Ayahuasca Field Report • ABC's 30th Anniversary & Timeline • Sustainable Herbs Program
Indian Kino Tree Reforestation • Industry B Corps • Coca-Cola Acquires Moxie • Herb Profile: Senna

# HERBALGRAM

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## *Senna*
## Herb Profile

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30th Anniversary Issue

HerbalGram 120 • Oct — Dec 2018 Senna Profile • ABC's 30th Anniversary & Timeline • Sustainable Herbs Program • Indian Kino Tree Reforestation • Industry B Corps • Coca-Cola Acquires Moxie www.herbalgram.org







# dear *reader*

On November 1, 1988, I went to the Secretary of State's office in Austin, Texas, to file the nonprofit incorporation papers for the American Botanical Council. The initial Board of Trustees comprised eminent economic botanist James A. Duke, PhD, internationally esteemed pharmacognosist Professor Norman R. Farnsworth, PhD, and me. (Professor Varro "Tip" E. Tyler, PhD, became the fourth Trustee after he retired from Purdue University the following year.)

The primary motivation for founding ABC was to create a nonprofit vehicle to enhance the publication of *HerbalGram*, which, at the time, was a small quarterly newsletter that I had published for five years with Rob McCaleb under the auspices of the American Herbal Products Association and the Herb Research Foundation that Rob founded. The vision was to turn this newsletter into a four-color, peer-reviewed journal/magazine hybrid that represented the best and most compelling aspects of herbs, herbal medicine, and related topics. In those days, mailed newsletters were a common form of communication — this was before the age of email, the internet, and instant access to research papers, news, and other information.

Since those early days, ABC has grown tremendously. In July of this year, we observed the 35th anniversary of *HerbalGram*. We have initiated many educational publications, projects, and programs to help fulfill our unique nonprofit educational mission. These are too numerous to fully list here, but some are worthy of mention: HerbClip summaries and critical reviews of published studies (more than 7,000 have been published to date); ABC's "Pharmacy from the Rainforest" Ethnobotany Ecotours in Peru, Belize, Costa Rica, Kenya, and South Africa; publication of the English translation of the German Commission E Monographs; development of the historic Case Mill Homestead for our headquarters; acquisition and expansion of the HerbMedPro database; founding the ABC-AHP-NCNPR Botanical Adulterants Prevention Program; and our latest strategic venture: the Sustainable Herbs Program. For a more detailed list of ABC's milestones over the past 30 years, see the fold-out timeline beginning on page 16 of this issue.

My primary feeling about these first 30 years is one of profound gratitude and heartfelt appreciation. Gratitude to Jim, Norm, and Tip for helping establish and guide ABC and for lending their names, time, and energy to ABC. Gratitude to the donors, sponsor members, and all ABC members who have supported our educational mission. Gratitude to our dedicated employees, past and present, who have helped make ABC successful in so many ways — some of whom have been here for 30 years! Gratitude to the ABC Trustees, friends, and colleagues who have volunteered their time to guide and govern ABC. And, finally, gratitude to the ABC Advisory Board members who have provided countless hours of service to ABC and its publications.

As ABC moves into its next decade of service to the international medicinal plant community, we are reminded of our equally important local commitments, particularly with respect to our stewardship of our 2.5-acre headquarters at the Case Mill Homestead. The 165-year-old main building needs repairs, and there is much that we wish to do to enhance our beautiful property. In the coming months, ABC members and others will be invited to participate in a new capital campaign as we seek the funding to properly maintain this special piece of East Austin.

I also extend my gratitude to regular contributor Karen Raterman for her article in this issue on B Corporations, ABC friend and contributor Chris Kilham for his extensive report on sustainability issues related to ayahuasca in Peru, and *HerbalGram* Assistant Editor Connor Yearsley for his article on a recent initiative for the reforestation of the Indian kino tree. Each of these articles reflects ABC's continued interest in and concern for medicinal and aromatic plant sustainability, conservation, the environment, and the people involved in supply and production throughout the value chain.

In this issue, we also have included a Research Review of an important paper published in the journal *Nature* that documents the effects of climate change on plants growing on European mountain summits. Many alpine plants are vulnerable to the documented warming of the biosphere, and, eventually, so are we!




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**Ayahuasca vine** *Banisteriopsis caapi*
Photo ©2018 Steven Foster

## 56 Ayahuasca Vine Harvesting in the Peruvian Amazon

*By Chris Kilham*

Ayahuasca, which is both a plant in the Malpighiaceae family and the name of the psychoactive brew made from the vine and other plants, is highly popular in Peru and throughout the Amazonian region of Brazil. As interest in ayahuasca healing ceremonies grows, however, so too does the potential for negative impacts on the plant's future populations. In January and June 2018, Medicine Hunter Chris Kilham traveled to Pucallpa, Iquitos, Peru, and the Rio Tamaya region in Peru to interview shamans, farmers, and ayahuasca suppliers to gain a better understanding of the plant's current wild and cultivated populations.



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# Senna

*Cassia angustifolia* and *Cassia senna*
(syn. *Cassia acutifolia, Senna alexandrina*)
Family: Fabaceae (Leguminosae)

## INTRODUCTION, NOMENCLATURE, AND GEOGRAPHICAL DISTRIBUTION

This article reviews the plant species commonly known as "senna" that have traditional and modern pharmaceutical uses as stimulant laxatives.

There were about 330 *Cassia* species, of which about 300 have been moved to the genus *Senna* for reasons of evolutionary relationships, with about 30 retained in the genus *Cassia*.[1] As an example, 23 Sudanese *Cassia* species were reclassified into three allied genera: *Senna* Mill. (13 species), *Chamaecrista* Moench. (three species), and *Cassia* L. (seven species).[2]

In the United States, the standardized common name "senna" refers to *Senna alexandrina* Mill.[3] This can be confusing because *Cassia angustifolia*, *C. acutifolia*, and *C. senna* remain accepted synonyms for *Senna alexandrina*. The *European Pharmacopoeia* continues to treat *C. angustifolia* and *C. senna* as distinct species, each with different geographic origins, morphology, quality and grade designations, and contents of active principles. As such, this article will describe these two species in terms of their Latin pharmacopeial and trade names.

This article does not address other types of senna used medicinally, such as American senna (*C. marilandica*), formerly official in the *United States Pharmacopeia* (USP)[4]; coffee senna (*C. occidentalis*), described in the *Ghana Herbal Pharmacopoeia 2015*[5]; dog senna, also called Senegal senna or Tripoli senna (*C. italica*), listed in the *Malian Pharmacopoeia*[6]; purging senna (*C. fistula*), described in the *Ayurvedic Pharmacopoeia of India Volume I*[7]; ringworm senna (*S. alata*), described in the *Malaysian Herbal Monograph 2015*; sickle-pod senna (*C. obtusifolia* and/or *C. tora*), described in the *Pharmacopoeia of the People's Republic of China 2015*[8] and in the *Ayurvedic Pharmacopoeia of India Volume III*; and tanner's senna (*C. auriculata*), which is also used in Ayurvedic medicine.[9]

*Cassia angustifolia* (syn. *S. alexandrina*), the commercial supply of which is obtained from semi-arid to arid zones of India, and *C. senna* (syn. *C. acutifolia* and *S. alexandrina*), obtained from Sudan and Egypt, are perennial xerophytic (adapted to survive with little water) undershrubs,[10] reaching 1 to 2 m (3.3-6.6 ft) in height, with small yellow flowers and compound leaves with four to eight pairs of leaflets that are bluish-green to pale green and emit a characteristic fetid odor when crushed.[11] Leaflets of *C. angustifolia* range from 20 to 50 mm (0.79-1.97 in) in length and 7 to 20 mm (0.28-0.79 in) in width at the center, while *C. senna* leaflets range from 15 to 40 mm (0.59-1.58 in) in length and 5 to 15 mm (0.20-0.59 in) in width. Dried fruits (pods) of *C. senna* are usually 40 to 50 mm (1.58-1.97 in) long and at least 20 mm (0.79 in) wide, with six to seven seeds, and contain at least 3.4% of hydroxyanthracene glycosides (HAGs). The pods of *C. angustifolia* are usually 35 to 60 mm (1.38-2.36 in) long and 14 to 18 mm (0.55-0.71 in) wide, with five to eight seeds, and may contain only 2.2% or more of HAGs.[12]

*Cassia senna*, traded as "Alexandrian senna," referring to the main Egyptian port from where it was exported historically,[13] is indigenous to parts of northern Africa (Egypt and Sudan),[14] eastern Africa,[10] and across the Red Sea in Hejaz (a region in western Saudi Arabia).[15] In Egypt, this species occurs in the southern part of the Eastern Desert (part of the Sahara Desert between the Nile River and the Red Sea) as well as in the Gebel Elba and Sinai regions.[10] In Sudan, *C. senna* (referred to there as "Khartoum senna") is widespread and occurs within the Nubian Desert and along the course of the Nile River from the central Sudanese state of Khartoum northwest to Dongola in the state of Northern in Sudan.[16] The species is also widespread from northeastern Sudan along the Red Sea coast to the eastern African countries of Eritrea, Djibouti, Somalia, and Kenya.[10]

*Cassia angustifolia*, traded as "Tinnevelly senna" or "Indian senna,"[11] is native to the Arabian Peninsula, Somaliland,[17] and Yemen.[18] It was introduced to India in the mid-18th century in the Tirunelveli District in Tamil Nadu, which was known as Tinnevelly during British colonial rule. Senna cultivation was introduced to the Indian state of Rajasthan only recently, near the end of the 20th century.[19] Its occurrence in the wild in the Indian state of Gujarat indicates that it has become naturalized over the past approximately 250 years since its introduction.[17] Three states in India (Tamil Nadu, Rajasthan, and Gujarat) now produce the majority of all senna in global trade.

## HISTORY AND CULTURAL SIGNIFICANCE

"Cassia" is derived from the Greek *kasia* (meaning "aromatic shrub"), which was later used by Swedish botanist Carl Linnaeus (1707-1778) in reference to medicinal senna.[20] The term "senna" is derived from the Arabic *sanaa* (meaning "thorny bush"), also *sana* in Persian and *sena* in Urdu.[21] In his 1753 publication *Species Plantarum*, Linnaeus listed 26 *Cassia* species, including *C. senna*, and stated its habitat as Egypt.[22] Danish-Norwegian botanist and herbalist Martin Henrichsen Vahl (1749-1804) later named *C. angustifolia* in his 1790 work *Symbolae Botanicae*, reporting its habitat as Arabia.[23]

Chemical analyses of wine residues absorbed into pottery jars dating to about 3150 BCE suggest that senna may have been a component of certain ancient Egyptian medicated wines, although the data are not yet conclusive.[24] While some literature suggests that senna was used in ancient Egyptian medicine — as reportedly described in the Ebers Papyrus, a formulary of prescriptions dated to about 1550 BCE[25] — other sources claim that no archaeobotanical evidence exists to support that senna was used in ancient Egypt.[26] In 1834, Egyptian mummy expert Thomas Joseph Pettigrew (1791-1865) described one method of embalming that involved washing the inside of the body with a purgative liquor, which was supposedly composed of an infusion of senna and cassia (*Cinnamomum* spp., Lauraceae), followed by salting the body for 70 days.[27] However, a paper published in 1960 in *Economic Botany* disputed Pettigrew's account, arguing that it was extremely doubtful that senna or cassia were used in any embalming processes.[14]

While the use of senna as a cathartic was first documented sometime in the ninth century in Arabia,[13] there is some archeological evidence of senna pod trade from the early Roman (first and second centuries) Egyptian Red Sea harbor of Berenike, which functioned as a trade hub between the Mediterranean and the Indian Ocean Basin.[28] Arabian traders reportedly established trade between the Roman Empire and India of botanicals, including the pulp of purging senna (*C. fistula*) from India, Babylonia, and Arabia; senna from *Cassia* species native to Nubia, Arabia, and India; and a preparation of sickle-pod senna (*C. tora*).[29] Some literature suggests that ninth-century physician Serapion the Elder, of Baalbek (in Lebanon), was the first to recommend medicinal uses of senna. Egyptian-Jewish physician Yitzhak ben Shlomo ha-Yisrael, also known as Isaac Judaeus (ca. 832-932), wrote that senna from Mecca was the best quality. In any case, Arabian physicians were responsible for the eventual introduction of senna to European medicine.[18]

Due to the known side effects of using senna as a monopreparation, such as mild abdominal discomfort or cramps, it has been used traditionally in formulations containing other herbs observed to counteract the side effects. In 1820, senna (*C. senna* leaves) was included in the primary Materia Medica of the first publication of the USP, as well as monographs for several traditional senna-containing medicinal preparations. These include:

- "Confection of Senna," also called "Lenitive Electuary" (senna leaf with coriander [*Coriandrum sativum*, Apiaceae] fruit, licorice [*Glycyrrhiza glabra*, Fabaceae] root, fig [*Ficus carica*, Moraceae] fruit, prune [*Prunus domestica*, Rosaceae] fruit, tamarind [*Tamarindus indica*, Fabaceae] fruit pulp, and refined sugar [*Saccharum officinarum*, Poaceae])
- "Compound Infusion of Senna" (senna leaf with supertartrate of potass [cream of tartar], ginger [*Zingiber officinale*, Zingiberaceae] rhizome, and boiling water)
- "Infusion of Senna and Tamarind" (senna leaf with tamarind fruit, coriander fruit, sugar, and boiling water)



**Senna** *Senna alexandrina*
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- "Aromatic Tincture of Senna," also called "Warner's Gout Cordial" (senna leaf with coriander fruit, fennel [*Foeniculum vulgare*, Apiaceae] fruit, red sanders [*Pterocarpus santalinus*, Fabaceae] wood, saffron [*Crocus sativus*, Iridaceae] stigma, licorice root, stoned (no stones, pits, or pips) raisins [*Vitis vinifera*, Vitaceae], and diluted alcohol)
- "Compound Tincture of Senna," also called "Elixir Salutis" (senna leaf with bruised jalap [*Ipomoea jalapa*, Convolvulaceae] root, coriander fruit, caraway [*Carum carvi*, Apiaceae] fruit, bruised cardamom [*Elettaria cardamomum*, Zingiberaceae] seed, diluted alcohol, and sugar).[4]

In 1833, a monograph titled "Senna, U.S., (Sennae Folia)" was included in the first edition of the *United States Dispensatory* (USD), which permitted several different species to furnish the official drug, including *C. acutifolia* (syn. *C. senna*), *C. elongata*, and *C. obovata* (syn. *S. italica*). For use as a purgative, the USD monograph stated that although senna leaf is sometimes prepared in the form of a confection or tincture, the form of infusion (herbal tea) is almost universally preferred.[13]

Indian government ministries have established standards for the various grades and qualities of senna produced in India. In addition to the official senna monographs of the *Indian Pharmacopoeia*,[30] the *Ayurvedic Pharmacopoeia of India*,[7] and the *Unani Pharmacopoeia of India* (of the Ministry of Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy, or AYUSH),[21] India's Ministry of Agriculture established "AGMARK" grade designations in 1964 that defined the quality of Tinnevelly senna (*C. angustifolia*) leaves and pods. Interestingly, grade designations were also established for permitted blends of Tinnevelly senna leaf with tanner's senna leaf.[31]

In 1975, the US Food and Drug Administration (FDA) proposed the establishment of monographs for nonprescription, over-the-counter (OTC) laxative, antidiarrheal, emetic, and antiemetic drug products that listed various senna substances (e.g., senna leaf powder, senna fluidextract, senna fruit extract, senna pod concentrate, senna syrup, and sennosides A and B, crystalline) as safe and effective stimulant laxative active ingredients for short-term relief of constipation.[32] Stimulant laxatives are agents that promote bowel movement by one or more direct actions on the intestines. Ten years later, in 1985, the FDA published a tentative final monograph for OTC laxative drug products listing the same senna ingredients with dosage and labeling statement requirements.[33] However, in 1998, the FDA proposed to amend its tentative final monograph for OTC laxative drug products to reclassify aloe (*Aloe barbadensis* and *A. ferox*, Xanthorrhoeaceae) latex, bisacodyl, cascara sagrada (*Frangula purshiana*, Rhamnaceae) bark, and senna (including sennosides A and B) from Category I (Generally Recognized as Safe and Effective [GRASE]) to Category III (safety and/or efficacy unknown; further testing is required).[34] In a 2002 final rule, only aloe and cascara were removed from the FDA monograph and placed into Category III. Senna and official preparations made from it remain classified as safe and effective OTC laxative active ingredients.[35]

The United States Pharmacopeia (USP) provides official monographs for "Senna Leaf USP," "Senna Pods USP," "Senna Fluidextract USP," "Senna Oral Solution USP," "Sennosides USP," and "Sennosides Tablets."[36] Furthermore, in 2000, the FDA ruled that certain OTC drug monograph claims, including claims listed in its laxative drug monograph, would also be acceptable structure/function claim statements for dietary supplement products. In particular, this included the claim "for the relief of occasional constipation," because occasional constipation is not a characteristic symptom of a disease.[37] This led to the remarkable situation in which senna-based OTC drug products and dietary supplement products could now be labeled and marketed with the same label claim. However, supplement labels must bear the additional disclaimers: "This product is not intended to cure, treat, mitigate, or prevent a disease," and "This claim has not been evaluated by the Food and Drug Administration."

In 1993, the German Commission E approved the use of both "Senna leaf" and "Senna pod" as nonprescription medicines for treating constipation.[38] Since then, national labeling standards monographs of European Union (EU) member states, such as those of the German Commission E, have been superseded by monographs of the European Medicines Agency (EMA). In 1999, comprehensive monographs (quality and therapeutics) for "Folium Sennae" and "Fructus Sennae" were included in volume one of the *WHO Monographs on Selected Medicinal Plants*.[6] In 2006, the EMA published labeling standards monographs for senna leaf[39] and senna pod[40] (of PhEur-quality and supplied from either Alexandrian/Khartoum senna or Indian/Tinnevelly senna), applicable when used as active ingredients of licensed well-established use herbal medicinal products (WEU-HMPs) in the EU. Correspondingly, the European Directorate for the Quality of Medicines (EDQM) published quality standards monographs for "Alexandrian Senna Pods PhEur," "Tinnevelly Senna Pods PhEur," "Senna Leaf PhEur," and "Senna Leaf Standardized Dry Extract PhEur."[12]

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

Although the types of senna described in this article originate from northern and eastern Africa and neighboring Arabia, senna was incorporated into Asian and European systems of medicine hundreds of years ago. In countries where the Ayurvedic system of medicine is practiced, senna leaf (स्वर्णपत्री, *svarnapatri* in Sanskrit) is used in formulations for the treatment of constipation and diseases of the abdomen.[7] In the Unani system of medicine, senna leaf (*sana makki* in Romanized Arabic) is used in formulations for treating arthralgia (joint pain), lumbago (backache), hip pain, sciatica, gout, cardiac asthma (a type of coughing or wheezing that occurs with left heart failure), scabies, acne, pimples, and colic.[21] In Chinese medicine, senna leaf (番瀉葉, *fanxieye* in Pinyin transliteration) is indicated for treating accumulation of heat marked by constipation and abdominal pain, as well as for edema.[8]

In the United States, the FDA classifies selected senna substances (Senna Leaf USP, Senna Pods USP, Senna Fluidextract USP, Senna Oral Solution USP, and Sennosides USP) as GRASE active ingredients of laxative drug products. The permitted indication for use statement is "for relief of occasional constipation," which may be followed by the word "irregularity."[33] Senna is also 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 that conforms with dietary supplement current Good Manufacturing Practices (cGMPs).[41]

## MODERN RESEARCH

HAGs are considered to be the primary active components of senna. The HAGs present in senna include both dianthrone glycosides (including sennosides A, $A_1$, B, C, and D) and anthraquinone glycosides (including rhein-8-*O*-glucoside and rhein-8-sophoroside).[42,43] The leaves and pods of senna contain slightly different amounts and ratios of these compounds; the leaves contain approximately 1.5-5% HAGs (75-80% of which are dianthrones), and the pods contain 2.2-3.5% HAGs (85-90% of which are dianthrones).[42,44] The sennosides, particularly sennosides A and B, are thought to be primarily responsible for the purgative (laxative) effects of senna by increasing fluid secretion and influencing colonic motility and fecal transit time.[6] Senna also contains naphthalene glycosides, which are not considered to be pharmacologically significant but can be used to distinguish *C. angustifolia* from *C. senna* (tinnevelin glycoside is found only in *C. angustifolia* and 6-hydroxymusizin glycoside is found only in *C. senna*).[42] In addition to the various glycosides, senna leaves and pods contain small amounts of flavonoids (e.g., derivatives of kaempferol and isorhamnetin), mucilage (e.g., galactose, arabinose, and rhamnose), polyols (e.g., pinitols), minerals, and sugars.[44]

Human clinical trials largely have focused on senna's laxative effects. Researchers have investigated senna's ability to relieve different types of constipation (e.g., chronic, drug-induced, and postoperative) in various populations, including children, postpartum women, and the elderly. Similarly, senna has been investigated as a bowel-preparation method for use before diagnostic procedures such as colonoscopy or abdominal imaging.[45,46] While most studies involve off-label uses for serious conditions (e.g., chronic constipation), the safety and efficacy of OTC senna preparations for non-serious conditions (e.g., occasional constipation) is well-established.[33,39]

The Natural Standard Research Collaboration (NSRC), an independent, science-based research organization, published a systematic review in 2011 that examined and graded evidence from randomized controlled trials (RCTs) of senna for the previously mentioned conditions. Although some of the reviewed studies reported significant favorable effects for chronic constipation, drug-induced constipation, and colonoscopy preparation, as discussed below, the NSRC ranked the overall scientific evidence as "unclear or conflicting."[45]

Two of the seven reviewed studies on chronic constipation assessed the effects of a senna preparation in postpartum women. Both studies used Senokot (Avrio Health LP; Stamford, Connecticut), a standardized senna preparation that contains "the equivalent of 7 mg sennosides A and B" per dose.[47] The first study was a single-blind comparative trial of 175 women published in 1973 that compared Senokot to Normacol (Norgine Limited; Amsterdam, Netherlands), a bulk-forming laxative that contains sterculia (*Sterculia* spp., Malvaceae) and frangula (*Frangula* spp., Rhamnaceae) bark powders and docusate sodium.[48]



**Senna** *Senna alexandrina*
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The second study was an RCT of 267 women published in 1980 that compared Senokot to an identical placebo that contained powdered cornflakes and dried grass.[47] Both studies found that Senokot was significantly better than the control at relieving constipation in this population of women.

Of the three studies on drug-induced constipation reviewed by the NSRC, only one small study found significant favorable effects for senna in relation to gastric emptying and small and large intestinal transit time.[49] The 1993 study examined the effects of a senna preparation in 24 subjects who were given loperamide (an antidiarrheal medication commonly sold under the brand name Imodium [Johnson & Johnson; New Brunswick, New Jersey]) to simulate opioid-induced constipation. Patients were given loperamide and gastrointestinal (GI) transit time was measured. GI transit time was remeasured after the patients were given one of three active preparations: (1) Sennatin, a product that contains 20 mg of purified sennosides; (2) Agiocur (MEDA Pharma GmbH & Co.; Bad Homburg, Germany), a fiber product that contains 20 g of psyllium (*Plantago ovata*, Plantaginaceae) seeds/husks; or (3) Agiolax (Flordis; Crows Nest, NSW, Australia), a combination product that contains 5.4 g of psyllium seeds/husks and 1.2 g of senna pods containing 30 mg of sennosides. Although the quality of the study was ranked as "poor," the authors reported that the two preparations containing senna were able to significantly reduce GI transit time.

None of the four studies that examined the use of senna before abdominal diagnostic procedures reported significant effects, and only two of the 11 reviewed studies on the use of senna prior to colonoscopy found significant favorable effects. The first (Valverde et al., 1999) was a randomized, single-blind equivalence trial of 523 patients with colonic or rectal carcinoma that compared a senna preparation to polyethylene glycol (PEG), an osmotic laxative.[50] The study, which was one of the few that the NSRC authors ranked as "good" quality, found that the senna preparation performed significantly better than PEG in preparing patients for abdominal imaging. The second study (Radaelli et al., 2005) was a randomized, single-blind equivalence trial comparing a senna preparation to PEG in 283 adults who were preparing for a colonoscopy.[51] The authors concluded "that overall cleansing was better with senna compared to the standard PEG solution."[45]

An earlier systematic review published in 2005 assessed the evidence supporting the use of traditional medical therapies for chronic constipation, including senna. The authors found no placebo-controlled trials of senna for the period reviewed and included only studies that compared senna preparations to other stimulant laxatives (e.g., products containing anthraquinone derivatives or bisacodyl, a conventional pharmaceutical drug for constipation) or lactulose (a conventional osmotic laxative used for constipation). "Three studies that compared a preparation containing psyllium and senna with lactulose suggested that the fiber/stimulant [psyllium/senna] combination was more efficacious and may even be more cost-effective," the authors noted. However, the authors concluded that, overall, there was "a paucity of quality data" regarding the use of senna preparations for chronic constipation.[46]

## FUTURE OUTLOOK AND SUSTAINABILITY

There are three main producers and exporters of senna leaves and pods: India (cultivated only), Sudan (mostly wild harvested and some cultivated), and Egypt (wild harvested and cultivated). India is now the world's largest senna-producing region, with a cultivation area of about 22,000 hectares (54,363 acres). In the agricultural year (April to March) 2014-2015, India's top three exported botanical drugs were psyllium husk and seed, sickle-pod senna (*C. tora*) seed, and senna (*C. angustifolia*) leaves and pods.[19] In the 2015-2016 agricultural year, India exported 15,952,830 kg (35,169,970 lbs) of senna leaves and pods with a customs value of about $14,530,000. In the subsequent agricultural year 2016-2017, India exported 12,744,070 kg (28,095,865 lbs) of senna leaves and pods.[52] More than 70% of India's export volume of senna is imported by only 10 countries: Vietnam, China, Japan, Germany, Poland, the United States, Egypt, Spain, Thailand, and Mexico. Domestic consumption of senna leaves and pods by the Indian herbal drugs industry is estimated at about 1,284,350 kg (2,831,507 lbs) annually.[19] Furthermore, India produces an estimated 180,000 kg (396,832 lbs) of sennosides (partially purified natural complex of anthraquinone glucosides obtained from senna leaflets and/or pods) annually, of which about 140,000 kg (308,647 lbs) are exported.[53]

In Sudan, senna pod — along with two other Sudanese botanicals, gum arabic (*Acacia senegal* and *A. seyal*, Fabaceae) and hibiscus flower (*Hibiscus sabdariffa*, Malvaceae) — ranks among the top 10 export commodities and is prioritized for increased export potential.[54] In 2014, Sudan exported about 5,052,000 kg (11,137,754 lbs) of senna pods[55] but only about 2,300,000 kg (5,070,632 lbs) in 2015.[56] Separate data for Sudan's exports of senna leaf are not provided. A relatively minor amount is produced in Egypt for export. One report estimated about 5,000 kg (11,023 lbs) was exported from the St. Katherine Protectorate, a national park in the South Sinai region, in one year.[57] Senna, however, reportedly is the most common medicinal plant wild-collected by local Bedouin pastoralists living in downstream Wadi Allaqi, a major dry river in the southeastern part of the Eastern Desert of Egypt and a UNESCO Biosphere Reserve.[58] The Bedouins use senna (local name *senamekki*) medicinally but also as a grazing resource and for fuel.[59] The primary author of this article (JB) is aware, however, of increasing certified-organic cultivation of senna in Egypt.

Although Batanouny (1999) reported that wild senna has been overexploited in Egypt for trade, and should be cultivated in marginal land with limited water resources,[10] the conservation status of *C. senna* has not yet been assessed according to the International Union for Conservation of Nature (IUCN) *Red List Categories and Criteria*. This would be relevant for the commercial supply of wild-collected senna from the Sudan and Egypt. The commercial supply of *C. angustifolia* is procured entirely from cultivation in India, where it is an introduced species, and, since the mid-2000s, cultivation of certified organic senna has increased steadily. Before 2000, there was almost no certified organic senna in the global market.

The main risks to a sustainable supply of senna leaves and pods for the global phytopharmaceutical market include increasingly unpredictable rainfall (for example, where the senna crop is monsoon-dependent) and the fact that senna is procured largely in conflict zones. Although the United States lifted sanctions against Sudan in 2017 that had been in place for two decades, there has been almost constant ethnic and rebel militia fighting since the mid-20th century.[60] (The US Department of State continues to advise against travel to the Darfur region, Blue Nile state, and South Kordofan state due to risks of terrorism and civil unrest.[61]) In Egypt, both home-based and foreign-based terrorist organizations operate in parts of the country where senna is produced.[60] In northwestern India, commercial senna cultivation takes place near the border with Pakistan, where terrorist organizations operate and where both countries' militaries are perpetually on high alert. India conducts war games along the Rajasthan and Pakistan border in preparation for war in a potentially nuclear-contaminated battlefield.[62]

Supply interruptions and shortages tend to invite economic adulteration in trade. Substitutes or adulterants of the senna supply may include plant parts of the tree of heaven (*Ailanthus glandulosa*, Simaroubaceae); tanner's senna; *C. holosericea*; dog senna (*C. italica*); Deccan senna (*C. montana*); bladder senna (*Colutea arborescens*, Fabaceae); Currier's sumach (*Coriaria myrtifolia*, Coriariaceae); province senna or wild senna (*Globularia alypum*, Plantaginaceae); argel (*Solenostemma argel*, Apocynaceae) leaf, which is used as an herbal tea in Sudan; and hoary pea (*Tephrosia apollinea*, Fabaceae).[10] Although the government of India's "Senna Leaves and Pods Grading and Marking Rules" permit the admixing of leaves of *C. auriculata* with leaves of *C. angustifolia* for some lower-quality grades of senna blends,[31] a recent study assessing the authenticity of market samples in India uncovered examples of products in two Tamil Nadu markets labeled as "*C. angustifolia*" that were actually *C. auriculata*.[63]

Given its almost global regulatory status as an essential, safe, and effective medicine for the relief of constipation, annual demand for senna leaves and pods and preparations made from them will likely continue to increase. If the supply of senna from Egypt and Sudan was interrupted for socio-political reasons, establishment of commercial production bases in other senna range states, such as Eritrea, Somalia, Djibouti, and/or Yemen, may pose similar challenges and risks.

**—Josef Brinckmann and Tyler Smith**



**Senna** *Senna alexandrina*
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Founder & Executive Director
American Botanical Council
Austin, TX

AMERICAN BOTANICAL COUNCIL
1988 – 2018

# American Botanical Council Celebrates 30th Anniversary

**On November 1, 2018, the nonprofit American Botanical Council (ABC) celebrated its 30th year of providing reliable, science-based information on the responsible use of herbs, medicinal plants, teas, phytomedicines, essential oils, fungi, and other related natural materials. ABC's 30th anniversary is a major milestone for the Austin, Texas-based organization and speaks to its enduring message about the benefits of herbal medicine and the science behind it that has resonated with thousands of members and supporters both locally and in more than 80 countries around the world.**

In 1988, Founder and Executive Director Mark Blumenthal established ABC with internationally esteemed ethnobotanist James A. Duke, PhD, and Professor Norman R. Farnsworth, PhD, a renowned pharmacognosist and medicinal plant researcher. A few years later, Professor Varro E. Tyler, PhD, another eminent pharmacognosist and author, joined the Board of Trustees. They created the organization with the goal of providing accurate information to assist the public in making educated, responsible choices about herbal medicine in self-care and as an accepted part of conventional health care. Thirty years later, their vision still drives the nonprofit's mission, publications, and programs.

"My primary thought on reflecting on 30 years of ABC's service to the medicinal plant community is one of profound gratitude and deep appreciation to all who have helped ABC reach this important milestone," said Blumenthal. "This includes my gratitude to the late Jim Duke, Norman Farnsworth, and Varro Tyler for helping me establish ABC and for being the first members of the ABC Board of Trustees; gratitude to the many employees of ABC, past and present, who have worked to make the organization so successful; gratitude to the hundreds of Sponsor Members and thousands of other ABC individual, academic, and professional members who have supported ABC's unique nonprofit research and educational mission; gratitude to the ABC Board of Trustees and Advisory Board for their many hours of volunteer service; and gratitude and appreciation for the plants, without which there would be no life on Earth and which provide us their amazing nutritional and healing energies."

## Publication Milestones

In the summer of 1983, Blumenthal published the first issue of *HerbalGram*, then an eight-page, black-and-white newsletter with brief updates on medicinal plant research, community events, and regulatory news. In November 2018, ABC published the 120th issue of the magazine, now an 80-page, full-color, peer-reviewed journal that has become a leading publication in the field.

ABC celebrated a number of other publication milestones in 2018. In February, ABC's monthly e-newsletter HerbalEGram began its 16th year; since 2004, ABC has published more than 160 issues of this digital companion to *HerbalGram*. HerbClip, a twice-monthly publication that provides summaries and critical reviews of medicinal plant-related clinical research, began its 26th year in 2018. ABC has now published almost 7,500 HerbClips. ABC's newest online publication, Herbal News & Events, entered its seventh year in 2018. Launched in 2012, the weekly Herbal News & Events newsletter was created to keep ABC members and supporters up to date on relevant educational events and news articles.

## New Digital Resources

ABC has now published more than 45 articles in its HerbalEGram Food as Medicine series, which explores the history, traditional uses, nutritional profile, and modern research of a different conventional food each month. The Food as Medicine series is based on work by interns in ABC's dietetic internship program, led by ABC Education Coordinator Jenny Perez, and is produced in collaboration with *HerbalGram* Associate Editor Hannah Bauman and ABC Chief Science Officer Stefan Gafner, PhD.

In 2016, ABC added a complete digital archive of *HerbalGram* issues dating back to 1983. Previously, only issues 85 and later were available online as PDFs. ABC also added a new Herbal MediaWatch feature to its website in 2016. Updated weekly, Herbal MediaWatch is a news feed that contains links to articles, press releases, and other online publications on a wide range of subjects of interest to ABC's members and supporters.

## Onsite Happenings

ABC's headquarters at the 165-year-old Case Mill Homestead in the heart of East Austin serves as an extension of the organization's commitment to herbal education. Purchased in 1997, the property was renovated with the help of the nonprofit's first capital campaign and updated with expansive medicinal plant gardens, a greenhouse, and annex that functions as home for ABC's library and a community meeting space sometimes used by other Austin nonprofits. With guidance from ABC's dedicated education department, the gardens are used as a tool for dietetic and pharmacy interns from local universities, who apply their research in hands-on medicine-making labs and presentations using herbs from the grounds.

The Case Mill Homestead also functions as the idyllic setting of ABC's annual HerbDay event, where community members gather to celebrate the healing properties of plants. In March 2018, ABC hosted its 13th annual HerbDay celebration.

**In 2016, ABC added a complete digital archive of *HerbalGram* issues dating back to 1983. Previously, only issues 85 and later were available online as PDFs. ABC also added a new Herbal MediaWatch feature to its website in 2016. Updated weekly, Herbal MediaWatch is a news feed that contains links to articles, press releases, and other online publications on a wide range of subjects of interest to ABC's members and supporters.**

In the past five years, ABC added two new features to its expansive, 2.5-acre grounds. In 2015, ABC completed work on a new garden space, which received official designation as a Certified Wildlife Habitat by the National Wildlife Federation, the largest wildlife conservation and education organization in the United States. Three years before that, in 2012, ABC introduced its Sacred Seeds garden, which is part of the United Plant Savers' international network of garden sanctuaries intended to protect locally important and traditionally used plants.

## Botanical Adulterants Prevention Program

The nonprofit continues to expand the scope and reach of its Botanical Adulterants Prevention Program (BAPP) in collaboration with the American Herbal Pharmacopoeia (AHP) and the National Center for Natural Products Research (NCNPR) at the University of Mississippi in Oxford, Mississippi.

BAPP is an international consortium of nonprofit professional organizations, analytical laboratories, research centers, industry trade associations, industry members, and other parties with interest in herbs and medicinal plants. The program advises industry, laboratories, researchers, health professionals, government agencies, the media, and the public about the various challenges related to adulterated botanical ingredients sold in global commerce. Since 2011, more than 200 US and international parties have financially supported or otherwise endorsed the program.

To date, the BAPP has released 45 extensively peer-reviewed publications, including detailed articles featured in *HerbalGram*, Botanical Adulterants Prevention Bulletins, Laboratory Guidance Documents, and Botanical Adulterants Monitor e-newsletters, all of which are available for free to the public on the program's website.

For more information about ABC, including the benefits of ABC membership, visit www.herbalgram.org or call (512) 926-4900.

**—ABC Staff**

**Herbal News & Events! Weekly eNewsletter from ABC**

Keeping you up to date on upcoming conferences, symposia, webinars, and other herbal community events.

Also includes a weekly roundup of media articles of interest. And more!

ABC members automatically receive the premium version of Herbal News & Events each week, so join today at www.herbalgram.org/join.

A **free version** is also available when you register at www.herbalgram.org.



# A History of Herbal Excellence

# American Botanical Council

# The First 25 Years

## 1983

First issue of *HerbalGram* is published.




## 1988

- *HerbalGram* is one of the first US publications to publish science-based literature reviews on herbs, beginning with a review on sarsaparilla (*Smilax* spp., Smilacaceae) in issue 17.
- Mark Blumenthal incorporates ABC as a tax-exempt nonprofit organization.
- James A. Duke, PhD, Norman R. Farnsworth, PhD, and Blumenthal become the first trustees of the ABC Board.



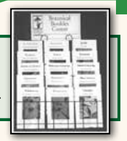

## 1989

- Varro E. Tyler, PhD, joins the ABC Board of Trustees.
- ABC publishes "Classic Botanical Reprints," a series of articles related to ethnobotany and pharmacognosy.

- The term "nutraceutical" is coined by Stephen DeFelice, MD.
- Bastyr College (now University) becomes the first accredited naturopathic school in the United States.

## 1991

- ABC begins producing "Botanical Booklets" that cover popular herbs for consumers, researchers, health professionals, journalists, and others.



## 1992

- ABC launches its HerbClip service, which provides members with summaries and critical reviews of herbal studies.
- ABC initiates the Pharmacy Continuing Education Program.
- ABC creates herbal notecards.

HerbClip™ Summaries and critical reviews of seminal herb articles

## 1993

- ABC initiates the Ginseng Evaluation Program to review North American ginseng products to determine if product contents meet label claims.
- ABC creates extensive mail-order catalog containing science-based reference, technical, and hard-to-find medicinal plant books, videos, and other products.
- ABC begins co-sponsoring ethnobotanical eco-tours to the Peruvian Amazon, Machu Picchu, Belize, and Costa Rica for continuing education credits for health professionals.



## 1994

- US Congress passes Dietary Supplement Health and Education Act of 1994 (DSHEA).

- ABC publishes "Common Herbs" pamphlets, the first "third-party literature" published in accordance with DSHEA; more than one million copies are distributed.

## 1995

- ABC initiates the Traditional Medicine Research Project to document the regulation and approval of herbal medicines in six industrialized nations. Blumenthal presents the Executive Summary before the President's Commission on Dietary Supplement Labeling.
- ABC co-edits the 1994 proceedings of the National Institutes of Health's Office of Alternative Medicine's "Botanicals: A Role in US Healthcare?" Conference.
- ABC produces Pharmacy Continuing Education teleconference modules commissioned for Walmart pharmacists nationwide.
- Blumenthal begins teaching a course on herbs at the University of Texas College of Pharmacy as an adjunct associate professor.
- ABC is named a University of Texas pharmacy preceptor site and initiates internship program for pharmacy and dietetic students.

## 1996

- California becomes the first state to legalize medicinal cannabis.
- The first issue of Nutrition Business Journal is published.

- Andrew Weil and "Herbal Medicine Boom" appear on TIME magazine covers.

## 1997

- ABC launches a capital campaign to purchase the Case Mill Homestead for its new headquarters.
- ABC purchases the 140-year-old Case Mill Homestead in Austin, Texas.
- ABC publishes "Popular Herbs in the US Market" for Pharmacy Continuing Education; more than 100,000 copies are published.
- ABC receives national media attention by addressing two major stories on adulterants in herbal products, including plantain and a product labeled "kava" that contained no kava.
- ABC launches its website.



## 1998

- ABC moves its headquarters to the Case Mill Homestead.
- ABC publishes *The Complete German Commission E Monographs*.






## 1999

- Doody Publishing, the leading reviewer of medical titles, ranks ABC's *The Complete German Commission E Monographs* as #2. The title was chosen from more than 3,500 published in 1998 and was the first alternative medicine book to qualify for this award.
- Michael Balick, PhD, Steven Foster, and Fredi Kronenberg, PhD, join the ABC Board of Trustees.

## 2000

- ABC publishes *Herbal Medicine: Expanded Commission E Monographs*.
- ABC establishes electronic content licensing program, expanding the reach of ABC's herbal information.
- ABC's *Herbal Medicine: Expanded Commission E Monographs* receives a four-star rating from Doody Publishing.
- ABC publishes its 50th issue of *HerbalGram*.



## 2001

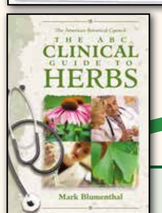
- ABC's Media Education Campaign launches with distribution of North American Precis Syndicate (NAPS) releases for ginkgo and saw palmetto (kava and St. John's wort were added in 2002).
- *Natural Health* magazine inducts Blumenthal into its Hall of Fame with 30 international leaders.
- *Nutraceuticals World* lists Blumenthal among its top 10 innovators in natural health.

## 2002

- ABC launches online versions of HerbClip and *HerbalGram*.
- Herb Society of America (HSA) names Blumenthal its honorary president (2002-2004).
- ABC adds HerbMedPro as a benefit of ABC membership.
- *HerbalGram* issue 56's cover story on *Rhodiola rosea* introduces the herb to the public.
- ABC receives NAPS Certificate of Excellence for Superior Achievement in Media Relations.

## 2003

- ABC publishes *The ABC Clinical Guide to Herbs* as a reference book and continuing education module for health professionals.




- Blumenthal gives a presentation on herbal medicine to the HSA, one of its first presentations on medicinal herbs.
- ABC donates the American Botanical Council Heber Youngken Sr. Medicinal Plant Herbarium collection (salvaged from the Massachusetts College of Pharmacy) to the Botanical Research Institute of Texas (BRIT).
- Consumers receive the first mass-market herb products bearing labels through ABC's Safety Labeling Program on Pharmavite's Nature's Resource herb line.
- ABC's Media Education Campaign generates an estimated 90 million impressions in national media coverage.
- Peggy Brevoort and Morris Shriftman join the ABC Board of Trustees.

## 2004

- ABC launches the ABC Herbal Information Course online in collaboration with Virgo Publishing.
- ABC Safety Assessment Program expands to offer the use of ABC's peer-reviewed Safety Assessment Reports to companies marketing herbal dietary supplements.
- Blumenthal co-authors and edits *Rational Phytotherapy*, 5th ed., based on the leading text in Germany.
- ABC launches HerbalEGram, a monthly electronic newsletter for members.

herbalegram an electronic publication of the American Botanical Council

## 2005

- ABC introduces Healthy Ingredients online database.
- ABC launches ABC Herbal Information Course 2.

ABC Herbal Information Course — American Botanical Council

Healthy Ingredients

## 2006

- ABC coordinates and launches its first HerbDay event, promoting the grassroots movement to celebrate the importance of herbs.
- First annual American Botanical Celebration is held at Expo West. ABC introduces its inaugural James A. Duke Excellence in Botanical Literature Award and Norman R. Farnsworth Excellence in Botanical Research Award.
- Neil Blomquist joins the ABC Board of Trustees.
- ABC publishes *The Identification of Medicinal Plants: A Handbook of the Morphology of Botanicals in Commerce* with the Missouri Botanical Garden.

American Botanical Celebration



## 2008

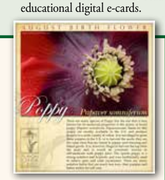
- ABC announces its first Varro E. Tyler Commercial Investment in Phytomedicinal Research Award.
- *Natural Foods Merchandiser* names Blumenthal a "Natural Legacy."
- ABC acquires HerbMed and HerbMedPro databases from the Alternative Medicine Foundation.
- Bernadette Marriott, PhD, joins the ABC Board of Trustees.
- ABC's Adopt-an-Herb Program launches, allowing companies to underwrite updates for specific herbs in ABC's HerbMedPro database.

ADOPT-AN-HERB HerbMedPro™ PROGRAM

- The FDA approves the first botanical prescription drug, Veregen (sinecatechins), from green tea extract.

## 2009

- HerbClip goes paperless and is published only online.
- Margaret Wittenberg joins the ABC Board of Trustees.
- ABC releases series of free, beautiful, educational digital e-cards.




- "The Dr. Oz Show" premieres.

## 2010

- ABC launches "Herbal Insight" segments on the popular public television series "Healing Quest," co-hosted by Olivia Newton-John, reaching millions of viewers.
- Blumenthal receives the prestigious Varro E. Tyler Prize from the American Society of Pharmacognosy.

## 2011

- Blumenthal is awarded the 2012 Jean Andrews Visiting Faculty Fellowship at the University of Texas.
- ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP) collaboration begins to address adulteration of botanical ingredients.

Botanical Adulterants Prevention Program

## 2012

- New Hope Natural Media inducts Blumenthal into its Hall of Legends.
- ABC introduces online database of *The ABC Clinical Guide to Herbs*.
- Thomas Newmark joins the ABC Board of Trustees.
- ABC launches the "Herbal News & Events" weekly online newsletter.

## 2013

- ABC presents its first annual Mark Blumenthal Herbal Community Builder Award.
- ABC celebrates 25th anniversary.
- ABC publishes its 100th issue of *HerbalGram*.






# The Past 5 Years

OPEN to see the first 25 years

- The world's largest medicinal plant research group, the Society for Medicinal Plant and Natural Product Research (GA), officially endorses BAPP.
- ABC publishes its 500th issue of HerbClip
- New Hope Natural Media awards ABC the NBJ Education Award for 2013 in recognition of *HerbalGram*'s 100th issue and ABC's leadership in creating BAPP.
- IADSA officially endorses BAPP.
- ABC publishes its first Tea Market Report.
- BAPP publishes first issue of the "Botanical Adulterants Monitor" newsletter.




- ABC publishes its 7,000th HerbClip.
- HerbClip celebrates its 25th anniversary.
- *HerbalGram* celebrates 35 years of publication.

35 YEARS
HERBALGRAM

- ABC announces the inaugural Fredi Kronenberg Excellence in Botanicals for Women's Health Award.
- BAPP releases draft of "Best Practices SOP to Prevent Resale of Irreparably Defective Articles" for industry and public comment.
- ABC launches partnership with Sustainable Herbs Program.
- ABC celebrates its 30th anniversary.

Sustainable Herbs Program
AMERICAN BOTANICAL COUNCIL

- BAPP publishes its first Lab Guidance Document.
- ABC introduces its first ABC Champion Award.
- ABC publishes its first Herbal Pet Supplement Market Report.




- BAPP publishes the first three Botanical Adulterants Prevention Bulletins on bilberry extract, grape seed extract, and skullcap.
- *Nutritional Outlook* names BAPP one of its "Best of 2016" award winners.
- ABC's 2.5-acre headquarters and herbal demonstration gardens are certified by the National Wildlife Federation's Garden for Wildlife program.
- ABC launches Herbal MediaWatch, an online news feed.

Herbal MediaWatch

30
AMERICAN BOTANICAL COUNCIL
1988 – 2018

- Blumenthal receives the Society for Ethnopharmacology-India's Outstanding International Ethnopharmacologist Award for 2017.
- ABC makes *The Identification of Medicinal Plants: A Handbook of the Morphology of Botanicals in Commerce* available as an online member benefit.
- Bethany Davis, Richard Kingston, PharmD, and Holly Shimizu join the ABC Board of Trustees.

**Moving Forward with Another 30 Years of Excellence and Integrity in Herbal Research and Education**

2014 2015 2016 2017 2018

# ABC CAPITAL CAMPAIGN

## Help Restore and Improve ABC's Historic Case Mill Homestead

The American Botanical Council's (ABC) offices are located in a 165-year-old house on 2.5 acres in Austin, Texas. ABC has been fortunate to call this location home for 20 years! During that time, ABC has improved the facilities and grounds, whenever possible, to meet the needs of our nonprofit and the local and international herbal community.

But as with any facility, particularly one as old as ABC's, there are repairs and improvements that must be made over time. That time is now for ABC!

We hope you'll join us in restoring and improving ABC's homestead, including the buildings and grounds with our 20+ herbal demonstration gardens.

Your gifts will help us keep this beautiful property a resource where ABC's educational content is created day in and day out to promote the responsible use of herbs and herbal medicine; where herbalists often see their favorite herbs in the ground for the first time; and as a destination for visitors from around the world.



8x10 tintype photograph of Case Mill front porch.
Photo ©2018 Matthew Magruder

With your donation, ABC will be able to:

- Make necessary repairs to the 165-year-old house including fixing the leaky roof, replacing the siding and drafty windows, and other essential repairs to keep the building functioning well for the next 30 years.
- Improve the building, including refurbishing the kitchen (our herbal workshop) to better accommodate ABC interns (pharmacy and dietitian students), visiting herbalists, and ABC staff.
- Add water and energy conservation elements, including solar, throughout the building and grounds, helping improve ABC's sustainable footprint while reducing operating costs.
- Improve the grounds, increase water conservation efforts (including updating ABC's 20-year-old rainwater collection system), and enhance the garden-classroom environment.
- And so much more of the necessary improvements that will help make ABC more productive and better able to achieve its nonprofit educational mission for the next 30 years.



Case Mill Homestead aerial image ©2018 StudioVista.

## HOW CAN YOU HELP?

**Companies and individuals are invited to participate in the Capital Campaign to restore and improve ABC's beloved homestead.**

To learn more about these upcoming efforts, please visit ABC's website at:

www.abc.herbalgram.org/capital

You can also contact Denise Meikel, ABC's Development Director, at denise@herbalgram.org for more information.



# 20 Years at ABC's Historic Case Mill Homestead: Heart, Soul, Headquarters

**In July 1998, the nonprofit American Botanical Council (ABC) officially moved operations from Founder and Executive Director Mark Blumenthal's home in northwest Austin, Texas, to the historic 2.5-acre Case Mill Homestead in East Austin. Twenty years on, the flourishing campus has evolved into an educational resource where ABC's herb-focused, science-based content is created and then disseminated around the world. It is also a refuge for plants and wildlife, a hands-on resource for herbalists and visitors, and a vital part of ABC's research and educational mission.**


Case Mill Homestead

The history of the Case Mill Homestead began in 1853, when Connecticut clock peddler Sherman Case arrived in the newly formed state of Texas and settled on a 451-acre Texas Republic land grant in the area that was named after the "Father of Texas" Stephen F. Austin. ABC purchased the homestead with its remaining 2.5 acres, two-story 1850s house, and renovated carriage house.

As a steward of the land, ABC honored the historical roots of its new home and took great care to landscape the grounds and maintain the buildings. The house retains its original Bastrop pine* wooden flooring and two of its original coal-burning fireplaces. Most of the rooms have been converted into offices, filled with natural light, that allow ABC staff unobstructed views of the natural splendor of the gardens and grounds. The carriage house, with the garage that was added in the early 1950s, has found new life as the center of ABC's shipping and receiving activities.

Over the last 20 years, not only has ABC expanded, adding new programs and staff, but so have the offerings of the homestead, particularly in regard to its sustainability. These improvements include a separate annex building for meetings and a small library; a greenhouse; and a rainwater collection system, a vital addition that helps sustain the gardens. The greenhouse nurtures seedlings for the organization's gardens and annual HerbDay plant sale and, in winter, houses its collection of tropical plants, many of which were donated by the US Botanic Garden in Washington, DC. Surrounding the main building are medicinal- and culinary-themed gardens, including Ayurvedic and traditional Chinese medicine gardens that flank the northeast side of the property and a Sacred Seeds native plant garden with a small pond next to it that is surrounded by memorial plantings to honor the legacy of loved ones.

These exquisite features of ABC's headquarters have served as an educational resource for thousands of people, including members of the public, who are welcome to tour the grounds during operating hours; school children who are encouraged to touch, taste, and smell the plants in their natural surroundings on field trips; interns pursuing postgraduate degrees in pharmacy or dietetics; and visiting herbalists and scientists from around the world. In many cases, people see these plants in the ground for the first time when they visit ABC's gardens.

ABC Education Coordinator Jenny Perez uses the gardens to foster a closer connection with the earth. "I have always thought of gardens as living repositories of ancient knowledge and potential uses for healing people and the planet," said Perez. "ABC's gardens are a unique resource for teaching the community and health care providers about the plants: their history of use, their chemistry and relevant research, and also how to work with the plants themselves, planting, growing, gathering, and preparing food and medicine grown right in our own backyard."

Former ABC employee and herbalist Nicole Telkes also finds educational value in the demonstration gardens, and she holds classes for her Wildflower School of Botanical Medicine on the ABC campus. "The Case Mill Homestead is a beautiful and welcoming space full of medicinal themed gardens that are an important teaching tool for my students," said Telkes. "We are so lucky that ABC is preserving the space as a historical and cultural marker in East Austin."

The learning continues when these plants are harvested and brought inside. ABC's large kitchen hosts many teachable moments when Perez and ABC Education Assistant Caroline Caswell process the plants. Interns are given the opportunity to roll up their sleeves, spend time outside in the subtropical Texas heat, and work with the plants in the ground. Then, they troop into the kitchen and receive hands-on instruction on how to make medicated oils, extracts, infusions, honeys, vinegars, and more from these materials — natural remedies in almost every form.

* The pine used for the floors was harvested from a group of pine trees near Bastrop, Texas, about 25 miles east of the Case Mill Homestead. The "Lost Pines" of Bastrop are a 13-mile belt of loblolly pines (*Pinus taeda*, Pinaceae) that are closely genetically related to a large expanse of pine trees 100 miles to the east in the Piney Woods region that covers much of East Texas and parts of Arkansas, Louisiana, and Oklahoma.

In the spring especially, the kitchen is overrun with plant life (and a few insects). A nook by the back door of the main building holds drying racks redolent with the fragrances of lavender (*Lavandula* × *intermedia*, Lamiaceae) flowers, fennel (*Foeniculum vulgare*, Apiaceae) seeds, holy basil (*Ocimum tenuiflorum*, Lamiaceae) leaves, or any number of freshly harvested herbs. For roots such as ginger (*Zingiber officinale*, Zingiberaceae) or ashwagandha (*Withania somnifera*, Solanaceae), the hum of a dehydrator fills Perez's office. A cupboard stuffed with all sizes of bottles and jars holds tinctures and glycerites made onsite, and an antique case stores dried herbs and harvested seeds for future use. ABC staff enjoy the harvest of vibrant red hibiscus (*Hibiscus sabdariffa*, Malvaceae) calyces in particular and often partake in freshly steeped herbal iced teas.



ABC Founder and Executive Director Mark Blumenthal on the porch of the Case Mill Homestead.

**"When I first walked onto the property in May 1997 and saw an echinacea plant in bloom, I knew this would be — and should be — ABC's new home"**

Every year, on the first Saturday in May, ABC hosts its annual HerbDay celebration for the regional community. People are invited to explore the grounds, participate in a maypole ceremony, and hear talks from Blumenthal and guest herbalists from around the country. Herb walks make use of the themed gardens to educate visitors about medicinal and culinary plants, and the event includes a large plant and book sale to encourage interest in and connection with herbs and natural healing modalities. HerbDay at ABC, which draws an increasing number of attendees every year, has expanded to include children's activities, arts and crafts projects, entertainment from local musicians, and outside vendors sprawled out on the lawn between the carriage house and greenhouse. Members of the public can thus learn more about ABC's educational mission, history, publications, and programs.



**Echinacea** *Echinacea purpurea*
Photo ©2018 Matthew Magruder

"Prior to purchasing the Case Mill Homestead, ABC had no space to offer the public something like our HerbDay celebration," said Gayle Engels, ABC's special projects director. "Community outreach and consumer education are part of ABC's mission, and this beautiful space in the heart of East Austin has provided us the opportunity to welcome visitors who learn from regional, national, and international speakers, both on HerbDay and at other times throughout the year."

From its origins in early Texas to the present-day, the historic Case Mill Homestead has stood witness to 165 years of history. ABC is proud to be a part of this property's story.

"When I first walked onto the property in May 1997 and saw an echinacea plant in bloom, I knew this would be — and should be — ABC's new home," said Blumenthal. "Over the past 20 years, I've always been grateful that we have such a beautiful and historic location from which to base our international nonprofit research and educational activities."

The opportunities afforded to the organization cannot be quantified or overstated: The grounds offer organically cultivated herbs and food, a meeting space for ABC's Austin-based staff and other herb organizations, and an outdoor classroom unlike anything else the area has to offer. The gardens and pond support native Texas flora and fauna, and it is not unusual to see a frog hop along a border of horsetail reed (*Equisetum hyemale*, Equisetaceae) and into the pond, or a spiny lizard skitter underneath the shade of a prickly ash tree (*Zanthoxylum americanum*, Rutaceae) to escape the notice of a neighborhood cat.

ABC celebrates Case Mill's past while looking to the future. Updates to the property will always be made with the goal of extending the life of the historical building, which is currently in need of restoration and preventative maintenance. Such improvements will help create a more sustainable presence with an emphasis on water conservation, regenerative agriculture, and, in the future, solar power; and help further ABC's nonprofit mission of providing education using science-based and traditional information to promote the responsible use of herbal medicine. HG

**—Hannah Bauman**




**Join more than 200 responsible companies, laboratories, nonprofits, trade associations, media outlets, and others** in the international herb and natural products/natural medicine community.

Become a valued underwriter of the ABC-AHP-NCNPR Botanical Adulterants Prevention Program, a multi-year, supply chain integrity program providing education about accidental and intentional adulteration of botanical materials and extracts on an international scale.

For more details on joining the program, and access to the free publications produced to date, **please see www.botanicaladulterants.org or contact Denise Meikel at denise@herbalgram.org.**

**Underwriters, Endorsers, and Supporters of the ABC-AHP-NCNPR Botanical Adulterants Prevention Program***

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*By acknowledging the generous support of these companies and organizations, ABC, AHP, and NCNPR are not endorsing any ingredients or products that may be produced or marketed by them.

# ABC Partners with Sustainable Herbs Program to Promote Business, Consumer Consciousness

**The American Botanical Council (ABC) has partnered with the Sustainable Herbs Program (SHP) as part of ABC's ongoing commitment to conservation education. The SHP website is being developed as a new educational resource for the international herb and medicinal plant communities.**

SHP was founded in 2015 as the Sustainable Herbs Project by Ann Armbrecht, PhD, an anthropologist and author who became interested in herbal healing after conducting research in Nepal for her doctorate. Along with her husband, Terrence Youk, Armbrecht produced the award-winning documentary "Numen: The Nature of Plants," which celebrates the healing power of plants and traditional Western herbalism. While producing "Numen," Armbrecht perceived a disconnect between the growth of the herbal supplement industry in the United States and the belief that natural medicine can heal both people and the Earth. After a successful Kickstarter crowdfunding campaign that raised more than $65,000 (surpassing the original goal of $54,000), she launched the Sustainable Herbs Project, a multimedia website that follows medicinal plants through the supply chain from farm to shelf.

Armbrecht said: "It is difficult to see the impacts of producing most of the products on which we depend. I created the Sustainable Herbs Project to tell the stories of the people and places behind the herbal remedies on the shelf in order to see those impacts. My goal in sharing these stories is to launch a consumer movement supporting high-quality herbal remedies, sustainable and ethical sourcing, and greater transparency" (email, October 31, 2018).

The increased interest in and awareness of sustainable sourcing is intended to benefit parties involved in every step along the supply chain, from growers to businesses to consumers.

ABC Founder and Executive Director Mark Blumenthal said: "ABC is profoundly grateful to Dr. Ann Armbrecht for her initiative to create and foster the initial 'Sustainable Herbs Project' website. We also appreciate that she chose to partner with ABC. Our new partnership intends to energize and take the renamed 'Sustainable Herbs Program' to a new level of educational and inspirational engagement with the global medicinal plant community."

Armbrecht and ABC are sharing the responsibilities of developing new educational content and maintaining the program's website. ABC also has taken on responsibilities related to development, fundraising, and marketing.

"ABC brings a depth of experience and expertise to our exploration of these issues," Armbrecht said, "and this partnership will allow us to reach a larger and more diverse audience than was possible on our own. The first time I heard about [herbal medicine sustainability] was at a workshop called 'Sustainable Herbalism' taught by longtime ABC Board of Trustees member Steven Foster. That workshop planted the seed that eventually led me to create the Sustainable Herbs Project, and it is an honor to now have the opportunity to work with Steven Foster and others at ABC."

SHP's website is a valuable resource for consumers, herbalists, manufacturers, and others in the herbal healing community. The many videos are particularly compelling. Ranging from one to 15 minutes long, these short videos offer an in-depth look at the multifaceted issues that face the herb industry and touch on quality and sustainability, raw material processing, quality control and testing, and the wild-harvest of medicinal plants. Armbrecht interviewed international experts and professionals from many different companies, including Josef Brinckmann of Traditional Medicinals and Sebastian Pole of the United Kingdom-based Pukka Herbs, about the challenges and rewards of fostering economic, social, and environmental sustainability.

According to Foster, who is also an author and photographer, the partnership comes at a crucial point for the herbal medicine industry's growth and development. "The SHP, with stewardship enhanced and strengthened by partnering with ABC, creates the opportunity to develop more awareness and action around the simple question: 'Where do herbs come from?'" he said (email, October 30, 2018). "During this critical time of imperiled biodiversity, the SHP website and its rich multimedia content will help create more mindfulness on botanical sustainability issues from the collector to the consumer."

Disseminating information on vitally important issues such as conservation, regenerative agriculture, and sustainability for the herb industry is a natural extension of ABC's existing educational mission. In 2018, ABC expanded the scope of its conservation education efforts and reported on goldenseal (*Hydrastis canadensis*, Ranunculaceae) conservation issues in eastern North America, Indian kino (*Pterocarpus marsupium*, Fabaceae) tree reforestation in India, the state of ayahuasca (*Banisteriopsis caapi*, Malpighiaceae) wild-harvesting and cultivation in the Peruvian Amazon, and the growing popularity of B Corporation third-party certification among major companies in the herb industry.





Blumenthal sees the partnership as an exciting new opportunity for ABC as it observes its 30th anniversary. "As an educational nonprofit organization, ABC has a long history of interest in and coverage of important topics related to medicinal and aromatic plant (MAP) conservation and sustainability," he said. "We have published numerous articles dealing with such subjects in ABC's peer-reviewed publications, one of the most salient being our 2009 cover story in *HerbalGram* issue 81 on the effects of climate change on the future of MAPs around the globe — an underreported topic in herbal medicine and botany publications at the time.

"In addition to focusing on supply chain sustainability, SHP will also provide herb businesses access to resources to become more sustainable in their warehousing, processing, and administrative operations," Blumenthal continued. "This is part of our 'education and inspiration' goal. We want to inspire and stimulate more awareness of sustainable activities in the herb industry at all levels of operation."

At a time of increasing herbal supplement sales, discerning consumers demand more from their products, including social empowerment efforts, organic and sustainable harvesting, regenerative farming practices, and supply chain transparency. Younger generations of consumers in particular are responding positively to companies they perceive as responsible, trustworthy, and environmentally conscious. Companies are taking notice of this trend and engaging in marketing strategies that emphasize their commitment to better business practices for the people and the planet.

Blumenthal added: "We're inviting people from all over the herb community to collaborate with us. SHP is designed to invite and promote responsible information on herb sustainability from many sectors of the herb and medicinal plant communities in all parts of the globe."

As of October 31, 2018, there were 17 Inaugural Underwriters that represent leading stakeholders in the herbal supplement industry. These underwriters include botanical ingredient suppliers, branded product manufacturers, and a leading dietary supplement trade association. ABC and SHP are grateful to these companies for their generous and timely support:

- **Ingredient suppliers**: Applied Food Sciences, Euromed, Indena, RFI, Valensa, and Verdure Sciences
- **Herbal product manufacturers**: doTerra, EuroPharma/Terry Naturally, FoodState/MegaFood, Gaia Herbs, HumanN, Nature's Way, New Chapter, NOW Foods, Standard Process, and Thorne
- **Industry organization**: United Natural Products Alliance

More information on the Sustainable Herbs Program can be found at www.sustainableherbsprogram.com.

## ABC AND SHP ARE GRATEFUL FOR THESE INAUGURAL UNDERWRITERS:

Inaugural supporters as of November 5, 2018

# Adoptions by Valensa and Natac Support ABC's Adopt-an-Herb Program

**The American Botanical Council (ABC) welcomes Valensa and Natac's adoptions of saw palmetto (*Serenoa repens*, Arecaceae) and grape (*Vitis vinifera*, Vitaceae), respectively, through ABC's Adopt-an-Herb botanical education program. Their adoptions support ABC's extensive HerbMedPro database, ensuring that this essential educational resource remains up to date for researchers, health professionals, industry members, students, consumers, and other members of the herbal and dietary supplements and natural medicine communities.**

HerbMedPro is a comprehensive, interactive online database that provides access to important scientific and clinical research data on the uses and health effects of more than 250 herbs, spices, and medicinal plants.

ADOPT-AN-HERB
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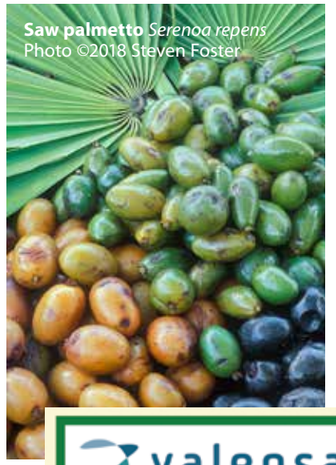
## Valensa Adopts Saw Palmetto

"Saw palmetto is an important botanical with extensive scientific and clinical literature supporting its use," wrote Umasudhan C.P., president and CEO of Valensa. "Specifically, the oil from the ripe saw palmetto berry is extracted to obtain a nutraceutical that has proven benefits in the management of lower urinary tract symptoms associated with an enlarged prostate.

"Valensa is committed to creating the highest quality, effective nutraceuticals, and is proud to be a world leader in producing saw palmetto extract, obtained using our sustainable wild-harvest practices and clean supercritical $CO_2$ extraction process," Umasudhan continued. "ABC is providing a valuable service by helping industry and consumers access scientifically accurate and relevant information regarding the efficacy of saw palmetto and the quality differences that can exist in marketed products."

Saw palmetto dietary supplements ranked 11th in total sales in natural health food stores in the United States in 2017 and 14th in the mainstream retail channel, according to ABC's *HerbalGram* Herb Market Report for 2017. Retail sales for saw palmetto supplements in these two market channels totaled almost $30 million in 2017.

Mark Blumenthal, founder and executive director of ABC, said: "ABC is deeply grateful to our good friends at Valensa for their adoption of saw palmetto on ABC's HerbMedPro database. Valensa's adoption allows ABC to be able to provide its members with up-to-date information on this economically important medicinal plant."


**Saw palmetto** *Serenoa repens*
Photo ©2018 Steven Foster

valensa
Saw Palmetto
*Serenoa repens*

## About Saw Palmetto

Saw palmetto is the only member of the genus *Serenoa* and the most common palm in the United States, where it is endemic to coastal states from South Carolina to Louisiana and occurs in every county in Florida. It is a hardy perennial that usually is found as a two-to-seven-foot shrub, but can grow as a tree up to 25 feet tall, depending on the habitat.

As a shrub, it is more common in scrublands. As a tree, it is more common in uplands and maritime hammocks (i.e., narrow bands of forest that develop on stabilized backdunes of barrier islands). The species is considered a survivor species due to its ability to recover quickly from fire.

The plant's petioles (which bear the rounded, palmate, or fan-shaped, leaves that each include about 20 leaflets) are lined with sharp spines or teeth, hence the common name "saw." "Palmetto" is a Spanish derivative that owes to the plant's small size. The species name *repens* is Latin for "creeping" or "prostrate."

The stems usually are subterranean or prostrate. By using estimates of their growth rate, researchers have determined that some plants may be as old as 500 to 700 years. The fragrant, yellowish-white, insect-pollinated flowers are followed by the fruits (drupes) that ripen from September through October. Many migrant harvesters in Florida rely on the fruits for income between tomato (*Solanum lycopersicum*, Solanaceae) and citrus (*Citrus* spp., Rutaceae) seasons.

Saw palmetto fruit extracts contain fatty acids and phytosterols and are popular for addressing symptoms of benign prostatic hyperplasia (BPH),





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including urinary problems. These extracts may have anti-androgenic, anti-edema, anti-exudative, anti-inflammatory, and anti-proliferative effects.

In Florida, saw palmetto was an important food source for pre-Columbian peoples, the later Seminole and Miccosukee tribes, and settlers like the Spanish. Remains of saw palmetto, sea grape (*Coccoloba uvifera*, Polygonaceae), and cocoplum (*Chrysobalanus icaco*, Chrysobalanaceae) are all common at archaeological sites across Florida. Native Americans also used saw palmetto fruits medicinally, including as a diuretic and for prostate problems. Settlers used the fruits to make soft drinks as late as the early 1900s. Various plant parts have been used as a source of fiber, oil, wax, roof thatch, paper, and cork substitute.

Saw palmetto also is ecologically important. It provides cover for various animals, including the threatened Florida scrub jay and grasshopper sparrow. The fruit provides food for white-tailed deer, foxes, gopher tortoises, black bears, and other animals. In addition, bees use the nectar to make honey.

According to the Florida Farm Bureau, "widespread gathering of [saw palmetto] berries is depleting a wildlife food source and threatening the stability of some ecosystems." As such, saw palmetto has been added to the Florida Department of Agriculture and Consumer Services' list of commercially exploited plants. As of July 2018, harvesters must have a Native Plant Harvesting Permit to harvest saw palmetto fruit on public or private land.

### About Valensa

Established in 1999 and headquartered in Eustis, Florida, Valensa is a science-based discoverer, developer, and provider of "innovative, nature-based product formulations for human health," according to its website. It specializes in condition-specific formulations that use microalgae, botanicals, and compounds that appear to have specific health benefits. The company focuses on nutraceutical supplements, functional foods, general nutrition, functional cosmetic ingredients, and pharmaceutical formulations. It also supports sustainable harvesting practices, environmentally friendly manufacturing technologies, and fair labor practices for people who are involved in the production process.

### Natac Adopts Grape

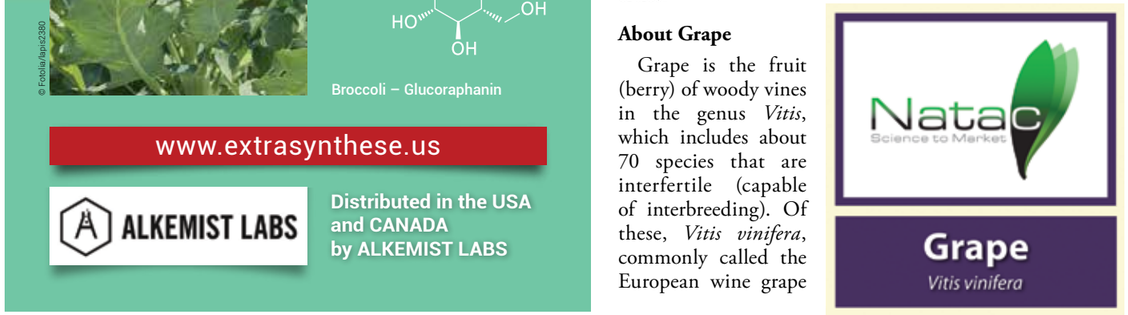
"Grape is one of our core products as a specialist in Mediterranean extracts," wrote Antonio Delgado, CEO of Natac. "Furthermore, we have a deep commitment to the scientific world and have invested significant resources to study this ingredient and its bioactive principles. The next natural step is to make the knowledge of this excellent source of health benefits available to the scientific community and general public. Nobody can do that better than ABC through its outstanding Adopt-an-Herb program.

"Even though grape has been present in the market for a long time," Delgado continued, "consumers know only a fraction of its potential benefits. Thanks to Natac's adoption, and given the veracity and proven reputation of ABC, we are confident that knowledge of grape's beneficial activities will spread."

Blumenthal said: "ABC is grateful to Natac for its adoption of grape on ABC's powerful HerbMedPro database. As with its previous adoption of olive, Natac continues to support ABC's unique nonprofit educational mission by providing much-appreciated funding to update and maintain the scientific and clinical research on grape and its numerous preparations and their health-promoting properties."

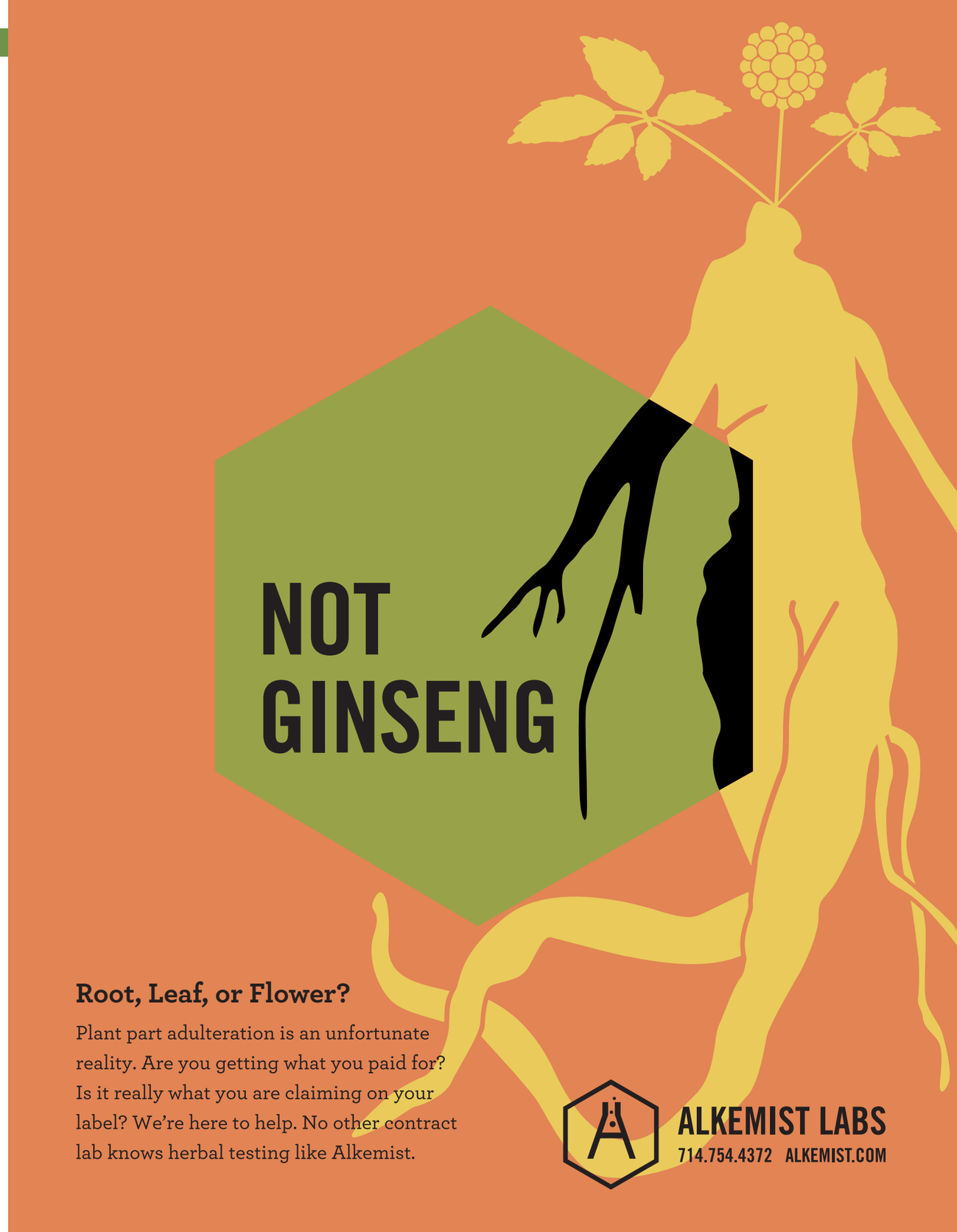
### About Grape

Grape is the fruit (berry) of woody vines in the genus *Vitis*, which includes about 70 species that are interfertile (capable of interbreeding). Of these, *Vitis vinifera*, commonly called the European wine grape









or common grape, is the most significant. With branched tendrils (threadlike appendages that coil around support), the species can climb to treetops or grow horizontally across low-growing plants. If unpruned, it can grow up to 60 feet long, but plants grown for grape production usually are pruned to about three to nine feet long. The small, greenish flowers give way to big, sweet, brightly colored fruits that attract birds and other animals, which then disperse the seeds.


**Grape** *Vitis vinifera*
Photo ©2018 Steven Foster

*Vitis vinifera* is native to southwestern Asia and adjacent Europe and reportedly was one of the first domesticated fruit crops, along with date palm (*Phoenix dactylifera*, Arecaceae), fig (*Ficus* spp., Moraceae), olive (*Olea europaea*, Oleaceae), and pomegranate (*Punica granatum*, Lythraceae). Today, there are an estimated 10,000 cultivated varieties of this species, which is the source of more than 90% of the global production of grapes. Grapes of *V. vinifera* are used mostly for making wine but also as fresh fruit or dried as raisins, currants (not to be confused with the fruits of the currant plant [*Ribes* spp., Grossulariaceae]), and sultanas.

*Vitis vinifera* has been used medicinally for millennia. The ancient Egyptians reportedly made use of the antiseptic properties of wine. In the first century, Greek physician Dioscorides noted that the leaves and tendrils could be used as a poultice for headaches and had cooling and astringent properties. Much later, 18th-century Swedish botanist Carl Linnaeus noted that the leaves were used to treat stranguria (slow, painful urination) and tussis (cough). In addition, both the fruit and seed contain polyphenolic compounds that have beneficial antioxidant activities.

Archaeological evidence from Gadachrili Gora, a Stone Age village near Tbilisi, Georgia, indicates that people who lived there were the world's earliest known winemakers and produced wine on a large scale as early as 6000 BCE. In addition, impressions of actual vine leaves on the bases of ceramic pots (often created when prehistoric Greek potters stood the pots on mats of leaves to dry before firing) provide evidence of grape's use in places like the Cyclades islands and southern Crete in the Early Bronze Age (ca. 3000 BCE to 2400 BCE).

The *Epic of Gilgamesh* (ca. 2100 BCE), an epic poem from ancient Mesopotamia, reportedly includes the earliest known written accounts of winemaking. Furthermore, excavations of the Uluburun shipwreck, a Late Bronze Age shipwreck that was discovered off the Mediterranean coast of present-day Turkey, yielded *V. vinifera* remains among the cargo. Remains of *V. vinifera* from the fifth to seventh centuries also have been excavated from Roman latrines at Sagalassos, an archeological site in Turkey, which indicates that the plant was part of the inhabitants' diets.

### About Natac

Based in Madrid, Spain, Natac was established in 2010 and researches, develops, manufactures, and markets natural ingredients for use in food supplements and functional foods, as well as natural pharmaceutical ingredients, primarily plant extracts and functional lipids. Natac's sustainable business model involves building and maintaining relationships with farmers, large food companies, and others, and this allows the company to offer ingredients from different regions, especially grape- and olive-derived extracts. According to the company, "the integration of different processes, technologies, and equipment into an unparalleled synergy" enables it to control the cycle from the farmer to the finished product.

### About Adopt-an-Herb and HerbMedPro

Valensa and Natac are among the 57 companies that have supported ABC's educational efforts to collect, organize, and disseminate reliable, traditional, and science-based information, including clinical studies, on herbs, medicinal plants, and other botanical- and fungal-based ingredients through the Adopt-an-Herb program. This program encourages companies, organizations, and individuals to "adopt" one or more specific herbs for inclusion and ongoing maintenance in the HerbMedPro database. To date, 63 herbs have been adopted.

Each adopted herb is continuously researched for new scientific articles and pharmacological, toxicological, and clinical studies, ensuring that its HerbMedPro record stays current and robust. Access to the studies is conveniently organized by publication type, with each study condensed to a one-sentence summary with a link to the study's official abstract on PubMed (the US National Library of Medicine's free-access database) or other publicly accessible database.

HerbMedPro is available to ABC members at the Academic level and higher. Its "sister" site, HerbMed, is available to the general public at no cost, with access to 25-30 herb records from the larger HerbMedPro database. In keeping with ABC's position as an independent research and education organization, herb adopters do not influence the scientific information that is compiled for their respective adopted herbs. HG

**—ABC Staff**





# BAPP Publishes Botanical Adulterants Prevention Bulletin on Maca Root and Laboratory Guidance Document on Tea Tree Oil

**The ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP) has released two new publications: a Botanical Adulterants Prevention Bulletin on maca (*Lepidium meyenii* syn. *L. peruvianum*, Brassicaceae) root* and root extract and a Laboratory Guidance Document (LGD) on tea tree oil, the essential oil obtained from the leaves of tea tree (*Melaleuca alternifolia* and *M. linariifolia*, Myrtaceae).**

## Maca Bulletin Describes Undeclared Addition of Flours from Corn, Wheat, or Yam

Maca roots have been cultivated in the Peruvian Andes for thousands of years as a nutritious food, and have a history of use as a medicine to enhance fertility, to provide energy, and for their effects on mood and well-being.

The use of maca as a dietary supplement is relatively recent. It was a little-known ingredient in the United States market before 2000, but retail sales have started to increase over the last decade. US retail sales exceeded a total of $15 million in the natural and mainstream retail channels in 2017, according to *HerbalGram*'s 2017 Herb Market Report. Maca ranked eighth in the natural channel and 36th in the mainstream channel.

Though maca is native to the Andes, its popularity in the past few years, especially in Asian countries as a means to enhance sexual stamina, has led to large amounts being grown in China from roots smuggled out of Peru. This has caused uncertainty about supply volume and pricing. At the same time, published reports have highlighted the undeclared dilution of maca root powders with flours from corn (*Zea mays*, Poaceae), wheat (*Triticum aestivum*, Poaceae), or yam (*Dioscorea* spp., Dioscoreaceae). As with other herbal ingredients marketed to boost sexual stamina, there is also evidence of the illegal sale of conventional

* Technically, in the case of maca, the plant part used is a tuber consisting of the root and the hypocotyl, the stem of a germinating seed just above the root.


Botanical Adulterants Prevention Program
BOTANICAL ADULTERANTS PREVENTION
BULLETIN

Adulteration of
Maca
(*Lepidium meyenii*)

By Jeremy Stewart, PhD,[a] and Bill Chioffi[a]

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*Correspondence:* email

Citation (JAMA style): Stewart J, Chioffi B. Adulteration of maca (*Lepidium meyenii*). *Botanical Adulterants Prevention Bulletin*. Austin, TX: ABC-AHP-NCNPR Botanical Adulterants Prevention Program; 2018.

**Keywords:** *Lepidium meyenii*, maca root, adulterant, adulteration

Goal: The goal of this bulletin is to provide timely information and/or updates on issues of adulteration of maca (*Lepidium meyenii*, Brassicaceae) to the international herbal industry and extended natural products and natural health communities in general.

**1. General Information**

**1.1 Common name**: Maca[1,2]

**1.2 Other common names**:

*Chinese*: *Ma ka* (玛卡); *hei ka* (黑卡), or *hei ma ka* (黑玛卡) for black maca; *huang ka* (黄卡), or *huang ma ka* (黄玛卡) for yellow maca

*French*: Maca

*German*: Maca

*Italian*: Maca

*Quechua*: Ayakwillku. Other names used in Peru: Maka, maca-maca, maino, ayak, chichira, ayak willku, huno–huno[3,4]

*Spanish*: Maca[1]

*Swedish*: Maca[1]

**1.3 Accepted Latin binomial:** *Lepidium meyenii* Walp.

**1.4 Synonyms**: *Lepidium peruvianum* G.Chacón,[1] *Lepidium affine* Wedd., *Lepidium gelidum* Wedd., *Lepidium weddellii* O.E.Schulz[4]


Maca *Lepidium meyenii*
Photo ©2018 Steven Foster

**1.5 Botanical family**: Brassicaceae

**1.6 Plant part, form and production method**:

The Government of Peru has published national technical standards that define the raw material, the processed forms and processing methods:[5-7]

- NTP 011.180:2011 – Dried maca, requirements
- NTP 011.181:2014 – Toasted flour of maca – requirements
- NTP 011.182:2014 – Gelatanized flour of maca – requirements

Drafts of Peruvian national standards for three additional processed forms (crude flour, liquor, and nectar) are expected to be published.[8]

Whole hypocotyls and roots are field dried and separated according to size and color. The material is ground and left as is, "raw" or can be "gelatinized" using water, temperature, and pressure, and then further processed into powder. According to one supplier, maca is also offered cut into large pieces for further processing (R. Das [BI Nutraceuticals] email communication, October 17, 2017). Extracts are offered as liquid extracts (hydroethanolic extracts, dry extracts dissolved or suspended in glycerin-water mixtures) or dry extracts plated onto a suitable starch base, such as maltodextrin or acacia gum (*Acacia*



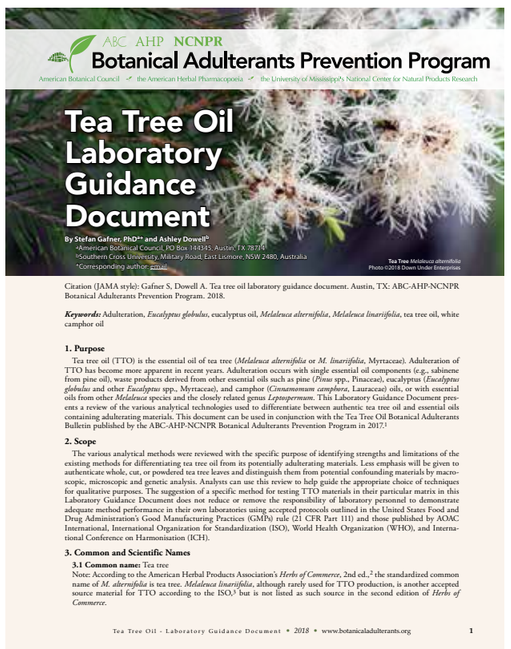

Maca *Lepidium meyenii*
Photo ©2018 Steven Foster

sexual enhancement drugs (e.g., sildenafil) masquerading as maca dietary supplements.

The maca bulletin was authored by Jeremy Stewart, PhD, vice president of scientific affairs at herbal products manufacturer Gaia Herbs (Brevard, North Carolina), and Bill Chioffi, former vice president of global sourcing and sustainability at Gaia Herbs. It summarizes the published data on maca adulteration, details supply chain issues and their consequences for the maca market, and discusses maca's market importance. It also includes a short section on analytical methods to detect adulteration. Fifteen quality control experts from academia and the herb industry in the United States and Europe provided input on the bulletin during the peer-review process.

"Maca is an example of a formerly obscure herb that has enjoyed recent popularity, and with this increased demand, unscrupulous suppliers have tried to take advantage of consumers by offering maca material adulterated with undisclosed lower-cost ingredients," said Mark Blumenthal, founder and executive director of ABC and the director of BAPP. "We are deeply grateful to our friends at Gaia Herbs for their compilation of published data and technical information for the maca bulletin."

Stefan Gafner, PhD, chief science officer of ABC and technical director of BAPP, commented: "The adulteration of maca root, or any botanical ingredient, with undisclosed lower-cost material is unacceptable. It is our hope that these issues will altogether disappear once the supply chain has stabilized. Nevertheless, maca dietary supplement manufacturers should be aware of the potential authenticity issues that can occur."


ABC AHP NCNPR
Botanical Adulterants Prevention Program
American Botanical Council ✓ the American Herbal Pharmacopoeia ✓ the University of Mississippi's National Center for Natural Products Research

Tea Tree Oil Laboratory Guidance Document

By Stefan Gafner, PhD*† and Ashley Dowell‡
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Tea Tree *Melaleuca alternifolia*
Photo ©2018 Down Under Enterprises

Citation (JAMA style): Gafner S, Dowell A. Tea tree oil laboratory guidance document. Austin, TX: ABC-AHP-NCNPR Botanical Adulterants Prevention Program. 2018.

***Keywords:*** Adulteration, *Eucalyptus globulus*, eucalyptus oil, *Melaleuca alternifolia*, *Melaleuca linariifolia*, tea tree oil, white camphor oil

**1. Purpose**

Tea tree oil (TTO) is the essential oil of tea tree (*Melaleuca alternifolia* or *M. linariifolia*, Myrtaceae). Adulteration of TTO has become more apparent in recent years. Adulteration occurs with single essential oil components (e.g., sabinene from pine oil), waste products derived from other essential oils such as pine (*Pinus* spp., Pinaceae), eucalyptus (*Eucalyptus globulus* and other *Eucalyptus* spp., Myrtaceae), and camphor (*Cinnamomum camphora*, Lauraceae) oils, or with essential oils from other *Melaleuca* species and the closely related genus *Leptospermum*. This Laboratory Guidance Document presents a review of the various analytical technologies used to differentiate between authentic tea tree oil and essential oils containing adulterating materials. This document can be used in conjunction with the Tea Tree Oil Botanical Adulterants Bulletin published by the ABC-AHP-NCNPR Botanical Adulterants Prevention Program in 2017.[1]

**2. Scope**

The various analytical methods were reviewed with the specific purpose of identifying strengths and limitations of the existing methods for differentiating tea tree oil from its potentially adulterating materials. Less emphasis will be given to authenticate whole, cut, or powdered tea tree leaves and distinguish them from potential confounding materials by macroscopic, microscopic and genetic analysis. Analysts can use this review to help guide the appropriate choice of techniques for qualitative purposes. The suggestion of a specific method for testing TTO materials in their particular matrix in this Laboratory Guidance Document does not reduce or remove the responsibility of laboratory personnel to demonstrate adequate method performance in their own laboratories using accepted protocols outlined in the United States Food and Drug Administration's Good Manufacturing Practices (GMPs) rule (21 CFR Part 111) and those published by AOAC International, International Organization for Standardization (ISO), World Health Organization (WHO), and International Conference on Harmonization (ICH).

**3. Common and Scientific Names**

**3.1 Common name:** Tea tree

Note: According to the American Herbal Products Association's *Herbs of Commerce*, 2nd ed.,[2] the standardized common name of *M. alternifolia* is tea tree. *Melaleuca linariifolia*, although rarely used for TTO production, is another accepted source material for TTO according to the ISO,[3] but is not listed as such source in the second edition of *Herbs of Commerce*.

Tea Tree Oil - Laboratory Guidance Document • *2018* • www.botanicaladulterants.org 1

The goal of the Botanical Adulterants Prevention Bulletins is to provide accounts of ongoing issues related to botanical identity and adulteration, thus allowing quality control personnel and lab technicians in the herbal medicine, botanical ingredient, dietary supplement, cosmetic, herbal tea, conventional food, and other industries where botanical ingredients are used to be informed about adulteration problems that are apparently widespread and/or imply safety concerns.

## LGD Assesses Strengths and Limitations of Lab Methods to Verify Authenticity of Tea Tree Oil

Tea tree oil is a popular ingredient known for its antimicrobial properties. Medicinally, it is widely used as a topical treatment for minor cuts, wounds, and other skin problems, and as an inhalant or in chest rub formulations to help alleviate symptoms of the common cold. In addition, it frequently is included as an ingredient in animal care, home care, personal care, and cosmetic products. Australia is the major producer of tea tree oil, providing an estimated 80% of the global supply. In 2018, Australian tea tree oil exports reached a market value of AU$35 million (roughly US$21 million).[1]

Due to the relatively high cost of authentic tea tree oil, some suppliers substitute materials labeled to contain tea tree oil with lower-cost adulterants. Tea tree oil adulterants include monoterpene-rich materials obtained from the industrial waste stream after the purification of camphor (*Cinnamomum camphora*, Lauraceae), eucalyptus (*Eucalyptus globulus* and other *Eucalyptus* spp., Myrtaceae), and pine (*Pinus* spp., Pinaceae) essential oils. Tea tree oil also can be adulterated by adding pure chemical compounds that originate from fermentation, chemical synthesis, or other plant materials.

Common analytical assays to evaluate the identity of essential oils include organoleptic (sensory) evaluations, physicochemical tests, and chemical methods. The main advantages and disadvantages of each analytical method and their usefulness to detect tea tree oil adulteration have been summarized by Gafner and Ashley Dowell, manager of the Analytical Research Laboratory at Southern Cross University (East Lismore, New South Wales, Australia).

In addition to the assessment of analytical methods, the document details the chemical composition of tea tree oil, potential confounding species, and known adulterants. The LGD was peer-reviewed by 13 international experts from third-party contract analytical laboratories and the herbal industry.

"In the past three decades, tea tree oil has become a significant ingredient in many consumer health products, particularly topical products used for their antibacterial, antifungal, or other beneficial health effects," said Blumenthal. "The rise in tea tree's popularity has motivated unscrupulous suppliers to add cheap, sometimes synthetic chemicals to materials that are fraudulently marketed as 'tea tree oil' in international commerce. The tea tree oil LGD will help enhance the quality control process and help protect companies and consumers from being victimized by sellers of fraudulent material."

Gafner commented: "Essential oils have a long history of being adulterated. As unethical suppliers become more sophisticated in their ways of substituting essential oils with lower-cost materials, companies that manufacture products with ingredients such as tea tree oil need the right tools to detect potential adulteration. I hope that the tea tree oil LGD will be a useful contribution in helping companies select the best methods for the task at hand."

BAPP's LGDs identify the most suitable analytical methods for detection of certain adulterants and authentication of specific botanical materials in various forms (whole, cut, powdered raw materials, extracts, juices, and/or essential oils). Positive assessments of analytical methods are based on a thorough review of available methods from official compendia and the peer-reviewed scientific literature, and sometimes those provided by botanical ingredient suppliers, manufacturing companies, and independent third-party analytical laboratories. The guidance is intended for quality control personnel in the herbal medicine, botanical ingredient, dietary supplement, conventional food, and cosmetic industry sectors.

To date, the program has published 45 peer-reviewed articles, Botanical Adulterants Prevention Bulletins, LGDs, and Botanical Adulterants Monitor e-newsletters. All of the program's publications are freely available on the program's website. HG

**—ABC Staff**

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Tea tree *Melaleuca alternifolia*
Photo ©2018 Steven Foster

## About the ABC-AHP-NCNPR Botanical Adulterants Prevention Program

The ABC-American Herbal Pharmacopoeia (AHP)-National Center for Natural Products Research (NCNPR) Botanical Adulterants Prevention Program is an international consortium of nonprofit professional organizations, analytical laboratories, research centers, industry trade associations, industry members, and other parties with interest in herbs and medicinal plants. The program advises industry, researchers, health professionals, government agencies, the media, and the public about the various challenges related to adulterated botanical ingredients sold in commerce. More than 200 US and international parties have financially supported or endorsed the program.

# ADOPT-AN-HERB

## HerbMedPro™ PROGRAM

The American Botanical Council's Adopt-an-Herb Program provides a mutually beneficial opportunity to support ABC's nonprofit educational efforts and promote a company's most important herbs.

One of the benefits of supporting the Adopt-an-Herb Program is that it ensures that the most current information on the adopted herb is available through ABC's powerful HerbMedPro™ database.

HerbMedPro provides online access to abstracts of scientific and clinical publications on more than 250 commonly used medicinal herbs. A free version, HerbMed®, is available to the general public and includes access to adopted herbs. HerbMedPro is available as a member benefit to all ABC members at the Academic Membership level and up.

In addition to ensuring that recently published information on an adopted herb is up to date on HerbMedPro, another benefit adopters enjoy is being included among their peers in each issue of ABC's acclaimed quarterly, peer-reviewed scientific journal, *HerbalGram*, on the ABC website, and at scientific, medical, and other educational conferences. Press releases also are issued on new adoptions, bringing attention to the program, the adopted herb, and the adopting company. Each adopted herb is featured on its own page on the ABC website.

Parties interested in taking part in the Adopt-an-Herb Program are invited to contact ABC Development Director Denise Meikel at 512-926-4900, extension 120, or by email at denise@herbalgram.org.

AMERICAN BOTANICAL COUNCIL

1988 – 2018

## Herbal Adopters

| | | | |
|---|---|---|---|
| natural REMEDIES | Licorice *Glycyrrhiza spp.* | Soladox BOTANICALS | Black Chokeberry *Aronia melanocarpa* |
| valensa | Saw Palmetto *Serenoa repens* | | Elderberry *Sambucus nigra* |
| CENTROFLORA NUTRA | Yerba Maté *Ilex paraguariensis* | | Stinging Nettle *Urtica dioica* |
| Nature's Gift | Helichrysum *Helichrysum italicum* | natural Factors | Echinacea *Echinacea spp.* |
| PHARMACTIVE BIOTECH PRODUCTS | Saffron *Crocus sativus* | ARTEMIS INTERNATIONAL | Purple Corn *Zea mays* |
| NATURE'S SUNSHINE | Cayenne *Capsicum annuum* | FOUR ELEMENTS | Lemon Balm *Melissa officinalis* |
| EMBRIA Health Sciences | EpiCor® Fermentate *Saccharomyces cerevisiae* | afrigetics BOTANICALS | Bulbine *Bulbine natalensis* |
| JIAHERB essentials of nature | Rhodiola *Rhodiola rosea* | | Broccoli *Brassica oleracea* Broccoli Group |
| neem BIOTECH A ZALUVIDA COMPANY. | Garlic *Allium sativum* | indena | Indian Frankincense *Boswellia serrata* |
| | Artichoke *Cynara cardunculus* Scolymus Group | DownUnder enterprises | Tea Tree *Melaleuca alternifolia* |
| DMH ingredients | Baobab *Adansonia digitata* | Aromatics | Peppermint *Mentha x piperita* |
| | Rooibos *Aspalathus linearis* | HERBALIFE | Aloe Vera *Aloe vera* |

## Visit us at www.herbalgram.org/adopt

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## Herbal Adopters

| | | | |
|---|---|---|---|
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| FUTURECEUTICALS | Coffee Fruit *Coffea spp.* | AMAZING HERBS | Black Cumin *Nigella sativa* |
| KSM-66® | Ashwagandha *Withania somnifera* | Teawolf | Guayusa *Ilex guayusa* |
| RFI | Hibiscus *Hibiscus sabdariffa* | Gaia Herbs Company, Inc. | Hops *Humulus lupulus* |
| SFI | Bacopa *Bacopa monnieri* | THE ACTIVES FACTORY | Birch *Betula spp.* |
| Nature's Way | Ginkgo *Ginkgo biloba* | Natac Science to Nature | Olive *Olea europaea* |
| biotropics MALAYSIA | Kesum *Persicaria minor* | | Grape *Vitis vinifera* |
| | Tongkat Ali *Eurycoma longifolia* | Pharmatoka | Cranberry *Vaccinium macrocarpon* |
| la-n USA | Monk Fruit *Siraitia grosvenorii* | ECOSO DYNAMICS | Devil's Claw *Harpagophytum spp.* |
| travel medic travelmedic.net | Kratom *Mitragyna speciosa* | EuroPharma. | Turmeric *Curcuma longa* |
| DIANA Performance from nature | Acerola *Malpighia spp.* | Zembrin | Sceletium *Sceletium tortuosum* |
| Friends of the Honey Bee | Propolis | Natural Health International | Maca *Lepidium meyenii* |
| YOUR LOGO | Plant name *Scientific name* | YOUR LOGO | Plant name *Scientific name* |

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ORGANIZATION NEWS

# Committed to Higher Standards: Natural Products Companies Turn to B Corp Certification

**By Karen Raterman**

*Editor's note: An earlier version of this article appeared in the June 2018 issue of ABC's HerbalEGram newsletter.*

**Consumer demand for transparency surrounding product ingredients, sourcing, processing, and manufacturing is growing. Recent studies by Nielsen and Label Insights indicate that many consumers are now willing to pay more for products with ingredients they perceive as cleaner and that they will be loyal to brands that provide transparency about their supply chain.[1] Now, the movement is progressing a step further, with a growing number of consumers, especially younger ones, seeking out companies with high ethical standards and that support causes like fair trade, sustainability, social responsibility, and environmental stewardship.[2]**

Companies across the consumer packaged goods spectrum are responding by paying more attention to their ingredients, fixing problems in their supply chain, taking on social and environmental causes, and being more transparent in general.[2]

Cause-related initiatives are prevalent in the natural products industry, with many companies being among the first to establish employee-rights initiatives and address social and environmental issues. However, natural products brands face the challenge of communicating these efforts to their customers in a meaningful way. While many third-party certifications are now available, B Corporation (B Corp) certification is considered one of the higher standards because it requires biannual verification of multiple aspects of business operations, from employee rights and community support to environmental and legal performance, among others.

B Corp certification has a relatively high profile, and several well-known companies, such as Patagonia and Ben & Jerry's, have the designation. According to B Corp statistics, more than 100 natural products companies in many different sectors also have the certification, including Dr. Bronner's, Traditional Medicinals, KeHE Distributors, Seventh Generation, New Chapter, Garden of Life, and Pukka. Others are jumping on board, such as MegaFood brand supplements and Herb Pharm, both of which received the certification in 2018, and Bioforce USA, which represents numerous European natural products companies and is currently obtaining its own certification. (One Bioforce brand, the Italy-based personal care company Herbatint, is already B Corp certified.)

## What Is a B Corp?

By definition, B Corporations are for-profit companies that are certified by the nonprofit organization B Lab for their standards of social and environmental performance, accountability, and transparency.[3] Since its founding in 2006, B Lab says it has certified more than 2,500 B Corps from 50 countries and in more than 130 different industries.[3,4] B Lab founders Jay Coen Gilbert, Bart Houlahan, and Andrew Kassoy envisioned the organization as a way to redefine success in business and to help companies do well by doing good.[5]

The certification process involves a comprehensive "B Impact Assessment," which measures the overall impact of a company on its stakeholders. The specifics of each assessment vary depending on the company's size, sector, and primary location of operations.[6] The candidate company must then follow up with a review of the assessment and provide supporting documentation.

To achieve B Corp status, companies need to score at least 80 points out of a possible 200 on the B Impact Assessment. Companies receive a score for their practices in five areas: environmental initiatives (e.g., use of renewable energy, emissions, water, and waste); worker treatment (e.g., compensation, benefits, and work environment); customer relations (e.g., products and services and serving those in need); community practices (e.g., job creation, diversity, and engagement); and governance (e.g., accountability and transparency practices).[7,8]

Companies also pay a membership fee based on their annual revenues that helps support B Lab operations, such as improving the assessment tool and providing third-party auditing services. Once certified, companies are able to join the B Corp community, which includes opportunities to collaborate with other B Corps and play a role in policy and legislation in countries where B Corps are located.[7]

## B Corp Status — A Natural Fit

Natural products companies typically have been ahead of the curve when it comes to supporting social and environmental causes and third-party certifications. In the 1990s, many companies adopted fair trade principles, and in the early 2000s, many also obtained organic certification. However, the means to certify a company's commitment to sustainability and supply chain integrity on a broader basis was not available until B Corp certification was established.

B Corp certification was particularly appealing to herbal tea company Traditional Medicinals, which was one of the first natural products companies to receive the certification after its first assessment in 2010. "In 1974, Drake Sadler co-founded Traditional Medicinals and pioneered a new social business model in which the company viewed all its stakeholders equally," said Blair Kellison, CEO of Traditional Medicinals (email, July 11, 2018). "Its stakeholders encompass herb growers, processors, employees, shareholders, retailers, and consumers. The company makes decisions with each of them in mind. About 35 years later, B [Lab] came along to certify and measure the activity of companies like [Traditional Medicinals], so we, of course, jumped on board among the first B Corps in order to demonstrate our social business model."

Today, B Corporations are well-represented in the natural products industry because "it makes sense," said Sara Newmark, vice president of social impact for MegaFood (email, May 21, 2018). "As a community, we are known for pushing the envelope and being thought leaders on ways of doing things. Organic [certification] came out of our industry, as did the Non-GMO Project. So you would expect natural products businesses to take the lead on B Corp [certification], and they have."

Robert Craven, CEO of MegaFood, expressed similar thoughts. "Natural products industry companies were founded [by] passionate leaders with an inner calling to change the world," he said (email, May 30, 2018). "Becoming a B Corp just standardizes what it means to be best for the world. Natural products companies are also continuously improving the assessment to keep pushing all B Corps to become better — we will certainly be one of the pioneers for improvements."

A case in point is Herb Pharm, another newly certified company that has upheld rigorous standards for social and environmental responsibility since it was founded by herbalists Ed Smith and Sara Katz. "Caring about the planet has been in our DNA since Herb Pharm was founded in 1979," CEO Tal Johnson was quoted as saying in an Herb Pharm press release from March 2018.[9] "We farm organically, wild-

### B Corporations and Benefit Corporations: What's the Difference?

While there are now many certifications and labels to help companies show independent confirmation of specific initiatives that range from animal rights programs and marine stewardship to fair trade causes, the B Corp certification program is one of the most comprehensive. It is not, however, the only broad-based business certification program. It often is confused with a Benefit Corporation (a term recognized in 34 states in the United States, with six more states working on legislation[17]), which has legally binding requirements to support and establish certain levels of transparency and accountability.[16]

Both of these programs look at business as a force for change and good, and require companies to meet higher standards of transparency and accountability. However, there are some differences between the two. Benefit Corporation status was developed because some companies believed that B Corp certification would not provide the legal protection of a government-recognized standard.[7] So, while any type of for-profit entity can become a B Corp, a Benefit Corporation is a corporation type that, in addition to providing value for its shareholders, has three legal attributes: accountability, transparency, and purpose.[7]

Benefit Corporations have to provide an annual report detailing their social and environmental performance to shareholders and the public and can be brought to court for failing to do so. B Corps, on the other hand, are encouraged but not required to provide such data annually.

Traditional Medicinals carries both certifications, said Kellison, "to make our social mission official in our bylaws," (email, July 11, 2018).

"One of the cool things about the B Corp standard is that in a state that has Benefit Corp legislation, a B Corp is obligated to become a Benefit Corporation under state law," explained Brinckmann.

The Benefit Corporation certification also provides an added measure of protection for a company's social and sustainability objectives. Traditional Medicinals realized the risk of doing good when shareholders can sue a company for using profits on things not related to profitability. "If you want to invest profits in doing good, you have to state your goals and get them publically signed by your board and then show that you achieved these goals," Brinckmann explained.

Some companies use the Benefit Corporation legal structure to help them meet the requirements for their B Corp certification.[4] Conversely, Benefit Corporations can use the free B Impact Assessment Tool developed by B Lab as a guide to meet their statutory transparency requirements. Unlike B Corp candidates, Benefit Corporation candidates do not have to meet a specific score or have their performance audited by a third party.[18]

Attaining Benefit Corporation status typically costs less than B Corp certification. State filing fees for Benefit Corps range between $70 and $200, while B Corp certification fees are based on revenues and can cost between $500 and $50,000 annually.[18,19]

craft responsibly, and protect at-risk herbs, butterflies, bees, wildlife, and the health of our neighboring waterways."

The company decided to take the certification step this year to formalize and solidify these efforts. "When the idea to get certified came up, a board member asked, 'Why? ... We've been doing things this way for years,'" Johnson explained (email, September 26, 2018). But, he added: "We decided to become a B Corp to institutionalize how we do business. Our corporate legal documents now give us permission to think and act beyond profit. Baking it into our structure makes it less likely to be overturned by some future owner or manager. B [Lab] calls it 'mission lock.' For us, it is a way to pour some concrete on Ed and Sara's legacy."

Similarly, Traditional Medicinals saw early on the complexities of the botanical supply chain, which set the stage for many of its initiatives, according to Josef Brinckmann, Traditional Medicinals' research fellow for medicinal plants and the botanical supply chain. "When we made site visits and learned about the botanical supply chain, it was difficult to reconcile that a company could make products for health care and right livelihood, knowing that some ingredients were coming from marginalized people living in abject poverty and without health care," Brinckmann said (oral communication, June 26, 2018). "It hung over our heads, so we felt a personal obligation to correct that. We didn't know at the time [that] there would be a fair trade movement or a sustainability movement."

Although B Corp certification resonates with many natural products companies, Pierce Sioussat, president and CEO of Bioforce USA, said he believes that many companies in the industry are still behind the curve, especially in areas like employee compensation, gender issues, and supply chain management (oral communication, June 4, 2018).

The sheer number of certifications a company can consider may be another reason that some industry companies are not pursuing B Corp status. "I think one of the challenges for this industry is that there are so many certifications with really good reasoning behind them, like certified organic and non-GMO. These certifications are relevant and important," Sioussat said. But, he added: "I think in this era where people have begun to distrust companies, B Corp [certification] addresses broader issues and shows that a company is one you can feel good about doing business with."

According to B Corp statistics, this latter concept is a valid notion. Compared to other non-third-party verified sustainable businesses, certified B Corporations are 68% more likely to donate at least a tenth of their profits to charity, 55% more likely to cover at least some health insurance costs for employees, 47% more likely to use on-site renewable energy, and 45% more likely to give bonuses to non-executive members.[10]

Ari Goldsmith, executive director of marketing for KeHE Distributors, a wholesale distributor of natural products that received its initial B Corp certification in February 2016, said she believes that B Corp certification is trending because of the changing consumer and retail environments.

"Consumers are looking for advanced transparency and want to know a company's story, not just the product but the brand behind it," Goldsmith said (oral communication, June 5, 2018). "In the past, sourcing and supply chain issues were quiet and underground. Now, customers want to understand how a product is made and who touched it."

MegaFood's Newmark is seeing similar trends. "We just completed a consumer brand study where transparency and advocacy were the most important reasons to believe in our brand. That is exactly on trend from what we hear in other sectors as well," she explained. "Consumers want us to move beyond just quality and efficacy; they expect us to take action and make a difference."

### It Takes a Mission

For most companies, it starts with a mission supported at the top of the organization and filters down to business operations, processes, and people. MegaFood, for example, has a mission "to nourish a world in nutritional crisis" and has a vision of "a world without nutritional poverty." The company believes it must take bold action to ensure that this vision becomes a reality, Newmark said. "We believe that it takes more than a product to cure this crisis. Our social impact aspiration is to transform 'agri-culture' by empowering communities, revolutionizing food systems, and committing to radical transparency," she explained. "We have to tackle all aspects of human and planetary health to see our vision become reality.

"It starts at the top," Newmark continued. "There needs to be leadership that believes a successful business means more than just healthy financial returns. And that does start with a clear mission, that North Star that everything else lines up to. At MegaFood, we all know that all of the actions should lead toward curing nutritional poverty in our lifetime. Knowing that, it's not hard for us to make sure we make the right decisions."

This has led MegaFood to create a supportive employee and community environment, including programs that give employees 20 work-hours each year to volunteer at nonprofit organizations and 12 weeks of paid family leave, as well as a company commitment to pay workers 20% above the living wage in New Hampshire, where the company is based.

For United Kingdom-based Pukka Herbs, it started with the company's clear intention for how it wanted its business culture to influence the world, noted Sebastian Pole, co-founder and master herbsmith for the company (email, June 27, 2018). "For us, it's embedded in our name. *Pukka* is a Hindi word meaning 'authentic,' and this is at the heart of everything we do," he said. "Being a B Corp cements our ongoing commitment to using business as a force for good — and it means we can join with like-minded activists to create more coordinated momentum for positive progress."

Part of Pukka's mission is to drive conservation through commerce in a way that benefits people, plants, and the planet. The company also explores initiatives outside of B Corp certification to ensure that it fulfills this commitment. For example, Pole noted, all of Pukka's herbal teas and supplements are made with pharmacopeial-grade herbs that are 100% certified organic, down to the organic string on the tea bags. The teas are certified Fair For Life (a standard for fair and ethical trade), and the company is also committed to Fair Wild, a standard for regulating sustainable collection of wild-harvested herbs.

Bioforce USA was inspired to pursue its B Corp certification by the efforts it saw from Herbatint, a founding B Corp company based in Italy. "We saw that what they were doing was consistent with what we do as a company, so we wanted to take up the mantle and move forward and promote value," said Sioussat. "Like a lot of other B Corp companies, we were already doing a lot of these things, so we thought 'Why not document and formalize it?' It was kind of a no-brainer for us," he said.

As a distributor, Bioforce USA has to consider its own "supply chain" — the branded products it chooses to represent. Sioussat said the company has specific criteria for these brands. "We want heritage brands that have been in the industry for a long period and are in alignment with concepts of sustainable agriculture and environmental responsibility," he noted. "Each has a different way they get certified and express their responsibility as a company."

Part of Bioforce's B Impact Assessment was to document these criteria and show that their brands meet them. Key Bioforce brands, such as Herbatint and AnneMarie Börlind, have been recognized with a B Corp certification in their own right or the comparable Certified Sustainable Economic (CSE) designation.[11,12]*

Another key goal for Bioforce USA is to support its employees and the local community. "Because we are based in a small rural community, I want our employees to be the fabric of that community," Sioussat said.

Ten percent of Bioforce USA's profits go to charitable social services and cultural institutions, according to Sioussat. The company also has a very specific compensation plan in which the minimum wage is the published living wage in its home state of New York, which is almost twice as much as the federal minimum wage. "We also have a policy to address income equality in which the highest paid person in the company cannot make more than 10 times that of the lowest paid person," he said.

### The Value of the Process

Those who have been through the B Corp certification process say it is both arduous and enlightening.

"The process took a full year to complete," said Goldsmith of KeHE. "If our leadership had wanted a better dollar value, it might have stalled out, but our mission is to make a better company for all, and that pushed it to the finish line. Every team had to be part of the process and to align with the business."

Newmark agreed. "It is not easy being a B! And it shouldn't be," she said. "But when you are done, you have an accurate and thorough look at your business practices. You know where you excel, and where there is room for improvement."

Craven added: "The process was incredibly detailed for multiple departments, but [it was] worth it to really get to know where we measure up against some of the best

* The CSE standard for sustainable business management was developed by the German-based Society for Applied Economic Ethics and the working group Living Sustainability. The standard requires an independent sustainability performance audit and an assessment of the ecological impact and social economy of a company.[13,14]

companies out there. For us, the biggest challenge was obtaining the legal status change to B Corporation, a step that we underestimated in the approval process of our stakeholders."

For KeHE, these challenges and miscalculations were an important learning experience that Goldsmith characterizes as defining moments for the company. "We did have to go back and change things," she said. "I can't say all the things we changed, but it changed how we operate. Now, it's not just operations for operations' sake. It was definitely a rigorous process, but we learned more and more as we moved forward."

After completing the initial steps of the process, Sioussat said he hired a dedicated employee to take the company through the documentation process. "If you are a small company, it's a good idea to get someone to help do this. We are not big enough for a chief corporate responsibility officer, but we are all responsible to walk the walk." However the process is structured, he added, "it is important to have someone who can focus on these tasks and knows the nuts and bolts of how your business operates."

Craven added: "It takes one passionate leader and one passionate executor to get it done, with the help of the whole village of course. Find the right people in your organization who will cascade the passion and inspire others to come along with them."

## Working within the System

Herb Pharm scored a 92.7 on its impact assessment.[15] The company's farms are certified organic, salmon-safe, bee-friendly and both a Monarch Butterfly Waystation and a United Plant Savers' Botanical Sanctuary. Its products also are non-GMO. However, the company realized it could do more to commit to these values.[9]

"What we didn't expect is how much B Corp is helping us get better," Johnson said. "The survey is thorough. We scored high in the environment section, but it's helping us find ways to improve in other areas. We're trying to be a better B Corp. We are also trying to help B Corp understand and appreciate our industry."

The latter point seems particularly important for companies in the herbal products industry. Although B Corp assessment questions are meant to be broad and cover many industries, there are challenges that come up with respect to the specific practices of a given industry. "Some questions just didn't fit our scenario," noted Ben Couch, sustainability manager for Traditional Medicinals (oral communication, June 26, 2018). For example, he explained, companies get points for helping their producers conserve water. "Some of our highest-volume herbs grow wild, or in semi-arid or desert [climates], so these plants don't use irrigation at all, but you don't get any points for using less water in that case. But the great thing is that B Corp does allow you to submit questions and comments to help improve the assessment process."

Companies also get points for working with local companies and women- or minority-owned businesses. "We commented early on that our herbs will never be local," Brinckmann added, referring to Traditionals Medicinals' location about 75 miles north of the San Francisco Bay. "If we sourced out of the Bay Area, we would be out of business. So we had to talk about provenance for quality and that we are supporting local communities where these herbs are grown and helping them keep traditions alive ... [and] have thriving local economies and sustainable herb collection."

**Companies that are B Corp certified believe the certification has multiple benefits, from helping to recruit top employees to promoting customer loyalty and increasing consumer confidence.**

Couch noted that adequately assessing a program's impact is another challenge of B Corp assessments. "B Corp normalizes practices and scores by asking questions [such as] 'What percent of your purchase dollar does the practice take?'" he said. "These kinds of measuring tools and questions compel companies to look at how they can create programmatic impact and where to invest to make their resources create the most impact."

Companies that want to build a model for something unique may not, at least initially, get a lot of credit, Couch added. "One of the challenges as an herbal company is that we have pharmacopeial standards, so sometimes that quality is only coming from a given supplier or product," he said. "So, the leverage we have to implement improved practices is stymied by access to high-quality material."

## Why B Corp Certification Is Worth It

Companies that are B Corp certified believe the certification has multiple benefits, from helping to recruit top employees to promoting customer loyalty and increasing consumer confidence. While the dietary supplement category is a relatively new category for B Corporations, Newmark believes that having the certification helps distinguish MegaFood's products in customers' eyes.

"The supplement aisle can be overwhelming with choice," Newmark said. "Our bottles are small, so the ability to communicate what we stand for in a short amount of time and space is important. That is what the 'B' does. It gives people trust that not only are we saying, but we are doing, good, and that someone else has come in and evaluated us against a standard. It helps with trust and transparency."

The certification also helps a company prioritize activities and show progress, Sioussat noted. Companies have to operate within the confines of their financial capabilities. "You don't have to be all things. But you can look at the assessment and where you are scoring well, and where you are not, and then move the needle," he said.

Pukka Herbs' Pole said: "We are due to re-certify in September this year [2018], and in preparation for this, and in the spirit of continual improvement, we have completed a project to understand and improve our carbon footprint from crop to cup."

This year, the company also launched a volunteering program as part of its flexible engagement policy. "It empowers staff to take up to four volunteering days with a charity or responsible organization of their choice, which helps drive the Pukka mission in our local community," Pole said.

The B Corp process also helps companies better articulate their mission to both internal and external stakeholders, said Couch. "B Corp gives companies the tools and motivation to build and demonstrate their own model and share how that might help inform or create systems for other companies. You can also go to the leadership conference and see how the movement is growing and what else can be done."

B Corp certification also can help prepare companies for the cultural shift that is already in progress, Goldsmith said. It speaks volumes that more than half of US consumers now say they will pay more for products they know well, she said. "Millennials don't have much money, but they are choosing to use it to support companies that they trust." However, the story is not just about millennials, Goldsmith added; it is just more evident because they now have the most buying power.[16]

Craven added: "People want to work for companies that are mission-driven and always have all of their stakeholders in mind when making decisions. Quite frankly, they are demanding it, and it's changing the course of how the world is doing business."

Herb Pharm's Johnson believes that becoming a B Corp is bigger than any one company and helps connect like-minded businesses. "B Corp certification is a movement of companies using business for good," he said. "We can do more together than apart — in public policy and to encourage more companies to join in."

Pole said: "Conscious consumerism is on the increase and for good reason. We are becoming more and more aware of our contribution to the planet, and the plants, animals, and people who inhabit it." Ultimately, he added, "at Pukka, we believe that the health and well-being of the planet is intimately linked to our own; you simply can't have one without the other. … Joining a movement like B Corp, in which business acts as a driver of positive change, helps us continuously strive to improve our impact." HG

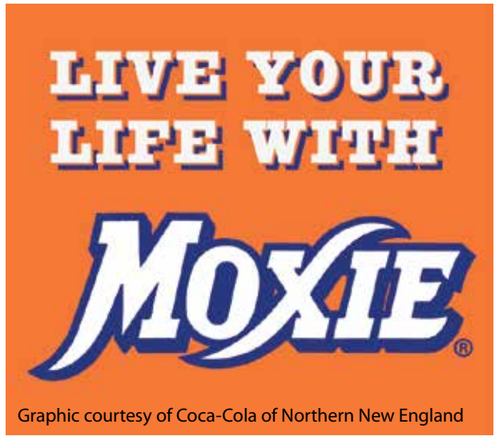
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# Moxie, 'An Acquired Taste,' Acquired by Coca-Cola

**By Connor Yearsley**

**In August 2018, the Coca-Cola Company (TCCC) announced that it would acquire Moxie, a small regional soda brand known mostly in New England, for an undisclosed sum.[1,2] Moxie is one of the oldest surviving bottled soda brands in the United States* and predates Coca-Cola and Pepsi (see "History of Moxie" section).[3] Its unusual flavor, which has been described as bittersweet, owes largely to the presence of gentian (*Gentiana* spp., Gentianaceae) root extract.[2-4]**




Graphic courtesy of Coca-Cola of Northern New England

TCCC's purchase of Moxie is part of a steady stream of acquisitions by the Atlanta-based beverage behemoth, which now produces more than 800 beverages in the United States across 100 brands.[1,5] However, this acquisition may seem surprising to some. After all, while Moxie reportedly produced about 225,000 cases of its soda in 2017,[1,2] TCCC sold a prodigious 29.2 billion unit cases.[6†]

TCCC reportedly wants to separate bottling operations from its corporate umbrella. Both TCCC and its bottling partner, Coca-Cola of Northern New England (CCNNE), which previously owned Moxie, agreed it made sense to transfer ownership of the brand to TCCC.[2] "CCNNE purchased the Moxie brand, well known for its 'distinctively different' flavor, over a decade ago in order to bring its roots back to New England," wrote Nick Martin, a CCNNE spokesman (email, September 7, 2018). "TCCC's acquisition will provide the Moxie brand with the resources needed to evolve for a new generation of drinkers."

A general, gradual decline in sales of sugary beverages in the United States (as many consumers have started reducing their consumption of sugar and/or high-fructose corn syrup) may be largely responsible for TCCC's acquisition flurry. In October 2015, *The New York Times* reported that "Over the last 20 years, sales of full-calorie soda in the United States have plummeted by more than 25 percent." Many TCCC brands reportedly have declined. So, it is likely that the company has made a habit of buying brands like Moxie to maintain market share.[1]

TCCC reportedly wants to be "a total beverage company" and has claimed it will focus on more low- and no-sugar beverage options.[5,7] It apparently supports the World Health Organization's 2015 sugar guideline, which includes a recommendation for adults and children to reduce daily intake of free sugars‡ to less than 10% of their total energy intake, or less than 5% (roughly 25 grams) for additional health benefits.[7,8] Previously, Moxie was known for its low sugar content, with 25 grams per can.[1] (However, this author recently ordered some through Moxie's website[9] and observed that each can now contains 37 grams of sugar.) Regular Moxie also contains less caffeine than other sodas, including Dr Pepper, Coca-Cola, and Pepsi.[9]



**Gentian** *Gentiana lutea*
Photo ©2018 Steven Foster

Graphic courtesy of Coca-Cola of Northern New England




Moxie's taste apparently is quite polarizing. An article in HuffPost notes: "Moxie lovers are just slightly less effusive than Moxie haters. We're pretty sure we've never met anyone who thinks this oddly bittersweet soda is 'just okay.'" Some describe it as "root beer on steroids" and some have compared it to bubble gum.[4] Even Moxie's website admits it can be "an acquired taste."[9] This author thinks it has an interesting and pleasant smell and tastes like root beer with a bitter aftertaste: sweet at first, then noticeably bitter.

There apparently are no plans to change that distinctive taste. TCCC "will ensure Moxie stays true to its Northeastern roots, as it has done with many other fan-favorite and regional brands," Martin wrote. To Moxie lovers, that is a relief. In addition, Moxie will continue to be produced in Londonderry, New Hampshire.[2] TCCC has no immediate plans to change Moxie distribution, but at least one industry expert thinks TCCC can incrementally increase annual sales of Moxie to 500,000 cases.[1,2] Publicity from the transaction may prompt a new group of Americans to finally acquire a taste for one of the oldest soda brands in the United States.




Graphic courtesy of Coca-Cola of Northern New England

### History of Moxie

In the late 1800s, Augustin Thompson, a homeopathic physician, US Civil War veteran, playwright, and native of Union, Maine, created Moxie in Lowell, Massachusetts. He wanted to introduce a "cure-all" without cocaine or alcohol and reportedly included gentian root extract, cinchona (*Cinchona* spp., Rubiaceae) bark extract, sassafras (*Sassafras albidum*, Lauraceae) root bark extract (the primary botanical flavoring used in root beer), caramel, and other ingredients in his early formulation.[3,9] Moxie's formulation has changed over the years, and it now includes high-fructose corn syrup, like many sodas.[4]

"Moxie Nerve Food," as it was originally called, was invented and patented in 1885, according to Moxie's website.[9] Dr Pepper was introduced the same year, and Coca-Cola followed in 1886.[3] Moxie distribution initially was attempted in Atlanta, Chicago, and Denver, but the soda never really became successful outside the Northeast. Early on, Moxie was introduced in an ultimately unsuccessful lozenge form.[9]

Like other early sodas in the United States, Moxie originally was intended as a medicine, not a refreshment, and it was once the subject of many far-fetched curative claims. Carbonated liquids, or tonics, had been thought to have medicinal benefits for centuries.

### Coca-Cola's Botanical Beverages

Moxie now joins TCCC's portfolio of beverage brands with notable plant-derived ingredients. In 2016, the company launched Aquarius Vive, which is available in Spain and includes baobab (*Adansonia* spp., Malvaceae) extract. The baobab tree, sometimes called "the tree of life," is native to sub-Saharan Africa, and its fruits are rich in calcium and vitamin C.[14,15]

In 2018, TCCC introduced a version of Coca-Cola that is sweetened with only a purified extract of the leaves of the South American herb stevia (*Stevia rebaudiana*, Asteraceae). This product, first launched in New Zealand, reportedly avoids the bitterness that can be caused by steviol glycosides, the sweet-tasting constituents of stevia.[16]

TCCC also distributes Core Power, a high-protein, cow's milk-based recovery shake for fitness enthusiasts that is sweetened with monk fruit (*Siraitia grosvenorii*), a vine in the gourd family (Cucurbitaceae) that is native to China.[17] One of monk fruit's constituents, mogroside V, is approximately 250 times sweeter than common table sugar. Inclusion of these plant-derived ingredients in TCCC beverages likely reflects its attempts to offer options with less sugar and fewer calories without compromising taste.

* Vernors, a ginger ale brand that was started in Detroit, is older than Moxie.

† TCCC defines a unit case as 24 eight-ounce bottles.

‡ According to the World Health Organization, "free sugars include monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook or consumer, and sugars naturally present in honey, syrups, fruit juices and fruit juice concentrates."

Thompson claimed that Moxie could address imbecility, helplessness, and paralysis, among other conditions.[3,10] An early ad stated: "Moxie Nerve Food is a most healthful drink, strengthens the nerves and gives you a good appetite."[9] These claims, however, stopped with the passage and implementation of the Pure Food and Drug Act of 1906.[3,10]

Gentian, the source of Moxie's main ingredient, is a name that refers to species in the genus *Gentiana*. There are about 40 or 50 species in the genus, all of which contain the bitter principles for which gentian is known. King Gentius of Illyria (on the Balkan Peninsula), who died sometime after 167 BCE and for whom the genus was later named, reportedly was the first to discover the plant's medicinal value and gave it to his army to treat a mysterious fever. Since then, gentian (mainly *G. lutea*) root has been widely used for medicinal purposes, including the treatment of digestive issues and wounds. It also has long been used to flavor alcoholic drinks, especially in Germany and Switzerland, where it was used to make beer before hops (*Humulus lupulus*, Cannabaceae) was introduced.[11,12] So, it is not unexpected that Thompson used gentian to make Moxie (and added sugar to help mask its bitterness).[3]

Moxie was a big hit at the Louisiana Purchase Exposition (the St. Louis World's Fair) in 1904.[10] In 1920, it outsold Coca-Cola, probably largely because of promotional strategies that included a Moxie Song, magazine ads, Moxiemobiles, and the Moxie Man, who still appears on Moxie products.[3] US President Calvin Coolidge reportedly was a fan of Moxie, and, in 1923, celebrated his inauguration with a cold glass of the soda. It was also popular with Pulitzer Prize winner E.B. White, author of *Charlotte's Web*. In the 1950s, baseball great Ted Williams, left fielder for the Boston Red Sox, was a spokesman for the brand. And in 2005, the state of Maine made Moxie its official state soft drink.[9]

"Moxie" has come to mean nerve, verve, spirit, spunk, etc. Some say Moxie gives the drinker moxie, and some say it requires moxie to drink Moxie. Perhaps surprisingly, though, the name of the soda seems to have preceded this use of the word.[3] It is possible that "moxie" derives from the Abenaki term for "dark water," which would be an understandable description of the soda. The Abenaki are a Native American tribe and First Nation from New England, Quebec, and the Canadian Maritime provinces. "Moxie" also figures in waterway names in Maine, including Moxie Falls (one of New England's highest waterfalls).[13] The soda's early curative claims (including that it "strengthens the nerves") may in fact explain today's common definition of the term.[3] HG

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# Apple and Pear Consumption Associated with Lower Risk of Type 2 Diabetes, According to Meta-analysis

**Reviewed:** Guo X-F, Yang B, Tang J, Jiang J-J, Li D. Apple and pear consumption and type 2 diabetes mellitus risk: A meta-analysis of prospective cohort studies. *Food Funct.* 2017;8(3):927-934.

| Study Details: At a Glance | |
|---|---|
| **Study Design** | Meta-analysis |
| **Included Studies** | Five prospective cohort studies that associated consumption of both apples and pears with incidence of type 2 diabetes |
| **Study Length** | Various |
| **Test Material** | N/A |
| **Control** | N/A |
| **Disclosures** | The authors declared no conflicts of interest. The study was funded by the National Basic Research Program of China, the National Natural Science Foundation of China, and the PhD Programs Foundation of the Ministry of Education of China. |

Incidence of type 2 diabetes mellitus (T2DM) is increasing worldwide, but changes in diet and lifestyle may help prevent this chronic disease. Fruits and vegetables contain a variety of beneficial constituents, including dietary fiber, minerals, phytochemicals, and vitamins. Apples (*Malus* spp., Rosaceae) and pears (*Pyrus* spp., Rosaceae) are rich sources of polyphenols, and they are widely consumed as fresh fruits, jams, and juices. The purpose of this meta-analysis was to determine the relationship between apple and pear consumption and risk of T2DM.

The authors searched the Cochrane Library, Embase, and PubMed databases from inception through November 2016 using the terms "fruit," "vegetable," "apple," or "pear" in combination with "type 2 diabetes." Citations from more recent literature reviews and meta-analyses also were searched. Only prospective cohort studies that evaluated apple and/or pear consumption in relation to T2DM were included. All included studies used a validated food frequency questionnaire.

To conduct the meta-analysis, the authors converted all consumption data into servings per week using a standard portion size of 106 g per week. (On average, a small apple weighs approximately 100 g, and a small pear weighs 150 g.) The meta-analysis was conducted according to the criteria for Meta-analysis of Observational Studies in Epidemiology (MOOSE), and individual study quality was assessed using the Newcastle-Ottawa Scale.

Of the 3,971 articles that were located, only three met all inclusion criteria. However, one of the three articles comprised three separate prospective cohort studies, so data from five studies were reviewed. According to the Newcastle-Ottawa Scale, one study was of moderate quality and the other four studies were of high quality.

The included studies had a total of 228,315 participants, of which 14,120 (6.2%) developed T2DM. As detailed in Table 1 of the article, each of the included studies controlled for various confounding factors (e.g., age, gender, ethnicity, weight, smoking status). The meta-analysis revealed that consumption of apples and pears was associated with a significant 18% reduction in T2DM risk ($P < 0.001$). The authors also found a dose-response relationship between apple and pear consumption and T2DM risk: One, two, three, four, and five servings per week



**Apple** *Malus* spp.
Photo ©2018 Steven Foster



**Pear** *Pyrus* spp.
Photo ©2018 JJ Harrison

corresponded to respective reductions of 3%, 8%, 12%, 15%, and 19% in T2DM risk ($P < 0.001$).

The authors conclude that apple and pear consumption was significantly associated with a decreased risk of developing T2DM. This finding is of value because apples and pears are popular fruits consumed worldwide and provide numerous beneficial compounds to the diet. In the United States, apple consumption contributes approximately 22% of the total polyphenol intake of an average person.

The authors hypothesize that the decrease in T2DM risk from consuming apples and pears could be related to the fruits' contents of (1) polyphenols, which have favorable effects on antioxidant capacity; (2) soluble fibers, such as pectin, which slow gastric emptying, reduce postprandial glucose spikes, and are associated with reduced hyperinsulinemia; or (3) various other phytochemicals that may reduce inflammation.

The strengths of this study are its large sample size, strong statistical power, and inclusion of studies that were of moderate and high quality. Limitations of this analysis are that all the studies were conducted in the United States and the varieties of apples and pears were not addressed. HG

**—Heather S. Oliff, PhD**






# Increased Plant Species Richness on Mountain Summits Associated with Climate Warming

**Reviewed:** Steinbauer MJ, Grytnes JA, Jurasinski G, et al. Accelerated increase in plant species richness on mountain summits is linked to warming. *Nature*. 2018;556(7700):231-234.

| Study Details: At a Glance | |
|---|---|
| **Study Design** | Analysis of plant survey data |
| **Included Studies** | 698 surveys, conducted from 1871 to 2016, of alpine plants on 302 European mountain summits |
| **Study Length** | Various |
| **Test Material** | N/A |
| **Control** | N/A |
| **Disclosures** | The authors declared no competing interests. The study was funded by numerous grants and institutions, including The Carlsberg Foundation, an EU Marie Skłodowska-Curie action grant, and the Velux Foundation, among others (see "Acknowledgements" section in the journal article for the full list). |

Climate warming is affecting many natural habitats, including mountainous regions. Mountain summits, which serve as natural, permanent study sites that are easy to find, are well-suited for long-term studies of biotic responses to environmental changes. Records of vegetation on European mountain summits date back more than a century. Thus, it is possible to resurvey the occurrences of plant species in these locations and determine changes in the number of species over time. The authors of this journal article resurveyed plant communities on European mountain summits and assessed trends in plant diversity dynamics. They sought to determine whether climate warming is accelerating changes in plant species richness (i.e., the number of plant species in any given location).

This study is based on 698 surveys, dating from 1871, of 302 European mountain summits with historical vegetation records. For each survey, the authors assessed all plant species generally occurring on the top 10 meters of elevation. For each summit, the authors calculated the mean monthly temperature and precipitation and analyzed changes in species richness across the summits for the entire time period. They reported that the number of plant species has significantly increased during the past 145 years on 87% of the surveyed European mountain summits ($P < 0.001$), with an accelerated increase during the past 20 to 30 years. This trend was observed for all nine geographic regions studied.

From 1957 to 1966, the summits gained an average of 1.1 species, and from 2007 to 2016, the summits gained an average of 5.4 species. A positive relationship was observed between the magnitude of increase in plant species richness and the rate of warming across all sampled mountain summits ($P < 0.001$).

Although precipitation change had a moderate positive effect on changes in species richness across Europe, the effect was not consistent or significant compared with the effect of temperature change in the studied regions.

The authors also observed growth strategies in new plant colonizers that are characteristic of species from lower elevations, such as larger size ($P < 0.001$), greater specific leaf area ($P < 0.001$), and association with warmer temperatures ($P < 0.001$), compared with established species. As more species become established at higher elevations, the slow-growing alpine species may be replaced by more vigorous generalist species that benefit from warming. However, according to the authors, replacement of resident species requires large populations of new colonizers.

From 364 resurveys that included 12,738 observations of 873 species, plant trait values of new established colonizers were compared with those of species found in previous surveys. New colonizers had significantly greater specific leaf area ($P < 0.001$) and plant height ($P < 0.001$) compared to resident species, but there were no significant differences in seed mass ($P = 0.85$). According to the authors, the new species also adapted to warmer climates better than resident species ($P < 0.001$).

Local studies suggest that grazing and frequent disturbance by tourists may suppress the upward advance of alpine plants in response to warming on mountains. However, "Without a consistent impact on species re-distribution, it is unlikely that changes in grazing and tourism can account for the consistent continent-wide increase in plant species richness evident in our data," the authors noted.

The findings of this study support the hypothesis that climate warming is the primary driver of the upward shifts of species on mountains and agree with shorter-term studies demonstrating that the number of cold-adapted plant species is declining while those that prefer warmer conditions are increasing.[1-3]

According to the authors, results of this study "provide a particularly compelling example of the human-driven impact on terrestrial biota" that is consistent with the Great Acceleration, a term that refers to the hastening trends in societal development and human impact on the environment since the mid-20th century. They conclude that the "accelerating increases in species richness on mountain summits across this broad spatial extent demonstrate that acceleration in climate-induced biotic change is occurring even in remote places on Earth, with potentially far-ranging consequences not only for biodiversity, but also for ecosystem functioning and services." HG

**—Shari Henson**

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# Proprietary Ginkgo Extract Is Comparable to Pentoxifylline for Treatment of Chronic Tinnitus

**Reviewed**: Procházková K, Šejna I, Skutil J, Hahn A. *Ginkgo biloba* extract EGb 761® versus pentoxifylline in chronic tinnitus: a randomized, double-blind clinical trial. [published online June 1, 2018]. *Int J Clin Pharm*. doi: 10.1007/s11096-018-0654-4.

People with tinnitus hear sounds, often described as ringing or buzzing, when no external sources are present. It can be caused by cochlear lesions, disturbances in hearing pathways, or by metabolic, cardiovascular, or musculoskeletal disorders. Tinnitus often is treated with local anesthetics, antidepressants, benzodiazepines, drugs that enhance blood flow in the cochlea and brain, anti-inflammatory agents, or drugs that improve neuroplasticity. The ginkgo (*Ginkgo biloba*, Ginkgoaceae) leaf extract EGb 761 (Tebonin; Dr. Willmar Schwabe Pharmaceuticals GmbH & Co. KG; Karlsruhe, Germany) and the drug pentoxifylline are among the treatments that enhance blood flow in the brain. EGb 761 is a dry extract of ginkgo leaves (35-67:1) with 60% (per weight) acetone as extraction solvent. It is standardized to 22-27% ginkgo flavone glycosides and 5-7% terpene lactones. The authors conducted a randomized, double-blind, reference-controlled, single-center trial to compare the effects of EGb 761 and pentoxifylline on psychosocial symptoms in patients with subchronic or chronic tinnitus. They also assessed the safety and tolerability of the two treatments.

The 12-week trial was conducted at the Department of Otorhinolaryngology at Královské Vinohrady University Hospital in Prague. Male and female patients aged 30 years and older who had unilateral or bilateral subchronic or chronic tinnitus for at least three months before the onset of the study were eligible for the trial. Patients were enrolled if they had maskable tinnitus (i.e., tinnitus that can be made less annoying by external sound), if they had annoyance scores of 3 or greater on an 11-Point Box Scale, and if their score on an abridged Tinnitus Questionnaire (Mini-TQ) indicated psychological distress. Patients were recruited from September 2012 to April 2014.

**Study Details: At a Glance**

| | |
|---|---|
| **Participants** | • 200 men & women<br>• ≥ 30 years of age<br>• Diagnosed with unilateral or bilateral chronic or subchronic tinnitus |
| **Study Design** | Randomized, double-blind, reference-controlled trial |
| **Study Length** | 12 weeks |
| **Test Material** | Ginkgo leaf extract EGb 761 (Dr. Willmar Schwabe Pharmaceuticals GmbH & Co. KG; Karlsruhe, Germany) |
| **Control** | Pentoxifylline |
| **Disclosures** | None declared |

**Ginkgo** *Ginkgo biloba*
Photo ©2018 Steven Foster



The patients had subchronic or chronic tinnitus for seven years on average and had tried many remedies. In addition to the 11-Point Box Scale and the Mini-TQ, the authors used the Hospital Anxiety and Depression Scale (HADS) and the Sheehan Disability Scale, a self-rating tool that assesses how work, school, social life, and family life are impaired by panic, anxiety, phobic, or depressive symptoms. Safety and tolerability of the trial products were assessed by physical and otological examinations, electrocardiograms, laboratory tests, and vital signs. All patients who took at least one treatment dose were included in the safety analysis set (SAF). Patients in the SAF who had at least one 11-Point Box Scale measurement after baseline were included in the full analysis set (FAS).

Eligible patients were randomly assigned to take one EGb 761 tablet (120 mg) with one pentoxifylline-like placebo tablet twice daily (n = 100) or one extended-release pentoxifylline tablet (600 mg) with one EGb 761-like placebo tablet twice daily (n = 100).

In the EGb 761 group, seven patients discontinued the trial (six because of adverse events [AEs] and one for reasons not given). In the pentoxifylline group, 17 patients discontinued the trial (14 because of AEs, one who withdrew consent, one who was lost to follow-up, and one for reasons not given). One patient in the EGb 761 group and two patients in the pentoxifylline group were excluded from the FAS because of a lack of data. Based on tablet counts, compliance rates were 99.4% in the EGb 761 group and 98.8% in the pentoxifylline group.

Significant improvements in anxiety, disability, and all tinnitus-related measures were seen in both groups after 12 weeks. In the EGb 761 group, improvements were seen on the Mini-TQ ($P < 0.0001$) and in loudness ($P = 0.0021$) and annoyance ($P = 0.0002$) scores. In the pentoxifylline group, improvements were seen on the Mini-TQ ($P < 0.0001$) and in loudness ($P = 0.0015$) and annoyance ($P = 0.0003$) scores. The between-group differences were not significant. Slight, though nonsignificant, improvements in HADS depression scores were observed in both groups at 12 weeks. In patients with elevated depression scores at baseline, improvements in the Mini-TQ, loudness, and annoyance scores were seen in the EGb 761 group but not in the pentoxifylline group.

Thirty-four patients in the EGb 761 group and 29 in the pentoxifylline group had abnormal HADS anxiety scores at baseline. (The authors define "abnormal" HADS anxiety scores as those greater than 7.) After 12 weeks, those numbers decreased to 22 in the EGb 761 group ($P = 0.005$) and to 23 ($P = 0.105$) in the pentoxifylline group.

Nineteen patients in the EGb 761 group reported a total of 20 AEs, and 27 patients in the pentoxifylline group reported a total of 36 AEs. A causal relationship with the study product could not be excluded for 18 AEs in 17 patients in the EGb 761 group or for 32 AEs in 24 patients in the pentoxifylline group. None of the AEs were serious, and no clinically relevant changes in the safety measures were observed during the trial. The most frequent AEs reported in the pentoxifylline group were "gastrointestinal disorders" (n = 11) and "infections and infestations" (n = 5), and the most frequent AE reported in the EGb 761 group was "worsening of tinnitus" (n = 5).

The authors explain that treating chronic tinnitus is challenging because of its various causes and because the condition changes over time. Pharmacological and nonpharmacological approaches should be prescribed after evaluating the suspected cause of the tinnitus and the psychological reaction in each patient.

In this study, EGb 761 and pentoxifylline were similarly effective in reducing the loudness, annoyance, and overall discomfort of patients with subchronic or chronic tinnitus. Fewer AEs were reported in the EGb 761 group. Limitations of this study include the use of tablet counts to determine compliance and the single-center setting. HG

**—Shari Henson**

**Ginkgo** *Ginkgo biloba*
Photo ©2018 Steven Foster



# Review of Sweet and Tart Cherries Shows Decreased Risk of Chronic Inflammatory Diseases

**Reviewed**: Kelley DS, Adkins Y, Laugero KD. A review of the health benefits of cherries. *Nutrients*. March 2018;10(3):368. doi:10.3390/nu10030368.

| Study Details: At a Glance | |
|---|---|
| **Study Design** | Literature review |
| **Included Studies** | 29 human clinical trials |
| **Study Length** | Various |
| **Test Materials** | Tart cherries or tart cherry products (n = 20), sweet cherries or sweet cherry products (n = 7), and unspecified fresh or canned cherries (n = 2) |
| **Control** | Various |
| **Disclosures** | The authors declared no conflicts of interest. The study was supported by the US Department of Agriculture, and the work of one author (Kelley) was partially funded by the Washington State Fruit Commission and the California State Advisory Board. |

Increased consumption of fruits and vegetables is associated with a decreased risk of chronic inflammatory conditions such as cardiovascular disease, stroke, diabetes, and some cancers. Fruits and vegetables provide essential vitamins and minerals, fiber, and plant compounds that have antioxidant, anti-inflammatory, and other beneficial activities. Sweet cherry (*Prunus avium*, Rosaceae) fruit and tart cherry (*P. cerasus*) fruit are rich in fiber, carotenoids, and polyphenols and contain small amounts of tryptophan, serotonin, and melatonin. Human and animal studies suggest that cherry consumption may reduce the risk of chronic diseases and improve sleep, cognitive function, and recovery from strenuous exercise. The purpose of this review was to summarize the evidence from human studies evaluating the effects of sweet and tart cherries on oxidative stress, inflammation, exercise-related muscle damage, arthritis, diabetes, cardiovascular disease, sleep, mood, and cognitive function.

MEDLINE and Google Scholar databases were searched to identify studies that used sweet cherry or tart cherry interventions. No information was provided about search terms, search strategy, or criteria for including or excluding studies in this review. No meta-analysis was conducted.

A total of 29 clinical trials were reviewed. The studies were published between 2003 and 2017, with the exception of one study published in 1950. Study treatments included tart cherries or tart cherry products (n = 20), sweet cherries or sweet cherry products (n = 7), and unspecified fresh or canned cherries (n = 2). Cherry products included juices, powders, and concentrates. Study treatments provided the equivalent of 45-270 cherries per day, corresponding to 55-720 mg of anthocyanins per day. Study populations ranged from nine to 633 participants and included healthy adults, trained athletes, elderly people with dementia, and people with arthritis, gout, obesity, diabetes, and/or hypertension. Treatment durations ranged from a single dose of cherries on one day to daily use for three months. Nineteen studies were randomized, placebo-controlled trials.

The reviewed studies were grouped by medical condition or clinical markers measured, including: oxidative stress (n = 10); inflammation markers (n = 16); arthritis markers other than inflammation (n = 5); exercise-induced pain and muscle damage or recovery from exercise (n = 9); risk factors for diabetes and cardiovascular disease (n = 9); quality and quantity of sleep (n = 4); and stress, anxiety, mood, memory, and cognitive function (n = 6).

Eight of the 10 studies that measured oxidative stress found that cherries reduced oxidative stress markers or increased antioxidant capacity. Sweet cherry powder given for three days improved antioxidant capacity in healthy adults. A single dose of sweet cherries increased one antioxidant measure (oxygen radical absorbance capacity) but decreased another (ferric reducing ability of plasma [FRAP]) in healthy women. In several placebo-controlled studies, dried sweet cherries and tart cherry juice, concentrate, or fruit decreased lipid peroxidation, increased FRAP, decreased unspecified oxidative stress markers, and increased urinary antioxidant capacity in healthy adult and elderly populations. Two placebo-controlled studies found no change in oxidative stress in male athletes given tart cherry powder or juice.

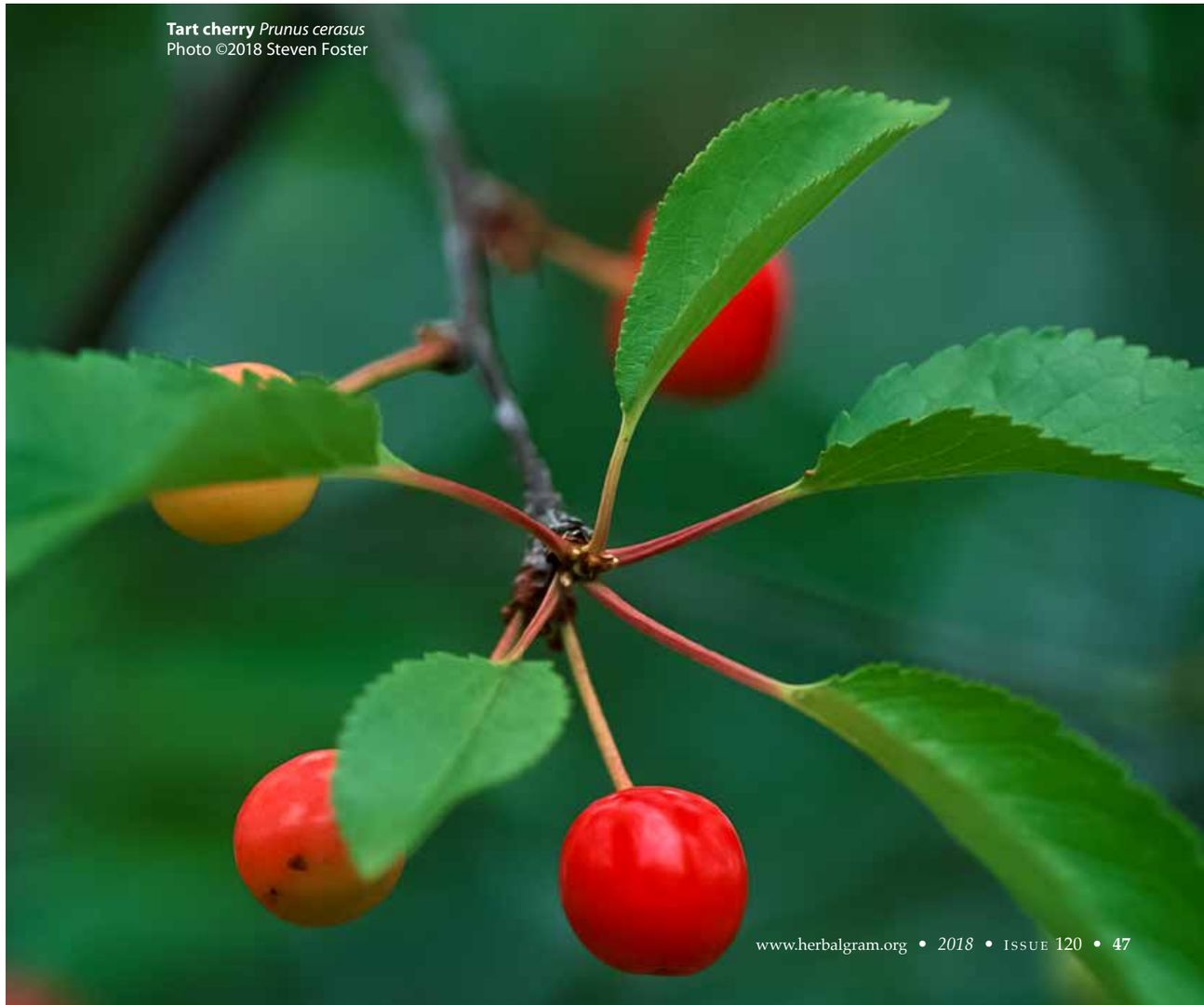
Eleven of the 16 studies that measured inflammation found that cherries reduced various inflammation markers, but these reductions were significant in only nine of the 16 studies. In healthy people, single doses of sweet cherries or tart cherry juice decreased serum levels of C-reactive protein (CRP) and uric acid. In people with mildly elevated CRP levels, eating sweet cherries for 28 days decreased serum levels of CRP, interleukin-6 (IL-6), and other inflammatory markers.

No significant changes in inflammation markers were found in overweight or obese people who consumed sweet cherries for four weeks, highly trained athletes who consumed tart cherry juice or powder, elderly people with dementia who drank sweet cherry juice, or patients with osteoarthritis who drank tart cherry juice. One placebo-controlled trial found increased inflammation markers in healthy people who consumed sweet cherry powder.

Eight of the nine studies that evaluated exercise-induced pain, exercise-induced muscle damage, or recovery after exercise found that cherries reduced pain and muscle damage. However, the results of only eight studies are presented in the article. Six placebo-controlled trials with highly trained athletes found that tart cherry juice or powder improved performance, reduced post-exercise pain and muscle damage, decreased markers of muscle breakdown, and reduced recovery time. One placebo-controlled trial with male college students found that tart cherry juice reduced loss of strength, muscle damage, and pain after exercise compared to placebo. A separate study of tart cherry juice in male water polo players found no changes in performance or recovery.

All five studies that evaluated the effects of cherries on arthritis and gout found benefits. Published in 1950, the first study to test the health effects of cherries found that fresh or canned tart cherries improved joint mobility and decreased gout attacks and uric acid in the blood. Another study found that a single dose of sweet cherries decreased serum uric acid and increased urinary excretion of uric acid in healthy women. Consuming cherries or cherry extract was associated with a decreased risk of gout attacks in a case-control study. Two placebo-controlled trials found that tart cherry juice reduced serum uric acid in overweight or obese people and improved pain, stiffness, and function in people with osteoarthritis.

Five of the nine studies that evaluated the effects of cherries on risk factors for diabetes and cardiovascular disease found some health benefit from cherries. In women with diabetes, tart cherry concentrate supplementation for six weeks decreased systolic blood pressure, diastolic blood pressure, and levels of hemoglobin A1c, total cholesterol, and low-density lipoprotein cholesterol. In healthy adults, 300 mL of sweet cherry juice decreased systolic and diastolic blood pressure when taken as a single dose, but not when taken in three divided doses over three hours. In placebo-controlled



**Tart cherry** *Prunus cerasus*
Photo ©2018 Steven Foster

trials, sweet cherry juice decreased systolic blood pressure but not diastolic blood pressure in elderly people with dementia; tart cherry concentrate lowered systolic blood pressure but not diastolic blood pressure in people with early hypertension; and tart cherry juice decreased levels of triglycerides and very-low-density lipoprotein cholesterol in overweight and obese people. The remaining studies did not show benefits from consuming cherries. It should be noted that in these few studies, cherries decreased inflammation markers associated with diabetes, metabolic syndrome, and cardiovascular disease, but did not consistently affect blood levels of lipids, glucose, or insulin.

Several studies evaluated the effects of cherries on sleep, mood, and cognitive function. In healthy adults, consuming sweet cherry powder increased total sleep time and decreased sleep latency (the time it takes to fall asleep). In placebo-controlled trials, dried sweet cherries increased total sleep time and decreased sleep latency and the number of awakenings, and tart cherry juice decreased the severity of insomnia but did not affect sleep latency or sleep efficiency in older adults with insomnia. One placebo-controlled trial found that dried sweet cherries consumed for five days improved mood and decreased anxiety in adults. A second placebo-controlled study found no effect of a single dose of tart cherry concentrate on cognitive function or mood in healthy adults. The many inconsistencies regarding the clinical studies described in the text make it difficult to summarize the overall effects of cherries on mood and cognitive function.

The authors conclude: "Evidence from published reports is reasonably strong to indicate that consumption of cherries decreased markers for oxidative stress, inflammation, exercise-induced muscle soreness and loss of strength, and blood pressure acutely after ingesting cherries." The acute studies ranged in duration, but most of the previously mentioned effects were determined by assessments conducted within five hours of ingestion. Limited evidence suggests possible benefits in arthritis, diabetes, hyperlipidemia, sleep quality, cognitive function, and mood.

The authors explain that discrepancies among the published reports may be due to the small numbers of participants in some studies, differences in the composition of participants' diets, short treatment periods, and variations in polyphenol content among the different types of cherries and cherry products tested. The authors recommend that stable, standardized cherry products should be developed for use in randomized controlled trials, and that future studies should have longer durations and report the anthocyanin and total polyphenol contents of the tested products. HG

**—Sandy Jean**








# Therapeutic Use of Cannabis Root for Pain and Inflammation

**Reviewed:** Ryz NR, Remillard DJ, Russo EB. Cannabis roots: A traditional therapy with future potential for treating inflammation and pain. *Cannabis Cannabinoid Res*. August 2017;2(1):210-216. doi: 10.1089/can.2017.0028.

| Study Details: At a Glance | |
|---|---|
| **Study Design** | Literature review |
| **Included Studies** | Pharmacological studies, historical records, and ethnobotanical reports related to the medicinal use of cannabis root preparations |
| **Study Length** | N/A |
| **Test Material** | N/A |
| **Control** | N/A |
| **Disclosures** | None declared |

The many uses of cannabis (*Cannabis* spp., Cannabaceae) leaves, flowers, seeds, stalks, and trichomes (resin glands) for food, fuel, fiber, medicine, and other purposes are well known. However, the medicinal use of cannabis roots, which was documented as early as 77 CE by Roman naturalist Pliny the Elder, has been largely neglected by the modern medical research community. The authors of this review summarize the medical history and traditional use of cannabis roots, as well as the limited pharmacological data on the composition of cannabis root.

Cannabis root preparations have been mentioned in the *Pên-ts'ao Ching*, an ancient Chinese pharmacopeia; Persian medicinal texts from the 12th century; accounts of European physicians dating back to 1542 and US Eclectic physicians; as well as ethnobotanical reports of traditional practices in South America, Indonesia, and Réunion Island.

Historically, cannabis root was taken orally as a hot water decoction or used topically as a "cataplasm" or poultice. In addition, the ground-up roots were mixed with wine and taken orally, or mixed with fat or butter and taken orally or applied topically. Cannabis root has been used for painful joints; gout; fever and inflammation; difficult childbirth and postpartum hemorrhaging; burns and calluses; as both an emetic and anti-emetic; to treat infections; and as a veterinary vermicide. Historical records also mention cannabis root as a treatment for "tumors," but the authors note that it is unclear if these reports were referring to cancerous tumors; historically, the word "tumor" often


**Cannabis** *Cannabis sativa*
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was used to refer to any abscess, sore, ulcer, or swelling, including inflammation associated with joint pain.

Active compounds in cannabis roots include the triterpenoids friedelin and epifriedelanol. Both are abundant in many plants, algae, lichen, mosses, coal, and mineral wax. To date, researchers have not isolated friedelin or epifriedelanol specifically from cannabis roots. Friedelin from other plant sources has been found in vivo and in vitro to have various activities, including anti-inflammatory, anti-pyretic, analgesic, estrogenic, antioxidant, hepatoprotective, and cytotoxic.

An oil fraction of wild cannabis roots from Jammu, India (misspelled as "Jammy, India" in the journal article), was found to have the characteristic minty aroma of carvone (found at 77.7%) and dihydrocarvone (23.3%). These monoterpenes, which are also found in spearmint (*Mentha spicata*, Lamiaceae) and dill (*Anethum graveolens*, Apiaceae) oils, have antinociceptive (blocking the detection of pain stimuli) effects in vivo and are being investigated for their potential therapeutic use in patients with osteoarthritis. N-(*p*-hydroxy-β-phenylethyl)-*p*-hydroxy-*trans*-cinnamamide, also found in cannabis roots, has also been shown to have analgesic activity in vivo. No pharmacological data are available on the cannabis root alkaloids cannabisativine or anhydrocannabisativine. Cannabis roots also contain choline and several sterols, including sitosterol, campesterol, and stigmasterol. Cannabis roots, unlike its flowering tops and resin glands, have no appreciable amounts of cannabinoids.

Although there have been no reports of the cardiac activity of cannabis roots, a 1971 article in the *Journal of the American Medical Association* discussed a case from 1931 that linked "Indian hemp" roots, which were used as a treatment for dropsy, with bradycardia (slow heart rate). However, the authors of this review note that the 1931 treatment most likely referred to dogbane (*Apocynum cannabinum*, Apocynaceae), which was commonly called "Indian hemp" in the 1930s and earlier, has known cardiac glycosides, and was used historically to treat dropsy in folk and Native American medicine.

When considering therapeutic compounds in and possible uses of cannabis roots, it is important to keep in mind the great variability of the plant in different climates, growth conditions, and among its different chemovars and varieties. Just as different chemovars have been identified in relation to their cannabinoid content, different root chemovars may emerge. Many cannabis dispensaries in the United States now offer body lotions, salves, lip balms, and other products made from cannabis or hemp (non-intoxicating cannabis) roots. Great care must be taken when sourcing roots for any medicinal purpose because they readily accumulate heavy metals from soil, including iron, chromium, and cadmium. HG

**— Mariann Garner-Wizard**





# Indian Kino Tree Reforestation

## *Sami-Sabinsa Group Funds Major Conservation Project in India*

**By Connor Yearsley**

**The Sami-Sabinsa Group* has committed to fund a 10-year reforestation project that will oversee the planting of more than 166,600 Indian kino (*Pterocarpus marsupium*, Fabaceae) trees on 250 acres in the large central Indian state of Madhya Pradesh.[1] The group expects to spend about $500,000 on the project, which it claims is the first initiative to conserve this high-value, multipurpose, threatened species in India. The project earned the NutraIngredients-USA Editors Award for Industry Initiative of the Year for 2018.[2] The Indian kino tree has been used in India's traditional medicine system of Ayurveda, and extracts of the heartwood† have demonstrated antidiabetic properties (see "About the Indian Kino Tree" sidebar).**

"While there have been some initiatives by Indian forest departments for propagating teak and other timber trees, an initiative for the cultivation of the Indian kino tree has hardly been done by government agencies or private enterprise," wrote Shaheen Majeed, president of Sabinsa Worldwide (email, June 6, 2018). "Natural populations of this tree have been greatly reduced, and often no young saplings can be found in the forest."

The Sami-Sabinsa Group produces two proprietary standardized ingredients from the Indian kino tree: Silbinol, a pterostilbene-enriched fraction of the ethanol extract of the heartwood, and pTeroSol, a C-glycosides-enriched fraction of the aqueous extract of the heartwood.[3] The reforestation project was started with the expectation that these products will increase demand for this already-threatened species.

"When Sabinsa looked into supplies with an eye to the future, we found that this tree's population was declining, and it was neglected," wrote Majeed. "The Sami-Sabinsa Group has focused on cultivation, propagation, and conservation of medicinal plants for more than 20 years, and been involved in symposia discussing how traditional Indian plants should be protected, but this program illustrates even longer-term thinking, beyond meeting Sabinsa's supply needs."



Bark of the Indian kino tree (*Pterocarpus marsupium*)
Photo ©2018 Vinayaraj

Suma Tagadur Sureshchandra, a medicinal plants specialist and an assistant professor at the University of Trans-Disciplinary Health Sciences and Technology (TDU)-the Foundation for Revitalization of Local Health Traditions (FRLHT), Bengaluru, thinks this initiative should be appreciated and replicated for other Indian botanicals. "Certainly it will reduce pressure on the wild genepool of the species," she wrote, and added that such initiatives should be encouraged by forest departments and the National Medicinal Plants Board of India (email, July 9, 2018). She said that similar programs could be undertaken for other important species in the region, including the ashoka tree (*Saraca asoca*, Fabaceae), red sandalwood (*Pterocarpus santalinus*, Fabaceae), and false calumba (*Coscinium fenestratum*, Menispermaceae).

The Indian kino tree is considered Near Threatened according to the Red List criteria of the International Union for Conservation of Nature

* Sami Labs, founded in 1991, is a Bengaluru, India-based manufacturer and exporter of herbal extracts and other natural products. It is the parent company of Sabinsa Corporation, which was founded in 1988 and is a manufacturer, supplier, and marketer of herbal extracts, dietary ingredients, and other natural products. Sabinsa has offices around the world with US headquarters in East Windsor, New Jersey. The companies often are referred to as the Sami-Sabinsa Group because they are under the same ownership and both companies contribute to many of the same initiatives.

† Heartwood is the older, harder, nonliving inner wood of the trunk that is usually darker, denser, less permeable, and more durable than the surrounding sapwood.

Map courtesy of Sami-Sabinsa




The Indian kino tree has a wide native range and occurs across much of India and Sri Lanka, as well as in Nepal, Bangladesh, and Taiwan. It grows at elevations up to about 1,200 meters (about 4,000 feet) in moist and dry deciduous forests and in hilly areas. The species prefers deep, well-drained, low-fertility soils and abundant light. The status of populations across the species' range is not fully known, however. The Indian kino tree reportedly is declining in Sri Lanka, and field observations in India suggest that populations there are probably small. Furthermore, the plant's range overlaps with some areas where the Global Forest Watch considers there to have been a 30% loss of tree cover since 2000.[4]

The reforestation project will take place on a 250-acre plot of land, located in the districts of Seoni and Balaghat in the southeastern part of Madhya Pradesh, which was provided and is owned by the government of Madhya Pradesh. According to Majeed, the Madhya Pradesh Forest Department is also concerned about the conservation status of the Indian kino tree, and the Sami-Sabinsa Group's initiative is well-regarded by the government.

The project officially began in March 2018 when the Sami-Sabinsa Group entered into a memorandum of understanding with the Forest Department. Seedlings are being grown in nurseries, and planting was done in July 2018, when monsoon season was in full effect. Cultivation will be managed by the reforestation organization Madhya Pradesh Rajya Van Vikas Nigam Ltd., which was incorporated in 1975 and is funded by the state government of Madhya Pradesh and the government of India.

The plantation will be monitored constantly for five years, and trees will be replaced if there is any mortality.

(IUCN).‡ This is based on a 2017 assessment that used version 3.1, the current version, of the *Red List Categories and Criteria*. According to the IUCN, "a taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future."[4,5] Previously, based on a 1998 assessment that used an earlier version of the *Red List Categories and Criteria* (version 2.3), the Indian kino tree was considered Vulnerable.[4] According to Majeed, one of the goals of the Sami-Sabinsa Group's new project is to prevent this autogenic-reproductive-deficient species** from qualifying for one of the IUCN's three threatened categories (i.e., Vulnerable, Endangered, or Critically Endangered) again.

Also using version 2.3 of the IUCN criteria, the FRLHT evaluated Indian kino tree populations in six states in India (Table 1).

**Table 1: Threat Status of *Pterocarpus marsupium* in Six Indian States***

| Indian State | Threat Status (Assessment Year) |
|---|---|
| Chhattisgarh | Vulnerable (2003) |
| Madhya Pradesh | Vulnerable (2003) |
| Maharashtra | Vulnerable (2001) |
| Odisha | Endangered (2007) |
| Rajasthan | Critically Endangered (2007) |
| West Bengal | Endangered (2007) |

*Based on the FRLHT's assessments using IUCN criteria.[6]

‡ The IUCN's *Red List of Threatened Species* is the world's most comprehensive information source on the conservation status of plant, animal, and fungal species. *Red List Categories and Criteria* provides an explicit, objective framework for classifying species at high risk of global extinction, based on parameters such as population reduction and restricted geographic range.

** An autogenic-reproductive-deficient species is one in which "reproduction is low due to self-generated and biotic factors," according to Majeed. The Indian kino tree has a low germination rate (14-20%) and "early development of seedlings is hampered" by various factors, such as competition from weeds or thick grass. Also, young roots are vulnerable to rot, and most of the tree's pods fall during the hot season and may be damaged by fire.





After five years, the trees will be self-sustaining. It was determined that 166,600 trees is the maximum number that the 250-acre plot can support. Since Indian kino trees are deciduous trees that usually have straight boles, the trees initially should be able to thrive in the allotted space, according to Majeed, but thinning will be required after 10 years. After 15 to 20 years, the Forest Department may decide about the harvesting of selected trees.

"For each hectare of land, it is estimated that 999 man-days will be required for plantation and maintenance of the trees for a period of five years," Majeed wrote. "The clearing of undergrowth in the forest land, while preserving fruit-bearing and other desirable trees on the five meters around the periphery, has been done. The trees will be monitored regularly to make sure they are taking root and starting to thrive."



**Indian kino tree** *Pterocarpus marsupium*
Photo ©2018 Sami-Sabinsa

According to Majeed, many initial challenges associated with the project have been overcome already, such as finding the cultivation partner and getting the government to provide the land. "While there is concern that the trees may be poached before they are mature, the area has been wire-fenced and will be under supervision," Majeed wrote. "Unwanted interference and/or forest devastation should not occur to disturb this ongoing project. Any soil concerns and potential pathogens will be strictly observed by our scientists, botanists, and agro-specialists, and remedied immediately."

## About the Indian Kino Tree

### A 'Multipurpose Forest Tree'

The Indian kino tree, also called *vijayasar* in Hindi and *asan* in Sanskrit, is a perennial, tropical, deciduous tree in the legume family (Fabaceae) that can grow to 30 meters (98 feet) tall. Its elliptic-ovate or oblong leaflets are arranged alternately on the rachis, and there is one unpaired terminal leaflet. From about June to August, the tree produces showy golden yellow flowers in panicles (loose, branching flower clusters). Its pods are orbicular, flat, and winged, each with one or two seeds.[7-9]

The tree's timber can be used for plywood, veneer, poles, tools, furniture, containers, boats, musical instruments, and more.[10] In fact, the species has been described as one of the most "multipurpose forest trees."[4] However, unlike species that are valued primarily for their fruit, leaves, or flowers, which can be harvested without killing the entire plant, the Indian kino tree mostly is valued for different parts of its trunk (e.g., the heartwood), so human use usually requires harvesting the entire tree. This creates concerns about the sustainability of the species.

It has been proposed that a population census be conducted across the Indian kino tree's range, its international trade be monitored, and harvest quotas be introduced.[4] According to Majeed, the sustainable management of valuable trees, including this species, requires longer-term thinking than for other plants, because trees typically have longer life cycles.

### Traditional Uses

According to the *Indian Materia Medica* (1908): "Kino is a simple astringent, administered in diarrhea; somewhat milder in action than catechu, therefore better adapted for females and children. Gum is used for toothache."[11] The red exudate, called kino gum, which is yielded when incisions are made through the bark up to the cambium layer, contains kino tannic acid and has astringent properties.[12]

The stem bark of the Indian kino tree is used in ethnomedicines in India for diabetes, anemia, asthma, body pain, digestive disorders, diarrhea, dysentery, herpes, skin diseases, toothache, leukorrhea, and dysmenorrhea.[13]

Kol tribes in Odisha, India, reportedly have made a paste mixture from the bark of the Indian kino tree and the barks of mango (*Mangifera indica*, Anacardiaceae), sal tree (*Shorea robusta*, Dipterocarpaceae), and *Spondias pinnata* (Anacardiaceae) to treat dysentery. In addition, the Kannada people reportedly have made wooden tumblers (drinking vessels) from the yellowish-brown heartwood of the tree. The tumblers are then filled with water that is allowed to sit overnight, which creates an extract of the heartwood that is drunk the next morning to treat diabetes.[7]

### Modern Research

Epicatechin, found in the bark and heartwood of the tree, is chemically similar to insulin but reportedly works through a different mechanism of action.[14] In diabetic rats, epicatechin has been shown to be able to regenerate pancreatic beta cells, which release insulin.[12] In addition, in one study, marsupin and pterostilbene from the heartwood of the tree performed comparably to the conventional diabetes drug metformin in reducing blood glucose levels in hyperglycemic rats.[8] In another study, the Sami-Sabinsa Group's pTeroSol extract lowered blood glucose and HbA1c levels and increased insulin levels in diabetic rats. Oxidative stress and inflammatory markers also were reduced in this study.[15]

Multiple studies have investigated the Indian kino tree's effects in human subjects. At least two of these were conducted by the Indian Council of Medical Research (ICMR). In the first, 67 (69%) of 97 patients with newly diagnosed or untreated diabetes and who took the Indian kino tree preparation (a dried aqueous decoction of the bark) achieved blood glucose control by week 12. The majority of those achieved control with a daily dose of two grams. No adverse side effects were reported.[16]

In the second study, patients with newly diagnosed or untreated type 2 diabetes were randomly assigned to receive either the Indian kino tree preparation (a dried aqueous decoction of the heartwood) or the standard antidiabetic medication tolbutamide. After 36 weeks of treatment, 86% of 172 patients in the Indian kino tree group and 94% of 177 patients in the tolbutamide group achieved blood glucose control. The study authors concluded that the Indian kino tree performed comparably to tolbutamide and without any significant adverse side effects.[17]



Planting of Indian kino trees *Pterocarpus marsupium*
Photo ©2018 Sami-Sabinsa

The plot is located near forests where the Indian kino tree currently grows. A variety of other medium-sized and large tree species also grow in these areas, including *Butea monosperma* (Fabaceae), *Dalbergia* spp. (Fabaceae), *Ficus religiosa* (Moraceae), *Lagerstroemia* spp. (Lythraceae), *Schleichera oleosa* (Sapindaceae), *Syzygium cumini* (Myrtaceae), and *Terminalia* spp. (Combretaceae). According to Majeed, *tinsa* (*Desmodium oojeinense*, Fabaceae) and *sheesham* (*Dalbergia sissoo*) often are found as key associates of the Indian kino tree.

In Madhya Pradesh, the Indian kino tree has been used primarily as a source of timber, according to Majeed. "Our focus is also on the better availability of the compound of our interest," he wrote. "Considering the species' low germination rate, Sami-Sabinsa with the Forest Department is identifying pterostilbene-rich chemotypes of *Pterocarpus marsupium*. After evaluation, the selected chemotypes will be taken up for micropropagation. We expect this value addition will have a great impact on the conservation of the species in general and the elite chemotypes in particular."

This project is part of the Sami-Sabinsa Group's larger commitment to sustainability. "The industry, or parts of it, has struggled to address growing challenges in sourcing of botanical ingredients in the face of increased demand, climate change, inadequate protection of indigenous species, and sometimes questionable agricultural practices," Majeed wrote. "Sabinsa's well-established cultivation program contracts directly with farmers in rural India, ensuring income for the small farmers, supporting schools, and improving rural infrastructure. Sabinsa is replicating this successful program in other countries, because the impact of climate change on weather patterns will create the necessity of sourcing in different regions."

Majeed hopes this effort, which is unusual because it intends to proactively prevent shortfalls in supplies of this species ahead of anticipated future demand, will serve as a model. "There are declining species around the world, and the effects of climate change are already exacerbating vulnerabilities created by exploitation without replanting," he wrote. "As far as we know, this venture is the first of its kind in the dietary supplements industry. It goes beyond farms and into the forest. We hope that it will inspire other similar programs. We have already had other government entities in India take notice of our efforts, and we are in discussions for greater conservation efforts for this species as well as other threatened species in and around India. This collaboration model can be replicated by other companies and in other countries. We hope it will be." HG

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Botanical illustration of *Pterocarpus marsupium* from *Köhler's Medizinal-Pflanzen* by Franz Eugen Köhler (1897).


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**Ayahuasca vine** *Banisteriopsis caapi*
Photo ©2018 Chris Kilham

# Ayahuasca Vine Harvesting in the Peruvian Amazon

## *Field report assesses supply of ayahuasca vine in areas around Iquitos, Pucallpa, and the Rio Tamaya*

**By Chris Kilham**

### Introduction

Over the past several years, members of ayahuasca groups and various social media sites have referred to the supply of ayahuasca vine (*Banisteriopsis caapi*, Malpighiaceae) in Peru as imperiled and environmentally devastated. Ayahuasca, which is the name of both the plant and the psychedelic brew that is typically made from ayahuasca vine and the leaves of *chakruna* (*Psychotria viridis*, Rubiaceae) or *huambisa* (*Diplopterys cabrerana*, Malpighiaceae), is now highly popular in Peru and other areas of the Amazon. It also is brewed and bottled for export for increasingly popular ceremonial use in the United States and elsewhere.

While the leaves of chakruna and huambisa grow on bushes that can be ready for harvest in two or three years, the ayahuasca vine takes a minimum of five years to mature. According to numerous people with whom I have spoken since 2006, the main supply issue concerns the future wild populations of ayahuasca.

To better determine the state of ayahuasca supply, I conducted a multi-site field assessment in the Peruvian Amazon. The first trip took place in January 2018, in the areas surrounding Pucallpa and Iquitos in Peru, where the largest ayahuasca retreat centers are located. In the Iquitos area alone, there are approximately 120 ayahuasca centers that largely cater to foreign *pasajeros* (passengers), according to Iquitos-based guide Juan Maldonado. I have known Juan for more than 10 years and previously have relied on him for information, supply of hard-to-obtain plants, and assistance visiting some villages in the region. My initial assessment provided valuable insight into the status of ayahuasca cultivation and supply in two of the most heavily trafficked areas for ayahuasca ceremonies.

My collaborators and I were repeatedly advised by those with whom we spoke during our first assessment that the Rio Tamaya southeast of Pucallpa had the greatest amount of wild-harvesting and trade in the vine in Peru. Several people interviewed said that they either knew of vine traders in that area or personally dealt with them. To follow up on the many comments regarding the Rio Tamaya, I, along with three others, undertook a field assessment on that river in June 2018.

My partner in both of these assessments was Sergio Cam of Chakarunas Trading Company. Sergio and I have worked and traveled together for 20 years, and we have explored various regions of the Amazon for at least a dozen of those years. Sergio is smart, jovial, and a tremendous asset in all of the activities in which I have engaged in Peru. He and I are ideally complementary in our work. For the Rio Tamaya survey, our two other teammates were Jaime Baca, our friend and boat driver, and Kley-



**Ayahuasca vine** *Banisteriopsis caapi*
Photo ©2018 Chris Kilham




Map of Peru indicating some of the areas explored during Kilham's travels.

lie Vargas, another friend and an agroforestry engineering student of Shipibo heritage. The Shipibo-Conibo are one of many tribes indigenous to the Rio Ucayali in the Peruvian Amazon.

During these assessments, my team and I visited and stayed in native villages, spoke with people actively involved in ayahuasca trade, asked as many questions as we could, took photographs and notes, and reached conclusions based on the consistency of information we gathered and the conditions we witnessed. The purpose of this field work was to provide those involved in the ayahuasca scene in particular, and the botanical industry in general, with valuable, up-to-date knowledge. We derive no income from ayahuasca or from this particular research effort. All wages, expenses, and project costs for both ayahuasca field assessments were paid for entirely by my business, Medicine Hunter.

Based on my observations, as detailed below, the supply of vine has thus far been sufficient for the current levels of demand in these regions. However, because ayahuasca is also popular in Brazil, Colombia, Ecuador, Costa Rica, Hawaii, and other tropical locales, my field research in the Pucallpa, Iquitos, and Rio Tamaya regions cannot provide definitive information about the supply of vine throughout the entire ayahuasca scene.

For the purposes of simplicity, "ayahuasca" will be used hereafter in this report to refer to *B. caapi*, the ayahuasca vine, and not the ritual brew of which it is a primary ingredient. Among local and native people in Peru, this is common parlance.

## Pucallpa, Ucayali Region

To understand the state of supply and cultivation, I traveled around Pucallpa with Sergio, visiting growing sites and speaking with people mostly of Shipibo native origin, who are involved in ayahuasca supply. Pucallpa is the home of the majority of Shipibo natives, who feature prominently in ayahuasca shamanism and supply.



Jimmy Rojas, an ayahuasca maker. Photo ©2018 Chris Kilham

*Notes from conversation with shaman Wiler Noriega from the village of Limongema, about an hour by boat south up the Rio Ucayali from Pucallpa:*

According to Noriega, he and his son have planted both ayahuasca and chakruna extensively on five hectares of land near Limongema, with the intention to plant much more. They accomplished this by planting sections of main vine, or vine branches, in soil. Noriega claims that he has planted approximately 3,000 vines, but does not know the exact number in the ground. The vines will not be ready to harvest for at least four years.

Noriega informed us that for several years he has acquired ayahuasca from brokers. Those who supply the vine come from the Pucallpa region, aggregating collections from harvesters who cut wild forest populations along the Rio Tamaya. This river runs east from the Rio Ucayali just south of Pucallpa, toward the Brazilian border.

Currently, Noriega pays 150 Peruvian soles (approx. $46 USD) per 25- to 30-kilogram sack of dried ayahuasca vine. By his recipe, he will get one to two liters of brew from each sack of vine, and will use approximately five kilograms of chakruna for the same batch. He was introduced to ayahuasca suppliers through friends, and said that if he orders ayahuasca, he receives the shipment in about 15 days. Noriega has been told that gathering ayahuasca has become more challenging, as harvesters need to venture further into the forest to harvest. Vines are typically cut in a sustainable manner, with the roots remaining in the ground, which allows the plant to regenerate over time.

Prepared ayahuasca brew is currently being shipped (in general, illegally; see "Ayahuasca Legality in the United States" sidebar) in liquid form to the United States and other foreign countries for approximately $400 per liter. Noriega told us that in Peru, the same prepared ayahuasca brew sells for approximately $100 per liter. In Peru, ayahuasca plants and brew are legal, and the medicine is revered as part of the country's "national patrimony."



Wiler Noriega, a shaman in the village of Limongema. Photo ©2018 Chris Kilham

Noriega also gave us a tip on a place called Tupac off kilometer 15 in Pucallpa, where he says ayahuasca is being cultivated.

Noriega informed us that the best brew comes from freshly harvested ayahuasca vine that is still juicy. The drier the vine, the poorer the quality of the brew. He also claimed that ayahuasca is superior in quality when grown on higher ground.

*Notes from boat captain Jaime Baca, with whom I have traveled on several rivers in the Ucayali and Loreto regions:*

Baca informed me that a forestry engineer has planted approximately 2,500 ayahuasca vines near the Brazilian border, somewhere along the Rio Tamaya. Through Baca, Sergio and I were introduced to Jimmy Rojas, who makes large quantities of ayahuasca on a regular basis. We were taken to the Manantay neighborhood where Rojas lives and cooks his brew.

*Notes from a visit with Jimmy Rojas Minos, in the Manantay neighborhood of Pucallpa:*

Rojas comes from Utucuro, a Shipibo village in the Ucayali region, where he was both a shaman and a chief. He learned his craft from his grandfather, Vicente Sanchez, and decided to leave his village for greater opportunities in the Pucallpa area. He has been cooking ayahuasca for several years and supports his family with this activity.

Every month, Rojas makes 30-40 liters of ayahuasca, which he sells to two customers, Kush and Eric, who run healing centers in the Cuzco area. His recipe consists of 30 kg of ayahuasca vine and 12 kg of chakruna leaves per liter of finished brew. He pays 80 soles ($24.61) per 30-kg sack of ayahuasca, which he obtains from two sources: one is a day upriver south on the Rio Ucayali, and the other is along the Rio Tamaya. Rojas sells his ayahuasca for 150 soles ($45.97) per liter.

*Notes from a visit to Vivero Ucayali Rainforest, a supplier of seedlings of medicinal plants, fruit trees, and ornamental plants in Pucallpa:*

According to the son of the recently deceased founder of Vivero Ucayali Rainforest, ayahuasca is becoming increasingly popular, and sales of seedlings are up. He was not able to disclose quantities being sold, but insisted that there has been a steady increase in popularity of the vine. Each seedling sells for 5 soles ($1.55). The seedlings we saw were four months old.



A woman making ayahuasca at Los Cielos. Photo ©2018 Chris Kilham



The author at Vivero Ucayali Rainforest with four-month-old seedlings of ayahuasca. Photo ©2018 Chris Kilham

*Notes from a visit to the Ministry of Agriculture in Pucallpa:*

We met briefly with Raoul, an officer of the ministry. We asked if the ministry was engaged in any kind of assessment of ayahuasca populations or sustainability. Raoul told us that at present there are no such programs or plans for any programs focusing on ayahuasca.

*Notes from a visit to Los Cielos Amazonian Healing Retreat Center:*

Sergio and I traveled approximately two hours with a driver named Gilmer from Pucallpa to Los Cielos, south of the city. There we were met by Sylvie Meier, who runs the center. (Her name, which stems from the Latin *silva* for "forest," seems perfect for her profession and geographical situation.) At the time of our arrival, they were cooking 100 kg of vine and 125 kg of chakruna to make approximately 10 liters of ayahuasca brew.

According to Meier, the center pays about 900 soles (approx. $277) for 100 kg of ayahuasca, and approximately 800 soles (approx. $246) for 125 kg of chakruna. Since its inception, the center has purchased ayahuasca from dealers who aggregate collections from the Rio Tamaya. In 2017, the center planted 250 ayahuasca vines, and Meier said they intend to plant more. The center also uses some shade-grown chakruna cultivated near Pucallpa.

Ayahuasca is prepared every two to three months at Los Cielos in an elaborate and lengthy process that takes 11-12 days from start to finish. The center employs strict standards of cleaning, washing, straining, and preparation, making theirs the most elaborate ayahuasca preparation I have witnessed. The resulting brew made from this prepared vine is clean, thick, dark, and sweet, with a tolerable flavor that is uncommon to ayahuasca brew.

Meier gave us a tour of the property at Los Cielos, where dozens of species of native medicinal plants are cultivated. Though they currently obtain their ayahuasca from dealers, they hope in time to be self-sustaining.

## Iquitos, Loreto Region

After our time in Pucallpa, I traveled to Iquitos to visit growers and

### Ayahuasca Legality in the United States

Brewed ayahuasca is illegal to purchase, sell, prepare, dispense, or transport in the United States. Two churches, Santo Daime and União do Vegetal, enjoy limited protected status to employ ayahuasca as a sacrament in their church services.

Ayahuasca vine is legal to purchase, sell, prepare, dispense, or transport, but chakruna and huambisa are not legal due to their DMT content. Any shipping of prepared ayahuasca into the United States, outside of the two designated churches above, is against international drug trafficking laws.

interview people from various ayahuasca retreat centers about the supply of ayahuasca vine.

*Notes from a visit with Elizabeth Bardales Rengifo of Natural Chacruna Productos Naturales:*

In the company of Juan Maldonado, I visited Bardales, whose 15-year-old business Natural Chacruna is well-known in the Iquitos area. An agronomic engineer, Bardales runs an impressive herbal processing and manufacturing business including solar drying, grinding, milling, sanitizing, cooking, evaporating, package labeling, and sales. Her business is completely unmarked on the outside, yet is expansive on the inside.

Bardales makes "bricks" of ayahuasca, which are solid blocks of cooked ayahuasca that have been dehydrated. In commercial extraction, this product is referred to as a native extract. The bricks take up relatively little space compared with the liquid ayahuasca brew, and are appreciably easier to ship. She did not say how much ayahuasca vine she uses on a monthly basis, but did share that the ayahuasca comes from the Rio Tamaya. Her recipe of 25 kg of ayahuasca and 7 kg of chakruna also contains smaller amounts of *ajo sacha* (*Mansoa alliacea*, Bignoniaceae), *mapacho* (*Nicotiana rustica*, Solanaceae), and *Ilex guayusa* (Aquifoliaceae), and makes 1 kg of finished solid brick. A single brick, when reconstituted, will yield 10 liters of liquid ayahuasca brew.

*Notes from a visit to Francisco Montes, kilometer 18 on the Nauta Road south of Iquitos:*

Juan and I visited Francisco Montes at his Sacha Mama Lodge. Montes has been a respected *curandero* (folk healer) in the Iquitos area for 35 years. His ayahuasca retreat center lies some distance away from the Nauta Road, behind his lodge, which has an herbal bar and a visionary art gallery.

Montes has the most ambitious ayahuasca cultivation I have encountered so far. He has planted more than 6,000 vines on his property, and some are more than 15 years old. In fact, he has so much ayahuasca that he uses the dried vines for handrails on stairs, railings around porches, and as decorations inside and outside the many buildings on his property. Montes does not purchase ayahuasca, as the amount he grows is more than sufficient for his needs. Montes currently grows 3,000 DMT-containing huambisa plants on his property instead of chakruna, because he prefers the somewhat stronger visionary effect of the huambisa. As a result of this cultivation, Montes is self-sufficient.

Montes appears to be a model in the ayahuasca scene. Cultivating vastly more than he needs, he is assured of a steady supply of ayahuasca for as long as he wishes. He provides some prepared ayahuasca to other shamans in the Iquitos area.

*Notes from a visit with Ron Wheelock, a "gringo shaman" popularized by a CNN special on ayahuasca hosted by Lisa Ling:*

Wheelock has a camp down the Nauta Road at kilometer 23 called *El Purgero*, but we met at his home at kilometer 9 on the Nauta Road. Shortly after we arrived, he pointed to a very large ayahuasca vine in his yard and explained that it is 20 years old, planted in 1997. According to Wheelock, he had harvested 280 kg of material from that one vine just the week before our visit. Looking at the massive climbing vine, it was not possible to tell that so much material had been taken.

Until two years ago, Wheelock had regularly purchased ayahuasca. But he currently has enough mature vines to supply the needs of his camp and the pasajeros who visit. Wheelock estimates that he currently has approximately five tons of mature vine on his home property, and that the five tons of vine will yield 1,000 liters of ayahuasca brew, which he sells for $250 per liter.

The recipe that Wheelock follows for making ayahuasca brew is 40 kg of ayahuasca and 5 kg of huambisa per pot, yielding 6-8 liters of finished brew.

*Notes from a visit with Julio Siri, curandero in San Rafael, about 45 minutes up the Amazon River from Iquitos:*

A village shaman, Siri has approximately 50 vines growing on his property, and some are 15 years old. He said that the vine needs to grow for at least five years prior to use, and that younger vines yield a diminished effect.

Siri does not purchase ayahuasca, and grows his own chakruna for ayahuasca brew. He offers ceremonies to those who seek his guidance, and does not run a typical ayahuasca retreat. Ceremonies are held on the porch of his house. He said that he makes a fresh batch of brew once the last batch is gone, however long that takes. Siri's recipe for ayahuasca is 5 kg of vine and 1 kg of chakruna to yield one liter of brew.

*Notes from a conversation with Carlos Tanner of the Ayahuasca Foundation, which runs three ayahuasca retreat centers*:

The Ayahuasca Foundation has three curanderos making ayahuasca. Tanner estimates his current purchases of ayahuasca at around 10-13 sacks per month, approximately 25-30 kg per sack, at a cost of 150 soles per sack.

Staff members at the centers started planting ayahuasca eight years ago. Currently, the centers have more than 300 vines. Plus, every program participant at the Ayahuasca Foundation plants a vine. This is now standard practice. Tanner intends to get to the point that the Ayahuasca Foundation can rely on its own vines for ayahuasca.



Ayahuasca ceremony at the Temple of the Way of Light. Photo ©2018 Chris Kilham

Tanner says that he has never experienced difficulty obtaining ayahuasca. "People understand when there is a market for something," he explained.

Tanner informed me that shaman Don Lucio of Kapitari on the Rio Nanay has more than 1,000 cultivated vines.

*Correspondence from Matthew Watherston, founder of the Temple of the Way of Light:*

> This subject is of course an important and ongoing conversation and significant focus for us at the Temple! I shared with you last year our plans redeveloping sustainable ayahuasca plantations in local villages and our intention to establish a new initiative called "Ayni Ayahuasca." This project is still in development although will be launched later this year.
>
> Just around the Temple, we now have over 1,000 vines growing and various different areas with chakruna plants. However, our main interest is to support local communities to grow vine and to generate income over the long term. The plan is to do this through successional polycropping (i.e., regenerating degraded/slash-and-burnt lands through planting fast-, medium-, and slow-growing plants/trees with ayahuasca planted initially to grow up fast-growing trees and then move on to slower growing trees). Therefore, generating yields over 10 years from different plants in the short-, medium-, and long-term with the main goal being reforestation with ayahuasca growing throughout.
>
> We actually do have issues with the supply of vine (not leaf) which we source from the Ucayali, and we are finding that it is becoming harder and harder to source and more and more expensive. And I hear the same for other centers too.

According to the people with whom I spoke, it appears that the Rio Tamaya region is a primary area for forest harvesting of ayahuasca. Comments about availability of vine are mixed, with some people expressing that harvesting is becoming more challenging, and others claiming no difficulty obtaining the vine. At this time, there appears to be no crisis with regard to supply in the areas surrounding Iquitos and Pucallpa.

## Return to Peru: The Rio Tamaya

A few months later, we returned to Peru to conduct the second part of our ayahuasca field assessment. For many years, Sergio and I have relied consistently on Jaime Baca



Rio Tamaya
Photo ©2018 Chris Kilham



Moises Arevalo with ayahuasca.
Photo ©2018 Chris Kilham

for logistical support and to captain any boat we use. He has proven highly resourceful and has always added great value to our investigations. For our trip to the Rio Tamaya, Jaime found a good boat: aluminum, covered, and about 18 feet long. The middle of the boat was dominated by an enormous plastic petrol barrel that held more than 60 gallons of fuel. A covered boat is essential to prevent burning from the scorching sun and getting drenched by the regular, hard rains.

We shipped out from the port of Pucallpa and headed southeast to the Shipibo native village of Caimito on the Rio Tamaya, where we were previously told there was a large plantation of ayahuasca vine. The river trip from Pucallpa to Caimito took most of the day, from 9:15 am to 5:15 pm, with a brief lunch stop in the ramshackle village of Puerto Alegre. In subsequent days, Puerto Alegre would play a role in some unfortunate incidents involving loss of life.

Caimito lies on the shores of the majestic Lago Imiria, through which the Rio Tamaya runs. When we arrived in Caimito, we were helped with our bags and led to the home of an elderly Shipibo woman named Elizabeth Ancon Amaringo, who graciously invited us to share her house. Each building in the village was equipped with solar panels, so we had electricity and light. Kleylie, who speaks fluent Shipibo and grew up in that area, proved a great help in translating. She also turned out to be well-known and much admired as a young, successful native woman who is doing good work in Pucallpa. Many people either knew her or knew of her, and expressed pride in her pursuit of a degree in agroforestry engineering. To many villagers, Kleylie is an inspiration.

After we stored our gear in Elizabeth's house, we met with some village men who explained that except for a few vines here and there, no ayahuasca grows in Caimito. We asked about the plantation we'd heard of and were told that there was no such plantation. The information we had received was utterly worthless. This happens sometimes.

A man named Moises Arevalo, who is the cousin of the famous Shipibo shaman Guillermo Arevalo, told us that there used to be plenty of ayahuasca around Caimito, but that most of it was harvested and sold. According to Arevalo and another man, the nearby village of Junin Pablo was the center of a bustling trade in ayahuasca vine where ayahuasca vine harvesters and traders lived. Arevalo took us around Caimito, showed us some remaining vines, and explained that they were used only for local ceremonies.

As evening approached, a woman in the village prepared fish, rice, and plantains (*Musa* × *paradisiaca*, Musaceae) for us. This is fairly typical in such villages, where women and men will prepare food for visitors to supplement their income. Arevalo stopped by and offered me ayahuasca brew that he and a few other men from the village were preparing to drink. I declined the offer because it is advisable to wait many hours between eating food and drinking ayahuasca. But I was touched and grateful for his kind offer.

In the morning, we bathed in the lake because there is no running water in Caimito. The village has numerous well pumps, none of which work. After the morning bath, I made coffee, which both Sergio and I consider absolutely essential on any project. After our crew drank coffee and ate biscuits, we gathered our gear and headed back out onto the river into a heavy morning mist.

After about 40 minutes, we arrived in Junin Pablo, a 3,550-hectare (8,772-acre) community along Lago Imiria. Fourteen villages occupy the shores of the lake. Along the way, Sergio twice smelled the scent of coca (*Erythroxylum coca*, Erythroxylaceae) cooking in the jungle. We did not realize it at the time, but the area where we were traveling is heavily occupied by armed *narco* traffickers and is largely a lawless region.

Once we landed at Junin Pablo, we were greeted by several men who cheerfully helped us with our boat and belongings. We stored our gear temporarily at the home of a man named Matteo Teco, one of the primary ayahuasca harvesters and dealers in the village. Jaime was aided by a couple of men from the village in stashing the outboard motor in a secure building to avoid theft.

According to Matteo, ayahuasca buyers regularly show up in Junin Pablo to acquire ayahuasca vine. Alternately, harvesters in Junin Pablo boat their collected vine to Pucallpa and sell it at the waterfront to dealers who remain on the lookout for shipments. Matteo says that harvesters have their favorite spots, and that there is a lot of vine growing in the areas around Lago Imiria.

We set off to find lodging for our stay in Junin Pablo. In the clouded heat, we headed over to a four-room lodge, which turned out to be occupied. We were directed to another spartan, four-room building in the village, where we were able to secure a place to stay.

Once we had secured lodging, Matteo took us on a tour of the many ayahuasca vines growing in the village, some young and some old. In the course of the village tour, he also showed us chakruna that had gone to seed.



Matteo Teco with ayahuasca.
Photo ©2018 Chris Kilham

Junin Pablo proved sweltering, dusty, and hot during the day, with intermittent, epic rain. It also proved a feasting ground for hungry, aggressive mosquitoes. After the trip, I succumbed to a fierce case of malaria that would set me back for the better part of a month. (I was able to successfully treat the disease using *Artemisia annua* [Asteraceae], the Chinese herb from which the effective antimalarial compound artemisinin is derived.)

The village features wide dirt avenues that were swept every day. This minimizes snake traffic and clears away the desiccated dog feces that seems to be everywhere. The materials swept up are burned along the edges of the avenues, and this keeps the village quite neat overall. Luciano, the owner of the place where we stayed, told us of a nearby area called Chaoya where a lot of ayahuasca can be found in the forest. This, we learned later, was one of Matteo Teco's primary harvesting spots.

### Junin Pablo Ayahuasca Committee

In the late morning of our first day in Junin Pablo, Sergio, Kleylie, and I met in a small community center building with the village chief Ronald Cauper and a man named Nikeas Vasquez, who is the head of a newly formed ayahuasca committee that was established to put some order to the wild-harvesting in the area. Jaime did not join us, as he was already engaged in a marathon poker game.

According to the two men, buyers from Pucallpa started arriving in Junin Pablo in 2014, requesting ayahuasca. Around the same time, other people showed up from Pucallpa and began to harvest vine without permission from the local communities. In 2017, Vasquez and a few others started a committee to develop a plan for wild harvesting. Both Cauper and Vasquez told us that when harvesters sell to visitors who come to Junin Pablo, they get only 40 soles per fresh 30-kg bundle. At the current exchange rate, this is about $12.17, a poor wage for difficult forest labor.

Cauper and Vasquez also told us of a US group that arrived in the community in 2017 and proposed a project to purchase large quantities of vine. According to the two men, the group offered to pay 100 soles per 30-kg bundle to start, 200 soles once the project was up and running, and eventually 500 soles per bundle. In this scheme, the harvesters would receive the money. Supposedly, the Americans wanted people from the community to cook pure vine, without any chakruna, to ship out. This proposed project has not yet begun, but Cauper and Vasquez were hopeful about the prospect.

Shipping ayahuasca out of Peru to other countries like Costa Rica, Mexico, and the United States may serve the interests of people who wish to drink outside of Peru, but it puts significant pressure on the supply of vine. Demand for ayahuasca continues apace, and exports could well prove a big threat to sustainability.

> Matteo tells us that more people are coming into the Lago Imiria area from outside, pulling out 60 or 70 loads at a time, and charging 30 soles per bundle. There is a gold rush mentality, and outside harvesters may not leave enough of each vine to regenerate.

Cauper and Vasquez expressed eagerness for financial support for their committee. They also told us that some academic investigators were in the village conducting an ayahuasca survey, and they suggested that we might want to meet and speak with them.

As we spoke with different people, we heard varying prices for ayahuasca. We were told that harvesters get 30 or 40 soles per 30-kg bundle. We were also told by several people that vine sells for 80 soles per 30-kg bundle to traders at the port of Pucallpa.

### Conversations with Matteo Teco

As we spent several days in the Rio Tamaya area, we had ample opportunity for conversation. In the case of Matteo Teco, we spoke several times. Matteo has been involved with ayahuasca harvesting for about five years, since 2013. He supplies vine to about 50 customers on a regular basis, harvesting an average of 120 30-kg bundles, or about 3,600 kg of

vine, per month. He said that over time he has had to walk an additional 10 minutes into the forest to obtain ayahuasca.

Matteo and others told us that the vine sells for 80 soles per bundle to buyers in Pucallpa. Matteo hires other harvesters and pays them 30 soles per bundle. He also pays 5 soles for each bundle for boat transport to Pucallpa, where he ships every week or every other week. In the case of shipping vine to Pucallpa, his gross profit per bundle, after shipping, is 45 soles. In this case, a month's harvest of 120 30-kg bundles, or a total of 3,600 kg of vine, would result in 5,400 soles profit, or roughly $1,644.

Hammes Werner Reinecke, Michael Coe, Laura Dev, and Marcos Maynas. Photo ©2018 Chris Kilham



Matteo tells us that more people are coming into the Lago Imiria area from outside, pulling out 60 or 70 loads at a time, and charging 30 soles per bundle. There is a gold rush mentality, and outside harvesters may not leave enough of each vine to regenerate. Matteo says that the local areas of Chaoya, Saweta, Mapuye, and Michaya are rich with vine. The big problem is that narco traffickers control a lot of territory where there is vine, and one has to get their permission to go into many areas to avoid getting shot. There is a great deal of coca cultivation and cooking in the general area, and virtually no law enforcement. By law, coca cultivation and refining are illegal, but we saw no police or coast guard patrols in the Rio Tamaya area during our stay.

On our second morning in Junin Pablo, we were informed that a few hours earlier three people were found shot dead nearby, possibly by robbers who work the river. The victims were apparently from outside the area, and details were sketchy. A couple of people cautioned us about Puerto Alegre, where we had previously stopped for lunch, saying that robbers and narcos frequent that village. It definitely had the look of a seedy frontier town. We were told that robbers usually have rifles, and that narcos in the region often carry automatic weapons. The majority of arms in villages, by contrast, are single-shot shotguns. The disparity in firepower keeps the villagers cautious.

## A Student Ayahuasca Survey

We set out to find the academic group we'd been told of by Cauper and Vasquez, at a small lodging in the village. Under a blue tarp awning at a picnic bench, we met Michael Coe, a PhD candidate from the University of Hawaii at Manoa; Laura Dev, a master's student at UC Berkeley; and Marcos Maynas and Hammes Werner Reinecke, both from Alianza Arkana, an alliance that promotes the interests of the Amazon rainforest, indigenous peoples, and rainforest biodiversity. Alianza Arkana made for a natural participant in an ayahuasca sustainability survey.

Lago Imiria
Photo ©2018 Chris Kilham



The information they were gathering, as they described to us, included population density of ayahuasca vine, community benefits related to harvesting and trade, genetic diversity of cultivated vine, and the long-term impact of wild-harvesting. Coe explained that he needed to finish his doctoral thesis, and that the data collection from 2018 was essential to that end. Financial support for the project had dried up, so Coe was footing the bill.

According to the four, in 2017, they plotted several plots of forest 2-3 hectares in size around Lago Imiria, and tagged a number of ayahuasca vines in those plots. This year, they returned to record the vines' size and growth. When they revisited the plots, the team discovered a high level of harvesting. More tagged vines were gone than remained. Coe made it clear that they considered one year to be an inadequate amount of time to assess ayahuasca sustainability, and that he wanted to continue for five more years. I suggested to the group that they might want to supplement their knowledge by speaking with the village traders, who seemed very well informed about the supply.

## Conversation with Antonio Sinarhua Cauper

Antonio Cauper lives in a somewhat remote corner of Junin Pablo by the river. He said that he is in touch with 14 people who buy vine on a regular basis, and he supplies them all. He also supplies Jimmy Rojas in Pucallpa, who we interviewed for the first part of our ayahuasca assessment. Antonio told us that he would like to cook and sell finished ayahuasca, but has found no interest from buyers. That was not a surprise to me, as people cook ayahuasca with many different proportions of vine and leaf.

According to Antonio, orders come in every day, typically around 15-20 bundles per customer. Amenities may be modest in Junin Pablo, but many people have mobile phones, so he is able to know what customers need. He spends much of his time in the forest cutting vine and said that he has to go several minutes further into the woods than before to harvest. Antonio gets between 60 and 80 soles per bundle of vine. He told us that when he brings a boatload of ayahuasca to Pucallpa, he is very easily spotted by buyers who go to his boat to purchase what he brings.

Antonio explained that two types of ayahuasca vine grow in the area: *amarilla* (yellow) and *negra* (black). Amarilla is preferred because it looks nicer cooking in a pot, whereas the negra looks burned. I had heard similar stories when conducting the first part of our assessment in January 2018.

At first, Antonio was reluctant to show us any loads of vine. But he relaxed as we hung out and eventually disappeared briefly, returning with a bundle of vine on his back. He estimated the vine to be 20 years of age, and said that there was a lot of vine of similar size and age in the forest, and some much bigger and older. He claimed to know of 80-year-old vines where he harvests.

For 27 years, Antonio has worked with ayahuasca. This makes him one of the most experienced harvesters in the Peruvian Amazon, and certainly one of the most longtime suppliers. For the last five years, since 2013, he has witnessed a significant increase in demand. I asked him if he is

Antonio Cauper with a boatload of ayahuasca.
Photo ©2018 Chris Kilham



happy with the money he makes, and he said "no." I then asked him if he wants more business, to which he replied "yes."

After speaking with us for a while, Antonio decided that it was okay to show us a boatload of newly harvested vine. We walked down the road with him a bit, and then cut through a grassy path to the lake shore, where he had stashed a boat in high grass, obscured by a tree. He pulled the boat over so we could get a better look. The boat was filled with approximately 25 bundles of the same 20-year-old vine, each bundle weighing about 30 kg. At 60 soles per bundle, he'd gross about 1,500 soles altogether, or a little more than $456. At 80 soles per bundle, he'd make about 2,000 soles, or about $609. It is a modest sum for hard, sweaty work in a forest filled with snakes and in an area populated by narco traffickers.

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### We Exit

During our stay in Junin Pablo, we were repeatedly cautioned regarding our safety getting back to the Rio Ucayali and to Pucallpa, via the Rio Tamaya. The morning we planned to leave, two more people were found shot dead nearby, adding to local tensions. Chief Ronald Cauper and Nikeas Vasquez sought us out to advise us to hire an armed guard for the trip out. Luciano, the host of our lodging, had previously introduced us to a guard named Fermine, who we hired for the boat trip. Fermine came with a shotgun and a pocket full of shells, little defense against automatic weapons of narco traffickers or the rifles of pirates. Still, an armed guard can serve as a warning.

We departed Junin Pablo at 7:20 am and made a dead run to Pucallpa, exiting the Rio Tamaya and arriving in Pucallpa at noon sharp.

### Conversation with Pucallpa Trader Carlos Chauca

Once ayahuasca vine hits the docks of Pucallpa, much of it makes its way to various ayahuasca retreats and to people who cook and resell ayahuasca for a living. We know from the survey we conducted in January 2018 that ayahuasca centers in and around Pucallpa and Iquitos pay upwards of 150 soles per bundle. One center outside of Pucallpa we interviewed for the last survey, Los Cielos, pays significantly more. Bundles of ayahuasca tied together with other vines get transferred into sacks, which then make their way to these customers. I personally have observed dozens of shipments of such sacks at centers, and have observed and participated in the making of ayahuasca with the vines contained in those sacks. The trade in vine and the brewing of ayahuasca are highly popular now, and ayahuasca brew is very much in demand.

In between harvesters like Matteo Teco and Antonio Cauper, and the ayahuasca centers and cookers, traders purchase and resell vine. One such trader is Carlos Chauca in Pucallpa.

Carlos sells cat's claw (both species, *Uncaria tomentosa* and *U. guianensis*, Rubiaceae), *chuchuhuasi* (*Maytenus krukovii*, Celastraceae), ayahuasca vine, and copaiba (*Copaifera officinalis*, Fabaceae) oleoresin. Sergio and I visited with Carlos at his warehouse distribution center to gather information about his trade in ayahuasca vine. During our time there, several men were loading a large truck with sacks of cat's claw.

Carlos purchases around 700-800 kg of ayahuasca vine per month, the equivalent of about 23-26 30-kg sacks or bundles. He stores the vine rather unceremoniously in the corner of his warehouse and sells it for 3.5 soles per kg, equivalent to 105 soles per 30-kg bundle. Carlos also has ayahuasca brew prepared for him, which he sells for 60 soles per liter, the lowest price we have encountered. Previous prices we have been given for prepared ayahuasca have ranged between 100 and 820 soles (between $30 and $250) per liter. Carlos described his sales of ayahuasca as incidental but steady relative to the sales of the other botanicals he trades.



Carlos Chauca with chuchuhuasi (*Maytenus krukovii*)
Photo ©2018 Chris Kilham



Our Team: Jaime Baca, Kleylie Vargas, Chris Kilham, and Sergio Cam.
Photo ©2018 Chris Kilham

### Summary

There is no adequate way to assess how much vine remains in the vast Amazonian forest. But both Matteo Teco and Antonio Cauper have described areas of abundant and largely untouched wild vine around the shores of Lago Imiria. Due to heavy rains and deep mud, our team did not go into the forest with either trader to harvest. This would be an obvious next step.

As far as I can determine, the supply of wild ayahuasca is holding for now, but this will end at some point. The popularity of ayahuasca appears to be steadily increasing, and demand for the brew outside of Peru is on the rise as well. Now, it is no longer simply a matter of supplying small village ceremonies and ayahuasca centers in Pucallpa and Iquitos. Demand from outside of Peru for prepared ayahuasca is compounding the pressure on wild populations of vine, and this demand will likely hasten the scarcity of the plant over time.

This is a classic situation in the herbal trade. A wild product becomes popular, and this puts pressure on populations of that plant. Clearly, cultivation is the way forward. Cultivation assures sustainability and offers full traceability of materials. It also opens up new economic opportunities for individuals and communities. Since ayahuasca likes to climb trees, vines can be planted in wooded areas, and the trees can be preserved because the ayahuasca, not timber, becomes the focus of economic gain.

Cultivation of ayahuasca is very much on people's minds, both from a sustainability standpoint and from a cost perspective. These are great advantages. Additionally, there is a sense among many that ayahuasca, even if it is relatively plentiful in these areas, will sooner or later become endangered if cultivation efforts are not widely initiated.

The work my collaborators and I have conducted is by no means full and complete. Rather, it is an approximation, a snapshot, assembled thanks to the help of a great many people. So far, we have been successful in getting good and relatively consistent information from key players in ayahuasca harvesting, cultivation, preparation, and trade. At the same time, it is obvious to me and my teammates that we need to continue these assessments.


### Acknowledgements

Any project of this kind is a team effort. I especially wish to thank Sergio Cam, Juan Maldonado, Jaime Baca, and Kleylie Vargas. Without their participation and combined talents, I could not have conducted this work. Thanks also to the various individuals in Iquitos, Pucallpa, and along the Rio Tamaya who took time to aid us, showed us around, allowed us to take photographs, and provided the information included in this report. HG

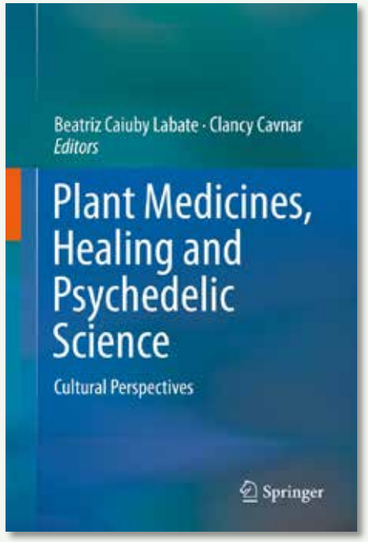


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**This is a classic situation in the herbal trade. A wild product becomes popular, and this puts pressure on populations of that plant. Clearly, cultivation is the way forward. Cultivation assures sustainability and offers full traceability of materials. It also opens up new economic opportunities for individuals and communities. Since ayahuasca likes to climb trees, vines can be planted in wooded areas, and the trees can be preserved because the ayahuasca, not timber, becomes the focus of economic gain.**

BOOK REVIEWS

***Plant Medicines, Healing and Psychedelic Science: Cultural Perspectives*** by Beatriz Caiuby Labate and Clancy Cavnar, eds. Cham, Switzerland: Springer International Publishing; 2018. Hardcover, 227 pages. ISBN: 978-3-319-76719-2. $169.99.




This book describes its aims in terms of the "intersections of three dimensions:" the history of psychedelics in healing and psychiatry; psychoactive compounds and their effects in humans; and traditional healing. It also claims a broad potential audience of healers, academics, and students. Such an expansive scope indicates lofty ambitions that proved difficult to fulfill. The reader is bound to be challenged by this text, which certainly weighs heavily toward the sociological-political-philosophical spectrum, as opposed to the botanical-pharmacological-anthropological. Its vocabulary is similarly esoteric. More than once, this reviewer had to reach for another reference to decipher terms such as "therianthrope" (a mythical shape-shifting human), "ontoseismic" ("earthquake of being," used to describe the psychological effect of a first psychedelic experience), and "unEnglishable" — all ineffable manifestations of entheogenic ("god-within") pharmacology and words guaranteed to challenge your competitors at your next Mensa Scrabble match.

The first chapter addresses the ever-present friction between clinical or cultural uses of mind-altering plants and drugs versus their recreational or "non-clinical" uses. The latter applications often lead to a "fall from grace" in the form of almost universal prohibition outside of indigenous refugia. The growing audiences at psychedelic symposia, coupled with renewed medical research on these agents, is said to reflect a renaissance in the status of these substances. The next chapter highlights this situation with respect to peyote (*Lophophora williamsii,* Cactaceae), an endangered species native to northern Mexico and the Rio Grande border, and describes a so-called "race problem:" possession of peyote is allowed for Wixárika ("Huichol") indigenous peoples and members of the Native American Church, but it is prohibited for others.

This concept is extended in Chapter 3, which describes the contemporary situation in the Sierra Mazateca Mountains where psychonautic pilgrims gather leaves of "divine sage" (*Salvia divinorum*, Lamiaceae) or the "magic mushrooms" of the genus *Psilocybe* (Hymenogastraceae), often for uses and contexts quite different from their ritual- and faith-based antecedents in Mexico. These chapters are missing the fascinating backstories of how indigenous use of these sacraments was suppressed by the Catholic clergy, or, in the case of peyote, how it was a mainstream US medicine for a time in the 19th century, much like cannabis (*Cannabis* spp., Cannabaceae). (See Edward F. Anderson's *Peyote: The Divine Cactus* for additional insights.[1])

Some of this ground is made up in Chapter 4, in which the traditional usage of *S. divinorum* is discussed in detail, along with its adoption and adaptation to countercultural use, usually by smoking of concentrates. The book's momentum is maintained in the next chapter, which thoroughly explores the kratom (*Mitragyna speciosa*, Rubiaceae) phenomenon. This Southeast Asian plant harbors morphine-like alkaloids that possess analgesic properties and are claimed to be able to treat opioid addiction. The topic is of critical current interest, as the plant's proponents tout its medical attributes while the US Drug Enforcement Administration (DEA) is now in its third year of attempts to place the kratom alkaloids in Schedule I of the Controlled Substances Act before science has had the opportunity to fully and critically appraise the plant's pros and cons. As stated on pages 79-80: "it appeared that kratom might be one in a string of many drugs that essentially ended up in the pharmacological scrap heap of American drug regulation."

Chapter 6 examines the curious case of ayahuasca (also known as *yajé* or *hoasca*), which traditionally is a mixture of the liana *Banisteriopsis caapi* (Malpighiaceae) and the leaves of *Psychotria viridis* (Rubiaceae). The use of this psychedelic brew by Amazonian indigenous tribes has spread to syncretic religious groups in Brazil and subsequently elsewhere, creating the strange situation in which the DEA has become an arbiter of what might constitute true religion in the application of ayahuasca sacraments. Chapter 7 examines the thorny issues of how psilocybin and mushrooms might be integrated into psychiatry, whether chemical isolates are necessary (as opposed to whole mushrooms with their "entourage effect"), and problems related to proper blinding in clinical trials.[2] This theme is examined in greater detail in Chapter 8, which focuses specifically on this single-chemical versus whole-plant argument. For the herbally oriented, the debate will be quite familiar, and readers may enjoy the bias of Sidarta Ribeiro, PhD, toward whole-plant preparations. He claims that synthetics are the true "snake oil" and have not fulfilled their promise.

Chapter 9 tackles the huge problems associated with placebo blinding in psychedelic studies. Placebo responses have been rising for decades, and the problem is more acute with respect to any drug with psychoactive effects, or when only subjective measures from the patient are available (e.g., with pain conditions).[3,4] Chapter 10 pertains to do-it-yourself mycology and presents an interesting history and sociology of the phenomenon surrounding *Psilocybe* mushrooms and their allies, blurring the lines between medicine, recreation, and activism.

Chapter 11 focuses on ayahuasca and presents the challenge of recognizing and categorizing "plant teachers" in their own terms. When Laura Dev asked plant teachers during an ayahuasca experience how humans could collaborate with them in in disseminating knowledge, their response was simple, yet profound: "We build life." In the scheme of Amazonian cosmology and efforts to survive and thrive in an endlessly challenging environment, the message seems entirely appropriate, but does it also hold relevant lessons for modern urban dwellers?

Finally, Chapter 12 examines *N,N*-dimethyltryptamine (DMT), that enigmatic psychedelic lightning strike of a compound. Though it is a trace endogenous chemical in the human brain, DMT is widespread in Amazonian plants and even temperate *Phalaris* spp. (Poaceae) grasses. The problem remains as to how to describe to the uninitiated a phenomenon in which the DMT-affected mind is overwhelmed by whirling fractal geometries and 18 simultaneous tangential thought processes.

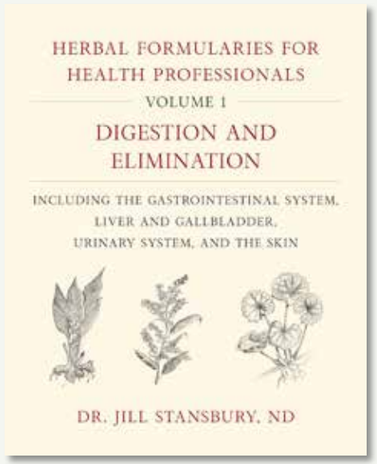
*Plant Medicines, Healing and Psychedelic Science* certainly is a worthy contribution to the sociological literature on psychotropic drugs, but it is a very expensive tome and difficult to use as a reference. Although it has a detailed introduction and chapter headings, it lacks an index that would allow for more thorough exploration of topics. People interested in this topic on botanical, historical, or pharmacological levels may find some classics available on the used book market to be more fruitful purchases, especially those of Richard Schultes[5-7] and Jonathan Ott.[8,9] HG

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**International Cannabis and Cannabinoids Institute**
**Prague, Czech Republic**

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***Herbal Formularies for Health Professionals, Volume I: Digestion and Elimination*** by Jill Stansbury. White River Junction, VT: Chelsea Green Publishing; 2018. Hardcover, 352 pages. ISBN: 9781603587075. $59.95.




*Herbal Formularies for Health Professionals* by Jill Stansbury, ND, is a welcome and long-awaited addition to the library of botanical medicine resources for health care practitioners. *Digestion and Elimination*, which focuses on the gastrointestinal system, liver and gallbladder, urinary system, and skin, is the first volume of a planned series of five books. The second volume, *Circulation and Respiration*, was published in September 2018.

Volume 1 is outstanding in that it provides an overview of herbal formulation that is based on herbal tradition, the author's clinical experience, and current scientific understanding. This book can certainly be used as a go-to reference for herbal formulas. At its core, and by providing hundreds of formulas, Stansbury has bestowed readers with a clinically pragmatic guide to perfecting their own herbal formulating. As such, this book will be useful for both the beginning and the experienced practitioner.

The book begins with an introduction to herbal formulation. In Chapter 1, the author presents an elegantly simple strategy for herbal formulating based on the combination of base herbs, specific herbs, and synergistic herbs. The base, or lead, herb nourishes the main organ system affected. The specific herb is precisely matched to a certain aspect of the patient's health concern, and the synergistic herb supports the base herb's effect by addressing other contributing factors. This triangle strategy underlies the many herbal formulas spread throughout the remaining chapters. It also speaks to the importance of knowing individual herbs in order to place them into effective formulas. To that end, while the emphasis of *Herbal Formularies for Health Professionals* is,

rightly so, formulas, information about individual herbs also is found throughout the book.

The last four chapters focus on conditions associated with the "emunctory" organs, a medical term that refers to the organs of elimination. Chapter topics include gastrointestinal and biliary conditions, liver and gallbladder conditions, renal and urinary conditions, and dermatologic conditions. Within each of these chapters, health conditions are discussed and a variety of herbal formulas presented.

For instance, there is a section in the gastrointestinal and biliary conditions chapter on herbal formulas for irritable bowel syndrome (IBS). A brief discussion of pathophysiology and the factors that contribute to IBS is followed by an explanation and listing of carminative (flatulence-relieving) herbs, which are essential to the management of IBS. From there, specific herbal formulas are presented for the following: IBS with painful gas and cramping, IBS-diarrhea predominant, IBS with blood and/or mucus diarrhea, IBS-constipation predominant, IBS stimulated by stress, IBS in allergic individuals, and IBS in association with PMS or hormonal fluctuations. Each herbal formula includes a suggested dosage, an explanation of the formula's purpose, and a description of the included herbs. Throughout the book, most formulas emphasize Western herbs, although there are some traditional Asian herbs included as well.

Using this template, the reader gains immediate understanding of, in the example of IBS, the versatility and importance of herbs such as chamomile (*Matricaria chamomilla*, Asteraceae) and licorice (*Glycyrrhiza glabra*, Fabaceae) and the specific IBS indications for herbs such as yarrow (*Achillea millefolium*, Asteraceae), lemon balm (*Melissa officinalis,* Lamiaceae), and dong quai (*Angelica sinensis*, Apiaceae) to name just a few. Furthermore, the reader comes away with many formulas that specifically target unique presentations of various symptoms. These formulas can be incorporated immediately into clinical practice. This pattern of presentation is followed throughout the book.

As the previous example illustrates, this book is comprehensive in both its breadth and its depth. After the discussion of each condition, there is an alphabetical listing of herbs used for that condition, each with a monograph. At the end of the volume, there is a listing of scientific names and corresponding common names, as well as a glossary of therapeutic terms. The index is outstanding and includes both conditions and herbs. Under each indexed herb, its respective formulas are organized by condition. The index itself is an incredible resource.

Stansbury is an experienced practitioner who has gleaned wisdom from her global travels to indigenous communities, devoted study of traditional herbal texts and current scientific literature, conversations with herbalist peers, and her own clinical practice. She has, quite remarkably, distilled this vast treasure trove of knowledge into a gem of a practical clinical resource. If you are a health practitioner looking for trustworthy and clinically tested herbal formulas for digestion- and elimination-related conditions, the first volume of *Herbal Formularies for Health Professionals* is a must-have.

In the introduction, the author writes: "It is my sincere hope that this book helps you in your clinical work and efforts to heal people." Dr. Stansbury, you have succeeded, and I, for one, thank you for this amazing gift. I hope that this book finds itself in the offices of all health practitioners who aspire to harness the amazing healing potential of plants. Their patients will be better for it. HG

**—Lise Alschuler, ND, FABNO**
**Professor of Clinical Medicine,**
**University of Arizona Center for Integrative Medicine**
**Executive Director, TAP Integrative**
**Tucson, Arizona**

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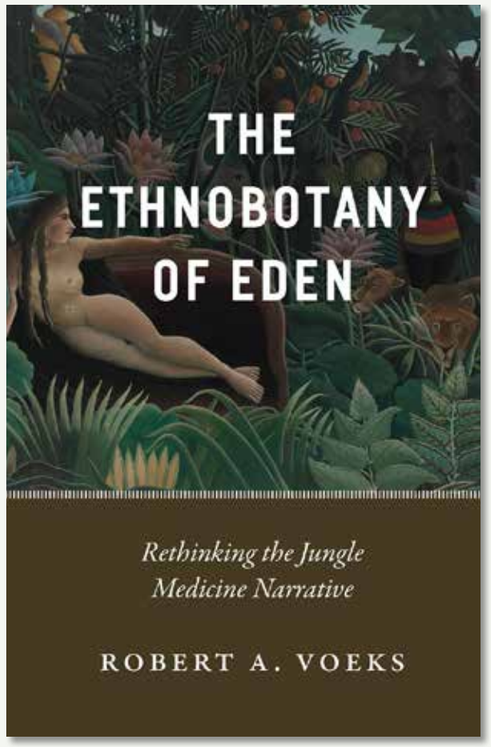
***The Ethnobotany of Eden: Rethinking the Jungle Medicine Narrative*** by Robert A. Voeks. Chicago, IL: The University of Chicago Press; 2018. Hardcover, 328 pages. ISBN: 9780226547718. $45.00.

This is a remarkable book that I found engaging and fascinating. It is, in many ways, a tour de force. *The Ethnobotany of Eden* explores the history of medicine, voyages of discovery, and the evolution of natural products-derived medicine. It is also a tribute to female healers, a reminder of the horrors of the rubber boom, a psychological evaluation of early explorers of the "New World" and their patrons, and a sweeping global analysis of how people manage, use, and disperse knowledge about plant medicines and food. That may seem to be a lot to cover in a book of 328 pages. In fact, these topics account for only a portion of the rich narrative contained within this book.

The author, Robert Voeks, PhD, is a highly respected investigator, scholar, professor, and geographer. He has conducted field research in Brazil, northern Borneo, and Mozambique, and has been the editor of the journal *Economic Botany* for the past eight years. He uses his experience to present an amazing diversity of research findings in this book. In fact, there are 41 pages of references and citations from at least 17 countries in Asia, Africa, and Latin America. There are also 50 historic plates and black-and-white photographs. I love the cover, which is Henri Rousseau's painting *Le Rêve* ("The Dream").

The book is divided into nine chapters and begins with "God's Medicine Chest," which sets the theme for much of the book. There is a clear focus on the concept of the "Garden of Eden," which has captured the imagination of explorers, their benefactors, and the general public as a living paradise awaiting discovery. This paradise, Voeks writes, would include healing plants from "God's own medicine chest." The reader is reminded of the many drugs that have been developed based on traditional medicine research, including the antimalarial compound artemisinin (from *Artemisia annua*, Asteraceae) for which half of the 2015 Nobel Prize in Physiology or Medicine was awarded to Tu Youyou.

There is also a brief focus on bioprospecting and the environmental rationale of saving rainforests for future miracle cures, and a brief mention of biopiracy. In this chapter, the following statement is made: "In the end, however, … this compelling story helped spread the gospel of *save the rainforest,* [but] ... no lifesaving drugs were developed, no diseases were cured, no fortunes were made and no tropical rainforests were saved." This theme, occasionally repeated elsewhere, is incorrect and must be challenged with more factual information. For example, in December 2012, the US Food and Drug Administration (FDA) approved crofelemer (sold under the trade name Mytesi; Napo Pharmaceuticals; San Francisco, California) — the first oral botanical drug ever approved under the FDA's Botanical Drug Guidelines — for the treatment of HIV-related diarrhea. Crofelemer was discovered and developed initially by Shaman Pharmaceuticals using an ethnobotanical and ethnomedical drug-discovery methodology and was derived from the Amazonian rainforest plant *Croton lechleri* (Euphorbiaceae) during a 25-year research and development program. In addition, *Plants, People, and Culture: The Science of Ethnobotany* (WH Freeman & Co.; 1996) by Paul Cox, PhD, and Michael Balick, PhD, provides examples of 50 pharmaceutical drugs that have been developed in the last 75 years, some of which are based on medicinal or toxic plants from the rainforest. The $8-billion market for botanical dietary supplements in the United States also includes numerous products based on rainforest or other tropical species that play a significant role in human health. Another missing element is an elaboration of the conservation projects funded by drug-discovery programs that have been started and maintained in numerous tropical nations and communities specifically to conserve both the tropical forest ecosystems and the plant medicines contained within them for the benefit of local communities.



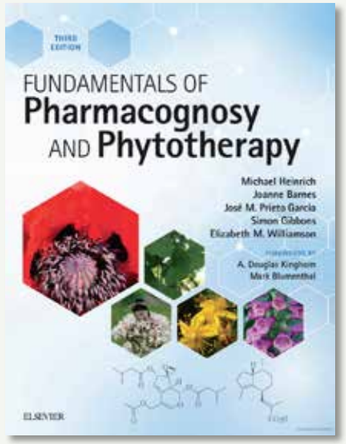

I found the chapters "Weeds in the Garden" and "Gender and Healing" particularly inspiring because the author focuses on the large number of plant medicines that are found in secondary forests and, literally, as weeds in gardens. These weeds represent "disturbance pharmacopeias," as the author describes them, and these plants often contain chemical compounds that help them resist insects, birds, small mammals, and other plants that seek to compete for light, nutrients, and space. In the chapter "Gender and Healing," Voeks elegantly pays homage to the extremely important roles of female healers, or "master herbalists," in many cultures, who often have discovered and used plant medicines with greater frequency and depth of knowledge than their male counterparts. This also helps correct a common misconception that traditional medicine is and has been the domain of male healers.

The world's fascination with traditional medicine and knowledge from tropical rainforests has never been stronger. There is a growing global focus, for example, on the rainforest species ayahuasca (*Banisteriopsis caapi*, Malpighiaceae) and its admixtures, which are discussed in the book. That, combined with the global interest in plant medicines as a component of integrative medical practices and primary health care, particularly in underserved areas, suggests that there is much more to be discovered, developed, collected, cultivated, and appreciated from tropical forests.

This book will be useful in the classroom as an important reference and enjoyed by scholars from a broad diversity of disciplines. While there are other books that consider some of the themes presented in this remarkable scholarly work, I have never encountered such a detailed and rich synthesis of so many fields of interrelated knowledge. HG

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***Fundamentals of Pharmacognosy and Phytotherapy*, 3rd edition,** by Michael Heinrich, Joanne Barnes, José M. Prieto Garcia, Simon Gibbons, and Elizabeth M. Williamson. New York, NY: Elsevier; 2018. Softcover, 360 pages. ISBN: 9780702070082. $59.99.




*Fundamentals of Pharmacognosy and Phytotherapy* has been revised, updated, and improved with this third edition, which includes online resources and is available as an e-book. Having researched natural products chemistry for more than 25 years and spent the last decade training students, particularly graduate students, in this field, I consider this treatise to be an essential addition to the library of anyone who strives to explore, understand, or use the chemistry of natural products.

Much of the text of *Fundamentals* resonates with me, based both on my own training in the 1990s and on what I expect of students in 2018. Being a graduate of Purdue University, my education was heavily influenced by the writings of the late Varro ("Tip") Tyler, PhD, and his co-authors, particularly James Robbers, PhD, and Lynn Brady, PhD. As graduate students, we were expected to know essentially everything that was in their classic book *Pharmacognosy* (Lee & Febiger), the ninth edition of which was last published in 1988. Akin to their book, but with a 21st-century treatment, Part A of *Fundamentals* does a nice job of outlining the history of pharmacognosy (including pre-recorded history of native peoples around the globe); describing key discoveries, particularly those that led to mainstream Western pharmaceuticals; and explaining some of the tools and techniques of the trade, including biosynthesis, structure elucidation, and isolation/purification of small molecules. While those topics represent a great deal of content, the information is presented at an introductory level so that students can get a taste for the breadth of subject matter that can fall under the heading of "pharmacognosy."

Interestingly, Part B of the book has more of a biomedical tone, outlining "phytomedicines" based on how they may be used, such as in the cardiovascular or respiratory systems, to treat infectious diseases, or to aid in weight loss. In this manner, I was reminded again of Tyler's writings, particularly what evolved into *Tyler's Herbs of Choice* (CRC Press, 1999). While Part A might be pitched for laboratory researchers, Part B seems more geared toward health care professionals, such as pharmacists, physicians, nurses, or anyone who may be asked questions about the use of herbal remedies. A strength of this book, particularly for students who may be considering a career that involves natural products, is that it gives nearly equal billing to the historical, laboratory, and practitioner sides of pharmacognosy, allowing one to explore them all with enough depth to whet the appetite for further training.

There were many portions of this book that I found myself drawn to with respect to the training of students. In Chapter 7, there were several diagrams and figures of fundamental experiments, such as those that outline the use of a Soxhlet for extractions, how an acid/base alkaloid partition works, and the various components of gas chromatograph and high-performance liquid chromatography systems. In our current "omics" revolution, some may consider such topics a bit pedantic, but I find that many of these techniques and tools are, shockingly, foreign to the generation of students that grew up with computers. At a bare minimum, knowledge of these techniques helps one understand the literature, and in practice, some of those tools can be used as a straightforward way to circumvent a research problem, especially when performing field work in developing countries or working with students that hail from and may one day return to those countries.

Other examples abound, including sections on structure elucidation using mass spectrometry and nuclear magnetic resonance (NMR) spectroscopy, polyketide biosynthesis, and even some of the basics of plant taxonomy. For every section of this book, one could easily find texts that go into those topics in much greater detail (such as Crews et al.[1] for NMR or Dewick[2] for biosynthesis). However, the authors of *Fundamentals* do exactly what the title implies and outline the key concepts, tools, and knowledge base that one needs to begin to study pharmacognosy. I have heard more than one person state that a pharmacognosist is sort of like the proverbial "Jack of all trades," having to know a little bit about a great number of topics. The authors of *Fundamentals* do a great job of providing the foundation one would need to start a journey into the many rich areas of pharmacognosy. If you are a student of pharmacognosy, I suggest learning everything contained within its pages.

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***American Eden: David Hosack, Botany, and Medicine in the Garden of the Early Republic*** by Victoria Johnson. New York, NY: Liveright Publishing Corporation; 2018. Hardcover, 461 pages. ISBN: 9781631494192. $29.95.

Early US history as taught in many schools is often a sanitized, slanted, and semi-fictionalized account of this country's founding. Perhaps due to the lack of accuracy and the focus on memorizing dates, history is not most people's favorite subject. It is only rather recently, with the incredible popularity of the Broadway musical *Hamilton*, that this once-neglected topic is reaching a wider audience. The book that this musical is based on, Ron Chernow's *Alexander Hamilton* (Penguin Publishing Group, 2005), has, in a time of decreasing book sales, sold more than two million copies. It also has opened people's eyes to the rough-and-tumble world of early US politics, the strengths and flaws of often-idealized historical figures, and the deep interconnectedness of pre- and post-revolutionary American law, finance, medicine, botany, agriculture, industry, and popular culture. For those interested in Chernow's book, as well as the history of botany and medicine in general, I have a recommendation for your to-read list: *American Eden.*

On the flyleaf of Victoria Johnson's new book, she writes: "On a clear morning in July 1804, Alexander Hamilton stepped onto a boat at the edge of the Hudson River. He was bound for a New Jersey dueling ground to settle his bitter dispute with Aaron Burr. Hamilton took just two men with him: his 'second' for the duel, and Dr. David Hosack." The life of this renowned but sadly forgotten surgeon, physician, educator, botanist, and friend to both Hamilton and Burr is explored in this well-written and thoroughly researched book.

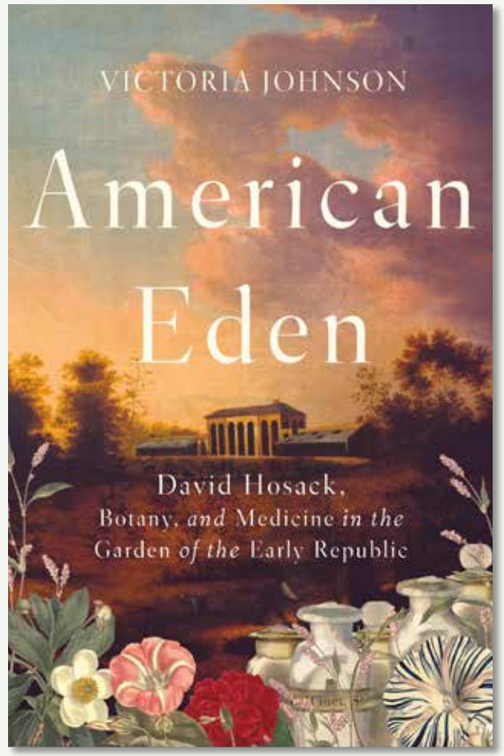
Few people today know of Hosack's (1769-1835) contributions to the United States and, in fact, the world. He created the first botanical garden (Elgin Botanic Garden in New York City) in the United States; introduced new surgical procedures (he was the first to successfully treat a femoral artery aneurysm with a ligature, and to treat a hydrocele by injection); conducted early pharmaceutical research; taught the theory and practice of medicine, materia medica, obstetrics, botany, natural history, and the diseases of women and children at Columbia College, Rutgers College, and Geneva College; and was the founder and first president of the New York Horticultural Society, as well as a founding member and the fourth president of the New York Historical Society.

Hosack not only knew Hamilton (he was the Hamilton family physician who saved his son Philip's life when he contracted a severe and mysterious fever), but also was a friend and confidant of other highly influential men of his time such as Thomas Jefferson, John Adams, Sir Humphry Davy, Senator and New York Governor DeWitt Clinton, and Benjamin Rush, MD (another signer of the Declaration of Independence). Hosack was also a friend and patron of artists, naturalists, and inventors, including Samuel F.B. Morse (who contributed to the invention of the telegraph), the poet and journalist William Cullen Bryant, the painter Thomas Cole (the founder of the Hudson River School), the author Washington Irving, and botanists John Torrey and Amos Eaton.

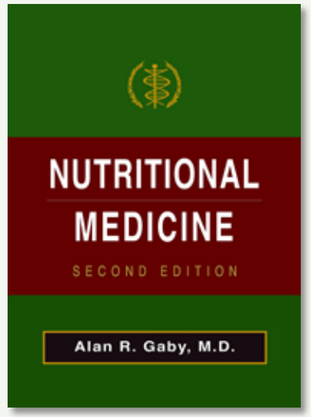
The story of this fascinating polymath touches on many aspects of early American life, but Hosack is probably best remembered as a man who did more than any other "of his generation to foster in his fellow citizens a fascination of plants." According to his student Amos Eaton, it was Hosack's work at the Elgin Botanic Garden and his home in Hyde Park, New York, which was a showplace of horticultural design, that created "the first spark of zeal for botany" among Americans. It is this love of plants and gardening, the quest to create our personal backyard and indoor oases, that continues to this day.

Until now, Hosack's many contributions to this country had mostly been forgotten, but this book vividly tells the story of a unique and brilliant man, whose life was lived in a time of great change, history-making events, and the beginning of the American experiment. HG

**—David Winston, RH (AHG)**
**Dean, David Winston Center for Herbal Studies**
**Director, Herbal Therapeutics Research Library**
**Washington, New Jersey**



BOOK REVIEWS




***Nutritional Medicine*, 2nd edition,** by Alan R. Gaby. Concord, NH: Fritz Perlberg Publishing; 2017. Hardcover, 1,453 pages. ISBN: 978-1-5323-2209-9. $195.00

In today's age of electronic publishing, online and open-access journals, and almost instant access to the scientific literature, a reference book on any biomedical topic might seem quaint at best and instantly obsolete at worst. However, nothing could be further from the truth if context, perspective, and veracity are considered important.

These are critical characteristics of *Nutritional Medicine*, a "natural pharmacopoeia" first published in 2011 after a dedicated 30-year effort by the author, Alan Gaby, MD. The first edition contained 1,358 pages and 16,800 references. Six years later, this second edition contains 96 additional pages and more than 1,700 new references, with a special emphasis on recent clinical trials that help to either confirm or question results of previous research.

While clearly a reference volume, the book opens with an answer to the question "Why nutritional medicine?" and outlines its key components in a 52-page section on the fundamentals of the field. Gaby begins by describing the need to "clean up" the average diet by emphasizing the positive and minimizing the negative attributes of specific food constituents and overall dietary patterns.

Aspects of clinical assessment also are touched on throughout the book. Thereafter, nutritional therapies, especially dietary supplements, are described to help individualize treatment, particularly through a clear understanding of their additive and synergistic effects.

Spanning more than 250 pages, 60 short chapters are dedicated to the basic "tools" of nutritional medicine, including individual vitamins, minerals, amino acids, and other therapeutic agents such as dietary bioactive components (e.g., carotenoids, flavonoids, probiotics, etc.). The author states that "this is not a book on herbal medicine," and lamentably little attention is devoted to botanical medicine and its complementary role in the practice of nutritional medicine. Instead, readers are directed to the excellent but dated *Herbal Medicine* (Beaconsfield Publishers, 1988) by R.F. Weiss and *The Complete German Commission E Monographs* (Integrative Medicine Communications, 1998) edited by Blumenthal et al. In the one chapter on "Selected Herbal Treatments," Gaby covers only three products — ginkgo (*Ginkgo biloba*, Ginkgoaceae), ginger (*Zingiber officinale*, Zingiberaceae), and licorice (*Glycyrrhiza glabra*, Fabaceae) root — with an emphasis on adverse effects and only brief comments on their clinical indications. Under selected chapters on specific conditions, reference is made to St. John's wort (*Hypericum perforatum*, Hypericaceae) for depression; pygeum (*Pygeum africanum* syn. *Prunus africana*, Rosaceae), saw palmetto (*Serenoa repens*, Arecaceae), and stinging nettle (*Urtica dioica*, Urticaceae) for benign prostatic hyperplasia; lemon balm (*Melissa officinalis*, Lamiaceae) for herpes simplex; *Phyllanthus amarus* (Phyllanthaceae) for jaundice; and hawthorn (*Crataegus laevigata* syn. *C. oxyacantha*, Rosaceae) for congestive heart failure.

The largest section of the book comprises 264 chapters that discuss more than 400 health conditions, symptoms, and specific diseases, and the nutritional options for their treatment. The section covers a large swath of medical fields and includes entries on cardiology, dermatology, gastroenterology, hematology, hepatology, nephrology, neurology, ophthalmology, otolaryngology, psychiatry, pulmonology, rheumatology, and urology as well as specific topics in endocrine disorders, gynecology, infectious diseases, obstetrics, pediatrics, and oral diseases. Additional chapters address genetic disorders, drug-nutrient interactions, and some specific modalities like anesthesiology, detoxification, intravenous nutrient therapies, and radiation therapy.

While all the reference information provided is evidence-based, some chapters end with illuminating and intriguing summaries of the author's personal clinical approach and recommendations regarding the condition. Gaby makes it clear that these comments are intended to give the reader an idea about his thinking processes and preferred order of treatment options. Thus, it is noteworthy that the preface contains a warning/disclaimer that the information provided in the book is for educational purposes only and about the possibility of errors, omissions, and misinterpretations despite the extensive efforts made to assure the accuracy of the contents.

Like the first edition, the second edition of *Nutritional Medicine* provides an evidence-based but clinically oriented guide for the prevention and treatment of an extensive array of physical and mental conditions. As most chapters range from one to four pages, the information provided in this volume is neither comprehensive nor extremely detailed. Each presentation is concise, clearly written, and touches on the essential knowledge most often needed by a practitioner such as clinical indications, dosage and preparation information, pharmacokinetics, and adverse effects including nutrient-drug interactions. This weighty tome should provide many practitioners with a quick but authoritative check on critical facts that can serve as a ready first step for a more thorough search of the literature. HG

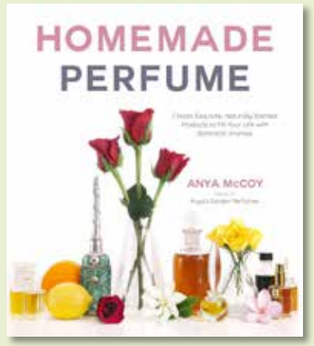
**—Jeffrey Blumberg, PhD, FASN, FACN, CNS-S**
**Friedman School of Nutrition Science and Policy**
**Tufts University**
**Boston, Massachusetts**

# New Book Profiles



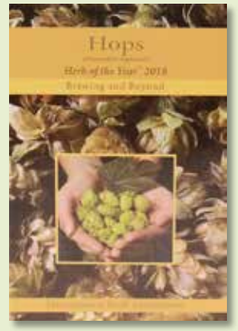
***Aquatic Dicotyledons of North America: Ecology, Life History, and Systematics*** by Donald H. Les. Boca Raton, FL: CRC Press; 2017. Hardcover, 1,334 pages. ISBN: 9781482225020. $249.95.

This text provides an overview of the biology of major aquatic plant species. The plant genera descriptions are based on recent phylogenetic analyses, and the individual species entries include information such as distribution, morphology, preferred habitat, and food and medicinal uses. The practical information is suitable for academic researchers and students, and for the purposes of wetland management.



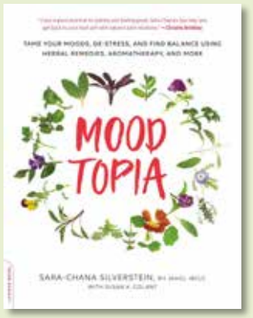

***Homemade Perfume: Create Exquisite, Naturally Scented Products to Fill Your Life with Botanical Aromas*** by Anya McCoy. Salem, MA: Page Street Publishing Co.; 2018. Softcover, 192 pages. ISBN: 978-1-62414-585-8. $21.99.

*Homemade Perfume* is a comprehensive resource for the creation of artisanal perfume. The text includes step-by-step instructions for a variety of techniques for making scented body sprays, body butters, massage oils, and more, using local plants and common household ingredients. McCoy also explores the nuances of scent blending to create unusual, delightful fragrances. The book includes a glossary of fragrance terminology, instructions on how to home-distill essential oils, and recipes for numerous scented products that can be made with common household tools and ingredients.



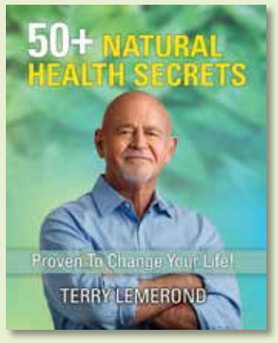

***Hops, Herb of the Year 2018: Brewing and Beyond*** compiled and edited by Gert Coleman, ed. Jacksonville, FL: International Herb Association; 2018. Softcover, 293 pages. ISBN: 978-1-5323-4413-8. $15.95.

The International Herb Association designated hops (*Humulus lupulus*, Cannabaceae) as the Herb of the Year for 2018 and produced this text that celebrates all aspects of the bitter botanical. This compilation of more than 40 essays covers various topics: botany and cultivation, history and harvest, lore, recipes, and medicinal uses. The text also includes illustrations, photos, and poetry that take hops beyond beer and explore the plant's lengthy history of use in cultures around the world.




***Moodtopia*** by Sara-Chana Silverstein. New York, NY: Hachette Book Group; 2018. Softcover, 256 pages. ISBN: 9780738220055. $11.99.

Herbalist Sara-Chana Silverstein, RH (AHG), introduces readers to natural remedies for stress, anxiety, and general health. This text explores the physical, emotional, and spiritual aspects of mental health and how strategies that include aromatherapy and adaptogenic herbs can help maintain well-being with minimal side effects. Silverstein primarily addresses women in this book and offers insights from her own experiences or those of her clients. The final part of this book includes a 90-day program that incorporates the previously mentioned strategies to achieve emotional and mental wellness.




***50+ Natural Health Secrets: Proven to Change Your Life*** by Terry Lemerond. Green Bay, WI: Terry Talks Nutrition; 2018. Softcover, 184 pages. ISBN: 978-1732195905. $12.99.

Natural products industry pioneer Terry Lemerond brings more than 40 years of experience to this easy-to-understand guide to natural medicine. Full-color profiles explore the benefits of botanicals and ingredients such as coenzyme Q10 and astaxanthin. The topics range from popular ingredients, such as curcumin (from turmeric [*Curcuma longa*, Zingiberaceae]), to less well-known plants like copalchi (*Hintonia latiflora*, Rubiaceae). Each profile also mentions dosing suggestions and contraindications associated with the botanical or ingredient, if applicable. Lemerond also briefly discusses other holistic aspects of health and wellness with recommendations for diet and exercise.

# Annelise Lobstein
# 1956-2018



Annelise Lobstein, PharmD, PhD, a highly respected professor of pharmacognosy at the University of Strasbourg, died in January 2018 after a lengthy illness that she fought with strength, constant positivity, and full dedication to her team and loved ones.

Lobstein dedicated her career to studying and understanding the impacts of plants and traditional herbal medicines on human health, with a particular and internationally renowned expertise in aromatherapy. In 1979, she obtained her PharmD, followed by her first doctoral degree in 1983 with a dissertation on the "Analytical Studies of Terpenes from *Ginkgo biloba* L." She earned her second State doctorate ("habilitation") after completing her work on the phytochemical and pharmacological studies of "Amentoflavone from *Viburnum* species (Caprifoliaceae)." With her PharmD and two doctoral degrees, which reflected her passion and scientific perseverance, Lobstein joined the Faculty of Pharmacy as a research assistant professor at the University of Strasbourg, and then became a full professor of pharmacognosy in 2007 within the Laboratory of Therapeutic Innovation ("Laboratoire d'Innovation Thérapeutique").

Lobstein directed the pharmacognosy and bioactive natural compounds team (Pharmacognosie et Molécules Naturelles Bioactives), supervising and mentoring international scientists, postdoctoral students, and undergraduate students with great listening and pedagogical skills and creating a highly dynamic and friendly research environment. She inspired her students not only through her scientific knowledge, rigor, and enthusiasm but also through her kindness and availability. Her office, in which she would welcome visitors with her encouraging smile, was a heaven, always decorated with luxurious plants and items from different seasons. It was a place where one felt the freedom to exchange scientific ideas. She loved sharing her passion for herbal medicine and pharmacognosy with her fundamental motto: "You tell me, I forget. You teach me, I remember. You involve me, I learn."

Besides her teaching responsibilities at the University of Strasbourg, Lobstein was in charge of three Diplôme Universitaire (DU) programs (continuous training for pharmacists and health professionals) in homeopathy and aromatherapy. Her lectures were appreciated for their strong attention to detail. All those who had the chance to attend her DU course (which had a waiting list every year) were impressed by the high quality of her teaching and her constant attention to others. Lobstein also taught pharmacognosy in Mahajanga, Madagascar, and Yaoundé, Cameroon.

Lobstein published more than 100 research articles based on the work of her team or through her multiple international collaborations. She was an invited speaker at diverse international scientific meetings and shared her work with passion, notably in aromatherapy, one of her favorite fields of expertise. Additionally, she filed six patents in collaboration with several cosmetic companies, including Phytodia, which she co-founded in 2006. In fact, she has helped consolidate multiple university-industry partnerships (e.g., with the companies LVMH Recherche-Guerlain, Estée Lauder, SEPPIC-BiotechMarine, Boiron, and Phytodia), which provided financial support for several PhD students and research associates. Her research team chemically characterized and biologically evaluated African traditional herbs, orchid (Orchidaceae) species from tropical regions, various algae, and halophytes to understand not only their dermo-cosmetic properties, but also their mechanisms of action as potential anticancer, anti-inflammatory, antioxidant, and anti-diabetic agents. Lobstein constantly emphasized the value of interdisciplinary collaboration in her second fundamental motto based on an African proverb: "Alone, we run fast; together, we go further."

Despite her illness, her involvement as manager of the pharmacognosy laboratory and her commitment to the well-being of her team never failed. Her colleagues and friends want to acknowledge her incredible strength through the adversity of illness, caring for others and motivating her team with enthusiasm. At the time of her death, Annelise Lobstein was affiliated with the UMR 7178 research unit at the Hubert Curien Multidisciplinary Institute (Institut Pluridisciplinaire Hubert Curien) and the Analytical Chemistry of Bioactive Molecules and Pharmacognosy (CAMBAP) team of the University of Strasbourg in Strasbourg, France, in collaboration with the French National Center for Scientific Research (CNRS).

We, as friends, colleagues, and former students, miss her terribly. We will keep in our minds the image of a strong, scientific woman, always positive and dedicated. Annelise Lobstein inspired us in so many ways. HG

**—Charlotte Simmler, Mélanie Bourjot, Aurélie Urbain, Laurence Gondet, Veronika Vallion, Christian D. Muller, Gisèle Archipoff, Bruno Didier, Carole Minker, Amélie Leick, Saliou Ngom, Olivier Placide Noté, Frédéric Bonté**





# Light Miller
# 1947-2018



Light Miller, ND, died peacefully in her sleep in the presence of family on April 28, 2018. She was born in New York City, New York, in 1947, the daughter of an Indian diplomat. Her mother was an aromatherapist and her grandmother practiced as an Ayurvedic herbalist.

In 1988, Miller received a special Ayurvedic treatment called kaya kalpa (an anti-aging or rejuvenation treatment) from Ram Panday. During that experience, she awakened to her Ayurvedic heritage. Panday accepted her for training, and she began self-study with books by David Frawley, Vasant Lad, Robert Svoboda, and Maya Tiwari. She started an aromatherapy company and soon traveled across the United States teaching Ayurveda and aromatherapy.

Seeking deeper instruction in kaya kalpa, Miller traveled to India to train under Pancha Bai Chotai (a compatriot/physician of Mohandas "Mahatma" Gandhi), local herbalist and healer, former freedom fighter, co-founder of Aruli Nature Cure Center, Ayurvedic physician, and one of the few remaining kaya kalpa practitioners in the world. He accepted her as a student and she became the first female kaya kalpa practioner. Upon returning to the United States, she passed her training along to husband Bryan Miller, DC, and they added kaya kalpa to their treatments as they taught Ayurveda and aromatherapy in the United States, Canada, and Europe.

The Millers co-authored *Ayurveda and Aromatherapy,* published by Lotus Press in 1995. Light Miller's relationship with Santosh Krinsky of Lotus flowered into the publication of two more books: *Ayurvedic Remedies for the Whole Family* in 1999 and *Ayurvedic Curative Cuisine for Everyone* in 2011. She also self-published a 1,000-page textbook for correspondence and classroom teaching and a handbook for *panchakarma* cleansing treatments. With Batool Merali, she co-authored *The Divinity Within* (Nourish Myself, 2017), a 12-month calendar and guide to self-development.

By 2000, Miller was a regular contributor to the California Association of Ayurvedic Medicine (CAAM). When the National Ayurvedic Medical Association (NAMA) was formed, she was an ardent supporter and coordinated the first conference in Tampa, Florida. She served on the NAMA board of directors in 2002 and worked with Marc Halpern, DC, CAS, PKS, on the education committee. She also was a member of the National Association for Holistic Aromatherapy (NAHA). She strongly supported the licensing of Ayurvedic consulting as a profession but was disillusioned by the politics and egos involved in organizations.

In 2012, Miller founded the Ayurvedic College for Wellbeing in Sarasota, Florida, then moved it to Hollywood, Florida, in 2014. In 2015 and 2016, she taught classes both in Florida and San Juan, Puerto Rico. In 2016, the Millers moved to Rincón, Puerto Rico, and took their college online, recording more than 500 hours of Ayurveda lectures. They taught yearly panchakarma courses to more than 150 students. Miller taught that Ayurveda is an expanding discipline that took in new treatments, methods, and teachings. Traditional Ayurveda preserved the past but held no constraints for her. She continues to teach through her videos in the online incarnation of her college. She had more than 1,500 students during her teaching career.

Miller preferred to provide herbal blends taken as infusions for the various complaints of her patients. She was not an advocate of herbal capsules, as she believed cut-and-sifted herbal teas had greater potency. She believed that the use of pills and capsules was a byproduct of the British medical influence on Ayurveda. She pioneered the use of essential oils added to abyanga (massage) oil as a more effective alternative to other oil blends. Miller added the juice of wheatgrass (*Triticum aestivum*, Poaceae), tulsi (*Ocimum tenuiflorum*, Lamiaceae), and other herbs to her panchakarma green juice arsenal. She incorporated the kaya kalpa technique of mindful breathing into her teaching as well. Miller performed more than 1,200 kaya kalpa treatments and conducted more than 450 panchakarma programs. She also recommended a parade of gourmet vegetarian food that was spiced to heal the gastrointestinal tract as it satisfied the palate.

Miller's symptoms of the last 10 months were largely countered with natural remedies of her own design. A contingent of possible causes were treated with mixed results, culminating with her eventual diagnosis of advanced lymphoma, for which she declined chemotherapy.

Light Miller will be missed by her family, friends, students, and patients. "Light Miller helped thousands of people in her amazing life on this planet," wrote herbalist and nutritional consultant Brigitte Mars, who was a personal friend of Miller (email to H. Bauman, August 30, 2018). "She will forever be lovingly remembered." HG

**—Bryan A. Miller, DC**
**Instructor, Ayurvedic College for Wellbeing**
**Rincón, Puerto Rico**

# Ronald G. Udell
# 1948-2018



Former President and CEO of Soft Gel Technologies, Inc., Ronald Udell died on June 19, 2018, at the age of 69. Udell had more than 35 years of experience in the nutrition and natural products industry. Many of his colleagues considered him a pioneer in providing innovative, clinically tested delivery systems through softgel capsule technology.

Udell was born on July 2, 1948, in Philadelphia, Pennsylvania. His family moved to California in his youth, and he earned a bachelor's degree from the University of Southern California's Marshall School of Business in 1973. Udell was first introduced to the natural products industry in 1981, when he started working as a food and beverage distributor. Over time, he used his marketing skills and operational experience to focus on delivery systems for supplement ingredients such as coenzyme Q10 (CoQ10) and vitamins, and in 1994, he became the president and CEO of Los Angeles, California-based Soft Gel Technologies. In his 20 years at Soft Gel, Udell steered the company through periods of both declining sales and rapid growth. His vision and tenacity helped build a high-performance company with a robust clientele, new ingredients and formulations, and a global reach.

Udell was also president of Chemco Inc. (now known as OptiPure), a distributor of botanical and other ingredients for the natural products industry, from 1994 to 2014, and previously worked for Chemco as a broker. Chemco imported botanical ingredients including standardized herbal extracts as well as combination formulas to support weight management and mental health.

Jingang Shi, CEO of Beijing-based ingredient manufacturer EPC Natural Products, recalled Udell's mentorship and innovative spirit. "When I started in the supplement business, he always reminded me of the true value and unique benefit any new herb extract could contribute to human beings and the industry," Shi wrote (email to M. Blumenthal, September 4, 2018). "He introduced many new ingredients from Europe and Asia into the US market and played an important role in educating the industry. Ingredient suppliers loved to work with him because he appreciated authentic products."

In 2015, Udell served as the director of business development for J+D Labs' Pharma Manufacturing facility in Vista, California. Two years later, he became the director of business development for Captek Softgel International, a position he held until the time of his death. In these roles, he oversaw the manufacture of softgels for a variety of clients, including mass-market brands, multi-level marketing brands, and health professionals, among others. He also assumed marketing duties for new products.

"Ron was a good friend and colleague and was a consistent supporter of the nonprofit educational work of the American Botanical Council. He would sometimes promote ABC to various industry colleagues to suggest that they too support ABC," said Mark Blumenthal, founder and executive director of ABC. "On a personal basis, he was very generous by providing me with free softgel capsules of CoQ10 for my personal use for many years."

Over the course of his career, Udell registered 10 patents related to softgel delivery for product formulations and ingredients, including vitamin E, solubilized CoQ10, and carnitine. In 2005, *Nutritional Outlook* magazine awarded Soft Gel Technologies a Natural Product Award for its CoQsol-CF ingredient, a more bioavailable form of CoQ10.[1] The new formulation used citrus peel extract, D-limonene, and vitamin E to prevent crystallization during the manufacturing process, and Udell oversaw the development of this new ingredient as president of the company.

Anthony Udell, Udell's nephew, worked with his uncle for 10 years at Chemco. "Ron was presented an opportunity to promote some nutritional items that few people in the United States had any real knowledge of," wrote Udell (email to M. Blumenthal, October 11, 2018). "He studied how CoQ10, ginkgo [*Ginkgo biloba*, Ginkgoaceae], and fish oil could help people, and he also realized, if marketed correctly, [that these products] could be a good business opportunity. What started as possible line extensions ended up being a very successful business. Ron took a chance and was open to something new and different. Based on the end result, he should be considered as a true trailblazer in the nutraceutical industry."

Udell's daughter Shana Sadowsky remembers her father as a devoted family man and an intrepid worker. "My father loved working and loved the industry," she wrote (email to M. Blumenthal, August 20, 2018). "He was very good at selling and was highly knowledgeable. He also loved his family including his children and grandchild, Ella. He was a collector of classic cars and loved dogs."

Ron Udell is survived by his four children, Scott Udell, Shana (Elon) Sadowsky, Gabrielle Udell, and Allegra Udell, and his granddaughter, Ella. A memorial service celebrating his life was held in Los Angeles, California, on June 24, 2018. HG

**—Hannah Bauman**

## Reference

1. *Nutritional Outlook* Staff. Natural Product Awards. *Nutritional Outlook*. December 21, 2005. Available at: www.nutritionaloutlook.com/omega-3/natural-product-awards. Accessed August 29, 2018.





## Publications

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

***Australian Journal of Herbal Medicine***: 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, P.O. Box 696, Ashfield, NSW 1800, 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.

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Photograph by Hannah Bauman
Captured with a Panasonic Lumix DMC-ZS100

## Sweet Cherry
## *Prunus avium*, Rosaceae

The sweet cherry (*Prunus avium*, Rosaceae) tree is a domesticated cultivar of wild cherry species native to temperate regions of Europe and Western Asia.[1] The cherry fruit has a high sugar and low acid content in addition to high amounts of flavonoids such as anthocyanins. Cherry fruit consumption is associated with reductions in oxidative stress and inflammation, and cherry juice has long been used as a home remedy for gout in North America. Cherry fruit's anti-inflammatory properties reportedly benefit other chronic conditions such as cardiovascular disease and type 2 diabetes. Cherry fruit is also a good source of tryptophan, serotonin, and melatonin, which all play important roles in supporting mood and cognition. HG

### Reference


1. Bauman H, Perez J. Food as medicine: Cherry (*Prunus avium* and *P. cerasus*, Rosaceae). HerbalEGram. 2018;15(8). Available at: http://cms.herbalgram.org/heg/volume15/08August/FAM-Cherry.html. Accessed September 5, 2018.


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