tunica albuginea results in venous occlusion, which increases the intracavernosal pressure, generating and sustaining a full erection (Zanolari, 2003).

The erection ends when the muscles of penis contract, opening outflow channels. The relaxation of cavernous smooth muscle is mediated by Nitric Oxide (NO) via cyclic guanosine monophosphate (cGMP). After sexual stimulation, nitric oxide is released by nerve endings and endothelial cells. Nitric oxide (NO) stimulates GMP cyclase to produce cGMP, which

leads to relaxation of smooth muscle. The erection ceases after a while because cGMP is hydrolysed by phosphodiesterase enzime into inactive GMP. Five types of phosphodiesterases are known to cause hydrolysis in cGMP. In the penis, phosphodiesterase is type V. Thus, a drug that inhibits the phosphodiesterase type V (cGMP-specific) should accelerate the action of nitric oxide and cGMP in erection (Drewes et al., 2003).

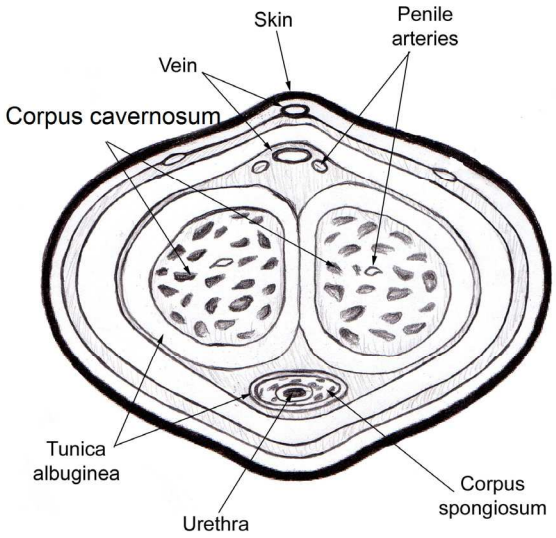


Fig. 1. Penis anatomy diagram

2.1 Male dysfunction therapies

The treatment with a psychotherapeutic approach is indicated to patients with psychological disorders. To patients with physical disorders, current treatments include oral medication, intracavernosal injection, vacuum pumps and penile prosthesis.

Some oral medications are available and well-established for ED treatment, among of them, two natural products: Cantharidin (Spanish fly) and Yohimbine, besides synthetic selective inhibitors, such as sildenafil (Viagra®), vardenafil (Levitra®), tadalafil (Cialis®), lodenafil (Helleva®) and udenafil (Zydena®) (see fig.2). The PDE-5 inhibitors have shown efficacy compared to placebo, in addition to present similar form of action and side effects like headache, flushing, dyspepsia and nasal congestion (Matheus et al., 2009; Wang et al., 2008).

The cantharidin is a lactone found in Spanish flies (also called Cantharides), beetles that have been cited in most of Asian and European Pharmacopoeias and have been used in dried form in internal preparations to impotence. Cantharides acts causing irritation of the urethra with vascular congestion, and inflammation of the erectile tissue. The Spanish flies are fallen into disuse due to their toxic effects (Zanolari, 2003).

Yohimbine is an indole alkaloid with a 2-adrenergic blocking activity. It comes from the bark of the African tree *Corynanthe yohimbe*, its first isolation was in the early 1930s and remained on the African market until 1973 like a drug marketed Aphrodex. Renewed

interest in yohimbine for ED has prompted several new investigative trials; however, there are indications of side-effects such as hypertension, anxiety, manic symptoms and interactions with used medications (Drewes et al., 2003).

Some natural products act like non-selective PDE inhibitors as the methylxanthines caffeine and theophylline, but others show similar effects to PDE-5 inhibitors, for example: flavonoids and derivatives (quercetin from *Allium cepa*, pyrano-isoflavones from *Eriosema kraussianum* - Kraussianone 1 and 2); alkaloids (Neferin from *Nelumbo nucifera*, Berberine from *Berberis aristata*, Papaverine from *Papaver somniferum* – used in association with Prostaglandin-E1 to injections intracavernosal), saponins (Steroidal saponins from *Allium tuberosum*), coumarins (Osthole from *Angelica pubescens*) and terpenes (Forskolin from *Coleus forskohlii*) (Drewes et al., 2003; Guohua et al., 2009; Rahimi et al., 2009; Sumalatha et al., 2010; Zanolari, 2003).

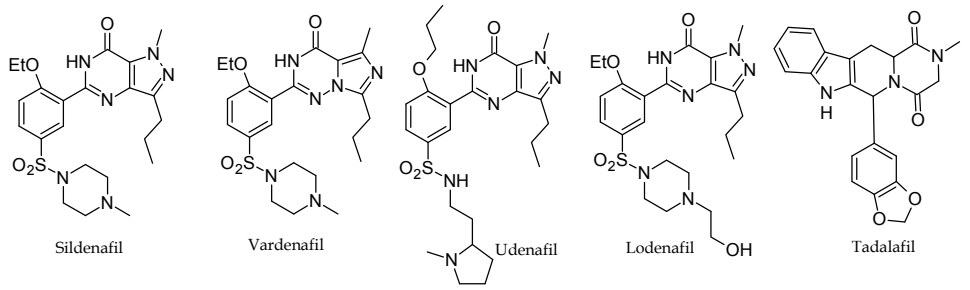


Fig. 2. Selective inhibitors of PDE-5

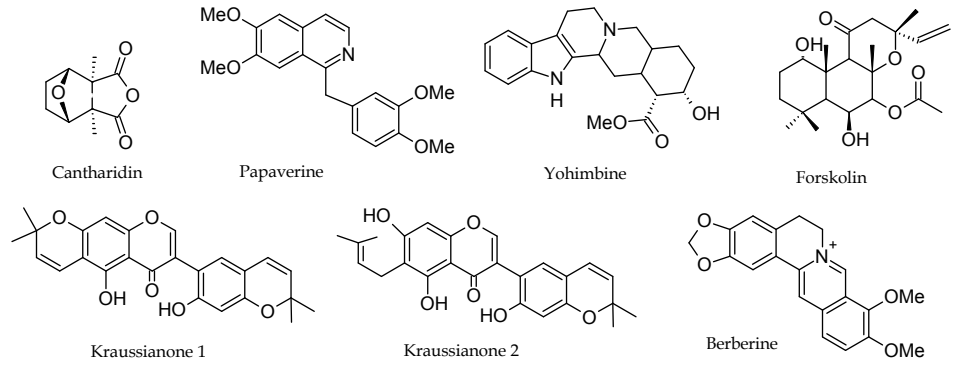


Fig. 3. Examples of natural products with aphrodisiac effect

2.2 Chemical of some Brazilian aphrodisiacs species and rationalization between structure and activity

The success of PDE-5 inhibitors, particularly of Viagra, the first inhibitor that has been marketed, the aging of the population and the quest for improved quality of life led to the search for new drugs with fewer side effects. As sources of research, plants used as aphrodisiacs have turned to folk medicine in whole world.

There are many herbal drugs that have been used by men with ED with varying degrees of success. Most potent aphrodisiacs herbal are available and have few side effects (Malviya et al., 2011).

Some of the genera and species listed in this work in *in vitro* tests showed satisfactory answers to such an aphrodisiac effect like *Turnera diffusa* (Estrada-Reyes et al., 2009), *Pfaffia paniculata* (Arletti et al., 1999), *Passiflora* (Patel et al. 2009), *Mucuna pruriens* (Suresh et al., 2009), *Mimosa pudica* (Pande & Pathak, 2009), *Mimosa tenuiflora* (Souza et al., 2008), *Achyrocline satureioides* (Hnatyszyn et al, 2004; Simões et al., 1986) and *Anemopaegma arvense* (Chieregatto, 2005).

The effects of the Brazilian herbal medicine Catuama® and each of its plant constituents (*Paullinia cupana, Trichilia catigua, Zingiber officinalis and Ptychopetalum olacoides*) were investigated on rabbit corpus cavernosum. Catuama® induced relaxations, but P. *cupana* was the most effective, increased the cAMP levels by 200% indicating that it is the main extract responsible for the relaxing effect (Antunes et al., 2001).

Specie (Family)	Part used	Popular Name
Achyrocline satureioides (Asteraceae)	Inflorescence	Macela do campo Macela
*Anacardium Ocidentale (*Anacardiaceae)	Nut Pseudo-fruit	Caju
Anemopaegma arvense (Bignoniaceae)	Stem bark Roots	Catuaba verdadeira Marapuama Alecrim do campo
Aristolochia cymbifera (Aristolochiaceae)	Stem	Cipó mil homens
Arrabidaea chica **(**Bignoniaceae)	Leaves	Cipó cruz Carajiru
Artocarpus integrifolia (Moraceae)	Seeds	Jaca
Davilla rugosa (Dilleniaceae)	Stem , Leaves	Cipó caboclo
Erythroxylum viceniifolium (Erythroxylaceae)	Stem bark	Catuaba
Hippeastrum psittacinum (Amaryllidaceae)	Bulbs	Alho-bravo Alho-do-mato Açucena-do-campo
Mimosa pudica (Fabaceae)	Stem bark	Dormideira
Mimosa tenuiflora (Fabaceae)	Stem bark	Jurema preta
Mucuna pruriensis (Fabaceae)	Seeds	Pó-de-mico Mucuna preta
Nymphaea ampla (Nymphaeaceae)	Whole plant	Ninfa branca
Passiflora sp. (*P. edulis, P. alata and P. caerulea)* (Passifloraceae)	Leaves	Maracujá
Paulinia cupana (Sapindaceae)	Seeds	Guaraná
Pfaffia paniculata (Amarantaceae)	Roots	Ginseng brasileiro
Ptychopetalum olacoides (Oleaceae)	Bark	Marapuama
Schinus terebinthifolius (Anarcadiaceae)	Bark	Aroeira vermelha
Trichilia catigua (Meliaceae)	Bark , Leaves	Catuaba
Turnera diffusa (Turneraceae)	Leaves	Damiana

Table 1. Main Brazilian species with aphrodisiac activity

2.2.1 Aphrodisiacs chemical classes

The classes of substances discussed were those with proven aphrodisiac activity or with this possible action. The compounds were separated in three main groups, according to structures similarities: flavonoids and others phenolics compounds; alkaloids, xanthins and others amines; and saponins.

2.2.1.1 Flavonoids and other phenolic compounds

Flavonoids are polyphenols with a diphenylpropane core. According to the chemical and biosynthetic routes, flavonoids are separated into different classes: chalcones, flavonols, flavones, dihydroflavonoids, anthocyanidins, isoflavones, aurones, pterocarpanes, neoflavonoids, bioflavonoids and are presents in all flowering plants.

The major classes are flavones, flavonols, anthocyanins, isoflavones and the flavan-3-ol derivatives (catechin and tannins) (Miean & Mohamed, 2001).

The flavonoids are widely distributed in gymnosperms and angiosperms with therapeutic potential because of their antioxidant, anti-inflammatory, hepatoprotective, cardio protective, antiulcer, anticancer, antimutagenic, antispasmodic, anti-allergic and antiviral activities, besides to show inhibit xanthine oxidase, protein kinase C and PDE (Rahimi et al., 2009; Ko et al., 2004).

Miean & Mohamed (2001) studied 62 tropical species to presence of flavonoids and observed that flavonol quercetin and derivatives, mainly quercetin glycosides, had major occurrence, however glycosides of kaempferol, luteolin and apigenin were also present. In fruits contained almost exclusively quercetin glycosides.

In plants surveyed, in addition to flavonoids, other phenols were found such as caffeic and chlorogenic acid in *Achyrocline satureioides* (Desmarchelier et al., 2000) and chlorogenic acid in *Trichilia catigua* (Lagos, 2006), besides anacardic acid in *Anacardium ocidentale* (Kubo et al., 1994).

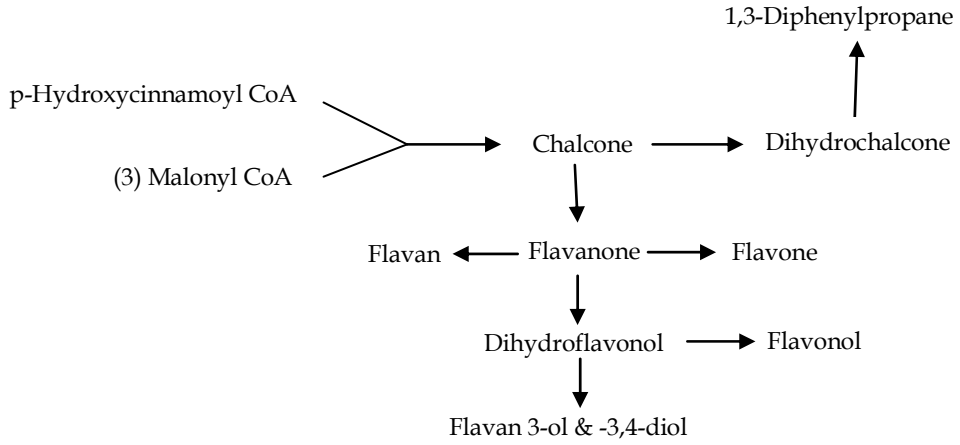


Fig. 4. Biosynthetic relationship among classes of flavonoids (Barron & Ibrahim, 1996)

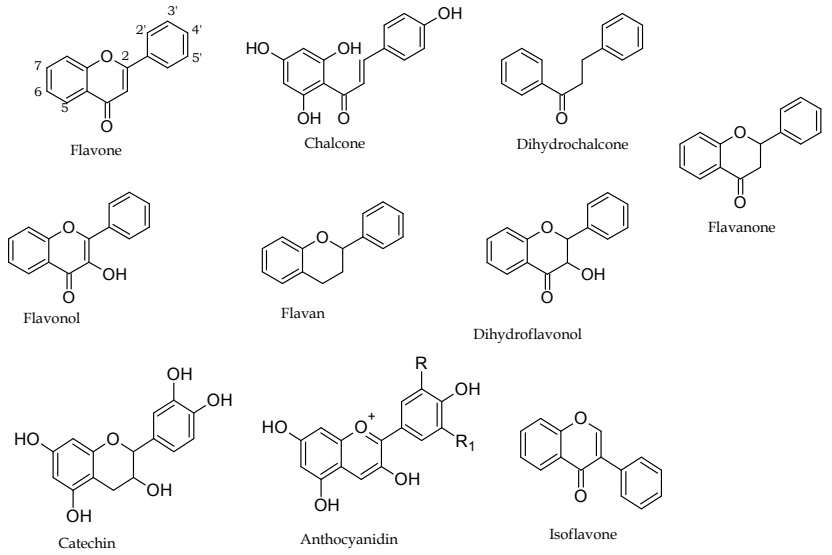


Fig. 5. Basic Structures of Flavonoids

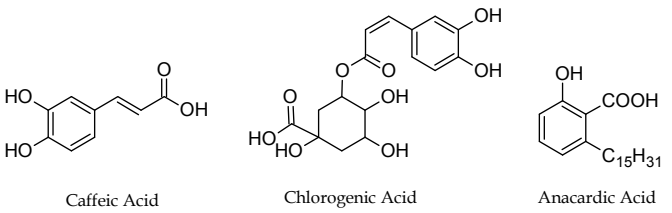
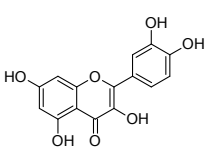
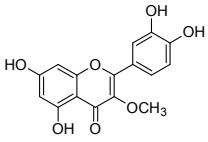
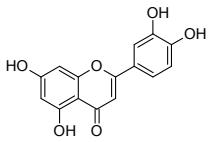
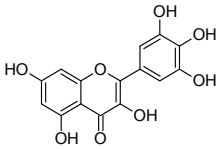
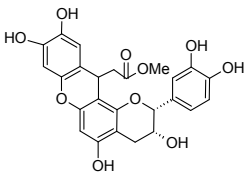
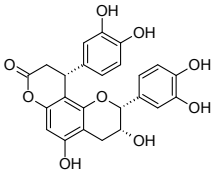
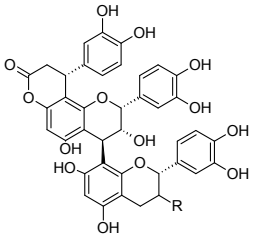
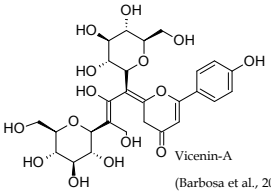
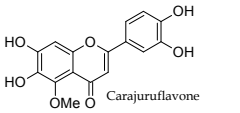
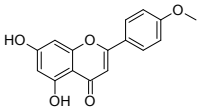
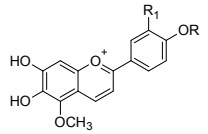
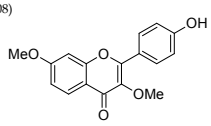
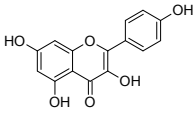
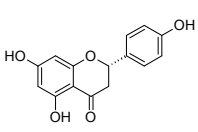
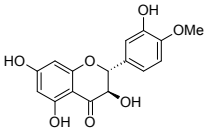
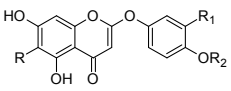
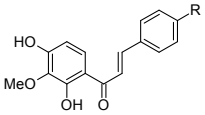
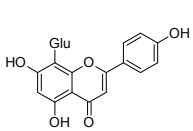
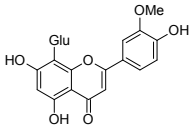
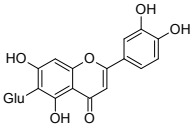
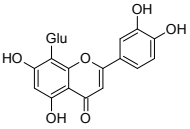
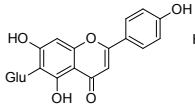
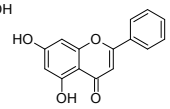


Fig. 6. Phenolic substances

Studies conducted by Ko and colleagues (2004) in flavonoids as inhibitors of PDE have suggested that C-4′ and C-5′ hydroxyl groups is not important for PDE-5 inhibition. The replacement of the hydroxyl by a methoxyl did not alter its inhibitory effect and it deletion resulted in no effect on PDE-5 inhibition. However, the C-7 hydroxyl group is very important for PDE-5 inhibition. C-7-glucoside showed no inhibition of the enzyme, being possible that the bulky glycosyl residues may hinder its binding to active site. Also, the C-3-hydroxyl group of flavonols seems difficult the binding with the PDE-5.

The luteolin showed more potent than other flavonoids, indicating that the presence of a double bond between C-2 and C-3 is important for PDE-5 inhibition. Between a flavon and an isoflavone, it may be easier for isoflavones than flavones to bind to the moiety of PDE-5. The removal of the C-5 hydroxyl group promoted the loss of inhibition of PDE, proposing that the hydroxyl group is vital for PDE-5 inhibition (Ko et al., 2004).

Specie (Family)	Flavonoids and phenols
Achyrocline satureioides (Asteraceae)	 Quercetin  3-O-Metil Quercetin  Luteolin And Caffeic, chlorogenic and isochlorogenic acids (Desmarchelier et al., 2000).
Anacardium Ocidentale (Anacardiaceae)	 Myricetin And Quercetin, Anacardic Acids and derivatives (Kubo et al., 1994; Miean & Mohamed, 2001).
Anemopaegma arvense (Bignoniaceae)	 Catuabine A  Cinchonain Ia  R = OH Cinchonain IIa R= OH KandelinAl (Tabanca et al.,2007)
Arrabidaea chica (Bignoniaceae)	 Vicenin-A (Barbosa et al., 2008)  Carajuruflavone (Takemura et al., 1995)  Acacetin (Zorn et al., 2001)  R_1= H; R = CH_3 - Carajurin  4'-hydroxi-3,7-dimethoxiflavone (Barbosa et al., 2008)  Kaempferol (Barbosa et al., 2008) R_1= OH; R= H - 6,7,3',4'-tetrahydroxy-5-methoxyflavylium R_1= H; R= H - 6,7,4'-trihydroxy-5- methoxyflavylium (Zorn et al., 2001)

Specie (Family)	Flavonoids and phenols
Davilla rugosa (Dilleniaceae)	 Narigenin  4'-O-methyltaxifolin Quercetin (David et al, 2006)
Mimosa tenuiflora (Fabaceae)	  R= O Me; R_1= OH; R_2= Me - Tenuiflorin A R= R_1= OMe; R_2= H - Tenuiflorin B R= H; R_1= OH; R_2= Me - Tenuiflorin C R= H; R_1= H; R_2= H - 6-Dimethoxycapilarisin R= H; R_1= H; R_2= Me - 6-Dimethoxy-4'-O-methylcapilarisin R= O Me - Kukulkan A R= OH - Kukulkan B (Souza et al., 2008)
Nymphaea ampla (Nymphaeaceae)	Quercetin derivatives (glycosides) (Marquina et al., 2005)
Passiflora sp. (Passifloraceae)	 Vitexin  Scoparin  Isoorientin  Orientin  Isovitexin  Chrysin (*P. Caeruleae*) Dhwan et al., 2002) Apigenin and luteolin derivatives (*P. edulis*) (Ferreres et al., 2007) Flavonoids above (*P. alata*)(Doyama et al, 2005)
Paulinia cupana (Sapindaceae)	Epicathechins, Cathechins (Ushirobira et al., 2007)
Schinus terebinthifolius (Anarcadiaceae)	Quercetin, myricetin, Kaempferol and derivatives (Ceruks et al., 2007; Johann et al., 2010)
Trichilia catigua (Meliaceae)	Chlorogenic acid, catechin and epicatechin (Lagos, 2006)

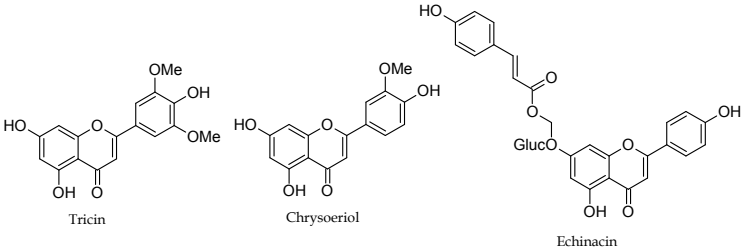
Specie (Family)	Flavonoids and phenols
Turnera diffusa (Turneraceae)	 Tricin Chrysoeriol Echinacin Luteolin, apigenin, quercetin, orientin and vitexin derivatives (Zhao et al., 2007)

Table 2. Aphrodisiacs plants, their flavonoids and phenols

2.2.1.2 Alkaloids, xanthines and others amines

In broad sense, the alkaloids are natural nitrogen-containing secondary metabolites mostly derived from amino acids and found in about 20% of flowering plants. They are not limited to plants but also occur in marine organisms, insects, microorganisms and some animals (Rahimi et al., 2009).

Until 2005, 150,000 compounds were known and 14% these have been alkaloids. They are special interesting due to the heterogeneity of the group and the great bioactive potential particularly as inhibitors of PDE (Silva, 2006). Many of them have been used as a basis for design and development of new and more selective drugs with reduced side effects.

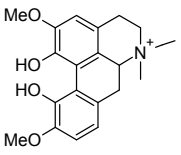
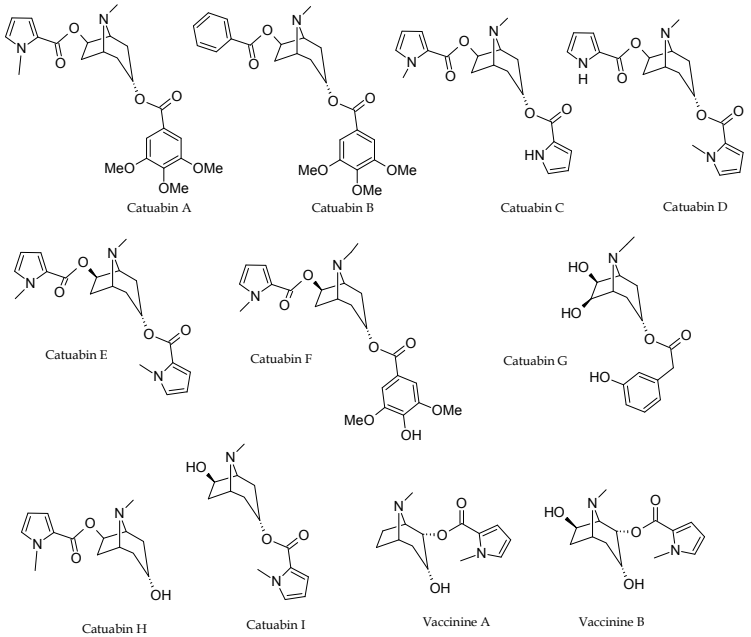
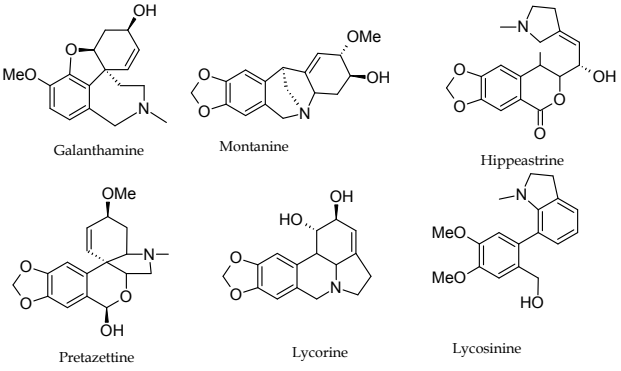
The methylxanthines are purine bases and have structural similarity with the cAMP and cGMP, therefore bind competitively to the sites of the various PDEs. They are considered non-selective inhibitors, such as caffeine found in *Paullinia cupana* seeds, theobromine and adenine from *Ptychopetalum olacoides*, which validate its aphrodisiac effect.

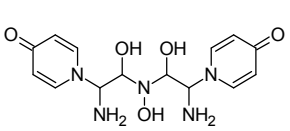
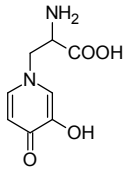
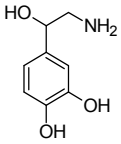
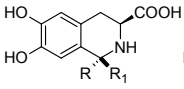
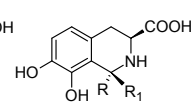
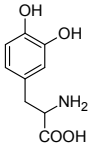
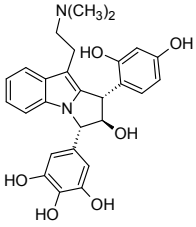
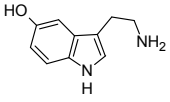
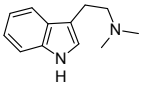
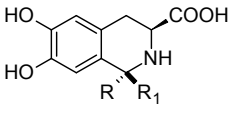
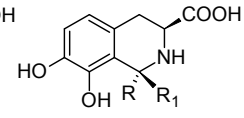
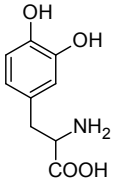
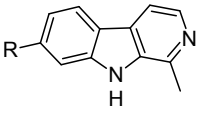
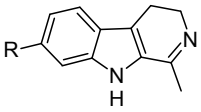
Introducing achiral cyclopenthyl and hexylamines moiety in xanthines analogues enhanced inhibitory activity. The ethyl group at the N-1 and N-3 positions showed the highest effect in PDE-5 (Wang et al., 2002).

Aporphines alkaloids act as dopamine agonists, due to their structural similarity. They improve central pro-erectile mechanisms by binding to receptors in the paraventricular nucleus of the hypothalamus. In clinical trials, apomorphine was found to be effective in patients with ED of various aetiologies and levels of severity, albeit with substantially less efficacy than any of the PDE-5 inhibitors (Seftel, 2002).

Other plants that seem to act this way are: *Mimosa tenuiflora, Mimosa pudica and Mucuna pruriens*, but they need more studies to investigation their aphrodisiac activities.

While many β-carbolines have effect as a selective inhibitor of PDE-5, the alkaloids of *Passiflora* seems to have effect as serotonin uptake inhibitors and therefore act with antidepressants. Recently, harmine and numerous related β-carboline derivatives were found as potent and specific inhibitors of cyclin-dependent kinases (CDKs), and the structure activity relationships (SARs) analysis demonstrated that the degree of aromaticity

Specie (Family)	Alkaloids, xanthines and others amines
Aristolochia cymbifera (Aristolochiaceae)	 Magnoflorine (Wu et al.,2005)
Erythroxylum viceniifolium (Erythroxylaceae)	 Catuabin A, Catuabin B, Catuabin C, Catuabin D, Catuabin E, Catuabin F, Catuabin G, Catuabin H, Catuabin I, Vaccinine A, Vaccinine B And derivatives (Zanolari, 2003)
Hippeastrum psittacinum (Amaryllidaceae)	 Galanthamine, Montanine, Hippeastrine, Pretazettine, Lycorine, Lycosinine (Jin, 2011; Pagliosa et al., 2010)

Specie (Family)	Alkaloids, xanthines and others amines
Mimosa pudica (Fabaceae)	 Mimopudine  Mimosiine  Pheniletylamine (Muthumani et al., 2010; Ueda & Yamamura, 1999a, 1999b)
Mimosa tenuiflora (Fabaceae)	 1) R=R_1= H 2) R=H; R_1=Me 3) R=R_1= Me  4) R=R_1= Me  L-dopa  Yurema mine  5 Hydroxytryptamine  N,N-dimethyltryptamine (Souza et al., 2008)
Mucuna pruriensis (Fabaceae)	 1) R=R_1= H 2) R=H; R_1=Me 3) R=R_1= Me  4) R=R_1= Me  L-dopa (Misra & Wagner, 2004; Siddhuraju &Becker, 2001)
Passiflora sp. (Passifloraceae)	 R=H- Harman R=OH - Harmol R=OCH_3 - Harmin  R=OH - Harmalol R=OCH_3 - Harmalin (Ingale & Hivrale, 2010)

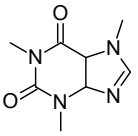
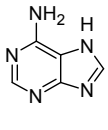
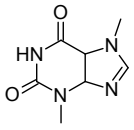
Specie (Family)	Alkaloids, xanthines and others amines
Paulinia cupana (Sapindaceae)	 Caffeine (Ushirobira et al., 2007)
Ptychopetalum olacoides (Oleaceae)	 Adenine  Theobromine And caffeine, muirapuamine (Montrucchio, 2005)

Table 3. Aphrodisiacs plants and their alkaloids, xanthines and others amines

of the tricyclic ring and the positioning of substituents were crucial for inhibitory activity. In addition, N-2-furoyl and N-2- pyrimidinyl β-carbolines were found to strongly inhibit activity against phosphodiesterases (PDEs) (Cao et al., 2007).

Tropane alkaloids present in *Erytroxylum* species have a structure similar to cocaine and seem to have the same action in the transport of dopamine (Singh, 2000).

2.2.1.3 Saponins

Saponins are a vast group of non-nitrogenous compounds, in general glycosides of steroids or polycyclic terpenes and widely distributed in higher plants. Their surfactant properties are what distinguish these compounds from others. They are soluble in water and form colloidal solutions that foam upon shaking (Schenkel et al., 2007; Sparg et al. 2004).

They have a diverse range of biological activities including hemolytic, hepatoprotective, antimutagenic, antiviral, antileishmanial and antiinflammatory (Rahimi et al., 2009).

Saponins are high molecular weight substances and occur in complex mixtures due to the concomitant presence of structures with varying number of sugars or because of the presence of various aglycones. As a result of structural complexity, isolation and structural elucidation of these compounds can be very difficult and has developed only recently (Schenkel et al., 2007).

Although some saponins inhibit PDE-5, like those present in *Allium tuberosum*, those found in plants studied did not have any reports for this activity (Guohua et al., 2009; Rahimi et al, 2009), except *Pfaffia paniculata* (Brazilian ginseng) presented saponins as the main active components due to its similarity with those saponins from *Panax ginseng,* known as ginsenosides (Rates & Gosmann, 2002). The ginsenosides are adaptogens substances or anti-stress agents, but their action mechanisms are not clear (Schenkel et al., 2007).

The term adaptogen, or resistogen, as it is called to classify a group of substances that can improve nonspecific resistance of body after being exposed to various stressing factors,

promoting a state of adaptation to the exceptional situation. Some plants like *Pfaffia paniculata, Paulinia cupana, Turnera diffusa, Anemopaegma arvense, Ptychopetalum olacoides* and *Trichilia catigua* are considered adaptogens (Mendes, 2011).

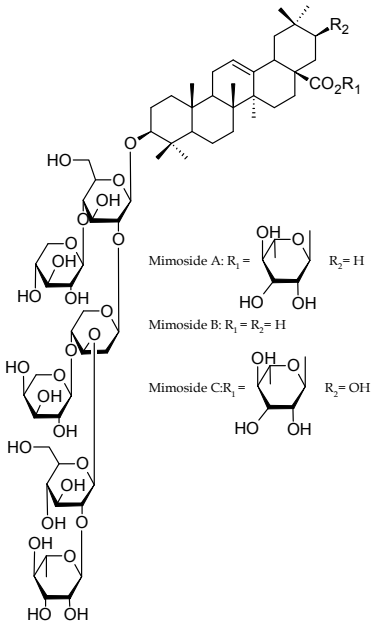
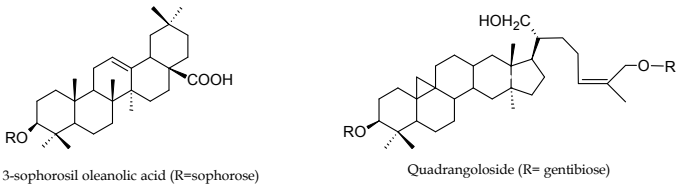
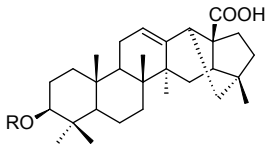
Specie (Family)	Saponins
Mimosa tenuiflora (Fabaceae)	 (Souza et al., 2008)
Passiflora sp. (Passifloraceae)	 3-sophorosil oleanolic acid (R=sophorose) Quadrangoloside (R= gentibiose) (*P. alata*) (Doyama et al., 2005)
Pfaffia paniculata (Amarantaceae)	 R= H - Pfaffic acid R= β-D-glucoronic acid(2-1)-β-D-xilose (Rates & Gosmann, 2002)

Table 4. Saponins and derivatives found in some Brazilian plants

Pharmacological studies of *P. paniculata* extracts indicate that they might act mainly by increasing central noradrenergic and dopaminergic tone, and possibly (indirectly) oxytocinergic transmission (Arletti et al., 1999).

It is possible to speculate that the activity is related to the distance between the groups at C-3 and groups at C-17 and the architecture of the molecule must be important.

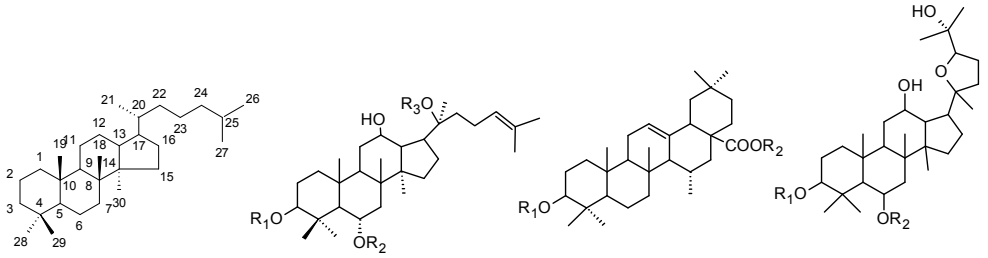


Fig. 7. Saponins basic strutures from *Panax Ginseng* (Jia & Zhao, 2009)

3. Conclusion

Despite the search promoted by pharmaceutical companies for analogues of sildenafil, the use and interest in herbal products based on folk and traditional medicine is growing globally, aiming to increase access to treatment for erectile dysfunction and to reduce the adverse effects and costs, improving the quality of life.

The investigation of classes of metabolites present in plants can indicate a possible rationalization of relations between the structure - aphrodisiac activity of substances, contributing to the development and generation of new drugs more effective and secure derivatives from regional floras.

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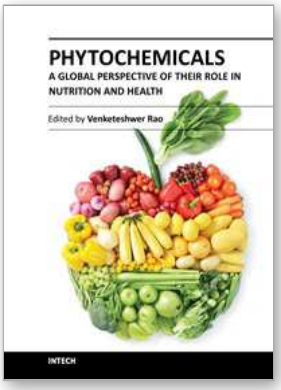

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