Impotence, and the evaluation of traditional ethnopharmaceutical remedies, are examined in this article. The modes of action of the remedies are described, and details of their chemical constituents given.

Male erectile dysfunction or impotence affects 10-15% of all men, which includes the figure of one in three men over the age of 60.

Impotence is defined as the inability to have an erection that is rigid enough and be able to sustain it long enough to complete sexual intercourse. About 50% of all diabetic men experience impotence after the age of 55.

Impotence is not a disease, but a secondary condition brought on by other, primary causes. Primary dysfunction is rare (Merck).

**Causes of erectile dysfunction**

Male erectile dysfunction can be caused by a number of factors:

- Psychological (mood disorders): about 10%.
- Physical (organic impotence): about 85%.
- Mixed origin (both physical and psychological).
- Unknown origin: about 5%.

An erection is triggered by the release of chemical messages sent by the nervous system. This chemical message involves the release of nitric oxide (NO) in the corpus cavernosum during sexual stimulation. The nitric oxide subsequently activates the enzyme guanylate cyclase, which in turn increases the levels of cyclic guanosine monophosphate (cGMP), that produces smooth muscle relaxation in the corpus cavernosum to allow the inflow of blood.

The failure to initiate an erection may arise through spinal injury, radical pelvic surgery, multiple sclerosis, Parkinson’s disease and hormonal insufficiency. Poor blood flow into the penis and poor sustainability of an erection may be due to blocked arteries, hypertension, smoking, diabetes or high cholesterol levels. Endocrine diseases such as diabetes, low testosterone (which can be caused by an overactive pituitary gland producing too much prolactin) or thyroid hormone levels also have a negative effect on the quality of an erection (if at all). The over use of alcohol, tobacco or abuse of drugs can also lead to impotence.

**Treatment**

There are a number of commercially available synthetic preparations for the treatment of impotence.

The major drug to be launched worldwide is Viagra or Sildenafil citrate (ex Pfizer Laboratories) (Fig. 1).

It is interesting to note that this preparation is an indole alkaloid, and that similar structures can be found in certain plant materials (especially in the plants of the family Apocynaceae).

The Chinese herb of choice as a treatment for impotence is Horny Goat Weed (*Epimedium sagitattum*). The “Sexual Plant”, according to Chinese herbal legend, is a herb discovered by a goat herder, who observed that his goats became extremely sexually active after eating this particular plant. This herb strengthens sexual potential and has the ability to greatly reduce impotence. Analysis reveals a group of compounds in this herb that has an anti-platelet effect, which improves blood circulation.

Available are a variety of commercially available herbal treatments for impotence.

The sale of unlicensed preparations for the treatment of impotence is widespread, with advertisements appearing in newspapers, supplements and on the internet. Following are a few examples:

- Viagra. Ingredients: Damiana, Schizendra, Mate, Guarana, caffeine (max 250), tropical fruits, acids, sugar, preservatives (E211), colouring (E133), water and carbonation.
- Male Plus. Ingredients: Muria puama, Catuaba, Sarsaparilla, Damiana.
- Elixir of Maca. Ingredients: Maca (*Lepidium meyenii*), Yohimbe, Saw Palmetto (*Sabat serrulata*).

The use of a potpourri of ingredients is often justified by the producer with outlandish claims that are contrary to the guidelines recommended by the Medicines Control Agency (GN8). The targeting of a vulnerable section of the population is also contrary to accepted pharmaceutical practice.

These preparations often contain one

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**Figure 1: Sildenafil citrate.**

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**Horny Goat Weed.**

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or more traditional materials used for impotence, but also include “tonic” materials such as Ginseng (Panax ginseng), which has alternative effect, Guarana (Paullinia cupana) which is a rich source of tannin, Liquorice (Glycyrrhiza glabra) which is a natural source of sugars. Other, less justifiable materials, such as Saw Palmetto (cited for prostate conditions), Royal Jelly (which has no pharmacological action) and Capsicum (Piper nigrum) more often encountered as a topical rubifacient are also frequent components.

The lack of clinical evidence for these blended products, and the manner in which they are sold and marketed, tends to discourage any pharmacological trust that one might have in these materials.

**Erotic foods**

Women who eat chocolate have the highest levels of desire, arousal and satisfaction from sex. Those who have a daily intake of chocolate showed higher levels of desire than women who did not have this habit. Chocolate can have a positive physiological impact on a woman’s sexuality, and women who have a low libido could become more amorous after eating chocolate and this delight could be particularly medicinal for women who suffer from premenstrual tension. Work in this area was funded from a university research budget, not by the confectionery industry.

Theobromine (Fig. 2) can be useful for anti-depression treatment. Chocolate may possess natural analgesic properties and according to some sources eating high-fat, chocolate foods can trigger the brain’s production of natural opiates. There are two anandamidelike compounds in chocolate, N-leoylethanolamine and N-linoleoylethanolamine, which both delay the production of natural opiates. There are oils that irritate the skin and encourage skin action. Physical stimulant (provide a tonic effect).

**Topical rubefacients**

There are oils that irritate the skin and encourage skin flow to the surface of the skin in order to cool it. Oils that produce this effect are capiscum oil, ginger oil, wintergreen, black pepper and other hot peppery materials like mustard and horseradish. These will cause huge increases in blood flow and despite the obvious discomfort could induce topically a state of arousal in man. The major problem is that these materials can transfer during coupling and might be unacceptable and uncomfortable to the woman.

Many products rely on the application of lubricious oils, an act that in itself is extremely pleasurable. A commercial product declared the composition Hellanthus Annus (Sunflower), Prunus Dulcis (Sweet Almond), Commiphora Myrrh (Myrrh), Cananga Odorata (Ylang Ylang), Hyssopus Officinalis (Hyssop), Melissa Officinalis (Melissa), Citrus Bergamia (Bergamot), Rosa Damascena (Rose Absolute). This blend contained no rubefacient materials. There are also gels which include the typical aphrodisiac plants, but which probably would have no effect topically even when applied directly to the genitalia. A typical composition might be: distilled water, Aloe Vera gel, olive squalene, apricot kernel oil, vitamin C, extracts of Korean Red Ginseng, hawthorne berry, Ginkgo Biloba, Muira Pauma, Catuaba Bark, Cuscuta deed and many more in a formula which was said to be clinically proven.

**Study of ethnobotanical literature**

The literature surveyed has shown that there are many hundreds of plant materials cited for their use in the treatment of male erectile dysfunction. It is often not clear from the traditional use how these materials might act. However, in general they can be separated into several distinct groups:

**Psychological action**

- Mental stimulants (to combat tiredness).
- Psychotropic (to produce an abnormal state of reality).
- Sedatives (to allay stress and or have a calming effect).
- Inhaled.
- Phallic implication or placebo effect (having penile shape or form).

**Physical action**

- Induce physiological action on the corpus cavernosum.
- Physical stimulant (provide a tonic action).
- Replace deficiencies (e.g. oestrogenic, steroidal precursors, hormones, vitamins etc).
- Rubefacient action to increase blood flow to the tissue by topical application.

Objectives in the preparation of this article was to examine the many materials cited in the literature and to classify them where possible according to the groups above, and to examine the chemical composition of the pharmacologically active plants and to look for patterns and trends within those structures.

**Potential remedies from ethnobotanical and traditional use**

**Acanthaceae**

- Asystasia calycina – twigs are used [Burkhill, 1985].
- Blephasis edulis [Syn. Acanthus repens]– unspecified part of plant used [Jayaweera, 1981].
- Blephasis ciliaris – unspecified part of plant used [Duke].
- Crossandra infunduliformis.
- Hygrophila spinosa – seeds are used [Jayaweera, 1981; Watt & Breyer-Brandwijk], the plant is diuretic [Oliver-
Bever] and contains diastase, lipase and protease.

- *Justicia nasuta* – the root boiled in milk is employed [Jayaweera, 1981,1]. The roots contain rhinacanthin and are also rich in potassium salts.

- *Justicia pectoralis*.

- *Phaulopsis barteri* – part unspecified, but probably the leaves used [Burkhill, 1985].

- *Phaulopsis falcisepala* – the sap is used [Burkhill, 1985].

- *Phaulopsis imbricata* – the leaves are used [Burkhill, 1985].

- *Rhynacanthus communis*.

- *Rhynacanthus nasuta*.

- *Rhynacanthus rottlerianus*.

- *Ruellia albicaulis*.

The use of this family as aphrodisiacs is sparse in data and the action is likely due to the diuretic nature of these materials.

**Apocynaceae**

Many of this family are used in the treatment of oncolytic conditions.

- *Alstonia scholaris*.

  Akuammidine (Fig. 3) is present in *Alstonia scholaris* [Aphrodisiac], *Alstonia boonei* (Apocynaceae) [Aphrodisiac], *Aspidosperma quebracho-blanco* (Apocynaceae) [Syn. Schinopsis quebracho-lanco] [Aphrodisiac].

  Alstonidine – stereoisomer of serpentine (Fig. 4) is found in *Alstonia constricta* (Apocynaceae) [Aphrodisiac], *Rauwolfia vomitoria* (Apocynaceae) [Aphrodisiac], *Rauwolfia obscura* (Apocynaceae) [Aphrodisiac], *Vinca rosea* (Apocynaceae), *Strychnos spp.* (Loganiaceae) [Aphrodisiac].

- *Carissa edulis* Carissa edulis roots are used in the treatment of sarcoma and contain carissin (a cardenolide) [Oliver-Bever, 1986]. The leaves significantly reduced blood glucose levels in STZ (streptozotocin) diabetic rates during the first three hours of treatment. [El-Fiky et al]. The root sap is considered to restore virility in Ghana [Burkill, 1985].

- *Catharanthus roseus* (Madagascar Periwinkle) [Syn. Lochnera rosea, *Vinca roseus*] is traditionally used as a remedy for diabetes (commercial product called Vinculin), which is prepared from an infusion of the leaves [Wyk van Oudtshoorn van, Gericke, 1997]. The roots and twigs, which are also hypoglycaemic contain catharanthine, lochnerine and vindoline (indole alkaloids) [Oliver-Bever, 1986]. Other indole alkaloids include vincristine and vinblastine which are oncolytic (Hodgkin’s disease/lymphoma, childhood leukaemia, testicular teratoma) [Mann, 1989], and
reserpine and which are hypotensive and tranquillising.

Ajmalicine or Raubasine (Fig. 9) is found in Catharanthus trichophyllus (Apocynaceae), Catharanthus roseus (Apocynaceae) [Aphrodisiac], Catharanthus roseus (Apocynaceae) [Aphrodisiac].

Catharanthine (Fig. 10) is found in Catharanthus roseus (Apocynaceae) [Aphrodisiac].

Lochnericine (Fig. 11) is found in Vinca rosea (Apocynaceae), Catharanthus roseus (Apocynaceae) [Aphrodisiac].

Reserpine (Fig. 12) is found in Rauwolfia tetraphylla (Apocynaceae) [Aphrodisiac], Rauwolfia serpentina (Apocynaceae) [Aphrodisiac], Rauwolfia vomitoria (Apocynaceae) [Aphrodisiac], Rauwolfia caffra (Apocynaceae) [Aphrodisiac], Vinca minor (Apocynaceae).

Serpentine (Fig. 13) is found in Rauwolfia serpentina (Apocynaceae) [Aphrodisiac], Vinca minor (Apocynaceae), Corynanthe yohimbe (Rubiaceae) [Aphrodisiac].

Reserpine (Fig. 12) is found in Rauwolfia tetraphylla (Apocynaceae) [Aphrodisiac], Rauwolfia serpentina (Apocynaceae) [Aphrodisiac], Rauwolfia vomitoria (Apocynaceae) [Aphrodisiac], Rauwolfia caffra (Apocynaceae) [Aphrodisiac], Vinca minor (Apocynaceae), Strychnos spp. (Loganiaceae).

Ajmalicine may improve cerebral blood flow [Lawrence, 1994]. The hypoglycaemic alkaloids leurosine, vindoline and vindolinine were more potent than tolbutamide. However, it was suggested that these alkaloids be separated from the oncolytic materials present in the plant [Svoboda et al., 1964]. Also contains yohimbine.

Intraperitoneal injection of the total leaf alkaloids vinblastine and vincristine produced degenerative changes in the spermatogenic elements of the testes in animals and oligospermia in men. [Joshi & Ambaye, 1968; Bustos-Obregon & Fesito, 1974; Vilar, 1974; Cooke et al., 1978; Parvinen et al., 1978; Farnsworth & Waller, 1982].

- **Funtumia elastica**
  - Funtumia elastica (West African rubber tree): the latex is used for impotence [Abbiw, 1990]. The young leaves are mixed with those of Phyllanthus muellerianus (Euphorbiaceae) to improve male fertility. Possible source of strophanthin (usually obtained from Strophanthus species) (Fig. 14).

- **Holarrhena antidysenterica**

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| Figure 9: Ajmaline or Raubasine. |
| Figure 10: Catharanthine. |
| Figure 11: Lochnericine. |
| Figure 12: Reserpine. |
| Figure 13: Serpentine. |
| Figure 14: G-strophantline. |
| Figure 15: Raunescine. |
| Figure 16: Rescinnamine. |
| Figure 17: Reserpiline. |
Rauvolfia serpentina
Rauvescine (Fig. 15) is found in Rauwolfia tetraphylla (Apocynaceae) [Aphrodisiac], Rauwolfia spp. (Apocynaceae) [Aphrodisiac], Rauwolfia canescens (Apocynaceae) [Aphrodisiac].

Rescinnamine (Fig. 16) is found in Rauwolfia serpentina (Apocynaceae) [Aphrodisiac].

Reserpiline (Fig. 17) is found in Rauwolfia serpentina (Apocynaceae) [Aphrodisiac].

Rauvolfia vomitoria
Saba florida
Strophanthus gratus
Tabernanthe iboga

Tabernanthe iboga contains a psychoactive drug called ibogaine, which is an hallucinogen, stimulant and aphrodisiac [Richardson, 1988; Watson, 1993]. It is also recommended for the treatment of diabetes.

Ibogaine (Fig. 18) is found in Tabernanthe ibogaine (Apocynaceae) [Aphrodisiac], Evertamia hirta (Apocynaceae).

Vinca major
Akuammine (Fig. 19) is found in Picralima nitida (Apocynaceae) (Aphrodisiac), Vinca major (Apocynaceae) (Aphrodisiac).

Wrightia tinctoria

Wrightia tinctoria is cited as an aphrodisiac [Duke & Beckstrom-Sternberg].

Erythroxylaceae
Erythroxylum coca
Erythroxylum catuaba [Syn. Juniperus brasiliensis] or Catuaba

Hyacinthaceae
Scilla natalensis

Scilla natalensis – the bulb is used in decoction as an enema for female infertility and to enhance male potency and libido. The plant is said to contain saponins and cardiac glycosides of the bufadienolide type, e.g. Scillaren A. (Fig. 20).

Melianthaceae
Bersama abyssinica
Bersama abyssinica Fresen: the stem bark extract has been used as an aphrodisiac [Iwu, 1993]. It contains a mixture of cardenolides including abyssinol A, B, C, bersaldegenin, hellebrigenin (Fig. 21), and bufadienolide-O-acetate, as well as saponins, mangiferine, and gallic acid derivatives.

Bersama lucens
Bersama lucens is known as glossy bersama and the stem bark and/or roots are used to treat impotence and sterility [Wyk van; Oudshoorn van, Gericke, 1997]. A tincture of the bark is used to treat nervous disorders. The major active component is a toxic cardiac glycoside melianthugenin (Fig. 22).

Olacaceae

Liriosma ovata

Liriosma ovata Miers. is better known as Muira-puama and the dried roots contain esters of behenic and arachidic acids and lupeol, together with free lupeol, campesterol and b-sitosterol. These materials would be unlikely to account for the plants aphrodisiac activity, and thus it must be concluded that the active compounds are unknown [Wren, 1994]. Identification is confused, and the plant has been identified as Ananthaea virilis (Acanthaceae family) [Merck, 1940], others suggest that the plant is Psychotropical oxaloides Bentham and Psychotropical uncinatum Anselmino [Tyler, Brady & Robbers, 1988]. It is indicated for impotence [BHP, 1983] and is reported in Brazil to be one of the most powerful treatments [Wren, 1985].

Lupeol (Fig. 24) is found in Liriosma ovata (Olacaceae) [Aphrodisiac], Lupinus luteus (Leguminosae), Phyllanthus emblica (Euphorbiaceae) [Phyllanthus floribundus, Phyllanthus muellerianus, and Phyllanthus stolzianus are all Aphrodisiac].

The liquid extract of the plant is either taken internally in liquid extract • 10-60 drops [Wren, 1985].
• 0.5-5 ml liquid extract of root [Wren, 1994].
• 1-4 ml @ 3 t.p.d. [Merck, 1940].
• 2 tbsp in 1 pint water boiled for 15 min, 30 ml of decoction pre-intercourse [Watson].
• 30 g of bark in 2 cups vodka, infuse 2 weeks. 1 ounce pre-intercourse [Watson].

Figure 18: Ibogaine.

Figure 19: Akuammine.

Figure 20: Scillaren A.

Figure 21: Hellebrigenin.

Figure 22: Melianthugenin.

Figure 23: Lupeol.
Figure 24: Harmine.

Figure 25: Ajmaline.

Figure 26: Typhasterol.

- Muira puama (Syn. Psychotropical uncinatum, or P. olacoides)
- Olax subscorpioidea
- Psychotropical olacoides
- Ximenia americana L., also known as Wild Olive [Abbiw, 1990] or Olax [Lewis & Elvin-Lewis, 1977].

**Rubiaceae**
- Avranthe cladantha
- Brenania brielly
- Catunaregam nilotica
- Chicoocca alba [Seafirth, 1988]
- Chione venosa
- Corynanthe pachyceras

- Corynanthe yohimbe
- Corynanthe yohimbe, also known as Yohimbe, contains the alkaloid yohimbine (also known as quebrachine, aphrodisin and cortine) which resembles reserpine (but with antiadrenaline action and effect on heart muscle) [Evans & Trease, 1989]. It is an analogue of harmine (Fig. 24) and so can have mild hallucinogenic properties [Sporerke, 1990]. Harminie itself is cited for its aphrodisiac properties [Duke & Beckstrom-Stemnberg]. It also has local anaesthetic properties [Greenish, 1929]. The dose is important, since too high a dose can lead to depression [Wren, 1994]. For yohimbe structure see Catharanthus lanceus (already mentioned).

Yohimbine has been used as a pharmacological probe for the study of 2-adrenergic receptor and used therapeutically as an adrenergic blocking agent [Merck, 1996], but does not affect 3-adrenergic receptors [Martindale, 1967]. It has also been found that it causes pre-synaptic inhibition of noradrenergic neurons [Costa & Elvin-Lewis, 1977]. Wild Olive [Abbiw, 1990] or Olax [Lewis, 1986] contains the alkaloid yohimbine, isoxsuprine and pentoxifylline used as an adrenergic blocking agent [Merck, 1940; Leung, 1980; Hutchens, 1973, 1992].

- Typhaceae

- Turnera diffusa (Fig. 27)


The major pharmacological component is declared as a bitter principle damianin (7%), although extensive searches have failed to identify the structure of this material. The leaf or stem is used. The plant also contains gum (13.5%), starch (6%), sugars, tetrophylin B (0.26%, a cyanogenetic glycoside), arbutin (up to 0.7%, a phenolic glycoside), and tannins (3.5%, unspecified). A volatile oil is also present (0.5-1.0%). [Newall, Anderson and Phillipson, 1996]. The volatile oil contains at least 20 components from which the sesquiterpenes d-Cadinene (10%), copaene (3%) and calamenene (3%), the sterones c-4-pine (2%) and β-pinene (1%), and also thymol (4%) have been identified. 1,8-cineole and p-cymol were reported, but not found in subsequent investigations [2,3]. Small amounts of triacontaine CH3(CH2)3(CH3)2CH2OH, β-sitosterol and gonzalitosin 1 (5-hydroxy-7,3',4'-trimethoxyflavone) are also present. [Bradley, 1992]

The origin of the plant being used was in the 1870s when an American pharmaceutical firm Helmnick and Company, of Washington DC, introduced the plant as a “powerful aphrodisiac to improve the sexual ability of the enfeebled and aged, and apparently to have a specific effect upon all the organs of the pelvis, giving increased tone and activity to all the secretions in that vicinity,” [Creegin & Philpott, 1990]. The National Dispensatory of 1884 noted that damiana had been widely and boldly advertised as a remedy for sexual impotence, “but there is not the slightest reason for confiding in this statement of its virtues.”

Ecdysteroids. There are indications that these phytoestrogens can be metabolised in mammals to either androgen or oestrogen-like substances.
The British Medical Association was very scathing of many of the commercial preparations. As an example, a product "Therapion" (the expiring lamp of life lighted up afresh) a recuperative medicine contained a plethora of ingredients including liquorice, gentian, damiana and unidentified alkaloid [BMA, 1909]. "Cocaphos" was marketed as a nerve tonic and recuperative stimulant contained (undeclared) damiana, but little or no cocoa as implied in the label. Another "Murrays Combined Treatment", claimed permanent cure for spermatorrhoea, impotence and other disorders also contained damiana [BMA, 1912].

The plant has been described as having testosterone-mimetic action that generally provides a stimulating and enhancing influence on those functions related to the male reproductive system [Mills, 1989; Hoffmann, 1996]. It has been speculated that it acts through its mildly irritant volatile oil causing increased peristalsis and mild stimulation of the genito-urinary tract during excresion [BPC, 1923]. Numerous references mention the use of the plant for the treatment of nervous tension and depression as a general tonic [Talalaj & Czechowicz, 1989; Mitton & Mitton, 1976]. Another reference cites the use with oafs for general depression, and if anxiety is a problem, then combined with skullcap or wood betony [Ody, 1993; Hoffman, 1998]. The somewhat outdated term "neurasthenia" has been used to describe the overall indication for damiana [Powell, 1981]. Hypoglycaemic activity and CNS depressant activity have also been reported [Newall, Anderson and Phillipson, 1996].

Studying the literature, one is left with certain clues as to the true beneficial composition of the preparation. Coca has been proposed as one additive in some of the earlier preparations [Tyler, Brady & Robbers, 1988].

Adulteration could have been made with other plant materials as well. "Tired businessmen dropped in for a tonic made out of Kola (Cola spp.) – as stimulating as cocaine – and Damiana (Turnera diffusa var., aphrodisiaca) which, as its official name suggests, is believed in Mexico to be especially good for tired businessmen." [Greggs, 1987]

Nonetheless, numerous preparations exist commercially (see above also), such as Dorwest Damiana and Cola tablets, Frank Roberts Strength Tablets, Gerard House Vig-a-Tea, Potter's Elixir of Damiana and Saw Palmetto etc [Ody, 1996]. Though in reality, these products are best considered as they are in Mexico – as a tea substitute [Bellamy & Pfister, 1992].

**Vitaceae**

*Rhicissus tridenta*

*Rhicissus or Wild Grape: the roots or tubers are used for infertility and dysmenorrheoa. The components are likely to be phenophenos, anthocyanins and proanthocyanidins.*

**Conclusions**

It has been shown that the presence of indole alkaloids is most likely to be the future source of a herbal Viagra. This work continues. The use of these materials topically will be unlikely to have any effect on libido or the male erection, but may have effect when taken orally.

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