



## Aphrodisiac agents from medicinal plants: an ethnopharmacological and phytochemical review.

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Received on:08-12-2011; Revised on: 27-12-2011; Accepted on:15-01-2012

### ABSTRACT

This article provides a comprehensive review of medicinal flora inhabiting throughout the world regarding their traditional usage as aphrodisiacs. Aphrodisiacs are substances that stimulate/increase sexual desire and performance.

**Key words:** Anticancer, Antioxidant, BHA, FRAP, *Operculina turpethum*

### INTRODUCTION

Biodiversities of plants can be a great source of drugs. The long history of folklore medicines demonstrates the potential of plants as sources of lead compounds. Traditionally employed, indigenous plant based herbal medicines have been popular from time immemorial, and recently have commanded major attention worldwide due to their potential nutraceutical values<sup>1-4</sup>. There are numerous reports of aphrodisiac activity exhibited by plants<sup>5-7</sup>.

#### *Allium tuberosum* Rottl. ex Spreng (Chinese chive, Liliaceae):

Chinese chive is one of the daily edible green vegetables for Chinese. The scientific name is *Allium tuberosum* Rottl. ex Spreng (Chinese chive, Liliaceae) which is distributed all over mainland of China and used as food and in medicine. It is widely cultivated in China, the seeds have been used in traditional Chinese medicine for treating both impotence and nocturnal emissions<sup>8</sup>. Steroidal saponins, alkaloids and amides have been reported from the seeds of this plant<sup>9-18</sup>. The *n*-BuOH extract of *Allium tuberosum* seed was evaluated on the sexual behavior of male rats. Sexually active and inactive animals showed increased and improved sexual performance, when administering *Allium tuberosum* seeds extract (500mg/kg body weight) for a period of 30–40 days<sup>19</sup>.

#### Ginseng (*Panax quinquefolium* and *Panax ginseng*) (Araliaceae).

Ginseng is the root of the perennial herbs of *Panax quinquefolium* which grows in United States and Canada known as American ginseng and *Panax ginseng* known as Korean or Chinese ginseng, is indigenous to the mountainous forests of eastern Asia. Ginseng has been used in eastern Asia for more than 500 years as a tonic and to promote health and longevity. Traditionally, ginseng is used to improve stamina, concentration, healing process, stress resistance, vigilance and work efficiency in healthy individuals as a short term use and to improve well-being in debilitated and degenerative conditions especially those associated with old age as a long term use<sup>20</sup>. Ginseng contains a series of tetracyclic triterpenoid saponins, ginsenosides, derivatives of 20(S)-protopanaxadiol, and derivatives of 20(S)-protopanaxatriol<sup>21</sup>. Ginseng is an essential constituent in traditional medicine for the treatment of sexual impotence. This effect reflects the tonic and restorative properties of this plant. Experimental studies have indicated that ginsenosides relax rabbit corpus cavernosum and this effect is mediated by nitric oxide, released from endothelial or neural cells, account for the aphrodisiac effect of *Panax gin-*

*seng*<sup>22</sup>. Clinical studies showed Korean red ginseng to be effective in erectile dysfunction (changes in penile rigidity and girth, libido and patients satisfaction) in 30 patients<sup>23</sup>.

#### *Butea frondosa* Koen. ex Roxb. (Papilionaceae):

*Butea frondosa* Roxb is a small tree which grows to a height of 12 to 15 meters. It truly stands out like a flame in the forest with its orange coloured flowers very often it has a crooked trunk and irregular branches<sup>24</sup>. The phytochemical investigation *Butea frondosa* leaves revealed the presence of hydrocarbons (eicosane 22.5%), triterpenes ( $\beta$ -amyryn 20.5%) and sterols (campesterol 3.2%,  $\beta$ -sitosterol 2.4%), lauric (4.8%), myristic (3.3%), palmitic (24.9%), linoleic (36.8%) and linolenic (5.1%) acids. They are also rich in flavonoids such as vicenin II, vitexin chrysoeriol 7-O- $\beta$ -D-glucuronic acid 6, 8-di-Crhamnosyl apigenin and luteolin<sup>25</sup>. Aqueous bark extract of *B. frondosa* at doses of 400 mg/kg body wt was investigated for the aphrodisiac activity in male rats and found to possess increased and improved sexual performance in sexually active and inactive animals when administered for a period of 21 to 28 days<sup>26</sup>.

#### *Montanoa tomentosa*

Cihuapatli, the Mexican zoapatle (*Montanoa tomentosa*) has an extensive ethnomedical history of use as a traditional remedy for reproductive impairments. New sesquiterpene lactones<sup>27</sup> and Tomexanthin, an oxepane diterpene<sup>28</sup> has been reported from this plant. Volatile organic compounds have also been reported from leaves and flowers of this plant<sup>29</sup>. The aphrodisiac property of aqueous extract of *M. tomentosa* was reported by investigating on the expression of male rat sexual behavior in sexually experienced animals, on sexually inactive rats, i.e., noncopulators, and on animals with local anesthetization of the glans penis. The study confirmed the ability of the crude extract of the plant to enhance male sexual behavior expression in sexually active rats and to promote sexual activity in sexually inactive male animals<sup>30</sup>.

#### *Caesalpinia benthiana* (Mezoneuron benthianum) (Fabaceae)

*Caesalpinia benthiana* (Baill.) Herend. and Zarucchi (=Mezoneuron benthianum Baill.) (Caesalpinaceae)<sup>31</sup>. It is a tropical plant successfully used in African traditional medicine for the treatment of erectile dysfunction. Two cassane diterpenoids, benthaminin 1 and 2 were isolated and reported from this plant<sup>32</sup>. The aphrodisiac properties of this plant were evaluated by observing the sexual behaviour of male rats, on administration of aqueous extract of *C. benthiana* (AECB) orally (50 mg/kg body weight) by gavage. Latent times of observation, intromission and ejaculation, mounting behaviour, number of intromissions and mating performances were evaluated. Male rats in the presence of both receptive and non-receptive females showed improved sexual performance when treated with AECB. Observation at each

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experimental time in the presence of a receptive female rat exhibited that all sexual parameters were significantly enhanced compared to untreated rats<sup>33</sup>. ***Trichopus zeylanicus*, Gaerten (Trichopodaceae).**

*Trichopus zeylanicus* Gaerten Trichopodaceae, is a small glabrous herb growing in the Agasthyar hilly forests of Kerala, India. This plant is known as "Arogyappacha" the greener of health, in this area and peoples use this plant as a health tonic and rejuvenator<sup>34</sup>. Reports on the phytoconstituents present in this plant are not available. *Trichopus zeylanicus* leaf (ethanol extract) when administered to male mice stimulated their sexual behavior by showing increase in number of mounts and mating performance. Oral administration of a single dose (200 mg/kg) was effective, daily administration of the extract for 6 days was found to be more effective. The pups delivered by the mice treated with the extract were found to be normal in growth, litter size and sex ratio. The water as well as *n*-hexane extracts of the plant leaf were found to be inactive<sup>35</sup>.

#### **Tongkat Ali (*Eurycoma longifolia* Jack) (Simaroubaceae)**

*Eurycoma longifolia* Jack (Tongkat Ali, Family, Simaroubaceae) is one of the most popular tropical herbal plants, indigenous to South-East Asian countries like Malaysia, Indonesia, and Vietnam. The root extract of this plant have been used in indigenous traditional medicines for its antimalarial, anti-pyretic, antiulcer, cytotoxic and aphrodisiac properties<sup>36-38</sup>. Number of chemical compounds such as canthin-6-one alkaloids,  $\beta$ -carboline alkaloids, quassinoids, quassinoid diterpenoids, Eurycomaoside, tirucallane-type triterpenes, squalene derivatives, biphenylneolignans, eurycolactone, laurycolactone, and eurycomalactone have been isolated and reported from the roots of this plant<sup>39-44</sup>. Four quassinoids diterpenoid, viz., eurycomalide A, eurycomalide B, 13B, 21-dihydroxyeurycomanol, and 5a, 14B, 15B-trihydroxyklaineanone have been isolated and reported from this plant<sup>45</sup>. The effects of *E. longifolia* roots extracts (chloroform, methanol, water and butanol) were reported on the libido of sexually experienced male rats treated with various doses (200, 400 and 800 mg/kg BW, 2 times daily for 10 days). A dose-dependent increase in mounting frequency of the treated animals with 400 mg/kg of chloroform, methanol, water and butanol fractions were observed<sup>46</sup>. The aphrodisiac effect of fractions of *E. longifolia* roots (0.5 g/kg) was reported in non-copulator male rats using an electrical cage<sup>47</sup>. Male rats treated with 800 mg/kg of *E. longifolia* increased orientation activities towards the receptive females (anogenital sniffing, licking and mounting) accompanied with the increased genital grooming towards themselves and restricted movements to a particular area of the cage<sup>48</sup>.

#### ***Tinospora Cordifolia* Miers. (Menispermaceae).**

*Tinospora cordifolia* Miers. (Menispermaceae) popularly known as Amrita in Sanskrit, has been used for several centuries in Ayurvedic medicine for the treatment of various ailments. It is an important medicinal plant used in traditional system of medicine<sup>49,50</sup>. The major phytoconstituent in *Tinospora cordifolia* include tinosporine, tinosporide, tinosporaside, cordifolide, cordifol, heptacosanol, clerodane furano diterpene, diterpenoid furanolactone tinosporidine, columbin and b-sitosterol. Berberine, Palmatine, Tembertarine, Magniflorine, Choline, and Tinosporin are reported from its stem<sup>51,52</sup>. Tinocordiside, a cadinane sesquiterpene glycoside consisting of a tricyclic skeleton with a cyclobutane ring, has been isolated and reported from this plant<sup>53</sup>. A new clerodane furano-diterpene has been reported from the stems of *Tinospora cordifolia*<sup>54</sup>. Tinocordifolin, a new daucane-type sesquiterpene, along with tinocordifolioside and N-trans-feruloyl tyramine has been isolated from the stem of the plant<sup>55</sup>. Aphrodisiac potential of this plant has been reported on administration of hydroalcoholic extract of *Tinospora cordifolia* stem (400 mg/kg body weight) on male wistar albino rats based on the significant increase in number of mounts and mating performance<sup>56</sup>.

#### ***Crocus sativus* Linn (Iridaceae)**

*Crocus sativus* L. (Iridaceae) is an autumn-flowering plant extensively grown in the Mediterranean basin and Near East<sup>57</sup>. The dried red stigmas of *C. sativus*, saffron has been used as a flavouring and colouring agent and is currently considered the world's most expensive spice. Saffron consists of complex mixture of volatile and non-volatile compounds that is responsible for its overall aroma and flavour<sup>58</sup>. The major components of saffron are the apocarotenoids cis- and trans-crocins, picrocrocin and its degradation product, the odour-active safranal<sup>59</sup>. Aphrodisiac activities of aqueous extract of *Crocus sativus* stigma and its constituents, safranal and crocin, has been reported in male rats when treated with the aqueous extract (80, 160 and 320 mg/kg body wt.), crocin (100, 200 and 400 mg/kg body wt.), safranal (0.1, 0.2 and 0.4 ml/kg). Crocin, at all doses, and the extract, at doses of 160 and 320 mg/kg body wt., increased Mounting frequency (MF), intromission frequency (IF), erection frequency (EF), and reduced mount latency (ML), intromission latency (IL) and ejaculation latency (EL). Safranal did not show aphrodisiac effects<sup>60</sup>.

#### ***Microdesmis keayana* J. Leonard (Pandaceae)**

*Microdesmis keayana* (Pandaceae) is an African tropical plant, the stem bark, leaves and roots have numerous medicinal uses<sup>61</sup>. Three new N1,N5,N10-tris(4-hydroxycinnamoyl) spermidines were isolated and reported from methanolic root extract of this plant<sup>62</sup>. Two new quinoline and tris(4-hydroxycinnamoyl)spermine derivatives has been isolated and reported from the hydromethanolic root extract of *Microdesmis keayana*<sup>63</sup>. Effects of two major alkaloids of *Microdesmis keayana* roots, keayanidine B and keayanine, on vascular parameters of erectile dysfunction has been reported<sup>64</sup>. Effect of the aqueous extract and two major alkaloids of *M. keayana* were reported to stimulate all sexual parameters in male rats' sexual behavior<sup>65</sup>.

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**Source of support: Nil, Conflict of interest: None Declared**