



Ayurvedic Naturoceuticals: Evidence Based Data and Clinical Implications. Part III

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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 third part of this four part series reviews another seven popular ayurvedic supplements.

2. DISCUSSION

This section of the four part article looks at saffron, shatavari, shilajit, triphala, turmeric, tamarind and terminalia arjuna. A review of all citations on PubMed regarding these naturoceuticals was done. We found entries as follows: saffron: 737 entries dating back to 1946; shatavari: 13 entries dating back to 1969; shilajit: 32 entries dating back to 1965; tamarind: 364 entries dating back to 1945 ; terminalis arjuna: 141 entries dating back to 1982; triphala: 84 entries dating back to 1963 and turmeric: 2554 entries dating back to 1945. Other pertinent scientific articles and studies with evidence based data were also reviewed.

2.1 Saffron

Saffron is derived from the dried stigmas of the plant *Crocus sativus* (Family Iridaceae). It is known as the world's most expensive spice, and is used in cooking as a seasoning and coloring agent. It is also used in pharmaceuticals, cosmetics, perfumery, and textile dye-producing industries. (Gohari et al, 2013) Its rich golden yellow hue comes from a carotenoid, crocin. Its potential prophylactic and therapeutic activity against several diseases has been known for centuries. This abstract reviews evidence based prophylactic and therapeutic potential of saffron in human ailments.

2.1.1 Evidence Based Data

Traditional ayurveda ascribes anti-carcinogenic, anti-mutagenic, anti-oxidant, antidepressive and immune-modulating activities to Saffron. It may also help protect against macular degeneration and retinitis pigmentosa. Beneficial effects in depression, premenstrual syndrome and Alzheimer's disease have also been described. Saffron also has cardiovascular protective properties. (Kamalipour et al, 2011; Joukar et al, 2010) These emanate from its antioxidant, lipid lowering and anti-inflammatory properties. Saffron is a common ingredient in Mediterranean cooking, known for its cardioprotective values. Clinical studies indicate that saffron preserves hemodynamics and left ventricular function and protects platelets from aggregation and lipid peroxidation. (Jessie et al, 2005) Crocetin in saffron has antitumor activities, affecting the growth of cancer cells by inhibiting nucleic acid synthesis, enhancing anti-oxidative system, inducing apoptosis and hindering growth factor signaling pathways. (Abdullaev, 2002, Abdullaev et al, 2004; Gutheil et al, 2012) Antidepressant effects were found in some clinical studies. (Schmidt et al, 2007; Moshiri et al, 2006; Akhondzadeh et al, 2005) Ayurveda also claims that it also improves general health and promotes longevity. Saffron has more than 150 biological components in saffron stigmas, which include carotenoids like zeaxanthin, lycopene, and various α - and β -carotenes.

2.1.2 Clinical Implications

Epidemiological and clinical studies provide supportive evidence for the positive effects on certain cancers and ischemic heart disease. Further research is needed to define the possible use of saffron as a chemopreventive, cardioprotective and anti-depressant agent in clinical trials.

2.2 Shatavari

Shatavari is the tuberous root of *asparagus racemosus*. It is commonly found throughout Sri Lanka and India. Shatavari means "curer of a hundred diseases".

2.2.1 Evidence Based Data

Ayurvedic practitioners in India have used the shatavari root in the prevention and treatment of a host of medical ailments. (Goyal et al, 2003) Besides its use in the treatment of diarrhea and dysentery, the plant also has potent anti-dyspepsia effects. (De et al, 1997; Goel et al, 1991) Its main therapeutic interest has been in its ability to stimulate milk production during lactation, (Joglekar et al, 1967; Pandey et al. 2005, Mortel et al, 2013) due to an increase in the release of corticoids and prolactin. (Meites, 1962) Various studies have indicated immunomodulatory properties of Shatavari root extracts and formulations. (Gautam et al, 2009) In Ayurvedic literature, *Asparagus racemosus* has been described as a rasayana herb or an adaptogen. (Gautam et al, 2009) It has also shown some promise as a carminative, diuretic, antiseptic, nerve tonic, antimutagenic, antitumor, antifungal and immunostimulatory agent. (Edenharder 1990, Shimoyamada et al. 1990, Shao et al. 1996, Balansard & Rayband 1987) It is also thought to be an aphrodisiac (Nadkarni 1976, Chadha 1985) and may have antidiabetic properties. (Hannan et al, 2007) *A. racemosus* has been described as absolutely safe for long term use, and especially during pregnancy and lactation

2.2.2 Clinical Implications

Research data on the medicinal use of shatavari is insufficient to make clinical recommendations. Well-designed and well-conducted clinical trials are needed to provide evidence based data regarding the therapeutic potential of shatavari for human ailments.

2.3 Shilajit

Shilajit is a natural blackish brown powdery substance found on rocks, mainly in the Himalayas. It is formed over centuries by the gradual decomposition and microbial action on certain plants, including the Euphorbia species of cactus, molds as *Barbula*, *Fissidens*,

Minium, and *Thuidium* and other species like *Asterella*, *Dumortiera*, *Marchantia*, *Pellia*, *Plagiochasma*, and *Stephenrencella-Anthoceros*. It is also known in India as *shilajatu*, *mimie*, or *mummiyo*.

2.3.1 Evidence Based Data

Various research studies indicate that shilajit exhibits adaptogenic, analgesic, anti-allergic, antidiabetic, anti-dyslipidemic, anti-fungal, anti-inflammatory, anti-oxidant, anti-ulcerogenic, anxiolytic and immunomodulatory properties. It has properties as a neuroprotector against cognitive decline and a memory enhancer. This may help this nutraceutical in patients with Alzhiemers disease. (Carrasco-Gallardo et al, 2012; Wilson et al, 2011; Acharya et al, 1988) It also works as a protector for high altitude stresses, stimulating the immune system and reducing tiredness, lethargy, and chronic fatigue, (Meena et al, 2010) and an enhancer of spermatogenesis. It has also been used a rejuvenator, an adaptogen - attributed to the enhanced production of ATP, (Agarwal et al, 2007) and an enhancer of the quality of life. (Mittal et al, 2009) Other traditional uses include digestive and liver disorders, epilepsy, chronic bronchitis, anemia, kidney stones, hemorrhoids, and a synergistic enhacer of other drugs. Fulvic acid acts as its main biologically active ingredient. (Ghosal et al, 1990) Its safety has been established in animal and human studies. (Stohs et al, 2013)

2.3.2 Clinical implications

Limited animal and clinical studies provide evidence for the positive modulation of cognition, protector against high altitude stresses and as a rejuvenator. However, its role as a viable nutraceutical depends on future well controlled clinical trials.

2.4 Tamarind

Tamarindus indica belongs to the family Leguminosae. It is a tropical fruit tree common in the Indian subcontinent. Its pulp is commonly used as a food ingredient in curries, chutneys, sauces, ice cream, and sherbet. The seeds, wood, bark, flowers and leaves also have significant medicinal and commercial uses. It is also used as a traditional medicine in many tropical countries. (Bhadoriya et al, 2011)

2.4.1 Evidence Based Data

Tamarindus indica L. (*Fabaceae*) exhibits antidiabetic activity, antimicrobial activity, antivenomic activity, antioxidant activity, antimalarial activity, hepatoprotective activity, antiasthmatic activity, laxative activity, and anti-hyperlipidemic activity. It is extensively used in Ayurveda for treating abdominal pain, diarrhea, helminthes infections, wound healing, cold, fever, constipation, jaundice, blood disorders, malaria, gonorhea, eye diseases and acne. (Doughari, 2006) The plaster of leaves is applied for curing inflammation locally. (El-Siddig et al, 2006; Bhadoriya et al, 2011) It may also have antifungal properties. (Rimbau et al, 1999) Several studies have reported that *T. indica* fruit pulp demonstrates hypocholesterolaemic and antioxidant properties by increasing hepatic gene expression of Apo A1, Abcg5 and LDL receptor while suppressing HMG-CoA reductase and Mtp gene expressions. (Chor et al, 2013; Martinello et al, 2006) Studies also suggest a potential therapeutic value of tamarind in the treatment of diabetes mellitus. (Sole et al, 2012; Sole et al, 2013) It also has anti-inflammatory (Dighe et al, 2009) and anti-bacterial activity. (Doughari et al, 2006) The medicinal properties of *T. indica* have been ascribed to its compounds such as catechin, procyanidin B₂, epicatechin, tartaric acid, mucilage, pectin, arabinose, xylose, galactose, glucose, uronic acid and triterpenes. Several other biological active compounds are also present. (Bhadoriya et al, 2011)

2.4.2 Clinical Implications

Epidemiological and clinical studies provide strong evidence for the medical benefits of tamarind as an anti-diabetic, hypolipidemic and anti-bacterial. However, further work is needed to confirm the efficacy and proper dosage of the *T. indica* fruit pulp and other parts of the tree as a therapeutic agent.

2.5 Terminalia arjuna

Terminalia arjuna is a deciduous tree which grows all over India. Its thick, white to pinkish-gray bark has used in Ayurvedic medicine for centuries, primarily as a cardiac tonic. (Maulik et al, 2010)

2.5.1 Evidence Based Data

The cardioprotective effects of terminalia arjuna have been well studied. (Colabawalla, 1951; Vaidya, 1994) It is known to provide antidyslipidaemic, (Chander et al, 2004) hypocholesterolaemic, (Gupta et al, 2001) and antioxidant activity. (Raghavan et al, 2006) These effects have been studied and well established by various animal and human studies. (Gupta et al, 2001) Other cardiovascular effects such as antihypertensive, coronary vasodilatory and antihypertrophy effects have also been reported. (Maulik et al, 2012; Dwivedi et al, 1994; Bharani et al, 2002) It has also benefitted patients with heart failure (Bharani et al, 1995) The plant has also been found to possess antimutagenic, anticancer activity, (Kaur et al, 2002) and antibacterial activity. (Singh et al, 2008) The heart-health effects of *Terminalia arjuna* are related to the triterpenes (arjunic acid, arjunolic acid, arjungenin, arjunglycosides), tannins, polyphenols (arjunone, arjunolone, luteolin, minerals (calcium, magnesium, zinc, and copper) and other bioactive compounds

present in its stem bark. (Saha et al, 2012; Saha et al, 2012) It has also been used for asthma, HIV infections, lung conditions, diarrhea, urinary problems and water retention. Other uses include bile duct disorders, scorpion stings, and poisonings. However evidence based data on these is lacking. Ingestion of terminalia arjuna appears to be safe.

2.5.2 Clinical Implications

Epidemiological and both animal and human studies provide compelling evidence based data supporting the extensive cardiovascular benefits of the bark of terminalia arjuna. Further clinical studies are needed for dose standardization, toxicity and drug interactions.

2.6 Triphala

Triphala (Sanskrit tri = three and phala = fruits), composed of equal quantities of three medicinal fruits of Terminalia chebula, Terminalia bellerica and Emblica officinalis. It is a widely used in Ayurveda as a colon cleanser, digestive, diuretic, and laxative. It is also commonly used in dentistry as an anti-bacterial agent.

2.6.1 Evidence Based Data

According to Ayurveda, triphala possesses antioxidant, anti-inflammatory, antipyretic, analgesic, antimutagenic, wound healing, anticariogenic, antistress, adaptogenic, hypoglycaemic, anticancer, chemoprotective, radioprotective and chemopreventive properties. Clinical studies have also shown that Triphala works as a laxative, appetite improver and reducer of gastric hyperacidity. (Baliga et al, 2012) It has also been recognized to have antibacterial, antiviral, antifungal actions. (Srinagesh et al, 2012) Clinical studies have shown that Triphala was effective in preventing dental caries and that this effect was equal to that of chlorhexidine. (Bajaj et al, 2011; Tandon et al, 2010) It has a therapeutic potential as a chemopreventive and radioprotective agent. (Baliga, 2010; Deep et al, 2010) Its hypoglycemic activity may have a role in the treatment of diabetic patients. (Rajan et al, 2008) It may also have a promise as an anti-inflammatory agent. (Rasool et al, 2007) Animal studies suggest its use in noise and stress induced conditions. (Srikumar et al, 2006)

2.6.2 Clinical Implications

Although well revered in traditional Ayurvedic medicine, well controlled clinical studies on the therapeutic effects of triphala are lacking. Some studies do suggest a role as an antibacterial agent in mouth wash, to prevent dental caries. Widespread complementary use will depend on more robust evidence based data.

2.7 Turmeric

The rhizome of Curcuma longa, a perennial herb, is boiled, cleaned, and dried, yielding a yellow powder called turmeric. Curcumin, (diferuloylmethane) which gives the yellow color to turmeric is a major component of turmeric and is commonly used as a spice and food-coloring agent. Its essential oils are also used in perfumes. Commercially it is used as a pigment dye for textiles and religiously as a pigment for skin in ceremonial functions. Its medicinal use goes back several centuries in Ayurveda.

2.7.1 Clinical Data

Curcumin has been shown to exhibit antioxidant, anti-inflammatory, (Menon et al, 2007) antiviral, antibacterial, antifungal, anti-amyloid and anticancer activities. (Zhou et al, 2011; Aggarwal et al, 2007) Its use has therefore been investigated in a wide variety of diseases. (Aggarwal et al, 2009; Aggarwal and Harikumar, 2009) It is commonly used for indigestion. Clinical studies have shown that it has an anti-ulcerogenic activity, including those caused by Helicobacter pylori infection, chronic ingestion of non-steroidal anti-inflammatory drugs, and exogenous substances. (Yadav et al, 2013) It also plays a therapeutic role in inflammatory bowel diseases (Baliga et al, 2012) Its anti-inflammatory actions help ameliorate arthritis (Funk et al, 2006; Jackson et al, 2006) It also demonstrates cardioprotective effects, (Kapakos et al, 2012; Miriyala et al, 2007) including safety against adriamycin induced cardiomyopathy. (Mohamad et al, 2009) Several clinical trials are testing its therapeutic value in diseases such as multiple myeloma, pancreatic cancer, myelodysplastic syndromes, colon cancer, psoriasis and Alzheimer's disease. (Hatcher et al, 2008) Although turmeric has been used for a host of other conditions such as liver and lung diseases, depression and inflammatory and infectious skin conditions, robust clinical data remains lacking.

2.7.2 Clinical Implications

Epidemiological and clinical studies provide strong evidence for the therapeutic use of turmeric in gastrointestinal disorders and arthritis. Its cardio-protective properties also appear promising. It is relatively cheap, well tolerated and pharmacologically safe.

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 ayurvedic naturoceuticals (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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