



Ayurvedic Naturoceuticas: Evidence Based Data and Clinical Implications. Part IV

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General Note



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1. INTRODUCTION

Ayurveda is a several millennia old Indian medical system. Data from experimental, epidemiological and clinical studies provide compelling evidence that several ayurvedic naturoceuticals not only provide prophylactic and therapeutic activity against several diseases, but may actually improve general health and promote longevity. These include herbs, oils, spices, plants, minerals and trace amounts of heavy metals. Although widely used in India, firm scientific evidence for their effectiveness has been lacking due to the small and often improperly done clinical trials. However more expansive and rigorous research is now being done, providing evidence based data on the effectiveness and safety of these natural products. In the United States, Ayurvedic medications are regulated as dietary supplements. The final part of this four part series reviews the last seven popular ayurvedic supplements.

2. DISCUSSION

The last section of the four part article looks at cumin, garlic, ginger, gokshura, guduchi, isabgol and yashtimadhu. A review of all citations on PubMed regarding these naturoceuticals was done. We found entries as follows: cumin: 187 entries dating back to 1854; garlic: 4156 entries dating back to 1928; ginger: 1794 entries dating back to 1936; isabgol: 712 entries dating back to 1938; *tinospora cordifolia* (guduchi): 200 entries dating back to 1986, *tribulus terrestris* (gokshura): 252 entries dating back to 1951 and yashtimadhu (licorice): 2908 entries dating back to 1946; Other pertinent scientific articles and studies with evidence based data were also reviewed.

2.1 Cumin

Cumin (*Cuminum cyminum*) is a flowering plant (Family Apiaceae). Its oil has distinctive flavor and strong, warm aroma, and is commonly used in many world cuisines. The seeds, both whole and ground, are often used as a flavoring ingredient in cheeses, breads, curry powder and chili powder. This abstract reviews evidence based prophylactic and therapeutic potential of cumin seeds in human ailments.

2.1.1 Evidence Based Data

Cumin has been used as a carminative, eupeptic, antispasmodic, astringent, antiseptic, purgative, abortive, antihypertensive and galactagogue in several traditional medicines for several millennia. (Ahmad et al, 2013) It is also used in the treatment of mild digestive disorders such as bloating, flatulence, colic, dyspepsia and diarrhea. (Johri, 2011) It has also found therapeutic use in epilepsy, toothache and other conditions requiring analgesia, bronchopulmonary disorders and to improve liver function. (Joshi, 2000) It has also been used to treat scorpion bites. In animal studies it has been found to have anti-oxidant and immunomodulatory properties. (Bettaieb et al, 2010; Chauhan et al, 2010) It appears to function as an antidiabetic, antibacterial, antineoplastic, estrogenic, anti-osteoporotic, adaptogenic, neurotropic and hypolipidemic actions. (Johri, 2011) Besides nutrients such as vitamins, amino acids and minerals, cumin is also rich in many bioactive compounds including cuminaldehyde, limonene, pinenes, 1,8-cineole, terpinenes, safranal and linalool and phenolic substances. (Bettaieb et al, 2010, El-Savi et al, 2002)

2.1.2 Clinical Implications

Animal studies provide strong evidence that cumin seeds and its *nigella sativa* oil have significant medicinal properties. However, there is a marked lack of studies in human subjects. Robust clinical studies are needed to justify its use for its promising gastrointestinal, antimicrobial and anti-cancer effects.

2.2 Garlic

Garlic (*Allium sativum*) is a species in the onion genus, *Allium*. It is commonly used in cooking. It is often added to bread, pasta and vegetables as a seasoning or condiment. It is also pickled and smoked. Commercially it is available in many forms including garlic powder, tablets, oil of steam-distilled garlic, oil of oil-macerated garlic, ether-extracted oil of garlic, and aged garlic extract. This abstract reviews evidence based prophylactic and therapeutic potential of garlic in human ailments.

2.2.1 Evidence Based Data

Garlic has been documented to have many potential therapeutic effects, including cardioprotective, antibiotic, anticancer, antioxidant, immunomodulatory, anti-inflammatory, hypoglycemic and hormone-like effects. (Reuter et al, 1996) Animal and human studies with garlic have demonstrated multiple beneficial cardiovascular effects by reducing blood pressure, inhibiting platelet aggregation, enhancing fibrinolytic activity, reducing cholesterol and triglyceride synthesis and protecting the elastic properties of the aorta and peripheral arteries. It stimulates nitric oxide generation and reduces inflammation. (Dhawan et al, 2004) Clinically this results in a decrease in unstable angina, peripheral artery disease and progression of coronary calcification. (Ackermann et al, 2001; Rahman et al, 2006; Brace, 2002; Ried et al, 2013) Garlic also has cancer anti-proliferative effects. This property is due primarily from its oil-soluble compounds such as diallyl sulfide (DAS), diallyl disulfide (DADS), diallyl trisulfide (DATS) and ajoene. (Yi et al, 2013; Tsubura et al, 2011) It also exhibits antibacterial effects against a wide range of bacteria. (Houshmand et al, 2013) Garlic intake may also help protect against insect bites. (Stjernberg et al, 2000) and has shown antifungal activity. (Shuford et al, 2005) Proven adverse effects are minimal. Excessive garlic intake may result in malodorous breath and body odor. Occasionally flatulence, esophageal and abdominal pain, allergic reactions, and bleeding can occur. Garlic is rich in thiosulfates and many other metabolites, including γ -glutamyl peptides, scordinins, steroids, terpenoids, flavonoids and other phenols, all with bioactivity.

2.2.2 Clinical Implications

Garlic holds promise as a complimentary cardioprotective naturoceutical. Larger clinical studies with standardized preparations are needed to conclusively demonstrate a reduction in cardiovascular morbidity and mortality with this natural bulb. Experimental and animal studies also suggest an anti-proliferative effect against several cancers.

2.3 Ginger

Ginger is the underground stem, or rhizome, of the plant *Zingiber officinale* Roscoe. Its main use is culinary – it is used as a common kitchen spice, cooked with many food dishes, pickled, steeped in boiling water to make ginger tea and also used to make candy and wine. This abstract reviews evidence based prophylactic and therapeutic potential of ginger in human ailments.

2.3.1 Evidence Based Data

Ginger rhizomes have been used for a wide range of medical ailments including arthritis, asthma, diabetes, dementia, fever, hypertension, nervous disorders, toothache and stroke. (Hanaidka et al, 2013) Ginger is also shown to be effective in several gastrointestinal ailments and in preventing gastric ulcers induced by drugs, stress and H pylori. (Haniadka et al, 2013) It has chemopreventive and chemotherapeutic effects. (Kundu et al, 2009) It also helps protect normal tissues against radiotherapy side effects (Baliga et al, 2012) and reduces nausea associated with chemotherapy (Hanaidka et al, 2012) and pregnancy. (Ding et al, 2013) The gingerols and shogaol in ginger generate an antihyperglycemic effect in both animals and humans. Ginger affects insulin release and improves carbohydrate and lipid metabolism and protects against diabetic complications. (Li et al, 2012) Ginger has shown to have hypolipidemic, anti-thrombotic, anti-inflammatory, hypotensive, anti-oxidative and anti-platelet effects, suggesting an anti-atherogenic role in cardiovascular protection. (Nicoll et al, 2009) The health benefits of ginger are related to its ingredients such as gingerols, shogaols, paradols, and volatile constituents like sesquiterpenes and monoterpenes. (Butt et al, 2011)

2.3.2 Clinical Implications

The best available evidence suggests that ginger is a safe and effective complementary treatment for gastrointestinal disorders and chemotherapy and pregnancy related nausea. It may also play a role in the treatment of diabetes mellitus and cardiovascular disorders.

2.4 Gokshura

Tribulus terrestris (*Gokshura in Ayurveda*) belongs to the family, Zygophyllaceae. It is a small prostate flowering plant with roundish five cornered seeds covered with hard prickles. It is found in the temperate and tropical regions of the world.

2.4.1 Evidence based data

Tribulus terrestris has been used in ayurveda and other folk medicine for multiple therapeutic actions, including as an aphrodisiac, analgesic, diuretic, astringent, abortifacient, diuretic, anti-urolithiasis and general tonic. (Majeed et al, 1988). It has also been touted to increase athletic performance. Its main use in Ayurveda has been for treatment of sexual dysfunction in males. (Adaikan et al, 2001) In animal studies in rats, it has been shown to improve sexual function by increasing testosterone, dihydrotestosterone, and dehydroepiandrosterone. (Gautaman et al, 2008, Singh et al, 2012) Increased nitric oxide release from the nerve endings innervating the corpus cavernosum appears to be the physiologic mechanism. (Gauthaman et al, 2003) It has also shown some benefit in oligozoospermia related infertility. (Sellandi et al, 2012) However human studies have failed to find an increased sexual response, (Neychev et al, 2005) or an increase in strength or muscle size. (Antonio et al, 2000) Some studies indicate that it has diuretic properties, (Chopra et al, 1958) and this in turn may result in antihypertensive effects. (Murthy et al, 2000) Human studies have documented a decrease in angina, probably from a vasodilatory action on the coronary arteries. (Wang et al, 1990) This vasodilator action appears to be related to its saponin content. (Arcasoy et al, 1998) Experimental studies also demonstrate antibacterial and antifungal activity. (Firas et al, 2008) Its main bioactive component is protodioscine. Side effects are rare, and an occasional stomach upset with its use can be counteracted by taking it with food.

2.4.2 Clinical Implications

Tribulus terrestris may improve sexuality, and may have antihypertensive and anti-angina effects. However most of the data is based on animal and in vitro studies, and therapeutic validation in humans requires further research.

2.5 Guduchi

Tinospora cordifolia commonly called "Guduchi" in Sanskrit, belongs to the family Menispermaceae. It is deciduous climbing shrub with heart shaped leaves, greenish yellow flowers and red fruits. It is found at higher altitude areas of India, Myanmar and Sri Lanka. (Rana et al, 2012) This brief article reviews evidence based prophylactic and therapeutic potential of guduchi in human ailments. Its use is very popular in Ayurvedic medicine, especially as a rasayana herb to detoxify the body and help increase resistance to stress, anxiety, and illness.

2.5.1 Evidence based data

In ayurveda guduchi is used as a general tonic and also for its anti-inflammatory, anti-eczema, anti-psoriatic, analgesic, anticholinesterase, anti-malarial, anti-leprotic and gastrointestinal protective effects. (Panchabhai et al, 2008) Its adaptogenic properties are attributed to its diterpene compounds, polyphenols, and polysaccharides. (Singh et al, 2003) A study in humans indicated a beneficial effect in allergic rhinitis. (Badar et al, 2005) Experimental and animal studies indicate that guduchi also exhibits antidiabetic properties (Sangeetha et al, 2013) and may provide protection against hyperalgesia in diabetic neuropathy (Nadig et al, 2012) and liver and kidney damage. (Prince et al, 2004) It has beta-Ecdysone, which has demonstrated therapeutic value in the prevention and treatment of osteoporosis and osteoarthritis. (Kapur et al, 2010) It also has immunomodulatory active compounds (Sharma et al, 2012). Also anti-tumor (Dhanasekaran et al, 2009) and radiosensitizing effects. (Rao et al, 2008) Other documented effects are anti-microbial, anti-HIV, antioxidant and anti-toxic. (Saha et al, 2012) Bioactive alkaloids, steroids, diterpenoid lactones, aliphatics, and glycosides are present in different parts of the plant body, including root, stem, and whole plant. (Upadhyay et al, 2010) Guduchi is safe although rare constipation has been reported with prolonged use.

2.5.2 Clinical Implications

Guduchi appears to have a promising role as an anti-allergic and anti-arthritis agent in humans. Its anti-diabetic and anti-cancer activities need to be further studied in humans.

2.6 Isabgol

Isabgol or psyllium is a soluble fiber that is obtained from a shrub called *Plantago ovata*. The seeds of this plant are used to produce mucilage, which absorbs excess water while stimulating normal bowel elimination. The mucilage of isabgol is used as a super disintegrant in many sustained release drug formulations. This abstract reviews evidence based prophylactic and therapeutic potential of isabgol in human ailments.

2.6.1 Evidence Based Data

It helps increase stool frequency in patients with constipation. It has been found to decrease diverticular disease and irritable bowel syndrome. Its actions help reduce metabolic risk factors such as obesity, dysglycemic responses to food intake, hypercholesterolemia, hypertriglyceridemia, hypertension and inflammation. This helps reduce metabolic syndrome, and cardiovascular disease. It is estimated that increased fiber intake as a dietary supplement has contributed to the reported 30% decline in death rate from coronary artery disease observed over the past 15 years. Isabgol can cause choking if taken without adequate water as it thickens in the throat. Rare cases of an allergic reaction to psyllium have also been reported.

2.6.2 Clinical Implications

Evidence based data provides strong evidence that increased soluble dietary fiber or psyllium supplementation is associated with cardiovascular protection. It is also an important complementary nutraceutical for the treatment of constipation, diverticulosis and irritable bowel syndrome.

2.7 Yashtimadhu

Glycyrrhiza glabra Linn. or licorice, is a purple and white flowering perennial, with sweet tasting roots. It is native of the Mediterranean region and central and southwest Asia. Known as mulethi or yastimadhu in India, it is commonly sold as dried roots for medicinal use. In China it is used as a culinary spice. In the West it is a common ingredient in candies or sweets. It is also used as a flavoring in soft drinks, and in medicines to disguise unpleasant flavors. It is also used in the cosmetic industry.

2.7.1 Evidence Based Data

Licorice root has been used for millenia in Egyptian, Greek, and Roman times in the West and China, Japan and India (Shibata, 2000) for a wide variety of medical ailments. Recent research finds that licorice root demonstrates anti-inflammatory, anti-diabetic, anti-malarial, anti-ulcer, antioxidant, anti-tumor, immunomodulatory, hepatoprotective, cardioprotective effects and has antimicrobial and anti-viral properties. (Ming et al, 2013, Fu et al, 2013) Other uses include therapeutic benefits in hepatitis C, and pulmonary and skin diseases. (Asi et al, 2008) It also plays a therapeutic role in the prevention and treatment of oro-dental diseases such as caries, periodontitis, oral thrush and aphthous ulcers, (Reitz, 2012)) due to its action on oral microbial agents and host immune responses. (Messier et al, 2012) Licorice is also useful as an antitussive agent (Anderson, 1961) and may have some value as an antiviral agent for the treatment of viral upper respiratory tract infections and hepatitis. (Fiore et al, 2008) Research also documents gastroprotective effects, due to increased mucous and decreased acid production, and inhibition of *Helicobacter pylori*. (Wittschier et al, 2009) Other gastrointestinal uses are as an antispasmodic in irritable bowel syndrome and Crohn's disease. Due to its effects on the mineralocorticoids, licorice may promote retention of sodium and water and may raise blood pressure. (Heikens et al, 1995) The bioactive constituents of licorice include triterpene saponins, flavonoids, isoflavonoids and chalcones. Glycyrrhizic acid is the main biologically active component (Asi et al, 2008; Gao et al, 2009).

2.7.2 Clinical Implications

Licorice appears to have beneficial effects as an antitussive and oro-dental and gastrointestinal protective agent. However clinical studies are lacking.

3. CONCLUSIONS

Ancient medicine was based on naturopathic principles, and recent well organized clinical trials are providing evidence based legitimacy to these ancient claims. This four part article evaluates twenty eight popular ayurvedic nutraceuticals (ayur-ceuticals) which have been garnering the medical interest and appreciation they deserve. However, more clinical studies need to be done, to define doses and investigate side effects, so that more targeted guidelines are made available for their clinical integration.

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