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# Andrographis

## *Andrographis paniculata*

Family: Acanthaceae

### INTRODUCTION

Andrographis is an erect, branched annual that prefers shady, moist locations. It grows to a height of one to three feet (30-90 cm) and produces small, pink or white flowers with brown or purple spots.<sup>1,2</sup> The flowers are followed by oblong seed capsules containing six to 12 yellow-brown, flat, ovoid seeds.<sup>1,3</sup> The entire herb has been used medicinally in India,<sup>1,4</sup> but the dried leaves or aerial parts — which are harvested in the fall when the flowers appear — are used more commonly.<sup>5,6</sup>

Andrographis is native to the Indian subcontinent (India, Pakistan, and Bangladesh) and Sri Lanka, and it has been introduced to the islands of the Caribbean and West Indian Ocean, China (specifically Guangdong, Guangxi, Fujian, Yunnan, Sichuan, Jiangsu, and Jiangxi provinces), Indonesia, Laos, Malaysia, Myanmar, Thailand, Vietnam, and Mesoamerica.<sup>7,8</sup> Its natural habitat in India comprises five of India's 15 specified agro-climatic zones including the "Middle Gangetic Plains Region" in the states of Bihar and Uttar Pradesh; the "Upper Gangetic Plains Region" in the states of Uttar Pradesh and Delhi; the "Eastern Plateau and Hill Region" in the states of Bihar, Orissa, and Madhya Pradesh; the "Central Plateau and Hill Region" in the states of Madhya Pradesh, Uttar Pradesh, and Rajasthan; and the "East Coast Plains and Hill Region" in the states of Orissa, Andhra Pradesh, and Tamil Nadu.<sup>9</sup> Commercial plant material is obtained mainly from wild collection, but it also is sourced from new cultivation projects in India.<sup>10</sup>

### HISTORY AND CULTURAL SIGNIFICANCE

Other common names for andrographis include king of bitters, *kalmegh* (Bengali, Hindi, Unani), *kirita* or *kirata* (Sanskrit),<sup>5</sup> *kiriyata* (Hindi), creat, green chiretta, Indian chiretta,<sup>11</sup> and *hinbinkohomba* (Sinhalese).<sup>3</sup> It has been called *chirayta* or *chirayita desi* ("southern chirata") because it is used in India as a substitute for the bitter herb *Swertia chirayita* (Gentianaceae).<sup>2,5</sup> Common names used specifically in the Indian Ayurvedic medicine tradition also

include *bhunimba* and *mabatikta* (Sanskrit).<sup>1,11</sup> In traditional Chinese medicine (TCM), andrographis is known as *chuan xin lian* ("thread-the-heart lotus"), *chuan-hsin-lien*, or *i-chien-hsi*.<sup>5,6,11,12</sup> In Japanese it is known as *senshinren*,<sup>5</sup> and, in Korean, *ch'onsimyon*.<sup>6</sup>

Andrographis has been used traditionally as an antiplatelet, antipyretic (fever reducer), anti-inflammatory, a bitter tonic (herb that strengthens and tones specific organs or the entire body), choleric (bile stimulator), hepa-



*Andrographis Andrographis paniculata*  
Photo ©2015 Michael Balick, Steven Foster Group, Inc.

toprotective agent, immunostimulant, and, possibly, as an adaptogen.<sup>5,13</sup> In addition, it is believed to protect against free radical damage and help normalize blood sugar.<sup>5</sup>

Traditionally, the plant has been used to treat a wide range of conditions, including atonic dyspepsia (indigestion with impaired stomach muscle tone), bowel conditions in children, diabetes, diarrhea, dysentery, flatulence, gastroenteritis, general debility, loss of appetite, poor liver function (including toxic liver damage and liver infections), to aid recuperation from fever, and for respiratory and skin conditions.<sup>5,13</sup>

In TCM, andrographis, or *chuan xin lian*, is said to have bitter, cold properties and is believed to clear heat and eliminate toxins, dry dampness, stop diarrhea, and enter the lungs, stomach, bladder, and channels of the large and small intestines.<sup>5,12,14,15</sup> The plant is thought to have antibacterial, antiviral,<sup>12</sup> abortifacient, antipyretic, anti-inflammatory, antivenom, antihypotensive, immunostimulant, hepatoprotective, and cholagogic properties.<sup>13,16</sup> It has been used in TCM for cold, influenza, sore throat, fever, headache, acute and chronic cough, colitis, snake bites, eczema, sores, carbuncles, acute enteritis, bronchitis, dysentery, infectious diseases, nephritis, pneumonia, purulent otitis media, pustular dermatitis, tonsillitis, and urethritis.<sup>12,14,16</sup> Curiously, one source claims that andrographis does not appear in any traditional Chinese herbal text.<sup>12</sup>

In Ayurveda, andrographis has been used for centuries for intermittent fevers and jaundice, and it is an ingredient in more than half of the multi-ingredient herb formulations used in India for treating liver conditions.<sup>1</sup> The leaves and roots have been used in Ayurvedic medicine as an adjunct treatment for cholera, diabetes, dysentery, enteritis, gastritis, malaria, pneumonia, pyelonephritis, and rabies.<sup>1</sup> The leaf juice has been utilized as an alterative (i.e., a plant that gradually restores body functions), a tonic, to relieve pain and stomach distress, to expel parasites, to promote bile flow, to reduce fever, and as an antiseptic, antispasmodic, and laxative.<sup>1,3</sup> As a traditional household remedy, the leaf juice is used for diarrhea, dysentery, dyspepsia, general debility, and loss of appetite.<sup>3</sup>

Andrographis is used as a substitute for chirata (*Swertia* spp., Gentianaceae) — which is scarce in the northern Himalayas — particularly in southern parts of India where andrographis is relatively abundant.<sup>17</sup> Andrographis and chirata exhibit similar therapeutic actions (anti-inflammatory, hepatoprotective, antidiarrheal, antiviral, and antimalarial), and they share the name *Kiriyattu* in Malayalam and *Kiratatikta* (“black-colored with bitter taste”) in Sanskrit.<sup>17</sup> Furthermore, adding to continued likelihood of acceptable substitution, chirata is considered to be critically endangered and possibly on the verge of extinction.<sup>18</sup> Known as *say-gha-gyi* in the Burmese language, andrographis reportedly grows wild throughout Myanmar where an aqueous decoction or whole-plant powder is used in Myanmar traditional medicine for treating fevers, malaria, paresis, and paralysis, among other conditions.<sup>19</sup>

English-language *Andrographis paniculata* monographs have been published in the *Hong Kong Chinese Materia Medica Standards* (Volume 3, 2010),<sup>20</sup> *Indian Pharmaco-*

*poeia* (7th edition, 2014),<sup>21</sup> *Malaysian Herbal Monograph* (Volume 1, 1999),<sup>22</sup> *Medicinal Plants of Myanmar* (Volume 1, 2008),<sup>23</sup> *Pharmacopoeia of the People's Republic of China* (PPRC, 2010),<sup>24</sup> *Thai Herbal Pharmacopoeia* (Volume 1, 1995),<sup>25</sup> and *WHO Monographs on Selected Medicinal Plants* (Volume 2, 2002),<sup>26</sup> as well as in the *United States Pharmacopoeia* (USP 37).<sup>27</sup>

## CURRENT AUTHORIZED USES IN COSMETICS, FOODS, AND MEDICINES

In countries where the Ayurvedic system of medicine is recognized and practiced (e.g., India, Bangladesh, Bhutan, Malaysia, Nepal, and Sri Lanka), the dried leaves and tender shoots of *kalmegh* are used as a component of preparations indicated for treating a range of conditions including the following: burning sensation, chronic fever, malaria, intermittent fever, inflammation, cough, bronchitis, skin diseases, intestinal worms, dyspepsia, flatulence, colic, diarrhea, dysentery, and hemorrhoids.<sup>2</sup>

In China and other countries where TCM is recognized and practiced (e.g., Malaysia, Taiwan, and Singapore, as well as a few Western countries), andrographis herb is indicated for treating influenza with fever, sore throat, ulcers in the mouth or on the tongue, acute or chronic cough, colitis, dysentery, urinary infection with difficult or painful urination, carbuncles, sores, and venomous snake bites.<sup>28</sup>

“Herba Andrographis” is classified as a medicinal ingredient in Canada where it is listed in Table 1 (General Medicinal Ingredients) of the Natural Health Product (NHP) Traditional Chinese Medicinal Ingredients monograph.<sup>29</sup> At the time of this writing, there were nearly 100 licensed NHPs containing *A. paniculata* as a medicinal ingredient.<sup>30</sup>

In the United States, although andrographis herb is not classified as a generally recognized as safe and effective (GRASE) active ingredient for use in over-the-counter drug products, it is within the scope of practice of certain licensed healthcare practitioners — such as licensed acupuncturists (LAc) and naturopathic doctors (ND) — to dispense andrographis-containing preparations to their patients. For example, a popular and frequently dispensed TCM formulation for soothing severe sore throat with swollen glands is a traditional three-herb combination containing andrographis herb (50%), Mongolian dandelion (*Taraxacum mongolicum*, Asteraceae) whole plant (25%), and isatis (*Isatis indigotica*, Brassicaceae) root (25%).

Although andrographis is not classified as generally recognized as safe (GRAS) for use in food products in the United States, it is permitted as a component of dietary supplement products, which require FDA notification within 30 days of marketing if a “structure-function” claim is made and product manufacturing according to current Good Manufacturing Practices (cGMPs).<sup>31</sup> The USP has developed dietary supplement quality standards monographs for “Andrographis” (dried stems and leaves), “Powdered Andrographis,” and “Powdered Andrographis Extract.” These USP monographs are acceptable for the verification of dietary supplement component specifica-

tions and quality control testing before use in a product.<sup>32</sup>

The situation is different in the EU, where the Committee on Herbal Medicinal Products (HMPC) of the European Medicines Agency (EMA) began to develop a labeling standards monograph to be used by applicants for the labeling of andrographis “leaf” herbal medicinal products. In February 2011, the EMA requested submissions of scientific data to be used in the assessment of andrographis as part of the establishment of a community herbal monograph and/or community list entry.<sup>33</sup> However, following the assessment process, EMA announced in September 2013 that a community herbal monograph on *A. paniculata* leaf could not be established because certain basic requirements for the development of a monograph (e.g., whether for traditional use or well-established use) were not fulfilled. Importantly, although the EMA requested data on andrographis “leaf,” most of the information that the agency received and assessed concerned the primary material of commerce: aerial parts, including leaf and stem. The plant did not qualify as a Traditional Herbal Medicinal Product (THMP) — due to a lack of evidence of any single-component andrographis preparations with 15 years of medical use in the EU — or as a Well Established Use Herbal Medicinal Product (WEU-HMP), due to a lack of studies required for WEU-HMP marketing authorization.<sup>34</sup>

According to the August 2014 EMA final assessment report, there are no known andrographis single-herb preparations with marketing authorizations granted in EU member states.<sup>35</sup> There is, however, an andrographis-containing combination product registered in Denmark, Kan Jang® coated tablets (Swedish Herbal Institute; Vallberga, Sweden). Each tablet contains 33–35 mg andrographis herb dry extract with 5.7 mg dry extract of eleuthero (*Eleutherococcus senticosus*, Araliaceae) root. A Swedish product by the same name — Kan Jang coated tablets (Bringwell AB\*; Stockholm, Sweden) — is registered as a THMP; however, it does not contain andrographis herb.

There is just one andrographis ingredient approved for use in cosmetic products by the European Commission Health and Consumers Directorate General: “Andrographis Paniculata Leaf Extract,” which is listed as an astringent and skin-conditioning substance.<sup>36</sup>

## MODERN RESEARCH

The main known chemical components of *A. paniculata* are diterpene lactones, collectively referred to as andrographolides, which include aglycones (e.g., andrographolide; shown to be responsible for much of the herb’s anti-inflammatory activity) and glucosides (e.g., neoandrographolide and andrographoside), diterpene dimers, and flavonoids, as well as xanthone in the roots.<sup>5</sup>

At least two studies have evaluated the efficacy of *A. paniculata* extract (HMPL-004, a 90/10 v/v ethanol/water leaf extract; Hutchison MediPharma Ltd.; Shanghai, China) in treating mild-to-moderate ulcerative colitis. The first, published in 2011, was an eight-week, randomized, double-blind, multicenter, parallel-group study wherein 120 patients in five locations were randomized and given either

1200 mg/day HMPL-004 or 4500 mg/day slow-release mesalazine (i.e., a conventional ulcerative colitis drug also known as mesalamine).<sup>37</sup> Colonoscopy scores at baseline were compared to those performed at the end of the eight-week study, and mucosal healing was compared. At week eight, 21% of patients in the HMPL-004 group were in remission compared to 16% in the mesalazine group. An additional 36% in each group were in partial remission, defined as a 50% reduction in symptoms. The overall efficacy — which included remission, partial remission, and/or improvement — was calculated as 76% for the HMPL-004 group and 82% for the mesalazine group. In this study, at this dose, HMPL-004 was determined to be similar to mesalazine in efficacy, and adverse events were rare and limited to allergic reactions (urticaria/hives).

The second study, in 2013, was a randomized, double-blind, placebo-controlled trial wherein patients with diagnosed ulcerative colitis (n=224), most of whom were failing first-line therapy with mesalazine, were randomized to receive either 1200 or 1800 mg daily HMPL-004 in three divided doses, or placebo for eight weeks.<sup>38</sup> At week eight, 45% of patients taking 1200 mg and 60% taking 1800 mg daily HMPL-004 experienced a clinical response, compared with 40% of those taking placebo. Additionally, at week eight, 34% of patients taking 1200 mg and 38% taking 1800 mg daily HMPL-004 were in clinical remission, compared to 25% taking placebo. Adverse events consisted mainly of a mild, reversible rash in 8% of participants. The authors stated that while treatment with HMPL-004 was more effective than placebo in mucosal healing of mild-to-moderate active ulcerative colitis in this short-term study, additional clinical trials are needed to evaluate the safety and efficacy of higher doses of HMPL-004 in both ulcerative colitis and other conditions such as Crohn’s disease.

An andrographis leaf extract has been evaluated for its role in the relief of rheumatoid arthritis (RA). A 2009 prospective, randomized, double-blind, placebo-controlled study investigated the efficacy of 30 mg Paractin® (dried extract, 30% andrographolides; Farminustria SA; Santiago, Chile) three times per day for 14 weeks.<sup>46</sup> Sixty women were randomized into two groups, one receiving Paractin, and the other receiving placebo. The Paractin group experienced a significant reduction in tender joints, number of swollen joints, and total grade of tender joints.

A number of clinical studies have investigated *A. paniculata*’s effectiveness, alone or in a combination product, in treating upper respiratory infections (URI), colds, and pharyngotonsillitis. At least one study has examined its efficacy in the prevention of colds, and one evaluated its usefulness in treating influenza.

In a 2010 double-blind, placebo-controlled clinical study, 223 patients were randomized to receive either 200 mg/day KalmCold™ (100 mg *A. paniculata* leaf extract standardized to 31.30% andrographolide content; M/s Natural Remedies Pvt. Ltd.; Bangalore, India) or placebo for five days.<sup>39</sup> KalmCold was found to be 52.7% more effective than placebo; the KalmCold group experienced significantly reduced symptoms — including cough, expectora-

\* AB Bringwell is the exclusive distributor of Swedish Herbal Institute products for Denmark, Norway, and Sweden.



tion, nasal discharge, headache, fever, sore throat, malaise/fatigue, and sleep disturbance, but not earache — whereas the symptoms in the placebo group were either unchanged or worsened after the third day of the study period. Adverse effects were minor with no significant difference between groups.

The leading clinically tested andrographis-containing product is the andrographis/eleuthero fixed combination product, Kan Jang (Swedish Herbal Institute; Vallberga, Sweden; 85 mg *A. paniculata* extract, SHA-10, containing 5.25 mg andrographolide, deoxyandrographolide [with precisely 5 mg andrographolide], and 9.7 mg *E. senticosus* extract). It should be noted that results from Kan Jang studies do not reflect or correspond directly with the clinical efficacy of andrographis extract alone.

A 2004 three-arm study compared Kan Jang with an echinacea product (Immunal® drops; Ljubljana, Slovenia; 80 ml *Echinacea purpurea* expressed juice from freshly collected flowering plants and 20 ml ethanol) for the treatment of uncomplicated upper respiratory disease in children.<sup>40</sup> Children aged four to 11 (n=133) with symptoms of headache, cough, rhinitis, sore throat, hoarseness, and fever for less than 24 hours were randomized to receive two tablets Kan Jang three times per day for 10 days (n=53), 10 drops Immunal three times per day for 10 days (n=41), or standard care including throat gargles, antiseptic nose drops, and acetaminophen at 500 mg three times daily as needed for headache and fever (n=39). All three groups improved by day two or three, but the Kan Jang group had an increased rate of recovery on the second and third examination, with virtually no symptoms by the third exam.

At least four additional studies between 1995 and 2002 evaluated 1200 mg daily Kan Jang for URI and found statistically significant results.<sup>41-44</sup> Two studies evaluated adults with URI symptoms of fewer than three days duration,<sup>41,43</sup> and another investigated the use of Kan Jang in adults with URI symptoms for fewer than two days.<sup>42</sup> In yet another study, adult patients were started on Kan Jang treatment within 36 hours of symptom onset. In the last study, patients had symptoms for “several” days and suspected sinusitis.<sup>44</sup>

Additionally, andrographis has been evaluated in at least two studies for its effectiveness in treating influenza.<sup>45</sup> In a pilot study from 1999, 540 patients were randomized to receive either Kan Jang (two tablets three times per day for three to five days) or conventional therapy (acetaminophen for fever and the antiviral agent amantadine). In the second study, 66 patients were randomized to receive the same dosage of Kan Jang as in the pilot study or conventional therapy. Kan Jang-treated subjects recovered from symptoms (headache, throat pain, cough, and rhinitis) faster than the control group, suffered fewer post-influenza complications, and were able to return to work sooner. The study authors also reported that Kan Jang’s effects were consistent in patients with different types of influenza.

In 2013, Omeros® Corporation, a Seattle-based biopharmaceutical company, submitted a patent application to the United States Patent and Trademark Office for its invention claiming methods and compositions of *A. paniculata* for the treatment or prevention of addiction and impulse control disorders.<sup>47</sup>

## FUTURE OUTLOOK

Of the estimated 960 medicinal plant species that form the source of 1,289 botanical raw drugs in trade in India, *A. paniculata* is among the top 117 species, the annual domestic consumption of which exceeds 100 metric tons (MT).<sup>10</sup> In 2008, ranking at number nine in terms of volume, Indian domestic consumption of andrographis was estimated at 3,279 MT, of which about 51% was consumed by large herbal manufacturing units and the rest by small or very small companies.

While much of the commercial supply is wild collected, the Indian government’s National Medicinal Plants Board (NMPB) has included andrographis in its “State wise list of plants recommended for cultivation and development,” and farmers who cultivate it through the NMPB scheme are eligible for a 20% subsidy.<sup>2</sup> NMPB has included a chapter on agronomic practices for andrographis in the second volume of its publication *Agro-techniques of Selected Medicinal Plants*. The information provided is based on an agro-technique study carried out by the Centre for Advanced Studies in Botany at the University of Madras in Chennai. According to NMPB, andrographis can be grown easily through seed and vegetative methods, although for commercial cultivation, propagation through seed is more economical. The crop is grown during the cooler season and remains in the field for 120 days. Cultivation in a cooler climate helps the plant produce a higher level of bitter principles that are associated with efficacy.

Following NMPB guidelines, whole-plant yield should be 2.5 tons (dry weight) per hectare and should provide a reasonable profit to growers. The farmer’s cost of cultivation per hectare is estimated to be 25,000 Indian rupees (Rs), or about \$400. A 2014 news report indicated a market price paid to Indian farmers of 60 Rs/kg,<sup>48</sup> while the Indian Council of Agricultural Research (ICAR) reported summer 2014 farmgate prices of 15 Rs/kg for fresh leaf and 40 Rs/kg for dried leaf.<sup>49</sup>

Similarly, in China, current market prices for dried andrographis herb produced in the Guangxi Zhuang Autonomous Region range from 4.5 Chinese yuan (CNY)/kg (\$0.73/kg) at the Chengdu TCM Market in the Sichuan province to 6 CNY/kg at the Anguo TCM Market in the Hebei province.<sup>50</sup>

According to a November 2014 market research survey of 27 Chinese businesses trading in andrographis herb, 26% reported that the current market for andrographis was better than had been expected, 55% worse than expected, and 19% just as expected. Regarding market outlook, none of the companies expected upward price movement, 26% expected downward price movement, and 74% of companies predicted no change.

Production, price, and availability of andrographis herb appear stable in the countries where it is most widely used such as in China and India, where traditional herbal medicines are a big part of the national healthcare systems. India’s 20% subsidies to farmers willing to cultivate andrographis may indicate an increasing demand for the herb or a transition from reliance on wild collection. Outside of India, andrographis-based medicinal products are licensed, listed,

or registered in several member states of the Commonwealth of Nations, including Australia, Canada, Malaysia, and Sri Lanka.

Market access to medicinal andrographis preparations in the European Union and United States remains complicated due to its lack of recognition as a safe and effective active ingredient. Thus, while the prospect of gaining marketing authorization for the sale of andrographis medicinal products in the EU and US is very low at the present time, there is still a way into these markets through the health practitioner market and authorized clinics, dispensaries, or pharmacies where patients can obtain TCM prescriptions. In the United States, it can be possible to label and market andrographis as a dietary supplement product without making reference to its traditional uses in the Chinese or Indian systems of medicine, which are, for the most part, disease treatment indications. HG

—Gayle Engels and Josef Brinckmann

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# dear reader

## Regulating the Regulators: NY AG Relies Only on DNA Testing for Commercial Herbal Supplements – Significant Problems with the Misuse of an Analytical Method

As many are now aware, on February 3, New York State Attorney General Eric T. Schneiderman announced that he had commissioned lab testing of a total of seven herbal dietary supplements sold by four major national retail chains. The test results indicated that most of the supplements were deficient in regards to identity and purity. Extensive mainstream media coverage followed the lamentable lead of the *New York Times*, which introduced the story with a front-page, above-the-fold article by reporter Anahad O'Connor. Mr. O'Connor contacted the American Botanical Council (ABC) for input, but our comment was not included. We issued a press release questioning if any of the tested products were extracts in pill form, which subsequent information has suggested that possibly about 75% were. Experts have noted that using DNA testing alone to identify an *extract* in a single-herb commercial product has limited application as most plant extracts do not contain the DNA of the source plant material; also, heat and other processing conditions can degrade any DNA that may migrate into an extract. Many medicinal plant and analytical experts believe that the NY AG relied too heavily on results determined solely by the DNA testing method, and that other appropriate analytical methods also should have been used. Validated methods published in official pharmacopeias include microscopy to identify plant cell structures and various chemical tests to detect the presence or absence of key chemical marker compounds that are characteristic of the herbs and their extracts. As we pointed out to the Associated Press and in other media interviews, Mr. Schneiderman, the highest law enforcement official in New York, should be committed to the highest levels of due diligence — procedurally and scientifically. Unfortunately, this appears questionable.

ABC is not attempting to defend the tested products or the companies; instead, we, and many others, question the appropriateness of the analytical method and scientific protocol used in this case, on which legal and regulatory enforcement actions have been based. One of many problems is that consumers have a misunderstanding of the relevance of DNA in herbal extracts due to some popular media such as television crime dramas, and will presume that the NY AG's methods and data are accurate and sufficient.

The American Herbal Pharmacopoeia (AHP) sent a 58-page document to the NY AG that presented pharmacopoeial standards and test methods for all of the seven contested herbs, and the United States Pharmacopeia has issued statements emphasizing the need for multiple analytical methods to confirm the identity of botanical supplements.

ABC is the managing partner, with AHP and the University of Mississippi's National Center for Natural Products Research (NCNPR; a Food and Drug Administration-funded Center of Excellence for Botanical Dietary Supplement Research), in the ABC-AHP-NCNPR Botanical Adulterants Program, an international educational program designed to educate industry members and related stakeholders about the prevalence of adulteration of botanical dietary ingredients and supplements. We recognize that there is a quality problem in the global herbal industry. However, the actions of the NY AG — which we have called premature — do not meet the criteria for the basis of strong evidence for rational law enforcement and only further muddy the water regarding the perception of the quality of herbal products. Consumers deserve both reliable herbal products *and* responsible and accountable actions from their elected officials. The misuse of analytical methods and lack of scientific discipline do not benefit the public's welfare.

In this issue, our friend and ABC Advisory Board member Giovanni Appendino and his colleagues in Italy have reviewed the Mediterranean plant *Helichrysum italicum*, a traditionally used herb and source of an essential oil with a wide range of applications.

As part of our ongoing series of herb profiles, veteran ABC staffer Gayle Engels and ABC Advisory Board member Josef Brinckmann of Traditional Medicinals provide a concise review of andrographis, one of my most trusted herbs during cold-and-flu season.

Finally, old friend and herbal tea expert Brian Keating and *HerbalGram* Editor Ash Lindstrom and colleagues have written this publication's first-ever Tea Market Report. The 2014 Tea Market Report joins our long series of Herb Market Reports, which are often our most-cited articles.

*Mark Blumenthal*

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**Mission:** Provide education using science-based and traditional information to promote responsible use of herbal medicine—serving the public, researchers, educators, healthcare professionals, industry, and media.

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*Helichrysum italicum*. Photo ©2015 Steven Foster

## **34** *Helichrysum italicum*: The Sleeping Giant of Mediterranean Herbal Medicine

By Giovanni Appendino, Laurea; Orazio Tagliatela-Scafati, PhD; Alberto Minassi, PhD; Federica Pollastro, PhD; Mauro Ballero, Laurea; and Andrea Maxia, PhD; Cinzia Sanna, PhD

Long prized for its vibrant yellow hue and unique fragrance, *Helichrysum italicum* is a valued plant in perfumery and aromatherapy. However, the potential health benefits of the plant and its essential oil have not been the focus of many modern studies. Giovanni Appendino and his colleagues examine traditional uses of *Helichrysum*, including its anti-inflammatory properties and history of use in veterinary medicine, citing classical texts from the Greek physician Dioscorides and the work of Leonardo Santini. In the 1930s, Santini studied the activity of *Helichrysum* preparations for respiratory infections, and he determined that the plant contained a cortisone-like compound. Santini's work prefigured *Helichrysum*'s uses as a dietary supplement and medicine, bringing its potential use beyond luxury goods in the 21st century.

## **46** Maca Madness: Chinese Herb Smugglers Create Chaos in the Peruvian Andes *Consequences for the market, consumers, and local farming communities*

By Tyler Smith

Inhabitants of the central highlands in Peru have been cultivating a small, turnip-like herb for millennia. Maca, which thrives at elevations of up to 15,000 feet in the Andes, is a treasured national heritage product of Peru, where laws prevent the unprocessed herb from being exported. In the spring of 2014, Chinese nationals descended on the maca-growing regions in the area, illegally purchasing and smuggling much of the crop out of the country. These actions were prompted by an unprecedented demand for the root in China, where it is believed to impart longevity and improve sexual function. As HerbalEGram Editor Tyler Smith explains, the maca "gold rush" has had significant impacts on consumers, natural products companies, and local farmers — and maca's future remains uncertain.

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## ABC Becomes Increasingly International and Adds New Publications in 2014

The American Botanical Council (ABC) continues to enhance its efforts to improve healthcare and selfcare around the world by promoting the responsible use of herbs, essential oils, teas, other beneficial botanicals, and fungi.

ABC reaches people in 81 countries around the world using a diverse and effective array of educational services, which include unique publications, an information-rich website, online databases, social media, lectures, media education, consulting and research services, an online bookstore, herbal demonstration gardens, an internship program with local

universities, and events. ABC's activities serve consumers, healthcare practitioners, researchers, educators, professionals from all segments of the natural products and health industries, government employees, the media, and more.

Below is a brief look at some of ABC's accomplishments and activities in 2014.

### Two New Publications

In 2014, ABC created two new publications — the “US Tea Market Report” and the “Botanical Adulterants Monitor,” a service associated with ABC's management of the ABC-AHP-NCNPR Botanical Adulterants Program.

As a corollary to its extremely popular Herb Market Report, ABC created its first-ever US Tea Market Report in response to the increasing popularity of tea (*Camellia sinensis*, Theaceae) in the United States. As the Report shows, sales of tea — the second most-consumed beverage in the world after water — were up 5.9% in 2013.

In June, ABC released the first issue of the Botanical Adulterants Monitor. As an integral new part of the ABC-AHP-NCNPR Botanical Adulterants Program, this online newsletter focuses on issues related to botanical adulteration, including study reviews, regulatory updates, laboratory methodologies and findings, and more. To date, two issues of the Botanical Adulterants Monitor have been published, and four more will be published in 2015.

These two new publications were added to ABC's expanding library of reliable, science-based, high-quality educational materials. Other ABC publications in 2014 included the following:

- **Four issues of the quarterly publication *HerbalGram*.** Topics covered included: the German kava (*Piper methysticum*, Piperaceae) ban reversal, the 2013 Herb Market Report, wild American ginseng (*Panax quinquefolius*, Araliaceae) conservation, criteria for evaluating herbal supplement

clinical trials, the “Ethnobotany of Warfare,” and a Research Review on amla (*Phyllanthus emblica*, Phyllanthaceae) extract for type 2 diabetes, to name just a few.

- **12 issues of the monthly publication *HerbalEGram*.** This popular e-magazine includes original articles by ABC staff, updates on community news, links to current media stories and events, and a featured book section.
- **360 HerbClips.** ABC publishes 15 HerbClips twice per month containing critical reviews and/or summaries of recent clinical trials and articles of interest to the herbal community.
- **51 issues of the weekly *Herbal News & Events*.** In addition to providing information on upcoming conferences, webinars, seminars, and other events, this publication provides samples of media updates, HerbClips, and books available for purchase through ABC's e-Store.



### Increased International Involvement

In 2014, ABC added 10 international experts to its Advisory Board. The Advisory Board provides peer review, advice, and feedback on ABC activities including publications. These new international Advisory Board members represent a variety of scientific fields including ethnobotany, pharmacy, chemistry, pharmacognosy, and others.

The ABC-AHP-NCNPR Botanical Adulterants Program was pleased to receive new endorsements from several international organizations in 2014. Both the International Alliance on Dietary/Food Supplement Associations (IADSA) and the world's largest medicinal plant research group — the Society for Medicinal Plant and Natural Product Research (GA) — joined other international organizations in announcing their support for the Program. By early 2015, the National Institute of Medical Herbalists, the British Herbal Medicine Association, and Natural Products New Zealand had officially endorsed the Program.

### Ongoing ABC Educational Activities

In 2014, ABC issued 19 press releases and fielded approximately 36 separate media requests. As a reliable and independent third-party organization, ABC plays an important educational role in helping the media better understand and interpret the science of studies on herbs and other beneficial botanicals. ABC's press releases often attempt to bring clarity to complicated issues such as the January 2014 report on preliminary research that kava might prevent lung cancer in smokers, which was based on a study in mice.



Lectures are another important element of ABC's educational mission. In 2014, ABC Founder and Executive Director Mark Blumenthal delivered 31 lectures on topics including botanical adulteration and other quality control issues, regulation, and more. These lectures took him all over the United States and to England, South Korea, and Singapore. Other ABC staff presented an additional 10 educational lectures on specific herbs, the role and use of herbal medicine, and botanical adulteration.

Last year, ABC's internship program provided training for 17 pharmacy and dietetic interns from sixth-year pharmacy school and graduate dietetic programs, respectively. For many of these students, ABC's internship was their introduction to the science behind botanicals and herbal medicine. ABC interns engage with herbal professionals, research herbal topics, and work in the herbal demonstration gardens at ABC's headquarters in Austin, Texas. Each intern also researches and prepares a "Food as Medicine" or "Garden Apothecary" presentation covering an herb or herbal topic of their choice.

### People & Positions

In 2014, ABC was pleased to welcome Hannah Bauman as the new assistant editor of *HerbalGram*. Hannah brought with her a unique knowledge of maritime archeology, a passion for creative writing, experience as a copy and technical editor, and a thirst for learning. She has used those talents to create numerous original articles for ABC publications, and recently became *HerbalGram*'s book review and obituary editor.

Brian Armstrong joined ABC in 2014 as an executive assistant primarily supporting Blumenthal. Brian's background as an English, math, and science teacher in South Korea, Vietnam, Hong Kong, and Thailand has helped him manage the many diverse aspects of his job. Also essential to his job success is a sense of humor. Fortunately, as a stand-up comedian, he has an abundant supply.

Tom Newmark was elected the new ABC Board of Trustees president in late 2014. His experience in the commercial sector with New Chapter and 6Pacific Group, as well as his experience with nonprofits such as Greenpeace and his new organization The Carbon Underground, will serve Tom well in his new role with ABC.

### Milestones and Awards

In July, ABC published the 500th issue of HerbClip. As a service to its members, ABC publishes HerbClip twice per month. Each HerbClip contains 15 summaries of studies and articles — often with insightful critiques — making it easier to stay up to date on research findings relevant to the herbal community.

ABC was honored to receive *Nutrition Business Journal*'s 2013 Education Achievement Award (the second time ABC has received this honor). ABC was chosen in part for its educational efforts through the ABC-AHP-NCNPR Botanical Adulterants Program and for publishing 100 issues of its acclaimed journal, *HerbalGram*.

Each year at the ABC Celebration in Anaheim, Califor-

nia, held in conjunction with Natural Products Expo West, the nonprofit presents its own awards recognizing excellence in the herbal community. In 2014, ABC presented the James A. Duke Excellence in Botanical Literature Award to co-authors Kerry Bone and Simon Mills for their revised and updated clinical practice guide, *Principles and Practice of Phytotherapy: Modern Herbal Medicine*, 2nd ed. Wakunaga Pharmaceutical Company, Ltd. of Osaka, Japan, received the ABC Varro E. Tyler Commercial Investment in Phytomedicinal Research Award. Gordon M. Cragg, PhD, was awarded the ABC Norman R. Farnsworth Excellence in Botanical Research Award, and Sara Katz was the recipient of the second-ever Mark Blumenthal Herbal Community Builder Award.

### Forecast for 2015

ABC will continue to publish its ongoing high-quality resources and operate its unique and essential programs in 2015. In addition, ABC will accomplish the following:

- **Publish Laboratory Guidance Documents.** These documents summarize and evaluate existing lab analytical methods for determining authenticity and potential adulteration of herbs covered by the ABC-AHP-NCNPR Botanical Adulterants Program. The goal is to provide laboratory and quality control directors another tool to prevent adulterated botanical raw materials and extracts. (The first document on skullcap [*Scutellaria lateriflora*, Lamiaceae] was released in January 2015.)
- **Publish Botanical Adulterants Bulletins.** These short, two-to-three page advisories will alert the herb industry, and the community at-large, to the presence of confirmed adulterated botanical raw materials and/or extracts.
- **Publish a laboratory methods booklet.** This booklet will review and explain for non-chemists how to better understand laboratory methods for analysis of botanical materials and extracts.
- **Publish the ABC Solvents Reference Book.** This highly anticipated book will include a comprehensive listing of most or all solvents used in the botanical extracts industry. It will be available in both PDF and hard copy.
- **Publish new ABC-AHP-NCNPR Botanical Adulterants Program articles.** Forthcoming articles will address specific herbs with confirmed, and common, adulterants. Several articles currently are underway and in various stages of review.

All of the staff at ABC thanks ABC members for their contributions and commitment to helping ensure ABC's success. More information on supporting ABC's educational nonprofit mission, becoming a member, joining the Adopt-an-Herb Program, or making a donation, is available by contacting ABC at 512-926-4900 or [development@herbalgram.org](mailto:development@herbalgram.org). HG

## American Botanical Council Welcomes New Board of Trustees President Thomas Newmark

The American Botanical Council (ABC) announces that Thomas Newmark has been elected president of the ABC Board of Trustees. He succeeds author, photographer, and botanist Steven Foster, who has served in the position since 2008. The decision was made at a meeting of the Board in December 2014.

Newmark joined the ABC Board of Trustees in 2012, bringing with him a deep devotion to environmentalism, conservation, and organic herb production, along with more than a decade of experience within the regulatory environments of the natural products industry.

“We are pleased that Tom has agreed to serve ABC as its new Board president,” said ABC Founder and Executive Director Mark Blumenthal. “The ABC staff and I are looking forward to working with him and his dynamic energy to help ABC continue to expand its unique nonprofit educational mission.”

“Having had the honor to serve as president of the Board of Trustees since 2008, it is my delight to hand over the official ABC gavel to Tom Newmark,” said Foster, adding: “Tom brings a rich blend of nonprofit and for-profit board experience to ABC along with wide-ranging leadership in international environmental policy advocacy and development.”

Newmark holds a degree in law from Washington University and was an attorney earlier in his career. He is perhaps best known for his past role at New Chapter, Inc., where he helped the dietary supplement company become the first to have its entire line of vitamins certified as made with organic ingredients, and all products verified by the Non-GMO Project.

After serving as a legal consultant to his college friend and New Chapter Founder Paul Schulick, Newmark joined New Chapter as its president in 1999. In the 13 years that followed, his roles at the company included co-CEO, CEO, and chairman. With Schulick, Newmark co-authored *Beyond Aspirin* (Holm Press, 2000) and *The Life Bridge* (Herbal Free Press, 2002).

“In my three plus decades of connection with the herbal supplement field, I can confidently say that Tom (Tommy) Newmark is a rare force of nature,” said Schulick. “He is a key factor that helped catapult New Chapter to its leader-

**“Tom brings a rich blend of nonprofit and for-profit board experience to ABC along with wide-ranging leadership in international environmental policy advocacy and development.”**

### New Employee Profile: Brian Armstrong

In August 2014, Brian Armstrong joined the staff of the American Botanical Council (ABC) as executive assistant, supporting ABC Founder and Executive Director Mark Blumenthal. Originally from Houston, Texas, Armstrong has an extensive international background and came to Austin, Texas from Toronto, Canada. He graduated from the University of North Texas with a degree in English.

“After college, I went over to Korea first and started teaching English over there, and I was there for a little over a year and a half,” he explained. “Then I went to Vietnam and stopped there because I really liked it. I was in Hong Kong for a while, [then] Thailand, Laos, and Cambodia.”



Armstrong

A lifelong interest in stand-up comedy brought him back to North America. “I had started doing stand-up quite a bit in Saigon,” he said, “and so I wanted to make a little bit more of a run at it. Toronto is probably one of the top five places in North America to do it.”

While performing for American expats (and a few Vietnamese locals) looking for entertainment in Saigon, Armstrong showed a knack for organization and promotion. “When I showed up there, there was a small group of three people who were putting together shows. I had done that quite a bit in college, so I came in and helped them rearrange how they were running things. I teamed up with them and we started doing shows, and [it] quickly went from fifty people showing up to two hundred or so.”

At ABC, Armstrong assists Blumenthal primarily with his travel arrangements, schedule, and phone calls. He enjoys the variety of tasks necessary to keep everything running smoothly for the executive director. “I pretty much work as Mark’s arm here,” he said. “Since he’s always out creating and nurturing organization and busi-

ship position in the field,” Schulick continued, “and [he] will, I am certain, bring energy and wisdom to the leadership of the American Botanical Council. The herbal field and the planet’s health have the greatest of allies in Tom Newmark.”

Newmark co-owns the biodynamic organic herb farm Finca Luna Nueva in Costa Rica. He also co-founded and chaired the nonprofit Semillas Sagradas (now Sacred Seeds), an international network of 16 botanical sanctuaries that preserve traditional and medicinal plants and the knowledge surrounding their important uses. Sacred Seeds is now administered by United Plant Savers. ABC is part of the Sacred Seeds network with a foundational garden at its Austin, Texas, headquarters comprising plants used by Native American, Mexican American, and European settlers throughout the Central Texas region.

Newmark is also chairman of Greenpeace Fund USA, a tax-exempt funding organ for the environmental activist group Greenpeace, and is the



co-founder and chair of The Carbon Underground, a nonprofit that teaches farmers, ranchers, and corporations how to use regenerative agricultural practices to sequester carbon dioxide and possibly reverse climate change.

“We are delighted that Tom Newmark has been appointed president of the Board of Trustees of the American Botanical Council,” said Michael Balick, PhD, ABC Board of Trustees member and New York Botanical Garden vice-president of botanical science. “ABC will benefit from the critical thinking, kindness, and wealth of experience Tom brings to this position,” Dr. Balick continued, “including [as a] businessperson and entrepreneur, herbalist, organic farmer, nonprofit manager, author, and devoted activist for planetary health and healing. We are also deeply grateful to Steven Foster, the outgoing president, for his many contributions to this important and impactful organization.” HG

ness contacts, my work is a lot of the things which directly relate to that.” Armstrong is actively involved with scheduling Blumenthal’s appointments, calls, and speaking engagements, as well as his daily activities and on-site meetings. “There’s a lot of stuff to do here, and there’s a lot of little things,” he said. “Sometimes there can be fifty small tasks in a day, and it’s challenging.”

“This is the first time we’ve ever hired an executive assistant with any stand-up comedy experience,” said Blumenthal. “It’s really different to have someone in a position of such high-demand for organizational and professional skills who sees the inherent humor and absurdity in many day-to-day activities and tasks,” he added. “It’s really different, and a pleasure to work with someone who doesn’t get uptight just because there’s a big deadline approaching, or, perhaps, just because we just missed one!”

When he’s not pursuing his stand-up comedy, Armstrong keeps himself busy outside of work with music and cooking. He made a point of taking a cooking class in every country he went to, and he claims that his current pursuit of healthier cooking was inspired by ABC. Texas’s eclectic music scene has drawn his interest as well: social

and unafraid of a crowd, he attends open-mic nights with his girlfriend — also a stand-up comic — to play the guitar and sing.

Armstrong considers the location and mission of ABC to be the best job perks. Though he admits to having very little interest in herbal medicine prior to joining the staff, he finds it interesting to learn the basics from Education Coordinator Jenny Perez and Special Projects Director Gayle Engels. “It’s neat to go downstairs and see Jenny’s desk covered in vines,” he laughed, “and it’s nice to work for an organization that does some good.” Open to trying herbal remedies, he enjoys exploring various tinctures, teas, and other preparations. He also appreciates having his own corner office overlooking the 2.5-acre gardens at ABC’s Case Mill Homestead.

The sometimes hectic world of a nonprofit organization’s daily operation seems to suit Armstrong just fine. “I like the people I work with, and I like that there’s always something different to do,” he said. “I’m looking forward to a great 2015 here in my new home at ABC.” HG

—Hannah Bauman



## United Plant Savers and Sacred Seeds Sanctuary Collaborate for Plant Conservation

In October 2014, United Plant Savers (UpS) announced its merger with Sacred Seeds Sanctuary, uniting two organizations with the common goal of native plant conservation.<sup>1</sup> Both organizations oversee groups of botanical gardens devoted to raising and preserving native plants, including UpS's Botanical Sanctuary Network and Sacred Seeds' Foundational Gardens. According to a Sacred Seeds press release, the merger is intended "to grow our Botanical Sanctuary Network and the Foundation Gardens in the effort to safeguard traditional plant knowledge and the native habitats in which these sacred plants thrive."<sup>2</sup>

Sacred Seeds, a coalition of sanctuaries and gardens managed through the Missouri Botanical Garden in St. Louis, works to preserve biodiversity and plant knowledge around the world through its Foundational Gardens. Sacred Seeds began with Finca Luna Nueva in Costa Rica, and there now are Foundational Gardens in 14 different countries, including at the American Botanical Council's Case Mill Homestead in Austin, Texas. These gardens propagate native plants with medicinal, ceremonial, food, and craft value.

UpS celebrated its 20th year in 2014, and Executive Director Susan Leopold, PhD, looks forward to expanding the scope of its projects. "This merger allows us to share internationally the framework that UpS had created," she wrote (email, November 22, 2014). "Sacred Seeds brings with it the knowledge of [its founders]... [T]o have Tom Newmark, Steve Farrell, Dr. Michael Balick, and Dr. Rainer Bussmann join the intellectual mission of UpS is incredible." Similar to the founding of Sacred Seeds, the UpS Botanical Sanctuary Network started with the Goldenseal Botanical Sanctuary in Rutland, Ohio, and now includes gardens in 31 US states as well as two Canadian provinces.

As part of the organization's continuing efforts to conserve valuable medicinal plants, UpS recently published a "Plants at Risk" tool and assessment guide, in addition to its "At-Risk" and "To-Watch" lists. The tool and guide are focused primarily on plants in the United States, but Dr. Leopold hopes that the new partnership with Sacred Seeds will allow the project to go global. "[The list] has helped bring awareness and more sourcing of cultivated plant material when possible," she wrote. "We hope to work with international Sacred Seeds gardens to help establish regional lists of at-risk and to-watch plants."

Plants with traditional and medicinal uses face dwindling population numbers due to environmental factors and human activities, including overharvesting, destruction of habitat, an increased herbivore population, and drought. Such factors emphasize the importance of conser-



vation-focused organizations such as UpS and Sacred Seeds. "We all know the cultural and physical landscape is changing rapidly," Dr. Leopold wrote, "and we need the ethnobotanical tool box to reverse the loss of plant knowledge and the rapid extinction of native medicinal and sacred plants."

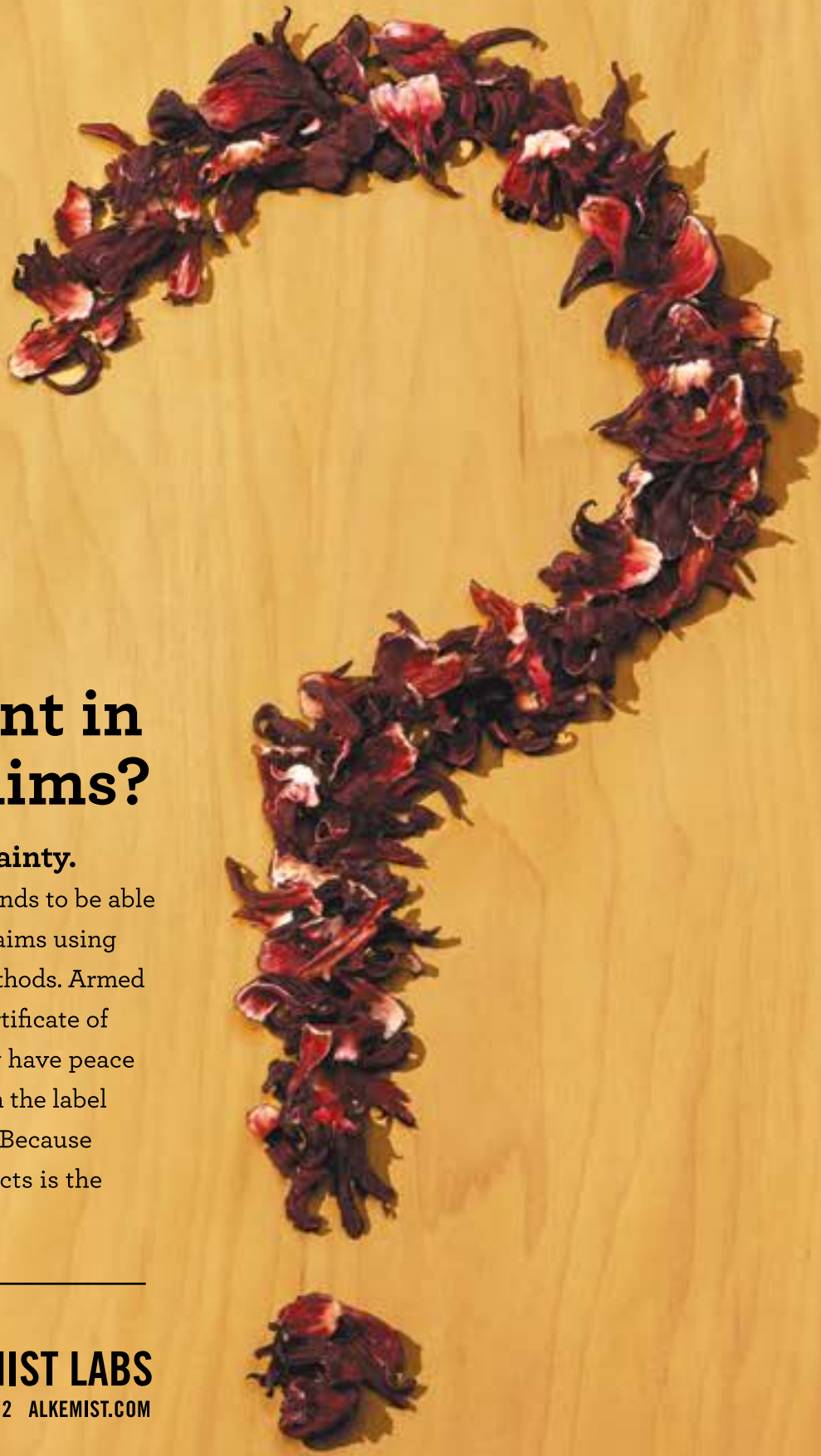
"All of us at Sacred Seeds are thrilled that Dr. Susan Leopold and her team at United Plant Savers will now be administering our international project," wrote Tom Newmark, chair and co-founder of Sacred Seeds (email, December 8, 2014). "We are deeply grateful to Ashley Glenn and the William L. Brown Center at the Missouri Botanical Garden for their foundational work on behalf of our project, and we look forward to their continued collaboration. We need to establish more Sacred Seeds sanctuaries around the world; indeed, our founding mission was to have sanctuaries in every life zone around the world, and by connecting them in an open network help to preserve both plants and traditional knowledge. We're well on our way, and through this confederation with UpS we expect a rapid build of our international network."

The collaboration between the two organizations was made possible through support from New Chapter®, a key sponsor of Sacred Seeds Sanctuary. HG

—Hannah Bauman

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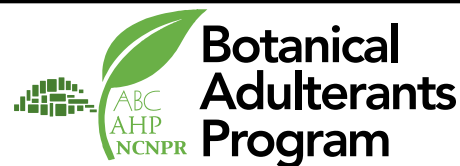
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For more details on joining the program, and access to the free publications produced to date, please see [www.herbalgram.org/adulterants](http://www.herbalgram.org/adulterants) or contact Denise Meikel at [denise@herbalgram.org](mailto:denise@herbalgram.org).

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 Complementary Medicines Australia (Australia)  
 Consumer Healthcare Products Association (US)  
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#### **Nonprofit/Professional Associations**

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## Two Leading British Herbal Organizations Endorse Botanical Adulterants Educational Program

*150-Year-Old UK Herbal Practitioners Association and Leading UK Herb Trade Association to Support ABC-AHP-NCNPR Botanical Adulterants Program, an International Herbal Quality Control Initiative*

The National Institute of Medical Herbalists (NIMH) and the British Herbal Medicine Association (BHMA) recently endorsed the ABC-AHP-NCNPR Botanical Adulterants Program, an international consortium of nonprofit organizations, analytical laboratories, industry members, professional scientists, and others that advises industry, researchers, health professionals, and additional communities about the various challenges related to adulterated herbs and botanical ingredients in commerce.

NIMH, which was founded in 1864 and is “the UK’s leading professional body representing herbal practitioners,” gave notice of its support in a letter dated December 15, 2014, from NIMH President Laura Stannard to Mark Blumenthal, founder and executive director of the nonprofit American Botanical Council (ABC) and general manager of the ABC-AHP-NCNPR Botanical Adulterants Program. In the letter, Stannard said of the decision: “The NIMH is happy to support the Botanical Adulterants Program. In lending our name to the program we hope that other professional associations will follow our lead. The adulteration of medicinal plants is an issue of grave concern for all herbalists and everyone involved in herbal medicine worldwide.”

BHMA, founded in 1964, promotes the advancement of “the science and practice of herbal medicine in the United Kingdom. It promotes the use of herbal medicinal products manufactured to pharmaceutical standards to ensure consistently high quality and effectiveness for the consumer.”

The BHMA’s support for BAP was confirmed on January 7, 2015. In an email to Blumenthal, BHMA Chairman Dick Middleton, PhD, commented: “The BHMA is delighted to endorse and support the ABC-AHP-NCNPR Botanical Adulterants Program. The principle objectives of the Program are pivotal to the ongoing development of high-



quality herbal health products in the US and related markets, including the United Kingdom. The core thrust of the program involving education and training will also lead to the increasing global availability of high-quality herbal materials to herbal product manufacturers. This will help to create more robust, high-quality supply chains.”

Adulteration refers to the accidental or intentional substitution or dilution of a material with an undisclosed or lower-cost ingredient, thereby giving the consumer a false sense of the value or quality of an ingredient or product containing such an adulterated ingredient.

The ABC-AHP-NCNPR Botanical Adulterants Program is a coalition of three American nonprofit groups: ABC, the American Herbal Pharmacopoeia (AHP), and the University of Mississippi’s National Center for Natural Products Research (NCNPR), with more than 130 other American and international parties supporting and cooperating with the Program.

“We are most grateful and encouraged by the strong show of support for our Program that we have received from our herb colleagues in the United Kingdom,” said Blumenthal.

“There is a long and robust history of the rational and responsible use of herbs as a form of selfcare and healthcare in the UK, going back centuries. Support for our educational efforts about how to detect adulteration and fraud in

the herbal market will not only help enhance the quality of herb products in the UK, but will provide greatly welcome added impetus and cooperation to the international educational efforts of our Program,” Blumenthal added.

NIMH’s endorsement of the ABC-AHP-NCNPR Botanical Adulterants Program follows similar endorsements made by other professional organizations, including the International Society for Medicinal Plant and Natural Product Research (known by its German acronym, GA) and the American Society of Pharmacognosy (ASP), both highly respected international organizations composed of leading medicinal plant research experts. The GA and ASP are the two largest organizations of professional researchers in the field of medicinal plants and drugs of natural origin.

“As people continue to use herbal medicines, the role of qualified practitioners in supporting them in making informed decisions is essential. This has never been more important than now with the ongoing challenge of adulterations of ingredients used in the products. The endorsement of this program by organizations with the expertise and reputation of the NIMH and BHMA will only strengthen access to high-quality herbal medicines globally,” said Michael Smith, ND, member of the World Health Organization Expert Advisory Panel on Traditional Medicines and the ABC Advisory Board.

Other endorsements of the Botanical Adulterants Program by healthcare-oriented organizations include those from the American Association of Naturopathic Physicians and the Council of Colleges of Acupuncture and Oriental Medicine.

BHMA’s endorsement also follows the endorsements of other leading trade organizations, both internationally and in the United States. These include the International Dietary/Food Supplement Trade Alliance (IADSA),

the Australian Self Medication Industry, Complementary Medicines Australia (formerly the Complementary Healthcare Council), the Australian Tea Tree Oil Association, and, just recently, Natural Products New Zealand.

In the United States, the trade associations underwriting the Botanical Adulterants Program include the Consumer Healthcare Products Association, the Council for Responsible Nutrition, the Natural Products Association, and the United Natural Products Alliance.

To date, the ABC-AHP-NCNPR Botanical Adulterants Program has published five extensively peer-reviewed and referenced articles on the history of adulteration, the adulteration of the herbs black cohosh and skullcap, and adulteration of extracts of bilberry fruit and grapefruit seed. These open-access articles are available on the Program’s webpage: [www.herbalgram.org/adulterants](http://www.herbalgram.org/adulterants). The Program also publishes a quarterly newsletter, “The Botanical Adulterants Monitor,” that highlights new scientific publications related to botanical authenticity and analysis to detect possible adulteration, recent regulatory actions, and Program news. Further, the Program recently released its first in a series of Laboratory Guidance Documents to help industry and third-party analytical laboratories determine the most effective analytical methods for detecting adulteration and authenticating botanical raw materials and extracts. The first of these was published on skullcap, an herb subject to documented adulteration. Additional publications from the Program are scheduled for release in the coming months. HG

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These are just a few of the recent additions to the ABC catalog of expert books.

***Ancient Pathways, Ancestral Knowledge: Ethnobotany and Ecological Wisdom of Indigenous Peoples of Northwestern North America*** by Nancy J. Turner, 2014. Turner, the preeminent ethnobotanist studying the First Nations of Canada, weaves together a complex understanding of the traditions of use and management of plant resources in this vast region. She follows Indigenous inhabitants over time and through space, showing how they actively participated in their environments, managed and cultivated valued plant resources, and maintained key habitats that supported their dynamic cultures for thousands of years, as well as how knowledge was passed on from generation to generation and from one community to another. To understand the values and perspectives that have guided Indigenous ethnobotanical knowledge and practices, Turner looks beyond the details of individual plant species and their uses to determine the overall patterns and processes of their development, application, and adaptation. Hardcover, Two volumes, 1056 pages. **\$100.00 (\$90.00 ABC Member Price)**

***Botanicals: Methods and Techniques for Quality and Authenticity*** by Kurt Rynertson and Khalid Mahmood, 2015. Insight compiled from expert contributors addresses the challenge of identifying a botanical extract or preparation on the basis of its chemical content and includes a range of methods and techniques that can be used to help guide quality and authenticity determinations. Topics include metabolic profiling, authentication via morphology, and genetic methods of authentication; NMR, NIR, and HPTLC methods; and tools for building models for the authentication of materials. Hardcover, 332 pages. **\$125.96 (\$113.36 ABC Member Price)**

***Essential Chinese Formulas: 225 Classical and Modern Prescriptions Organized by Clinical Category*** by Jake Paul Fratkin, 2014. Calling on the author's 35 years of clinical experience with Chinese herbal medicine, this book concisely summarizes existing information on 133 classical Chinese formulas, 83 modern formulas, and nine single herbs. It provides ingredient percentages, historical origins, TCM indications, commentary with clinical applications, and contraindications and cautions. Hardcover, 650 pages. **\$65.00 (\$58.50 ABC Member Price)**

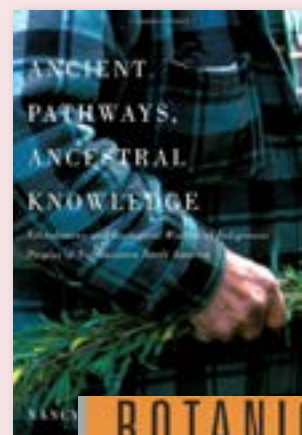
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***Handbook of African Medicinal Plants***, 2nd ed. by Maurice M. Iwu, 2014. An overview of 2000 species of plants available in Africa as medicinal agents, with information about botany, chemistry, pharmacology, and usage, including traditional healing methods. Provides a pharmacognosy-based profile of 170 of the major herbs, with a brief description of the diagnostic features of the leaves, flowers, and fruits and monographs with botanical names, common names, synonyms, African names, habitat and distribution, ethnomedicinal uses, chemical constituents, and reported pharmacological activity. Hardcover, 506 pages. **\$125.96 (\$113.36 ABC Member Price)**

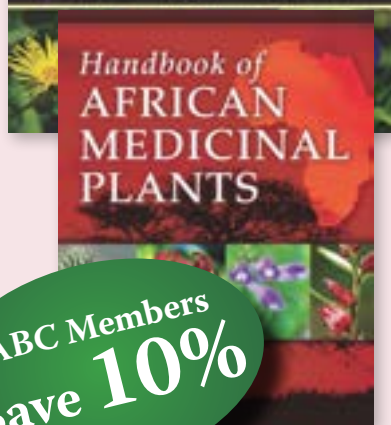
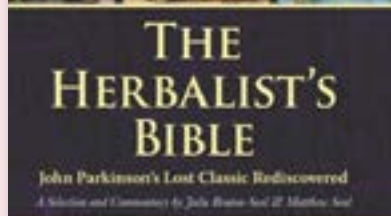
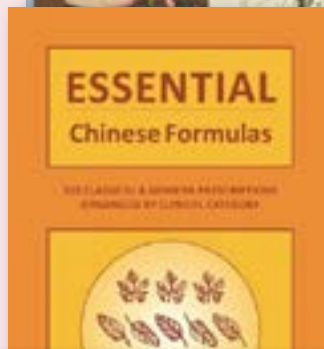


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Cranberry *Vaccinium macrocarpon*. Photo ©2015 Steven Foster



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## Chaste Tree Extract May Promote Healing of Long Bone Fractures in Women

**Reviewed:** Eftekhari MH, Rostami ZH, Emami MJ, Tabatabaee HR. Effects of “*Vitex agnus castus*” extract and magnesium supplementation, alone and in combination, on osteogenic and angiogenic factors and fracture healing in women with long bone fracture. *J Res Med Sci.* January 2014;19(1):1-7.

Broken or fractured bones are a common injury, but complications may delay the healing process. Vascular endothelial growth factor (VEGF) has been shown to induce angiogenesis (i.e., increased blood circulation to a tissue or organ), which may facilitate bone repair. Chaste tree (*Vitex agnus-castus*, Lamiaceae) fruit has been used traditionally for female reproductive system problems,<sup>1,2</sup> and recent in vivo research indicates that it may aid bone healing as well. This randomized, double-blind, placebo-controlled trial investigated the impact of chaste tree and magnesium (an essential mineral for bone formation and repair) supplementation on premenopausal women with long bone fractures.

In total, 64 women (aged 20 to 45 years) who received surgical treatment for their fractures were enrolled in the study. Patients were excluded if they were pregnant or lactating, smokers, postmenopausal, had a chronic disease, used alcohol, were taking pharmaceuticals to speed bone healing, or using diuretics, hormones, vitamins, minerals, or botanical supplements known to contain phytoestrogens.

The eight-week treatment consisted of 4 mg/day dried chaste tree fruit extract (Agnugol; Goldaru Pharmacy Company; Isfahan, Iran), 250 mg/day magnesium oxide (Nature Made®; Pharmavite, LLC; Mission Hills, California), or placebo (two forms of placebo were given to match the

Agnugol capsules and the magnesium tablets; both consisted of lactose, starch, and “maintaining substances,” procured from the Shiraz University of Medical Sciences School of Pharmacy; Shiraz, Iran). The authors did not provide an adequate description of the extract, but the manufacturer’s website states that each Agnugol tablet contains 3.2 to 4.8 mg *V. agnus-castus* dried extract, equivalent to 0.42 to 0.58 mg aucubin.

Included patients were assigned randomly to one of four groups. Group one received chaste tree and magnesium, group two received chaste tree and placebo, group three received magnesium and placebo, and group four received both placebos. Compliance was assessed every two weeks by phone, and those who did not take the treatment for more than six days were excluded.

At baseline, fracture history was taken, and participants’ pre-fracture exercise levels were assessed as light, moderate, or severe. A food frequency questionnaire (FFQ) was used to assess nutritional intake, with phytoestrogen intake rated as high (twice per day), moderate (two to seven times per week), or low (once per week to once per month). Fasting blood samples were collected at the beginning and end of the study

**CHASTE TREE EXTRACT** *continued on page 26*

Chaste Tree *Vitex agnus-castus*. Photo ©2015 Steven Foster





## Cranberry Supplements May Reduce the Severity of Radiation-Induced Cystitis

**Reviewed:** Hamilton K, Bennett NC, Purdie G, Herst PM. Standardized cranberry capsules for radiation cystitis in prostate cancer patients in New Zealand: a randomized double blinded, placebo controlled pilot study [published online July 4, 2014]. *Support Care Cancer*. 2014;23(1):95-102. doi: 10.1007/s00520-014-2335-8.

Patients with prostate cancer undergoing radiation therapy often experience acute radiation-induced cystitis (inflammation of the bladder). Although the symptoms of this condition can be treated, there are no preventative therapies available. Cranberry (*Vaccinium macrocarpon*, Ericaceae) supplements have been associated with urinary tract health and therefore may be beneficial for patients with radiation-induced cystitis. The aim of this randomized, double-blinded, placebo-controlled pilot trial was to evaluate the effects of a standardized cranberry supplement on the incidence and severity of radiation cystitis in patients with prostate cancer.

The men participating in this study received radiation therapy for cancer of their prostate and regional lymph nodes at the Southern Blood and Cancer Centre in Dunedin, New Zealand. Eligible patients were identified from planning computed tomography (CT) scans that assessed the prostate, bladder, and bowel. Excluded patients included men who had previous radiation therapy, metastatic disease, consumed the anticoagulant drug warfarin, had a Karnofsky performance status score of less than 70 (a scoring index that classifies functional ability of cancer patients; patients with scores under 70 required at least some assistance for personal care), had kidney stones, or had an allergy to cranberries.

In terms of radiation treatment, the patients were prescribed a dose of 74 Gy (Gray units) in 37 fractions or 64 Gy in 32 fractions to the prostate and prostate bed, respectively. The patients all received intensity-modulated radiation therapy (6 MV [megavolt] photon beam). Radiation treatment was directed to the prostate, prostate bed, and/or regional lymph nodes. There was a nine-week radiation treatment period for the prostate bed and a 10-week treatment for the prostate and prostate nodes. Patients (n=41) were randomly assigned to take one capsule per day with



breakfast of either a cranberry extract (Naturomed LTD; Rotorua, New Zealand) (n=20) or a placebo (n=21) during the radiation treatment period and for two weeks post-treatment. The cranberry capsules contained 72 mg proanthocyanidins (PACs), determined by UV-Vis/SEC standard method, and the placebo capsules were nearly identical in taste, color, and smell.

Patients were advised to limit or not consume wine, grapes (*Vitis vinifera*, Vitaceae), cranberries, or other berries during the study. Treatment effects were evaluated by assessing the Modified Expanded Prostate Index Composite (EPIC) scores both at the beginning and the end of the study. In particular, this study focused on five urinary symptoms and the degree to which seven urinary tract symptoms bothered the patients.

The results of this study were analyzed on an intent-to-treat basis for 40 patients (20 in both groups). A total of two patients did not comply with the study, including one that left the study after two weeks. Most of the men (mean age: 68 years) in this study were of European descent (93%)

**CRANBERRY** continued on page 26

**CHASTE TREE EXTRACT** *continued from page 24*

to assess VEGF and serum levels of the osteogenesis markers alkaline phosphatase (ALP) and osteocalcin (OCN). Also, at baseline and endpoint, participants were X-rayed to detect and measure the formation of calluses, an indication of fracture healing.

Of the 64 patients enrolled, 51 finished the protocol. In group one, six patients were excluded due to non-compliance, loss to follow-up, or transportation problems. In group two, one patient was lost to follow-up; in group three, four patients were excluded due to non-compliance, loss to follow-up, or personal causes; and in group four, two patients were excluded for non-compliance or transportation issues. Despite these issues, overall compliance in the trial was 95.45%.

The participants' fractures were caused by accidents (62.7%) or falls (37.3%). The fractures occurred in the tibia (52.9%), femur (25.5%), humerus (13.7%), and radius and ulna (7.8%). There were no significant differences among groups in age, fracture etiology, location of fracture, or consumption of phytoestrogens, magnesium, calcium, zinc, or vitamins C, D, and K.

The total change in ALP concentration from baseline to endpoint was not significantly different among groups; however, in group two (chaste tree and placebo), the increase in ALP concentration approached significance ( $P=0.05$ ). Osteocalcin levels were significantly higher in group one (chaste tree and magnesium) as compared to groups two and four ( $P=0.01$ ). Although there were no significant differences in VEGF changes among groups, VEGF significantly increased in group two from baseline to endpoint ( $P=0.01$ ). The average callus formation was 80.0% for group one, 71.4% for group two, 50.0% for group three, and 53.5% for group four, but the differences among groups were not significant. No adverse effects were reported.

Overall, participants consuming chaste tree extract alone or with magnesium had significant changes in VEGF and OCN levels respectively, suggesting the potential use of this botanical to promote bone fracture healing. The authors hypothesize that these effects may be due to the phytoestrogens present in chaste tree, although the potency of these phytoestrogens has been disputed<sup>2</sup> and was not measured in the extract tested. As some endpoints approached significance, the authors speculate that dosage may be an important factor. Further study is needed to confirm the efficacy of chaste tree extract for treating bone fractures and to assess the contribution of its different constituents. HG

—Amy C. Keller, PhD

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2. Upton R, ed. *Chaste Tree Fruit (Vitex agnus-castus)*. Scotts Valley, CA: American Herbal Pharmacopoeia; 2001.

**CRANBERRY** *continued from page 25*

and had a mid-range Gleason score (grading system for prostate cancer) of six or seven. In addition, nearly half of the patients had stage T1 disease (beginning of disease). Furthermore, all patient-related factors were distributed evenly between the two groups.

Based on symptom scoring, the researchers found that the incidence of cystitis was 65% for the patients in the cranberry treatment group and 90% for the patients in the placebo group ( $P=0.058$ ). Moreover, 30% of the patients in the cranberry group and 45% of the patients in the placebo group had severe cystitis ( $P=0.30$ ). No men in the study developed a urinary tract infection (UTI). All EPIC scores were consistently lower for the cranberry cohort. In particular, the cranberry cohort had significantly lower mean ( $P=0.045$ ) and maximum ( $P=0.019$ ) scores for pain/burning urination symptoms. The cranberry cohort also had better mean scores for urine stream, although this was not significant when accounting for baseline symptoms ( $P=0.14$ ).

Patients that presented with baseline urinary symptoms had worse EPIC scores for most symptoms. Less pain/burning ( $P=0.042$ ), better control ( $P=0.034$ ), stronger urine stream ( $P=0.036$ ), and less leaking/dribbling ( $P=0.024$ ), in comparison to the placebo group, were found to be significant only in the cranberry treatment group with baseline urinary symptoms. Additionally, patients in the cranberry cohort that followed the low-hydration regimen had significant effects on symptoms for pain/burning ( $P=0.038$ ), stronger urine stream ( $P=0.038$ ), and less frequent use of pads/liners ( $P=0.042$ ). There were no significant differences found in the high-hydration regimen.

The authors conclude, "Men receiving radiation therapy for prostate cancer may benefit from using cranberry capsules, particularly those on low hydration regimens or presenting with urinary symptoms before radiation treatment." Although the results are promising, one of the limitations of this study was that the improvements were based only on a questionnaire. This study also could have evaluated inflammation markers or other diagnostic features of cystitis. Despite this shortcoming, the interesting results of this pilot study warrant further investigations of the use of cranberry supplements for radiation-induced cystitis in both men and women. HG

—Laura M. Bystrom, PhD



## Fenugreek Seed Powder May Reduce Severity of Dysmenorrhea

**Reviewed:** Younesy S, Amiraliakbari S, Esmaceli S, Alavimajd H, Nouraei S. Effects of fenugreek seed on the severity and systemic symptoms of dysmenorrhea. *J Reprod Infertil.* 2014;15(1):41-48.

Painful cramps that occur during menstruation are known as dysmenorrhea, and they can negatively affect a woman's quality of life. Pain medication is a primary treatment, but commonly used non-steroidal anti-inflammatory drugs (NSAIDs) are associated with certain adverse side effects. Fenugreek (*Trigonella foenum-graecum*, Fabaceae) has been used traditionally for pain during menstruation and to induce childbirth,<sup>1</sup> and studies have shown that the plant has anti-inflammatory, antioxidant, carminative (flatulence-relieving), hypoglycemic, and hypolipidemic properties. This randomized, double-blind, placebo-controlled trial investigated the impact of fenugreek consumption in women with moderate-to-severe dysmenorrhea.

Unmarried female students were enrolled in this study and matched for age, onset of first menstrual cycle and dysmenorrhea symptoms, and body mass index (BMI). Excluded subjects had diseases that could affect fenugreek absorption or utilization — such as diabetes, chronic hypertension, or infectious diseases — or had irregular menstruation, endometriosis, a history of conventional pharmaceutical use, acute stress, or symptoms of vaginal infection. Patients who did not comply with the treatment protocol also were excluded.

Fenugreek seeds (procured from Zardband Pharmaceuticals; Tehran, Iran) were ground and transferred to capsules (900 mg). Placebo capsules contained potato (*Solanum tuberosum*, Solanaceae) starch. If pain medication was necessary, patients were instructed to take these drugs one hour or more after consumption of the treatment or placebo and to report the severity of pain. During the first three days of menstruation, patients were instructed to take two to three capsules, three times per day, for a maximum total of 2,700 mg per day, for two consecutive menstrual cycles.

Patients used a checklist to report additional medication taken for pain, the severity of pain, and menstruation symptoms. A visual analog scale (VAS) was used to assess pain during the first three days of menstruation. A score of 1-2 indicated mild pain, 3-7 was moderate, and 8-10 was severe. Associated systemic symptoms such as fatigue, diarrhea, syncope (fainting), nausea, vomiting, lack of energy, headache, and mood swings were scored from 0-3.

In total, 106 patients were enrolled, with 101 completing the protocol (51 in the fenugreek group; 50 in the placebo group). Reasons for dropouts or exclusions were not disclosed. At baseline, no significant differences were noted in overall age, age of menstruation or dysmenorrhea onset, pain severity, or BMI. At the end of the study, pain severity significantly decreased in both groups after the second cycle as compared to baseline. In the fenugreek group, base-

line pain was measured at  $6.4 \pm 1.83$  and decreased to  $3.25 \pm 1.25$  ( $P < 0.001$ ) after the second menstrual cycle. In the placebo group, baseline pain was measured at  $6.14 \pm 1.89$  and decreased to  $5.96 \pm 1.87$  ( $P = 0.016$ ) after the second menstrual cycle.

After each cycle, pain severity in the fenugreek group also was significantly less than in the placebo group ( $P < 0.001$  for both). After the first cycle, the fenugreek group had scores of  $4.32 \pm 1.50$ , and the placebo group rated  $6.03 \pm 1.78$ . After the second cycle, pain severity in the fenugreek group was  $3.25 \pm 1.25$ , and the placebo group was  $5.96 \pm 1.87$ . In the fenugreek group, duration of pain decreased significantly ( $P = 0.01$ ). In contrast to placebo, fenugreek also reduced dysmenorrhea-associated systemic symptoms, including nausea, vomiting, lack of energy, headache, diarrhea, mood swings, syncope, and fatigue ( $P < 0.001$ ). Lastly, the average use of pain medication in the fenugreek group significantly decreased at the study's endpoint as compared to the placebo group ( $P < 0.001$ ).

Overall, fenugreek consumption reduced both duration and pain severity of dysmenorrhea in otherwise healthy women. Those taking fenugreek used less pain medication and reported no adverse side effects. The effectiveness of fenugreek in reducing symptoms of dysmenorrhea in this study highlights the need for future studies to compare fenugreek with anti-inflammatory medications. HG

—Amy C. Keller, PhD

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Fenugreek *Trigonella foenum-graecum*. Photo ©2015 Steven Foster





## Tripterygium Compared with Methotrexate in Treatment of Rheumatoid Arthritis

Reviewed: Lv Q-W, Zhang W, Shi Q, et al. Comparison of *Tripterygium wilfordii* Hook F with methotrexate in the treatment of active rheumatoid arthritis (TRIFRA): a randomised, controlled clinical trial [published online April 14, 2014]. *Ann Rheum Dis*. doi: 10.1136/annrheumdis-2013-204807.

Rheumatoid arthritis (RA) is a painful and debilitating chronic autoimmune/inflammatory disease, which typically is treated with disease-modifying antirheumatic drugs (DMARDs). The root extract of the traditional Chinese medicine tripterygium (*Tripterygium wilfordii*, Celastraceae; sometimes referred to as thunder god vine) that is used to treat RA has anti-inflammatory and immunosuppressive activities, and has shown efficacy in three small RA clinical trials. Methotrexate is one of the most commonly used DMARD treatments in Western countries. The authors of this study have been using tripterygium plus methotrexate at the Peking Union Medical College Hospital in Beijing, China, to treat approximately 20,000 patients with RA per year. The purpose of this randomized, controlled, multicenter trial was to compare the efficacy of tripterygium (T), methotrexate (M), and the combination of tripterygium and methotrexate (C) in the treatment of RA.

Patients (n=207, aged 18-65 years) diagnosed with RA according to the 2010 American College of Rheumatology/European League Against Rheumatism (ACR/EULAR) criteria participated in this study conducted at nine general hospitals in China. Included patients had at least three swollen joints, five tender joints, RA for six weeks or longer, erythrocyte sedimentation rates (ESR) greater than 28 mm/hour, and C-reactive protein (CRP) concentrations greater than 20 mg/L. Patients were excluded from the study if they had an infection, cancer, received DMARDs within three months of study commencement, or were pregnant or lactating. All patients were informed of the risk of infertility associated with tripterygium, and patients who wanted to have children were excluded. Patients were permitted to take non-steroidal anti-inflammatory drugs (NSAIDs) and stable dosages of oral corticosteroids (no more than 10 mg prednisone or equivalent/day) during the study.

Patients were randomly assigned into one of three groups for 24 weeks of oral medication as follows: (T) 20 mg tripterygium (Zhejiang DND Pharmaceutical Company;

Shanghai, China) extract three times per day; (M) 7.5 mg methotrexate one time per week (which was increased once per week to 12.5 mg over four weeks) with 10 mg folic acid supplementation the day after each administration; or (C) tripterygium plus methotrexate. At week 12, patients with a reduction in the 28-joint Disease Activity Score (DAS28) of 30% or more were maintained on their current therapy; T and M patients with less than a 30% reduction in scores were changed to the combination therapy. Patients in the C

group who had a DAS28 reduction of less than 30% left the trial and were considered treatment failures.

The primary endpoint was the proportion of patients at week 24 who met the ACR efficacy criteria (ACR50), which include at least 50% improvement in DAS28 and at least 50% improvement in three or more of the following: the evaluator's or patient's assessment of global health status, the patient's assessment of pain on a visual analog scale, the patient's assessment of function using the Health Assessment Questionnaire (HAQ), and ESR or serum CRP levels. Outcome measures were assessed by a blinded investigator; patients and physicians were not blinded. There were no significant differences among the three groups at baseline.

Altogether, 269 patients were screened, 207 eligible patients were enrolled (intent to treat; ITT), and 174 completed the study per protocol (PP). At week 24, the ITT analysis indicated that ACR50 efficacy criteria were met by 46.4% of the methotrexate group, 55.1% of the tripterygium group, and 76.8% of the combination group. There were significantly more patients reaching 50% improvement in the C group compared with the M group ( $P<0.001$ ) and the T group compared with the M group ( $P=0.014$ ). Significantly more patients reached remission (DAS28 scores less than 2.6;  $P=0.002$ ), had at least a 50% improvement in clinical Disease Activity Index ( $P=0.003$ ), had a good or moderate EULAR response ( $P<0.001$ ), and had low disease activity ( $P<0.001$ ) in both the C/M group and T/M group comparisons. There was no significant difference between the T and M groups in DAS28 improvement from baseline to



*Tripterygium wilfordii*.  
Photo ©2015 Qwerty1234

week 24; however, the C group showed significant improvement compared with the M group ( $P=0.032$ ). Patients receiving tripterygium also had a much more rapid reduction in ESR compared with the M group.

Similar results were observed in the PP analysis of the 49 patients each in the tripterygium and methotrexate groups (86%) and the 56 patients in the combination group (81%) that completed the trial. Ten patients each in the tripterygium and methotrexate groups were switched to the combination therapy at 12 weeks. Four patients each in the T and M groups and three in the C group withdrew due to lack of efficacy. Ten patients were withdrawn from the study due to protocol violations: one in the M group, three in the T group, and five in the C group. Seven patients discontinued the study due to severe adverse effects (AEs): one in the T group, two in the M group, and three in the C group. A total of 52.7% patients reported AEs; the frequency of AEs was not significantly different among groups. Fifteen (8.8%) of the female patients had irregular menstruation, which is a known AE of tripterygium; however, there were no significant differences among groups.

The authors conclude that tripterygium extract was not inferior to methotrexate, and the tripterygium-methotrexate combination therapy was better than methotrexate alone for treating patients with RA who were naïve to DMARDs. The combination therapy was safe and effective. The acknowledged limitations of this study were that only evaluators assessing the clinical outcomes were blinded, disease progression was not documented radiologically, and while the dose of methotrexate evaluated (12.5 mg/week) is standard in Asia, higher doses commonly are used in Western countries. The authors point out that higher doses are unlikely to produce better results since the response to the combination therapy was higher than those reported with methotrexate monotherapy. HG

—Heather S. Oliff, PhD

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## Solvents Used in the Manufacture of Botanical Extracts, Food Flavors, and Natural Food Ingredients: An Educational Guide for Ingredient Extractors; Manufacturers of Conventional Foods, Dietary Supplements, Botanical Drugs, Natural Cosmetics, and Other Natural Products; and Analytical Laboratories

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## Pumpkin Seed Oil Consumption May Improve Hair Growth in Men with Androgenetic Alopecia

**Reviewed:** Cho YH, Lee SY, Jeong DW, et al. Effect of pumpkin seed oil on hair growth in men with androgenetic alopecia: a randomized, double-blind, placebo-controlled trial [published online April 23, 2014]. *Evid Based Complement Alternat Med.* doi: 10.1155/2014/549721.

Androgenetic alopecia (AGA) is a form of hair loss common in older men that is linked to both genetic factors and effects of androgenic hormones. Standard drug therapies used to treat AGA often produce adverse side effects. This has led researchers to explore alternative treatments, such as natural products that block the action of androgenic hormones or the enzyme 5 $\alpha$ -reductase, which is involved in the conversion of testosterone to dihydrotestosterone. Studies have suggested that pumpkin (*Cucurbita pepo*, Curcubitaceae) seed oil (PSO) may exhibit some of these effects, but it had not been investigated as a treatment for AGA. The aim of this randomized, placebo-controlled, double-blind study was to evaluate the efficacy and safety of PSO for male patients with mild-to-moderate AGA.

This 24-week study was conducted in Busan, South Korea. Patients had moderate hair loss that was classified as Norwood-Hamilton type II, III, III vertex, IV, or V. A total of 76 adult males (aged 20 to 65 years) participated in the study. Criteria for inclusion were mild-to-moderate AGA, no use of any hair-loss treatment for three months prior to the study, liver enzymes aspartate aminotransferase (AST) and alanine aminotransferase (ALT) levels less than 60 mg/dl, and creatinine levels below 1.5 mg/dl.

Patients were divided randomly into either the interven-

tion group (n=37) — which consumed two capsules of 100 mg PSO (Octa Sabal Plus<sup>®</sup>; Saerona Co., Ltd.; Daegu, South Korea) twice per day, 30 minutes before breakfast and dinner — or the control group (n=39), which received the same number of identical placebo capsules. No information about the supplement or placebo was provided.\* Safety and compliance were evaluated by reports of adverse side effects and pill counts, respectively, at each clinic visit after one, four, and 12 weeks of treatment. At baseline and at 24 weeks, blood samples were obtained after 12 hours of fasting. Fasting blood glucose, serum AST, serum ALT,  $\gamma$ -glutamyltransferase (GGT), creatinine, and testosterone levels were determined from the blood samples.

Patients rated their observations using a visual analog scale (VAS; from worst to best: 0-10) for hair growth improvement and satisfaction with the treatment. Pictures of the patients' scalps (vertex and superior frontal scalp) were taken at baseline and 24 weeks. Blinded investigators assessed these photos and rated changes in scalp appearance from baseline to 12 and 24 weeks using a seven-point rating scale (from worst to best: -3 to +3). Hair counts and hair diameters were measured at baseline, 12 weeks, and 24 weeks by phototrichography (a technique in which a close-up image of a well-defined scalp area is taken and analyzed using special software). The hair

Pumpkin Seed *Cucurbita pepo*. Photo ©2015 Steven Foster





changes were evaluated by a technician who established the most severe site of baldness as the region for all subsequent measurements.

There were no significant differences between the intervention and placebo groups' demographic data, body measurements, or clinical characteristics at baseline. At 12 weeks, there were no significant differences between the two groups for self-rated improvement ( $P=0.514$ ) or self-rated satisfaction ( $P=0.214$ ). However, self-rated improvement was significantly higher ( $P=0.013$ ) in the intervention group ( $3.4 \pm 2.9$ ) compared to the placebo group ( $2.1 \pm 2.0$ ) after 24 weeks. Self-rated satisfaction also was significantly higher ( $P=0.003$ ) in the PSO group ( $3.5 \pm 2.9$ ) in comparison to the placebo treatment ( $2.3 \pm 2.0$ ) at 24 weeks.

Blinded investigators determined that treatment with PSO significantly increased hair growth compared to the placebo group at both 12 and 24 weeks ( $P<0.001$ ). Based on measurements with phototrichography, it also was found that at 12 and 24 weeks the hair count percentages (change from baseline) were significantly higher ( $P<0.001$ ) in the intervention group (30% and 40% after 12 and 24 weeks, respectively) compared to the placebo group (5% and 10%). Conversely, there were no significant differences found for change in hair thickness at 12 and 24 weeks ( $P=0.991$ ). Most of the patients did not report any adverse side effects, although one patient from each group complained of a whole-body itching sensation. One patient in the intervention group also reported mild abdominal discomfort. No major toxicity issues were observed in this study; liver enzymes, creatinine, testosterone, blood pressure, and glucose were not significantly altered.

The authors conclude that PSO may be a promising treatment for AGA but also mention that the mechanisms of

action of PSO were not investigated. Although this was the first time a clinical study evaluated the efficacy and safety of PSO for the treatment of AGA, a previous 12-month randomized, double-blind, placebo-controlled study demonstrated that a similar dose of PSO was a safe and effective treatment for patients with benign prostatic hyperplasia (BPH).<sup>1</sup> The present study not only confirms the safety of PSO, but also suggests that the mechanistic effects of PSO may involve inhibition of  $5\alpha$ -reductase, which could explain the effects associated with the treatment of BPH and AGA. Future studies should evaluate the potential mechanistic effects of PSO and confirm the efficacy of this treatment for AGA. HG

—Laura M. Bystrom, PhD

*\*Editor's note:* Unfortunately, as is too often the case with pharmacological and clinical trial publications on botanical extracts and related phytomedicinal preparations, the researchers did not provide a description of the tested material, which makes it difficult to assess the results. The CONSORT document on reporting of botanical clinical trials calls for adequate descriptions of such chemically complex preparations.<sup>2</sup>

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## American Ginseng Reported to Be Safe When Used as Adjunctive Therapy in Patients with Type 2 Diabetes Mellitus

Reviewed: Mucalo I, Jovanovski E, Vuksan V, Božikov V, Romić Ž, Rahelić D. American ginseng extract (*Panax quinquefolius* L.) is safe in long-term use in type 2 diabetic patients [published online May 7, 2014]. *Evid Based Complement Alternat Med*. doi: 10.1155/2014/969168.

For patients with type 2 diabetes mellitus (T2DM), managing the condition is complicated by a growing number of hypoglycemic pharmaceutical agents used in various combinations and by concerns about the agents' potential interactions and associated adverse effects. Common among patients with T2DM is an interest in so-called complementary and alternative medicine, particularly the use of American ginseng (AG; *Panax quinquefolius*, Araliaceae), which reportedly is well tolerated by most users. Because of a lack of randomized clinical studies on the long-term use of ginseng in patients with T2DM, the authors conducted a double-blind, randomized, placebo-controlled, parallel study to determine the safety of 12 weeks of supplementation with AG when used as adjunctive therapy in patients with T2DM.

Seventy-four patients (mean age:  $63 \pm 9.5$  years) with T2DM recruited from a diabetes outpatient clinic completed the study. From the original group of patients screened, five participants dropped out because of changes in medication therapy, and two were unwilling to continue the study. Included participants had well-controlled T2DM for more than six months without complications, metabolic stability (average glycated hemoglobin A1c [HbA1c] between 6.5% and 8.1%), and were on diet modifications and/or conventional diabetes medications. Nine of the patients used diet only to treat T2DM; others used diet plus oral agents such as metformin (n=48), sulfonylurea (n=43), dipeptidyl peptidase-4 inhib-

itors (n=11), glucagon-like peptide-1 agonists (n=1), acarbose (n=4), and metformin with pioglitazone (n=1).

The patients were randomly assigned to receive either two 500 mg capsules of AG root extract (containing 10% ginsenosides) before meals three times daily (n=35) — a daily dosage recommended in traditional Chinese medicine<sup>1</sup> — or two 500 mg identical-appearing placebo capsules containing corn (*Zea mays*, Poaceae) starch (n=39). AG root was supplied by Ontario Ginseng Growers (Simcoe, Ontario, Canada) and extracted with ethanol. Treatment or placebo was taken along with any antihypertensive or hypoglycemic medications used by the patients. At baseline, body mass index and fasting plasma glucose levels were significantly higher in the AG group compared with the placebo group; all other demographic and clinical parameters were similar.

The patients visited the clinic at baseline and at weeks six and 12 to have biochemical and anthropometric measurements taken. During these visits, participants also completed the International Quality of Life Assessment SF-36v2 questionnaire, received a new supply of capsules, returned unused capsules, and were interviewed by a dietitian. Patients were instructed to maintain body weight, follow their usual dietary and physical activity habits throughout the study, and refrain from all medications, including AG or placebo, for 12 hours before each study visit.

Safety was assessed by measuring markers of hepatic (aspartate aminotransferase and alanine amino-

transferase), renal (serum urates and serum creatinine), and hemostatic (prothrombin time and international normalized ratio) functions.

The authors report that AG had no significant dependent or independent effects on any of the safety parameters. All hepatic, renal, and hemostatic function values were within normal limits. Regarding adverse events, stomach heaviness was reported in one patient in the AG group during the first six weeks, but the patient continued the treatment.

Safety concerns surrounding the use of ginseng followed a now widely discredited, uncontrolled, observational study by Siegel<sup>2</sup> in 1979, in which 12 weeks of ginseng supplementation was associated with elevated blood pressure and several other adverse effects (e.g., gastrointestinal disturbances, insomnia, and nervousness).\*



American Ginseng *Panax quinquefolius*  
Photo ©2015 Steven Foster

The ginseng dose assigned in the Siegel trial was much higher than the usually recommended dose, and “the validity of these side effects is questionable due to a lack of a control group in the study and the fact that subjects were not controlled for dose, duration, route of administration, type of ginseng, or other concurrent bioactive substances intake,” write the authors of the study reported here, who previously found that three grams of AG taken daily for 12 weeks compared with placebo was associated with decreased blood pressure in persons with hypertension and T2DM.<sup>3</sup>

The authors point out that the results of this current study may not be generalizable to other AG ingredients, including the unprocessed root or other ginseng extracts, but they conclude that the AG treatment in this study demonstrated “rather convincing long-term clinical safety when administered as an adjunct to conventional antihypertensive and antidiabetic therapy.” HG

—Shari Henson

\*The adverse effects mentioned in the Siegel study were reported in 10% of a group of persons claiming to use products containing “ginseng” in which such products were consumed at relatively high levels with concomitant high levels of coffee.<sup>4</sup> Notably, there was no control or analysis of the “ginseng” products’ contents in the study.

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# *Helichrysum italicum:*

## THE SLEEPING GIANT OF MEDITERRANEAN HERBAL MEDICINE

By Giovanni Appendino, Laurea<sup>a</sup>; Orazio Tagliatela-Scafati, PhD<sup>b</sup>;  
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*Helichrysum italicum*. Photo ©2015 Steven Foster



## Introduction

*Helichrysum italicum* (Roth.) Don. (Asteraceae) is an iconic plant of the Mediterranean area (Figure 1), but the use of its essential oil in glamorous perfumes and personal care products has turned it into a veritable icon of luxury. However, just like the geographical distribution of *Helichrysum* species extends beyond the Mediterranean region, the properties of *H. italicum* are not limited to fragrance as they can benefit human health as well. In this context, *H. italicum* can be viewed as the sleeping giant of Mediterranean herbal medicine, and its extracts have the potential to be developed as dietary supplement ingredients just like its essential oil has been used successfully in perfumery and aromatherapy. Waking this giant will not be simple, but recent studies have provided the basis for a *Helichrysum* renaissance. This article outlines the fascinating ethnopharmacology of *H. italicum* in the light of modern molecular investigations of its constituents and their pharmacological targets, and highlights the extensive clinical studies carried out in 1930s Italy by Leonardo Santini, a physician and clinical investigator.

**Figure 1.** The yellow color of *Helichrysum* is as iconic to the Mediterranean area as the blue of the sea. Photo ©2015 Laura Morelli





## How Many *Helichrysum* Species Exist and Why is Their Color so Fade-Resistant?

The genus *Helichrysum* belongs to the family Asteraceae and encompasses more than 500 different species, with hotbeds of biodiversity centered in the Mediterranean basin, South Africa, and Australia — three geographically and geologically unrelated areas.<sup>1</sup> This split distribution is presumably the result of parallel evolution from one or more ancestral and now-extinguished species. The name *Helichrysum* (from the Greek *helios* = sun and *krysos* = gold) makes reference to the bright yellow color of the flowerheads, which is particularly striking in full sun and also remarkably persistent in the dried plant. The name of the plant in many European languages — *perpetuino* and *semprevivo* in Italian, *immortelle* in French, *everlasting* in English, *siempreviva* in Spanish — recalls this property. The yellow color of *Helichrysum*'s flowerheads has been tied to the presence of the chalcone (a particular type of flavonoid) isosalipurposide,<sup>2</sup> and its steadfastness may be due to stabilizing co-pigments, to the anatomy of the flower that preserves the bracts' vacuolar contents from air oxidation, or to a combination of these factors. On the other hand, recent investigations of *H. italicum* failed to detect the presence of chalcones<sup>3</sup> — which are probably typical of the Northern species *H. arenarium* Moench.<sup>4</sup> — but found kaempferol-type flavonols instead.<sup>3</sup> Therefore, the exact nature of the yellow pigment from *H. italicum* and, in general, of the resistance of *Helichrysum* flowerheads to fading, seem unclear. Interestingly, when mixed with mulberry (*Morus* spp., Moraceae) leaves and fed to silkworms, the flowerheads of *H. italicum* induce the production of naturally yellow silk, a material used in central Sardinia for the production of folk garments (Figure 2). Ancient Romans and Greeks decorated the statues of gods with wreaths of *Helichrysum* flowerheads, a practice mentioned by classic writers since the 7th century BCE. This use may seem curious, since existing classic statues are now the color of the original materials from which they were made (e.g., marble or bronze). However, they were originally vividly colored, and the yellow hue of *Helichrysum* in full sun would have given the effect of a gold crown on a polychromous figure.

### *Helichrysum italicum* and its Baffling Scent

*Helichrysum italicum* is a xerophytic shrub 30 to 70 centimeters high, branched at the base with small, linear, hairy leaves that give the plant an overall grey hue until the appearance of the yellow flowerheads in June or July



**Figure 2.** A girl from Orgosolo in central Sardinia wearing a scarf woven from silk obtained from *Helichrysum*-fed silkworms. (Photo courtesy Ninni Marras)

(Figure 3).<sup>1</sup> It grows in dry, stony areas at an impressive range of altitudes from sea level to more than 2,000 meters. From a botanical standpoint, *H. italicum* is an umbrella name that covers at least six distinct varieties widespread mainly in the Western European Mediterranean region. The best-known variety grows around the northern Tyrrhenian Sea, on the islands of Corsica and Sardinia and on the Tuscany islands (Figure 4). The Tyrrhenian *Helichrysum* generally is referred to as *H. italicum* Don. subsp. *microphyllum* (Willd.) Nyman — a plant that also grows on the Balearic Islands off the eastern coast of Spain (e.g., Majorca and Minorca) — but recent taxonomical work classifies it as *H. microphyllum* subsp. *tyrrhenicum* Bacch., Brullo & Giusso.<sup>5</sup> Tyrrhenian *Helichrysum* is the variety most valued for the production of an essential oil that is used in perfumery and personal-care products.<sup>6</sup> Markedly, the *Helichrysum* note is used in commercial fragrances for both males and females (e.g., *Magie Noire* by Lancôme, *Femme*

by Rochas, and *Homme* by Van Cleef & Arpels).

*Helichrysum italicum* is also the most-investigated species in terms of ethnobotany and phytochemistry. Six other species of *Helichrysum* are endemic in the Western Mediterranean area, including: *H. frigidum* (Labill.) Willd., *H. montelinasanum* E. Schmid, *H. nebrodense* Heldr., *H. saxatile* Moris, *H. siculum* (Sprengel) Boiss., and *H. rupestre* (Rafin.) DC.<sup>1</sup> Each of these species has a distinct geographical distribution; *H. montelinasanum*, which grows only in a single location in Sardinia, has a particularly limited distribution.

*Helichrysum italicum* is famous and valued for its scent, which has been referred to as rosy, exotic, and spicy. The peculiar odor note was mentioned in the 1st century CE by Pliny the Elder, who, in his work *Naturalis Historia*, described it as not-at-all unpleasant and as being able to protect clothes from moths (*Vestis tuetur odore non inellegantis*).<sup>7</sup> Indeed, the Tyrrhenian *Helichrysum* has a pleasant and persistent odor, different from that of the essential oil, and difficult to describe in terms other than “odor of *Helichrysum*.” It is reminiscent of the perfume of licorice (*Glycyrrhiza glabra*, Fabaceae), Indian curry, tobacco (*Nicotiana tabacum*, Solanaceae), and roses (*Rosa* spp., Rosaceae). Conversely, other European species of *Helichrysum* and other populations of *H. italicum* have an unpleasant phenolic note (which some people find annoying for its persistence)<sup>8\*</sup> that is different from the manure-like note typical of some African *Helichrysum* species.<sup>9</sup> Despite its significance, the odor issue has been poorly investigated in terms

\*The foul odor is mentioned in some books as a distinctive characteristic of *H. italicum* (see, for instance: Riva E. *Piante Medicinali*. Ghedini e Tassotti Editori; 1995:274).



Immortelle illustration by J.J. Grandville  
(ca. 1850) from *Les Fleurs Animées*.



of both pleasant and unpleasant notes. During steam distillation, the licorice note is lost and a bitter, woody note is generated, presumably by the degradation of non-volatile constituents. Overall, the essential oil and the plant are quite different in terms of olfactory properties.

### Ethnopharmacology of *Helichrysum italicum*

The largest body of ethnopharmacological information on *H. italicum* comes from the northern Tyrrhenian area, where the use of the plant is well documented in both human and veterinary medicine for the management of respiratory and digestive problems, and for topical wound healing.<sup>10-13</sup> Thus, the plant is considered beneficial for inflammatory and infective airway conditions, including cough, bronchitis, laryngitis, and tracheitis. *Helichrysum italicum* also is used in herbal teas as a cholagogue (i.e., a bile stimulator) and choleric agent. The so-called *tisana del Quirinale* (“Quirinale” is the Italian equivalent of the White House) is a combination of *Helichrysum*, lavender (*Lavandula* spp., Lamiaceae), and fennel (*Foeniculum vulgare*, Apiaceae), and the herbal tea was popular with two Presidents of Italy, Oscar Luigi Scalfaro and Carlo Azeglio Ciampi.<sup>14</sup> Mixed with olive oil, *H. italicum* is used for the dermatological treatment of sun and fire burns and for wound healing. In veterinary medicine, the plant is used to treat cough in donkeys and joint ailments for both horses and donkeys.<sup>13</sup> Curiously, the first modern investigations on the plant were spurred by these animal uses.

*Helichrysum italicum* also has culinary uses. These uses are quite different, however, from those of the archetypal edible *Helichrysum* (*H. conchinchinensis*), whose seedlings and sprouts are used in Asia to prepare *banh khuc*, a delicacy of Vietnamese cuisine. *Helichrysum italicum* is the source of one of the most expensive and highly sought-after European honeys, *miele di spiaggia* (seashore honey).<sup>15</sup> Bees do not forage on *H. italicum*, but, while visiting the plant, they become covered with the resinous material that coats the flowers and pass it on to the pollen collected from other plants, eventually producing a honey that retains the flavor

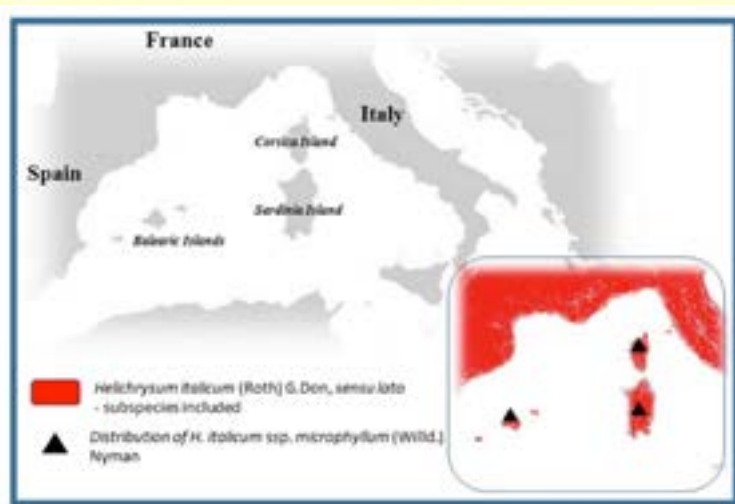


**Figure 3.** Tyrrhenian *Helichrysum* [*H. italicum* Don. subsp. *microphyllum* (Willd.)] in full bloom. Note the chromatic contrast between the grey color of the plant and the bright yellow color of the flowerheads. (Photo courtesy Ninni Marras)

of *Helichrysum*. In the Tyrrhenian area, the leaves are used like rosemary (*Rosmarinus officinalis*, Lamiaceae) to flavor local dishes and salads, and to impart a “curry-like” note to pork meat and stuffings.<sup>16</sup> The plant also is an ingredient in so-called Mediterranean curry (a mixture of *H. italicum*, onion [*Allium cepa*, Liliaceae], rosemary, wild fennel, thyme [*Thymus vulgaris*, Lamiaceae], and catnip [*Nepeta cataria*, Lamiaceae]). Owing to its antibacterial properties, *H. italicum* also has been used as a hop (*Humulus lupulus*, Cannabaceae) replacement in the production of beer. Finally, the use of *Helichrysum* to aromatize spirits and to prepare liqueurs is well documented, especially in Sardinia.

### *Helichrysum* in the Classic Medical Treatises

*Helichrysum* is mentioned in all major medical treatises of the Greco-Roman tradition. In many of them, a botanical distinction is made between the species with large flowers (e.g., *H. stoechas* group, from the ancient name of the Hyères Islands off the French Côte d’Azur) and those with small flowers (e.g., *H. italicum* group) — the two main types growing in the Mediterranean area — but the same properties



**Figure 4:** Distribution of *H. italicum* subsp. *microphyllum* in the Western Mediterranean basin.



are assigned to both species. Theophrastus (3rd century BCE) — in his *Historia Plantarum*, the oldest extant medicinal plant treatise from the Western tradition† — mentioned the application of *Helichrysum* mixed with honey to treat burns and wounds,<sup>17</sup> while Dioscorides (1st century CE) reported the use of a medicinal wine from *Helichrysum* to treat arthritic conditions and sciatica.<sup>19,20</sup> Similar information is provided by Pliny the Elder in his *Naturalis Historia*, and the medical literature of the Renaissance often referred to these sources, with emphasis on the treatment of back and hip pain. The Italian Renaissance physician and botanist Castore Durante (1529-1590) also noted the use of a medicinal wine infused with *H. italicum* flowerheads to treat liver disorders, and further recommended a decoction of the plant for catarrh.<sup>21</sup>

Overall, the most common medical uses of *Helichrysum* documented by ancient authors were as a topical antiseptic, a cicatrizing (i.e., scar-forming) agent, for joint health and liver protection, and as a treatment for airway infections. Peculiarly, Theophrastus classified *Helichrysum* as a mind-altering plant,<sup>17</sup> presumably because of its use in ritual fumigations. A similar use of *Helichrysum* is widespread in South Africa,<sup>9</sup> and some species are traded as psychotropic agents.<sup>9</sup> In fact, an African *Helichrysum* species is the only plant besides cannabis and hemp (*Cannabis sativa*, Cannabaceae) that contains cannabinoids, although researchers have isolated only the non-psychotropic agent cannabigerol (CBG) in the species.<sup>18</sup>

### ***Helichrysum* Essential Oil and its Use in Medicine and Aromatherapy**

The essential oil of *Helichrysum* is obtained from biomass of various geographical origins (e.g., the Balkan Peninsula, Ukraine, Corsica, Sardinia, Provence, and Spain),<sup>6</sup> and once was used mainly for the aromatization of pipe tobacco. Factors related to the Balkan wars of the 1990s as well as *Helichrysum*'s increased popularity in aromatherapy, perfumery, and cosmetics, led to a shortage of plant material that stimulated cultivation and collection in the Western part of the Mediterranean region, especially in Corsica and Sardinia.<sup>6</sup> The absolute is used only in perfumery, while the essential oil is employed in medicine and aromatherapy. The introduction of the oil of *H. italicum* in aromatherapy originated in France, and was popularized in English-speaking countries by aromatherapist and author Kurt Schnaubelt, who notably considers interchangeable the many uses of the pinene- and neryl ester-rich oils.

The essential oil of Tyrrhenian *Helichrysum* is significantly different from the oil of *H. italicum* subspecies and other *Helichrysum* species; it is characterized by a high content (25-45%) of neryl esters (acetate, isobutyrate,

† For a superbly annotated modern edition of Theophrastus's *Historia Plantarum*, see: Amigues S. *Theophraste Recherches sur le plantes*. Belin, Paris, 2010. For a survey on the anti-inflammatory plants mentioned in herbaria from the XVI-XVII century, see: Adam M, Berset C, Kessler M, Hamburger M. Medicinal herbs for the treatment of rheumatic disorders—A survey of European herbals from the 16th and 17th century. *J Ethnopharmacol* 2009;121:343-359.



*Helichrysum italicum*. Photo ©2015 Steven Foster

isovalerate), which are considered the plant's most distinctive constituents.<sup>22-26</sup> Also, the sesquiterpenoid fraction of the oil (about 10-20%) is distinctive, containing the bisabolane-derivatiative curcumene, bisabolane cycloadducts (italicenes), and eudesmane alcohols (rosifoliol).<sup>22-26</sup> The oils of *Helichrysum* from the Balkan peninsula and the Adriatic coast of Italy contain mainly pinenes, and, like some oils of French cultivation, they have a high curcumene content (ca. 20%).<sup>6</sup> The oils of *Helichrysum* also contain a series of diketones (italidiones) probably derived from the thermal degradation of non-volatile pyrones that are abundant constituents of several *Helichrysum* species.<sup>22-26</sup> Since these diketones are likely artifacts, their concentrations may be related to the duration of the distillation process, but their value as markers is limited because of their presence in the oils of other species of *Helichrysum*. The licorice note of Tyrrhenian *Helichrysum* is lost during steam distillation, while the compound(s) responsible for the unpleasant phenolic odor of some *Helichrysum* plants and oils, as previously mentioned, have not been characterized yet. Despite the popularity of *Helichrysum* essential oil, the molecular bases of its sensory properties have not been characterized fully.

*Helichrysum* oil is obtained by steam distillation of the flowerheads, and its yield is rather low, rarely above 0.1% of the starting fresh biomass.<sup>22-26</sup> This, along with the low biomass production of the plant, is responsible for the high price of the oil, which is currently one of the most expensive on the market (roughly 2,000 euro/kg). The composition of the oil is variable, even among samples of the same geographical origin; the texture and acidity of the soil seem to have a marked effect. Rich in neryl esters and diketones, Tyrrhenian *Helichrysum* oil is the variety most valued in perfumery and most used in aromatherapy, although it is not clear if the contents of neryl esters and diketones alone can explain this preference.<sup>6,26</sup> Owing to differences in the composition of the essential oil from *H. italicum*, it is possible that specific properties are associated with specific types of essential oil, but this issue has not yet been systematically investigated.

The main use of the essential oil of *Helichrysum* is to fade or reduce scars. Despite the lack of animal and human studies to substantiate this application, many practitioners are convinced of its utility for this purpose.<sup>27</sup> Another important use of the oil is for the treatment of bleeding wounds, an indication for which it is considered the essential oil of preference. For this indication, it has been suggested that the oil is best used undiluted to help sanitize the wound, foster its closure, and relieve pain. For all other uses, the oil is diluted in fixed oil.<sup>27</sup> The essential oil also has been used in combination with lavender (*Lavandula angustifolia*, Lamiaceae) and tea tree oil (*Melaleuca alternifolia*, Myrtaceae) to soothe skin conditions associated with chemotherapy such as palmar-plantar erythrodysesthesia, otherwise known as hand-food syndrome (a trophic skin disorder associated with the use of anticancer drugs, includ-

ing both cytotoxic [capecitabine, taxanes, camptothecins] and targeted [monoclonal antibodies such as cetuzimab as well as kinase inhibitors including erlotinib, sorafenib, and sunitinib] chemotherapy agents).<sup>27</sup> Similar combinations of essential oils with anti-VEGF (vascular endothelial growth factor) or anti-EGF (epidermal growth factor) agents can be used to manage chemotherapy-induced acne and the "face powder" desquamation associated with the use of 5-fluorouracil and irinotecan.<sup>27</sup> Despite the success of *Helichrysum* oil as an anti-aging agent, no published clinical data support the "Fountain of Youth" claims of some cosmetic products, although proprietary data might exist.

The growing use of *Helichrysum* oil in aromatherapy and medicine should stimulate randomized, controlled trials to assess its efficacy and help define standards of composition for the medicinal use of the oil, as has been done with neryl esters for use in perfumery.

### Modern Studies on *Helichrysum*: The Contribution of Leonardo Santini

Leonardo Santini (Figure 5) is considered the father of modern studies on *Helichrysum*. He was born in 1904 in Molazzana, a small village near Lucca, in Northern Tuscany.<sup>‡</sup> His father was a physician, as were many of his relatives. Santini earned a degree in medicine from the University of Pisa and, later, started a medical practice in Castelnuovo di Garfagnana, a small town in Northern Tuscany famous for being governed during the Renaissance by the poet Lodovico Ariosto. The involvement of Santini with *Helichrysum* is reminiscent of that of William Withering with foxglove (*Digitalis purpurea*, Plantaginaceae). Just like Withering was "tipped" on the properties of foxglove by an "old lady" of a country village, Santini was introduced to *Helichrysum*'s healing properties by a mule-driver who claimed to have successfully managed his donkeys' cough

**Figure 5.** Leonardo Santini (1904-1983), the father of modern studies on *H. italicum*. (Photo courtesy of Maurizio Santini)



with *canugioro*, the local name for *H. italicum*. (Since donkeys are more stoic than horses, cough generally is indicative of an advanced respiratory disease.) This, coupled with his awareness of the plant's widespread use for similar conditions in horses, led Santini to administer a decoction of the plant to some of his patients who were suffering from bronchitis and asthmatic cough. Not only did their respiratory conditions improve, but also other unrelated diseases from which they were suffering — particu-

‡ Most information on the life of Leonardo Santini, including his picture, was provided by his son Maurizio, to whom the authors are grateful. The life of Leonardo Santini also was outlined in a commemorative speech given by Paolo Mantegazza, the Rector of the University of Milano and the former Dean of the School of Medicine of Milano, on May 9, 2004, at Castelnuovo di Garfagnana during the commemoration of the 100th anniversary of the birth of Leonardo Santini.





*Helichrysum italicum*. Photo ©2015 Steven Foster



larly psoriasis and arthritis. Intrigued by these observations, Santini started to experiment with a decoction and syrup from *H. italicum* in the late 1930s, summarizing more than two decades of observations in a series of articles that were published from 1949 to 1953 in Italian journals with unfortunately limited distribution outside the community of general practitioners.<sup>28-31</sup> Santini determined that the clinical activity of *Helichrysum* was similar of that of cortisone — a drug in short supply at the time — and also reported an insulin-sensitizing activity in animal experiments. The proposed cortisone-like compound was named helichrysin, but it was never characterized chemically. Santini found the decoction's anti-psoriatic activity to be particularly useful and treated hundreds of patients with the condition. The beneficial effects of the treatment were confirmed in two independent clinical studies carried out in the 1950s.<sup>28-31</sup> More recently, the results of a small open study from 1995 supported the use of a 5% decoction for the treatment of psoriasis.<sup>32</sup> After three weeks of treatment, all study participants improved, with relapses observed within two months post-treatment. Though spontaneous regression of psoriasis is not uncommon, these studies provide a rationale for the initiation of controlled, double-blind, clinical trials for the use of *H. italicum* in managing psoriasis.

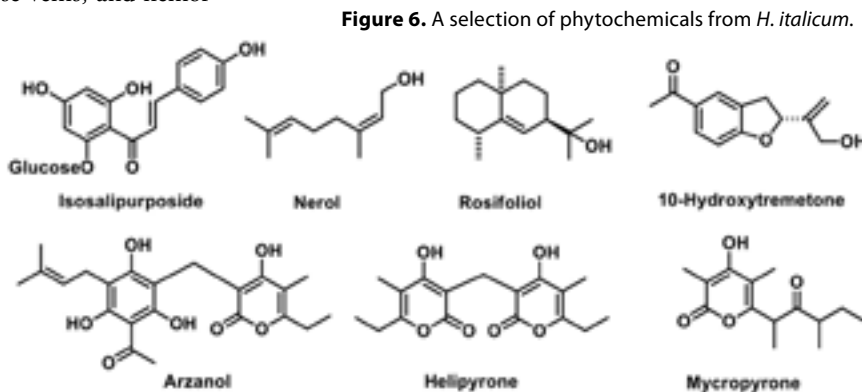
Santini also observed positive results from the use of an aerosolized *Helichrysum* decoction for allergic rhinitis and a *Helichrysum* ointment for the treatment of solar and fire burns, chilblains, venous stasis, varicose veins, and hemorrhoids. Interestingly, a topical product containing an extract from *H. arenarium* (L.) Moench. was developed in the former USSR for the management of radiation burns.<sup>33</sup>

The publication of Santini's studies in the early 1950s piqued the interest of Renzo Benigni — the chief pharmacologist of the Italian company Inverni della Beffa — who started systematic studies on the plant, including the formulation used by Santini (a simple 5% decoction of the dried flowerheads). Benigni found that filtration of the decoction led to a considerable loss of activity, suggesting that the active constituents had limited solubility in water, where it was dispersed and not well dissolved. To obtain more reproducible animal data, he investigated an extract ("Fraction H") produced using an organic solvent. This product exhibited some cortisone-like activity, and, at a dosage of

5 mg/day, could significantly prolong the life of rats whose adrenal glands had been surgically removed.<sup>33</sup> A series of clinical studies in various Italian centers substantially confirmed the findings of Santini, showing that Fraction H could replace, to varying degrees, corticosteroids in many of their uses without their adverse side effects.<sup>33</sup> Benigni, however, never published his findings; he only summarized them in a *Helichrysum* monograph that appeared in the monumental treatise on medicinal plants he coauthored with Capra and Cattorini.<sup>33</sup> In the wake of Santini's studies, a *Helichrysum* syrup was commercialized in the Italian pharmaceutical market as a cough syrup. However, the lack of standardization and information on the active principle led to the product's demise when more stringent rules on pharmaceutical products were introduced in Italy in the late 1960s. Notably, a small clinical study in 1981 on children affected by tracheo-bronchitis found a *Helichrysum* decoction highly efficacious.<sup>34</sup>

### Phytochemical and Pharmacological Studies on *Helichrysum italicum*

Most recent phytochemical analyses of *H. italicum* have focused on the northern Tyrrhenian variety (*H. italicum* subsp. *microphyllum*), which Santini used in his clinical studies. The most common non-volatile constituents of this plant belong to the acylphloroglucinol and pyrone classes of ketides. These compounds can occur in *H. italicum* as a



§ For a review of the biological profile of arzanol, see: Kothavade, PS, Nagmoti DM, Bulani VD, Jvekar AR. Arzanol, a potent mPGES-1 inhibitor: novel anti-inflammatory agent. *Scient World J.* 2013. doi: 10.1155/2013/986429.



monomer (micropyrene), symmetrical dimer (helipyrene), or mixed dimer (arzanol) (Figure 6).<sup>35</sup>

Arzanol is the best characterized of these ketides in terms of bioactivity. Its name is derived from the small town of Arzana (Figures 7) in East Sardinia, where the plant that yielded this compound was collected.<sup>35</sup> Arzanol has an anti-inflammatory profile not unlike that of curcumin, suggesting that the association of *H. italicum* with curry might extend beyond olfaction. (Both turmeric and *Helichrysum* essential oils contain the volatile curcumene sesquiterpene.) Arzanol interrupts pro-inflammatory signaling and increases antioxidant protection by acting at distinct time-domain targets.<sup>36</sup> The enzymes mPGES-1 and 5-LO are key players in the generation of inflammatory eicosanoids (the prostaglandin PGE<sub>2</sub> and leukotrienes, respectively) and represent the short-time domain target for arzanol, while the pro-inflammatory transcription factors NF-κB represent its primary long-term target.<sup>35</sup> The net result is the inhibition of the production of inflammatory cytokines (TNF-α, IL-1b, IL-6) and inducible inflammatory enzymes (COX2 and mPG2S). A study in 2011 found that, in contrast with non-steroidal anti-inflammatory drugs (NSAIDs), the production of beneficial prostanoids like PI<sub>2</sub> was not affected by arzanol, which retained activity in an in vivo model of inflammation (carrageenan-induced pleurisy in rats).<sup>36</sup>

Arzanol is refractory to chemical modification, but its structure-activity relationships can be elucidated by total synthesis, highlighting the relevance of its decoration of hydroxyls and heterodimeric structure for the inhibition of mPGES-1 and 5LO.<sup>37</sup> The symmetrical pyrene dimer helipyrene was much less potent against these anti-inflammatory targets, as was the monomeric phloroglucinol micropyrene. Arzanol also has shown remarkable antibacterial activity, outperforming the fluoroquinolone norfloxacin against many strains of super-bacteria of the infamous methicillin-resistant *staphylococcus aureus* (MRSA) type.<sup>38</sup> Polar fractions from extracts of *H. italicum* display antibiofilm activity against the gram-negative pathogen *Pseudomonas aeruginosa*.<sup>39</sup> In this context, it is interesting to note that a mixture of heterodimeric phloroglucinols known as arenarin was developed as a skin-and-eye antibacterial agent in the former Soviet Union.<sup>40</sup> The polyphenolic phloroglucinyl component makes arzanol a potent antioxidant, equipotent to caffeic acid and more potent than other plant-derived polyphenolics such as nordihydroguaiaretic (NDGA) acid, magnolol, and even myrtucommulone from myrtle (*Myrtus communis*, Myrtaceae) in in vitro assays of antioxidant activity.<sup>37,41</sup> Arzanol also was shown to inhibit lipid peroxidation in a series of in vivo systems.<sup>42</sup> Taken together, these observations suggest that arzanol may be the major bioactive constituent of helichrysin, the crude preparation of *Helichrysum* used by Santini in his clinical investigations.



*Helichrysum italicum* flowers. Photo credit Julio Reis

The major areas of *H. italicum* cultivation in the Western Mediterranean region are Corsica and Sardinia, and most biomass produced there is acquired by the cosmetic and the perfumery industries and distilled.

Apart from arzanol, *H. italicum* contains additional bioactive constituents that could complement its anti-inflammatory activity. For instance, the flowerheads and aerial parts are rich sources of ursolic acid (up to 0.5% by dry weight)<sup>38</sup> — an anti-inflammatory triterpenoid and popular cosmetic ingredient<sup>43</sup> — and also of benzofurans of the tremetone type,<sup>38</sup> some of which have shown anti-spasmodic effects.<sup>44</sup> A mixture of methylketones and sterols known as tremetol was long considered the toxic agent responsible for the plant-induced “milk sickness” that devastated large areas of the American Midwest in the first half of the 19th century (and whose most famous victim was Abraham Lincoln’s mother).<sup>45</sup> However, pure synthetic tremetone was not capable of reproducing the toxicity of extracts from white snakeroot (*Ageratina altissima*, Asteraceae), which is now considered the most likely plant source of milk sickness, although the nature of the toxin(s) involved is still unclear.<sup>46</sup> Also noteworthy is the presence of an unusual class of lipids, named santinols in honor of Leonardo Santini, in Tyrrhenian *H. italicum*.<sup>38</sup> Santinols are glycerides of branched medium-chain acids that represent a novel type of plant lipids. Curiously, one of the acids present in santinols (2-methyl-3-oxovaleric acid) is a marker for the diagnosis of propionic acidemia, a human genetic disease, and had never been identified before in plants.<sup>38</sup>

*Helichrysum italicum* shows remarkable plasticity in terms of growing conditions, thriving both on the coast and in the mountains with no apparent preference for a particular type of substrate (calcareous, acidic, sandy, stony). This ecological adaptability translates into a heterogeneous morphology, the presence of numerous ecotypes and varieties, and, ultimately, phytochemical polymorphisms. Thus, several



chemotypes of *H. italicum* exist, characterized by distinct phytochemical profiles and therefore unlikely to be pharmacologically equivalent. In particular, the presence of high concentrations of arzanol seems characteristic of the northern Tyrrhenian population of *H. italicum* (subsp. *microphyllum*); commercial samples from the southern Tyrrhenian area as well as those of Adriatic origin did not contain significant amounts of this compound.<sup>47</sup>

### The *Helichrysum italicum* Supply Chain

*Helichrysum* species have been commercially available as ornamentals since the 17th century. The species popular in nurseries today are mainly non-European, including *H. bracteatum* Andr. from Australia, *H. bellidioides* Willd from New Zealand, and *H. petiolatum* DC from South Africa. The most popular European species available in nurseries are *H. stoechas* (L.) Moench. from the Balkans and *H. arenarium* (L.) Moench. DC. from Eastern Europe. *Helichrysum italicum* is of more limited availability in the horticultural market; the commercial material used by the perfumery and cosmetic industries is rather heterogeneous and is derived from both cultivation and wild collection in different regions.<sup>6</sup> Apart from the northern Tyrrhenian area, *H. italicum* can be found along the Adriatic coast of Italy, the estuary of the river Po, and in Southern Italy. The major areas of *H. italicum* cultivation in the Western Mediterranean region are Corsica and Sardinia, and most biomass produced there is acquired by the cosmetic and perfumery industries and distilled. Essential oil production is highly fractionated, and it is difficult to estimate the total amount of oil produced. The medicinal supply chain of *H. italicum* remains underdeveloped, and, given the high price of the essential oil, many producers find it more convenient to distill the plant and sell the oil rather than to commercialize the whole plant for the production of extracts. The essential oil is produced exclusively from the flowerheads, while the rest of the plant — which contains significant amounts of secondary metabolites and could in principle be used to produce extracts — is left in situ.<sup>48</sup>

The expense of the oil, especially of Tyrrhenian origin, provides incentive for economically motivated (i.e., intentional) adulteration. Currently, there are no established reference criteria for medicinal-grade *Helichrysum* oil, but the aromatherapy market, like the perfumery market, emphasizes oil of Corsican origin, which sells at a considerably higher price. Remarkably, some vendors of “Corsican” *Helichrysum* oil provide gas chromatograph profiles on their websites that do not qualify the oil as of Corsican or Tyrrhenian origin. Low nerol contents and high hydrocarbon contents — like the Balkan and Adriatic *Helichrysum* oils — indicate either adulteration or the cultivation in Corsica of non-native chemotypes of foreign origin.<sup>49</sup> The limited production of Tyrrhenian *Helichrysum* oil and its relevance in the perfumery and personal care industries call into question whether or not significant amounts of the oil are in fact available on other markets.

Today, there is a huge disconnect between demand and availability of Tyrrhenian *Helichrysum*, which has been compounded by the past years’ poor harvest. Adulteration of some materials is filling this gap now, but wild harvesting is a growing problem in both Corsica and Sardinia, despite the hard-to-reach location of many populations of the plant. (Sardinia and Corsica have the longest undeveloped coastal areas in Western Medi-

terranean Europe.) Wild harvesting will not only significantly impact the status of the plant, but, by providing a lower-cost (but unsustainable) plant material, it also is damaging the ongoing projects intended to develop a sustainable *Helichrysum* supply chain and meet its strongly growing demand. Due to its superior properties, the Sardinian population of gentian (*Gentiana lutea*, Gentianaceae) was exterminated in the 1950s and 1960s by uncontrolled harvesting, and, despite efforts of re-introduction, it has not recovered. To avoid a similar fate for *Helichrysum*, a program to certify the plants’ sustainable cultivation through to harvest should be established for the plant, which also would foster consumer awareness of the fragility of the supply chain from wild harvesting.

### Conclusions

Extracts from *H. italicum* are used in topical products for the management of hemorrhoids and lower limb venous insufficiency (i.e., heavy legs) in the Italian healthfood market. These extracts are not standardized in the phytochemicals typical of *H. italicum*, and these uses do not represent the full potential of the plant. Santini published the results of his investigations on the presence of a cortisone-like compound in *H. italicum* in the 1940s, when the first synthetic corticosteroids were developed. The availability of corticosteroids — well characterized chemically and relatively low cost — undermined interest in Santini’s findings. Owing to the progress in chemistry, from the 1930s onward plant extracts had been increasingly replaced by their single primary active ingredients (lanatosides for foxglove, atropine for nightshade [Solanaceae]) or synthetic analogs (amphetamine for ephedrine). Meanwhile, the work of Santini was going in the other direction, apparently against the flow of medical history. The lack of information on the active ingredients of *Helichrysum*, the complications involved in the standardization of a phytochemically unexplored plant, and the isolation of Santini — who was not part of the medical establishment, self-financing research on helichrysin, and publishing his results in medical journals of limited distribution — led to a loss of interest in *H. italicum* and its cortisone-like properties. In the past decade, the discovery of arzanol, a compound with pleiotropic (multiple effects emanating from one single compound) anti-inflammatory activity, and a better phytochemical characterization of the plant have set the stage for the development of standardized preparations of *H. italicum*. A systematic investigation of their clinical potential will reposition *H. italicum* from the glittering world of perfumes and fashion to the world of medicine, where it also belongs. HG

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Maca *Lepidium meyenii*.  
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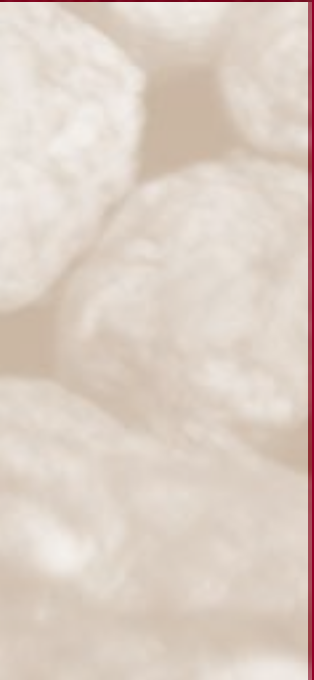
# Maca Madness:

**CHINESE HERB SMUGGLERS CREATE CHAOS IN THE PERUVIAN ANDES**  
**Consequences for the market, consumers, and local farming communities**

By Tyler Smith

*Editor's note:*\* This is an updated version of an article that first appeared in the December 2014 issue of HerbalGram. Accompanying the original article is a special video report filmed for the American Botanical Council (ABC) by the "Medicine Hunter" and maca expert Chris Kilham. The video was recorded on November 4, 2014, in Peru's Junin Plateau, where Kilham was conducting fieldwork and research on the current maca situation on behalf of Naturex, a major global supplier of plant-based extracts. Kilham's video can be viewed on ABC's YouTube page at [www.youtube.com/user/HerbalGram/](http://www.youtube.com/user/HerbalGram/).





For more than three millennia, inhabitants of Peru's central highlands have been cultivating the maca plant (*Lepidium meyenii*, Brassicaceae) for use as both food and medicine.<sup>1</sup> The tuberous vegetable thrives in the harsh, dry climate of the Junín and Pasco provinces in the Peruvian Andes at elevations of up to 15,700 feet (approximately three miles) above sea level, where few other plants grow besides alpine grasses and bitter potatoes (*Solanum* spp., Solanaceae).<sup>1</sup> At first glance, the maca plant may appear unremarkable. A member of the mustard family, the herb is similar in size and shape to a radish (*Raphanus sativus*, Brassicaceae), and mature plants grow to an average height of just four-to-eight inches. Below ground, maca forms a thick, bulbous hypocotyl, or tuber, that is rich in micronutrients and beneficial phytochemicals.<sup>1,2</sup>

Touted by news media and businesses as a superfood, maca's popularity has exploded in the past decade. In November 2013, Mehmet Oz, MD, included the herb on his "Hot List" of energy-boosting foods,<sup>3</sup> and maca is now commonplace in health food stores, smoothie shops, and major retail chains. According to *HerbalGram's* 2013 Herb Market Report, maca was among the year's 30 best-selling herbs in the mainstream multi-outlet channel, exhibiting a remarkable 150% increase in sales from the previous year.<sup>4</sup>

Maca's recent surge in popularity is perhaps most evident in China, where the herb is prized for its libido-enhancing effects and its reputation as a source of longevity. Such appealing claims have led to an unprecedented demand for the herb in China, a country of 1.3 billion people.<sup>5</sup> In May 2014, rumors began to surface of Chinese businessmen posing as tourists to illegally smuggle the fresh root out of the country. As the maca harvest began to disappear over the summer, prices increased — then skyrocketed.

Although the sudden popularity of this once-obscure herb has been a boon for local farmers and communities in the Peruvian Andes, the unprecedented Chinese demand for maca — and subsequent smuggling of the nationally protected plant out of Peru — has created a "highly volatile" market ripe with uncertainty.<sup>6</sup> In August 2014, the situation went from volatile to violent when a Chinese national reportedly was murdered in Peru's maca country.

"The arrival of the Chinese buyers in the Peruvian Andes has caused extraordinary chaos," explained Chris Kilham, Medicine Hunter and maca expert, who recently spent time in both China and Peru investigating the situation (email, November 4, 2014).

"Yesterday a Chinese maca buyer was shot dead in a field, and another was shot and badly wounded," alleged Kilham, noting that his information came directly from a police officer in the area (email, November 5, 2014). Kilham says he witnessed the ambulance carrying the second gunshot victim away. "It is now fair to say that the situation is out of control. It has all become very dangerous."

How the maca situation will unfold remains uncertain, but sources contacted for this article expressed a general lack of optimism. "As someone

who loves high-quality Peruvian Maca and who has sold it for many, many years, I am very concerned," noted Mark Ament, founder and owner of The Maca Team, a family-run Peruvian maca company based in Maryville, Tennessee (email, November 4, 2014). "Prices will likely continue to rise and the demand will possibly grow. If nothing is done to curb the Chinese, then we'll likely have a similar shortage indefinitely."

### Maca's Cultural Significance in Peru

In Peru, maca has been used traditionally to treat a range of conditions, many of which are related to sexual dysfunction and lack of energy. The herb, for example, has been used to increase fertility and stamina, promote cognitive function, enhance libido, and reduce menopausal symptoms, among other functions.<sup>1,2,7</sup> In recent years, several human clinical trials have lent support to some of these traditional medicinal uses (see Table 1). A systematic review of four randomized,

Much of Peru's maca cultivation takes place in the mountainous Junín Region, highlighted in red.



\*Throughout the production of this article, the American Botanical Council (ABC) has attempted to ensure the accuracy of all information contained herein. The statements and opinions presented by sources quoted herein do not necessarily reflect the opinion of ABC and, in some cases, may represent unsubstantiated or unconfirmed claims.

controlled trials in 2010, for example, concluded that maca significantly affected erectile dysfunction in men and improved other types of sexual dysfunction in both men and women.<sup>8</sup>

Many of those living in the maca-producing regions of Peru depend almost entirely on income derived from the season's harvest, which takes place from roughly May to October, the winter months of the South American country. In addition to relying on the herb for their livelihoods, Peruvians in the central highlands regularly consume maca, which is considered a staple food in the region.

"For the Andean people, maca is life. It is an absolutely essential food, as [almost] nothing else grows up at high altitude," wrote Kilham. "The plant ... is a source of great cultural pride."

In an effort to protect maca's heritage, the Peruvian Minister of Justice issued a regulation in 2003 officially banning the export of unprocessed raw maca.<sup>15</sup> Two years after the export ban was established, the National Commission for Native Peruvian Products recognized maca root as one of the country's first "flagship" products as part of a "national strategy to protect and promote Peruvian native crops ... of a recognized authentic quality that should be preferred by external markets."<sup>15</sup>

Most recently, Peru's National Institute for the Defense of Competition and Protection of Intellectual Property (INDECOPI) developed a Designation of Origin specification and certification for the protection of Peruvian maca grown and processed according to traditional methods in the provinces of Junín and Pasco. The government of Peru followed up this national initiative by registering a Maca Junín-Pasco Appellation of Origin with the World Intellectual Property Organization (WIPO).<sup>16</sup>

"Maca is considered to be a natural genetic heritage prod-

uct of Peru," wrote Ament (November 7, 2014). "Attempts to grow it outside of Peru legally should be approved by the Peruvian government. China does not have this approval and therefore the Maca they grow is grown under biopiracy conditions."

### Quality and Quantity: Issues with Chinese-Grown Maca

The numerous titles, designations, and legal protections assigned to maca, however, apparently are not enough to prevent the prized plant and its seeds from being smuggled out of Peru. In June 2014, Peru's Association of Exporters (Asociación de Exportadores, or ADEX) reported that seven patents related to maca processing had been filed in China. Through interviews, ADEX was able to determine that four of the patent holders' plant materials originated in Peru.<sup>17,18†</sup> The rest of the maca in question was from China.

"China has been cultivating maca in [the] Yunnan province for about ten years now," Kilham stated, "but the altitude there is lower than in the Peruvian highlands. Thus the maca must be grown with pesticides, herbicides, etc., and with commercial fertilizers, in contrast to the high altitude Peruvian maca, which is produced with no agritoxins at all."

Ament notes a number of important distinctions between Peruvian and Chinese-grown maca on The Maca Team's website.<sup>19</sup> In addition to potential issues with chemical contamination and the toxic growing conditions in China (Ament, speaking to *Modern Farmer*, referred to the Yunnan province as a "chromium dump"<sup>18</sup>), adulteration is listed as a primary concern.

Gaia Herbs, Inc., a major botanical products company based in North Carolina, already has begun testing samples of Chinese-grown maca products for evidence of contamination or adulteration. Recently, Gaia tested a sample

† English translations of Spanish-language sources were provided by Google.

Author (Year)	Purpose	Study Type	Author Conclusions
Lee et al. (2011)	Treatment of menopausal symptoms	Systematic review	The results of the systematic review provide limited evidence for the effectiveness of maca as a treatment for menopausal symptoms. <sup>9</sup>
Shen et al. (2010)	Improvement in sexual function	Systematic review	The results of the systematic review provide limited evidence for the effectiveness of maca in improving sexual function. <sup>8</sup>
Hunt et al. (2010)	Anti-aging effects on skin	Systematic review	No significant reduction [in skin wrinkling] was noted for maca root. <sup>10</sup>
Zenico et al. (2009)	Effects on well-being and sexual performance	12-week RCT	The data support a small but significant effect of maca supplementation on subjective perception of general and sexual well-being in adult patients with mild ED. <sup>11</sup>
Dording et al. (2008)	Effect on antidepressant-induced dysfunction	12-week pilot RCT	Maca root may alleviate SSRI-induced sexual dysfunction, and there may be a dose-related effect. Maca may also have a beneficial effect on libido. <sup>12</sup>
Gonzales et al. (2002)	Effect on sexual desire	12-week RCT	Maca has an independent effect on sexual desire at 8 and 12 weeks of treatment. <sup>13</sup>
Gonzales et al. (2001)	Effect on semen parameters	Four-month observational study	Treatment with maca resulted in increased seminal volume, sperm count per ejaculum, motile sperm count, and sperm motility. <sup>14</sup>



of Chinese maca powder submitted for analysis by an Asian company.

“[T]here was definite intentional adulteration as indicated by the lack of any viable DNA from their sample,” explained Bill Chioffi, vice president of global sourcing at Gaia (email, December 3, 2014).

“The HPLC [high-performance liquid chromatography] profiles of the Asian Maca powder and our validated reference of Peruvian Maca were similar, although the amplitude of the peaks in the Asian maca were much lower indicating a weaker product,” Chioffi added. “If you relied solely on these tests, which most companies do, you would be fooled into believing that you had true Maca. ... It is sophisticated adulteration that’s going on.”

Such intentional adulteration has the potential not only to tarnish the image of reputable companies but also to impact the effectiveness of such products. “If China is able to flood the market with their ... subpar Maca at cheaper prices, many potential new customers are likely not to get the normal benefits associated with Maca,” Ament wrote, “and thereby write off the product’s efficacy in general” (email, November 24, 2014).

On The Maca Team’s website, Ament has posted side-by-side images of Chinese and Peruvian-grown maca.<sup>19</sup> The differences are stark. The Peruvian tuber is a deep red color with symmetrical roots; the Chinese-grown maca plant is dark and twisted.

The observable differences between Peruvian and Chinese-grown maca, and potential safety concerns associated with the latter, have not stopped Chinese companies from aggressively pursuing maca cultivation in their country. Currently, Peru has more than 6,000 acres of land dedicated to maca farming.<sup>20</sup> Maca plantations in China occupy an estimated 10,000-15,000 acres, although Chinese officials have denied the accuracy of that figure.<sup>21</sup>

Even though China has two-to-three times more land dedicated to maca than Peru, Chinese consumers’ demand for Peruvian maca has shown no signs of decline. “The Chinese with whom I spoke while in China very much want high altitude Peruvian Andean maca,” wrote Kilham. “And apparently they are willing to pay for it.”

### Chinese Smugglers Arrive in Peru

Chris Kilham has been following the maca trade since the late 1990s, when he first met Sergio Cam, the owner of Chakarunas Trading Company in Peru, which



Maca *Lepidium meyenii*.  
Photo ©2015 Steven Foster

supplies maca to Naturex, where Kilham is employed as its sustainability ambassador. (Appropriately, Chakarunas is related to the Quechua word for “men who build bridges between cultures.”<sup>22</sup>)

“Since Sergio and I began this maca journey in 1998, the maca market has bloomed steadily, and has grown well and without major mishap, up until this year,” he wrote (email, November 4, 2014).

Kilham took multiple research excursions to Peru in 2014 in an effort to monitor the rapidly changing market and shifting dynamics on the ground. He first encountered Chinese buyers in the Andes back in May, shortly before the 2014 maca harvest began. Through interviews and conversations with police, officials, farmers, and others,

Kilham has become well informed of — and, in some cases, witnessed — the deteriorating situation in Peru and its impacts over the past year.

“[A]fter 16 years of relative stability, groups of Chinese buyers arrived in the highlands, and started snatching up maca anywhere they could get it,” he recalled. “The Chinese buyers include Red Dragon Triad crime syndicate members out of Hong Kong,” claimed Kilham. “They are armed, and carry large sacks of cash.”

Although Spanish-language newspapers and television stations in Peru have featured occasional updates of the illegal botanical smuggling activities taking place in the past year, the first official acknowledgement of the situation by a government organization came in a June 2014 press release from ADEX.<sup>23</sup>

Citing evidence of maca seeds smuggled by Chinese nationals out of Peru, ADEX Natural Products Committee Chair Alejandra Velazco denounced the illegal activity, calling it an act of biopiracy. According to an article from the International Trade Centre, Velazco claimed “that a large number of Chinese buyers have been present in Peru this summer making advance cash payments directly with maca farmers but informally without proper transaction and export documentation, evading taxes and violating other Peruvian laws concerning maca.”<sup>15</sup>

Just a few months after ADEX’s announcement, Diane Panella, formerly of the California-based natural products company Sol Raiz Organics, contacted the American Botanical Council after one of her company’s Peruvian maca suppliers informed her of the situation in Peru.

“A contingent of men from China have taken up residency in the province and are aggressively trying to control the maca trade,” Panella wrote. “[O]ne of our maca shipments was run off the road and the driver severely injured and hospitalized” (email, October 2, 2014).

Kilham, who most recently visited Peru in early November, described a generally chaotic and increasingly dangerous situation on the ground.

“The Chinese are still scouring the highlands post-harvest, snatching up any and all maca. A number of Chinese buyers hid from us when we sought them out, and some sped off when we approached their vehicles,” he recalled (email, November 11, 2014). “Just this week, Red Dragon Triad members murdered a restaurant owner in Peru who refused to pay shakedown money. It’s right out of a bad kung fu movie.”

## Peru’s Response, or Lack Thereof

The government of Peru’s response to the allegations of illegal smuggling and biopiracy by Chinese nationals appears to be out of proportion with the value it places on maca, one of the country’s inaugural flagship products.

“[T]here appears to be nothing positive to report,” responded Ament when asked what actions were being taken to stop or prevent such illegal activity. “We are in contact with suppliers and friends in Peru very regularly, and it seems that next to nothing has actually been done to stop the practice of illegally purchasing and removing Maca roots from Peru.”

A peer reviewer of this article familiar with the situation, however, noted that shipping containers “at the Port of Callao near Lima, Peru have been ‘Red Flagged’ for inspection by Sunat [Peru’s National Customs and Tax Administration] to ensure that they do not contain ‘whole maca’ roots” (email, December 3, 2014). He added that the inspection process had caused a major delay with one of his company’s shipments.

Maca *Lepidium meyenii*.  
Photo ©2015 Steven Foster





In the more than half a year since the Chinese arrived in Peru allegedly to begin securing the 2014 harvest, only two enforcement actions by Peruvian officials have been covered widely by local media. (American media coverage had been almost non-existent until early December 2014, when the *New York Times* and *Wall Street Journal* published articles on the topic.<sup>20,24</sup>) In late September, Peruvian officials seized a large shipment of maca that Chinese individuals were planning to smuggle across the northern border. The container, simply labeled “Flowers,” contained more than 10 tons of maca, valued at approximately \$1 million.<sup>25</sup> Shortly thereafter, Peru’s Interior Minister Daniel Urresti announced that 200 foreigners had been deported in the preceding three weeks. “Peru promotes tourism,” said Urresti in an article from Peru’s *Gestión* newspaper, “but [we] will not allow foreign citizens [to] break the rules.”<sup>25</sup>

Still, given the limited publicized actions Peru has taken to address — or even monitor — the biopiracy of one of its treasured natural resources, it is difficult to take Urresti’s claims seriously. The lack of official government action even prompted criticism from the former president of ADEX,

José Luis Silva Martinot. “The Chinese are taking maca without paying taxes,” he said in an August 19, 2014, article from *El Comercio*. “Where is Sunat and other authorities?”<sup>21</sup>

### Impacts on Companies and Consumers

The time for a swift government response, it seems, has passed. Effects of China’s “hijacking” of the 2014 maca harvest are being felt at almost every point in the supply chain, from Peruvian farmers and entrepreneurs to natural products companies and consumers in the United States.<sup>18</sup> Maca prices hover at uncomfortably high levels, and the market remains unstable.

“Because so little was done to curb the rapid export of Maca this year, the 2014 harvest of Peruvian Maca is 95% gone,” Ament estimated. “The harvest, which finishes in September, normally lasts until the following June/July. This year, as of late October it is next to impossible to purchase Peruvian-grown Maca.”

Sol Raiz Organics founder Ken Stittsworth, who has been in the maca-growing regions of Peru since late November 2014, expressed similar concerns. “As far as my company goes, I’m subjected to much higher prices now,” he wrote (email, November 24, 2014). “At the moment, we’re just weathering the storm” (email, December 15, 2014).

Small, family-run businesses such as Ament’s and Stittsworth’s, however, are not the only companies affected by the situation in Peru. “Naturex, Gaia Herbs, Navitas, and the many other companies who have relied on maca for years are now facing an absurd escalation of prices,” Kilham noted, “which surely will sit poorly with customers.”

If such rapid price escalation continues, it has the potential to “collapse the maca market,” Kilham warned. “Is anybody really going to pay \$60-\$80 US for a 12 ounce bag of maca powder? ... We are getting into the rarified ethers of pricing.”

And, according to Ament, American consumers can already smell the fumes. “US consumers are already affected by this,” he said. “We, for example, have raised our prices 25% ([our company’s] first price increase in over 5 years).” The Maca Team — which has exhausted its supply of premium maca product and expects to sell out of other products by early 2015 — alerted its customers to a second, unavoidable price increase in December.

“This situation will certainly price some customers who benefit from Maca out of the market,” Ament said. “We’ve already had several customers express that.”

Panella of Sol Raiz Organics also has been forced to face an unpleasant reality as a result of the chaotic maca market.





“I am on indefinite hiatus from the company since Oct. 1 because of the financial constraints being created by this problem,” she wrote (email, November 19, 2014). “This is a company that I love and believe in passionately, so I am hoping for a positive outcome someday to the situation.”

### Impact on Peruvian Farmers and Communities

According to Peru’s National Anti-Biopiracy Commission (chaired by INDECOPI), 120 companies are actively involved in the country’s maca production, and approximately 100,000 Peruvians depend on maca for their economic livelihoods.<sup>26</sup> Since it is illegal to export unprocessed maca from Peru, many such Peruvians find work during post-harvest processing. This year, however, up to an estimated 80% of the season’s maca harvest — which totaled 4,000 tons in 2013<sup>23</sup> — was smuggled out of Peru.<sup>28</sup>

“While the farmers have done well this year, all other people associated with the production, marketing, and distribution of Maca have been cut out of the loop,” Ament explained. “Since the Chinese took the roots in their whole form, rather than in powder, [thousands] of people ... are currently working less and may be out of work altogether.”

According to data from Peru’s Integrated Information System for Foreign Trade (SIICEX), maca exports for 2013 totaled \$14 million<sup>27</sup> (The 2013 export figure was calculated for “maca products;” as noted previously, only processed maca raw material is legally permitted to be exported,<sup>15</sup> but it is not clear if SIICEX’s number includes finished consumer products as well.) As depicted below, there was a particularly steep increase in the value of Peruvian maca exports to China in 2014 (Figure 1).<sup>29</sup>

There is big money in the Peruvian maca market, but even this year’s “gold rush” will not make millionaires of Peruvians farmers. In fact, concerns about food security may soon trump those of financial security.

“The people up there have modest means,” Kilham explained. “[W]hile growers are currently making absolutely wild money, maca is now un-affordable to non-growers, and thus an essential staple food is becoming out of reach for people who depend on it.”

Ament also expressed concerns about the long-term impacts and financial consequences for Peruvian farmers. “The farmers are in a tough situation here,” he said. “Most



of them have sold all of their harvest now and while they have been paid more than normal for their produce, the money is soon spent.”

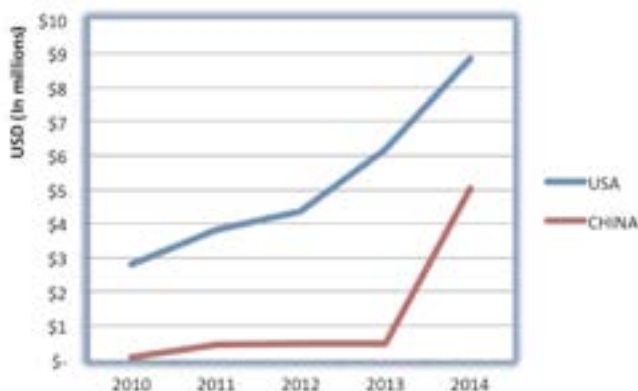
“There is an expression in Spanish, ‘*pan hoy, hambre mañana*,’ which basically means ‘feast today, famine tomorrow,’” Ament continued. “Some of these farmers, then, are not going to have more funds coming in for the next 8-10 months. Beyond that, what most of the farmers don’t understand is that China is attempting to dominate the world Maca market, which will potentially destroy their livelihoods.”

### Challenges and Proposed Solutions

There remains a dearth of information related to any recent, current, or planned actions by the Peruvian government to combat instances of biopiracy and illegal smuggling such as those that have taken place over the past year. However, in a September 2014 meeting of Peru’s Ministry of Foreign Commerce and Tourism, two proposals were presented by government officials to address the future of maca.<sup>25,28</sup> Although neither of the options would resolve any short-term issues, the ideas are a sign of progress.

The first proposal is to create a National Register of Maca, which would involve “fieldwork to collect and process information about the varieties of maca in all areas of production.” The detailed record could then be used by Peru’s National Anti-Biopiracy Commission to resolve future maca patent cases.<sup>30</sup> Magali Silva Velarde-Álvarez, Peru’s Minister of Foreign Trade and Tourism, suggested creating a new government office “responsible for providing technical assistance to farmers and entrepreneurs dedicated

**Figure 1.** Total Annual Values (in USD) of Peruvian Maca Exports from 2010-2014



Source: The Integrated Information System for Foreign Trade (SIICEX)<sup>29</sup>





Maca *Lepidium meyenii*.  
Photo ©2015 Steven Foster

to [maca].” The proposed group, ProMaca, “would foster partnerships through the implementation of best practices in international trade, collective marks, quality seals, ... [and] ad hoc export route[s] for maca.”<sup>30</sup>

Instead of waiting on Peru to take measures to protect the heritage product, Ament decided to take a more proactive approach, drafting and gathering signatures for a petition to Peruvian officials expressing the urgency of the situation.

“We are organizing a petition to submit to the Peruvian authorities in hopes of something being done to protect the genetic heritage and global supply of Peruvian Maca,” Ament wrote. For more information, or to sign the petition, visit [www.themacateam.com/save-peruvian-maca](http://www.themacateam.com/save-peruvian-maca).<sup>31</sup>

### Lessons & Predictions for the Future

Since the start of the annual Peruvian maca harvest in May, fortunes have been made and lives allegedly have

been lost over the tiny, tuberous plant that has been cultivated in the Andes for thousands of years. The impacts of the sudden, unrivaled demand for maca in China extend beyond Peru’s rugged borders, with consequences for major international natural products companies, loyal, long-term employees of small businesses, and maca enthusiasts worldwide.

“The Chinese market can swallow entire global industries whole and not even burp,” Kilham offered when asked if there was a lesson to be learned from the maca mayhem in Peru (email, November 21, 2014). “We will see this with many types of consumer goods. It used to be that the US got everything. Now China is the big dog at the table, and we need to get used to it.”

As Stittsworth explained, “The story of maca really is a three-piece puzzle on a global stage where you have two super powers importing and harnessing medicinal prod-



ucts and a country like Peru where farmers can be blinded by money and the government won't protect them" (email, November 23, 2014).

Chinese consumers have developed a taste for maca, and although the herb is thought to be the first botanical example of the massive and influential purchasing power of the country's middle class,<sup>32</sup> Kilham likely is correct that it will not be the last.

Some predict that China — which already dwarfs Peru in terms of acreage dedicated to maca cultivation — will dominate the global maca market in as little as one-to-three years.<sup>33</sup> Chinese nationals already have begun preparing for the 2015 harvest of the Peruvian plant.

"We have heard from one of our main suppliers in Peru that next year there will be approximately double the amount of Maca harvested as there was this year," Ament reported. "However, this same source has also told us that over [half] of that has already been purchased by Chinese individuals through back door deals."

Thus, the future of Peruvian maca market — and those who depend on the herb as a source of medicine, sustenance, and livelihood — remains uncertain.

"My conclusion is that maca prices will continue to climb; we will see adulteration of maca and poor quality maca in the market; the pressure from the Chinese buyers will escalate; [and] more illegal activity is inevitable," Kilham predicted. "[T]he effect of this on the current maca market could well cause it to crash, and the Andean people are going to have an increasingly difficult time securing maca for food. As far as I can figure, there is currently no silver lining to this cloud." HG

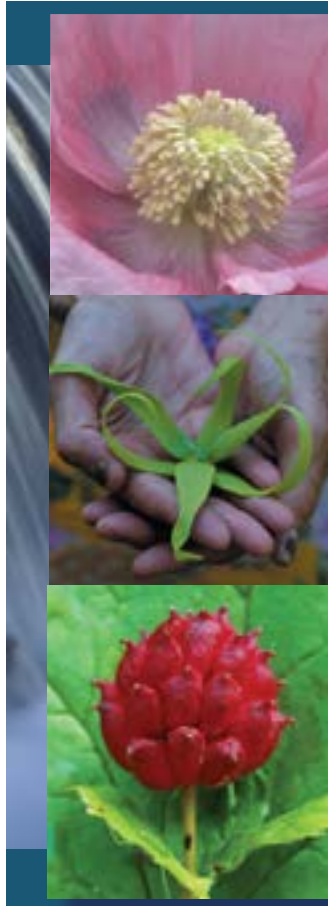
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## Sources of Data for Botanical Classification and Identification

*"Molecular biology, with its associated trinity of DNA, RNA, and proteins, has diverted a number of systematists from measuring petal lengths along the primrose path to phylogeny to a course supposedly more closely aligned with the inheritance of the individual taxon."* —Raymond Petersen, PhD

By Arthur O. Tucker, PhD

To a non-scientist, the world of plant taxonomy may seem to have been in a state of turmoil for the past few decades as some scientific names have experienced radical alterations. Not only have specific epithets and genera changed, but many plant families have changed as well. Certainly, a number of changes revealed by DNA analyses have been surprising to even the hardened plant taxonomist.

Systematists often quote botanical tomes from the 18th century; so, without a doubt, research on plant DNA has re-invigorated this somewhat staid science. Who in centuries past could have envisioned that the mare's tail (Hippuridaceae), many of the figworts (Scrophulariaceae), and the water starwort families (Callitrichaceae) are actually plantains (Plantaginaceae)?<sup>1</sup> Who could have predicted that many

verbenas (Verbenaceae) — such as beautyberry (*Callicarpa*), glorybower (*Clerodendrum*), and chaste tree (*Vitex*) — are mints (Lamiaceae), and that maples (*Acer*) are soapberries (Sapindaceae)?<sup>1,2</sup>

In recent years, plant DNA studies have helped clarify many taxonomical hypotheses. Paleobotanists have known for decades that the lycopods (lycophytes) are not really “fern allies,” and that they have had a separate evolutionary path from the rest of plants since the zosterophylls (Zosterophyllophyta) appeared in the Silurian Period approximately 430 million years ago. A DNA study from 2011 confirmed these propositions.<sup>3</sup> In 1971, David Bierhorst<sup>4</sup> caused an uproar by classifying the whiskferns (*Psilotum* and *Tmesipteris*) as leafless ferns — not extremely primitive plants related to the first land plants (Rhyniophyta), as was believed at the time — and DNA analyses have confirmed this as well.<sup>3</sup> However, I still have trouble recognizing horsetails (*Equisetum*) as highly modified ferns as DNA studies have indicated.<sup>3</sup>

Genetic research also has split plant taxa. The former genus *Lycopodium*, for example, now is recognized as comprising several genera, the most prominent of which is *Huperzia* (now probably best put in its own family, Huperziaceae, separate from the Lycopodiaceae).<sup>5,6</sup>

Perhaps the most radical change that DNA has revealed has been in the phylogeny of flowering plants. We no longer classify plants as monocotyledons or dicotyledons; it's just not that simple. Today, scientists also recognize basal angiosperms, monocots, and eudicots (which can be further divided into basal eudicots, rosids, minor core eudicots, and asterids). Among living taxa, *Amborella trichopoda* (Amborellaceae) from New Caledonia is recognized as the most basal angiosperm, and the genus *Acorus* (Acoraceae) — or sweetflag of North America and Eurasia — is recognized as the most basal monocot. Without a doubt, DNA analyses have supplied the crucial evidence that allowed this mystery to be unraveled.



Horsetail *Equisetum* spp.  
Photo ©2015 Steven Foster



When DNA was first applied to plant classification, it was viewed as the field's salvation and ultimate source of data. Using morphological or other characteristics was considered second-rate. However, we now know that there are caveats to DNA studies. As a result, many plant taxonomists have adopted a multidisciplinary approach to classification, which includes the use of genetic information. However, scientists differ on the amount of weight that should be applied to each factor in statistical or cladistic interpretations (i.e., methods of hypothesizing relationships among organisms), but DNA evidence often is very highly rated.

For example, two major botanical forensics books by Coyle<sup>7</sup> and Hall and Byrd<sup>8</sup> suggest using not only genetic data, but also algology (the study of algae), plant identification, plant anatomy and morphology, and palynology (the study of pollens and spores) to solve crimes and serve as evidence in court cases. Restated, each source of data has its use depending upon the available evidence, and each can contribute significantly. Likewise, in botanical classification and identification, data from these areas — in addition to others such as karyology (chromosome numbers, ploidy, etc.), secondary metabolites (alkaloids, essential oils, flavonoids, etc.), ecology, and genetics (crossability, sterility of hybrids, etc.) — all can provide useful information.

We now know the actual expression of nuclear DNA is modified by small messenger RNA chains (i.e., epigenetic changes), so the genotype reflected in the coding regions of nuclear DNA may not actually determine the phenotype, or expression, of the genes. In addition to epigenetics, two major discoveries in recent years have caused us to be careful when interpreting DNA data: (1) horizontal or lateral gene transfer and (2) non-maternal inheritance of organelles.

Normally, organisms acquire their genes through vertical transfer; that is, from parent to offspring. However, in horizontal or lateral gene transfer, genes are transferred via viruses, bacteria, fungi, or parasites.<sup>9,10</sup> Researchers have demonstrated a large number of horizontal or lateral gene transfers, which is not an anomaly. The process is most prominent among bacteria, which calls into question phylogenies that assume only vertical gene transfer.<sup>11</sup> Researchers have reported animal-to-animal and plant-to-plant gene transfers, but natural animal-to-plant and plant-to-animal gene transfers have not yet been discovered. Knowledge that horizontal or lateral gene transfer is normal suggests that GMOs (genetically modified organ-

isms) are not something totally new and manmade. The crown gall bacterium (*Agrobacterium tumefaciens*, Rhizobiaceae) — routinely used by botanists to insert genes into other organisms — has been performing this task since it first evolved. What is different today is the speed and direction of certain gene transfers.

Most general biology textbooks state that organelles such as chloroplasts and mitochondria (both of which carry their own DNA) are transmitted only maternally, not paternally. Previously, scientists viewed the egg as a sac of cytoplasm with a nucleus and organelles, while the sperm was considered merely stripped down nuclear DNA. We now know that it is not that simple. Chloroplast and mitochondrial genomes can be inherited maternally, paternally, or even biparentally, not only in plants, but also in some animals.<sup>12,13</sup> In many cases, we can group the method of inheritance by plant family, but many exceptions exist. For example, in the passionflowers (*Passiflora* spp., Passifloraceae), chloroplasts may be inherited maternally, paternally, or biparentally depending upon the species.<sup>14</sup> Obviously, previous studies that assumed only maternal inheritance of chloroplast DNA and mitochondrial DNA will have to be re-examined.

What's a novice to do to keep pace with all of these changes in plant classification? A good introduction is the book that I previously reviewed in *HerbalGram*, *Botany in a Day*, 6th ed., by Thomas J. Elpel.<sup>15,16</sup> This book just touches the surface of the controversies surrounding plant taxonomy today as analytical methods continue to evolve and new information becomes available. Still, for

a novice trying to find the most commonly accepted name (a term many taxonomists prefer over "correct" name, which invokes religion and politics), there are several websites that I routinely use and recommend:

- **GRIN, the Germplasm Resources Information Network** ([www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl/](http://www.ars-grin.gov/cgi-bin/npgs/html/taxgenform.pl/)), funded by the United States Department of Agriculture, is where I go first for questions about a species' most commonly accepted name. It also provides background literature and links to other pertinent sites. The only limitation to this database is that it focuses on higher plants of economic importance, not all plants.
- **The Plant List** ([www.theplantlist.org/](http://www.theplantlist.org/)) attempts to provide the accepted Latin name for all species of vascular plants (flowering plants, conifers, ferns, and their allies) and bryophytes (mosses and liverworts). The Plant List is a joint effort of the Royal Botanic Gardens at Kew and the Missouri Botanical Garden.

## When DNA was first applied to plant classification, it was viewed as the field's salvation and ultimate source of data. Using morphological or other characteristics was considered second-rate.

- **ITIS, the Integrated Taxonomic System** ([www.itis.gov/](http://www.itis.gov/)), provides taxonomic information on plants, animals, fungi, and microbes found around the world. ITIS was created by a partnership of US, Canadian, and Mexican agencies (ITIS-North America), as well as other organizations.
- **IPNI, the International Plant Names Index** ([www.ipni.org/ipni/plantnamesearchpage.do/](http://www.ipni.org/ipni/plantnamesearchpage.do/)), is a database of the names and associated basic bibliographical details of seed plants, ferns, and lycophytes. The Index is the product of a collaboration among the Royal Botanic Gardens at Kew, Harvard University's Herbaria, and the Australian National Herbarium. IPNI provides the history of a plant name; it is not formulated to make judgments pertaining to the most commonly accepted name.
- **Tropicos** ([www.tropicos.org/](http://www.tropicos.org/)) contains nomenclatural, bibliographic, and specimen data on tropical plant species in the Missouri Botanic Garden's electronic databases collected over the past 25 years.

What's next on the horizon? Scientists are still questioning if Linnaean nomenclature best reflects taxonomic relationships, but since commerce and other facets of our existence are closely tied to existing binomials, the chances are good that this system will remain. In the area of DNA research, previous studies have focused on chloroplast and mitochondrial DNA, which are comparatively short chains, or nuclear markers, that do not comprise the entire genome. With the cost of whole genome analysis decreasing, we now see papers like the one published in the December 12, 2014, issue of *Science*,<sup>17</sup> which revealed new classifications of birds based on such analyses. The surprising result of these whole genome analyses is that the non-coding regions of nuclear DNA (which regulate gene expression and were once mistakenly called "junk DNA") are often more diagnostic than coding regions (those genes that code for specific proteins).

Without a doubt, botanical names will continue to change. Science, even systematic science, is not absolute truth; it continues to evolve as knowledge increases. Yet, while DNA studies have revealed insights and changes in the systematics and phylogeny of various taxa, the majority of plant taxa based on traditional methods (including comparative morphology) has remained unaltered. Sundews (*Drosera*) are still in the sundew family (Droseraceae), and peppermint (*Mentha x piperita*) is still in the mint family (Lamiaceae). HG

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# Sales of Tea & Herbal Tea Increase 3.6% in United States in 2014

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## Introduction

Tea consumption in the United States, as in much of the world, is on the rise. Total retail sales (some exceptions noted herein) of bagged, loose, and concentrated teas in the United States increased by 3.6% in 2014, according to aggregated market statistics gathered by the market research firm SPINS (Table 1). This includes all types of tea and herbal teas in all packaging formats with the exception of ready-to-drink (RTD) tea sold through mainstream multi-outlets, natural, and specialty/gourmet channels.

Assembling a fully accurate statistical compilation of the US tea industry is a complex undertaking due to a lack of harmonized definitions and the fact that no commercial enterprise, trade association, or governmental agency tracks all of the diverse distribution channels through which tea is sold. Very few reporting entities monitor or analyze the US food-service industry specific to tea activity, despite the fact that — according to the Tea Association of America<sup>1</sup> — 85% of US tea consumption is iced tea, a majority of which is sold in food-service settings, including restaurants, cafés, delis, and similar establishments. Additionally, a number of other tea distribution channels are not assessed by any one entity, including mail order, online, network marketing, Whole Foods Market, and thousands of independent specialty tea shops. (Please consult the footnotes at the end of each table for the parameters of SPINS/IRI Channel coverage presented in this report.)

In 1990, annual sales of tea sold through all distribution channels in the United States was less than \$1 billion, according to Sage Group. Estimates of the total market size now range from \$4 billion to upwards of \$15 billion. The fact that tea is such a ubiquitous commodity sold in myriad packaging formats through a wide variety of diverse channels — some of which, such as food service, are not monitored — makes fully accurate and consistent quantification of sales an imperfect science.<sup>2</sup>

Three primary factors are catalyzing the US demand for tea:

1. *Health & Wellness Trends:* Consumers are seeking affordable, safe ways to enhance their personal wellness and selfcare regimens. Over 3,000 science-based studies have investigated tea-health connections (P. Goggi email to Brian Keating, January 14, 2015).
2. *Media Coverage:* Consistent media coverage delivering a stream of positive news on the research validating benefits of tea consumption

— including potential prevention or risk reduction of certain diseases and enhanced states of wellbeing — is helping educate and motivate consumers.

3. *Evolving Retail Landscape:* Thousands of independent and multi-unit tea retail outlets are expanding nationwide, offering greater consumer access to finer-quality specialty teas.

In 2012, global specialty coffee leader Starbucks acquired Teavana, the largest North American retail tea chain. Starbucks paid \$620 million for Teavana, which comprised more than 325 shops as well as a vibrant online consumer-direct business. This was the largest acquisition in Starbucks history. In 1999, Starbucks purchased specialty tea maker Tazo, a producer of both black and green tea blends and herbal teas, for \$8.1 million (D. Bolton email to Brian Keating, January 20, 2015). Tea now accounts for 10% of Starbucks' US retail sales, up from 8% in fiscal year 2009. Starbucks Chief Executive Officer Howard Schultz has noted that “tea represents a massive, strategic opportunity for Starbucks around the world ... and with the integration of Teavana complete, we are now executing our plan

### Tea Facts\*

- After water, tea (i.e., beverages from the tea plant, *Camellia sinensis*, Theaceae) is the second most-consumed beverage worldwide.
- On any given day, more than an estimated 50% of Americans drink tea (including iced). On a regional basis, the South and Northeast United States have the greatest concentration of tea drinkers.
- Approximately 85% of tea consumed in the United States is iced. From 2002 to 2012, the ready-to-drink tea sector grew more than 15-fold.
- Instant tea is declining and loose tea is gaining in popularity, especially in specialty tea and coffee outlets.
- In 2012, Americans consumed well over 79 billion servings of tea — more than 3.6 billion gallons. About 84% of all tea consumed was black tea and 15% was green tea, with the remainder comprised of oolong and white tea.
- The United States is the second largest importer of tea in the world
- In 2013, the United States imported over 130.1 million kg (almost 287 million pounds) of tea, including:
  - 49.7 million pounds of green tea
  - 237.2 million pounds of black tea

\*Courtesy of Tea Association of America<sup>1</sup>

to double our key [tea] business to \$2 billion over the next five years.”<sup>3</sup>

On January 6, 2015, Starbucks announced that the Tazo brand will no longer be sold at Starbucks retail stores and is being replaced by the Teavana brand. Tazo will now be sold in restaurants, big-box outlets such as Walmart, and grocery locations including Whole Foods. Meanwhile, tea-centric multi-unit retail chains such as DAVIDsTEA, Argo, T2 (Unilever), Peet’s, and Coffee Bean & Tea Leaf are attracting young tea drinkers, encouraging innovation in forms such as shaken teas and tea lattes, and also driving super-market sales. New tea brewing technologies such as the Keurig® single-serve K-Cups® tea pods are placing Bigelow and other major brands in tens of thousands of hotel rooms and stocking the shelves at big-box retailers like Target, Walmart, and Costco.<sup>4</sup>

Industry veterans anticipate continued major growth for tea. George Jage, founder of the World Tea Expo, predicted in 2014 that there will be nearly “8,000 tea-specific retail outlets in the US by 2018; moreover, an estimated 40,000 traditional coffee retailers will generate more than 30% of their beverage sales from tea.”<sup>5</sup>

With few exceptions, 2014 was another banner year for the majority of bagged and loose tea categories within all

distribution channels. Black tea (bags) held its seemingly permanent number-one spot in dollar sales even with very modest gains (2%) over 2013. Iced teas remained in the second overall position despite a 4% decline from 2013 sales, which could be due to weather or marketing factors occurring during the year.

Catalysts driving the reported consistent annual growth of tea in most formats depend on many factors including very warm summer weather in 2014 and consumers’ increasing disenchantment with carbonated soda. Total sales volume for carbonated soda drinks (CSD) fell 3% in 2013 — the ninth consecutive year of decline according to *Beverage Digest*<sup>6</sup> — after declines of 1.2% in 2012 and 1% in 2011. The publication further predicted in its January 16, 2015, edition that there will be further drops in CSD consumption during 2015.<sup>7</sup> All of these developments bode well for growth in other beverage categories, including tea.

Iced tea, as measured by gallons consumed and total sales, is the single largest type of tea consumed in the United States, yet most of this is consumed in food-service establishments, which are not tracked by major consumer product monitoring agencies.

Green and white tea bags continue to hold a respectable third overall position in terms of total dollar sales, with a

**Table 1. Bagged, Loose, and Concentrated Tea Annual Retail Sales in the United States in 2014\* (Data Combined from Mainstream Multi-Outlet, Natural, and Specialty/Gourmet Channels)**

<b>Tea†</b>	<b>US Dollar Sales</b>	<b>% Increase/Decrease 2013</b>
1. Black Tea (bags)	\$591,400,921	2.0
2. Iced Teas & Powder Tea Mixes (loose)	\$278,938,393	-4.3
3. Green & White Teas (bags)	\$236,012,393	4.4
4. Herbal Beverage Teas (bags)	\$212,247,705	6.6
5. Medicinal Teas (bags)	\$199,032,297	12.3
6. Iced Teas & Powder Tea Mixes (bags)	\$128,877,433	-1.5
7. Chai Teas (bags)	\$75,543,047	15.0
8. Liquid Tea Concentrates	\$50,213,254	21.2
9. African Red Teas (bags)	\$12,753,768	-7.0
10. Black Teas (loose)	\$8,764,137	3.5
11. Green & White Teas (loose)	\$5,931,284	41.6
12. Yerba Mate Tea (bags)	\$5,763,636	1.6
13. Yerba Mate Tea (loose)	\$3,702,677	14.9
14. Herbal Beverage Teas (loose)	\$3,236,445	53.2
15. Medicinal Teas (loose)	\$1,294,761	-2.3
16. Chai Teas (loose)	\$666,826	19.9
17. African Red Tea (loose)	\$253,087	7.3
<b>Total Tea Concentrate Sales</b>	<b>\$50,213,254</b>	<b>21.2%</b>
<b>Total Loose Tea Sales</b>	<b>\$302,787,610</b>	<b>-2.8%</b>
<b>Total Bagged Tea Sales</b>	<b>\$1,461,631,200</b>	<b>4.5%</b>
<b>Grand Total</b>	<b>\$1,814,632,064</b>	<b>3.6%</b>

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector ("FDM"; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer's clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

†Tea coded as single or primary ingredient.



**Table 2. Ready-to-Drink Tea Annual Retail Sales by Channel in the United States in 2013 and 2014\***

	2013	2014	% increase
Mainstream Multi-Outlet Channel	\$2,326,229,159	\$2,425,311,681	4.3
Natural Channel	\$27,368,670	\$32,940,177	20.4
Specialty/Gourmet Channel	\$30,393,568	\$31,772,442	4.5
<b>Total</b>	<b>\$2,383,991,397</b>	<b>\$2,490,024,300</b>	<b>4.4</b>

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector ("FDM"; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer's clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

4.4% gain in 2014 over 2013. It is important to note that total dollar sales of white tea in the United States remain nominal, with very few brands offering white tea products. Modest annual production — less than 1% of global annual tea production — is estimated by Sage Group in China's Fujian province, where white tea originated and remains the top-producing region. Between the mid-2000s and 2011, green tea consumption in the United States increased at a far greater rate — high double digits for many product formats — and has declined, in bagged formats, to more sustainable growth rates. In 2014, green and white teas in loose forms continued their explosive growth of more than 40% over 2013, significantly outperforming their bagged counterparts. Only herbal beverage teas enjoyed even higher 2014 vs. 2013 growth at more than 53% (Table 1).

The jump in loose tea sales is in part due to the increasing willingness of consumers to brew loose tea (which usually costs less than bagged tea) at home and also as a result of the dozens of tea brands more effectively educating consumers on the superior flavors typically associated with loose teas vs. tea bags; such brands essentially are encouraging their customers to trade the convenience of

tea bags for better "cup quality" (improved flavor, aroma, color, and mouth-feel). An endless stream of new tea-brewing accessories also is making loose tea preparation an easier exercise for consumers. That green tea bag sales in the United States are approaching half that of black tea bags is remarkable for a nation of tea drinkers who, historically, have favored black tea. The growing body of scientific research increasingly supporting green tea's health benefits is impressive, and announcements of recent positive findings are picked up by global media with more frequency.

Herbal beverage teas and medicinal teas sold in bags stood strong in fourth and fifth place, respectively, reaching year-over-year gains of 6.6% and 12.3%, respectively. Medicinal loose tea slowed a bit year-over-year (down 2.3%), likely due to more consumers reaching for bagged medicinal teas. Herbal beverage loose format teas had a massive increase in 2014 over 2013, which may be attributed to a combination of factors, including aggressive marketing by various brands.

When it comes to consumption of medicinal teas, Americans still prefer the ease of a teabag over loose tea, while many also consume herbal dietary supplements as documented and analyzed in *HerbalGram's* annual Herb

**With few exceptions, 2014 was another banner year for the majority of bagged and loose tea categories within all distribution channels.**

**Table 3. Ready-to-Drink Tea Annual Retail Sales by Channel in the United States: Organic, Fair Trade, Non-GMO in 2014\***

	2014	Organic <sup>†</sup>	Fair Trade <sup>‡</sup>	Non-GMO <sup>  </sup>	O/FT/NG
Mainstream Multi-Outlet Channel	\$2,425,311,681	\$57,979,974	\$66,933,606	\$10,211,722	\$6,267,380
Natural Channel	\$32,940,177	\$22,632,731	\$20,118,205	\$11,509,313	\$9,024,950
Specialty/Gourmet Channel	\$31,772,442	\$8,447,570	\$6,094,012	\$3,020,951	\$1,168,301
<b>Total</b>	<b>\$2,490,024,300</b>	<b>\$89,060,275</b>	<b>\$93,145,823</b>	<b>\$24,741,986</b>	<b>\$16,460,631</b>

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector ("FDM"; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer's clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

<sup>†</sup>USDA certified organic 70-100%.

<sup>‡</sup>Fair Trade claim or certified.

<sup>||</sup>Non-GMO Project certified.

Market Report.<sup>8</sup> The overall rise in sales for herbal beverage and medicinal teas in a majority of formats during 2014 can be attributed to many factors and is indicative of a growing interest in using readily obtainable botanicals to enhance personal wellness and self-care regimens. The 7.9% growth in total herbal dietary supplement sales in 2013 over 2012, as calculated by SPINS/IRI and reported in *HerbalGram*, adds further validation to this perspective.

African rooibos (“red tea”; *Aspalathus linearis*, Fabaceae) — one of the most popular herbal teas worldwide — has enjoyed consistent growth for more than a decade due its lack of caffeine, its naturally occurring antioxidants, and aggressive promotion by South African producers. In 2014, rooibos in bagged format experienced a rare decline in sales, likely due to market saturation and competition from other herbal teas. While herbal beverage and medicinal teas are commonplace in Europe and Asia, Table 1 illustrates that Americans are starting to embrace them more proactively. The fallout over undesirable effects of caffeine in energy drinks, greater awareness of caffeine-insomnia connections, and coffee “burn-out” also may be contributing to the rise in sales of herbal beverage teas as healthy, caffeine-free alternatives.

Chai tea is a traditional Indian tea-based beverage made with black tea and various spices such as ginger (*Zingiber officinale*, Zingiberaceae), cardamom (*Elettaria cardamomum*, Zingiberaceae), and cinnamon (*Cinnamomum* spp., Lauraceae), among others. In 2014, chai teabags experienced considerable advances with a 15.0% increase, likely due to a greater number of brands adding chai to their teabag lines. In this same realm, sales of liquid tea concentrates exhibited a very strong increase — 21.2% — over the previous year. These liquid tea concentrates most often are concentrated chai, tea and lemonade combinations, and other flavorful blends that offer consumers easy preparation without any brewing for iced or hot drinks. Some of the smaller chai companies that started in the 1990s are maturing into sizeable ventures, and this is one reason the category is heating up: most manufacture liquid concentrates, not teabags. A number of companies — including major producers of this tea format such as Tazo — also are promoting liquid tea concentrates as a more economical way to enjoy tea based on the fact that they provide consumers a lower per-serving cost than most ready-to-drink teas.

## The Ready-to-Drink Tea Market

Ready-to-drink bottled teas have improved in quality during the past few years, which may be one reason why the category has expanded so impressively in the United States. Additionally, greater numbers of low-/no-sugar and organic

**Table 4. Bagged, Loose, and Concentrated Tea Annual Retail Sales in the Mainstream Multi-Outlet Channel in the United States in 2014\***

Tea†	US Dollar Sales
1. Black Tea (bags)	\$566,835,670
2. Iced Teas & Powder Tea Mixes (loose)	\$276,910,932
3. Green & White Teas (bags)	\$213,782,253
4. Herbal Beverage Teas (bags)	\$189,765,330
5. Medicinal Teas (bags)	\$159,602,915
6. Iced Teas & Powder Tea Mixes (bags)	\$126,648,296
7. Chai Teas (bags)	\$71,032,107
8. Liquid Tea Concentrates	\$47,675,516
9. African Red Teas (bags)	\$9,170,847
10. Black Teas (loose)	\$6,916,445
11. Yerba Mate Tea (bags)	\$3,688,830
12. Herbal Beverage Teas (loose)	\$2,574,415
14. Yerba Mate Tea (loose)	\$1,474,546
13. Green & White Teas (loose)	\$1,421,716
15. Medicinal Teas (loose)	\$669,883
16. Chai Teas (loose)	\$88,379
17. African Red Tea (loose)	\$67,648
<b>Total</b>	<b>\$1,678,325,728</b>

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector (“FDM”; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer’s clubs and so-called dollar stores. It does not include convenience store sales.

†Tea coded as single or primary ingredient.

**Table 5. Bagged, Loose, and Concentrated Tea Annual Retail Sales in the Natural Channel in the United States in 2014\***

Tea†	US Dollar Sales
1. Medicinal Teas (bags)	\$32,020,017
2. Herbal Beverage Teas (bags)	\$13,801,050
3. Green & White Teas (bags)	\$13,800,392
4. Black Tea (bags)	\$9,884,412
5. Chai Teas (bags)	\$2,945,653
6. Green & White Teas (loose)	\$2,504,833
7. African Red Tea (bags)	\$2,254,875
8. Yerba Mate Tea (loose)	\$2,046,307
9. Liquid Concentrate	\$1,840,221
10. Yerba Mate Tea (bags)	\$1,725,640
11. Iced Teas & Powder Tea Mixes (bags)	\$1,461,341
12. Medicinal Teas (loose)	\$595,935
13. Black Teas (loose)	\$562,636
14. Iced Teas & Powder Tea Mixes (loose)	\$447,229
15. Chai Teas (loose)	\$381,696
16. Herbal Beverage Teas (loose)	\$328,906
17. African Red Tea (loose)	\$129,012
<b>Total</b>	<b>\$86,730,155</b>

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Does not include Whole Foods Market sales.

†Tea coded as single or primary ingredient.



RTD tea products have widened consumer choices further within the category. A decline in CSD consumption in the US is helping drive the RTD tea segment as well. Although CSDs are the most widely consumed beverage in the US, CSDs exhibited a year-to-year drop in volume during 2013 — down 1.42% in convenience store outlets (one of the strongest distribution channels for RTD tea) compared to 2012.<sup>9</sup>

Annual sales in RTD teas in the US increased 4.4% in 2014 over the previous year reaching a total of \$2.49 billion (Table 2), with a proliferation of organic, Fair Trade, and non-GMO (genetically modified organism) niches (Table 3). Market research firm Canadean forecast in its Global Iced/RTD Tea Drinks Report that the \$5.1 billion US market for RTD tea was expected to increase to \$5.3 billion in 2014, with a projected growth rate of 6% through 2018.<sup>10</sup> “The refreshing taste and perceived natural, healthy image of iced/RTD tea drinks will continue to generate growth and place the category in a good position to take advantage of the slowing carbonates market,” according to

**The overall rise in sales for herbal beverage and medicinal teas in a majority of formats during 2014 can be attributed to many factors and is indicative of a growing interest in using readily obtainable botanicals to enhance personal wellness and selfcare regimens.**

Canadean.<sup>10</sup> In spite of the positive performance of RTD tea brands owned by CSD conglomerates such as Pepsi and Coca-Cola, CSD sales in the US have declined nine years in a row through 2013.<sup>6</sup> CSD leader Coca-Cola witnessed a 2.2% decline in its 2013 sales,<sup>11</sup> while natural brands like Peace, Runa, Bhakti Chai, Guayaki, and others are increasingly capturing consumer engagement. With greater interest in sales of RTD teas, the CSD giants clearly are seeking additional avenues to enter the RTD tea segment with its positive growth outlook. Canadean reports that global sales of energy drinks are in the top spot for fastest-growing beverages followed by RTD teas, water, and coffee. The mainstream multi-outlet — a channel comprising the food, drug, and mass-market sector (or “FDM”; supermarkets, drugstores, and mass-market retailers), military commissaries, select buyer’s clubs, and so-called dollar stores (but not convenience stores or coffee/tea retailers such as Starbucks) — typically stock more conventional tea brands than specialty types, with fewer organic, long-leaf loose, and other types of tea more common to natural food and specialty gourmet outlets.

**Table 6. Annual Retail Sales of Organic, Fair Trade, Non-GMO Teas in Bagged, Loose, and Concentrated Forms in the United States in 2014\*; Data from Mainstream Multi-Outlet, Natural, and Specialty/Gourmet Channels**

Tea†	US Dollar Sales	Organic‡	Fair Trade¶	Non-GMO§	O/FT/NG
1. Black Tea (bags)	\$591,400,921	\$10,323,559	\$13,953,010	\$7,296,783	\$5,360,237
2. Iced Teas & Powder Tea Mixes (loose)	\$278,938,393	\$38,136	\$1,053	n/a	n/a
3. Green & White Teas (bags)	\$236,012,393	\$34,332,171	\$8,949,373	\$16,340,769	\$6,131,541
4. Herbal Beverage Teas (bags)	\$212,247,705	\$16,907,350	\$8,443,501	\$13,030,644	\$3,190,219
5. Medicinal Teas (bags)	\$199,032,297	\$112,543,976	\$25,030,600	\$77,188,135	\$22,088,335
6. Iced Teas & Powder Tea Mixes (bags)	\$128,877,433	\$146,534	\$119,926	\$82,589	\$25,421
7. Chai Teas (bags)	\$75,543,047	\$10,024,002	\$2,241,059	\$6,495,368	\$871,395
8. Liquid Tea Concentrates	\$50,213,254	\$13,788,620	\$18,953,558	\$654,677	\$298,234
9. African Red Teas (bags)	\$50,213,254	\$4,978,999	\$1,813,334	\$3,009,219	\$580,894
10. Black Teas (loose)	\$8,764,137	\$626,712	\$348,344	\$92,505	\$3,596
11. Green & White Teas (loose)	\$5,931,284	\$2,824,790	\$295,508	\$784,017	\$37,543
12. Yerba Mate Tea (bags)	\$5,763,636	\$4,584,126	\$4,236,505	\$4,236,166	\$4,236,145
13. Yerba Mate Tea (loose)	\$3,702,677	\$2,596,597	\$2,385,177	\$2,406,529	\$2,349,777
14. Herbal Beverage Teas (loose)	\$3,236,445	\$421,188	\$269,051	\$82,547	\$57,871
15. Medicinal Teas (loose)	\$1,294,761	\$151,115	\$49,498	\$25,253	\$7,625
16. Chai Teas (loose)	\$666,826	\$287,863	\$236,680	\$277,769	n/a
17. African Red Tea (loose)	\$253,087	\$159,994	\$78,756	\$67,296	\$7,422
<b>Total</b>	<b>\$1,814,632,064</b>	<b>\$214,735,732</b>	<b>\$87,404,933</b>	<b>\$132,070,266</b>	<b>\$45,246,255</b>

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector (“FDM”; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer’s clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

†Tea coded as single or primary ingredient.

‡USDA certified organic 70-100%.

¶Fair Trade claim or certified.

§Non-GMO Project certified.

Shoppers at mainstream outlets are purchasing greater varieties of tea types than ever before, but many still visit other retailers to purchase specialty teas. With teabags and loose tea products representing seven of the top-ten items ranked on tea sales, it is clear the mainstream market consumers are seeking convenience (Table 4).

## The Natural Channel and Medicinal Teas

While liquid tea concentrates in the form of ever-popular chai and various iced black and green teas are making headway in natural channel stores, green and white, herbal beverage, and medicinal teas are among the five top-selling tea types (Table 5). This is not surprising as natural channel retailers typically provide a greater breadth of all tea types, especially products with functional appeal. An aging “baby boomer” (Americans born between 1946 and 1964) population seeking little or no caffeine, which is characteristic of herbal and medicinal teas, and more support for their individual wellness programs, likely has helped secure the top sales rankings for the aforementioned teas. A steady flow of media coverage spotlighting the positive outcomes of clinical trials on various teas — especially green — and herbs used in medicinal tea formulations also is contributing to elevated sales, up from lower sales statuses in the mainstream mass-market outlets prior to the mid-2000s.

It is fitting that the total revenue generated by medicinal teas (both bagged and loose) sold through natural channel outlets once again represents more than a third of all tea sales in the channel for 2014 as they did in 2013, according to SPINS (Table 5). Clearly, the natural foods outlet shop-

pers are serious about wellness, and this is but one indicator of their commitment to selfcare. (These data do not include sales data from natural foods retail giant Whole Foods Market, which does not report its sales activity to SPINS. Whole Foods Market is a major US retail purveyor of tea, and Sage Group estimates the chain has total annual tea sales in all types and packaging formats of more than \$125 million.) Natural channel retail outlets have been the pioneering destinations for such teas since the 1960s, and they have continued to promote the benefits of medicinal teas (wellness, functional attributes, etc.) to their customer bases decades later via in-store classes, newsletters, and knowledgeable clerks. Refinements in the flavor and manufacture of medicinal teas, as well as the utilization of standardized botanical extracts and formulation with pharmacopeial-grade herbs, also have boosted this previously minor category to super-star status.

According to SPINS, the six top-selling medicinal tea brands for 2014 include Traditional Medicinals®, Celestial Seasonings®, Yogi Tea®, Organic India®, Bigelow®, and Stash Tea®.

Green and white teas held a strong third-place position in the natural channel for 2014, once again outselling black teas, which perpetually dominate green tea sales in mainstream channels. Natural channel consumers are generally aware of the health-promoting benefits afforded by green tea consumption, and many premium-grade green teas are available in natural channel outlets. Fittingly, in 2014, herbal beverage teas in teabag format hit the number-two spot in the natural channel, in which chai and African rooibos also sell exceptionally well. The cult-like fan-base for South American yerba maté (*Ilex paraguariensis*, Aquifoliaceae) purchases much of this botanical beverage from natural channel retailers, helping to place both bagged and loose forms among 2014’s top-ten sellers.

In the early 2000s, certified organic teas began to make solid inroads with American consumers, while certified Fair Trade tea was largely still in the germinal stage of project development with certifying agencies. Concerns over GMO ingredients, including tea and even teabag materials, simply were not in the public consciousness. Table 6 demonstrates that, in 2014, these three areas of interest and concern specific to tea have obtained significant market prominence, albeit still a small portion of total tea sales. Certified organic teas continue to make inroads into the overall tea landscape. Medicinal tea brands routinely seek out the purest possible botanicals — herbs, teas, and spices — which commonly equates to the use of certified organic ingredients free from pesticides and other chemical contaminants. Even with herbal beverage and black teas showing strong sales in the organic classification, SPINS-estimated sales for all organic bagged, loose, and liquid tea concen-

**Table 7. Bagged, Loose, and Concentrated Tea Annual Retail Sales in the Specialty/Gourmet Channel in the United States in 2014\***

Tea†	US Dollar Sales
1. Black Tea (bags)	\$14,680,839
2. Herbal Beverage Teas (bags)	\$8,681,325
3. Green & White Teas (bags)	\$8,429,748
4. Medicinal Teas (bags)	\$7,409,365
5. Green & White Teas (loose)	\$2,004,735
6. Iced Teas & Powder Tea Mixes (loose)	\$1,580,232
7. Chai Teas (bags)	\$1,565,287
8. African Red Teas (bags)	\$1,328,046
9. Black Teas (loose)	\$1,285,056
10. Iced Teas & Powder Tea Mixes (bags)	\$767,796
11. Liquid Tea Concentrates	\$697,517
12. Yerba Mate Tea (bags)	\$349,166
13. Herbal Beverage Teas (loose)	\$333,124
14. Chai Teas (loose)	\$196,751
15. Yerba Mate Tea (loose)	\$181,824
16. African Red Tea (loose)	\$56,427
17. Medicinal Teas (loose)	\$28,943
<b>Total</b>	<b>\$49,576,181</b>

\*Source: SPINS. 52 weeks ending December 28, 2014.

†Tea coded as single or primary ingredient.



trates topped \$214 million for 2014, nearly 12% of the year’s total US tea sales.

Total sales of certified Fair Trade teas as calculated by SPINS for 2014 were \$87.4 million, with medicinal teas (bags) once again in the number-one spot at \$25 million, and liquid tea concentrates taking second, bringing in \$18.9 million.

Non-GMO teas pulled in sales of \$132.1 million during 2014, according to SPINS. It is important to note that the authors were not able to locate any tea agency, association, or producer that is currently aware of teas (*C. sinensis*) being grown with GMO technology. With consumer awareness and concerns about GMOs, some tea brands are nonetheless seeking Non-GMO Project verification to perhaps allay potential fears or questions by consumers.

It is worth noting that some plant ingredients used in medicinal and herbal beverage teas can be obtained from GMO-sources, such as cornsilk (*Zea mays*, Poaceae) style and stigma<sup>12</sup> as well as eucalyptus (*Eucalyptus globulus*, Myrtaceae)<sup>13</sup> and papaya (*Carica papaya*, Caricaceae) leaves.<sup>12</sup> In teas formulated with excipients, colorants, extracts, flavors, and/or nutrients, GMO elements may be incorporated as well (J. Brinckmann email to A. Lindstrom, November 6, 2014). Extracts and flavors sometimes utilize corn- and soy-based components that are not legally required to be declared on labeling; dry “natural flavors,” for example, frequently are produced by combining corn- and/or soy-based excipients with essential oils. According to the Non-GMO Project, 88% of the American corn crop and 94% of the soy crop are genetically modified.<sup>14</sup>

The specialty/gourmet channel (i.e., full-format supermarkets with more than \$2 million in annual sales and with specialty items comprising at least 25% of overall volume, as well as high-end, experiential stores featuring full-service gourmet departments and high-quality products with a strong focus on specialty, imported, natural, and organic items), like the natural foods channel, consistently has supported specialty tea business development, and it is a prime avenue for new tea brands to garner sales experience before making the jump to mainstream market shelves. In this channel, bagged teas (vs. loose or liquids forms) lead the pack — as they do in all channels — with their ease-of-preparation and convenience. Black tea sales total-

ing \$14.7 million for 2014 in this channel showcase its immense popularity among specialty/gourmet consumers as indicated by a nearly two-to-one lead in sales over the next closest category, herbal beverage teas (bags), at \$8.7 million in sales.

While specialty/gourmet consumers frequent these outlets seeking out exotic foods, flavors, and ingredients, it should be noted that even in this channel, interest in and purchases of medicinal tea is high. Total sales of \$7.4 million in 2014 indicate that this is a small percentage of annual medicinal tea sales in the US; nonetheless, that medicinal teabags hold the fourth position of 17 monitored formats and teas illuminates the growing interest in medicinal teas.

As in the herbal dietary supplements sector, 2014’s top-selling herb ingredients in medicinal tea bags comprise those with structure-function claims such as immune and/or digestive support, stress regulation, and weight-loss promotion.

**Table 8. Top-Selling Herb Ingredients in Medicinal Tea (Bags) in 2014 in the United States in Mainstream Multi-Outlet, Natural, and Specialty/Gourmet Channels\***

<b>Herb†</b>	<b>Latin Binomial</b>	<b>2014 Sales (USD)</b>
1. Chamomile	<i>Matricaria recutita</i>	\$61,623,321
2. Senna	<i>Senna alexandrina</i>	\$20,619,527
3. Ginger	<i>Zingiber officinale</i>	\$16,697,092
4. Dandelion‡	<i>Taraxacum officinale</i>	\$13,301,804
5. Echinacea§	<i>Echinacea</i> spp.	\$11,995,829
6. Kava	<i>Piper methysticum</i>	\$7,185,019
7. Licorice	<i>Glycyrrhiza glabra</i>	\$5,536,281
8. Slippery Elm	<i>Ulmus rubra</i>	\$5,424,500
9. Holy Basil	<i>Ocimum tenuiflorum</i>	\$4,274,451
10. Fenugreek	<i>Trigonella foenum-graecum</i>	\$3,909,304
11. Garcinia	<i>Garcinia cambogia</i>	\$3,866,848
12. Schisandra	<i>Schisandra chinensis</i>	\$3,555,743
13. Passionflower	<i>Passiflora incarnata</i>	\$3,519,843
14. Fennel	<i>Foeniculum vulgare</i>	\$2,939,259
15. Red Raspberry	<i>Rubus idaeus</i>	\$2,340,854
16. Wild Cherry Bark	<i>Prunus serotina</i>	\$1,978,361
17. Eucalyptus	<i>Eucalyptus globulus</i>	\$1,512,801
18. Lavender	<i>Lavandula</i> spp.	\$1,475,544
19. Mints	<i>Mentha</i> spp.	\$1,326,594
20. Linden	<i>Tilia</i> spp.	\$1,033,571

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector ("FDM"; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer's clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

†Represents herbs used in single and/or multi-herb formulation where botanical is the primary ingredient. If item contains multiple the products sales are reported for the primary ingredient.

‡Includes dandelion root, leaf, and combination products

§Echinacea collectively refers to tea ingredients made from the roots and/or aerial parts of three species in the *Echinacea* genus: *E. angustifolia*, *E. pallida*, and *E. purpurea*.

**Table 9. 2014 Top-Selling Herb Ingredients in Herbal Beverage Tea (Bags) in the United States in 2014 in Mainstream Multi-Outlet, Natural, and Specialty/Gourmet Channels\***

<b>Herb†</b>	<b>Latin Binomial</b>	<b>2014 Sales (USD)</b>
1. Chamomile	<i>Matricaria recutita</i>	\$50,559,544
2. Mints	<i>Mentha</i> spp.	\$37,125,981
3. Ginger	<i>Zingiber officinale</i>	\$5,260,616
4. Valerian	<i>Valeriana officinalis</i>	\$617,578
5. Guayusa	<i>Ilex guayusa</i>	\$600,245
6. Ginseng‡	<i>Panax</i> spp.	\$506,370
7. Licorice	<i>Glycyrrhiza glabra</i>	\$469,147
8. Açai	<i>Euterpe oleracea</i>	\$429,571
9. Aloe	<i>Aloe vera</i>	\$294,437
10. Elderberry	<i>Sambucus nigra</i>	\$243,652
11. Dandelion	<i>Taraxacum officinale</i>	\$208,376
12. Artichoke	<i>Cynara scolymus</i>	\$190,881
13. Senna	<i>Senna alexandrina</i>	\$189,162
14. Cinnamon	<i>Cinnamomum</i> spp.	\$160,689
15. Linden	<i>Tilia</i> spp.	\$116,182
16. Lavender	<i>Lavandula</i> spp.	\$100,048
17. Cat's Claw	<i>Uncaria tomentosa</i>	\$98,092
18. Milk Thistle	<i>Silybum marianum</i>	\$92,822
19. Fennel	<i>Foeniculum vulgare</i>	\$79,018
20. Stevia	<i>Stevia rebaudiana</i>	\$73,005

\*Source: SPINS and SPINS Multi-Outlet powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector ("FDM"; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer's clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

†Represents herbs used in single and/or multi-herb formulation where botanical is the primary ingredient. If item contains multiple the products sales are reported for the primary ingredient.

‡Does not include *Eleutherococcus senticosus*, formerly known as "Siberian ginseng."

Chamomile, kava, and lavender are known for their anxiolytic effects, and passionflower has been administered to treat insomnia. Schisandra is an adaptogenic herb with claimed stress-protective properties.

Senna is reliably popular as a natural laxative, and therefore used in products meant to treat constipation or promote weight loss. Ginger and various mints are used in digestive-support formulations, and fennel to treat flatulence. In 2014, fennel — which appeared among the top-20 selling herbs in the medicinal tea category for both 2013 and 2014 (Table 8) — made its way into the herbal beverage top 20 as well, ranked at 19 (Table 9).

The presence of *Garcinia cambogia* illustrates the ongoing power of "The Dr. Oz Effect"; the cardiologist and talk-show host Mehmet Oz, MD, recently came under fire at a Senate hearing for his promotion of this purported weight-loss aid (among others) due to the alleged lack of scientific support. Despite the negative press, garcinia sales soared in 2014, increasing by about \$1 million and placing it at 11th in the medicinal tea category (Table 8).

Echinacea tea is part of many Americans' cold and flu prevention and/or treatment regimens; licorice and slippery

elm — due to their mucilaginous properties — are present in many formulations intended to soothe symptoms such as sore throat and cough, as is wild cherry bark. Eucalyptus, a major ingredient in many cough drops, often is utilized to relieve sinus and respiratory symptoms associated with colds and flu. Red raspberry leaf is a component of many pregnancy-support tea formulations.

Dandelion, the root of which is touted for its liver tonic and digestive-aid properties, had a banner sales year as both a medicinal and herbal beverage tea ingredient. An increase of approximately \$3.5 million in sales in the medicinal category resulted in a number-four ranking above 2013's number four, echinacea. In the herbal beverage tea sector, dandelion debuted in 2014 at number-11 ranking; its 2013 sales did not break the top 20 (Table 9).

## Tea Packaging

Folding carton "tea boxes" manufactured from boxboard remain the primary unit packaging for tea products for bagged and loose teas. Production of tea boxes is cost-effective for tea brands and, increasingly, such cartons are made from recycled or recyclable materials (and commonly printed with soy-based inks). During 2014, canister growth slowed considerably with roughly a half percentage point increase over 2013; a number of tea brands simply opted for the more cost-efficient folding carton tea boxes.

While some smaller and mid-size tea brands utilize round canisters to merchandise their teas, this type of packaging has its limitations — they are not always recyclable, they make less-efficient use of precious shelf space on already-crowded retail shelves, and they are considerably more expensive than cartons.

Liquid pouches containing single-serving portions of various herbal teas enjoyed a stellar 2014, though the category is still relatively small at just over \$6 million in sales (Table 10). Sales of canned teas also rose significantly during this time period as more brands started using the format to contain their teas, herbs, and yerba maté liquids.

Veteran tea industry analyst Dan Bolton (personal communication to Brian Keating, January 30, 2015) says tea in single-serve pod format automatic brew capsules has experienced remarkable growth in the past two years. According to Bolton, every major tea brand has entered this market segment. Furthermore, he points out that US household penetration of automatic coffee pod brewers is approaching 15 million units and may ultimately surpass 40% of all homes, exposing millions of coffee drinkers to quality tea conveniently prepared. Pods (or "cups") rose a surprising 11% in 2014.



**Conclusion**

The US tea industry, like much of the global tea space, is undergoing a major transformation of unimagined implications. Within the US and Canada, sales are rising for almost every type of tea and herbal tea, packaging format, and distribution channel. Media reports on “all things tea” are exceptionally positive and reaching consumers on a daily basis. Restaurants of all types are serving numerous options from fine tea service to exotic iced teas. A decade ago, a few die-hard tea aficionados brewed their teas mostly at home — now it is commonplace to brew specialty tea at home and in the workplace. That the world’s largest tea company — Lipton (Unilever) — invested \$40 million in a campaign to promote the brand globally with Muppet mascots and Oscar-night ads is but another sign that the time for tea to take center stage has arrived. Tea is seeping and steeping across the great American beverage landscape in innumerable ways.

While some consumers simply see tea as a non-caloric alternative to coffee and even energy drinks, many more are choosing tea as their daily drink-of-choice for specific health-promoting properties. This Tea Market Report demonstrates that sales of medicinal and herbal teas are exceptionally strong and rising. With an uncanny similarity, the hundreds of new tea retail outlets — and thousands more projected to open in the next few years — parallels the germinal stages of the fledgling US natural foods industry circa 1980-2000. Independent and smaller chains of tea shops are morphing into well-organized, multi-unit chains, and these tea-centric cafés, salons, and bars are raising awareness for tea. This phenomenon occurred with the “mom-and-pop” natural food stores for years, ultimately resulting in powerhouse retailers such as Whole Foods Market and others promoting the healthier-food agendas. A similar path is advancing rapidly with tea-focused retailing.

Tea is satisfying the thirst and wellness needs of diverse consumer populations seeking economical, easy beverage choices to support health and nurture wellbeing. HG

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**Table 10. 2014 Total Tea Annual Sales by Packaging (Mainstream Multi-Outlet, Natural, and Specialty/Gourmet Channels) in the United States\***

<b>Packaging</b>	<b>US Dollar Sales</b>	<b>% Increase/Decrease 2013</b>
Box (cardboard)	\$1,141,447,916	3.3
Canister	\$278,104,899	0.6
Pod/Cup	\$153,830,408	11.6
Other	\$87,030,029	n/a
Packet/Pouch - Dry	\$50,392,189	-14.0
Bag	\$45,112,378	30.5
Aseptic Carton	\$32,251,379	10.4
Plastic	\$18,187,755	12.6
Packet/Pouch – Liquid	\$6,076,604	2796.1
Glass	\$3,957,122	-5.6
Bulk	\$204,434	12.7
Can	\$75,224	562.2
Aluminum Bottle	\$727	-67.8

\*Source: SPINS and SPINS Multi-Outlet Powered by IRI. 52 weeks ending December 28, 2014. Mainstream multi-outlet channel coverage includes the food, drug, and mass-market sector (“FDM”; supermarkets, drugstores, and mass-market retailers), military commissaries, and select buyer’s clubs and so-called dollar stores. It does not include convenience store sales. Natural channel coverage does not include Whole Foods Market sales.

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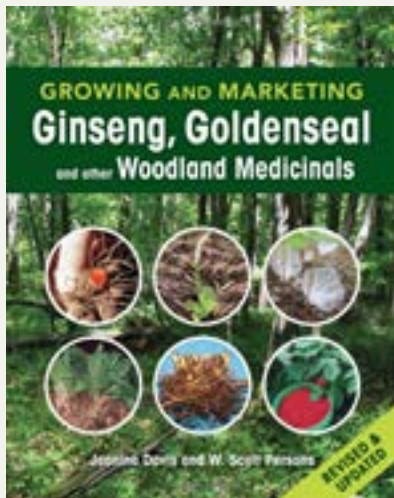
***Growing and Marketing Ginseng, Goldenseal and Other Woodland Medicinals***, 2nd ed., by Jeanine Davis and W. Scott Persons. Gabriola Island, BC, Canada: New Society Publishers; 2014. Softcover, 508 pages. ISBN: 978-0-86571-766-4. \$39.95.

If there was one book that people who are interested in growing American ginseng (*Panax quinquefolius*, Araliaceae) and goldenseal (*Hydrastis canadensis*, Ranunculaceae) should have, this is it. Jeanine Davis, PhD, and Scott Persons, PhD, have improved upon what was the seminal book regarding the growing and marketing of valuable Native American medicinal forest plants. The first edition was a must-have for people wanting to grow ginseng and goldenseal. This revised, updated edition will replace the first edition as the go-to source of information for growers.

The new edition is chock-full of useful information. Its contents reflect the authors' more than 60 years of combined experience working with and cultivating medicinal plants of eastern American forests. Dr. Persons shares his valuable knowledge based on his hands-on experience in Part Two, "A Ginseng Grower's Manual." Chapters in this section provide all the information that an interested entrepreneur needs to grow, harvest, process, and market American ginseng. Dr. Davis builds on, and complements, that section with chapters on goldenseal, ramps (*Allium tricoccum*, Amaryllidaceae), and many other forest herbs. Dr. Davis also provides details on growing forest herbs in home gardens as well as advice on sustainable wild harvesting.

Part One, "American Ginseng," sets the stage for later chapters, although it has some challenges. The section on the life cycle of ginseng is important for comprehension of how the plant grows. Although I know the definition of "prong," I was unable to find a clear explanation of the term in these pages. For someone new to ginseng, this could present a challenge in understanding the plant's life cycle, though not significantly. I found the distribution map of wild American ginseng wanting. It may have represented a historical perspective of American ginseng, but I question if wild ginseng is found in southern Mississippi or if it would grow in that environment. A current map would be very helpful. The section on government regulation, particularly the Convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES), could be improved as well. CITES is such a contentious matter among people involved with wild-harvested ginseng that presenting current and accurate information is critical for people interested in growing this valuable medicinal herb. There are 19 states approved to export wild American ginseng, according to the US Fish and Wildlife Service.

I really enjoyed the chapter on the history of ginseng trade, which begins with a synopsis of ginseng's value in



China and progresses through modernity. By doing so, the reader is provided with a sense of the link between American ginseng (both cultivated and wild) and the product's final destination in Asia. I have heard much about the grading of ginseng and would have enjoyed more on that subject. The one image of "octopus" or "spider" roots illustrates low-quality ginseng, although the reader would benefit from seeing images of other grades, too. Additionally, I would have preferred a list of average annual prices for ginseng rather than a range of prices, as the tendency is to concentrate on the highest price.

The "Ginseng Grower's Manual" provides sound advice on three ways to grow the plant: artificial shade, wild simulated, and woods cultivated. Obviously, the author has a wealth of knowledge on the subject. The information provided in these chapters is sufficient for an entrepreneur to get started in growing "green gold." The production budgets, which are very important considerations for people to get a sense of costs and benefits of growing, are improved from the previous edition. One concern I have with the budgets is that while projected income has increased since the previous edition, expenses have not. In the nine years since the first edition was published, the hourly labor rate has doubled.

The chapter on wild-simulated growing methods provides an approach that Dr. Persons has refined over the years to cultivate ginseng roots in a forest environment. At the end of the chapter, the authors present "alternative wild-simulated planting methods," which I find problematic. My understanding of wild-simulated planting is that minimal site disturbance is essential. However, the description of the alternative wild-simulated method includes using a tiller or "small tractors to disc seeds into the ground." This may be a valid approach to growing ginseng; perhaps it just needs to be presented as an alternative planting method and not as wild-simulated.

After an excellent introduction to growing ginseng, Dr. Davis does an admirable job presenting a similar story of growing goldenseal and ramps. As she states, the science of growing these forest herbs is not well developed. But Dr. Davis blends personal experience with research results to provide the reader with sound advice and counsel on growing valuable forest herbs. Similar challenges are perceived with the production budgets; this may be the nature of the budgets.

Part Four of the book provides short and informative summaries of 11 other forest herbs. These include economically significant forest herbs such as bethroot (*Trillium erectum*, Liliaceae), black cohosh (*Actaea racemosa*, syn. *Cimicifuga racemosa*, Ranunculaceae), blood root (*Sanguinaria canadensis*, Papaveraceae), and false unicorn (*Chamaelirium luteum*, Liliaceae). The short summaries cover the plants' description and range, uses, growing instructions,



and market and economic data. Like the other sections of the book, Part Four is a treasure trove of information that provides a good starting point for interested growers.

For the forest landowner who wants to have a woodland garden, this book is an excellent resource. In order to promote conservation of these plants, it is essential to encourage forest landowners to grow them in gardens. These *refugia* will help to ensure the long-term sustainability of the genetic resources. The reader also is presented with some simple products that can be created from the herbs they grow — completing the chain of beneficial plant cultivation from growth to use.

I would recommend this book to anyone interested in

growing forest herbs and anyone interested in becoming more educated about these plants. It is full of tables, charts, images, and figures that will be of immense assistance in learning more about the cultivation of valuable medicinal forest plants. The book has a prominent place on my shelves, next to the dog-eared first edition. I'm sure with time, the second edition will exhibit the same evidence of frequent use. HG

—Jim Chamberlain, PhD  
Forest Products Technologist, USDA Forest Service  
Blacksburg, Virginia

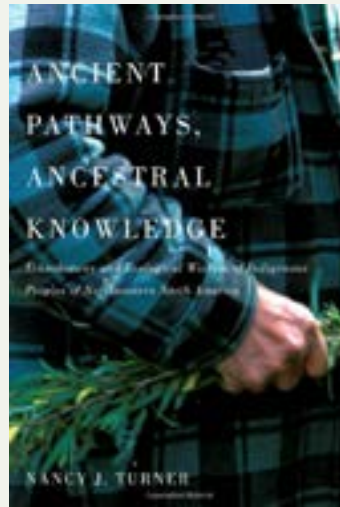
***Ancient Pathways, Ancestral Knowledge: Ethnobotany and Ecological Wisdom of Indigenous Peoples of Northwestern North America***, Vol 1 and 2, by Nancy J. Turner. Montreal, Quebec: McGill-Queen's University Press; 2014. Hardcover, 1161 pages. ISBN: 978-0773543805. \$100.00.

The book review editor of *HerbalGram* asked me to address the question: What were the goals of Nancy Turner, PhD, in publishing these magnificent tomes? In my first hours delightfully scanning through Volume 1 — *The History and Practice of Indigenous Plant Knowledge* — I was not convinced that the author had adequately laid out the goals for the books, but she cites them very clearly in her blog<sup>1</sup>:

The two-volume book ... represents, for me, a culmination of many years of research and thought about the complex, long-term, ever-changing relationships among humans, plants, and environments here in northwestern North America. How did people acquire the rich knowledge about their environments, including plants, algae, and fungi, that I learned about? How did they pass on their knowledge, practices, and beliefs from generation to generation, from family to family, and from community to community? And, how did they adapt these practices to new and changing situations they encountered? Finally, in the face of these rapidly changing times, with technological, societal, and environmental change happening at a seemingly ever-increasing pace, how can this precious knowledge be recognized, maintained, and perpetuated for the benefit of future generations? These are the big questions that have been building up for me with each new detail learned, each new insight, and each new recognition of significance and connection stemming from my participatory, collaborative research with First Nations plant experts. In this book I have attempted to address these questions.

As book reviewer, I say she has done a magnificent job!

I have long admired Dr. Turner's great work. As I skim through her books, I can see interesting parallels between



the late, great Richard E. Schultes, PhD, and his many students assembling anthropological and ethnobotanical data on the First Amazonian Americans into a solid framework. Nancy and her students have done the same for approximately 500 ethnobotanical species used by the First Americans in Northwest America. Nancy also tells me that there is much more unpublished data on a digital document storage repository at her university, since there is too much to fit into the books. Responding to my incessant curiosity, Nancy dug out some details for me.

I was pleased to be invited to review this exciting new ethnobotanical compendium. First, I commend the publishers for breaking this into two volumes. Too often,

oversized volumes break down too soon. Refreshingly, the 554-page Volume 1 and 552-page Volume 2 — *The Place and Meaning of Plants in Indigenous Cultures and Worldviews* — are colored differently and paginated separately. There are disadvantages, however: Volume 2 has the index to both volumes. I do not have much room beside my big computer screen, so I find it a nuisance to have to look up the pages for ethnobotanical comments on the higher plants, ferns, mushrooms, and seaweed, most of which are covered in Volume 1 but indexed only in Volume 2. It entails a lot of flipping back and forth. And another minor complaint: My 85-year-old eyes need a magnifying glass, frequently, in reading these packed pages.

Having enjoyed Thanksgiving dinner spiced with store-bought juniper berries, I picked *Juniperus communis* (Cupressaceae) to assess the indexing, which is very important to compilers like me. (My Thanksgiving hostess had been advised by the store where she brought her juniper berries not to pick wild ones, as some might be poisonous.) In Volume 2, *J. communis* is indexed to page 62 (berries eaten in small quantities [I ate two dried ones Thanksgiving night.]), page 128 (common names), page 132 (more common names translating “Brown Bear’s Spruce Bough,” “Raven’s arrow,” and “Raven’s berry”), page 175 (more plant names), page 343 (berry-like cones used for brown dye), page 420 (cone eaten

as panacea), page 421 (branch tea laxative), page 423 (tea for cold, fever, pneumonia, and tuberculosis), page 426 (tea or decoction for childbirth), page 427 (cone tea for backache, myalgia), and page 428 (tea and eyewash and for purification). There was only one entry indexed to Volume 2 on page 302, which contained some tribal medicine details (“Haida said it all had to be drunk to work”; “Nlaka’pamux suggest as sweathouse purification”; “Okanagan suggest decoction against death and illness”; “Hunn and Selum et al suggest as wash for babies to protect against fever and witchcraft.”).

Based on this single exploration, I say the index is good but a bit incommodious (meaning: damned unhandy), especially when juggling two volumes, a keyboard, and a magnifying glass. This cumber makes it difficult to write a review. Still, I recommend the book to cranky old men like me and the young at heart and strong of eye as well.

With good reason, Nancy challenges the naïve notion that these and other First Americans were hunter-gatherers (in Volume 1, page 265). I’ve never encountered any First Americans who did not deem it wise to plant nearby those things they had to travel far to gather. But rather than quote her book, I prefer to quote her blog once more<sup>1</sup>:

[A]ccounts of re-planting growing parts of highly valued root vegetables — northern riceroot [*Fritillaria camschat-*

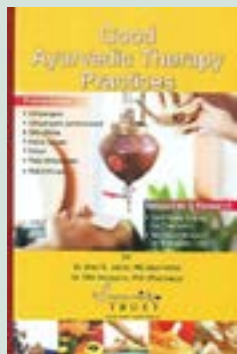
*censis*, Liliaceae] in the coastal estuarine root harvesting sites, and yellow glacier lily [*Erythronium grandiflorum*, Liliaceae] in the interior montane meadows — brought me to a realization of something that had been staring me in the face all along: Indigenous Peoples of northwestern North America have been long-time plant cultivators.

“Let food be thy medicine and medicine be thy food,” said Hippocrates (ca. 460-377 BCE), the “Father of Medicine.” In these tomes, Dr. Turner explains that First Americans often say “Our food is our medicine.” Dr. Turner and I agree with Tim Johns, PhD, and his book *With Bitter Herbs They Shall Eat It*, that many of our foods are proven medicinals, and many of our medicines come from edible plants. I have no reason to believe that First American herbs are any more or less medicinal than the First Ayurvedic and First Chinese herbs with which mankind has evolved for many thousands of years. If you count only the PubMed studies on traditional Chinese medicines and Ayurvedic herbs, there is much more published evidence for these long-established traditions, but there is little credible evidence that one species is better than the other. The First Americans have coevolved with their local species for some 14,000 years, and I believe that all traditional cultures have evolved

## New Book Profiles

***Good Ayurvedic Therapy Practices*** by Arun B. Jainar and DBA Narayana. Bangalore, India: Ayurvedy Trust; 2014. Softcover, 334 pages. \$50.00.

Published by the Ayurvedy Trust, *Good Ayurvedic Therapy Practices* is a manual of recommended working procedures for Ayurvedic therapy practitioners, including doctors, therapists, and technicians. The guide’s goal, as stated in the foreword by noted American Vedic expert David Frawley, is to integrate traditional therapies into a

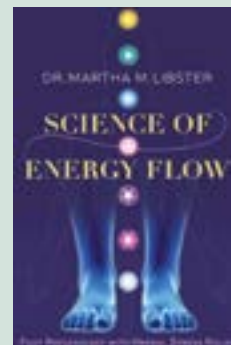


modern clinical setting, and to highlight procedures that may be unfamiliar to Western practitioners. There are 27 procedures described in Part One of the manual, each with extensive and detailed protocols, material lists, and instructions, including pre- and post-therapy directions for the practitioner and the patient. These instructions are often accompanied by line-drawn diagrams, particularly for massage-based therapies. In addition to the procedures, the manual contains a list of research publications on certain therapies, an index where therapies can be searched by ailment, a glossary of Sanskrit terms, and four color plates.

***Science of Energy Flow: Foot Reflexology with Herbal Stress Relief*** by Martha M. Libster. Naperville, Illinois: Golden Apple Publications; 2014. Softcover, 238 pages. ISBN: 978-0-9755018-5-6. \$39.95.

In this guide to the practice of reflexology, Martha Libster, PhD, RN, introduces the concept of spiritual and physical wellness by directing the flow of energy through

the feet. Chapter four focuses on the healing qualities of foot baths through the use of herbal remedies, including essential oils that are added to the bath water, and massage oils as well as herbal compresses, bath salts, oil packs, and infusions. Drawing from Traditional Chinese Medicine and Ayurveda, Dr. Libster uses the concept of the thermal qualities of herbs — cooling, neutral, and warming — to bring balance to the body. The practice of reflexology combined with elements of herbal medicine is intended to bring the body, mind, and spirit into balance in a gentle and relaxing way.





to learn which of their medicines work best for particular ailments.

All who know me well know that I am a strong believer in “Food Pharmacy.” Each food plant species contains thousands of biologically active phytochemicals. The longer humans have coevolved with and ingested those species, the more probable their food pharmacy applications. Homeostatically, our bodies have evolved to select from those many phytochemicals on the food pharmacy menu those which might restore the body to balance (health) from imbalance (disease). Concomitantly, *Homo sapiens* tend to reject the unnecessary, unbalancing chemicals. Accepting these speculative suggestions, First Africans are more likely to be helped by First African food plants, as are First Americans by First American food plants, First Ayurvedics by First Ayurvedic food plants, etc. Further, each of us will select from the same food pharmacy menu differently according to our evolutionary histories, homeostatic needs, and our individual temporary imbalances. So the food pharmacy menu is a polypharmacy approach giving the body a choice of many genetically familiar phytochemicals to help bring the body back into balance. Conventional medicine, too, often offers a single synthetic chemical unknown to our genes, which can disturb, rather than restore, balance.

The two volumes are generously laced with black-and-

white photos and fascinating ethnobotanical appendices and tables. For example, Table 1, starting on page 420 in Volume 1, details the following: general tonics (of which there are about 35 species); purgatives, laxatives, and emetics (about 20 species); dermatological poultices, salves, and washes (about 60 species); respiratory medicines (e.g., for cold, cough, and tuberculosis; about 70 species); internal ailments and injuries (about 50 species); gynecological medicines (about 30 species), and miscellaneous medicines (about 40 species).

Then on page 453, there’s a half-page table (Table 7-3) cataloging the miscellaneous uses to which the First Americans put their aromatic plants, with therapeutics leading the lot. The table contains more than 34 species used for internal medicine; 25 for external medicine; 25 for sweat baths and protectors against evil spirits, illness, and predators; 18 for masticatories and gums; 17 as antiseptics, insecticides, and insect repellents; 17 as anesthetics, or cosmetics for hair, scalp, and skin; 16 as aromatic beverage teas; 15 as fragrant or protective incenses or smudge; 10 as pediatric and baby therapies; 10 as cooking spices; nine as hunting and fishing gear cleansers, deodorizers, or good luck charms; six to induce dreams or sleep; and five species for ceremonial scrubbing.

I was pleased to see that Dr. Turner discusses pit cooking. I must confess to a penchant, if not a craving, for pit-cooked pork barbecue, and Dr. Turner includes historical and scien-



***The Plant Healer’s Path: A Grassroots Guide for the Folk Herbal Tribe*** by Jesse Wolf Hardin and Kiva Rose. Reserve, New Mexico: Plant Healer Publishing; 2014. Softcover, 304 pages. ISBN: 978-1495279928. \$29.00.

With contributions from noted herbalists and healers David Hoffmann, Phyllis Light, Sam Coffman, Paul Bergner, Rebecca Altman, and Roger Wicke, *The Plant Healer’s Path* explores the lifestyle of “folk herbalism.” The chapters put forward the goals of an herbalist, including the decision to practice professionally, and how to create and perpetuate a sense of community with other healers and practitioners. Tied together through-

out the chapters is a palpable sense of reverence and respect for the natural healing properties of plants and a connection to the natural environment. Chapters are accompanied by numerous black-and-white photos, and author Kiva Rose includes the occasional recipe such as rose vinegar or dandelion bitters along with suggestions for its use. In the foreword, David Hoffmann declares *The Plant Healer’s Path* to be a “truly grassroots manifestation of herbalism—of humanity’s reconnection with healing nature and the wild.”

***The Home Reference to Holistic Health and Healing*** by Brigitte Mars and Chrystle Fiedler. Beverly, Massachusetts: Fair Winds Press; 2015. Softcover, 224 pages. ISBN: 978-1-59233-636-4. \$24.99.

The second book from authors Brigitte Mars and Chrystle Fiedler, *The Home Reference to Holistic Health and Healing*, follows their earlier work, *The Country Almanac of Home Remedies* (Fair Winds Press), published in 2011. In *Home Reference*, Mars and Fiedler outline natural methods to nourish and support the whole body and mind, including essential oils, herbal reme-

dies, vitamin supplements, and nutrition, among others. While their previous work focused on herbal remedies for multi-system ailments, *Home Reference* looks specifically at mental well-being, with natural solutions for stress, insomnia, low energy, chronic pain, grief, and impaired immune function. Each chapter is devoted to one condition and contains easy-to-read information on selfcare regimens for the reader, including healing herbs and essential oils, as well as other holistic activities such as simple exercises, dietary changes, and nutritional supplements. The appendices offer a guide to aromatherapy, tea formulations, and a list of additional resources.



tific details of earth ovens and pit cooking in the text. Interestingly, pit-cooking camas (*Camassia quamash*, Liliaceae) and onions were significant to First Americans nutritionally because the process breaks down the complex carbohydrate inulin into fructose, which is sweeter and more easily digested. Pits were used to cook many relatively indigestible root vegetables, and there is a recognition of their use for clams, eggs, fish, meat, seal, etc. (But no pork — early on, at least.) Sooner or later, other roots were imported from the outside, like the potato (*Solanum tuberosum*, Solanaceae) and the turnip (*Brassica rapa*, Brassicaceae). Dr. Turner catalogs dozens of First American names for these two introduced root crops.

These magnificent tomes belong on the shelves of all good anthropologists, botanists, ecologists, ethnobotanists, food scientists, herbalists, linguists, naturalists, naturopaths, nutritionists, and those rare conventional physicians who have come to realize that nutritionally balanced and genetically

familiar foods should be our medicines, not unknown new synthetics. Viva food farmacy for the First Peoples, in Victoria and elsewhere!

Thanks much, Nancy Turner. Excellent job — wow! What a production! HG

—James A. Duke, PhD  
**Botanical Consultant, Economic Botanist**  
**Herbal Vineyard Inc./Green Pharmacy Garden**  
**Fulton, Maryland**

## Reference

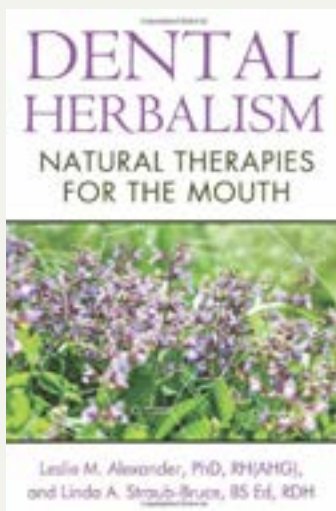
1. ASPP Spotlight: Ancient Pathways, Ancestral Knowledge, by Nancy J. Turner. Federation for the Humanities and Social Sciences website. August 12, 2014. Available at: [www.ideas-ideas.ca/blog/aspp-spotlight-ancient-pathways-ancestral-knowledge-nancy-j-turner](http://www.ideas-ideas.ca/blog/aspp-spotlight-ancient-pathways-ancestral-knowledge-nancy-j-turner). Accessed December 3, 2014.

***Dental Herbalism: Natural Therapies for the Mouth*** by Leslie M. Alexander and Linda A. Straub-Bruce. Rochester, Vermont: Healing Arts Press; 2014. Softcover, 454 pages. ISBN: 978-162055195-0. \$19.95.

Readers of *Dental Herbalism: Natural Therapies for the Mouth* should be advised that it is written from the perspectives of a dental hygienist and a practicing American herbalist and reflects their respective training and limitations thereof. Both authors have made an effort to be as comprehensive as possible, and also to simplify their presentations for the lay audience. However, it is difficult for me to understand the authors' approach, not only based on what was written about a number of dental issues, but also because I question how successful self-medication can be achieved without the personal guidance of a skilled herbalist.

Unfortunately, much of the book's information is incomplete, cursory at best, and repeated in a number of chapters. Also, while references are cited after each chapter, it is unclear how they are linked to many of the statements made. In other instances, certain references — the contents of which are utilized throughout each chapter and contain primary sources — should have been cited within the text; instead, those that represent popular books on herbalism and frequently lack primary sources have been given preference. Plant identification in the authors' *materia medica* is challenging due to the omission of corresponding pictures. Most importantly, the content of many of the chapters is so diffuse as to be confounding and should have been edited appropriately in order to provide a clearer approach to each core subject.

The lists of plants and formulations in the *materia medica* are presented in a classic format and clearly reflect



those familiar to the herbalist. Additional formulae and plant recommendations are inserted in chapters without explanations as to why they might take precedence over others. I find the ethnobotanical/dental overview to be understated at best and, as such, lacking a clear basis for the selection of those formulations cited and their comparative therapeutic worth. With only a few exceptions, most of the plants examined in detail are derived from European pharmacopeias or the Neo-Western herbalist tradition. Broad statements are provided about the plants' possible value in dentistry, but connections between their cited bioreactivities and known constituents are superficial at best. Further, there is a dearth of proof as to their relative efficacy

when used alone or in combination with other herbal constituents, many of which are not cited in the *materia medica*. The following paragraphs outline but a few examples of what I found to be the most disconcerting issues.

The selective criteria behind the herbal chew-sticks recommended in Chapters 1 and 12 and explanations as to why they may be more efficacious than others are never discussed. Unfortunately, the list of chew-sticks provided is confounding, since without accompanying botanical epithets and only an admixture of common and generic names to consider, it would be impossible to determine the true identity of some of these plants or how they might be obtained if not available locally. Citing marshmallow (*Althaea officinalis*, Malvaceae) as a common chew-stick also is perplexing since many references mention uses only for "teething babies"; overall, species within the Malvaceae family rarely are utilized for this purpose. Among the many chew-sticks used worldwide, some are well known for their therapeutic value and the proven clinical efficacies associated with known anti-inflammatory



and antimicrobial activities against odontoperiopathic organisms. Numerous commercial dental products in the form of wood chips, extracts, and oils have undergone clinical analyses to authenticate their value. While the authors of *Dental Herbalism* were reticent to include any of these data in the book, a simple table citing commercial names, ingredients, and proven bioreactivities and clinical efficacies would have been an invaluable addition to the text or its appendix.

Noteworthy among the omitted chew-sticks is miswak (*Salvadora persica*, Salvadoraceae), which, to many in Eastern and Northern Africa, the Middle East, and Western Asia, has proven its value not only as a chew-stick but also as an extract in a number of dentifrices (i.e., toothpastes and powders). This plant has been studied extensively for both its clinical virtues and the therapeutic basis for its bioreactive compounds. Agreeably, the cautionary note regarding neem (*Azadirachta indica*, Meliaceae) and fertility has merit, albeit this association has not been proven in humans. Also, there is no mention of allergic reactions that may be elicited by certain dental products that include flavoring and antimicrobial essential oils such as peppermint (*Mentha x piperita*, Lamiaceae), eugenol (a component of clove [*Syzygium aromaticum*, Myrtaceae] and cinnamon [*Cinnamomum* spp., Lauraceae] leaf oils), tea tree (*Melaleuca alternifolia*, Myrtaceae) oil, and bloodroot (*Sanguinaria canadensis*, Papaveraceae).

Although plant quids are used by many cultures to clean teeth, the authors' recommendation of using betel (*Piper betle*, Piperaceae) quid for this purpose makes little sense given that the quid often contains tobacco (*Nicotiana tabacum*, Solanaceae), the practice usually stains teeth red to black, and it has been known to cause oral cancer. Also lacking in the discussion of toothpastes and powders is the fact that many herbal formulations contain calcium carbonate, which can vary widely in its abrasive qualities. Charcoal is not mentioned for the purpose of teeth-cleaning and appears only in the appendix. Throughout the book, plants frequently are recommended in a general fashion without specifications as to the plant part used or how compositions can be formulated safely when they are combined from a number of taxa.

There is a plethora of information regarding dental anatomy and dental practices throughout the *Dental Herbalism*, only some of which is pertinent. It appears that much of this material was derived directly from professional texts without consideration as to how it would be of value to the lay reader or, frankly, how it is related to the title of the book. Furthermore, explanations of the causes and consequences of dental disease suggest an apparent lack of expertise in this area. For example, in Chapter 1, the discussion of inflammatory processes and their causes (e.g., stress and other factors) should have included information about the evolution of oral disease. The authors did not thoroughly elucidate that stress-related hormones can promote, inhibit, or have no effect on certain periopathic species, or that their endotoxins can serve to increase inflammatory cytokines. This can result in periodontal inflammation, and it can initiate or exacerbate arterogenesis and thromboembolic events when these

organisms are found with calcifying oral organisms in arterial plaque. The causes and results of bacteremia (i.e., bacteria in the blood) should have been delineated more fully and accurately as well. To be precise, bacteremia is less likely to occur after chewing and more likely to happen after tooth extraction, gum chewing, or tooth brushing. While it is possible that any one of these factors could contribute to the distribution of normal oral flora and oral pathogens in the blood stream, predisposing factors are essential for any of these to colonize aortic heart valves or joints, which can lead to endocarditis and arthritis, respectively.

It would have been useful if oral infection treatments were presented in one chapter rather than being interspersed throughout the book. Referring to microorganisms as “bugs or germs” clearly is outdated, as the terms do not specify the bacteria or viruses associated with a disease. For example, thrush due to the fungus *Candida albicans* (Saccharomycetaceae) was discussed in regard to its presence in the neonate, but elsewhere no reference was made to it being one of the first cardinal signs of immunosuppression due to AIDS. Also, there are many bacteria — not just *Streptococcus mutans* (Streptococcaceae) — that can cause caries (i.e., tooth decay), some of which are more prevalent during certain stages of life. I find the description of this disease symptom to be superficial at best.

Acknowledging that there are many contributing factors to the development of these diseases, I am puzzled as to why the authors discussed sugar in alcoholic beverages and glucose in carbonated beverages at some length without noting the primary cause of tooth decay: sucrose with its glucan-forming plaque and acidogenic potential. There appears to be a lack of understanding regarding the fact that sweetened beverages can differ in their cariogenic potential depending on whether or not they contain the disaccharide sucrose, the monosaccharide isomers of glucose/dextrose, or fructose. Of no relevance whatsoever were the authors' comments concerning the sourcing of glucose from genetically modified corn or if sea salt has any benefits over iodized sodium chloride as pertaining to dental disease. Factors that serve to inhibit the cariogenic process should have been discussed in greater detail. For example, *Dental Herbalism* excludes the protective effects of phytates found in a number of foods, including sugar cane (*Saccharum officinarum*, Poaceae). Also, while fluoride is mentioned in a number of places, its natural presence in soils, water, certain foods, beverages (including tea [*Camellia sinensis*, Theaceae]), or some chew-sticks and how this trace element and others can impact the cariogenic process are neglected.

Regrettably, I cannot recommend this book for either laypeople or a professional audience. HG

—Memory Elvin-Lewis, PhD, DSc (Honoris Causa)  
Professor of Microbiology and Ethnobotany in  
Biomedicine, Adjunct Professor of Biology  
Washington University  
St. Louis, Missouri

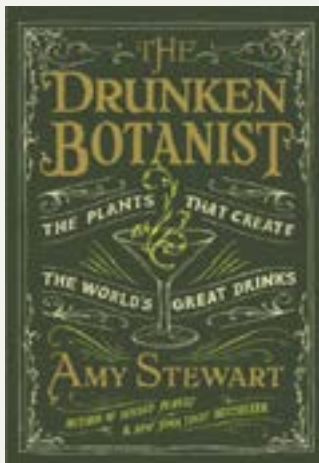
***The Drunken Botanist: The Plants That Create the World's Great Drinks*** by Amy Stewart. Chapel Hill, North Carolina: Algonquin Books; 2013. Hardcover, 381 pages. ISBN: 978-1-61620-046-6. \$19.95.

The subtitle “The Plants That Create the World’s Great Drinks” imparts *The Drunken Botanist’s* precise theme. In her most recent book, author Amy Stewart writes extensively on specific plants and their corresponding contributions to alcoholic beverages of all sorts.

The book comprises three parts: Part I explores the fermentation and distillation of 30 plants from agave to wheat; Part II explores the role of herbs, spices, fruits, nuts, bark, roots, and flowers as ingredients and additives in distilled beverages; and Part III takes readers into the garden to explore plant-inspired mixers and garnishes. The inclusion of the Recommended Reading section at the end of the book — divided into recipes and gardening — indicates the depth of research and continued support the author provides. Stewart also encourages the reader to get in touch through her website, [DrunkenBotanist.com](http://DrunkenBotanist.com), in her cleverly titled afterword, “Digestif.”

The 19-page index provides a wonderful cross-reference for the names of drinks, plants, recipes, ingredients, places, businesses, and individuals who played a significant role in creating or discovering the botanical beverages. The total is greater than the sum of its parts in *The Drunken Botanist*, and Amy Stewart has furnished historic perspective, entertained with stories, supported with facts, and offered her insights into the use of plants in cocktails, beer, and wine.

Part II, “Herbs and Spices,” offers the knowledgeable herbalist even greater insights into the traditional uses of many common and obscure herbs. It begins with allspice (*Pimenta dioica*, Myrtaceae), as it was named so aptly in



1686 by John Ray in *Historia Plantarum*. The Spanish had called it pimento, assuming it to be a pepper as they saw it being added to food in the West Indies. Allspice trees were overharvested in Jamaica for their aromatic, unbending wood, which was used by the English to make umbrellas and walking sticks. In their attempts to spread spice trees, traders found allspice impossible to germinate and discovered the seed needed to pass through the digestive tract of a bat to soften. (What a lot of information to discover about one plant in so few paragraphs!) And thus it is that Stewart delivers more than just how to mix the perfect cocktail, but also the history of its use. In the case of allspice, Stewart’s history lesson leads to the Bay Rum recipe,

which calls for St. Elizabeth Allspice Dram. As an herbalist, it makes me want to drop allspice berries into a bottle of dark rum and see what happens.

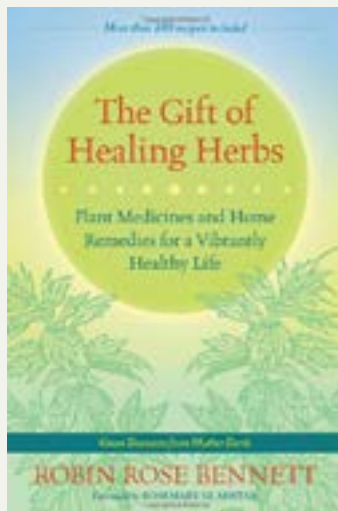
*The Drunken Botanist* contains so many wonderful cocktail recipes that I experienced a strong desire to try every beverage and recipe. How, then, will I choose? Must I drink my way through? Shall I use the inspiration to create more cordials? Perhaps Stewart’s next book should be titled *The Inebriated Herbalist*.

If I need to make any mention of what does not serve me as a reader, it is the choice to print the pages in chartreuse. As much as I love green, this color was difficult for my eyes. For adults who enjoy plants, this book is worthy of your time and consideration. I think it is a wonderful gift item, especially paired with a special glass or bottle of Aviation gin. HG

—Teresa Boardwine  
 Founder, Green Comfort Herbal Apothecary  
 Washington, Virginia

***The Gift of Healing Herbs: Plant Medicines and Home Remedies for a Vibrantly Healthy Life*** by Robin Rose Bennett. Berkeley, California: North Atlantic Books; 2014. Softcover, 552 pages. ISBN: 978-1-58394-762-3. \$24.95.

*The Gift of Healing Herbs* by Robin Rose Bennett is a treasure of well-lived stories and well-loved recipes. Bennett’s goal in writing this book is to deepen the integrity of the “people’s medicine movement” by making herbal medicine accessible to many. This book is useful for beginners looking for solid information and easy-to-find supplies and techniques that will start them on a safe path with healing herbs. Seasoned practitioners also will find great value from the author’s



years of experience and her mastery of food and plant medicine.

Rosemary Gladstar, who has brought kitchen apothecary to its rightful status, wrote a wonderful foreword. Robin’s work is deeply influenced by the Wise Woman tradition, and as an urban herbalist practicing in New York City, she has brought sophistication and a clinical perspective that makes it her own.

Part I is titled “What is Healing?” The first three chapters are about the spirituality of this work as well as ceremony and ritual. Far from presenting a superficial, New Age rendition of wholeness, Bennett comes from a



place of certainty, skill, and experience when she writes of the soulful nature of healing. This is relayed in her skills as a medicine gatherer, gardener, and a true herb crafter in the traditional sense of the word. The author infuses these chapters, and, actually, the entire book, with a sense of magic that organically arises from relating to plants and individuals through a heart- and spirit-centered practice.

For many traditions, all work with herbs is ceremony: from the gathering of plants to the apothecary and administration of remedies. Bennett shares very simple rituals that would be received tenderly by all because they honor the moment, the self, and the intention of healing.

Psychologist and author Jean Houston, PhD, is quoted in the beginning of the second chapter:

One of the most poignant human hungers is the need for ceremony and ritual. In its elemental form, this need is located in the deepest, oldest part of our brains. Spiritual ceremonies, especially when personalized open up new dimensions of the mind, spirit, and heart and can create surprising, beneficial results. Rituals of meaning, depth and beauty are needed now individually and collectively as we seek new ways of contributing to our own welfare and the well-being of all that we cherish.

Part I ends with a chapter on herbal preparations that includes very useful lists of tools and supplies needed for medicine making and processes for kitchen apothecary work. The author's descriptions and definitions are clear, written with obvious enthusiasm for the process, and are not intimidating to the beginner. The experienced herbalist also will find gems and new tricks of the trade that can come only from years of experience. No matter how many recipes on medicinal oils or products there are, skilled clinicians possess a kind of ingenuity and creativity that is well represented in *The Gift of Healing Herbs*.

Bennett's expertise in the field and the garden lends a depth that is not always present in books such as this one. She knows the seasonal rhythms for wildcrafting, recollects places in the streets of New York City where she often visits her favorite species, and, as a gardener, intimately knows the growth patterns and needs of various medicinal plants.

Part II is titled "The Herbs and Your Body Systems," which covers cardiovascular, digestive, immunelymphatic, musculoskeletal, nervous, respiratory, integumentary, and women's reproductive systems. As a "recovering scientist" (I was trained in conventional medicine and then as an herbalist), I had some difficulty with the layout of these chapters as I appreciate a different format for organizing material and methods of referencing information. The *materia medica* is dispersed throughout the chapters under different headings pertinent to given systems.

After sitting with this book, though, I realized that the very nature of this information is to induce the energetics of a spiral — the notion in permaculture that there is a sacred energy in form. Bennett's systems chapters ensure that one takes

time to read the stories and glean the medicine from each one. While very modern in the diseases she addresses and the realities of our current culture, the book is traditional (in the true meaning of the word) in that there is medicine in her stories as opposed to "case histories." That being said, there is a valuable index of more than 200 clearly named recipes and formulas. This book is a very user-friendly resource when looking for specific recipes.

Part III is titled "Everything is Medicine." Here, Bennett places the reader in the kitchen and uses the spice rack and everyday foods to bring home oft-quoted Hippocrates, who posited "That our food be our medicine and our medicine our food." Bennett offers solid information about spices, their actions, and how best to incorporate them. Foods become the material medica. There is a whole section on vinegar, its medicine, recipes like blood-building Concord Grape vinegar with molasses, and the author even includes a recipe for making apple cider vinegar from apple scraps. For these days, when sustainability and the do-it-yourself movement are gratefully taking hold, this section provides invaluable skills.

The final section, Part IV — "Additional Remedies, Tips and Thoughts on Healing" — provides the important chapter "Wound and Bruise Healing." Poulticing, fomentations, and emergency treatment with plant medicines seem to be fading arts. While appropriate protocol needs to be followed in all situations, herbalists have witnessed profound healing, pain relief, and near-miraculous tissue repair with herbal medicine. Again, Bennett's stories inspire the reader with confidence and know-how that will serve in a variety of situations.

Ms. Bennett's aim in writing the book was "to share a wealth of practical herbal knowledge ... and to offer clear guidance on how to apply that knowledge in everyday situations as well as extreme situations if need be." The plethora of beautiful recipes, healing stories, and decades of work as a community herbalist certainly make this book a success in accomplishing her goal. HG

—Kathleen Maier  
Director, Sacred Plant Traditions  
Charlottesville, Virginia



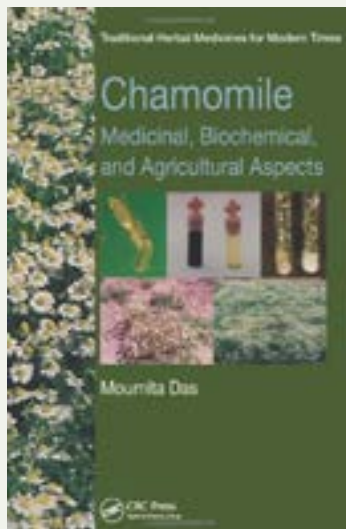
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***Chamomile: Medicinal, Biochemical, and Agricultural Aspects*** by Moumita Das. Boca Raton, Florida: CRC Press; 2015. Hardcover, 316 pages. ISBN: 978-1-4665-7759-6. \$129.95.

The thirteenth volume of the book series “Traditional Herbal Medicines for Modern Times” is presented as an updated reference for researchers, entrepreneurs, and cultivators of chamomile (*Matricaria recutita*, Asteraceae). The stated purpose of the full series is to “[provide] academia, health sciences, and the herbal medicines industry with in-depth coverage of the herbal remedies for infectious diseases, certain medical conditions, or the plant medicines of a particular country.” The latest book in this series serves as a comprehensive resource for individuals interested in the cultivation and harvest, medicinal chemistry, and pharmacologic profile of chamomile. The author, Moumita Das, PhD, has compiled the extensive available research on the plant and published a compact reference guide relevant to diverse audiences. As she notes in the first chapter, the book focuses exclusively on *M. recutita*, commonly known as German or Hungarian chamomile — other species known as chamomile such as English or Roman chamomile (*Chamaemelum nobile*, Asteraceae) are beyond the scope of the text. The book also presents an inclusive overview of the properties, components, chemistry, and quality descriptors of chamomile. This volume contains more than 30 extensively referenced tables, providing particular value in the chapter on chamomile oils and extracts. Dr. Das’s background in botany and the breeding of chamomile makes her an appropriate authority to produce this reference.

Readers can easily access information relevant to their specific needs through the detailed table of contents. Researchers will appreciate the extensive description of chamomile’s chemical properties, while cultivators and entrepreneurs will value the overview of the breeding and cultivation of the plant in diverse parts of the world. As mentioned, the book contains many tables to outline chamomile’s properties; however, the table summarizing chamomile’s extensive history, dating back to the 18th century, may be beyond the scope of interest for many in the intended audience.

The first chapter is a 48-page introduction to chamomile, including its medicinal uses in the context of three health systems. The detailed discussion of traditional health systems, homeopathy, and Unani is perhaps beyond the intended scope of the book and, although interesting reading, may be of less value to readers. Some of this information is repeated later in the book as well. The first chapter also provides specific details on the production and quality measures of chamomile’s many formulations including teas, tinctures, oils, and oral dosage forms. The discussion on adulteration and contamination of chamomile was partic-



ularly interesting and presents potentially new information to some readers. Although the basic starting material is the chamomile plant, many formulation issues are the result of incorrect identification, although the author did not specify any commonly misidentified substances.

Another chapter presents the latest information on the medicinal properties of chamomile. The comprehensive list of its medicinal uses is an easily accessible reference guide that contains descriptions of each potential therapeutic use; readers with a healthcare background likely will find the information to be presented at a basic level. For example, preceding the description of chamomile’s use as a sedative is a definition of insomnia. Much of the discussion of chamomile’s possible

medicinal properties are presented using animal data or in vitro models that may not be directly applicable to therapeutic use of chamomile in humans. When human data are presented, the discussion is quite brief and superficial in places. Readers with a health and science background would have benefited from a greater emphasis on the available human data given the widespread use of chamomile among individuals for its perceived safety and efficacy. A more thorough discussion of the study designs and, most importantly, clinical outcomes with different formulations would have been an important addition to the book overall. A discussion of the differences between animal or in vitro data and evidence in humans would have been an insightful addition as well.

The later chapters on chamomile oil and extracts, genetics and breeding, and cultivation were thorough, interesting to read, and well written. They likely will be applicable to diverse audiences. The final chapter on patents and products was somewhat superficial, and its value is unclear given the changing nature of this area especially in terms of the commercial chamomile products that currently are available.

Overall, the book provides a comprehensive review of the available research regarding the many aspects of the history, chemical properties, and good manufacturing practices of chamomile. The book is a modestly priced potential addition to the libraries of those involved in medicinal plant and natural sciences. HG

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## Victoria G. Fortner 1954-2014

Victoria Gene Fortner, RH (AHG), fought a long battle with cancer and passed away peacefully on October 11, 2014. The odds, it seems, were stacked against her; her grandmother had breast cancer and her mother, Nancy, died of colon cancer.

Victoria — also known as PeatohahNape Tamsah — was born and raised in St. Louis, Missouri. Of Shawnee and Scots-Irish descent, she was trained in conventional and traditional indigenous medicine. She worked in the conventional medical field for 15 years and was the owner of Shawnee Moon Herba-ceutical. All of the herbal medicines that have been offered through Shawnee Moon during the past 20 years were formulated by Victoria, who had 40 years of experience identifying, gathering, preparing, combining, administering, and teaching about herbs and herbal medicines. One of Victoria's students, Kerry Brock, will carry on her tradition and continue Shawnee Moon.

Victoria served on the board and as chapter coordinator of the American Herbalists Guild. She was also very proud to serve as chairperson of the cultural outreach program. Victoria was listed in the *International Who's Who in Medicine*, 2nd ed. (Routledge, 1995) and was an herbal consultant for Missouri Botanical Garden/Shaw Arboretum on their Osage Garden project. She worked as a natural herbal consultant for skincare products at Regis International and was active in the International Phytopharmacognosy web group, which shares research on phytochemistry, herbology, and natural medicines.



She was an indigenous dancer, storyteller, counselor, and award-winning artist and craft-person. Victoria authored numerous articles addressing both alternative health and Native American topics in national and international publications. Two of her corn dolls are on display in the permanent collection in the National Museum of the American Indian, part of the Smithsonian Institute in Washington, DC.

Victoria was a founding board member of Inside Dharma, a nonprofit outreach organization dedicated to offering teachings, support, and encouragement to incarcerated and recently released individuals in a manner consistent with Buddhist principles. Inside Dharma also engages in special projects serving the homeless community, which includes many former inmates. She also volunteered in the Missouri prison system as a spiritual advisor for Native American inmates.

In addition, Victoria served on the board of Living Insights and Earth Circle. She was an integral member of many spiritual groups including Sundance and Star Dance. She was a ceremonial leader and teacher for more than four decades, and her many students continue to share her knowledge across the globe. Victoria lives in our hearts and prayers as we continue in our spiritual lives.

She is survived by her sister, Christine Heidenreich, and her nephew, Jeffrey, and his wife. Friends and family celebrated Victoria's life on October 18, 2014, at DeClue Memorial Chapel in Potosi, Missouri. HG

—Terri Friend  
Potosi, Missouri

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## Lee W. Wattenberg 1921-2014

Known as the “father of chemoprevention,” Lee Wolff Wattenberg, MD, passed away on December 9, 2014, following complications from Parkinson’s disease at the age of 92.<sup>1</sup> Dr. Wattenberg researched the potential of cancer prevention before the medical community believed cancer to be a preventable disease, and he isolated compounds in plants from the Brassicaceae (cabbage) family, garlic (*Allium sativum*, Amaryllidaceae), and coffee (*Coffea arabica*, Rubiaceae) that inhibited the development of carcinogens.

Born in Manhattan, New York, on December 22, 1921, Dr. Wattenberg earned his bachelor’s degree from City College of New York and his medical degree from the University of Minnesota’s School of Medicine, where he taught for more than 60 years and earned the title of emeritus professor of laboratory medicine and pathology in 2005. After graduating from the University of Minnesota, he joined his brother, physicist Albert Wattenberg, PhD, on the Manhattan Project (the top-secret United States government program to develop the first atomic bomb) as a junior biologist from 1944 to 1946. While working on the Project, he studied the effects of radiation on the human body, and later credited this position with piquing his interest in cancer prevention. Afterwards, he served in the army at the Walter Reed Hospital during the Korean War, pursuing research for the war effort.

In 1966, Dr. Wattenberg published “Chemoprophylaxis of carcinogenesis, a review” in *Cancer Research*, the journal of the American Association for Cancer Research (AACR).<sup>2</sup> This groundbreaking paper reviewed 36 years of animal studies and laid the framework for understanding how certain compounds effect carcinogenesis (i.e., the transformation of normal cells into cancerous cells) and introduced the term “chemoprophylaxis” — or medication for the purpose of preventing a disease.

“He is rightfully considered the conceptual father of the chemoprevention of cancer,” wrote Paul Talalay, MD, the John Jacob Abel Distinguished Service Professor at Johns Hopkins School of Medicine, “and played this role at a time when cancer was not considered a preventable disease” (email to M. Blumenthal, December 28, 2014).

Dr. Wattenberg investigated two primary categories of chemopreventative agents: synthetic compounds and dietary constituents. He found that the antioxidant food preservatives butylated hydroxyanisole (BHA) and butylated hydroxytoluene (BHT) could block many carcinogens and stabilize free radicals — which often are associated with the onset of cancer — in the body and showed that several varieties of *Brassica oleracea* including cabbage, Brussels sprouts, cauliflower, and broccoli inhibit the development of some carcinogens. In addition, Dr. Wattenberg isolated a compound in garlic



that showed anti-cancer activity in animals as well as chemicals in coffee that could neutralize free radicals.

“There is no question in my mind that Wattenberg’s principal contributions to cancer prevention research were his more than a dozen papers (in the 1970s and 80s) showing that phenolic antioxidant food additives (e.g., BHA, BHT) prevented carcinogenesis in animals,” wrote Dr. Talalay (email to M. Blumenthal, January 2, 2015). “I designated this (in the literature) as the ‘Wattenberg Phenomenon’ as a tribute to him.”

He also noted: “He later wholeheartedly embraced the idea of dietary prevention of cancer, but this followed the work of others (who isolated many phytochemicals that prevented carcinogenesis).”

Dr. Wattenberg’s innovations and research earned him many honors and accolades from the medical community. He served on the board of directors of AACR twice, from 1985 to 1988 and 1991 to 1994; as president of AACR from 1992 to 1993; as president of the American Histochemical Society in 1996; and, in 2013, he was elected as a Fellow of AACR Academy. The AACR awarded him with the AACR-American Cancer Society Award for Outstanding Contributions to Cancer Prevention in 1996 and the AACR Award for Lifetime Achievement in Cancer Prevention Research in 2010.

“Lee Wattenberg was an excellent scientist, a person of impeccable integrity, and someone who made major contributions to the new science of trying to develop drugs that would prevent cancer, especially its initiation by chemical carcinogens,” wrote Michael Sporn, MD, professor of pharmacology and medicine at the department of pharmacology of Dartmouth Medical School. “He had an extremely productive and influential career. He was greatly respected by all of his colleagues.”

Services for Dr. Wattenberg were held on December 12, 2014, at Temple Israel in Minneapolis, Minnesota. Dr. Wattenberg is survived by Esther Wattenberg, his wife of 70 years; daughters Anne and Elizabeth Wattenberg; sons Mark and Binks; eight grandchildren; and one great-grandchild. He was preceded in death by his son Richard and his daughter Lynn Woolf. HG

—Hannah Bauman

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## Publications

**American Herb Association Quarterly Newsletter:** \$20/yr. AHA, P.O. Box 1673, Nevada City, CA 96969.

**Australian Journal of Medical Herbalism:** Quarterly publication of the National Herbalists Association of Australia (founded in 1920). Deals with all aspects of Medical Herbalism, including latest medicinal plant research findings. Regular features include Australian medicinal plants, conferences, conference reports, book reviews, rare books, case studies, and medicinal plant reviews. AUD/\$96 plus AUD/\$15 if required by airmail. National Herbalists Association of Australia, 33 Reserve Street, Annandale, NSW 2038, Australia.

**Medical Herbalism:** Subtitled "A Clinical Newsletter for the Herbal Practitioner." Edited by Paul Bergner. \$36/yr, \$60/2 yrs. Canada \$39/yr. Overseas \$45/yr. Sample/\$6. Medical Herbalism, P.O. Box 20512, Boulder, CO 81308.

## Other

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Nikon D3X with a 105mm f/2.8 lens

## *Sutherlandia frutescens*, Fabaceae

Known by the common names balloon pea, cancer bush, and duck plant, *Sutherlandia frutescens* is a spreading, weedy perennial native to southern Africa. It has a broad range of medical applications and a long history of indigenous use by many groups in southern Africa, including the Nama, Tswana, Sotho, and Zulu.<sup>1</sup> A tea made from the leaves of *S. frutescens* is used as a traditional cure for cancers, fever, the flu, diabetes, diarrhea, and stomach problems; dried, powdered leaf tablets have been used for patients with human immunodeficiency virus (HIV) to improve quality of life and prevent progression to acquired immunodeficiency syndrome (AIDS).<sup>2</sup> Although modern clinical research is limited, animal trials have shown that sutherlandia reduces stress reactions and exhibits analgesic, anti-inflammatory, and anti-diabetic effects.<sup>2-4</sup> However, researchers caution that the plant may interact with anti-retroviral medications administered to patients with HIV and AIDS.<sup>5</sup> HG

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