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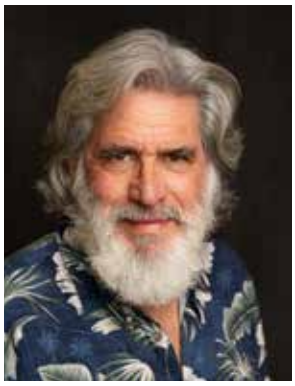

dear *reader*

This is the third issue of *HerbalGram* that is part of our yearlong celebration of *HerbalGram*'s 40th anniversary and the HerbalGram40 Project & Fund. In this issue, we provide a timeline of key articles that appeared in *HerbalGram* during the magazine's third decade (2003–2013). We invite you to peruse this annotated and illustrated timeline for a journey through some of the compelling topics and other milestones in the botanical community of that decade.

At the annual ABC Celebration and Botanical Excellence Awards Ceremony in March at Natural Products Expo West in Anaheim, California, we recognized achievements in service to the US and international herb and medicinal plant community. The list of awardees is too numerous to mention here, but our article in this issue salutes people who have made significant contributions through their personal and professional dedication to herbs and medicinal plants.

Further, the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP) contributes an article that details the unfortunate practice of excessive dilution of botanical extracts. ABC Chief Science Officer and BAPP Director Stefan Gafner and his co-authors — Loïc Loffredo of BotaniCERT, a third-party lab in France for botanical and essential oil analysis; Stacy M. Wise and Jim Kababick of Flora Research Laboratories, an analytical lab in Oregon specializing in botanicals; and Roy Upton, the president of the American Herbal Pharmacopoeia — have compiled supporting data and other information about such extracts. The dilution they document reaches such an extent that the extracts do not contain what most experts in herbs and phytomedicine would consider a sufficient level of the actual "native extract" for the material to provide a reasonable expectation of a health benefit. Some of the dried, powdered extracts contain significant levels of maltodextrin (a highly refined, vegetable-derived carbohydrate) and/or other excipients, which — when used appropriately — are often necessary for processing purposes (e.g., as flowing agents to help process extracts into capsules or tablets). However, some of these extracts that contain high amounts of excipients are in herbal products whose labels do not adequately describe, or in some cases misrepresent, the extract's composition and strength. The article also discusses excessive dilution of botanical extracts in the context of US dietary supplement labeling regulations, which allow manufacturers and suppliers to take different approaches to extract labeling.

Our deep gratitude to Marisa Williams, Erin McKinsey, and Aaron Jenks of the herbal tea company Traditional Medicinals for their time and energy in compiling and writing this issue's Herb Profile on acacia gum, the dried sap of at least two species native to Africa that has numerous traditional and modern medicinal and industrial uses.

More than 40 years ago, I came across two mind-altering books by Andy Weil: *The Natural Mind: A New Way of Looking at Drugs and the Higher Consciousness* and *Chocolate to Morphine: Understanding Mind-Active Drugs.* In the late 1980s, I read Ron Siegel's *Intoxication: Life in Pursuit of Artificial Paradise.* These books discuss the universal human urge to seek altered states of consciousness through plants, fungi, ritual, etc. In this vein, Mark Plotkin reviews Mike Jay's compelling *Psychonauts: Drugs and the Making of the Modern Mind*. Plotkin writes, "The author's central thesis is that self-experimentation with entheogens — outside of the Indigenous societies that first discovered them — did not begin in the 1960s with Timothy Leary and the Beatles, but rather had a long and esteemed tradition in Western circles, particularly in the 19th century." Leading literary and intellectual figures are noted. This book received the 2024 ABC James A. Duke Excellence in Botanical Literature Award in the consumer/popular book category.

Although he died in 2022 at the age of 94, we belatedly acknowledge the life of Luigi Della Beffa, son of the founder of Milan-based Indena. He led the company for many decades, instilling a strong scientific culture at Indena and making it a leader in the manufacture of clinically tested standardized botanical extracts for the global pharmaceutical, food, dietary supplement, and cosmetic industries.

We also mark the passing of medical botanist and polymath Edward Ayensu, Mohawk Wisdomkeeper Cecilia Mitchell, and Caribbean medicinal plant expert Winston Tinto.

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

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Hibiscus *Hibiscus sabdariffa*
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Acacia gum *Senegalia senegal*
Photo ©2024 Tukaram Karve

Acacia Gum

Senegalia senegal (syn. *Acacia senegal*, *A. verek*)
Vachellia seyal (syn. *A. seyal*)

Family: Fabaceae

By Marisa Williams, ND, RH (AHG), Erin McKinsey, MS, and Aaron Jenks, PhD

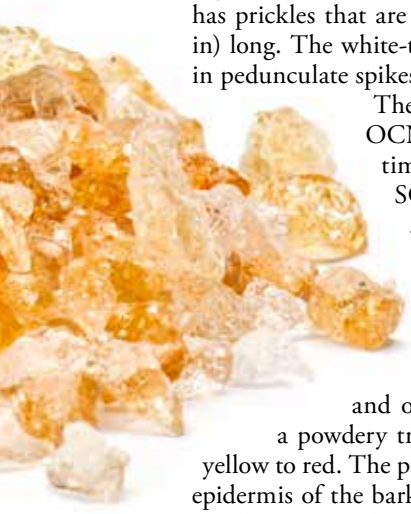
INTRODUCTION

Acacia gum, more commonly known as gum arabic, is the dried sap of various species of trees in the legume family (Fabaceae or Leguminosae), although no universally adopted definition specifies the species from which the gum must originate. The properties of this natural, edible, and polysaccharide-rich thickening agent have made it important for many applications across multiple industries, including food, beverage, cosmetic, and pharmaceutical.[1-3] For at least 4,000 to 5,000 years,[2,4] this gummy exudate has been hand-collected from the branches of various wild trees native to arid deserts or dry shrubland biome regions of North and East Africa, South Asia, and the Middle East,[5-7] but the name gum arabic is most commonly associated with two species: *Senegalia senegal* and *Vachellia seyal*.[2,8,9]

The names acacia gum and gum arabic are often used interchangeably, but the name gum arabic takes historical precedence over acacia gum and reportedly was used at an earlier date.[2,3] Gum arabic is the more widely and commonly used name referring to the gums of *S. senegal*, *V. seyal*, and other Fabaceae species.[1,2,4] Gum arabic is the preferred name in the United States[10] and is used by the United Nations and other organizations,[2] but the name acacia gum appears to be preferred in some other places, perhaps used more in the European Union (EU) than elsewhere.[8] The fact that *S. senegal* and *V. seyal* are no longer classified within the genus *Acacia*[11,12] adds to the confusion from referring to the gummy exudate of either species as acacia gum, and this perhaps lends credence to the use of the more widely adopted term gum arabic. The American Botanical Council's HerbMedPro database lists both gum arabic and gum acacia as common names,[13] and acacia gum will be used hereafter to refer to the gums of both species. When referred to as gum arabic in early and primary literature, that name will be used to maintain accuracy and preserve historical narrative.

The Standardized Common Name (SCN) for *S. senegal* is gum arabic tree according to the *American Herbal Product Association's Herbs of Commerce*, 3rd ed. (2023),[10] while the SCN for the dried gummy exudate of *S. senegal* is gum arabic. The Other Common Name (OCN) for this species is thorny acacia, and OCNs for the dried gummy exudate are acacia gum, gum acacia, and Senegal gum.[10] The Royal Botanic Gardens, Kew reports that their Survey of Economic Plants for Arid and Semi-Arid Lands database contains 196 local names for *S. senegal*. Common names include *tur*, *tulh*, *harheyr* (Jibbali), *temmar* (Dhofari Arabic), Sudan gum, *gommier*, *gomme* (French), *khor* (Punjab region), *kumta* (Rajputana region), and Somali gum.[6]

Senegalia senegal grows in thickets and stands, ecologically prefers arid semi-deserts and dry savannas, and has a native distribution across sub-Saharan Africa and from East Africa to South Africa. The species is also native across the Arabian Peninsula to India and has been introduced in Australia and elsewhere.[6] It is a shrub or tree that grows up to 12 m (40 ft) tall with bark that is gray, rough, and scaly. Botanical iden-



tity is based on several morphological characteristics including its "thorns": its stipules are not spinescent, but instead it has prickles that are very sharp and grow up to 7 mm (0.3 in) long. The white-to-cream flowers are fragrant and grow in pedunculate spikes 2–10 cm (0.8–4 in) long.[14]

The SCN for *V. seyal* is *talh*, while the OCNs for this species are red acacia, shittim wood, *talca*, and whistling tree. The SCN for the dried gummy exudate of *V. seyal* is gum talha, and the OCN is gum arabic.[10] *Vachellia seyal* has a range and distribution across sub-Saharan Africa (the Sahel) and East Africa.[7,15] It is a tree that is more or less flat-topped and grows from 3–9 m (10–30 ft) tall, and occasionally up to 12 m (40 ft),[16] with a powdery trunk that varies in color from white to yellow to red. The powdery nature of the flakes is due to the epidermis of the bark flaking off as the plant grows, revealing the red to yellow powdery inner bark. In contrast to *S. senegal*, the "thorns" of *V. seyal* are spinescent stipules that grow up to 8 cm (3 in) long.[14] *Vachellia seyal* has two subspecies, one of which is known for having stipules that swell into large galls that then become home to colonies of ants that are thought to provide protective benefits to the tree.[17] The sound of wind blowing through these large, hollow galls is thought to give rise to the common name whistling tree. The flowers are bright yellow and grow in axillary pedunculate heads 10–13 mm (0.4–0.5 in) long.[14]

While both *S. senegal* and *V. seyal* had been placed within the genus *Acacia* since the early 19th century,[18,19] a narrower taxonomic definition of the genus was proposed in 2005,[11,12] and *S. senegal* and *V. seyal* were placed in other genera. While these changes were debated for years,[20] they have been upheld and now are widely accepted based on morphology and molecular phylogenetic analyses.[21-23] *Senegalia* has widespread tropical and subtropical distribution, with 220 accepted species that range across all continents except Europe and Antarctica.[24] *Vachellia* has a similar range and distribution and contains 157 accepted species.[25]

While multiple parts of these species are used medicinally, including roots, bark, leaves, and seeds,[26,27] the gum, a dried exudate of scarified stems and branches, is the most important medicinal part and the primary item of commerce. The gum of *S. senegal* is considered to have superior properties compared with the gum of other related species (including *V. seyal*), and *S. senegal* is the primary species in international trade.[6] Prices for *S. senegal* gum are generally substantially higher than for *V. seyal* gum.[2] However, *S. senegal* gum is itself of varying quality and can be grouped into three grades.[27] The Kordofan region of Sudan is known for producing the highest quality acacia gum, and the Kordofan Hashab grade commands the highest price and is the standard against which other gums are compared.[2]

The three biggest markets for acacia gum are the EU, United States, and India.[6] In 2014–2016, it was reported that 47% of processed acacia gum was imported by European countries, 15% by the United States, and 35% by other countries.[2] The three largest producers of acacia gum are Sudan, Nigeria, and Chad,[6] with up to 80% being produced in Sudan. In the first half of 2013, Sudan's exports reportedly reached 33,000 metric tons, and the export volume was expected to increase.[28] Revenues for global exports of acacia gum were estimated at $337 million annually from 2014 to 2016.[2] Of the acacia gum harvesting and production nations reporting annual exports, in 2022, Senegal reported the most at 3,909,599 kg (estimated trade value of $20,060,095), followed by Nigeria at 3,655,230 kg ($3,332,030). Notably, Sudan and Chad did not report exports.[29] In 2022, the United States imported 12,039,420 kg of acacia gum from Sudan (valued at $36,524,000) and 3,194,710 kg from Chad (valued at $4,282,000).[30]

HISTORY AND CULTURAL SIGNIFICANCE

Use of acacia gum dates back to Ancient Egypt, where it was used as an adhesive component in paints and for the mummification of bodies.[31-33] Acacia trees were described in several important ancient traditional herbal writings. The Greek philosopher Theophrastus (ca. 371–ca. 287 BCE) described *akantha* (acacia) in his *Historia Plantarum*. The English translation, *Theophrastus: Enquiry into Plants and Minor Works on Odours and Weather Signs*, describes acacia tree uses and physical characteristics and mentions the tree's gum.[34] Greek physician, botanist, and pharmacologist Dioscorides (ca. 40–90 CE) also described acacia (as *akakia*). The English translation of his work, *De Materia Medica*[35] (original text ca. 64 CE), describes the color, aroma, and herbal applications of some of acacia's plant parts. Acacia gum is described as "astringent and cooling."[35]

Exodus 25-26 (King James Version) states that after their Exodus from Egypt, the Israelites used shittim wood to construct the Tabernacle and the Ark of the Covenant, which housed the stone tablets on which the Ten Commandments were written.[36] The shittim (or shittah) tree is historically identified as *V. seyal*; however, other related species may have been used.[37] This is one example of the sacredness ascribed to acacia, and the many unique properties of acacia gum found concomitant religious usage that continued into the Middle Ages.

The genus *Acacia* was first described in 1754 by English botanist and gardener Philip Miller (1691–1771) in his publication *The Gardeners Dictionary* (4th edition).[38] The name acacia is borrowed from the Greek word ἀκακία (or akakia), meaning "sharp," "point," or "thorn."[39] As early as 1623, Dioscorides' ἀκακία is credited as the source of the Latin word acacia, and he is credited as being the first to use akakia in reference to acacia.[40]

Senegalia senegal was first described as *Mimosa senegal* in 1753 by Swedish botanist Carl Linnaeus (1707–1778) in his work *Species Plantarum*.[41] The species was later placed in the genus *Acacia*[18] and later moved into the genus *Senegalia*.[42] The name mimosa is derived from the Greek μῖμος (or *mimos*), meaning "mime" or "actor," and the suffix *-osa*, meaning "resembling."[43] This probably refers to the leaves of

some *Mimosa* species (e.g., the "sensitive plant," *M. pudica*) that quickly roll up when touched, quietly moving on their own and thus "resembling a mime." Both the genus name *Senegalia* and epithet *senegal* refer to Senegal in West Africa, one of the first regions to supply acacia gum to Europe and a region previously known as the "gum coast."

Vachellia seyal was first described as *Acacia seyal* in 1813 in *Flore d'Egypte* by French botanist Alire Raffeneau Delile (1778–1850).[44] With the reclassification of the genus *Acacia sensu lato*, the species was then placed within the newly created genus *Vachellia*.[45] *Vachellia* is named in honor of English plant collector Reverend George Harvey Vachell (1799–1839), who collected widely in China,[12] and the epithet *seyal* is derived from the Arabic word لايس (or *sayāl*), meaning "prone to flow" or "flowing a lot."[46] The word is used in reference to the sap or gum that flows or is exuded from the stems and trunk of *V. seyal* and related species.

In the 18th century, acacia gum (gum arabic) became an important ingredient in textile printing for European linens.[47-49] As industrialization increased, so did the demand for this botanical ingredient. Export amounts doubled from the early 17th century into the 1780s due to European traders.[47] In fact, European traders made such a significant profit from gum arabic that it became a highly traded commodity, and competition between European powers for control of trade led to the "Gum Wars" of the 18th century.[48,49]

Some of the earliest proto-pharmacopeias such as Nuremberg (1546),[50] Augsburg (1564),[51] and the *Dispensatorium Brandenburgicum* (1698)[52] listed gum arabic (gummi arabici) without mention of source species. Historically, both species were listed in international official compendia since the late 18th century.[53-55] In the United States, acacia gum has a long history of use and was valued early on for its physical properties of enhancing consistency and stabilizing formulations. For example, "gum arabic mucilage" is listed throughout *The Pharmacopoeia of the Massachusetts Medical Society* (1808)[56] as an ingredient in preparations of infusions, emulsions, and troche formulations (lozenges). The mucilage of acacia gum is also a listed ingredient in *The Pharmacopoeia of the New York Hospital* (1816).[57]

The first edition of the *United States Pharmacopeia* (USP), published in 1820, listed Acaciae gummi (acacia gum, called gum arabic).[58] Today, the monograph in the *National Formulary* (USP-NF) is titled "Acacia" and defined as the "dried gummy exudate from the stems and branches of *Acacia senegal* or of other related African species of Acacia."[59] During the Civil War era in the 1860s, imported gum arabic (*S. senegal*) reportedly was not readily available in the supply chain, and slippery elm (*Ulmus rubra*, Ulmaceae) inner bark was an alternative for physicians and pharmacists.[60]

The value of the genus *Acacia sensu lato* is highlighted in several ethnobotanical surveys of African traditional and medicinal uses.[61] In the Nuba mountains of Sudan, an ethnobotanical survey found that approximately 40% of surveyed farmers maintain *hashab* (*S. senegal*) gardens in the local forest to support their household income.[62] In the remote area of southeastern Sudan, the gum powder from *S. senegal* has been used for kidney conditions.[63] A stem bark decoction of *V. seyal* has been given orally for dysentery and diarrhea.[63] In Benin, an ethnobotanical survey recorded 16 species of *Acacia* used in traditional medicines.[64] Based on field interviews, *S. senegal* was grouped with plants used for infectious diseases with a high fidelity level.[64] While the gum was not specifically described in the interviews, *S. senegal* (vernacular name: *gommier blanc*) is used for "pains of heart," the leaves for sore throats and abdominal pains, and the root for wounds.[64]

Vachellia seyal (vernacular names: *menèn*, *puwituani*) also is mentioned in the survey, with uses for stomach aches, edema (swelling), peritonitis (infection of the abdominal tissue layer called the peritoneum), bacterial infections, and rheumatism.[64] In Burkina Faso, an ethnobotanical study focusing on the Seno and Nayala provinces reported that consumption of the gum of *S. senegal* (vernacular name: *gommier*) suppressed appetite and helped with thirst.[65] A bark decoction of *V. seyal* (vernacular name: *gon-miougou*) supported weight loss.[65]

The *African Herbal Pharmacopoeia* (2010) mentions other ethnopharmacological uses of *S. senegal* bark, leaves, and gum to support coughs, sore throats, eye infections, diarrhea, gonorrhea, dysentery, and urinary tract infections.[66] The *West African Herbal Pharmacopoeia* (2013) describes topical uses of the gummy exudate for dressing burns, inflammation of tissues (mucous membranes), and irritated nipples.[67] Decoctions of the gum also may be used for wounds, conjunctivitis (inflammation of the eyes), and dermatitis (inflammation of the skin).[67] Plant material is also used for wood fuel, fence building, and livestock food during drought when other vegetation is limited.[68]

The widespread distribution and use of *S. senegal*, *V. seyal*, and other related gum-producing species throughout their native ranges across sub-Saharan Africa have prompted the name "gum belt," which refers to this region and is indicative of the economic importance and cultural significance of the gums.[4] Across this "gum belt" and in other gum-producing regions, acacia gum is wild collected from natural stands or forests of gum-producing trees, which may be managed with various agroforestry methodologies, or it is collected from trees that are cultivated on large, highly controlled plantations.[4,6] In either case, the crude gum exudes through the bark either naturally due to injury, disease, or environmental stress, or due to tapping (i.e., human-induced incisions on the trunk and branches of the tree). The tree exudes sap that dries upon contact with air, becoming gummy and gradually hardening.[4] This crude acacia gum ranges in color from light tan to red-orange, depending on factors including tree health and environmental conditions at time of harvest.[2] Darker colors of crude gum reflect a higher tannin content.[69] The color also generally indicates the species from which the gum originates. For example, gum derived from *V. seyal* and other species is darker compared to the pale white to amber gum from *S. senegal*.[70]

The gummy exudate, or crude acacia gum, is then hand-collected, facilitated by the use of hand-held tools including small axes and traditional tools such as *Sunki* and *Makmak*,[71] typically during the dry season, because the higher temperatures and environmental pressures result in greater yield and better quality.[72] Once the globose or spherical lumps of crude gum are collected, they are cleaned, then sorted and graded based on size, color, and amount of impurities in the gum.[4] These impurities are naturally occurring and can include sand, bark, and other organic materials.[73] The various grades of crude acacia gum are prepared for export or undergo additional processing. Some gum-producing countries and regions have facilities that are capable of converting crude acacia gum into more highly processed, refined products. However, in many other instances, processing occurs in more industrialized countries working as intermediaries between producing countries and those importing processed acacia gum. Processed acacia gum may take the form of powdered, flaked, spray-dried, and other more specialized final products for various industries and global markets.[2]

The unique properties of acacia gum have inspired innovation in many contexts, and its broad utility and versatility can be seen across many sectors, including medicine, food, art, and cosmetics.

CURRENT AUTHORIZED USES IN COSMETICS, FOODS, AND MEDICINES

Monographs for acacia gum (gum arabic) quality standards are published in official compendia of the United States such as the USP-NF[74] and in legally binding compendia such as the *Food Chemicals Codex* (FCC). The Gum Arabic FCC monograph is incorporated by reference in Title 21 of the US Code of Federal Regulations (CFR).[75] The US Food and Drug Administration (FDA) specifies "acacia (gum arabic)," in its regulation 21CFR § 172.780, as the dried gummy exudate from stems and branches of trees of various species of the genus *Acacia* that must meet the specifications of the FCC monograph for use as a generally recognized as safe (GRAS) food additive with maximum usage levels in certain foods, including alcoholic beverages, breakfast cereals, cakes and cookies, grain-based bars, soups and soup mixes, among others (for dietary fiber, emulsifier, stabilizer, and thickener functions).[76]

As per FDA regulation 21CFR § 184.1330, FCC-quality acacia is permitted as a GRAS direct food substance with maximum usage levels established for beverages and beverage bases, chewing gum, confections and frosting, dairy product analogs, fats and oils, gelatins, fillings, puddings, hard candy and cough drops, nut products, quiescently frozen confection products, snack foods, and soft candy, among other foods.[77] FDA regulation 21CFR § 582.7330 also permits the use of gum arabic as a stabilizer in animal drugs and feeds.[78]

The US Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF) regulation 27CFR § 24.246 permits the use of FCC-quality acacia gum for clarifying and stabilizing wine.[79] For use as an excipient in pharmaceutical drug product formulations (functioning as an emulsifying, gelling, release-modifying, suspending, and/or viscosity-increasing agent, or wet binder), the Acacia USP-NF monograph serves as the basis for quality specifications.[74] In addition to the Acacia USP-NF monograph, there is an Acacia Syrup USP-NF monograph, with other ingredients of sucrose, sodium benzoate, vanilla tincture, and purified water.[80] In 2021, the FDA granted a citizen petition to add acacia gum (gum arabic) as one of the defined dietary fiber ingredients.[81]

In Canada, the Natural and Non-prescription Health Products Directorate (NNHPD) lists various uses for "Acacia" in licensed Natural Health Products (NHPs), with the accepted species listed as *S. senegal* and *V. seyal*. For the medicinal purposes category, acacia is listed as an extract item.[82] An additional listing for "Acacia Senegal Gum" for non-medicinal purposes includes uses as a gum adhesive, thickening agent, emulsifying agent, stabilizing agent, adhesive, binder, controlled release vehicle, delivery system, and fragrance enhancer ingredient.[83]

In the EU, the *European Pharmacopoeia* (PhEur) monograph defines "Acacia" (Acaciae gummi) as "air-hardened, gummy exudate flowing naturally from or obtained by incision of the trunk and branches of *Acacia senegal* L. Willd. (syn. *Senegalia senegal* (L.) Britton), other species of Acacia of African origin and *Acacia seyal* Delile."[84] For use in cosmetics products, the defined ingredient "Acacia senegal gum" is listed for fragrance and film-forming functions, and "Acacia senegal gum extract" as a viscosity-controlling ingredient.[85] The defined ingredients "Acacia Seyal Gum" and "Acacia Seyal Gum Extract" have humectant (moisture-preserving) properties listed as an ingredient function.[85]

For use as a food additive, United Nations agencies (e.g., Joint FAO/WHO Expert Committee on Food Additives),[73] the *Japanese Specifications and Standards for Food Additives*,[86] and the Korean Ministry of Food and Drug Administration also have published specifications.[87] In Africa, monographs are published in unofficial, yet authoritative, compendia, including the *African Herbal Pharmacopoeia*, which describes "*A. senegal*,"[66] and the *West African Herbal Pharmacopoeia*, which provides separate monographs for "*A. nilotica*" and "*A. senegal*."[67]

MODERN RESEARCH

Constituents and Pharmacological Effects

Acacia gum is described as an arabinogalactan-protein complex[5,88] with salts of calcium, magnesium, and potassium. Arabic acid (not to be confused with its monosaccharide homonym, which is also known as arabinonic acid) is the primary polysaccharide[66] which is a highly branched, complex chemical structure that contains galactose, arabinose, rhamnose, and glucuronic acid.[2,89] Additionally, the main amino acids of serine, hydroxyproline, leucine, and proline are present in both species, with *S. senegal* generally containing higher amounts of amino acid content compared to *V. seyal*.[90,91] The phytochemical constituents have demonstrated variability, which can be influenced by ecological location, tree maturity, tapping conditions, climate, soil, and

Acacia tree (*A. seyal*) in Ein Khadra Desert Oasis, Nuweibaa, South Sinai, Egypt. Photo ©2024 اسور ال (La Rossa)

water availability.[5,90,91] Furthermore, post-harvesting techniques and processing conditions (e.g., variability in storage, heat, and pressure) also affect the chemical composition of acacia gum.[91]

Experimental in vitro studies have demonstrated acacia gum's prebiotic properties in human fecal microflora and dietary fiber fermentation models, which report an increase in the production of total short-chain fatty acids (SCFAs).[92,93] SFCAs are metabolites (e.g., acetate, propionate, butyrate) that are formed when dietary fibers are fermented by bacteria in the gastrointestinal tract.[94] SFCAs are purported to be beneficial for digestive health by supporting the intestinal epithelia cell structure and intestinal motility.[94] The prebiotic potential of acacia gum was evaluated in an in vitro colon model study over a 24-hour period and compared to a positive control, a prebiotic called fructo-oligosaccharides (FOS). The colonic bacteria population counts were followed in the study for both the acacia gum and the FOS control. Acacia gum increased *Bifidobacterium* (a probiotic bacteria) bacteria population counts after the 12- and 24-hour fermentation time points, though FOS had a faster fermentation rate at the 6-hour mark. At 24 hours, both FOS and acacia gum reported significantly higher *Bifidobacterium* counts compared to the negative control. Additionally, acacia gum and the prebiotic control FOS demonstrated a similar pattern of increasing SCFAs production.[95]

Toxicity

In 2017, EFSA's Panel on Food Additives and Nutrient Sources Added to Food determined that there is no safety concern for the general population in their assessment of acacia gum as a food additive within the recommended dietary exposure limits.[8] Additionally, the available studies of acute, sub-acute, and genotoxicity indicate no signs of toxicity.[8,66] Hypersensitivity may occur from the carbohydrate structure of acacia gum in atopic individuals with pollen sensitivity, which is based upon a few limited case reports.[8,66]

Human Clinical Studies

Acacia gum is primarily known in the food, beverage, cosmetic, dietary supplement, and pharmaceutical industries for its ability to improve physiochemical properties through emulsification and stabilization. Acacia gum's dietary soluble fiber content has been the focus of a few clinical studies. For example, acacia gum has demonstrated prebiotic properties in digestive health.[96,97] Additionally, its impact on metabolic, cardiovascular, and inflammatory risk factors has been evaluated,[98-101] and oral health studies have been performed.[102,103] Table 1 highlights selected clinical studies specifically on acacia gum mono-preparations.

ADULTERATION AND SUBSTITUTION

There are vast numbers of gum-producing trees belonging to the family Fabaceae including species in the genera *Senegalia*, *Vachellia*, *Acacia*, *Albizzia*, and *Combretum*, all of which produce exudates that are all variously marketed as gum arabic or acacia gum, at least regionally.[66,107]

Gum derived from *S. senegal* is the most commonly encountered gum arabic in the global marketplace, followed by gum from *V. seyal*.[1,2] Acacia gums from these two species generally appear to be marketed as different products, at least in Sudan, with different names for the respective gums: "gum hashab" for *S. senegal* and "gum talha" for *V. seyal*.[66,107] With the adoption of a more narrow definition by some regulatory and governmental agencies requiring acacia gum (gum arabic) to be derived from either *S. senegal* or *V. seyal*,[2,8] it should be expected that gums from those two species will continue to dominate the marketplace and that gums from other species will be generally directed toward smaller, more regional markets. For example, in Zimbabwe gum from *A. karroo* is sold as gum arabic but is reported only to be traded locally.[107]

There are pharmacopeial methods to identify acacia gum, assess purity, and detect adulterants.[84,86] Additional methods are able to distinguish between acacia gum derived from different species. Gum from *S. senegal* breaks with glassy fracture, while gum derived from *V. seyal*, which is more brittle and not as hard, breaks in a different manner.[73] Optical rotation can also be used to differentiate between these species: aqueous solutions of gum from *S. senegal* are levorotatory (rotates the plane of a polarized light ray counterclockwise) whereas solutions of gum from *V. seyal* are dextrorotatory (clockwise).[73,86] Gums derived from other *Acacia sensu lato* species are also reported to be dextrorotatory.[69] Finally, high resolution mass spectrometry has been reportedly used to successfully characterize the botanical origin (*S. senegal* versus *V. seyal*) of acacia gum used as a fining agent in wine,[108] and this method may prove similarly useful in non-oenological applications.

Table 1. Selected Clinical Studies of Acacia Gum in Chronological Order since 2012

Publication	Study Design	Interventions	Outcome
Babiker et al (2012)[98]	A 6-week, two-arm, R, PC, DB study evaluated effects of acacia gum on body mass index (BMI) and body fat percentage in healthy females (N = 120).	Treatment group (n = 60): 30 g/day of acacia gum (*S. senegal*, Dar Savanna Ltd.; Khartoum, Sudan) divided into 5 sachets, each taken with 250 mL of water after a meal; 3 sachets (18 g total) in morning and 2 sachets in evening (12 g total) Placebo group (n = 60): 1 g/day of pectin also in divided doses Weight, height, body fat percentage, and skin fold thickness were measured at baseline and at end of study.	BMI and body fat percentage significantly decreased in acacia gum treatment group after 6 weeks. Morning nausea, mild diarrhea, sensation in the mouth, and bloating were reported in treatment group but resolved after first week.
Babiker et al (2017)[99]	A 3-month, DB, R, PC study evaluated the effects of acacia gum on blood glucose, cholesterol (lipids) levels, and BMI in people with type 2 diabetes mellitus (T2DM) (N = 91; average age of 50) on oral hypoglycemic medication for T2DM.	Treatment group (n = 46): 30 g/day of acacia gum (*S. senegal*, Dar Savanna Ltd.; Khartoum, Sudan), divided into 2 sachets (15 g each) to be taken in morning in 250 mL of water Placebo group (n = 45): 5 g/day of pectin	Significant decrease in fasting blood glucose and hemoglobin A1c (HbA1c). From baseline, reductions in total cholesterol (8%), low-density lipids (LDL) (19%), triglyceride (10%), and BMI (2%), and an increase of high-density lipids (HDL) (19%). Mild gastrointestinal adverse effects of nausea, diarrhea, and bloating were reported first 2 weeks of the study.
Elamin et al (2017)[104]	A 4-week, open-label, R clinical trial evaluated effects of acacia gum supplementation in individuals with chronic kidney disease (CKD) (N = 36).	Treatment groups: 10 g, 20 g, or 40 g/day of acacia gum (premade packages of soluble granules; Agri-Rapid Acacia RE; Agrigum, UK) Lab studies and clinical interviews were performed at baseline and at end of the study intervention.	30 patients completed the study, with significant findings reporting a reduction of C-reactive protein (CRP) marker, a non-descriptive inflammatory marker; this also included the lower dose treatment group (10 g/day). However, other inflammatory markers —interleukin (IL), interferon (IFN), tumor necrosis factor (TNF) — measured in study did not show any significant effects; acacia gum was well tolerated.
Babiker et al (2018)[100]	R, DB, PC study evaluated effects of acacia gum on visceral adiposity index (VAI), blood pressure, and anthropometric obesity markers in people with T2DM (on oral hypoglycemic medication; N =97; average age of 50).	Treatment group (n = 50): 30 g/day of acacia gum (*S. senegal*, Dar Savanna Ltd., Khartoum, Sudan) Placebo group (n = 47): 5 g/day of pectin daily Included measurements of blood pressure, anthropometric obesity markers, VAI, and blood lipid levels, fasting blood glucose, and HbA1c.	All participants completed the study. Significant decreases of secondary outcomes in BMI, VAI, and body adiposity index in treatment group were seen. Additionally, a decrease of triglycerides and increase of HDL was reported in treatment group. No changes in waist circumference, waist-to-hip circumference, or diastolic blood pressure levels.
Kamal et al (2018)[105]	12-week, single-arm, controlled phase II clinical trial evaluated effects of acacia gum on inflammatory blood markers and disease severity scores in people with rheumatoid arthritis (RA) (N = 40; 18-70 years of age; 95% female).	Treatment group: 30 g/day acacia gum (*S. senegal*) powder, dissolved in 200 mL of water in morning Each study participant regularly completed a disease activity score (DAS 28), an indicator tool used to track RA symptoms/activity. Lab parameters (complete blood count, liver, and kidney function tests) and inflammatory blood markers (erythrocyte sedimentation rate and tumor necrosis factor-alpha) were assessed at baseline and end of study.	All participants completed the study. At end of study, inflammatory markers decreased with less swollen and tender joints. No changes in complete blood count (evaluation of red and white blood cell numbers, hemoglobin, platelets, and hematocrit) or kidney function tests. Less than a quarter of acacia gum-treated participants reported digestive symptom adverse side effects, which resolved during the study.
Bielfeldt et al (2021)[103]	R, controlled, monocentric clinical study evaluated effects of acacia gum product on salivary flow rate in participants with dry mouth (xerostomia) (N = 26).	Each participant was randomly assigned to one of 2 treatment groups. Study participants were provided control product on Day 1 and the treatment product on Day 3 (both of which were dissolved in mouth after 5-10 minutes), or inversely Investigational product: ipalat® Hydro Med (Dr. Pfleger Arzneimittel GmbH; Bamberg, Germany), a pastille containing the active ingredients of gum arabic, natrosol, sodium hyaluronate, and carrageenan; other ingredients include maltitol syrup, honey flavor, primulae extract, bitter fennel (*Foeniculum vulgare*, Apiaceae) oil, star anise (*Illicium verum*, Schisandraceae) oil, and sucralose Control: Parafilm containing paraffin wax and polyolefins Salivary flow rate (unstimulated to stimulated conditions) and visual analog scale were assessed at baseline. Examination of oral cavity was performed to determine safety tolerance, along with pulse rate and blood pressure measurements.	All participants completed the study. 2 mild and 2 moderate reactions reported with the investigational pastille with 5 mild and one moderation reaction with control product. Baseline unstimulated salivary flow rate in treatment group was 0.203 g/min and 0.213 g/min in control group. The salivary flow rate increased significantly to 8.03 g/10 minutes compared to control at 3.72 g/10 minutes.
Jarrar et al (2021)[101]	12-week, single-blind, R, PC, parallel-design clinical trial evaluated effects of acacia gum powder supplementation on specific cardiovascular and metabolic risk factors in adults (N = 80).	Treatment group (n = 40): 20 g of acacia gum (*S. senegal*) powder in prepared sachet, 2x/day in hot water, tea, milk, or a meal Placebo group (n = 40): 1 g of pectin in prepared sachet, 2x/day in hot water, tea, milk, or a meal At baseline and at end of study, waist circumference, weight, body fat mass, blood glucose, HbA1c, cholesterol, and blood pressure levels were measured. Also, satiety and bowel movements were followed by questionnaire.	61 participants completed the study (treatment group = 31 participants and control group = 30), with 19 participants that did not finish study due to lack of compliance. At end of study, authors reported significant decreases in blood pressure (both systolic and diastolic) in the treatment group. No changes to cholesterol and HbA1c levels were reported. No significant differences for body mass, waist circumference, or body fat mass. Treatment group participants reported decrease of bloating and increase in satiety and quality of bowel movements.
Larson et al (2021)[106]	Study evaluated effects of acacia gum on satiety, glycemic response, food intake, and digestion tolerance in healthy subjects (N = 48; 18-65 years of age).	Group A: Control group; prepared breakfast only (orange juice and bagel); no acacia gum Group B: Prepared breakfast with 20 g of acacia gum dissolved (Nexira; Rouen Cedex, France) Group C: Prepared breakfast with 40 g of acacia gum dissolved Each participant was randomly placed into 3 groups to receive each of the treatments and office visits separated by 1 week. Measurements of blood glucose, digestive tolerance, and satiety were measured at baseline and after 30, 60, 120, 180, and 240 minutes. Computerized visual analog scales were used to assess satiety symptoms, digestion symptoms by subjective questions, and blood glucose levels with glucometer.	Glycemic response did not show any significant differences throughout the study. Satiety did show improvement at 15-, 30- and 240-minute mark. Bloating and flatulence were higher in 40 g group compared to control group; however, treatment overall was well tolerated.

DB = double-blind; PC = placebo-controlled; R = randomized; RCT = randomized controlled trial

SUSTAINABILITY AND FUTURE OUTLOOK

Both *S. senegal* and *V. seyal* are well-adapted to desert and drought conditions and grow in areas where few other trees can flourish[6,7]; this, along with widespread propagation, will contribute in part to long-term sustainability of acacia gum production. Gum production is promoted and quality increased when trees are faced with environmental and physiological stressors including high temperatures, drought, insect predation, and physical injury to the tree whether occurring naturally or intentionally by humans.[4] Although these species are drought tolerant, extreme drought conditions lasting consecutive years do increase rate of desertification, and encroaching sands can kill the trees.[109] Pressures on sustainable supply of acacia gum are of a different nature than that of many crops in which increased stress, herbivory, and climate change are seen to negatively impact productivity. While herbivory and depredation from locusts, birds,[110,111] and longhorn beetles (*Cerambycidae*)[111] have at times been reported to drastically reduce or nullify productivity of gum trees, political unrest and lack of good livelihoods and fair wages for collectors are seen to be greater threats to acacia gum production than environmental stressors.[2] Reports that acacia gum is often harvested by vulnerable groups, such as women, ethnic minorities, politically displaced, and the very poor,[2] may further contribute to market volatility and suggests avenues of redress that could stabilize market and product availability in gum-producing regions.

There are efforts in some countries and by some international organizations[2,4] to provide optimum shares of economic returns to gum collectors and other stakeholders, specifically fair compensation, and thus encourage sustainable agroforestry practices and help prevent desertification and slow climate change (i.e., better wages to collectors will encourage better gum-tree management practices). The governments of some acacia gum-producing countries are encouraging and/or incentivizing farmers to set up plantations of cultivated *S. senegal* trees, helping to ensure sustainable acacia gum production.[4] Across Sahelian Africa, much of acacia gum is harvested from wild trees or from semi-wild, managed "gum gardens"; however, they are also widely cultivated and grown in large plantation-like farms, both in Africa and in other gum-producing countries such as India and Pakistan.[112]According to the International Legume Database and Information Service, the conservation status of *S. senegal* is listed as "Not Threatened."[113] According to the IUCN Red List of Threatened Species, the conservation status of *V. seyal* is listed as "Least Concern."[15]

FairWild Foundation does not list any suppliers that currently provide certified FairWild® acacia gum (gum arabic); however, they list two companies that could add certification for this ingredient if demand was sufficient.[114] According to the USDA Organic Integrity Database, only four countries currently produce certified organic acacia gum (gum arabic): Chad, India, Senegal, and Sudan.[115] Acacia gum grown in India may in fact not be gum from *S. senegal* or *V. seyal*, but it may be derived from *V. nilotica*, the official species in the *Indian Pharmacopoeia*.[116] In addition to countries producing organic acacia gum, a number of other countries process and distribute the organic product.[115]

Given the widespread and extensive use of acacia gum across multiple sectors of global industry, it is reasonable to conclude that quantities needed to meet the demand in the international marketplace will only continue to increase in the future.[2,4] With increased visibility and commitment to fair value shares for collectors, harvesters, and processors, and with reforms to address revenue segregation and combat gender inequality, acacia gum production has the potential to promote better rural livelihoods and greater economic equitability while at the same time helping to mitigate climate change. HG

References

1. Ahmed AA. Health Benefits of Gum Arabic and Medical Use. In: Mariod AA, ed. *Gum Arabic Structure, Properties, Application, and Economics*. London, UK: Academic Press; 2018:183-210.
2. United Nations Conference on Trade and Development (UNCTAD). *Commodities at a Glance: Special Issue on Gum Arabic*. No. 8. Geneva, Switzerland: United Nations; 2018.
3. Von Dalen D. *Gum Arabic: The Golden Tears of the Acacia Tree.* Leiden, Netherlands: Leiden University Press; 2019.
4. Prasad N, Thombare N, Sharma SC, Kumar S. Gum arabic — A versatile natural gum: A review on production, processing, properties and applications. *Ind Crops Prod.* 2022;187(Part A):115304.
5. Ashour MA, Fatima W, Imran M, et al. A review on the main phytoconstituents, traditional uses, inventions, and patent literature of gum arabic emphasizing *Acacia seyal*. *Molecules.* 2022;27(4):1171.
6. *Senegalia senegal* (L.) Britton. Plants of the World Online database. 2024. Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:518304-1/general-information#source-KSP. Accessed January 21, 2024.
7. *Vachellia seyal* (Delile) P.J.H.Hurter. Plants of the World Online database. 2024. Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:77089276-1. Accessed January 21, 2024.
8. Mortensen A, Aguilar F, Crebelli R, et al. Re-evaluation of acacia gum (E 414) as a food additive. *EFSA Journal.* 2017;15(4):4741.
9. Satti NME, Ahmed FAM, Bawadekji A, Eltahir S. Gum arabic (acacia gum): A review. *Journal of the North for Basic and Applied Sciences (JNBAS)* 2020;5(1):1658-7014.
10. Zimmermann M, Johnson HE, McGuffin M, Applequist W. *American Herbal Products Association's Herbs of Commerce*. 3rd ed. Silver Spring, MD: American Herbal Products Association; 2023.
11. McNeill JS, Stuessy TF, Turland NJ, Hörandl E. XVII International Botanical Congress: Preliminary mail vote and report of Congress action on nomenclature proposals. *Taxon.* 2005;54:1057-1064.
12. Seigler DS, Eblinger JE, Miller JT. The genus *Senegalia* (Fabaceae: Mimosoideae) from the new world. *Phytologia.* 2005;88(1):38-93.
13. *Acacia senegal*. HerbMedPro database. Available at: www.herbalgram.org/resources/herbmedpro/herb-list/acacia-gum. Accessed January 30, 2024.
14. Gillett JB, Polhill RM, Verdcourt B. *Flora of Tropical East Africa: Leguminosae.* London, UK: Crown Agents for Oversea Governments and Administrations; 1971.
15. *Vachellia seyal. The IUCN Red List of Threatened Species*. 2020:e. T136661595A136661636. Available at: https://dx.doi.org/10.2305/IUCN.UK.2020-2.RLTS.T136661595A136661636.en. Accessed November 30, 2023.
16. Hutchinson J, Dalziel JM. *Flora of West Tropical Africa: Mimosaceae.* London, UK: Crown Agents for Overseas Governments and Administrators; 1958.
17. Young TP, Stubblefield CH, Isbell LA. Ants on swollen-thorn acacias: Species coexistence in a simple system. *Oecologia*. 1996;109:98-107.
18. Willdenow CL. *Species Plantarum. Editio Quarta.* Vol 4(2). Berlin, Germany: Berolini; 1806.
19. Delile AR. *Description de l'Egypte, Histoire Naturelle. Tom. Second.* Paris, France: Imprimerie Imperiale; 1812.
20. Thiele KR, Funk VA, Iwatsuki K, et al. The controversy over the retypification of *Acacia* Mill. with an Australian type: A pragmatic view. *Taxon.* 2011;60:194-198.
21. Miller JT, Seigler D. Evolutionary and taxonomic relationships of *Acacia s.l.* (Leguminosae: Mimosoideae). *Aust Syst Bot* 2012;25:217-224.
22. Kyalangalilwa B, Boatwright J, Darum BH, et al. Phylogenetic position and revised classification of *Acacia s.l.* (Fabaceae: Mimosoideae) in Africa, including new combinations in *Vachellia* and *Senegalia*. *Bot J Linn.* 2013;172:500-

523.
23. Maslin BR, Seigler DS, Ebinger J. New combinations of *Senegalia* and *Vachellia* (Leguminosae: Mimosoideae) for Southeast Asia and China. *Blumea.* 2013;58:39-44.
24. *Senegalia* Raf. Plants of the World Online database. 2024. Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30003347-2. Accessed January 21, 2024.
25. *Vachellia* Wight & Arn. Plants of the World Online database. 2024. Available at: https://powo.science.kew.org/taxon/urn:lsid:ipni.org:names:30000732-2. Accessed January 21, 2024.
26. Kokwaro J. *Medicinal Plants of East Africa.* Nairobi, Kenya: Kenya Literature Bureau; 1993.
27. Burkill HM. *The Useful Plants of West Tropical Africa.* London, UK: Royal Botanic Gardens, Kew; 1995.
28. McEachran R. Gum arabic: The invisible ingredient in soft drink supply chains. August 16, 2013. *The Guardian*. Available at: www.theguardian.com/sustainable-business/gum-arabic-soft-drink-supply-chain Accessed Jan 21, 2024.
29. UN Comtrade Database. Available at: https://comtradeplus.un.org/TradeFlow?Frequency=A&Flows=X&CommodityCodes=130120&Partners=0&Reporters=all&period=2023&AggregateBy=none&BreakdownMode=plus. Accessed March 28, 2024.
30. Global Agricultural Trade System. USDA Foreign Agriculture Service. Available at: https://apps.fas.usda.gov/gats/default.aspx. Accessed March 28, 2024.
31. Baumann BB. The botanical aspects of ancient Egyptian embalming and burial. *Econ Bot.* 1960;14(1):84-104.
32. Lucas A, Harris J. *Ancient Egyptian Materials and Industries.* Mineola, New York: Dover Publications, Inc; 2012.
33. Brøns C, Rasmussen KL, Di Crescenzo MM, Stacey R, Lluveras-Tenorio A. Painting the palace of Apries I: Ancient binding media and coatings of the reliefs from the palace of Apries, Lower Egypt. *Herit Sci.* 2018;6(1):6.
34. Hort A, trans. *Theophrastus: Enquiry into Plants and Minor Works on Odours and Weather Signs, with an English Translation by Sir Arthur Hort.* Vol II. London, UK and New York, NY: William Heinemann and G.P. Putman's Sons; 1916.
35. Dioscorides Pedanius O. Wood RPA, trans. *De Materia Medica: Being an Herbal with Many Other Medicinal Materials: Written in Greek in the First Century of the Common Era: A New Indexed Version in Modern English.* Johannesburg, South Africa: Ibidis Press; 2000.
36. *The Holy Bible: Chapter Exodus 25 and 26. Containing the Old and New Testaments Translated out of the Original Tongues and with the former translations dillgently compared and revised by his Majesty's special command. King James Version.* Iowa Falls, Iowa World Bible Publishers.
37. Negash L. *A Selection of Ethiopia's Indigenous Trees: Biology, Uses and Propogation Techniques.* Addis Ababa, Ethiopia: Addis Ababa University Press; 2010.
38. Miller P. *The Gardeners Dictionary, 4th ed.* Vol 1. London, UK: John and James Rivington; 1754.
39. Quattrocchi U. *CRC World Dictionary of Medicinal and Poisonous Plants.* Boca Raton, FL: CRC Press; 2012.
40. Bauhin C. *Pinax Theatri Botanici.* Basileae Helvetica Ludovici Regis; 1623.
41. Linnaeus C. *Species Plantarum: exhibentes plantas rite cognitas, ad genera relatas, cum differentiis specificis, nominibus trivialibus, synonymis selectis, locis natalibus, secundum systema sexuale digestas. 2 vols.* Stockholm, Sweden: Impensis Laurentii Salvii; 1753.
42. Britton NL, Wilson P. *Scientific Survey of Porto Rico & Virgin Islands.* Vol 6. New York, NY: New York Academy of Sciences; 1930.
43. Gledhill D. *The Names of Plants*. 4th ed. Cambridge, UK: Cambridge University Press; 2008.
44. Delile AR. *Acacia seyal* Delile. *Descr Egypte, Hist Nat. 286, t. 52, f. 2.* 1813.
45. Mabberley DJ. *Mabberley's Plant-Book: A Portable Dictionary of Plants, Their Classification and Uses.* Cambridge, UK: Cambridge University Press; 2008.
46. لاميس. WordSense Online Dictionary. Available at: www.wordsense.eu/%D8%B3%D9%8A%D8%A7%D9%84/ Accessed February 2, 2024.
47. Webb J. The trade in gum arabic: Prelude to French conquest in Senegal. *JAH.* 1985;26:149-168.
48. Webb J. The mid-eighteenth century gum arabic trade and the British conquest of Saint-Louis du Senegal, 1758. *J Imp Commonw Hist.* 1997;25(1):37-58.
49. Wimmler J. From Senegal to Augsburg: Gum arabic and the central European textile industry in the eighteenth century. *Text Hist.* 2019;50:22-24.
50. Cordus V. *Dispensatorium, hoc est, pharmacorum conficiendorum ratio.* 1546.
51. Occo A. *Enchiridion sive, ut vulgo vocant, dispensatorium compositorum medicamentorum pro Reipub. Augstburgensis pharmacopoeis.* 1564.
52. Collegio Medico. *Dispensatorium Brandenburgicum.* Berlin: Sumptibus Joh. Völckeri Imprim. Ulricus Lielpertus; 1698.
53. Bruntz L, Jaloux M. *Plantes Officinales et Plantes a Drogues Médicamenteuses.* Vigot; 1918.
54. Friedrich C. *German Pharmacopoeias*. Eschborn, Germany: Internationale Gesellschaft für Geschichte der Pharmazie; 2024. Available at: www.histpharm.org/ISHPWG%20Germany.pdf. Accessed April 24, 2024.
55. Falck A. *Die Arzneibücher, Pharmakopöen, vergleichend besprochen mit einem Verzeichnis der Arzneibücher.* Barth; 1920.
56. Massachusetts Medical Society. *The Pharmacopoeia of the Massachusetts Medical Society.* Boston, MA: E & J Larkin; 1808.
57. Mitchill SL, Seaman V. *The Pharmacopoeia of the New-York Hospital.* New York, NY: Collins & Co; 1816.
58. US Pharmacopeial Convention. *The Pharmacopoeia of the United States of America.* Boston, MA: Charles Ewer; 1820.
59. US Pharmacopeial Convention. *The United States Pharmacopeia.* 45th rev. Rockville, MD: United States Pharmacopeial Convention; 2022.
60. Upton R. *American Herbal Pharmacopoeia and Therapeutic Compendium: Slippery Elm Inner Bark* Ulmus rubra *Muhl.* Scotts Valley, CA: American Herbal Pharmacopoeia; 2011.
61. Van Wyk BE. A review of commercially important African medicinal plants. *J Ethnopharmacol.* 2015;176:118-134.
62. Ballal ME, Salih NKE, Magid A. Ethnobotany of natural forests of Nuba Mountains South Kordofan State Sudan. *Journal of Forest Products & Industries.* 2014;3(1):13-19.
63. Musa MS, Abdelrasool FE, Elsheikh EMA, et al. Ethnobotanical study of medicinal plants in the Blue Nile State, South-eastern Sudan. *J Med Plant Res.* 2011;5:4287-4297.
64. Tchatchedre M, Amoussa AMO, Houinato MRB, et al. Ethnobotanical survey and phytogeographical study of plants species from genus *Acacia* in Benin. *J Med Plants Res.* 2019;13(9):199-212.
65. Pare D, Hilou A, Ouedraogo N, Guenne S. Ethnobotanical study of medicinal plants used as anti-obesity remedies in the nomad and hunter communities of Burkina Faso. *Medicines (Basel).* 2016;3(2).
66. Brendler T, Eloff JM, Gurib-Fakim A, Phillips LD. *Association for African Medicinal Plants Standards, African Herbal Pharmacopoeia.* Rue des Oursins, Baie du Tombeau, Mauritius: Graphic Press Ltd; 2010.
67. West Africa Health Organization. *West African Herbal Pharmacopeia.* Bobo-Dioulasso, Burkina Faso: West Africa Health Organization; 2013.
68. Wekesa C, Makenzi PM, Chikamai BN, Luvanda AM, Muga MO. Traditional ecological knowledge associated with *Acacia senegal* (gum arabic tree) management and gum arabic production in northern Kenya. *Int For Rev.* 2010;12(3):240-246.
69. O'Neil MJ, Heckelman PE, Dobbelaar PH, Roman KJ, eds. *The Merck Index: An Encyclopedia of Chemicals, Drugs, and Biologicals*. 15th ed. Cambridge, UK: The Royal Society of Chemistry; 2013.
70. Joint FAO/WHO Expert Committee on Food Additives 49th Session. Compendium of Food Additive Specifications. Addendum 5 (FAO Food and Nutrition Paper - 52 Add. 5). Available at: www.fao.org/3/W6355E/w6355e0g.htm. World Health Organization; 1997. Accessed February 13, 2024.

71. Adam HE, Eltahir MES, Elhaja ME, et al. Management of gum arabic production potentialities in the gum belt in Kordofan, Sudan. In: Prasad N, Thombare N, Sharma SC, Kumar S, eds. *A Versatile Natural Gum: A Review on Production, Processing, Properties and Applications.* Vol 187: *Ind Crops Prod.* 2017:1-9.
72. Sharma S, Prasad N, Pandey S. A review on status of gum tapping and scope for improvement. *Agricultural Mechanization in Asia, Africa, and Latin America.* 2016;47(3):68-75.
73. FAO/WHO Food Standards Codex Alimentarius, GSFA Online. Available at: www.fao.org/gsfaonline/additives/details.html?id=63&d-3586470-s=5&d-3586470-o=2&lang=. Accessed December 27, 2023.
74. United States Pharmacopeia. *NF Monograph, Acacia.* Rockville, MD: United States Pharmacopeia; 2024.
75. United States Pharmacopeia. Food Chemical Codex (FCC). Washington, DC: United States Pharmacopeial Convention; 2024.
76. Food and Drug Administration. 21 CFR 172.780 Acacia (gum arabic). *Code of Federal Regulations*. Washington, DC: Office of the Federal Register National Archives and Records Administration; 2023.
77. Food and Drug Administration. 21 CFR 184.1330 Acacia (gum arabic). *Code of Federal Regulations*. Washington, DC: Office of the Federal Register National Archives and Records Administration; 1988.
78. Food and Drug Administration. 21 CFR 582.7330 Gum arabic. *Code of Federal Regulations*. Washington, DC: Office of the Federal Register National Archives and Records Administration; 2023.
79. Food and Drug Administration. 27 CFR 24.246 Materials authorized for the treatment of wine and juice. *Code of Federal Regulations*. Washington, DC: Office of the Federal Register National Archives and Records Administration; 2022.
80. United States Pharmacopeia. *NF Monograph, Acacia syrup.* Rockville, MD: United States Pharmacopeia; 2024.
81. FDA Grants Citizen Petition on Acacia (Gum Arabic) as a Dietary Fiber [press release]. Silver Spring, MD: US Food and Drug Administration; December 17, 2021. Available at: www.fda.gov/food/cfsan-constituent-updates/fda-grants-citizen-petition-acacia-gum-arabic-dietary-fiber. Accessed December 4, 2023.
82. Defined Organism Substance — Acacia. Natural and Non-Prescription Health Products Directorate. March 15, 2023. Available at: https://webprod.hc-sc.gc.ca/nhpid-bdipsn/ingredReq.do?id=3740&lang=en. Accessed December 4, 2023.
83. Defined Organism Substance — Acacia Senegal Gum. Natural and Non-Prescription Health Products Directorate. March 15, 2023. Available at: https://webprod.hc-sc.gc.ca/nhpid-bdipsn/ingredReq.do?id=4307&lang=en. Accessed December 4, 2023.
84. European Pharmacopoeia Commission. *European Pharmacopoeia*. 11th ed. Strasbourg, France: European Directorate for the Quality of Medicines; 2022.
85. Ingredient: Acacia Senegal Gum Extract. Cosmetic Ingredient (CosIng) database. Available at: https://ec.europa.eu/growth/tools-databases/cosing/details/31561. Accessed December 4, 2023.
86. Monograph: Gum arabic. Database of Japan's Standards and Specifications for Food Additives. 2014. Available at: https://dfa25.nihs.go.jp/jssfa/detail.php?GV_code=&GV_name=gum%20arabic&GV_shiseicode=&GV_shiseianother=&GV_jundocode=&GV_jundoanother=&GV_hinmoku=&GV_kakunin=&GV_teiryo=&GV_kanren=&web_FullText_joint=&img_exists=&skip=0&HM_ID=HM00050. Accessed December 27, 2023.
87. Ministry of Food and Drug Safety Regulation. *Food Additives Code (Standards and Specifications of Food Additives).* 2023.
88. Al-Jubori Y, Ahmed NTB, Albusaidi R, et al. The efficacy of gum arabic in managing diseases: A systematic review of evidence-based clinical trials. *Biomolecules.* 2023;13(1):138.
89. Mahendran T, Williams PA, Phillips GO, et al. New insights into the structural characteristics of the arabinogalactan-protein (AGP) fraction of gum arabic. *J Agric Food Chem.* 2008;56(19):9269-9276.
90. Musa HH, Ahmed AA, Musa TH. Chemistry, Biological, and Pharmacological Properties of Gum Arabic. In: Mérillon K, Ramawat K, eds. *Bioactive Molecules in Food*. Cham, Switzerland: Springer International Publishing AG; 2018:1-18.
91. Lopez-Torrez L, Nigen M, Williams P, et al. *Acacia senegal* vs. *Acacia seyal* gums – Part 1: Composition and structure of hyperbranched plant exudates. *Food Hydrocoll.* 2015;51:41-53.
92. Bourquin LD, Titgemeyer EC, Fahey Jr G, Garleb KA. Fermentation of dietary fibre by human colonic bacteria: Disappearance of, short-chain fatty acid production from, and potential water-holding capacity of, various substrates. *Scand J Gastroenterol.* 1993;28(3):249-255.
93. Bliss DZ, Savik K, Jung HJ, et al. Dietary fiber supplementation for fecal incontinence: A randomized clinical trial. *Res Nurs Health.* 2014;37(5):367-378.
94. Zhang D, Jian YP, Zhang YN, et al. Short-chain fatty acids in diseases. *Cell Commun Signal.* 2023;21(1):212.
95. Rawi MH, Abdullah A, Ismail A, Sarbini SR. Manipulation of gut microbiota using *Acacia* gum polysaccharide. *ACS Omega.* 2021;6(28):17782-17797.
96. Calame W, Weseler AR, Viebke C, et al. Gum arabic establishes prebiotic functionality in healthy human volunteers in a dose-dependent manner. *Br J Nutr.* 2008;100(6):1269-1275.
97. Cherbut C, Michel C, Raison V, et al. Acacia gum is a bifidogenic dietary fibre with high digestive tolerance in healthy humans. *Microb Ecol Health Dis.* 2003;15:43-50.
98. Babiker R, Merghani TH, Elmusharaf K, et al. Effects of gum arabic ingestion on body mass index and body fat percentage in healthy adult females: Two-arm randomized, placebo controlled, double-blind trial. *Nutrition Journal.* 2012;11:111.
99. Babiker R, Elmusharaf K, Keogh MB, et al. Metabolic effects of gum arabic (*Acacia senegal*) in patients with type 2 diabetes mellitus (T2DM): Randomized, placebo controlled double blind trial. *Funct Foods Health Dis.* 2017;7(3):222-234.
100. Babiker R, Elmusharaf K, Keogh MB, Saeed AM. Effect of gum arabic (*Acacia senegal*) supplementation on visceral adiposity index (VAI) and blood pressure in patients with type 2 diabetes mellitus as indicators of cardiovascular disease (CVD): A randomized and placebo-controlled clinical trial. *Lipids Health Dis.* 2018;17(1):56.
101. Jarrar AH, Stojanovska L, Apostolopoulos V, et al. The effect of gum arabic (*Acacia senegal*) on cardiovascular risk factors and gastrointestinal symptoms in adults at risk of metabolic syndrome: A randomized clinical trial. *Nutrients.* 2021;13(1):194.
102. Kamal D, Hassanein H, Akah M, et al. Caries preventive and anti-bacterial effects of two natural mouthwashes vs chlorhexidine in high caries-risk patients: A randomized clinical trial. *J Contemp Dent Pract.* 2020;21(12):1316-1324.
103. Bielfeldt S, Wilhelm D, Neumeister C, et al. Effect of a newly developed pastille on the salivary flow rate in subjects with dry mouth symptoms: A randomized, controlled, monocentric clinical study. *BMC Oral Health.* 2021;21(1):117.
104. Elamin S, Alkhawaja MJ, Bukhamsin AY, et al. Gum arabic reduces C-reactive protein in chronic kidney disease patients without affecting urea or indoxyl sulfate levels. *Int J Nephrol.* 2017;2017:9501470.
105. Kamal E, Kaddam LA, Dahawi M, et al. Gum arabic fibers decreased inflammatory markers and disease severity score among rheumatoid arthritis patients, phase II trial. *Int J Rheumatol.* 2018;2018:4197537.
106. Larson R, Nelson C, Korczak R, et al. Acacia gum is well tolerated while increasing satiety and lowering peak blood glucose response in healthy human subjects. *Nutr J.* 2021;13(2):618.
107. Schmelzer GH, Gurib-Fakim A, Arroo R, et al. *Plant Resources of Tropical Africa: Medicinal Plants.* Vol 11. Wageningen, The Netherlands: University of Wageningen; 2008.
108. Nardin T, Ferrari G, Romàn T, et al. Botanical and commercial characterisation of gum arabic and its detection in wine using non-targeted high resolution mass spectrometry. *Food Hydrocoll.* 2019;95:385-395.
109. Eisa MA, Elhadi HM. Review of Gum Arabic Production Sudan. In: Yousef AF, ed. *Cutting Edge Research in Biology.* Vol 1. West Bengal, India: B P International; 2022:23-32.
110. Muller D, Okoro C. *Production and Marketing of Gum Arabic*. Nairobi, Kenya: Network for Natural Gums and Resinsin Africa; 2004. Available at: https://ngara.org/publications/production-and-marketing-of-gum-arabic-english-french-2/. Accessed April 24, 2024.
111. Eisa MA, Elhadi HM. Review of gum arabic production stability and fluctuation, Sudan. *Asian Journal of Research in Biosciences.* 2022;4(1):77-81.
112. National Academy of Sciences. *Firewood Crops. Shrub and Tree Species for Energy Production.* Washington, DC: National Academy of Sciences; 1980.
113. *Senegalia senegal* (L.) Britton. Plants of the World Online database. Accessed January 23, 2024.
114. Gum arabic. FairWild Ingredient Database. FairWild Foundation. Available at: www.fairwild.org/ingredients/gum-arabic?rq=acacia%20gum. Accessed January 22, 2024.
115. Organic INTEGRITY Database. US Department of Agriculture Agricultural Marketing Service. Available at: https://organic.ams.usda.gov/integrity/. Accessed January 23, 2024.
116. Indian Pharmacopoeial Commission. *Indian Pharmacopoeia 2022*. Vol III. Ghaziabad, India: The Indian Pharmacopoeia Commission; 2022.

Peggy Brevoort and Morris Shriftman Named Trustees Emeriti of the American Botanical Council

By Connor Yearsley

In February 2024, the Board of Trustees of the nonprofit American Botanical Council (ABC) named Peggy Brevoort trustee emerita and Morris "Mo" Shriftman trustee emeritus for their many years of service to the organization, whose mission is to "provide education using science-based and traditional information to promote responsible use of herbal medicine." Brevoort and Shriftman both joined ABC's Board of Trustees in 2003, and Brevoort served as president from 2003 to 2008.

Peggy Brevoort

In 1971, Brevoort and her husband Bill established East Earth Herb, Inc., a company specializing in the importation, manufacture, and sale of Chinese herbal products to both national and international markets. Initially, the Brevoorts imported Chinese herbal preparations to sell to health food stores, food co-ops, and anyone who was interested. In the mid-1970s, the Brevoorts lived in a rural area near the coast in Oregon, where they conducted their business.

Peggy Brevoort

She was the company's CEO from 1990 to 1999 and president from 1997 to 1999. AM Todd Company acquired East Earth Herb in April 1999, and she retired from AM Todd Botanicals in April 2000.

Brevoort has been a member of the boards of many organizations: Dharma Realm Buddhist University, Kokolulu Farm and Cancer Retreats, Bastyr University, Biomed Comm, Inc., the United Plant Savers, the Corporate Alliance for Integrative Medicine, Inc., and Citizens for Health. From 1990 to 1994, she was the president of the American Herbal Products Association (AHPA), the leading trade association in the United States for the herb industry.

Bastyr University named her the recipient of its 2008 William A. Mitchell, ND, Service Merit Award, which recognizes philanthropy and dedication to Bastyr University, and New Hope Network featured her and Bill Brevoort on its list of "25 Who Fortified Supplements" in April 2008.

Natural Business Communications named her the recipient of its "1999 Leadership in Business Award," and the Association of Women in Natural Foods named her its "1990 Woman of the Year." She was also a member of the First Herbalist Delegation to the People's Republic of China in 1988.

Based on her extensive market experience as both a business owner and past president of AHPA, she wrote two extensive and seminal articles on the growing market for herbal products in the United States in ABC's journal *HerbalGram*: "The U.S. Botanical Market — An Overview" in *HerbalGram* issue 36 (spring 1996) and "The Booming U.S. Botanical Market: A New Overview" in *HerbalGram* issue 44 (fall 1998). The former was reprinted, and thousands of copies were distributed at conferences for several years.

Brevoort is also a certified feng shui consultant through the Blue Mountain School of Feng Shui and certified labyrinth facilitator through Veriditas labyrinth facilitator training. She currently lives in Honolulu, Hawaii, on the edge of a wildlife bird sanctuary and lagoon and still occasionally builds labyrinths.

"Thank you to the ABC Board of Trustees for this acknowledgment," Brevoort wrote. "To be recognized by one's peers is always an honor. When I joined the ABC Board in 2003, it was smaller and less formalized. The meetings were then and continued to be a combination of dealing with ABC business and being sidetracked by fascinating subtopics of herbal interest. Each board member was an expert in his or her field, so it was appealing and great fun to digress into esoteric discussions. We all learned a lot!

"As ABC continued to mature as an organization, it was our responsibility to discuss, filter, and approve or modify Mark's wonderful suggestions and vision for the organization," Brevoort added. "What particularly stands out for me was our support and development of the Botanical Adulterants Prevention Program, the creation of ABC's chief science officer position and subsequent hiring of Dr. Stefan Gafner, and, of course, the continuing publication of the always-stunning *HerbalGram* on a quarterly basis. I trust that ABC continues to make wise decisions and grow as an organization for many years to come."

Mark Blumenthal, founder and executive director of ABC, said: "I have known Peggy for 50 years, since 1974, when she and her late husband Bill owned East Earth Herb and supplied me with Chinese herbal products for my small wholesale herb company in Austin, Texas. Since then, Peggy and I have been good friends and colleagues in a variety of

ways, probably the most important being her role on the ABC Board of Trustees for almost 20 years, particularly her time as president of the board. Peggy's experience, insights, passion, and good judgment have helped ABC in many ways that are not possible to measure, and I will forever feel grateful for her contributions to the herbal community as a whole and my life in particular."

Morris 'Mo' Shriftman


Morris "Mo" Shriftman

The founder and CEO of Mozart, LLC, Shriftman has helped build companies and brands in the natural, organic, and nutritional supplement industries since 1970. New Hope Network named him among "The Top Business Builders in the Natural and Organic Products Industry" and, in 2017, inducted him into its "Hall of Legends," which honors some of the natural products industry's greatest contributors.

Shriftman is an experienced entrepreneurial marketing executive with more than 50 years of branding, marketing, sales development, and distribution knowledge in the natural and organic food and nutritional supplement industries. He also has expertise in new product development and strategic planning and tactical initiatives and has helped differentiate companies and their products, solve supply chain issues, motivate and manage teams of sales and marketing professionals, and drive sales.

His clients have included some of the industry's largest natural products distributors, such as Tree of Life and United Natural Foods, as well as leading retailers, such as Whole Foods Market and Mrs. Gooch's Natural Food Markets (now part of Whole Foods), and leading consumer brands and companies, including Horizon Organic, Traditional Medicinals, Woodstock Farms, Smucker Quality Beverages, Avalon Natural Products, and others.

Shriftman also has been a member of the board of directors of Demeter Association, Inc. (a nonprofit whose mission is to enable people to farm successfully in accordance with Biodynamic® practices and principles) and Ninkasi Brewing (an artisanal craft beer brewery) and an investor and advisor for Mineral Fusion (a mineral-based skin care and cosmetics brand).

He earned a bachelor's degree in industrial and labor relations from Cornell University in 1964 and a master's degree in British and American literature from New York University in 1970.

Shriftman remembers his time on ABC's Board of Trustees fondly. He wrote:

> Over the past 20 years, there have been many highlights. Working with Mark and ABC's esteemed Board of Trustees and staff on an ever-changing variety of important topics and challenges related to plant-based medicine and providing scientific substantiation through our many publications and initiatives have given me great satisfaction, a sense of purpose, and a feeling of accomplishment.
>
> I hope ABC's Board of Trustees will adopt a dramatically expanded vision statement and new initiatives to extend ABC's leadership and critically important work for the next generation. I also hope ABC will expand *HerbalGram* circulation (it is such a beautiful publication and warrants wider readership) and broaden its educational reach and impact, particularly through more ABC educational videos.
>
> I have learned so much about herbs, medicinal plants, and the environments around them from Mark, ABC Chief Science Officer Stefan Gafner, the distinguished members of the Board of Trustees, and the world-class advisors on the ABC Advisory Board. I was especially inspired by ABC trustees including the late Steven Foster, Fredi Kronenberg, and Norman Farnsworth. I am deeply grateful for the knowledge they have shared with me, giving me insights into the secret life of plants and how much human life and health are intertwined with plant life. This has been one of the greatest learning adventures in my life, and I have profound gratitude to have had this experience for nearly 20 years as a member of the ABC Board of Trustees and now to have been named ABC trustee emeritus. This is a culminating honor of my career in the natural products community.

"I have known Mo since the 1980s, and I have always been amazed at his artistic and poetic expression of concepts and issues," said Blumenthal. "He uses words in such an exquisite fashion that I feel like I'm listening to a poet. When Mo speaks, people listen. No one I've ever met sees so much of the big picture and communicates his wide vision as beautifully as Mo. His support of ABC and our personal friendship have made my life, and the life of countless people, richer and more worthwhile."

As emeritus members of the ABC Board of Trustees, Brevoort and Shriftman will have the opportunity to continue to attend ABC Board meetings as nonvoting members as well as meetings of the ABC Advisory Board. They also have been granted honorary lifetime ABC membership. HG

American Botanical Council's Year in Review: 2023

By ABC Staff

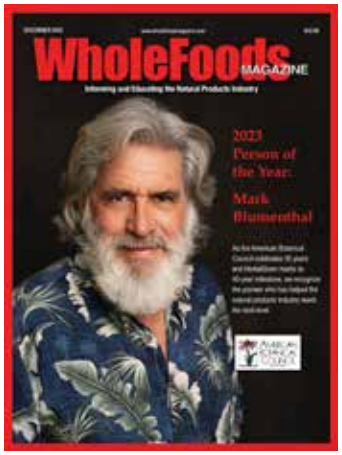
The American Botanical Council (ABC) celebrated its 35th anniversary in 2023. As a nonprofit research and educational organization, ABC focuses on creating meaningful social and cultural change that promotes health through the responsible use of scientifically researched medicinal plants and fungi.

To create its science-based educational content, ABC has a rigorous peer-review process and relies on the efforts of many committed individuals that make up its staff and network of contractors, editors, compilers, writers, and consultants. The organization has members in more than 80 countries and delivers vital, reliable, authoritative information to the herb community, academia, educators, consumers, and others. ABC accomplishes this through its information-rich website, highly researched publications, unique ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP), Sustainable Herbs Program (SHP), Adopt-an-Herb Program, internship program for pharmacy and dietetics students, webinars, lectures, and more.

Awards and Recognitions

In July 2023, NutraIngredients-USA recognized BAPP with the publication's "Editors' Award for Industry Initiative of the Year" for the "BAPP Best Practices Standard Operating Procedure (SOP) for the Disposal/Destruction of Irreparably Defective Articles."

In November, *WholeFoods Magazine* named ABC Founder and Executive Director Mark Blumenthal its "2023 Person of the Year." In the cover article of its December 2023 issue, the magazine detailed Blumenthal's career and accomplishments. "I am deeply and genuinely honored for *WholeFoods Magazine*'s recognition of the science-based nonprofit work of ABC," Blumenthal said. "And I want to express my profound gratitude to the many ABC supporters who commented about this wonderful acknowledgment of ABC's vital role in our fabulous herbal community."



HerbalGram40 Project & Fund

In 2023, ABC also commenced a one-year celebration of the 40th anniversary of *HerbalGram*, ABC's flagship publication, which began in summer 1983. Blumenthal co-founded *HerbalGram* five years before he started ABC, and the magazine has been a cornerstone of ABC's many nonprofit educational programs and publications and a highly valued resource for many people in the herbal community.

One reason for *HerbalGram*'s significance is that it has covered a wide breadth and depth of content, from the fascinating history of herb use and ethnobotany to climate, sustainability, and conservation topics, quality control, clinical research, market dynamics, and so many other aspects of herbs and medicinal plants.

The 40th anniversary of *HerbalGram* has provided ABC an opportunity to encourage its members and other friends to reflect on ABC's work and preparation for the future. This led to the launch of ABC's HerbalGram40 Project & Fund and a series of *HerbalGram* timelines, one for each decade, in *HerbalGram* issues 138-141. The HerbalGram40 Project & Fund is a self-evaluation and planning process that invites stakeholders to help ABC determine

what it is doing well, how it can improve its nonprofit educational mission, and what else can be done to enhance the interests of the domestic and global medicinal plant community.

Other 2023 Accomplishments

- BAPP published its 84th peer-reviewed document. BAPP publications are freely available and include Botanical Adulterants Prevention Bulletins, Laboratory Guidance Documents, Botanical Adulterants Monitor e-newsletters, and other information to support responsible industry members to produce products with authentic botanical ingredients.
- ABC Chief Science Officer and BAPP Director Stefan Gafner, PhD, co-authored four peer-reviewed papers published in scientific journals.
- ABC's SHP, which promotes education and collaborations to inspire industry efforts toward a responsible, sustainable, regenerative herb value network, published its free, updated SHP Sustainability and Regenerative Practices Toolkit Version 2.0.
- SHP also created a 20-minute video about regenerative agriculture for medicinal botanicals in Costa Rica, expanded its collaborative opportunities and offered its first Learning Journey experience, held a half-day conference on the importance of sourcing sustainable herbs, and presented five webinars.
- At its annual ABC Celebration, ABC awarded eight Botanical Excellence Awards to individuals, organizations, and companies for their valuable contributions to the herbal and botanical community.
- ABC's popular Food as Medicine series published its 77th article on the health benefits of specific plant- and fungus-based foods. These articles are featured in ABC's monthly HerbalEGram online newsletter and summarized in *HerbalGram*.
- As part of its annual HerbDay event, which featured widely respected herbalist Rosemary Gladstar and other herbalists, ABC hosted about 500 people at its headquarters in Austin, Texas.
- The 85th herb was adopted through ABC's Adopt-an-Herb Program, which supports ABC's robust HerbMedPro database.
- ABC published its 9,000th HerbClip. HerbClips are two- to three-page summaries and critical reviews of scientific journal articles, including clinical trials.
- ABC issued 25 press releases. As a reliable third-party educational resource, ABC helps the mainstream and industry trade media better understand and/or interpret scientific, regulatory, and market information on medicinal plants.
- ABC published 384 HerbClips, 52 issues of Herbal News & Events, 12 issues of HerbalEGram, 10 SHP newsletters, six BAPP publications, and four Food as Medicine articles.
- And much more.

Looking Forward

ABC is gearing up for a vibrant and robust 2024, with continued vital and relevant research and educational activities to serve the interests of the botanical medicine community, including members of the herb industry, and help enhance the quality and benefits of herbal products for consumer health.

ABC invites its members and others to consider expanding their support of ABC in 2024 through participation in the HerbalGram40 Project & Fund, donations (including stock), membership, program underwriting, herb adoptions, and/or planned giving by adding ABC to your will. To learn more about the different ways to support ABC's nonprofit research and educational mission, visit www.herbalgram.org or contact ABC Development Director Denise Meikel at denise@herbalgram.org. HG

Herbal & Antioxidant Derivatives Adopts Bergamot through ABC's Adopt-an-Herb Program

By Gayle Engels

In March 2024, the American Botanical Council (ABC) announced the adoption of bergamot (*Citrus bergamia*, Rutaceae) by Herbal & Antioxidant Derivatives (H&AD) through ABC's Adopt-an-Herb botanical research and education program.

Bergamot, often called "citrus bergamot" in commerce and sometimes "bergamot orange," is a member of the citrus family. The geographic origin of the species is unclear. Currently, it grows almost exclusively in the narrow coastal region of Calabria in Southern Italy, where it thrives due to the weather and soil conditions. Oil of bergamot is pressed mechanically from the peel of the almost-ripe fruit, which is gathered in November and December, and is known primarily as an ingredient in Earl Grey tea and fragrance and personal care products.

A polyphenolic fraction of bergamot fruit has been shown in some studies to improve human plasma lipid profiles (cholesterol and triglycerides), improve insulin resistance and inflammation, and help prevent atherosclerosis (buildup of plaques in arteries). Via inhalation, bergamot essential oil is considered relaxing, refreshing, and helpful to alleviate insomnia. Bergamot aromatherapy also has been used to help relieve anxiety, compulsive behavior, and mild depression.

"We believe that ABC's considerable resources, combined with decades of groundbreaking leadership in herbal science, will support our own continued efforts in exploring bergamot's abilities and projecting those science-supported benefits through compelling publications and marketing to brand owners, practitioners, retailers, and consumers," said Hame K. Persaud, executive vice president of HP Ingredients, a stakeholder in H&AD. "This partnership [with ABC] directly reflects our core values of making a positive

Bergamot *Citrus bergamia*
Photo ©2024 Sakoodter Stocker

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.

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Herbal Adopters

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	Fig *Ficus carica*		**Tongkat Ali** *Eurycoma longifolia*
iff Health	**Oat** *Avena sativa*	PLT HEALTH SOLUTIONS GROWTH THROUGH INNOVATION	**Indian Frankincense** *Boswellia serrata*
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BEEHIVE BOTANICALS	**Propolis**	Soladox BOTANICALS	**Black Chokeberry** *Aronia melanocarpa*
Terry Naturally	**Turmeric** *Curcuma longa*		**Elderberry** *Sambucus nigra*
CONTAINS Zembrin	**Sceletium** *Sceletium tortuosum*		**Stinging Nettle** *Urtica dioica*
Symphony NATURAL HEALTH	**Maca** *Lepidium meyenii*	FOUR ELEMENTS	**Lemon Balm** *Melissa officinalis*
Nature's Way	**Ginkgo** *Ginkgo biloba*	BRASSICA	**Broccoli** *Brassica oleracea* Broccoli Group
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Lavandula angustifolia

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Hibiscus
Hibiscus sabdariffa

YOUR LOGO

Plant name
Scientific name

NEW ADOPTER!

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European Elder Berry
Sambucus nigra

NEW ADOPTER!

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Mullein
Verbascum thapsus

NEW ADOPTER!

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Ocimum tenuiflorum

Andrographis
Andrographis paniculata

HERB PHARM®

Echinacea
Echinacea spp.

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Bilberry
Vaccinium myrtillus

eurofins | Botanical Testing

California Poppy
Eschscholzia californica

nexira Innovation Inspired by Nature

Acacia Gum
Acacia senegal (syn. *Senegalia senegal*), *Acacia seyal* (syn. *Vachellia seyal*)

ARTEMIS INTERNATIONAL

Tart Cherry
Prunus cerasus

Black Currant
Ribes nigrum

Purple Corn
Zea mays

Pharmatoka

Cranberry
Vaccinium macrocarpon

valensa

Saw Palmetto
Serenoa repens

NATUROPATHICA® HOLISTIC HEALTH

Arnica
Arnica montana

Gaia Trading Company, Inc.

Hops
Humulus lupulus

THE ACTIVES FACTORY

Birch
Betula spp.

impact in our industry, and, ultimately, [on] people and the planet. We are committed to and focused on continuing our research and sustainability efforts for this impactful bergamot ingredient."

H&AD's adoption of bergamot supports ABC's extensive HerbMedPro database, ensuring that this unique research and educational resource remains up to date for researchers, health professionals, industry members, students, consumers, and other members of the herbal and dietary supplement 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 265 herbs, spices, medicinal plants, and fungi.

"Adopting bergamot as part of the [laudable] program of the American Botanical Council [helps raise awareness of the] value of bergamot's use for human health," Persaud added. "H&AD is a research and development company located where bergamot is grown and is considered one of the top-ranking companies in bergamot derivatives and natural products. H&AD is the owner of several patents concerning both the extraction procedures and therapeutic activity of many of its products."

ABC Founder and Executive Director Mark Blumenthal said: "ABC is deeply grateful to H&AD for adopting bergamot. H&AD's adoption enables ABC to further its unique nonprofit research and educational mission by ensuring that HerbMedPro contains the latest scientific and clinical research on this respected traditional medicinal and aromatic herb."

About H&AD

Founded in 2008 and based in Bianco, Italy, H&AD is a company that develops and markets science-based and patented Mediterranean plant extracts in more than 20 countries throughout Europe and Asia, as well as Australia and the United States. According to its website, H&AD's mission is to provide superior standards of quality products that are supported by scientific evidence on their ingredients' benefits for consumers. Along with pre-clinical and clinical studies demonstrating its products' activities and benefits, H&AD adopted the longstanding principles of the Mediterranean diet, which is characterized by consuming healthy fats and an abundance of vegetables and fruits, including citrus. Within this context, H&AD re-evaluated the use of bergamot and uses it as a foundation in Bergamonte®, BPF® Bergamot Phenolic Fraction, Bergacyn®, CitruSlim®, and N.O. Max®.

About Adopt-an-Herb and HerbMedPro

H&AD is one of 75 US and international companies and organizations 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. As of March 2024, 89 herbs have been adopted.

Each adopted herb is researched continuously for new scientific articles in the areas of botanical, chemical, pharmacological, toxicological, and clinical studies, ensuring that its HerbMedPro record stays current and robust. Access to the studies is organized conveniently 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 databases.

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

American Botanical Council Presents Botanical Excellence Awards at 19th Annual Celebration Ceremony

By ABC Staff

The American Botanical Council (ABC) presented eight Botanical Excellence Awards during its 19th annual ABC Celebration and Botanical Excellence Awards ceremony on March 13, 2024. The event celebrated the recipients of the Botanical Excellence Awards, which ABC started in 2006, and some of ABC's accomplishments in 2023. Recipients of the Botanical Excellence Awards are chosen based on their outstanding contributions to the herbal community.

The celebration was held at the Hilton Anaheim during the annual Natural Products Expo West trade show and conference in Anaheim, California. Many people attended the event, including Celebration Sponsors and ABC Sponsor Members, as well as supporters of the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP), Sustainable Herbs Program (SHP), and ABC's Adopt-an-Herb Program.

Books on Herbal Nomenclature and History of Psychedelic Use Receive ABC Duke Awards

ABC presented its 2024 ABC James A. Duke Excellence in Botanical Literature Award in two categories: reference/technical and consumer/popular. The recipient of the reference/technical award is *American Herbal Products Association's* [AHPA's] *Herbs of Commerce*, 3rd edition, by Merle Zimmermann, PhD; Holly E. Johnson, PhD; Michael McGuffin; and Wendy Applequist, PhD. The recipient of the consumer/popular award is *Psychonauts: Drugs and the Making of the Modern Mind* (Yale University Press) by Mike Jay.

As in previous years, ABC also named an honorable mention in each category to acknowledge other outstanding books that were considered for the award. The honorable mention in the reference/technical category is *Holistic Cancer Care: An Herbal Approach to Preventing Cancer, Helping Patients Thrive during Treatment and Minimizing the Risk of Recurrence* (Storey Publishing) by Chanchal Cabrera, FNIMH, RH (AHG). In the consumer/popular category, the honorable mention is *Seeing through the Smoke: A Cannabis Specialist Untangles the Truth About Marijuana* (Globe Pequot/Prometheus) by Peter Grinspoon, MD.

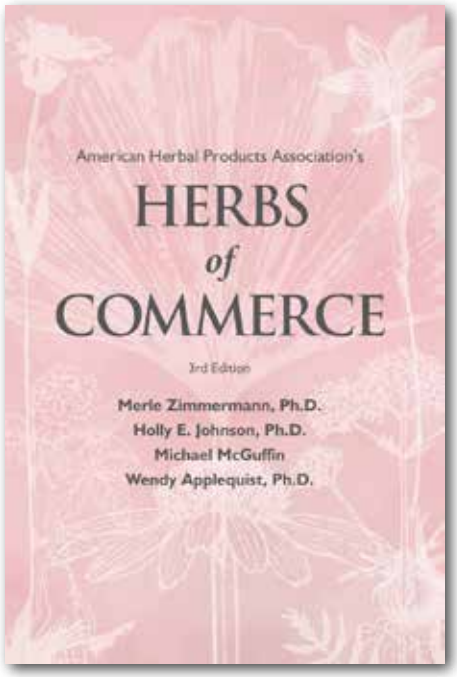
ABC gives the Duke Award annually to books that contribute significantly to medicinal plant-related literature and the fields of botany, taxonomy, ethnobotany, pharmacognosy, phytomedicine, and other related disciplines. The award was created in 2006 to honor economic botanist, ethnobotanist, and author James A. Duke, PhD (1929–2017). Duke's prestigious career achievements included decades of work as the lead medicinal plant expert at the United States Department of Agriculture and the authorship or co-authorship of more than 30 reference and consumer books. Among his many other activities and positions, he was also a co-founder of ABC and served on its Board of Trustees.

ABC James A. Duke Award Recipients*

2024: Reference/technical: *American Herbal Products Association's Herbs of Commerce*, 3rd edition
Consumer/popular: *Psychonauts: Drugs and the Making of the Modern Mind*
2023: Reference/technical: *Medicinal Herbs in Primary Care: An Evidence-Guided Reference for Healthcare Providers*
Consumer/popular: *Ginseng Diggers: A History of Root and Herb Gathering in Appalachia*
2022: Reference/technical: *A History of the Korean Ginseng Industry*
Consumer/popular: *The Plant Hunter: A Scientist's Quest for Nature's Next Medicines*
2021: *Christopher Hobbs's Medicinal Mushrooms*
2019: *Flora of the Voynich Codex: An Exploration of Aztec Plants*
2018: *Ethnopharmacologic Search for Psychoactive Drugs*, Vols. I and II
2017: Reference/technical: *Chinese Medicinal Plants, Herbal Drugs and Substitutes*
Consumer/popular: *Joseph Banks' Florilegium*
2016: *Handbook of Essential Oils*, 2nd edition
2015: *Clinical Aromatherapy*, 3rd edition
2014: *Ancient Pathways, Ancestral Knowledge*
2013: *Principles and Practice of Phytotherapy*, 2nd edition
2012: Reference/technical: *Medicinal Plants and the Legacy of Richard E. Schultes*
Consumer/popular: *Smoke Signals*
2011: Reference/technical: *American Herbal Pharmacopoeia: Botanical Pharmacognosy*
Consumer/popular: *Healing Spices*
2010: *Botanical Medicine for Women's Health*
2009: *An Oak Spring Herbaria*
2008: *Mabberley's Plant-Book*, 3rd edition
2007: Google Book Search
2006: *Medicinal Spices*
2005: *The Essential Guide to Herbal Safety*

* In some years, ABC presents the Duke Award to two books: one in the reference/technical category and the other in the consumer/popular category.

Reference/Technical Category

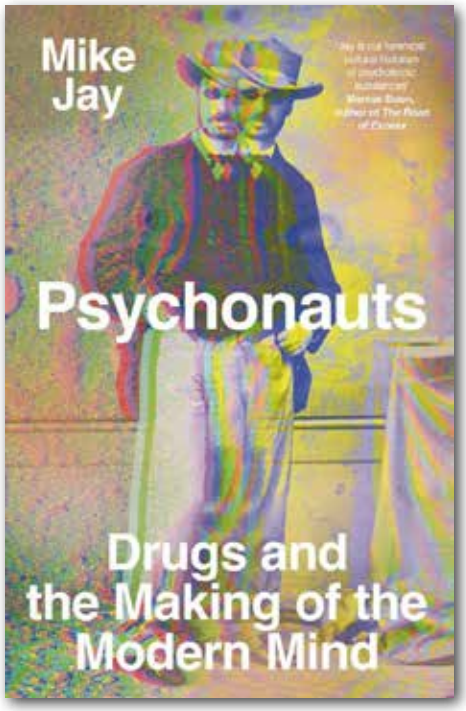


Herbs of Commerce provides guidance to those in the US botanical industry on the standardized naming of botanical and fungal ingredients on product labels. Since the first edition was published in 1992, *Herbs of Commerce* has been an effective self-regulation tool for the US herb industry. Subsequent editions, including the second in 2000, have been updated to reflect contemporary botanical nomenclature and expanded to include more herbs and fungi present in the US market (e.g., traditional Chinese herbs and Ayurvedic herbs). In contrast to the first edition's 800 plant entries, the second edition contains approximately 2,000 entries and the third edition contains more than 2,800. Each entry includes the standardized common name for each plant, plus "other common names," as well as the most recent corresponding Latin binomial(s) for each species. As with the second edition, certain entries also contain Ayurvedic and/or Pinyin (Chinese) names.

The US Food and Drug Administration (FDA) has recognized the first edition of *Herbs of Commerce* as an official reference for the labeling of herbal dietary supplement products sold in the United States. In November 2023, AHPA filed a citizen petition with the FDA requesting that the agency update its reference from the first edition to the third.

Zimmermann, the managing editor of *Herbs of Commerce*, 3rd ed., said: "On behalf of my co-editors, members of this edition's Expert Advisory Council, sponsors who made this important work possible, and the many other botanical lovers who generously contributed to developing this meaningful resource, I extend our deepest gratitude to ABC for the recognition of our efforts to support the herbal and dietary supplement industries with guidance on the consistent naming of botanical ingredients. We are truly honored to receive the 2024 ABC James A. Duke Excellence in Botanical Literature Award."

Consumer/Popular Category



Psychonauts is a historical survey of experimentation with psychoactive drugs and how these investigations have expanded the frontiers of psychology, art, music, medicine, and more. The book includes stories of well-known individuals like Sigmund Freud, who was addicted to cocaine and nicotine, as well as lesser-known figures like Paschal Beverly Randolph, one of the largest importers of hashish to the United States in the 1860s. This text offers a rich and detailed overview of the culture of self-experimentation and explores how these consciousness-expanding substances influenced luminaries such as Horace Wells, a dentist whose work with nitrous oxide became the basis for the practice of medical anesthesia; poet Samuel Taylor Coleridge; and Thomas De Quincey, an English author best known for his 1821 autobiography *Confessions of an English Opium-Eater*.

In his review for *HerbalGram*, which can be found on page 68 of this issue, ethnobotanist Mark Plotkin, PhD, praised *Psychonauts* for its "marvelous scope and scale," adding that "Jay proves himself a peer of writers like Thomas De Quincey in conjuring lost times and mysteries of the mind and the cosmos."

Much of Jay's work focuses on the cultural history of drugs, science, medicine, and politics. His previous works include *Mescaline: A Global History of the First Psychedelic* (Yale University Press, 2019), *Stranger than Fiction: Essays by Mike Jay* (Daily Grail Publishing, 2018), and *High Society: The Central Role of Mind-Altering Drugs in History, Science, and Culture* (Park Street Press, 2010). He also has contributed to *London Review of Books*, *Literary Review*, *The New York Review of Books*, and *The Wall Street Journal*, among other publications. In addition to his writing, Jay curates artwork for galleries around the United Kingdom, often to accompany and complement his written works.

"The plants currently being explored in psychedelic therapy have a deep and rich history in Indigenous cultures but have also been studied in the West for much longer than is usually recognized," Jay wrote. "I'm delighted to accept the 2024 James A. Duke Award for *Psychonauts: Drugs and the Making of the Modern Mind*, and to bring attention to the forgotten figures who pioneered the scientific investigation of mind-altering plants and drugs."

Professor Robin Marles Receives ABC Farnsworth Award

Robin Marles, PhD, received the 2024 ABC Norman R. Farnsworth Excellence in Botanical Research Award. Marles is an expert on botanical ingredient regulations, quality control, safety, and clinical trial reporting, as well as phytochemistry and ethnobotany, among other subjects. He was the senior scientific advisor of the Bureau of Nutritional Sciences at Health Canada's Food Directorate until his retirement in 2023.

ABC presents this annual award, named in honor of the internationally respected professor Norman R. Farnsworth, PhD (1930–2011), to an individual who has made significant research contributions in the fields of pharmacognosy (the study of drugs of natural origin, usually from plants), ethnobotany, ethnopharmacology, or other scientific disciplines related to medicinal plants. Professor Farnsworth was a widely published and internationally renowned research professor of pharmacognosy, a senior university scholar in the University of Illinois at Chicago (UIC) College of Pharmacy, and one of the founding members of ABC's Board of Trustees in 1988.

ABC Norman R. Farnsworth Award Recipients

2024: Robin Marles, PhD
2023: Michael Heinrich, PhD
2022: Guido Pauli, PhD
2021: Paula N. Brown, PhD
2019: Rachel Mata, PhD
2018: Otto Sticher, PhD
2017: Raphael Mechoulam, PhD
2016: Ameenah Gurib-Fakim, PhD
2015: John T. Arnason, PhD
2014: Harry Fong, PhD
2013: Gordon Cragg, PhD
2012: De-An Guo, PhD
2011: Djaja Soejarto, PhD
2010: A. Douglas Kinghorn, PhD
2009: Rudolf Bauer, PhD
2008: Ikhlas Khan, PhD
2007: Hildebert Wagner, PhD
2006: Edzard Ernst, MD, PhD
2005: Joseph Betz, PhD

"I am very honored to be selected as the recipient of this year's ABC Norman R. Farnsworth Excellence in Botanical Research Award," Marles said. "Professor Farnsworth was a wonderful mentor during my six years at UIC College of Pharmacy. My other professors provided excellent technical training, but Professor Farnsworth strongly encouraged us to apply critical thinking to problems, evaluate carefully rather than just accept what was published in the literature, and to try to see the big picture. I have tried to follow these principles throughout my career."

At Health Canada's Bureau of Nutritional Sciences from 2013 to 2023, Marles advised on quality, safety, and efficacy claims for botanical ingredients, novel foods, and new food additives, as well as clinical trials. He has volunteered with the United States Pharmacopeia (USP) since 2005 and is currently the chair of its Botanical Dietary Supplements and Herbal Medicines Expert Committee. Marles also serves on USP's Dietary Supplements and Herbal Medicines Nomenclature Joint Subcommittee, Botanical Pan-America Expert Panel, Cannabis Expert Panel, and Modern Analytical Methods Joint Subcommittee.

Before his work as senior scientific advisor at the Bureau of Nutritional Sciences, he served as the science advisor for Health Canada's Natural Health Products Directorate from 2003 to 2013. During this time, he also was the director of Health Canada's Bureau of Clinical Trials and Health Sciences, and he helped create and manage the Bureau of Product Review and Assessment.

Previously, Marles taught botany, plant taxonomy, ethnobotany, and phytochemistry, among other subjects, as a professor in the Department of Botany at Brandon University in Manitoba from 1992 to 2002. Earlier in his career, he worked as a wildlife biologist and park naturalist. He has been a member of the ABC Advisory Board since its creation in 1996.

Marles completed his PhD in pharmacognosy at UIC in 1988 with a specialization in natural product drug discovery. He completed two postdoctoral research fellowships at the University of Ottawa, where he investigated feverfew (*Tanacetum parthenium*, Asteraceae) herbal drug standardization and botanical pesticides derived from marigold (*Tagetes* spp., Asteraceae). He received his Bachelor of Science and Master of Science degrees in biology from the University of Victoria and University of Saskatchewan, respectively.

Throughout his career, Marles has published scientific articles on a range of topics, including botanical quality, safety, and health claims; ethnobotany; anticancer, antiviral, antidiabetic, and antimigraine plant-derived drug discovery; and nutrients and phytochemicals in dietary supplements and foods. His publications have appeared in

Robin Marles gives his acceptance speech.
Photo ©2024 ABC

Phytomedicine, Journal of Natural Products, Photochemistry and Photobiology, and *Pharmacology and Toxicology*, among other journals. He also is a co-editor of *Aboriginal Plant Use in Canada's North-West Boreal Forest* (University of British Columbia Press, 2000) and contributed to *Voice of the Drum: Indigenous Education and Culture* (Kingfisher Publications, 2000) and *Economic and Medicinal Plant Research* (Academic Press, 1994), which was co-edited by Farnsworth.

Marles has received numerous awards and recognitions for his work, including the Health Canada Award of Excellence: Science in 2022, Deputy Minister's Award of Excellence: Science in 2019, Natural Health Products Research Society of Canada's G.H. Neil Towers Award in 2018, Health Canada Assistant Deputy Minister's Award of Excellence: Exceptional Contribution in 2017, and Queen Elizabeth II Diamond Jubilee Medal in 2012.

"I can remember Norm telling me on more than one occasion how much he admired Robin's keen intelligence and deep commitment to pharmacognosy and medicinal plant research," said ABC Founder and Executive Director Mark Blumenthal. "ABC's recognition of Robin with the ABC Farnsworth Award is quite appropriate and very well deserved."

Stefan Gafner, PhD, chief science officer of ABC and the director of the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP), said: "I have had the privilege of working with Robin for many years on the USP Botanical Dietary Supplements and Herbal Medicines Expert Committee. He has been instrumental in many of USP's initiatives on botanical ingredients and is one of the most highly regarded experts in medicinal plants in North America. What amazes me is his breadth of knowledge, his hard work, and his commitment to science, as well as the calm and gentle manner in which he chairs the USP committee."

Euromed Receives ABC Tyler Award

The 2024 ABC Varro E. Tyler Commercial Investment in Phytomedicinal Research Award was given to Euromed, a Spain-based manufacturer of standardized botanical extracts and other herbal ingredients for the pharmaceutical, nutraceutical, food, pet care, and cosmetics industries.

The ABC Tyler Award was named in honor one of the most respected North American scientists in late-20th century herbal medicine and pharmacognosy. Professor Varro E. Tyler, PhD (1926–2001), was vice president of academic affairs and dean of the College of Pharmacy and Pharmaceutical Sciences at Purdue University, and an early ABC Board of Trustees member. He was the senior author of six editions of a leading pharmacognosy textbook in the United States and numerous other professional and popular books and academic articles. Tyler envisioned a rational phytomedicinal health care sector that valued the proper evaluation of a phytomedicinal product's quality, safety, and efficacy.

"We're thrilled to receive the ABC Tyler Award, which honors the legacy of Professor Varro E. Tyler and recognizes our ongoing commitment to phytomedicine research," said Andrea Zangara, head of scientific communications and marketing at Euromed. "This prestigious award reflects our commitment to the principles advocated by Professor Tyler: the rigorous evaluation of botanical products through scientific investigation to ensure their quality, safety, and efficacy."

Euromed has been a pioneer in herbal medicines since its founding in 1971 by the German phytopharmaceutical company Madaus. Today, Euromed is part of the Grünwald, Germany-based Dermapharm Group, a producer of pharmaceuticals and other health care products.

"We've led the pharmaceutical industry in providing standardized extracts from cultivated and wild plants like milk thistle [*Silybum marianum*, Asteraceae], saw palmetto [*Serenoa repens*, Arecaceae], St. John's wort [*Hypericum perforatum*, Hypericaceae], and horse chestnut [Aesculus hippocastanum, Sapindaceae], prioritizing quality control from seed to patient," Zangara said. "In 1971, we intro-

ABC Varro E. Tyler Award Recipients

2024: Euromed
2023: Sabinsa Corporation
2022: Max Zeller Söhne AG
2021: Swedish Herbal Institute
2019: Jaguar Health/Napo Pharmaceuticals
2018: GW Pharmaceuticals
2017: Pharmatoka
2016: Brassica Protection Products
2015: MediHerb/Integria Healthcare
2014: SFI Flordis International
2013: Wakunaga Pharmaceutical Company
2012: Horphag Research
2011: Bioforce AG
2010: New Chapter
2009: Bionorica AG
2008: Indena SpA
2007: Dr. Willmar Schwabe Pharmaceuticals

Mark Blumenthal, Xavier Roig of Euromed, and ABC Chief Science Officer Stefan Gafner. Photo ©2024 ABC

duced the first standardized milk thistle extract, [which has been] widely researched in thousands of patients for its hepatoprotective properties."

The company has continued to expand in recent decades. In 2004, Euromed invested in a saw palmetto berry extraction facility in central Florida, which emphasizes sustainable practices, traceability, and optimizing fatty acid content for consistent therapeutic outcomes in research and applications. In 2018, according to Zangara, the company acquired a production facility in Murcia, Spain, to strengthen its capabilities in the nutraceutical market with a growing line of Mediterranean fruit and vegetable extracts.

"In addition, we continue to support independent academic research by providing high-quality extracts and expertise for studies in several health areas," Zangara said. "Winning the ABC Tyler Award makes us even more determined to continue investing in the research and development of botanical products for the global pharmaceutical, nutraceutical, and food markets."

As part of its commitment to producing research-based products, Euromed's extracts and other botanical ingredients have been the subject of numerous studies and human clinical trials. In June 2023, Euromed announced that a research article on its Wellemon® extract, a flavonone extract from Spanish lemons (*Citrus* × *limon*, Rutaceae), received the Best Paper Award 2023 from the scientific journal *Antioxidants*. In addition, a research article on Euromed's Pomalive® — an ingredient that contains standardized polyphenols derived from pomegranate (*Punica granatum*, Lythraceae) and olive (*Olea europaea*, Oleaceae) fruits — which focused on the potential benefits for dyslipidemia and cardiovascular health, has been selected as a finalist for the "2024 Best Paper Award" from the journal *Nutrients*. The winner of this award will be announced in August 2024.

Gafner said: "When I think of ways to describe Euromed, the words 'quality' and 'trust' are among the first that come to mind. A lot of my trust in the quality of their ingredients comes from the company's long-standing commitment to clinical research into the extracts that they manufacture. Some of their research, e.g., on milk thistle and saw palmetto, is part of the foundation on which the evidence-based medicinal use of these plants is built."

Hellen Oketch-Rabah Receives ABC Kronenberg Award

Hellen Oketch-Rabah, PhD, received the 2024 ABC Fredi Kronenberg Excellence in Research and Education in Botanicals for Women's Health Award. Oketch-Rabah is a pharmacognosist, educator, and science administrator and the deputy director of the Office of Dietary Supplement Programs (ODSP) at the US Food and Drug Administration's (FDA's) Center for Food Safety and Applied Nutrition (CFSAN).

The ABC Fredi Kronenberg Award was created in 2018 and named in honor of distinguished researcher, educator, and longtime ABC Board of Trustees member Fredi Kronenberg, PhD, who died in April 2017. Kronenberg dedicated her professional life to the study of medicinal plants and phytomedicines for women's health conditions. She particularly was interested in botanicals, such as black cohosh (*Actaea racemosa*, Ranunculaceae), for the treatment of menopausal symptoms.

Kronenberg was a champion of integrative medicine and co-founded the Richard and Hinda Rosenthal Center for Complementary and Alternative Medicine at Columbia University — the first complementary and alternative medicine (CAM) program at an Ivy League school and the first government-funded CAM research and educational center. For 10 years, she also co-directed an onsite five-day continuing education course in botanical medicine for physicians and other health care providers.

"I am truly honored and humbled to receive the ABC Fredi Kronenberg Award and am even more privileged to be included among such great women's health researchers: Dr. Tieraona Low Dog, Dr. Mary Hardy, Dr. Gail Mahady, and Dr. Aviva Romm," Oketch-Rabah wrote, referring to previous recipients of this award.

"This award brings back sweet memories of my post-doc days doing research on black cohosh in a project we collaborated on with Professor Fredi Kronenberg," Oketch-Rabah added. "It is a recognition of a passion I inherited from my late mothers Iscah Oyuga and Rael Owuor, who introduced me to the healing power of herbal medicines. It is also an affirmation of what the late Dr. Shyamala Harris of the Lawrence Berkeley National Laboratory in California always told me: to remain true to myself and committed to my vision and never to let others define who I am or determine my interests for me. I still believe that when it comes to the healing power of plants, we have but just touched the tip of the iceberg. We must remain committed to good science to continue to unveil the healing power of plants."

ABC Fredi Kronenberg Award Recipients

2024: Hellen Oketch-Rabah, PhD
2023: Leanna Standish, PhD, ND, LAc, FABNO
2022: Gail Mahady, PhD
2021: Tori Hudson, ND
2019: Mary Hardy, MD
2018: Aviva Romm, MD
2017: Tieraona Low Dog, MD

Hellen Oketch-Rabah

Originally from Kenya, where her father managed one of Brooke Bond tea brand's manufacturing facilities in Kericho, Kenya, and her mother was a practicing herbalist, Oketch-Rabah developed a passion for herbal medicine from childhood.

She received a bachelor's degree in biology, zoology, and education from Kenyatta University in Nairobi, Kenya, a master's degree in plant biochemistry and physiology from Kenyatta University, and a PhD in pharmaceu-

tical chemistry and pharmacognosy from the University of Copenhagen in Denmark, with a dissertation on antimalarial and antileishmanial compounds from Kenyan medicinal plants.

From 1998 to 2001, she taught pharmacognosy at the University of Nairobi School of Pharmacy, where she established a pharmacognosy laboratory and antimalarial testing facility and supervised two PhD students and three master's degree students. From 2001 to 2006, she completed postdoctoral training at the Lawrence Berkeley National Laboratory in California, where her research included breast cancer biology and phytochemicals for treatment of postmenopausal symptoms.

As principal scientist of the herbal products company Herb Pharm from 2006 to 2010, Oketch-Rabah established a research and development and analytical laboratory, advised executive management, directed laboratory personnel, created and implemented standard operating procedures for quality control of raw materials and finished products, set testing specifications and standards, and performed research that helped develop new plant products as dietary supplements.

From 2011 to 2023, Oketch-Rabah was a scientific liaison and lead for USP, where she led the development of several policy documents, including nomenclature guidelines for dietary supplement monographs and herbal medicine monographs, and helped improve guidelines for USP admission of dietary ingredients for monograph development. She also managed a US Department of Defense-sponsored project that developed a multi-criteria decision analysis tool for predicting the potential of multi-ingredient dietary supplements to cause cardiovascular adverse effects. She was involved in the development of the USP Herbal Medicines Compendium, which includes monographs on herbal medicine ingredients and is recognized worldwide.

Oketch-Rabah is a member of the American Society of Pharmacognosy and Society of Toxicology and has co-authored more than 50 scientific articles, which cover diverse topics and have been cited more than 1,800 times. She co-authored the cover article, "Quality Standards for Botanicals: The Legacy of USP's 200 Years of Contributions," in *HerbalGram* issue 126 in 2020.

Mary Hardy, MD, who received the ABC Kronenberg Award for 2019, wrote: "Not only is Hellen an excellent scientist, but she is also an outstanding collaborator. Her kindness and brilliant smile are essential parts of her nature and give her technical skills heart with a capital 'H.' I am so pleased that she is being recognized with this award. She exemplifies what Fredi herself stood for."

Tieraona Low Dog, MD, a member of ABC's Board of Trustees and recipient of the inaugural ABC Fredi Kronenberg Award (2017), wrote: "When it came time to nominate this year's ABC Fredi Kronenberg Award recipient, I could not imagine anyone more deserving than Hellen Oketch-Rabah, PhD. With a doctorate in pharmacognosy and as the daughter of a practicing herbalist in Kenya, Hellen is unique in her vast scientific knowledge of botanicals, grasp of analytical methods, commitment to research, quality, and safety, and deep respect for traditional herbal medicine. Working alongside her for 12 years at the United States Pharmacopeia taught me so much. I am thrilled that she has been honored with this award."

Danna Leaman Receives ABC Foster Award

Danna J. Leaman, PhD, a Canadian-American conservation biologist and ethnobotanist, is the recipient of the 2024 ABC Steven Foster Botanical Conservation and Sustainability Award. She is the co-chair (and former chair) and Red List authority of the Medicinal Plant Specialist Group (MPSG) of the International Union for Conservation of Nature's (IUCN's) Species Survival Commission, a founding member of the FairWild Foundation's Board of Trustees, and a research associate at the Canadian Museum of Nature in Ottawa. She is also a member of ABC's Advisory Board.

The ABC Steven Foster Award was created in 2022 and recognizes excellence in conservation and sustainability efforts related to medicinal and aromatic plants. It is named in honor of botanist, author, and photographer Steven Foster (1957–2022) and commemorates his many years of professional interest, writing, and advocacy work in this field.

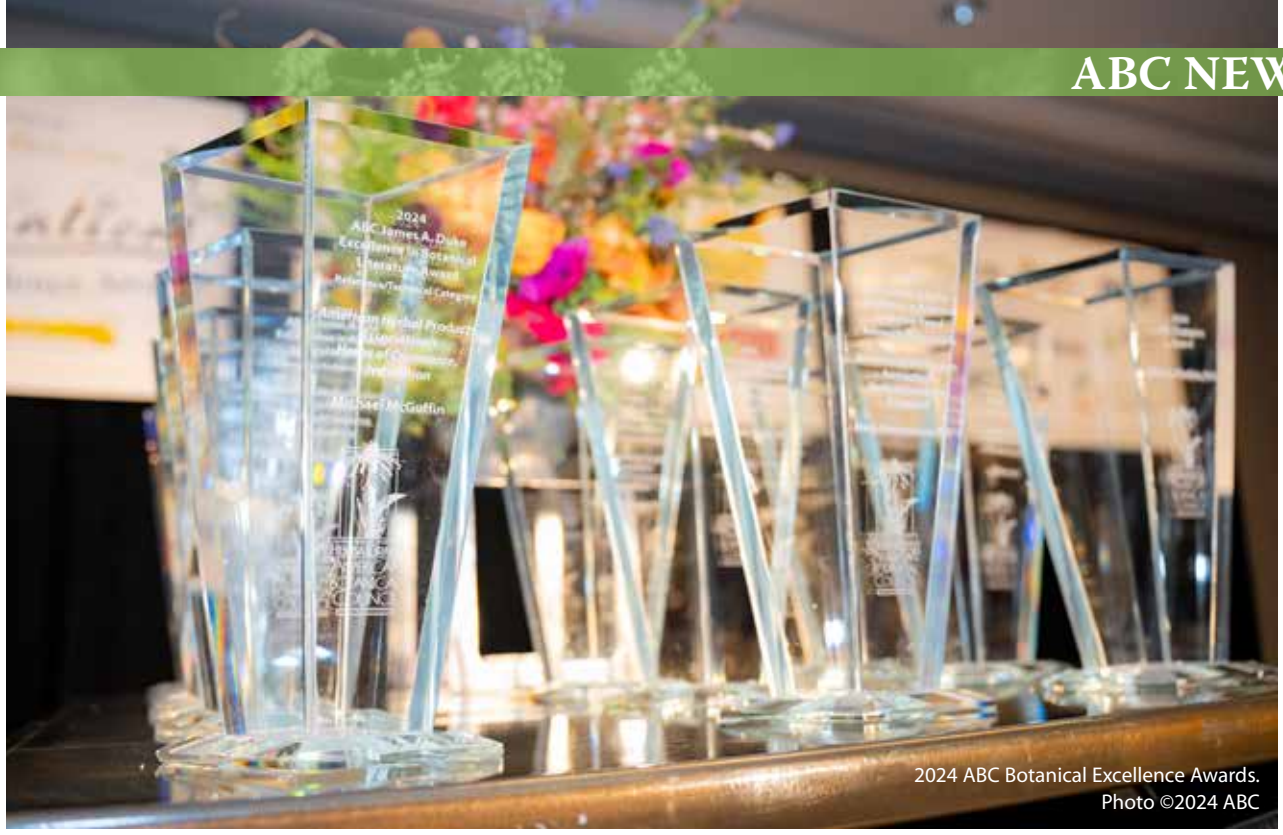
Each year since Foster's death, the Foster Award recognizes an individual, nonprofit organization, or commercial herb company that is committed to sustainable and/or regenerative practices in the botanical industry or wider community. Recipients of this award take action to address botanical conservation and sustainability issues and contribute to a broader understanding of cultural and biological diversity, soil health, climate change, economic justice, and more. They also demonstrate appreciation for the beauty of the natural world.

Foster had more than 40 years of experience with sustainability and conservation of herbs and medicinal plants. He served on ABC's Board of Trustees for more than two decades (including 10 years as chair), was a consultant and content contributor for SHP, advocated for botanical industry trade resolutions to protect threatened

ABC Steven Foster Award Recipients

2024: Danna Leaman, PhD
2023: FairWild Foundation
2022: United Plant Savers

Danna Leaman



2024 ABC Botanical Excellence Awards.
Photo ©2024 ABC

botanicals, and was a founding member of the advisory board of the nonprofit United Plant Savers (UpS), which was the inaugural recipient of the ABC Foster Award in 2022.

"In creating the Steven Foster Award, ABC honours not only Steven's many contributions to this field, but also the essential, often quietly diligent and detailed efforts that build the tools and enable the practice of conservation and sustainable use of medicinal and aromatic plants," Leaman said. "As the most recent recipient of this award, I acknowledge the contributions of the previous recipients, the United Plant Savers (2022) and the FairWild Foundation (2023), and am honoured by this recognition of my own contributions — including through the work of the MPSG and as a founding trustee of the FairWild Foundation.

"At a time when reversing threats to the survival of the earth's amazing biological diversity appears to require shifting global approaches, policies, and paradigms, I believe I share with many others a sense of trying to 'save the world, one species at a time,'" Leaman added.

Leaman has more than 40 years of professional experience with conservation and sustainable use of plants through her own research and working with multi-disciplinary scientific research teams, as well as numerous national and international nonprofit and government-supported agencies. She has contributed to the development of sustainability and biodiversity integrity standards and has a range of advisory and consulting experience related to national and international regulation and policy development and implementation.

As a founding member of the MPSG, which was established in 1994, Leaman coordinates and contributes to global and regional IUCN Red List conservation assessments of priority species of medicinal and other economically important plants. Her current projects include the first regional IUCN Red List conservation status assessment of North American medicinal and aromatic plants (MAPs), the second regional assessment of European MAPs, assessment of all MAP species listed by the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and assessment of all World Health Organization (WHO)-monographed MAP species.

In 2004, Leaman played a lead role in an international consultation workshop on the revision of the WHO/IUCN/World Wildlife Fund (WWF) 1993 Guidelines on the Conservation of Medicinal Plants, which helped lead the German government to fund Leaman and the MPSG to begin drafting the first "International Standard for the Sustainable Wild Collection of Medicinal and Aromatic Plants" (ISSC-MAP). The German Federal Agency for Nature Conservation, along with participants from the WWF, MPSG, TRAFFIC, and industry, formed a steering group to develop and test the proposed new international standard. Leaman's leadership is indicated by the progression of ISSC-MAP development, as she was the lead author of initial drafts of the standard.

This government-and nongovernmental organization (NGO)-supported standards-setting initiative led directly to the merger of the ISSC-MAP with the Swiss government-supported FairWild Initiative in 2008. In 2008, Leaman became a founding member of the newly established FairWild Foundation, a Swiss nonprofit organization that promotes the sustainable, traceable, and ethical trade of wild plant ingredients and products.

Leaman received a bachelor's degree in botany and general science from the University of Iowa in 1978 and a PhD in biology from the University of Ottawa in 1996, based on ethnobotanical research in East Kalimantan, Indonesian Borneo. She has been involved in ethnobotanical and conservation field research programs in Brazil, the Caribbean, Central America, Indonesia, Lebanon, and many other countries as a technical advisor, evaluator, and trainer

for various organizations, including UNESCO, International Development Research Centre, WWF, TRAFFIC International, Bioversity International, and the United Nations Development Programme.

She has served on ABC's Advisory Board since 2010, has been an inaugural member of SHP's Advisory Group since 2019, and has peer reviewed articles in *HerbalGram* and HerbClip. With Leah Oliver, she authored an extensive cover article, "Protecting Goldenseal: How Status Assessments Inform Conservation," on the conservation status of goldenseal (*Hydrastis canadensis*, Ranunculaceae) in *HerbalGram* issue 119 in 2018.

Josef Brinckmann, president of ABC's Board of Trustees and founding member of the FairWild Foundation's Board of Trustees, endorsed Leaman for the award. "Those who have worked alongside Dr. Leaman, as I have, on boards, expert committees, and working groups, know that her life's work is steeped in the collaborative co-development of credible standards, scientific methods, and tools for the conservation, protection, and monitoring of commercially traded medicinal plant species, not only in Canada and the United States, but globally," Brinckmann wrote. "Her work is often behind the scenes of projects that reach the desks of policy makers at the national and international levels."

Mark Plotkin Receives ABC Champion Award

The 2024 ABC Champion Award was presented to Mark Plotkin, PhD, a renowned ethnobotanist, conservationist, author, and co-founder and president of the nonprofit Amazon Conservation Team.

The ABC Champion Award, which was first presented in 2015, is given to individuals who have donated time and/or funds to support ABC's science-based nonprofit research and educational mission, publications, and programs.

As an active member of ABC's Advisory Board since its formation in 1996, Plotkin has generously donated his time and ethnobotanical experience and expertise to support ABC's unique research and educational mission. He has peer reviewed many articles in *HerbalGram* and other ABC publications and has authored compelling and informative feature articles for *HerbalGram*, including "Notes on the Ethnobotany of Warfare" in issue 101 in 2014 and two cover articles, "The Ethnobotany of Wine as Medicine in the Ancient Mediterranean World" in issue 129 in 2021 and "The Mushroom Moment" in issue 139 in 2024. Plotkin has also written book reviews for *HerbalGram*, including a review of *The Immortality Key* (St. Martin's Press, 2020) in issue 131 in 2021 and a review of *Seeing through the Smoke* (Globe Pequot/Prometheus, 2023) in issue 139.

"It is a great honor to receive this award from the American Botanical Council," Plotkin wrote. "Without question, ABC and its magazine *HerbalGram* are the leaders in providing accurate, intelligible, and compelling information, not only to the herbal community, but to the world at large. As ever, I salute ABC's efforts and those of its visionary and indefatigable leader Mark Blumenthal."

ABC Champion Award Recipients

2024: Mark Plotkin, PhD
2023: Christine Burdick-Bell
2022: Steven Foster
2021: Jerry Cott, PhD
2019: Thomas Brendler, PhD
2018: Jim Emme
2017: Dick Griffin
2016: Josef Brinckmann
2015: Ed Smith
2014: Terry Lemerond

Plotkin has studied traditional Indigenous plant use with elder shamans (traditional healers) of Central and South America for more than 40 years. He has carried out most of his research with the Trio (Tiriyó) Indigenous people of southern Suriname in northeastern South America, but also has worked with shamans from Mexico to Brazil.

Plotkin has a long history of working with organizations to promote conservation and awareness of the natural world, having served as a research associate in ethnobotanical conservation at Harvard University's Botanical Museum, director of plant conservation at WWF, vice president of Conservation International, and research associate at the Smithsonian Institution's Department of Botany. He co-founded the Amazon Conservation Team with his fellow conservationist and wife Liliana Madrigal in 1996.

He has authored or co-authored many books and scientific publications, including his most popular work *Tales of a Shaman's Apprentice* (Penguin Books, 1994), which is currently in its 40th printing and also has been published in Dutch, German, Italian, Japanese, and Spanish. Acclaimed filmmaker Miranda Smith produced a related 2001 documentary, "The Shaman's Apprentice," which features Plotkin's work and garnered awards at many film festivals. Plotkin also played a leading role in filmmaker Kieth Merrill's 1997 Academy Award-nominated IMAX documentary "Amazon." Plotkin's children's book *The Shaman's Apprentice: A Tale of the Amazon Rain Forest* (Houghton Mifflin Harcourt, 1998), co-authored and illustrated by Lynne Cherry, was called "the outstanding environmental and natural history title of the year" by *Smithsonian* magazine.

Mark Plotkin

Plotkin's critically acclaimed book *Medicine Quest: In Search of Nature's Healing Secrets* (Viking Penguin) was published in 2000. *The Killers Within: The Deadly Rise of Drug-Resistant Bacteria* (Back Bay Books), which he co-authored with Michael Shnayerson, was published in 2002 and was named one of the top 10 science books of that year by *Discover* magazine. His most recent book, *The Amazon: What Everyone Needs to Know*, was published by Oxford University Press in 2020.

Plotkin's 2014 TED Talk on the protection of the Amazon's uncontacted tribes has attracted more than one million views. He is also the host of the podcast "Plants of the Gods," which focuses on "hallucinogenic plants and fungi whose impact on world culture and religion — and healing potential — is only now beginning to be appreciated on a global scale as never before."

TIME magazine named Plotkin an environmental "Hero for the Planet" in 1999. His work has been featured in a PBS NOVA documentary and Emmy-winning Fox TV documentary, on the NBC Nightly News and TODAY show, on CBS' 48 Hours, and in *Life*, *Newsweek*, *Smithsonian*, *Elle*, *People*, and *The New York Times*, along with appearances on National Public Radio. In 2005, *Smithsonian* magazine's 35th anniversary issue profiled Plotkin as one of "35 who made a difference." In 2007, he was honored with the Cincinnati Zoo & Botanical Garden's Wildlife Conservation Award. And, in 2008, Plotkin and Madrigal were awarded the Skoll Foundation's prestigious Award for Social Entrepreneurship.

In 2010, Plotkin received the honorary degree of Doctor of Humane Letters from Lewis & Clark College in Portland, Oregon. The degree citation reads: "For teaching us that the loss of knowledge and species anywhere impoverishes us all; for combining humanitarian vision with academic rigor and moral sensibility; and for reminding us always, with clarity and passion and humor, that when we study people and plants, we are simultaneously exploring paths to philosophy, music, art, dance, reverence, and healing." In the same year, renowned primatologist and anthropologist Jane Goodall, PhD, presented Plotkin with an award for International Conservation Leadership.

In 2019, Plotkin was presented with the Harvard Extension Alumni Association's Michael Shinagel Award for Service to Others "in recognition of his lifelong commitment to the protection of the Amazon rainforest and tribal communities within them." He was educated at Harvard University Extension, the Yale School of Forestry, and Tufts University.

"While ABC is deeply grateful to its members, friends, and colleagues for the wide variety of ways that they support ABC's nonprofit mission, this year it was clear to us that Mark Plotkin is highly deserving of special recognition," said Blumenthal.

"Mark is the kind of guy who has called me over the years and asked, 'What can I do to help you and ABC?'" Blumenthal added. "While many ABC friends respond to our requests for assistance, donations, etc., few people go out of their way to offer, to volunteer to help. Mark Plotkin does that. He initiates conversations about helping ABC and our mission, and his assistance is a compelling part of ABC's educational content."

David Winston Receives ABC Blumenthal Award

The 2024 ABC Mark Blumenthal Herbal Community Builder Award was given to David Winston, RH (AHG). He is the founder and president of B Corp™-certified herb product manufacturer Herbalist & Alchemist (H&A) and dean of David Winston's Center for Herbal Studies.

The ABC Mark Blumenthal Herbal Community Builder Award is named for ABC's Founder and Executive Director Mark Blumenthal, who has been involved in the North American and international herbal medicine movement for more than 50 years. The Blumenthal Award is given annually to individuals who have played a significant role in creating a sense of connection and community among herbalists, botanical researchers, members of the herb and

David Winston

ABC Mark Blumenthal Herbal Community Builder Award Recipients

2024: David Winston, RH (AHG)
2023: Mimi Hernandez, RH (AHG)
2022: Emily Ruff
2021: Michael McGuffin
2019: Mary Blue, Katheryn Langelier, and Nicole Telkes
2018: Larry and Linnea Wardwell
2017: Jon Benninger
2016: Ikhlas Khan, PhD
2015: Michael Tierra
2014: Loren Israelsen
2013: Sara Katz
2012: Rosemary Gladstar

natural products communities and industries, and others who work with medicinal and aromatic plants.

David Winston is an ethnobotanist, author, and herbalist who serves as a mentor and consultant to physicians, other health care practitioners, and members of the natural products industry. He is a founding member of the American Herbalists Guild (AHG), where he serves on the clinical herbalist certification committee, a member of the review committee of the *American Herbal Product Association's Botanical Safety Handbook*, and a longtime member of the ABC Advisory Board. Winston has practiced herbalism since 1976 and is a sought-after speaker for many conferences and organizations. Winston founded H&A in 1982 to produce and sell his own herbal formulas and other preparations.

Winston also is the co-author of *Adaptogens: Herbs for Strength, Stamina, and Stress Relief* (Healing Arts Press, 2019), a 432-page book that compiles traditional as well as scientific and clinical information on herbs used as adaptogens, a term that he has helped to popularize in the current conversations about the health-promoting and immune-enhancing role of specific herbs and medicinal plants such as ashwagandha (*Withania somnifera*, Solanaceae), Asian ginseng (*Panax ginseng*, Araliaceae), and rhodiola (*Rhodiola rosea*, Crassulaceae).

When accepting the award, Winston said: "I would like to thank the American Botanical Council for this recognition honoring my 55-year love affair with herbs and herbal medicine.

"In 1969, all of my friends were interested in one herb, and I was interested in all of the other ones," Winston continued. "Learning about herbs at this time was difficult as there were few books and fewer teachers, but I was hooked and wanted to share what I was learning and find ways to learn more. In 1981, I heard that there was going to be an herb conference at Breitenbush Hot Springs, in Oregon. On the first day of the conference, there were 70 of us sitting in a circle and I thought, finally, 'these are my people.'"

Winston concluded: "Now, over 40 years later, the American herbal renaissance is in full bloom and our herbal community has grown exponentially. Last year, some of my former students who make up the Northern New Jersey chapter of the AHG held an HerbDay event at Well Sweep Herb Farm in New Jersey. I was asked to be the keynote speaker and was happy to participate. We hoped a few hundred people would show up, but over 2,000 people attended. As I walked around the grounds surrounded by current and former students, medical professionals, farmers, children, parents, and scores of interested people, I thought to myself, once again, 'these are my people.'"

Blumenthal said: "David is what I might call an herbalist's herbalist. He is highly respected by hundreds, probably thousands, of herbalists and natural health care practitioners in the United States and beyond. Frequently, I see emails from physicians and other licensed health care practitioners who have studied with David who all laud his comprehensive and responsible herb study courses. I am deeply grateful to consider David to be one of my colleagues and teachers, a supporter of ABC, and a good friend."

Celebration Sponsors

The 2024 ABC Celebration and Botanical Excellence Awards were generously underwritten by these ABC supporters: Alkemist Labs, Amin Talati Wasserman, Applied Food Sciences, Brassica Protection Products, Cepham, Eurofins, Euromed, EuroPharma, Herb Pharm, Indena, NOW Foods, PLT Health, RFI, RT Specialty, Sabinsa, and the United Natural Products Alliance (UNPA). HG

Sustainable Herbs Program Learning Journey: Listening in Appalachia

By Ann Armbrecht, PhD

In September 2023, the Sustainable Herbs Program (SHP) convened the first SHP Learning Journey. For three and a half days, 22 stakeholders from the botanical industry explored the people, places, and plants that are central to the herb trade in Appalachia. Though the Learning Journey was based in Appalachia, the issues that were explored are common in the herb trade as a whole, including the challenges of wild harvesting, raw material being undervalued, overharvesting, welfare of migrant farmworkers, and health of the soil.

The goal of the Learning Journey was to approach these seemingly intractable challenges in the botanical industry in a different, more systemic way. We hoped to inspire change by listening to the voices of those we do not always listen to: the people at the edges of the system, the places we visited, and the plants. Beyond analytics and industry interests, we wanted to open our hearts and connect with the earth. In this way, we hoped to tap into the inspiration and courage needed to act.

Care, Curiosity, and Respect

The Learning Journey was built on the work of the SHP Learning Lab, which has been meeting since 2022 and is co-facilitated by Julie Arts, a senior faculty member and consultant with the Presencing Institute, an organization that promotes awareness-based systems change. Not everyone on the Learning Journey had been part of the Learning Lab, but the core group has developed a way of relating to each other and the plants that is based on care, curiosity, and respect. This culture informed that of the Learning Journey.

The Learning Journey involved months of coordination, from arranging the site visits to planning meals, hotels, who would drive the vans, and how we would meet. Julie and I thought carefully about the structure and rhythm of each day, balancing time for reflection, time with the plants, and time for small and large group discussions and meaningful conversations with those we visited in the region.

The night before we began, we gathered on the rooftop of the Bristol Hotel in Bristol, Virginia. Guido Masé, RH (AHG), principal scientist and chief formulator at Traditional Medicinals, invited everyone to begin the journey by feeling present in the region. I invited them to listen, hear beneath the words spoken, and see beneath the obvious. We each shared our intentions for our time together.

Who We Were

The Learning Journey participants included those responsible for sourcing, purchasing, and sustainability at herbal products companies. Funding from Virginia Tech and a planning grant from the Appalachian Regional Commission through its Appalachian Regional Initiative for Stronger Economies (ARISE) program allowed us to invite individuals from primary processing companies (those that purchase and process wild-harvested and cultivated medicinal plants) in Peru, South Africa, and Nicaragua. An employee of Solidaridad, an international non-governmental organization that works with smallholders around the world, also joined the journey.

What We Did

We gathered early the next morning and climbed into vans for a day of field trips exploring the issues around wild harvesting and forest farming botanicals in Appalachia. Half of the group visited the Appalachian Harvest Herb Hub, a nonprofit center in Duffield, Virginia, that offers basic processing such as drying and cleaning for herb farmers and marketing and outreach to help them secure contracts. The other group visited the homestead of ethnobotanist and forest farmer Ryan Huish, PhD, and his family outside Duffield for a plant walk. This visit ended with Huish's four children playing music for us in a forest grove.

In the afternoon, we had a roundtable discussion with five wild harvesters and David Wallace, owner of Reed Valley Farm in Cleveland, Virginia, and his business partner, who are trying to set up a regional processing center in an abandoned school in Cleveland, Virginia. John Munsell, PhD, from Virginia Tech and Robin Suggs from the Herb Hub have begun offering what they call the Point of Harvest training, a peer-to-peer compliance and training program to provide additional support and resources for the wild-harvesting community in the region. Munsell outlined the key tenets of this training program before we arrived so that, while visiting the region, we could hear the perspectives of people who have experienced the program.

Ryan Huish holds a black cohosh seedling that was planted in the forest. Photo ©2024 Sarah Tanner

Issues around Wild Harvesting

This discussion focused on the need for higher prices to be paid for wild collection since the price point has not changed in years, sustainable harvesting practices, and the history of extractive industries in the region. The collectors focused on how the Point of Harvest training program is a way to begin to address these challenges.

The roundtable was a highlight of the Learning Journey because of the information shared and, as importantly, because it created an opportunity for wild harvesters, those at the bottom of the herbal sourcing network, to speak directly to brands and processors from around the world. Unlike most site visits that herb company representatives make, we were not there to fix things or make recommendations. We were there to learn.

After the discussion, we drove up a steep rocky road to a cabin, where Wallace spent time as a child. We then divided into smaller groups and walked into the woods with wild collectors. My group was casually walking up a logging road, talking with Donny Collins from eastern Kentucky. I asked him if this is where he would come to dig plants. Without hesitating, he replied that no, he wouldn't find anything along a logging road. I asked him to take us where he would go. He headed straight up the steep ridge to our right. He had what looked like an ice pick to keep his footing. We did our best to follow along, grabbing onto saplings and trees to climb the steepest parts, feeling just a bit of what it is like to walk through steep hollows of central Appalachia.

If I Had 20% More Courage, What Would I Do?

After another evening in Bristol, the next morning we drove to Gaia Herbs' 350-acre farm in Brevard, North Carolina, about two hours away. When we arrived, we took a silent walk to the creek flowing through the farm to greet the land. During our day and a half at Gaia, we had dialogue walks with one other person, discussions about migrant farmworker rights and challenges, and solo plant walks. We helped harvest ginkgo (*Ginkgo biloba*, Ginkgoaceae) leaves, journaled, and had large group discussions about what we were observing.

For the last session together, we gathered in a circle and answered the question, "What can we do together that we cannot do alone?" This was followed by the question, "If I had 20% more courage, what would I do?" Answers included: "Plant more," "Ask more difficult questions," "Speak my truth," and "Take every opportunity to tell the story of where herbs are from and why knowing that matters."

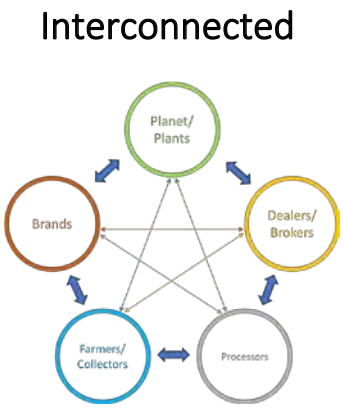
Scavengers

Carol Collins, a wild harvester from eastern Kentucky and Donny's sister, who put her children through college with the sales of wild-harvested Appalachian herbs, talked about how some diggers are scavengers who take whatever they can to make a quick buck.

"First the timber companies extracted timber from this region. Then the coal companies extracted coal. And then the pharmaceutical companies came," Lori Briscoe, an herbalist and founder of Appalachian Teas & Botanicals in Bristol, told us during the roundtable discussion. "This community doesn't want to feel like the coal companies are coming back, but companies need to demonstrate that the herb industry will act differently. If this medicine, these plants go out into the world but don't heal our communities, that is sick and twisted."

In the van afterward, Trent McCausland, vice president of global sustainability and transparency at Nature's Sunshine, a company based in Lehi, Utah, reflected on the differences between scavenging and replenishing, and not just in harvesting plants. He asked, "What [does] that look like at each level of the value network for sourcing herbs?" And, at each level, "Are we scavenging or replenishing in the work that we do?"

McCausland created this infographic to share his reflections:



Planting Seeds

"What seeds are we each planting, wherever we are in the value network? How can we create a community of accountability among each of us?" Ben LeVine, co-founder and chief herbalist at Rasa, based in Boulder, Colorado, asked where we can share what is difficult and not working and also be challenged to reach higher and do more than we could on our own. How can we work together to build a different model, one that is actually built on respect and care, each step of the way?

LeVine shared some of his takeaways from the Learning Journey:

1. The importance of being in place. Why do we, as an herb industry, find ourselves in Las Vegas or right next to Disneyland for our biggest industry events? Sinking in to the rolling hills of Appalachia provided a welcome contrast. How did being in the woods shape our conversations, decisions, and connections

Group meeting at Gaia Herbs' farm in Brevard, North Carolina. Photo ©2024 Ann Armbrecht

with one another? We also gave voices to the rivers, plants, and valleys that otherwise may have not been heard.

2. Appalachian Sustainable Development's new Point of Harvest program gave us a glimpse into the power of bottom-up, community-driven solutions. In an industry that is often modeled after colonial hierarchies and systems of trade, what would happen if power were more distributed throughout the supply system and came from a deep sense of place?
3. Storytelling in an embodied way (beyond clever marketing) is just as important as the tangible work. How can we better build the context, meaning, and value of our herbal products through powerful storytelling? How can a brand be a better bridge between the lives of the wildcrafters and farmers we depend on and the lives of the customers who depend on Rasa?
4. Community is everything. Over one dinner, I (LeVine) listened in on a beautiful conversation between people from Appalachia, South Africa, and Peru as they talked about the common challenges they face when working with wild plant populations. That is just one small example of so many from the week. How much more efficiently and joyously can we address sustainability issues when we do it together?

After the Learning Journey, I read something I had written right before, about how my hope was that we could create a space in which each participant could fully be who they are. So much richness flowed from our time together. Though there are many reasons for that richness, I think the main one is that we each did just that. We let our guard down and were present as ourselves. From there, we were able to connect in a real way with the people and places we visited, with the plants, with each other, and with ourselves. We each began to tap into what we need to have 20% more courage.

Creating the Conditions for Change

An underlying premise of the work I do at the SHP is that the challenges the herb industry faces are too big to tackle alone and that we need to come together in pre-competitive collaborations to address these challenges. On LinkedIn, someone recently posted that pre-competitive collaboration is a false theory of change. I do not even know what that means. Yet, I do know that during this Learning Journey, we touched something within ourselves and with each other that I have not experienced before in any circle I have entered in my work.

I do not know fully understand how that translates into a concrete theory of change, but I know that the Learning Journey changed me. It has changed the urgency I feel, the sense of possibility, my sense of confidence and ability to at least do something, and my sense of connection with people in my work whom I can reach out to when I feel that confidence lagging or am not sure what to do next. The change felt more meaningful than any new information or another article or resource guide.

On this Learning Journey, we helped create conditions needed for change. Like any change, what matters now is the steps we take individually and collectively toward shifting this industry, from one that is yet another extractive industry to one that brings healing to everyone involved, to people, to the plants, and to the planet.

Walking the Path Together

In the roundtable discussion in Cleveland, Virginia, Briscoe said the call to action is that we need to learn to play a new game. "The old game doesn't work anymore," she said. "I don't think it ever really worked for anyone. We learn to play the new game by walking the path together."

In an SHP webinar in December 2023, SHP members shared their experiences and perspectives from the first Learning Journey. In early 2024, Julie Arts and I held the third online session of the SHP Learning Lab with 40 new and current SHP members.

The second Learning Journey will take place in southwest Oregon in June 2024 with a group of 35 stakeholders from the herb industry, and the third (for alumni of previous Learning Journeys) will be held in Nicaragua in November 2024. HG

Products from some of the companies that participated in the Learning Journey. Photo ©2024 Ann Armbrecht

Tart Cherry Supplementation Decreased Systemic Inflammation in People with Gout after 12 Weeks

Reviewed: Wang C, Sun W, Dalbeth N, et al. Efficacy and safety of tart cherry supplementary citrate mixture on gout patients: A prospective, randomized, controlled study. *Arthritis Res Ther.* September 2023;25(1):164. doi:10.1186/s13075-023-03152-1.

By Dani Hoots

Gout is the most common type of inflammatory arthritis and is associated with elevated serum and urinary uric acid levels and low urine pH. Tart cherries (*Prunus cerasus*, Rosaceae) are high in anthocyanins and other polyphenols such as flavonols and hydroxycinnamic acids, which have anti-inflammatory and antioxidative effects. A previous study found that consumption of cherry products was associated with a 35% reduction in gout flare-ups.[1] One way to mitigate urolithiasis, a side effect of gout in which uric acid kidney stones leave the kidney and enter the urinary tract, is through urine alkalinization, which can help dissolve the stones. However, evidence for this therapy has been inconsistent. The authors conducted an open-label, prospective, randomized, parallel, controlled trial to assess the safety and efficacy of a tart cherry citrate mixture (TaCCi) in reducing gout flare-ups compared to sodium bicarbonate or a citrate mixture in people with gout.

The trial was conducted at the gout clinic of the Affiliated Hospital of Qingdao University in China between September 2021 and June 2022. The study included men between the ages of 18 and 70 years who met the 2015 American College of Rheumatology/European League Against Rheumatism criteria for gout, had a fasting urine pH ≤ 6, and were about to begin urate-lowering therapy. The authors excluded participants who were already on urate-lowering medication, had a gout flare within 14 days before recruitment, were taking drugs that affect serum uric acid or urine pH, or had secondary gout, secondary hypertension, or an allergy to any drugs or ingredients in the trial, among other exclusion criteria. Women were not included in the trial due to the low occurrence of gout in women.

Of the 354 people screened, 282 were randomized into one of three groups: the sodium bicarbonate group, the citrate mixture group, or the TaCCi mixture group (94 in each). In total, nine participants withdrew and 19 participants were lost to follow-up among the three groups.

Primary outcomes analyzed included changes in urine pH and serum uric acid levels. Other gout-specific outcomes included changes in C-reactive protein (CRP) levels, gout flares, and dual-energy computed tomography (CT)-detected monosodium urate volume. Renal and metabolic-specific outcomes included estimated glomerular filtration rate (a measure of kidney function), urine albumin-creatinine ratio (used to predict kidney disease), and metabolic syndrome components.

The sodium bicarbonate group consumed 1 g of sodium bicarbonate three times per day; the citrate mixture group consumed a 3.5-g mixture of 50% citric acid, 10% sodium citrate, 10% potassium citrate, 20% sodium carbonate, and 10% excipient twice daily; and the TaCCi mixture group consumed 3.5 g of 25% tart cherry powder, 30% citric acid, 2% sodium citrate, 2% potassium citrate, 30% sodium carbonate, and 11% excipient twice daily. The manufacturer of the trial products was not stated. All participants also took 20 mg of febuxostat (a medication used to treat hyperuricemia [abnormally high level of uric acid in the blood] and gout) daily and escalated to 40 mg daily if serum uric acid reached 360 µmol/L or greater at the first follow-up. Other gout-lowering pharmaceuticals were not allowed during the trial. Follow up occurred every four weeks for 12 weeks. If a participant had gout flare-ups during the study, they were prescribed 120 mg etoricoxib (a nonsteroidal anti-inflammatory drug) daily for three to five days.

Participants underwent a 14-day washout period and followed a low-purine diet before baseline data were collected. Demographic and medical history data also were collected at baseline. At baseline and weeks four, eight, and 12, blood and urine samples were collected to determine serum uric acid, triglycerides, total cholesterol (TC), fasting blood glucose (FBG), homeostasis model assessment of insulin resistance (HOMA-IR), transami-

Study Details: At a Glance	
Study Design	Open-label, prospective, randomized, parallel, controlled trial
Duration	12 weeks
Participants	254 men with gout
Intervention	Tart cherry citrate mixture, containing 25% tart cherry powder, 30% citric acid, 2% sodium citrate, 2% potassium citrate, 30% sodium carbonate, and 11% excipient
Comparators	Sodium bicarbonate or citrate mixture, containing 50% citric acid, 10% sodium citrate, 10% potassium citrate, 20% sodium carbonate, and 10% excipient
Disclosures	The authors declared no conflicts of interest.

nase, blood urea nitrogen (BUN), serum creatinine, estimated glomerular filtration rate, urine pH, urine protein, hemoglobinuria, blood pressure, and body mass index (BMI). At baseline and week 12, dual-energy CT, kidney ultrasonography, 24-hour urine albumin-creatinine ratio, CRP, serum potassium, serum sodium, and serum chloride levels were taken. Adverse events were monitored throughout the trial.

Demographic and clinical characteristics were not different among the groups at baseline. All groups experienced an increase in urine pH between baseline and week four and remained stable through week 12. However, there were no significant differences among the groups. All groups demonstrated a decrease in serum uric acid levels, with no significant differences among the groups.

There were fewer gout flares in the citrate mixture group (P = 0.033) and the TaCCi mixture group (P = 0.024) compared to the sodium bicarbonate group. However, there was no difference between the citrate mixture group and the TaCCi mixture group. After 12 weeks, there was a significant decrease in CRP in the TaCCi mixture group compared to other groups (P < 0.01). Although the dual-energy CT-detected monosodium urate volume decreased significantly in all groups, there were no between-group differences.

There was a significant increase in the estimated glomerular filtration rate for the TaCCi group at week eight. However, there were no differences among groups at any other time point. At week 12, there were significant decreases in urine albumin-creatinine ratio levels in the citrate mixture group (P = 0.007) and the TaCCi mixture group (P < 0.001) and a non-significant decrease in the sodium bicarbonate group (P = 0.253) compared to baseline. The difference in the ratio decrease was significant between the TaCCi mixture group after 12 weeks and both the sodium bicarbonate group (P < 0.001) and the citrate mixture group (P = 0.034). The citrate mixture group also showed a significantly higher decrease compared to the sodium bicarbonate group (P = 0.021).

There were significant improvements in systolic blood pressure, diastolic blood pressure, TC, FBG, and HOMA-IR levels after 12 weeks in all groups, and significant improvement in BMI in the sodium bicarbonate group. However, there were no differences among groups. There were no differences among groups for adverse events.

The authors conclude that TaCCi was safe and had the same positive effects on gout symptoms and urine pH levels compared to sodium bicarbonate and the citrate mixture. Limitations of the trial included using a single clinical center, the open-label study design, the lack of a placebo, using only male participants, and the relatively short duration. Additionally, information on the manufacturing process and the composition of the tart cherry powder was not provided. A larger and longer trial is needed to verify these results. HG

Reference

1. Zhang Y, Neogi T, Chen C, Chaisson C, Hunter DJ, Choi HK. Cherry consumption and decreased risk of recurrent gout attacks. *Arthritis Rheum*. 2012;64(12):4004-4011. Available at: www.ncbi.nlm.nih.gov/pmc/articles/PMC3510330/pdf/nihms-401649.pdf. Accessed April 11, 2024.

Tart cherry *Prunus cerasus*
Photo ©2024 Steven Foster Group

Large Clinical Trial in China Supports Use of Notoginseng in Patients with Ischemic Stroke

Reviewed: Wu L, Song H, Zhang C, et al. Efficacy and safety of *Panax notoginseng* saponins in the treatment of adults with ischemic stroke in China. *Jama Netw Open*. June 2023;6(6):e2317574. doi: 10.1001/jamanetworkopen.2023.17574.

By Mariann Garner-Wizard

Stroke is the leading cause of death in China. Roughly 70% of all strokes in China are ischemic strokes, which occur when the blood supply to part of the brain is blocked or reduced due to a clot. Saponins from notoginseng (*Panax notoginseng*, Araliaceae), also known as Chinese ginseng, have been used in China since antiquity to treat ischemic stroke. Xuesaitong capsules (XST; Luotai®; KPC Pharmaceuticals; Kunming, China), which contain notoginseng saponins, were licensed in 1999 by the Chinese National Medical Products Administration to treat ischemic stroke. The proposed neuroprotective mechanisms of XST include antioxidative, anti-inflammatory, and anti-apoptotic effects and enhanced angiogenesis. A 2022 systematic review and meta-analysis of 17 clinical trials (N = 1,942 total subjects) found that XST was associated with favorable outcomes in patients with ischemic stroke, but there is a lack of evidence from large prospective studies.[1] A separate group of authors conducted a randomized, double-blind, placebo-controlled clinical trial (RCT) to assess the safety and efficacy of XST compared to placebo in patients with ischemic stroke.

Study participants were recruited from 67 health centers in China from July 2018 through June 2020. Eligible patients were 18-75 years old with a clinical diagnosis of ischemic stroke and were able to begin the study within 14 days of symptom onset. They had a pre-stroke score of 0-1 on the Modified Rankin Scale (mRS) and a score of 4-15 on the National Institutes of Health Stroke Scale (NIHSS) at randomization. Patients were excluded if they had an aneurysm, intracranial hemorrhage, or other nonischemic brain disease, acute coronary syndrome, or contraindications for notoginseng use.

Of the 3,542 patients screened, 470 did not meet criteria, and 3,072 were randomized to XST (n = 1,535) or placebo (n = 1,537) groups. Those in the XST group received two 60-mg capsules twice daily, and those in the placebo group received a matched but otherwise undescribed placebo twice daily for three months. The "standard care" given to all patients is not explained. Outcomes were obtained via structured interviews.

The primary outcome was the proportion of patients with functional independence (defined as having an mRS score ≤ 2) at three months post-randomization. Secondary outcomes were percentages of patients with functional independence at 12 months and with no or minimal disability (mRS score ≤ 1) at three and 12 months, as well as rate of recurrent stroke, rate of composite cerebral events (i.e., ischemic stroke, intracerebral hemorrhage, myocardial infarction, or vascular death), and EuroQoL (Quality of Life) Group 5-Dimension (EQ-5D) scores at three and 12 months. Other efficacy outcomes were Barthel Index (BI) change from baseline to three and 12 months; NIHSS score change from baseline to three months; and platelet counts and coagulation indicators at three months. The primary safety outcome was serious adverse events (AEs) within three months. Secondary safety outcomes included symptomatic intracranial hemorrhage, all-cause mortality, and AEs.

Patients who received at least one treatment and efficacy evaluation were included

Notoginseng *Panax notoginseng*
Photo ©2024 Steven Foster Group

Study Details: At a Glance	
Study Design	Randomized, double-blind, placebo-controlled clinical trial
Duration	Three months
Participants	2,077 men and women with ischemic stroke (per-protocol cohort)
Intervention	Xuesaitong capsules (Luotai®; KPC Pharmaceuticals; Kunming, China), a standardized Chinese patent medicine that contains notoginseng saponins
Control	Matched placebo
Disclosures	The authors declared no conflicts of interest.

in the modified intention-to-treat (ITT; n = 2,966) cohort, and those who completed treatment without major protocol deviation comprised the per-protocol (PP; n = 2,177) cohort. The safety cohort included all participants who received treatment (n = 2,970). During the RCT, 47 patients in the XST group dropped out, one was lost to follow-up before the first evaluation, and 406 were excluded for protocol violations, leaving 1,081 for the PP analysis. In the placebo group, 55 dropped out, three were lost to follow-up before the first evaluation, and 383 were excluded for protocol violations, leaving 1,096 for the PP analysis. At baseline, the between-group difference in gender was significant (35.6% women in the XST group vs. 30.7% women in the placebo group; *P* value not given).

In the ITT cohort, the percentage of patients with functional independence at three months was 89.3% in the XST group and 82.4% in the placebo group ($P < 0.001$). Similar results were seen in the PP cohort, with 90.0% in XST and 83.3% in placebo with functional independence at three months ($P < 0.001$). Other outcomes also favored XST, including the proportion with no or minimal disability at three months (74.1% XST vs. 69.3% placebo; $P = 0.004$) and at 12 months (85.6% XST vs. 82.3%; $P = 0.01$). Median change in NIHSS score from baseline to three and 12 months and median BI change from baseline to three months were greater for XST than placebo ($P = 0.02$, 0.009, and 0.006, respectively).

There were no significant between-group differences in recurrent stroke or composite cerebral events at three or 12 months, functional independence or BI change at 12 months, platelet counts and coagulation indicators at three months, or preventive medications and status at one month post-randomization. Primary effects were consistent in subgroup analyses by age, sex, presence of diabetes or hypertension, and type of ischemic stroke, with similar results in PP and safety cohorts. Incidence of serious AEs was 1.0% in the XST group and 1.1% in the placebo group ($P = 0.85$).

This is the largest known RCT of XST efficacy and safety to date, and the results support the use of XST in patients with ischemic stroke. Other, once-promising neuroprotective agents (e.g., NA-1 [nerinetide], natalizumab, albumin, uric acid, and magnesium sulfate) have not been supported by clinical evidence or have been associated with serious AEs. In contrast, notoginseng's broader complement of compounds (e.g., > 20 saponins) has a range of neuroprotective effects that appear to act synergistically on ischemic brain tissue. This RCT aimed to include patients with mild to moderate stroke but enrolled mostly those with mild stroke. Since women are less likely than men to have favorable outcomes at three months post-ischemic stroke, the favorable results in the XST group, with a significantly higher proportion of women, strengthen the evidence for XST use, according to the authors of the study.

Generalizability of this study may be limited due to the fact that the study population (almost entirely of Han Chinese ethnicity) differed from those of other stroke trials, with a higher proportion of men and lower rate of cardioembolism. Most patients in this RCT did not receive recanalization therapy. Future studies should assess effects of XST as adjunct to these increasingly used procedures. The authors declared no conflicts of interest. HG

Reference

1. Gao Y, Chen Z, Li X, et al. The efficacy and safety of the Xuesaitong soft capsule in the treatment of patients with ischemic stroke: Systematic review and meta-analysis. *Ann Palliat Med*. 2022;11(8):2695-2708. doi:10.21037/ apm-22-748.

Systematic Review on the Effects of Hibiscus Combined with Other Herbal Extracts for Management of Metabolic Syndrome

Reviewed: García-Muñoz AM, García-Guillén AI, Victoria-Montesinos D, Abellán-Ruiz MS, Alburquerque-González B, Cánovas F. Effect of the combination of *Hibiscus sabdariffa* in combination with other plant extracts in the prevention of metabolic syndrome: A systematic review and meta-analysis. *Foods*. June 2023;12(11):2269. doi: 10.3390/foods12112269.

By Gavin Van De Walle, MS, RDN

Metabolic syndrome (MetS) is characterized by a cluster of interrelated metabolic risk factors that predispose a person to an increased risk of developing cardiovascular disease (CVD) and type 2 diabetes mellitus. Fruits and vegetables contain a high concentration of polyphenols, such as flavonoids and carotenoids, which have been associated with a reduction in mortality rates related to CVD. Polyphenol-rich extracts, such as hibiscus (*Hibiscus sabdariffa*, Malvaceae), lemon verbena (*Aloysia citrodora*, Verbenaceae), and passion fruit (*Passiflora edulis*, Passifloraceae) extracts, have shown potential in managing MetS. This systematic review and meta-analysis aimed to investigate the combined effects of hibiscus with other plant extracts for the prevention of MetS.

PubMed, Scopus, Web of Science, and the Cochrane Database were searched for articles published from January 2010 to May 2023 using relevant keywords. Eligible studies were randomized controlled trials (RCTs) that investigated the combination of hibiscus with other plant extracts for reducing markers related to cardiovascular risk in healthy participants or patients diagnosed with concomitant conditions, such as hypertension. Studies that compared the effects of hibiscus combined with other plant extracts while simultaneously incorporating different drug interventions were excluded. The Cochrane risk-of-bias tool was employed to evaluate the risk of bias in the included studies.

Of the 1,453 studies initially identified, seven studies with a total of 332 participants (59% females, mean age of 41.2 ± 10.3 years) were included in the systematic review and

Study Details: At a Glance	
Study Design	Systematic review and meta-analysis
Included Studies	Seven randomized controlled trials
Participants	332 adults with or without cardiovascular conditions
Intervention	Hibiscus extracts combined with other plant extracts
Control	Placebo or no treatment
Disclosures	The authors declared no conflicts of interest.

Hibiscus *Hibiscus sabdariffa*
Photo ©2024 Steven Foster Group

Hibiscus *Hibiscus sabdariffa*
Photo ©2024 Steven Foster Group

meta-analysis. Five of the studies were conducted in Spain and two in Asia. In four trials, 500-mg capsules containing hibiscus (35% by weight) and lemon verbena (65%) were administered daily for six to 12 weeks. In another trial, 500-mg capsules containing hibiscus (65% by weight) and lemon verbena (35%) were administered daily for eight weeks. One study administered 300 mL of a jelly drink containing hibiscus (44.53% by weight) and passion fruit (12.12%) daily for eight weeks. Finally, the last study administered a sachet containing 9 g of hibiscus, beefsteak plant (Korean perilla; *Perilla frutescens*, Lamiaceae), hawthorn (*Crataegus* spp., Rosaceae), Japanese apricot (*Prunus mume*, Rosaceae), hyacinth bean (*Lablab purpureus* subsp. *purpureus* syn. *Dolichos lablab*, Fabaceae) and rice bean (*Vigna umbellata*, Fabaceae) at a ratio of 6:10:2:4:4:5, respectively, daily for eight weeks. The patients included those with overweight or obesity, hypertension, and dyslipidemia. The overall risk of bias in the seven trials was uncertain, though some concerns were identified in six trials.

The analyzed parameters associated with MetS included body mass index (BMI), body weight, body fat percentage, blood pressure, lipid profile, and blood glucose levels. The pooled analysis of all seven studies revealed a significant reduction in BMI (standard mean deviation [SMD]: –0.52; 95% confidence interval [CI]: –0.72 to –0.31, I^2 = 41.51%; P = 0.00) with hibiscus combined with other plant extracts (treatment) compared with placebo. The pooled analysis of the five studies reporting the effects of treatment on body weight demonstrated a similar decrease in body weight (SMD: –0.90; CI: –1.74 to –0.05; I^2 = 90.30; P = 0.04) as observed for the BMI. Three studies assessed the change in body fat percentage in which a significant decrease was observed (SMD: –1.08; 95% CI: –1.42 to –0.73; I^2 = 0.00%; P = 0.00) with treatment.

The effect on blood pressure was assessed in six studies in which patients experienced a significant decrease in systolic blood pressure (SMD: –1.18; 95% CI: –2.11 to –0.25; I^2 = 92.55%; P = 0.01) and diastolic blood pressure (SMD: –0.83; 95% CI: –1.49 to –0.18; I^2 = 86.37%; P = 0.01) with treatment compared with placebo. The pooled analysis of six trials revealed a significant decrease in total cholesterol (TC; SMD: –0.36; 95% CI: –0.58 to –0.14; I^2 = 36.84%; P = 0.00) and low-density lipoprotein cholesterol (LDL-C; SMD: –0.44; 95% CI: –0.81 to –0.07; I^2 = 62.71%; P = 0.02) with treatment. Treatment had no significant effects on triglycerides (TGs), high-density lipoprotein cholesterol (HDL-C), or blood glucose. A statistically significant publication bias was found for body weight, systolic blood pressure, total cholesterol, and TGs.

The results of the systematic review and meta-analysis demonstrated that daily supplementation with hibiscus in combination with other plant extracts was associated with significant reductions in anthropometric profiles and blood pressure and improvements in TC and LDL-C in patients with overweight or obesity, hypertension, or dyslipidemia after six to 12 weeks. Importantly, because of the presence of various other plant extracts, the results of this study cannot be attributed solely to hibiscus.

The authors discussed several mechanisms by which hibiscus and the other plant extracts may have exerted the observed effects on metabolic health, though the specific mechanisms are still poorly understood. As such, the authors called for more in-depth investigations into the molecular pathways involved, as well as examinations of the impact of individual polyphenols or their combination. Larger and more homogenous sample sizes should be employed in future studies to reduce the potential for bias and improve the reliability of the results. Finally, the authors called for comparisons with other interventions or therapies, such as antihypertensive drugs or dietary approaches, to provide additional data for the role of these plant extracts in MetS prevention and management. HG

Oral Consumption of a Combination Herbal Product May Benefit Hair Growth

Reviewed: Ham S, Lee YI, Kim IA, et al. Efficacy and safety of persimmon leaf formulated with green tea and sophora fruit extracts (BLH308) on hair growth: A randomized, double-blind, placebo-controlled clinical trial. *Skin Res Technol*. September 2023;29(9):e13448. doi:10.1111/srt.13448.

By Dani Hoots

Persimmon (*Diospyros kaki*, Ebenaceae) leaf extract has shown antioxidant, anti-inflammatory, anti-atherosclerotic, anti-allergic, and anti-aging properties in vitro and in vivo. Persimmon leaf extract also has shown positive effects on inflammatory skin conditions in previous studies, but its use for other dermatological conditions has not been investigated. The authors conducted a randomized, double-blind, placebo-controlled study to investigate the efficacy and safety of an oral formula containing persimmon leaf extract, green tea (*Camellia sinensis*, Theaceae) leaf extract, and Japanese sophora (*Styphnolobium japonicum*, Fabaceae) fruit extract on hair growth and hair health in generally healthy participants.

Research was conducted at the Global Medical Research Center in Seoul, South Korea, from April 2021 to September 2021. Eligible adults were 19-60 years old without underlying medical conditions or a history of hair conditions. Patients with underlying skin disorders or other medical conditions who were undergoing treatment were excluded, as were those who had symptomatic cardiac disease, used topical finasteride or dutasteride within the past six months, had a history of allergy to any study product, were pregnant or breastfeeding, had participated in other clinical trials within the past 30 days, or had other medical conditions that could interfere with the study.

The test product, BLH308 (Ben's Lab Co. Ltd.; Anyang-si, South Korea), contained persimmon leaf extract, green tea leaf extract, and Japanese sophora fruit extract in a 2:1:1 ratio. Each 500-mg capsule contained 150 mg of plant extracts (75 mg persimmon leaf, 37.5 mg green tea leaf, and 37.5 mg Japanese sophora fruit extracts) with 350 mg of excipients. According to the authors, the persimmon leaf extract had a 12.5% tannic acid content, the green tea leaf extract contained 50% epigallocatechin-3-*O*-gallate (EGCG), and the Japanese sophora fruit extract had 3% sophoricoside. The 500-mg placebo capsules were similar in appearance and contained 150 mg of microcrystalline cellulose and 350 mg of the same excipients as the test product (maltodextrin, silicon dioxide, magnesium stearate, and gardenia yellow color). Participants were instructed to take one 500-mg capsule (BLH308 or placebo) twice daily for 24 weeks.

The study consisted of five visits: initial screening and weeks 0, 8, 16, and 24. Hair density, thickness, and gloss were assessed at weeks 0, 8, 16, and 24. The measurement site was marked on the scalp with a 1-mm circular tattoo.

Persimmon *Diospyros kaki*
Photo ©2024 Steven Foster Group

Study Details: At a Glance	
Study Design	Randomized, double-blind, placebo-controlled clinical trial
Duration	24 weeks
Participants	88 healthy men and women (per protocol set)
Intervention	BLH308 (Ben's Lab Co. Ltd.; Anyang-si, South Korea), a combination product containing persimmon leaf extract, green tea leaf extract, Japanese sophora fruit extract, and excipients
Control	Placebo containin microcrystalline cellulose and the same excipients as BLH308
Disclosures	The authors declared no conflicts of interest but acknowledged that their work was supported by Ben's Lab Co., Ltd., the producer of the study product.

Tea *Camellia sinensis*
Photo ©2024 Steven Foster Group

Density was assessed by counting the hair strands in a specific area of the tattoo; thickness was measured using the average diameter of five strands of hair around the tattoo; and gloss was evaluated by taking the average of five measurements using a scanning electron microscope. Safety was assessed during physical examinations, and any adverse events (AEs) were recorded.

A total of 101 participants were randomly assigned to the test group (n = 51) or the placebo group (n = 50). The full analysis set included 49 participants from the test group and 47 from placebo; the per protocol set analysis included 44 participants from each group.

There was a significant increase in hair density at weeks 8 (P = 0.0201), 16 (P = 0.0088), and 24 (P = 0.0015) in the test group compared to placebo. There were significant differences between groups for hair thickness* at weeks 8 (P = 0.0724), 16 (P = 0.0013), and 24 (P = 0.0001), with the test group experiencing significant improvements compared to placebo. At week 8, there was a significant increase in hair gloss in the test group (P = 0.0019) and placebo group (P = 0.4742) compared to baseline; however, no significant between-group difference was observed.

A total of 31 AEs were reported by 20 participants in the test group, and 32 AEs were reported by 22 participants in the placebo group, indicating no significant between-group difference. No serious AEs were reported, and no participants withdrew due to AEs; however, the schematic of the trial protocol states that one participant in the placebo group withdrew due to an AE and hence was not included in the full analysis set.

The authors conclude that study formula showed significant benefits for hair density and thickness in apparently healthy adults compared to placebo. Although the test product's effect on hair gloss was not significant compared to placebo, there was still a positive effect.

The paper has several limitations that the authors did not mention. Participants' ethnicity, hair type, and hair grooming habits were not reported, and the extracts in the test product were not described in detail (e.g., solvent types, tannic acid description, etc.). Additionally, the authors did not explain if they factored humidity into consideration, which can affect hair thickness. More research is needed to verify the results, specifically with photo-aged scalps, to understand the effects of BLH308 against oxidative stress induced by extrinsic aggregations. HG

* An expert reviewer of this article noted that determining hair thickness can be challenging with just five measurements, as hair typically is not perfectly round, especially with age. The reviewer also mentioned that hair diameter is dictated by the size of dermal papilla, and since hair growth is a multi-year process, a significant change (not due to swelling) within eight weeks is surprising.

Japanese sophora *Styphnolobium japonicum*
Photo ©2024 Steven Foster Group

Valerian *Valeriana officinalis*
Photo ©2024 Steven Foster Group

The Undisclosed Presence of Excipients and Diluents in Botanical Extracts

High levels of undisclosed excipients and diluents may give buyers and consumers a misleading sense of botanical extracts' strength and composition

By Stefan Gafner, PhD, Loïc Loffredo, James Kababick, Stacy M. Wise, PhD, and Roy Upton, RH (AHG)

This article discusses the composition and labeling of botanical extracts, with particular focus on the sale of botanical dietary ingredients and dietary and food supplement products. Published literature and reports from analysts suggest that some commercial extracts in the dietary and food supplement supply chain may contain little or none of the declared plant or plant extract. Experts in dietary supplement analysis have determined that this occurs mainly because of two schemes used by deceptive suppliers. First, certain suppliers excessively dilute native plant extracts with undeclared amounts of excipients and are ambiguous in disclosing the plant-to-extract ratio. Second, whole herbs are extracted to obtain specific fractions or compounds that are considered to be therapeutically beneficial and are provided to select markets. The marc (leftover or spent biomass) may then be re-sold without disclosure that it is pre-extracted material.

This article also discusses the undeclared addition of large amounts of diluents to botanical extracts in the context of US dietary supplement labeling regulations. Due to lack of specificity in US regulations, manufacturers and suppliers can take different approaches to labeling extracts, particularly when declaring plant-to-extract ratios, which are also known as drug-to-extract ratios (DERs) in the European Union (EU) and elsewhere, where the term "drug" refers to the original meaning of the term (i.e., dried plant material intended for use in or as medicine).

In addition, voluntary industry guidelines may unintentionally support excessively diluted or spent materials being sold under the pretense of an ingredient or product of specified quality. At the source of production, these practices of excessive dilution represent fraudulent attempts to deceive the industry buyer (e.g., a dietary or food supplement manufacturer) and finished product consumer. While not a safety concern, receiving and processing substandard ingredients as raw materials results in a finished product that may not meet regulatory requirements and will not deliver the benefits that are associated with the botanical extract.

Independent Lab Reports

Members from contract analytical laboratories have raised the issue of excessively diluted ingredients and products for a while. Bryan Fine from the contract analytical laboratory Alkemist Labs (Garden Grove, California) described one example during an informal conversation at

the 2023 annual conference of the Natural Health Product Research Society of Canada. Alkemist Labs was contracted to authenticate a valerian (*Valeriana officinalis*, Caprifoliaceae) root/rhizome extract by high-performance thin-layer chromatography (HPTLC). The result was a blank lane — hence, the ingredient failed the authentication criteria based on the absence of any characteristic valerian metabolites.

The manufacturer that requested the testing of the valerian extract was puzzled by the test results and queried the ingredient's supplier about the lack of valerian in the material. The supplier did not have the knowledge to respond (despite this being required by regulation), and the manufacturer was referred to several more ingredient suppliers further back in the value chain until the company that produced the extract eventually was identified. Upon asking the initial production company about the composition of the valerian extract, a company representative reportedly stated that the extract contained 0.25% valerian extract and 99.75% maltodextrin* and claimed that this dilution was the only way to produce a "valerian extract" that met the customer's price demands (B. Fine oral communication to S. Gafner, June 21, 2023).

This is an extreme example in which price, and not authenticity and activity, drove the botanical ingredient's composition. As the example also shows, such diluted ingredients are readily detected by routine identity tests, will not meet established specifications, and will be rejected by any dietary supplement or food supplement manufacturers that comply with current regulations related to identity testing of ingredients.

Manipulation and mislabeling of concentrations and dilutions of extracts are a big problem, according to an author of this article (JK). Many of these x:y extracts at claimed concentration ratios of 4:1, 10:1, or 20:1 seem to be more characteristic of 1:20. A lot of these inferior extracts are "phytochemical shadows" of the native botanical, the author explained.

There is also the potential for these already highly diluted extracts to be further diluted by the addition of more maltodextrin, a plant-derived filler or carrier commonly used, in appropriate amounts, for its functional benefits (e.g., enhanced stability, flavor, etc.) in the extract industry. According to author JK, this is very common and can often be seen by microscopy and FTIR (Fourier transform infrared microspectroscopy).

Four examples of very diluted botanical ingredients analyzed by HPTLC are shown in Figure 1.

The dilution of botanical extracts is not a new issue. In 1998, 18 commercially available aloe vera (*Aloe vera*, Asphodelaceae) products, including one dietary supplement, obtained from the US marketplace were analyzed using size-exclusion chromatography with refractive index detec-

* Maltodextrin is a short polymer of 3-17 glucose units obtained after partial hydrolysis from various carbohydrate sources such as corn (*Zea mays*, Poaceae), potato (*Solanum tuberosum*, Solanaceae), or tapioca (*Manihot esculenta*, Euphorbiaceae) starch. It is used as an excipient or filler in botanical extracts and other commercial formulations.

Figure 1. HPTLC Analysis of Four Diluted Botanical Ingredients

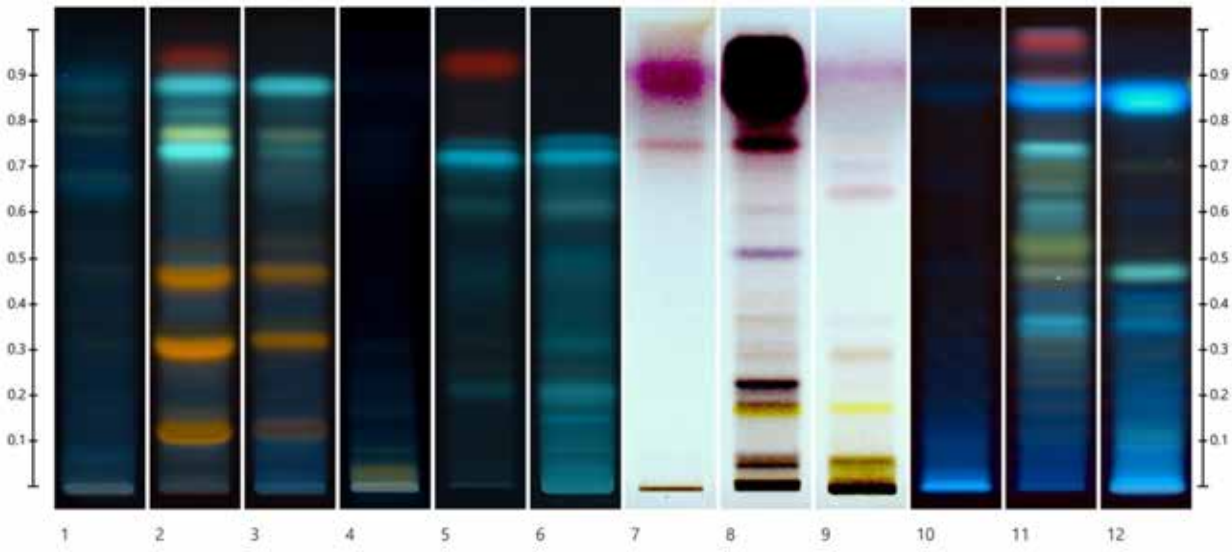


Image provided by Stacy Wise and James Kababick at Flora Research Laboratories, LLC.

Lanes 1-3: Peppermint (*Mentha* × *piperita*, Lamiaceae) leaf
Lanes 4-6: Lemon balm (*Melissa officinalis*, Lamiaceae) leaf
Lanes 7-9: Nettle (*Urtica dioica*, Urticaceae) leaf
Lanes 10-12: Chamomile (*Matricaria chamomilla*, Asteraceae) flower

Lanes 1, 4, 7, and 10: Commercial hot water extracts
Lanes 2, 5, 8, and 11: Botanical reference (methanol extracts)
Lanes 3, 6, 9, and 12: Botanical reference (water extracts)

Ginkgo *Ginkgo biloba*
Photo ©2024 Steven Foster Group

tion. The supplement product did not contain detectable amounts of the main polysaccharide in aloe vera.[1] In a separate summary of HPTLC reports of various aloe materials submitted for analysis between 2015 and 2017, Alkemist Labs indicated that it has "failed" aloe samples because they contained an excessively high content of maltodextrin.[2]

The presence at trace levels or absence of characteristic marker constituents (so-called "fairy-dusting") in botanical extracts is documented in the peer-reviewed literature and in unpublished reports. While the absence of chemical marker compounds does not always mean that an ingredient is not present in a formulation, it raises questions about the basis of any stated or implied structure-function claims or potential health benefits of the herbal dietary supplement.

Flora Research Laboratories (Grants Pass, Oregon) has reported suspected instances of spent biomass being re-distributed in the dietary supplement supply chain. After analyzing water extracts of saw palmetto (*Serenoa repens*, Arecaceae) fruit and valerian root, the independent lab found some of these extracts to be mainly composed of sugars and devoid of any of the characteristic saw palmetto fatty acids or typical valerenic acids. While the absence of these constituents can be explained by the polar extraction solvent (although the valerenic acids should be present in trace amounts), no known pharmacological or human clinical research supports any potential health benefits of such extracts.

Author JK suspects that these extracts may have been made from spent plant materials, such as fruits or roots that previously were solvent-extracted to obtain the valuable constituents, which were then sold at higher prices to the pharmaceutical industry or dietary supplement manufacturers, while the leftover spent material was re-extracted and the resulting extract sold as a low-cost dietary supplement ingredient (oral communication to S. Gafner, December 1, 2023). In most cases, absence of characteristic marker compounds associated with a particular botanical is indicative of a poor-quality material.

This was emphasized by Karl-Werner Quirin, managing director of Flavex Naturextrakte GmbH (Rehlingen-Siersburg, Germany), a manufacturer of supercritical botanical extracts. "The important active and marker constituents of botanicals used in dietary supplements are well known," he wrote (email to S. Gafner, March 5, 2024). "Serious extraction companies choose a solvent which is best suited for these substances which finally constitute the value of the extract. The companies add a qualified and batch-related CoA [certificate of analysis] to each product."

Published Literature

In a report on ginkgo (*Ginkgo biloba*, Ginkgoaceae) leaf extract food supplement† quality, Czigle et al[3] described a product with 0.49% flavonol glycoside and 0.03% terpene lactone content and concluded that this product contained "just traces of the [ginkgo] extract together with excipients of the dosage formulation."

Collins et al[4] also presented data about "ginkgo" dietary supplements with very low or no ginkgo constituents. A total of 20 bulk ginkgo leaf extracts from 15 suppliers to the US market were analyzed qualitatively by HPTLC, and quantitatively by nuclear magnetic resonance (NMR) and high-performance liquid chromatography (HPLC) with ultraviolet/visible detection (HPLC-UV/Vis) for flavonol glycosides and HPLC with evaporative light-scattering detection (HPLC-ELSD) for terpene lactones. One sample contained no flavonol glycosides or terpene lactones, while another sample contained trace amounts of terpene lactones but no flavonol glycosides when assayed by HPLC-ELSD and no measurable amounts of any characteristic ginkgo metabolites when NMR was used for the analyses. One bulk extract was devoid of any triterpene lactones but contained traces of flavonoids, and three others were composed solely of rutin and quercetin.[4] Similar results were reported in an investigation of ginkgo products combining HPTLC and NMR.[5]

Frommenwiler et al[6] published data on their HPTLC analyses of black cohosh (*Actaea racemosa*, Ranunculaceae) root and rhizome, echinacea (*Echinacea* spp., Asteraceae) root and/or aerial parts, and milk thistle (*Silybum marianum*,

† In the United States most botanical products for internal use are termed and regulated as "dietary supplements." In the EU and elsewhere they are termed and regulated as "food supplements."

Asteraceae) seed commercial dietary and food supplements and bulk ingredients. Dietary and food supplement samples consisted of extracts (n = 57), powdered plant (n = 15), mixtures of extracts and powdered plant (n = 6), or liquid extracts (n = 9). All bulk ingredients (seven extracts and 20 whole, cut, or powdered roots) were labeled to contain black cohosh. In total, 60 black cohosh, 23 echinacea, and 31 milk thistle samples were analyzed. Three black cohosh, two echinacea, and two milk thistle samples did not show any bands characteristic of the labeled plants and no or only very weak signals beyond the application point. Overall, 11 milk thistle samples, three echinacea samples, and 33 black cohosh samples were considered to be of questionable quality. Similarly, in a report on HPTLC analyses of 73 commercial elder (*Sambucus nigra*, Viburnaceae) berry preparations, three products essentially had a blank lane, indicative of a lack of any plant metabolites, with several others having bands unrelated to elder berry at a very low concentration.[7]

Analyses by HPTLC of 47 commercial St. John's wort (*Hypericum perforatum*, Hypericaceae) aerial part dietary supplements sourced from the United Kingdom, Germany, and the United States showed a number of products providing a "weak" fingerprint (i.e., low contents of marker constituents). Ten samples were categorized as having a faint flavonoid fingerprint, with six of them exhibiting spots of undeclared food dyes.[8]

Also using HPTLC, data from an unpublished investigation on the authenticity of aerial parts of single-ingredient eyebright (*Euphrasia officinalis*, Orobanchaceae) dietary supplements showed four out of 10 products with a weak fingerprint or no detectable eyebright at all (Figure 2, lanes 14-17), while the product in lane 13 was determined to be made from an unidentified *Odontites* (Orobanchaceae) species (Figure 2).

Brusač et al[9] also reported products with undetectable or trace levels of marker constituents. Of the 35 dietary supplements analyzed by HPLC-UV/Vis, two single-ingredient products purchased online — one labeled to contain andrographis (*Andrographis paniculata*, Acanthaceae) aerial parts and one labeled as boswellia (*Boswellia serrata*, Burseraceae) oleogum resin — were considered by the authors to be of no therapeutic value due to low contents or absence of constituents.** Three additional products containing either boswellia or combinations of boswellia and turmeric (*Curcuma longa*, Zingiberaceae) rhizome with or without andrographis had only trace levels of the typical marker constituents. However, these supplements also were labeled to contain glucosamine with or without chondroitin and other ingredients. Hence, it is possible that these products were predominantly made of either of both of these non-botanical ingredients.

Case Study: Berry Extracts

Another possible source of diluted or manipulated extracts originates from manufacturers that repurpose byproducts or waste products of other industries to make a dietary ingredient (i.e., an ingredient for use in a finished dietary supplement). While some of these byproducts may contain constituents with valuable medicinal properties, the benefits of such ingredients should be determined in appropriate studies.

** Constituents included andrographolide, neoandrographolide, or 14-deoxy-11,12-didehydroandrographolide for andrographis, and 11-keto-β-boswellic acid, 3-*O*-acetyl-11-keto-β-boswellic acid, α-boswellic acid, β-boswellic acid, 3-*O*-acetyl-α-boswellic acid, or 3-*O*-acetyl-β-boswellic acid for boswellia.

Figure 2. HPTLC Analysis of Authenticated *Euphrasia* Species and 10 Dietary Supplements Sold in the United States

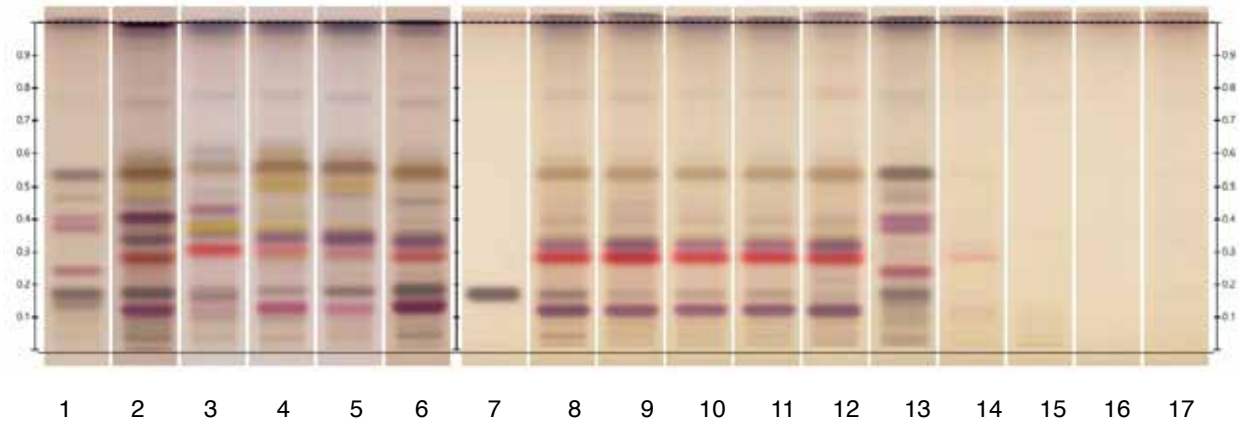


Image provided by Camag, AG.

Lane 1: *Odontites luteus*
Lanes 2 and 4: *Euphrasia rostkoviana*
Lane 3: *Euphrasia picta*
Lanes 5-6: *Euphrasia stricta*
Lane 7: Aucubin (1 mg/mL)
Lanes 8-17: Commercial dietary supplements labeled to contain *Euphrasia officinalis* or eyebright herb

For example, it has become somewhat common for some suppliers to take the leftover marc from cranberry (*Vaccinium macrocarpon*, Ericaceae) fruit juice production and use these "press cakes" for solvent extraction. Cranberry is commonly used as a dietary supplement ingredient to support urinary tract health and cranberry juice is frequently served in assisted living facilities for elders to help prevent urinary tract infections. The urinary tract health benefits are due at least partly to water-soluble proanthocyanidins (PACs) present in cranberry juice.[10,11] However, these occur predominantly in the juice, and only traces remain in the skin and seeds (press cakes), which are characterized by the presence of insoluble PACs (i.e., PACs that are bound to the plant's cellulose fibers). While some benefit is associated with insoluble PACs, no known credible published evidence supports their use for maintaining a healthy urinary tract.[12]

This example of cranberry illustrates the complexity of the diluted extract market. When extracts obtained from spent botanical materials are traded, they may not be clearly labeled as missing some of the plant part's putative beneficial compounds. They often are presented as if they are whole-herb extracts that contain a broad spectrum of constituents in appreciable amounts. Manufacturers may purchase these in good faith, believing they will deliver the benefits expected from the botanical ingredient. In a finished product, a consumer seldom knows the difference among the various ingredients derived from the same plant, but products made from waste ingredients will always cost less than those made from herbs containing the full spectrum of phytochemicals, thus presenting an economic advantage (to the seller) for the sale of potentially ineffective products. The same practice has been shown to occur with other fruit extracts, most notably elder berry[13] and bilberry (*Vaccinium myrtillus*, Ericaceae) extracts.[14]

Labeling Dietary Supplements/Botanical Extracts in the United States

Highly diluted herbal extracts or spent plant materials sold as dietary ingredients and dietary supplements are not considered a safety risk, as the diluents typically represent materials that are generally recognized as safe (GRAS). However, selling herbal extracts that do not deliver the expected benefits does a disservice to public health, is a violation of public trust in herbal products, and, depending on the label claims, may violate federally mandated current Good Manufacturing Practices (cGMPs), which require herbal products to be accurately labeled.

Current requirements for nutrition labeling are codified in section 21 of the *United States Code of Federal Regulations* (specifically CFR 101.36). In section 21 CFR 101.36(b)(3)(ii)(C), the regulation stipulates that "For a dietary ingredient that is an extract from which the solvent has been removed, the weight of the ingredient shall be the weight of the dried extract."[15] The term "extract," however, is not defined in CRF 101.36.

Clarification is provided in the American Herbal Products Association's (AHPA's) guidance policy for "Retail Labeling of Dietary Supplements Containing Soft or Powdered Botanical Extracts," which was published in 2000.[16] This document defines extracts as a combination of the native extract[††] *and* any added carrier and excipient, since this is often the form in which bulk extracts are sold worldwide. While this pragmatic definition likely was based on the idea that small amounts of carriers and excipients are sometimes an essential part of the manufacturing of extracts (to prevent clumping or increase the flow characteristics of a powder, for example), an unintended consequence is that it has left the door open for some producers to sell highly diluted extracts while still complying with AHPA's guidance.

Often, diluents like maltodextrin are added to "comply" with drug-to-extract ratio (DER) requirements of a dietary supplement manufacturer. DERs represent the amount of material obtained after extraction from a plant material relative to the starting amount of biomass. As an example, if 100 kg of dried Asian ginseng (*Panax ginseng*, Araliaceae) root yields 20 kg of ginseng root extract, the DER is 5:1.[17] Since this is the native or genuine DER, this is referred to as $DER_{genuine}$ or native extract ratio (NER). If an excipient is added to the native extract, the resulting DER is called DER_{total} according to the European Medicines Agency.[18] It rarely happens that a specific amount of crude botanical material consistently yields exactly the same amount of extract, even when using the same solvent. This occurs because of the natural variation of the chemical constituents in the botanical material. Therefore, labels in some geographic regions (e.g., Europe and Australia) appropriately use ranges for the DER (e.g., 4-7:1 rather than 5:1).[17] In North America, the use of a single value DER on herbal dietary supplement labels is much more common. Two cases of how these DERs can be, and are, manipulated are outlined below.

The first case deals with a supplier that provided a milk thistle extract with a stated DER of 4:1. The COA indicated that the extract consisted of 5% milk thistle extract and 95% maltodextrin. The supplier justified this high amount of maltodextrin as being necessary to comply with the 4:1 DER request of the manufacturer and stated that the original milk thistle extract was an 80:1 native extract, hence this extract had to be diluted by a factor of 20 times to obtain the 4:1 extract requested. The supplier proposed to specify "180 mg of milk thistle extract (4:1)" on the label, even though the product contained only 9 mg (5%) of native milk thistle extract (80:1).

The second example is from a contract manufacturer commissioned to make an Asian ginseng root dietary supplement. In a statement to the company ordering the ginseng products, the contract manufacturer explained how the DER was calculated:

Ratio extracts are made from highly concentrated material and a carrier. The more concentrated the starting material, the more carrier is needed to obtain the final ratio.

[††] Native extract means the material that consists only of components present in the original plant or formed during the extraction process, excluding any excipients or other added substances.

There are countless combinations to end up at the desired ratio. Here are a few examples:

- 80% of 5:1 concentrate + 20% carrier = 4:1 final ratio
- 40% of 25:1 concentrate + 60% carrier = 10:1 final ratio
- 60% of 10:1 concentrate + 40% carrier = 6:1 final ratio
- 40% of 10:1 concentrate + 60% carrier = 4:1 final ratio

Sibyl Swift, PhD, chief science officer and vice president of regulatory affairs at cbdMD and former associate director for research and strategy at the US Food and Drug Administration (FDA), a position in which she directed the research agenda of the Office of Dietary Supplement Programs and worked closely on office policy and enforcement, wrote: "The FDA always interpreted the law on labeling of dry extracts from plants that any excipient has to be listed separately from the native dry extract, i.e., that the amount of labeled extract does not include any flow agents, anticaking agents, antistatic agents, lubricants, or whatever else companies may add to an extract to improve the ability to process it. And it certainly wouldn't include any fillers used to adjust the plant-to-extract ratio" (email to S. Gafner, April 4, 2024). This suggests that the current interpretation of the regulations as detailed in AHPA's aforementioned guidance document is not in agreement with the FDA's interpretation.

Highly Diluted Botanical Extracts in the International Market

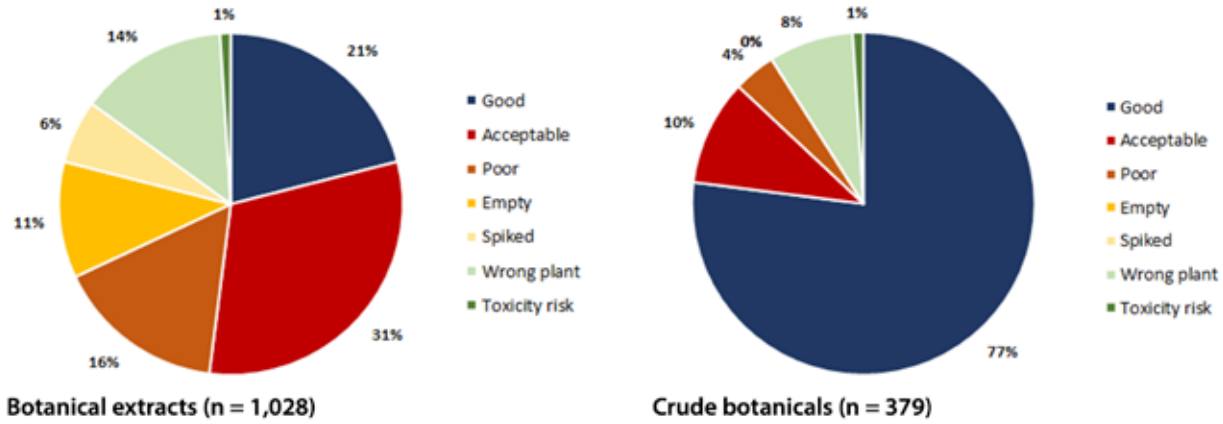
Based on the available information, it appears that the issue of highly diluted herbal dietary supplements is international in scope. Several of the published studies cited previously were carried out with samples obtained in Europe.[3,6,8] Absence or low levels of the typical chemical markers have been reported in bilberry fruit and broccoli (*Brassica oleracea*, Brassicaceae) food supplements purchased in Germany.[14,19] In a separate study of products purchased from different countries, very low concentrations of the typical flavonolignans were determined in four of 26 milk thistle dietary supplements by ultra high-performance liquid chromatography with mass spectrometric detection (UHPLC-MS). Two of the milk thistle products were from the United States, and the other two from the Czech Republic.[20]

The increased sale of highly diluted or "empty" extracts also has been noted at BotaniCERT, a contract analytical laboratory based in Grasse, France. A review of test results obtained by UHPLC with ultraviolet/visible detection (UHPLC-UV/Vis) over the period from 2017 to 2019 — conducted on 379 crude (whole, cut, or powdered) botanical ingredients and 1,028 extracts — showed no crude materials lacking the expected constituents, but 11% of the extracts were considered "empty" or devoid of any constituents characteristic for the labeled or any other botanical ingredient (Figure 3).

Based on the results obtained, crude botanicals, such as whole, cut, or powdered plant parts have a lower risk of being diluted or adulterated compared to extracts. Specific examples of a highly diluted and an acceptable extract based on the UHPLC-UV/Vis analyses are provided in Figure 4.

The use of highly diluted extracts appears to be a problem primarily in products sold as dietary or food supplements, in contrast to those regulated as herbal drugs in Europe or as traditional herbal medicines (e.g., traditional herbal medicinal products [THMPs] in the EU) throughout much

Figure 3. Review of Test Results on Botanical Extracts and Crude Botanicals by BotaniCERT*



* Samples were analyzed between 2017 and 2019 and were sourced in France (70%) or other countries in Europe (30%).

Good: Compliant with the label expectation/expected quality.
Acceptable: A little diluted (two-fold or more), but the concentration of chemical markers is acceptable.
Poor: Highly diluted (from five- to 100-fold or more) samples, but the typical chemical markers are detectable. The botanical ingredient concentration is low but high enough to confirm that it is the right species.
Empty: Unable to see any compounds, or only few chemical markers in trace amounts (close to a few µg/g for each compound) may be detectable but not at sufficiently high concentrations to confirm the identity of plant.
Spiked: Spiked by pure compounds not originating from the claimed sources, such as caffeine in guarana (*Paullinia cupana*, Sapindaceae) or vitamin C in acerola (*Malpighia emarginata*, Malpighiaceae).
Wrong plant: The labeled ingredient has been substituted to a large degree by another plant (not a simple contamination).
Toxicity risk: Presence of undeclared exogenous compounds (such as sildenafil, psilocin, etc.) or a toxic plant.

of the world. When regulated as traditional herbal medicines, individual botanical ingredients used in products must meet formal pharmacopeial specifications of the various countries. THMPs in the EU also are manufactured in a manner that requires in-depth characterization and control of raw materials and minimum quality standards according to pharmacopeial monographs, and the products must be supported by a detailed dossier outlining the herb's pharmacology and safety.

Conclusion

There are many high-quality botanical dietary and food supplements available worldwide. These products are produced by reputable manufacturers and undergo stringent identity and strength testing, often involving third party analysis or pharmacopeial methods to ensure purity and potency. However, scientific publications and data from contract analytical laboratories provide evidence that some so-called botanical extracts mainly consist of carriers and excipients. The presence of such highly diluted herbal extracts sold as dietary supplements is not considered a safety risk, as the diluents (e.g., maltodextrin, lactose, various types of starch, etc.) are GRAS materials.

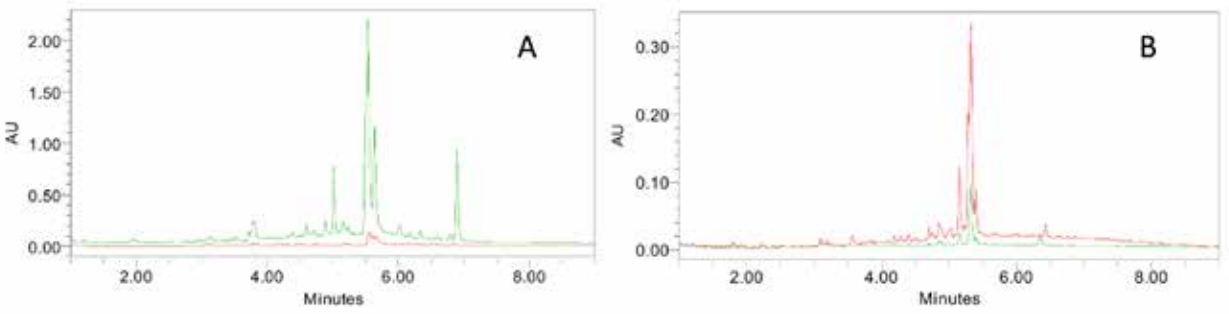
However, selling herbal extracts in very low concentrations to consumers or health professionals is misleading, as they pay for inferior products that do not provide the expected (or claimed) health benefits. Using ineffective products also harms the herbal dietary supplement industry, as it lowers consumer confidence in the benefits of using such products. It can also negatively impact the reputation of the industry when products fail to meet their claimed or implied benefits and the media reports information about low-quality products.

While current US regulations do not stipulate that herbal extracts cannot be sold in minute quantities, the law requires the labeled amount of the botanical ingredient to be accurate. Nevertheless, additional regulatory clarity regarding the labeling of dried botanical extracts and — specifically — further clarification of the meaning of an extract in 21 CFR 101.36(b)(3)(ii)(C) would be useful for the botanical dietary supplement industry. Finally, the inclusion of high amounts of carriers, diluents, and excipients as part of the labeled herbal ingredient concentration is a practice that certain companies in the herbal dietary supplement industry should reconsider. HG

References

1. Ross SA, ElSohly MA, Wilkins SP. Quantitative analysis of *Aloe vera* mucilaginous polysaccharide in commercial *Aloe vera* products. *J AOAC Int.* 1997;80(2):455-457.
2. Bejar E. Adulteration of aloe (*Aloe vera*) leaf ingredients. *Botanical Adulterants Prevention Bulletin*. Austin, TX: ABC-AHP-NCNPR Botanical Adulterants Prevention Program; 2019.
3. Czigle S, Tóth J, Jedlinszki N, Háznagy-Radnai E, Csupor D, Tekeľová D. *Ginkgo biloba* food supplements on the European market: Adulteration patterns revealed by quality control of selected samples. *Planta Med.* 2018;84(6-07):475-482.
4. Collins BJ, Kerns SP, Aillon K, et al. Comparison of phytochemical composition of *Ginkgo biloba* extracts using a combination of non-targeted and targeted analytical approaches. *Anal Bioanal Chem.* 2020;412(25):6789-6809.
5. Booker A, Frommenwiler D, Reich E, Horsfield S, Heinrich M. Adulteration and poor quality of *Ginkgo biloba* supplements. *J Herb Med.* 2016;6(2):79-87.
6. Frommenwiler DA, Reich E, Sharaf MHM, Cañigueral S, Etheridge CJ. Investigation of market herbal products regulated under different categories: How can HPTLC help to detect quality problems? *Front Pharmacol.* 2022;13.
7. Hänni M, Do T, Reich E. *Evaluation of Elderberry Fruits and Extracts to Create a Basis for Identification, Species Discrimination and Detection of Adulteration.* Muttenz, Switzerland: Camag AG; 2021.
8. Booker A, Agapouda A, Frommenwiler DA, Scotti F, Reich E, Heinrich M. St John's wort (*Hypericum perforatum*) products: An assessment of their authenticity and quality. *Phytomedicine.* 2018;40:158-164.

Figure 4. UHPLC Analyses of (A) Lady's Mantle and (B) Tick Trefoil

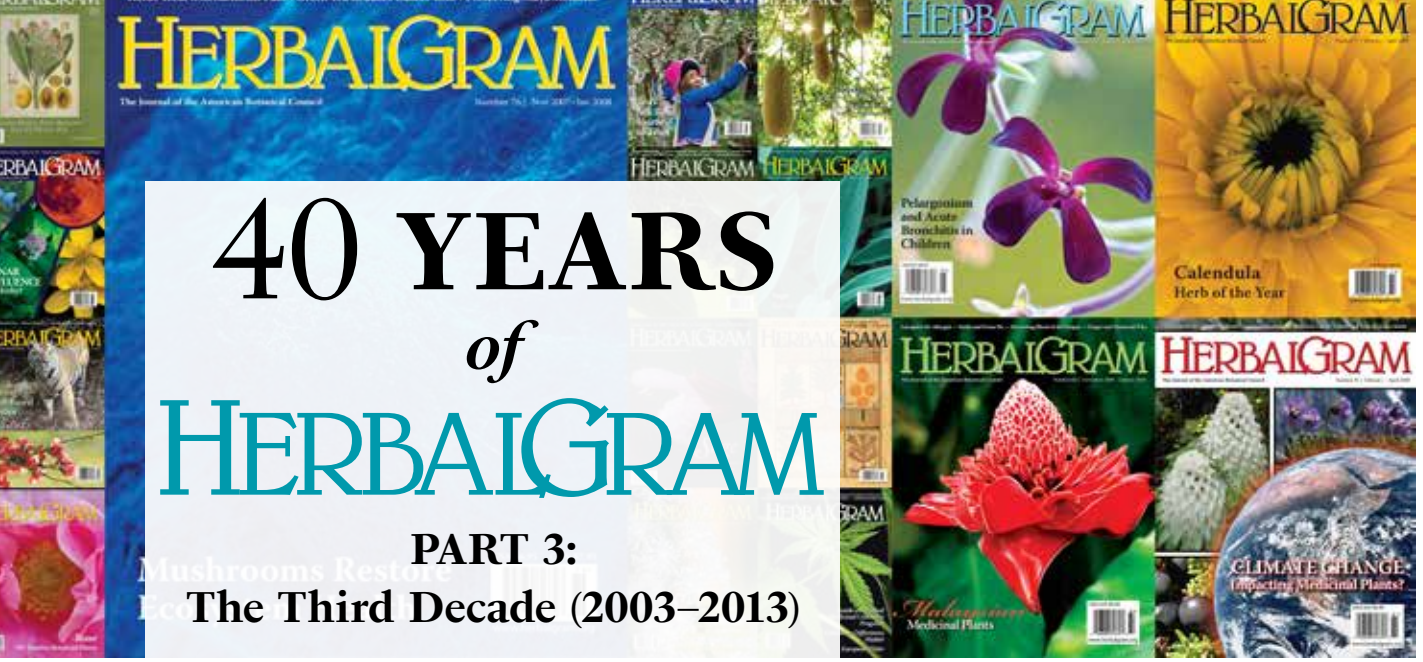


Chromatogram A shows the profile of 30% aqueous ethanol extract of authentic lady's mantle (*Alchemilla vulgaris*, Rosaceae) leaf (green) versus a commercial 30% aqueous ethanol extract of lady's mantle leaf with a specified DER of 5:1 (red). The quantitative data reveal that the commercial extract is approximately 80-fold more diluted than the specification (5:1). The calculated DER_{total} is approximately 0.06:1.

The UHPLC-DAD chromatogram B shows the profile of water extract of reference of tick trefoil (*Grona adscendens*, Fabaceae) (green) versus a commercial dried water extract with a specified DER of 2:1 (red). Quantitative analysis reveals the commercial extract is approximately 60% more concentrated than the specification; hence the DER_{total} is approximately 3.2:1. According to the result, this commercial dried extract is compliant with the specified DER.

9. Brusač E, Jeličić ML, Nigović B, Amidžić Klarić D, Mornar A. Determination of curcuminoids, piperine, boswellic acids and andrographolides in food and dietary supplements by HPLC. *Food Technol Biotechnol.* 2022;60(4):434-448.
10. Howell AB. Bioactive compounds in cranberries and their role in prevention of urinary tract infections. *Mol Nutr Food Res.* 2007;51(6):732-737.
11. González de Llano D, Moreno-Arribas MV, Bartolomé B. Cranberry polyphenols and prevention against urinary tract infections: Relevant considerations. *Molecules.* 2020;25(15):3523.
12. Upton R, Brendler T. *American Herbal Pharmacopoeia and Therapeutic Compendium: Cranberry fruit. Vaccinium macrocarpon Aiton revision: Standards of Analysis, Quality Control and Therapeutics.* Scotts Valley, CA: American Herbal Pharmacopoeia; 2016.
13. Gafner S, Borchardt T, Bush M, et al. Tales from the elder: Adulteration issues of elder berry. *HerbalGram.* 2021;130:24-32.
14. Gaspar DP, Lechtenberg M, Hensel A. Quality assessment of bilberry fruits (*Vaccinium myrtillus*) and bilberry-containing dietary supplements. *J Agric Food Chem.* 2021;69(7):2213-2225.
15. §101.36 Nutrition labeling of dietary supplements. *Code of Federal Regulations.* Washington, DC: US Food and Drug Administration; 2023.
16. AHPA guidance policy. Retail labeling of dietary supplements containing soft or powdered botanical extracts. 2000. Available at: www.ahpa.org/Portals/0/PDFs/Policies/Guidance-Policies/AHPA_Retail_Labeling_DietarySupplements_ContainingSoftPowderedBotanicalExtracts.pdf. Accessed April 15, 2024.
17. Monagas M, Brendler T, Brinckmann J, et al. Understanding plant to extract ratios in botanical extracts. *Front Pharmacol.* 2022;13:981978.
18. Committee on Herbal Medicinal Products. Guideline on quality of herbal medicinal products/traditional herbal medicinal products. Amsterdam, the Netherlands: European Medicines Agency; 2022.
19. Lechtenberg M, Hensel A. Determination of glucosinolates in broccoli-based dietary supplements by cyclodextrin-mediated capillary zone electrophoresis. *J Food Comp Anal.* 2019;78:138-149.
20. Fenclova M, Novakova A, Viktorova J, et al. Poor chemical and microbiological quality of the commercial milk thistle-based dietary supplements may account for their reported unsatisfactory and non-reproducible clinical outcomes. *Sci Rep.* 2019;9(1):11118.

Bilberry *Vaccinium myrtillus*
Photo ©2024 Steven Foster Group



40 YEARS *of* HERBALGRAM

PART 3: The Third Decade (2003–2013)

By ABC Staff

***Editor's note**:* HerbalGram *celebrated its 40th year of publication in summer 2023. As part of the American Botanical Council's (ABC's) yearlong commemoration of this milestone,* HerbalGram *is including a series of timelines of each of the magazine's first four decades in print. This issue's timeline explores the third decade of* HerbalGram *— from 2003 to 2013 — and highlights notable articles and other developments. The ABC editorial staff hopes the "40 Years of* HerbalGram*" series provides a glimpse into the evolution of ABC's flagship publication and the role it has played and continues to play in the development of ABC and the wider herbal community.*

#59 HerbalGram (Summer 2003)

Article Highlights

"Industry Increasingly Nervous about Drug Orientation of FDA's [US Food and Drug Administration's] Proposed GMPs for Dietary Supplements"

Mark Blumenthal describes industry hesitation about proposed good manufacturing practices (GMPs) and notes that the high costs of implementation threaten the economic viability of smaller herb companies.

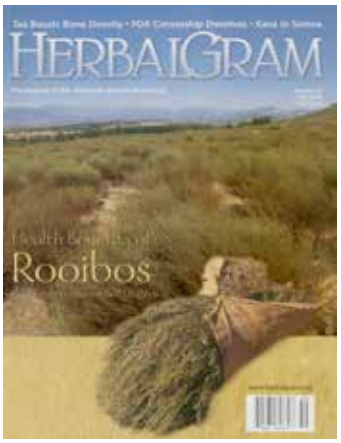
"Using Cultural Items for Science Is No Longer Acceptable: Objections to 'The Patterson Bundle'"

In a guest commentary, Cindy Bloom discusses why collections of Indigenous people's spiritual objects for intellectual pursuits are unacceptable.

"Rooibos Tea: Research into Antioxidant and Antimutagenic Properties"

Laurie Erickson, MS, reviews research on antioxidant and antimutagenic activities of South Africa's rooibos (*Aspalathus linearis*, Fabaceae) tea.

"The Slow Demise of FDA Censorship" by Jonathan W. Emord



Issue 59

#60 HerbalGram (Fall 2003)

Article Highlights

"A Rational Perspective on Adverse Events Reports on Herbs"

Mark Blumenthal and pharmacovigilance expert Richard Kingston, PharmD, review adverse event reporting of herb products, particularly *Ephedra sinica* (Ephedraceae), and how safety data can be manipulated.

"FDA Publishes Rule to Incorporate AHPA's *Herbs of Commerce* in Herb Labeling"

The FDA adopts the *American Herbal Products Association's* [AHPA's] *Herbs of Commerce*, 2nd edition, as the officially recognized source of common names for herbs used in commercial products in the United States, Blumenthal explains.

Issue 60

"Classic Herbal Texts Brought into the Digital Age" by Sarah Jackson

"Canada Issues Final Natural Health Product Regulations" by Joel B. Taller

In a major regulatory shift, Canada creates a new class of drug products, Natural Health Products (NHPs), which include certain herbs, nutritional dietary supplements, and other natural items used for health.

2004

- ABC launches HerbalEGram, the organization's monthly electronic newsletter for members.

#61 HerbalGram (Winter 2004)

Issue 61

Article Highlights

"FDA Announces Ban on Ephedra Supplements" by Mark Blumenthal

The FDA's ban on ephedra-containing dietary supplement products follows similar bans by California, Illinois, and New York.

"Challenges and Opportunities for Herb Farmers: The Case of St. John's Wort [*Hypericum perforatum*, Hypericaceae]" by Marlin Huffman

"Activity and Constituents of Sage Relevant to the Potential Treatment of Symptoms of Alzheimer's Disease"

Peter J. Houghton, PhD, describes new research on the potential cognitive benefits of sage (*Salvia officinalis*, Lamiaceae) extract for Alzheimer's disease.

#62 HerbalGram (Spring 2004)

Issue 62

HerbalGram Happenings

- Michael Finney becomes the managing editor after Karen Robin, who served as *HerbalGram*'s managing editor for issues 50-61.

Article Highlights

"Devil's Club (*Oplopanax horridus*): An Ethnobotanical Review"

Trevor C. Lantz, PhD, Kristina Swerhun, and Nancy Turner, PhD, discuss the medicinal and spiritual importance of this plant in the Araliaceae family among Indigenous peoples of the Pacific Northwest.

"Research to Determine Osha's Economic Potential as a Sustainable Agricultural Crop" by Kim West and Sarah Jackson

One of the first articles to deal with the challenges of the commercialization of oshá (*Ligusticum porteri*, Apiaceae), a traditionally used native American medicinal plant with sustainability-related concerns.

"FTC Issues Reports on Deceptive Weight Loss Advertising" by Rakesh Amin

#63 HerbalGram (Summer 2004)

HerbalGram Happenings

- This issue features multiple articles on botanical reference standards.

Article Highlights

Issue 63

"Quality Control in Herbal Preparations: Using Botanical Reference Standards for Proper Identification" by Trish Flaster and Jim Lassiter

"Development of Standard Reference Materials for the Analysis of Dietary Supplements" by Katherine E. Sharpless, PhD, and colleagues

"New Dietary Ingredients: DSHEA Provides Protection from Potentially Unsafe New Ingredients with No Prior Market History in the US" by Chris Noonan and W. Patrick Noonan

Marking the 10th anniversary of the Dietary Supplement Health and Education Act of 1994 (DSHEA), the authors discuss New Dietary Ingredient (NDI) regulations. In March 2024, nearly 30 years after DSHEA became law, the FDA released the final guidance document for NDIs for the natural products industry.

"Tamanu [*Calophyllum inophyllum*, Calophyllaceae] Oil: A Tropical Topical Remedy" by Chris Kilham

#64 HerbalGram (Fall 2004)

Article Highlights

"Third-Party Evaluation Programs for the Quality of Dietary Supplements"

Marie K. Whybark, MS, RD, explains that dietary supplement manufacturers are increasingly turning to third-party independent certifications for manufacturing quality.

"The Secret Garden: Important Chinese Herbs in American Horticulture: A Photo Essay" by Steven Foster

"The Medicinal Plant Supply Chain"

Herb sourcing and sustainability expert Josef Brinckmann emphasizes the importance of social and environmental responsibility in herbal supply chains.

Issue 64

"The Utilization and Conservation of Medicinal Plants in Mauritius" by Ameenah Gurib-Fakim, PhD

"WHO Approves Artemisinin for Malaria in Africa" by Katherine Purcell

#65 HerbalGram (Winter 2005)

Issue 65

Article Highlights

"Traditional Australian Aboriginal Bush Medicines" by Marcello Pennacchio, PhD

"The Potential Health Benefits of Purple Corn"

Kenneth Jones describes the antioxidant and anti-obesity effects of purple corn (*Zea mays*, Poaceae).

"The Aboca Museum: Displaying the History of Herbal Medicine in Italy and Europe" by Robin DiPasquale, ND

"Sudan War Impacts Availability of Gum Arabic, A Key Ingredient for Many Commercial Products" by Katherine Purcell

Also known as acacia gum, this ingredient is the dried sap of various trees in the Fabaceae family. (For more information on acacia gum, see the Herb Profile in this issue beginning on page 6.)

"WHO Releases 'Guidelines on Good Agricultural and Collection Practices' of Herbs"

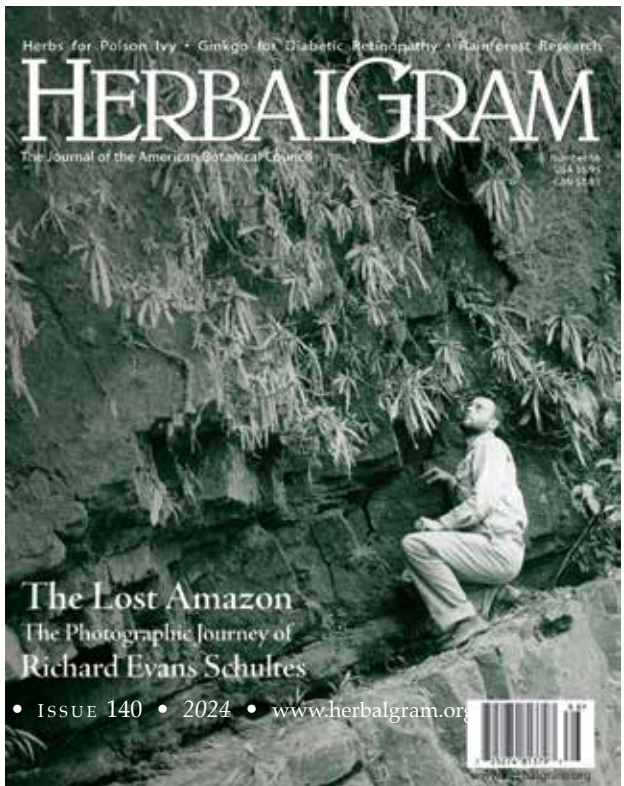
Mathias Schmidt, PhD, and colleagues review the World Health Organization's (WHO's) new guidelines.

#66 HerbalGram (Spring 2005)

Article Highlights

"ABC Files Public Comments to FDA on New Dietary Ingredients"

Issue 66



"A Critical Review of Herbal Remedies for Poison Ivy [*Toxicodendron* spp., Anacardiaceae] Dermatitis" by David S. Senchina

"A Pharmacist's Role in Herbal Counseling" by Sandra Morales

"Americans Confident in Dietary Supplements According to CRN Survey" by Mark Blumenthal and Elena Ward

#67 HerbalGram (Summer 2005)

Article Highlights

"The Neuropsychological Efficacy of Ginkgo Preparations in Healthy and Cognitively Intact Adults"

W. David Crews, Jr., PhD, and colleagues provide one of the first comprehensive systematic reviews of ginkgo (*Ginkgo biloba*, Ginkgoaceae) efficacy based on clinical trials with healthy adults.

Issue 67

"German Government Reconsiders Kava [*Piper methysticum*, Piperaceae]" by Mark Blumenthal

"Survey Finds Women Want More Guidance from Doctors about Alternative Therapies for Menopause Symptoms" by ABC Staff

#68 HerbalGram (Fall 2005)

Issue 68

Article Highlights

"India's Foundation for the Revitalization of Local Health Traditions"

Sarah K. Khan and colleagues explore the history of Ayurvedic medicinal plants and long-term conservation strategies, particularly through a nonprofit organization that empowers women, their families, and their communities to grow herbs in small home gardens for commercial sale.

"Historical Evidence Supports Medicinal Use of Saffron"

Brenda Milot describes ancient Greek frescoes that depicted the medicinal use of saffron (*Crocus sativus*, Iridaceae).

"ABC Launches Virtual Tour of Herb Gardens" by Gayle Engels

"Rooibos Tea Trademark Dispute Settled" by Mark Blumenthal, Wayne Silverman, PhD, and Rakesh Amin

2006

- ABC coordinates and helps launch its first HerbDay event on October 14, 2006.
- ABC holds the first annual American Botanical Celebration at the annual Expo West trade show and conference in Anaheim, California.
- Neil Blomquist joins the ABC Board of Trustees.

Issue 69

#69 HerbalGram (Winter 2006)

Article Highlights

"Herb Industry Self-Regulation Initiative on Common Names for Herbal Ingredients Becomes Federal Law in January" by Mark Blumenthal

"Jimson Weed"

Kofi Busia, PhD, and Fiona Heckels review the history, perceptions, and potential therapeutic benefits of *Datura* species in the Solanaceae family.

"Herbal Medicine in Belarus"

Jolie Lonner, MS, and Ivan Darashkevich, MS, discuss herb use and development in Belarus in the post-Soviet era.

Issue 70

#70 HerbalGram (Spring 2006)

HerbalGram Happenings

- This issue features multiple articles on wild American ginseng (*Panax quinquefolius*, Araliaceae).

Article Highlights

"Government Increases Restrictions on Wild American Ginseng Export" by Mark Blumenthal

"Threats to Wild Ginseng" by James McGraw, PhD

"Preserving Ayurvedic Herbal Formulations by *Vaidyas*"

Chandra Prakash Kala, PhD, an Indian ecologist and professor, discusses traditional healers of the Uttarakhand state in India.

Guest Editorials:

- "The Unaffordable Cost of Not Funding Research in Herbal Medicine" by Edzard Ernst, MD, PhD
- "New Review on Echinacea [*Echinacea* spp., Asteraceae] Reinvigorates Debate on Evidence of Popular Herb's Benefits" by Bruce Barrett, MD, PhD

#71 HerbalGram (Summer 2006)

Article Highlights

"Improving the Quality of Reporting Randomized Controlled Trials Evaluating Herbal Interventions"

Joel J. Gagnier, PhD, and colleagues review the Consolidated Standards of Reporting Trials (CONSORT) guidelines for herbal products in clinical studies.

"Himalayan Snow Lotus [*Saussurea* spp., Asteraceae] Threatened with Extinction" by Nancy Dennis

"Tibetan Herbal Medicine"

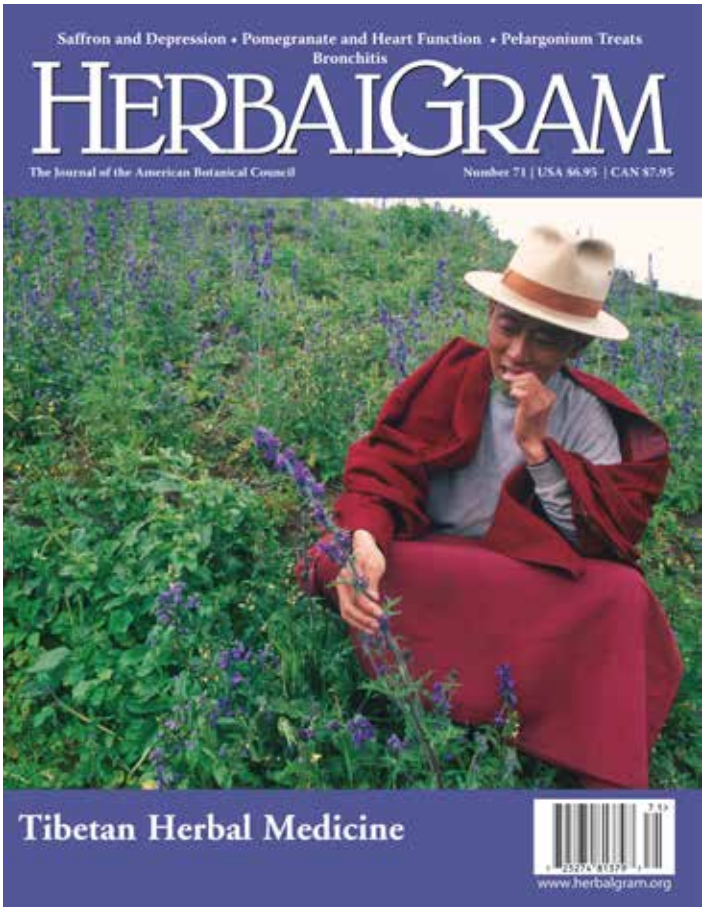
Alessandro Boesi, PhD, and Francesca Cardi, PhD, discuss the classification and use of natural products in Tibetan *materia medica*.

"Supreme Court Ruling Protects Religious Group's Access to Ayahuasca"

Mark Blumenthal and Courtney Cavaliere review a legal decision with implications for the use of ayahuasca, a psychedelic brew made with *Banisteriopsis caapi* (Malpighiaceae) and other plants.

"Australian TGA [Therapeutic Goods Administration] Publishes Liver Warning Policy for Black Cohosh [*Actaea racemosa*, Ranunculaceae]" by Mark Blumenthal

Issue 71



#72 HerbalGram (Fall 2006)

Issue 72

Article Highlights

"Appeals Court Sides with FDA in Ephedra Ban Case" by Courtney Cavaliere and Madeline Hollern

"European Health Agencies Recommend Liver Warnings on Black Cohosh Products" by Mark Blumenthal

"Health Canada Issues Advisory on Black Cohosh" by Courtney Cavaliere

"Medicinal Plants of Montenegro" by Steven Foster

"FDA Denies Medicinal Value of Smoked Marijuana [*Cannabis sativa*, Cannabaceae]" by Mariann Garner-Wizard

#73 HerbalGram (Winter 2007)

Issue 73

Article Highlights

"AHPA Developing Database of 'Old Dietary Ingredients'" by Courtney Cavaliere

"Sho-saiko-to, A Clinically Documented Herbal Preparation for Treating Chronic Liver Disease"

Jipu (Dan) Wen, MD, reviews the evidence for a seven-herb traditional Japanese formula that traditionally is used for liver conditions.

"President Signs New Law to Require Reporting of Serious Adverse Events of Dietary Supplements and OTC Drugs" by Courtney Cavaliere

"Brazilian Women Promote Sustainable Harvesting of Endangered Rosewoods [*Aniba rosaeodora*, Lauraceae]" by Courtney Cavaliere

#74 HerbalGram (Spring 2007)

Issue 74

HerbalGram Happenings

- *HerbalGram* stops including "authority" names with the Latin binomials (genus and species) of herbs.

Article Highlights

"FDA Approves Special Green Tea [*Camellia sinensis*, Theaceae] Extract as a New Topical Drug for Genital Warts" by Mark Blumenthal

The FDA approves the first prescription botanical drug under its regulatory policy for botanical products as well as its New Drug Application process.

"Paradise Nearly Lost"

Kevin Spelman, PhD, and Jill Yesko write about Jamaica's forgotten, high-elevation Cinchona Botanical Gardens.

"Illegal Stripping and Conservation of Slippery Elm [*Ulmus rubra*, Ulmaceae] Trees" by Courtney Cavaliere

ABC continues its coverage of the conservation and sustainability of at-risk medicinal plants.

#75 HerbalGram (Summer 2007)

Article Highlights

"Supreme Court Denies Appeal of Ephedra Ban" by Courtney Cavaliere

"Peruvian Maca and Allegations of Biopiracy"

Josef Brinckmann reports on Peruvian allegations of biopiracy of maca (*Lepidium meyenii*, Brassicaceae) and the ethical and legal implications.

"Wisconsin Ginseng Farmers Fight to Protect Product Reputation" by Mark Blumenthal and Courtney Cavaliere

Dear Reader: "FDA Finally Publishes GMPs for Herbs and Other Dietary Supplements" by Mark Blumenthal

Issue 75

#76 HerbalGram (Fall 2007)

HerbalGram Happenings

- Matt Magruder becomes the art director after Sean Barnes, who served as *HerbalGram*'s art director for issues 51-72.

Article Highlights

"Review of FDA's Final GMPs for Dietary Supplements" by Courtney Cavaliere and Mark Blumenthal

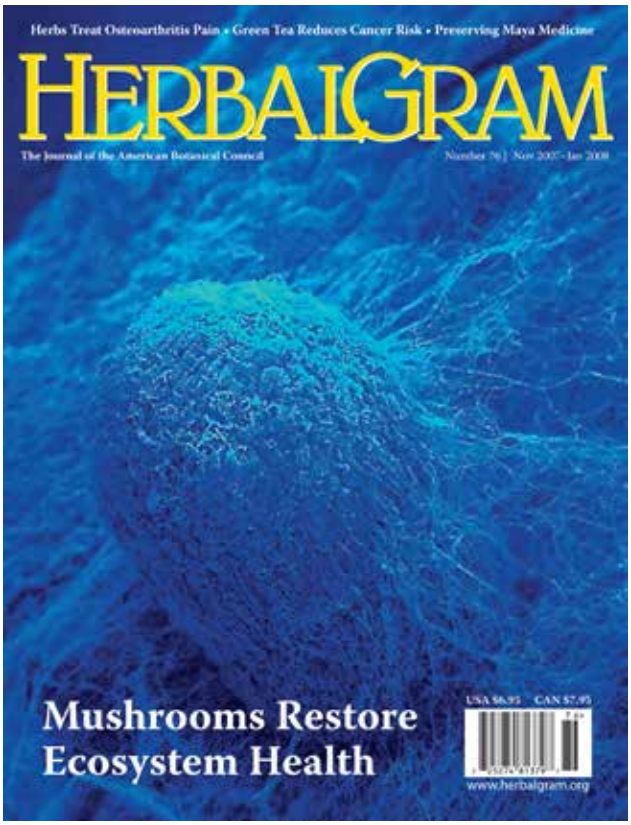
"Naturopathic Profession Growing Rapidly in US and Canada" by Courtney Cavaliere

"Mycelium Running: How Mushrooms Can Help Save the World: A Book Review" by Solomon P. Wasser, PhD

"Itzama: Revival of Traditional Healing by the Q'eqchi' Maya of Southern Belize" by Todd Pesek, MD, and colleagues

2008

- ABC celebrates its 20th anniversary.
- ABC acquires HerbMed and HerbMedPro databases.
- ABC launches the Adopt-an-Herb Program. As of March 2024, 75 organizations have adopted a total of 89 herbs through the botanical research and education program.
- Roberta Lee, MD, and Bernadette Marriott, PhD, join ABC's Board of Trustees.



Issue 76

#77 HerbalGram (Winter 2008)

Article Highlights

Issue 77

"The Botanical Garden of Padua: Historic Botanical Garden Created to Cultivate Medicinal Plants"

Courtney Cavaliere profiles the world's oldest continually operating botanical garden, which dates to 1545.

"Native American Herbal Prescription Sticks: Indigenous 19th Century Pharmacopeias"

Daniel Moerman, PhD, explores an attempt to record medicinal plant prescriptions in symbolic "writing" on wood to preserve this important part of Native American culture in the face of genocide.

"ABC Introduces Product-Specific Monographs" by Mark Blumenthal

"Lloyd Library and Museum to Launch New Initiative: Historical Research Center for the Natural Health Movement" by Anna Heran and Maggie Heran

#78 HerbalGram (Spring 2008)

Article Highlights

Issue 78

"Doctrine of Signatures: Through Two Millennia"

Bradley C. Bennett, PhD, shares evidence of the doctrine's use as a mnemonic tool in preliterate societies.

"Kampo: From Old Wisdom Comes New Knowledge"

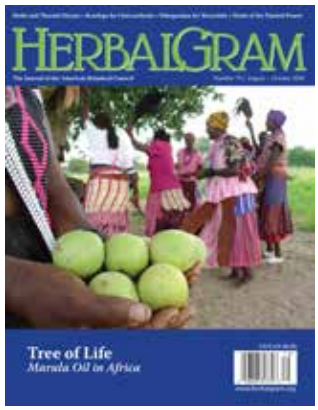
Gregory A. Plotnikoff, Kenji Watanabe, and Fumiko Yashiro discuss Japan's Kampo traditional medicine system and ongoing research on its ancient formulas.

"AHPA Offers Tools for Identifying Adulterated Bilberry [*Vaccinium myrtillus*, Ericaceae] Products" by Courtney Cavaliere

"CRN Survey Indicates Most Physicians and Nurses Use and Recommend Dietary Supplements" by Courtney Cavaliere

Issue 79

#79 HerbalGram (Summer 2008)



Article Highlights

"The Painted Desert: A Southwestern Ethnobotanical Perspective" by Phyllis Hogan and Jessa Faith Fisher

"Tree of Life: The Use of Marula Oil in Southern Africa"

Lucy Welford, PhD, Maria E. Abad Jara, and Nigel Gericke, MD, report on the use of marula (*Sclerocarya birrea*, Anacardiaceae) oil from southern Africa in cosmetic products.

"Herbs for Potential Adjunct Treatment of Thyroid Disease" by Katie Welch, PharmD

A former pharmacy intern at ABC summarizes the results of her research on the applications of botanicals for thyroid conditions.

"Wisdom Natural Brands Begins Marketing SweetLeaf® Stevia as a Sweetener" by Kelly E. Lindner and Courtney Cavaliere

After years of FDA resistance, the company is the first to market stevia (*Stevia rebaudiana*, Asteraceae) as a natural sweetener based on the Generally Recognized as Safe (GRAS) self-determination process.

#80 HerbalGram (Fall 2008)

Article Highlights

"The Pharmacologically Active Constituents of White and Red Ginseng Root"

Issue 80

Dennis Awang, PhD, and Michael Li, MD, describe ginsenoside differences in preparations of American ginseng and Asian ginseng (*Panax ginseng*).

"The Content and Quality of Human Clinical Trials on Herbs and Phytomedicines Published in Russian Medical Journals in the 21st Century" by Lena Bezman, MD

"African Blackwood Conservation Project"

Kelly E. Lindner reports on an organization's efforts to plant African blackwood (*Dalbergia melanoxylon*, Fabaceae) trees, which were considered "near threatened" in Tanzania.

2009

- ABC publishes the 4,000th HerbClip, which is now paperless.
- Margaret M. Wittenberg joins ABC's Board of Trustees.

#81 HerbalGram (Winter 2009)

Article Highlights

"Comparison of Herbal Product Use in the Two Largest Border Communities between the US and Mexico"

Armando González-Stuart, PhD, and José O. Rivera, PharmD, report on the frequent use of medicinal herbs by Hispanics in border communities near El Paso, Texas.

"The Effects of Climate Change on Medicinal and Aromatic Plants"

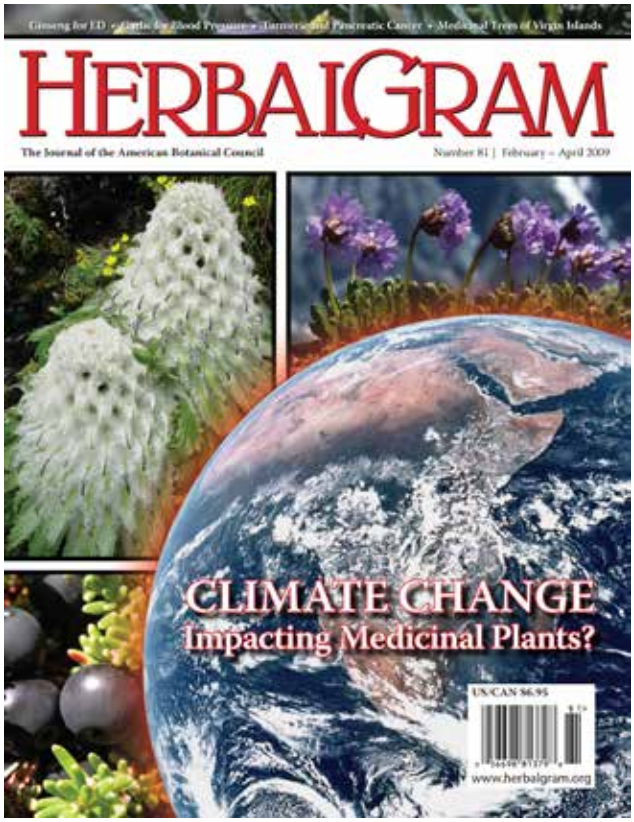
In what may be the first article of its kind, Courtney Cavaliere explores the effects of climate change on medicinal and aromatic plants through in-depth research and more than 20 interviews.

"FDA Accepts Safety of Two Stevia Preparations for Food and Beverage Use" by Courtney Cavaliere

"A Century of Herbal Innovation: Indiana Botanic Gardens Celebrates 100 Years" by Deborah S. Ramstorf

The first in an occasional series of articles on "Herbal Legacy Companies," in which herb businesses that have been operating for more than 100 years are profiled.

Issue 81



Issue 82

#82 HerbalGram (Spring 2009)

HerbalGram Happenings

- Courtney Cavaliere becomes managing editor after Michael Finney, who served as *HerbalGram*'s managing editor for issues 62-81.

Article Highlights

"Managing and Interpreting the Complexities of Botanical Research" by Francis Brinker, ND

"The Expanding Market and Regulatory Challenges of Supplements for Pets in the United States" by Courtney Cavaliere

"Honoring Those Who Came Before Us"

In his Dear Reader column, Mark Blumenthal pays tribute to Nina Etkin, PhD, Madalene Hill, and Michael Moore.

"After Another Canceled Partnership, the Future of Hoodia Remains Unclear"

Lindsay Stafford Mader reports on the uncertain future of *Hoodia gordonii* (Apocynaceae) as a weight-loss supplement.

Issue 83

#83 HerbalGram (Summer 2009)

Article Highlights

"Steps Towards Revival of Graeco-Arabic Medicine in the Middle East: A New Project" by Stephen Fulder, PhD, and Omar Said, MD

"England's Kew Gardens Celebrates 250 Years" by Kelly Saxton Lindner

"*Cordyceps sinensis* Medicinal Fungus"

Francesca Cardi, PhD, and Alessandro Boesi, PhD, review harvesting techniques and traditional and modern uses of cordyceps by Tibetan people.

"WHO Congress Passes Beijing Declaration on Traditional Medicine" by Lindsay Stafford Mader

#84 HerbalGram (Winter 2009)

Article Highlights

"Balancing Nature and Wellness: Malaysian Traditions of 'Ramuan'"

Steven Foster discusses the history, biodiversity, and scientific assimilation of medicinal herbs in Malaysia.

"'Silver Bullet' Drugs vs. Traditional Herbal Remedies: Perspectives on Malaria" by Kevin Spelman, PhD

"Blood of the Dragon"

Kelly Lindner reports on the sustainable development of dragon's blood (*Croton lechleri*, Euphorbiaceae) in the Peruvian Amazon.

"Impact of Current Good Manufacturing Practices for Dietary Supplements on Small Manufacturers" by Lindsay Stafford Mader

"AHPA and CRN Comment on FDA's Proposed Policy on Economically Motivated Adulteration" by Kelly Lindner

Issue 84

Issue 85

2010

- ABC launches "Herbal Insight" segments on the popular public television series "Healing Quest," co-hosted by Olivia Newton-John, Judy Brooks, and Roy Walkenhorst.

#85 HerbalGram (Spring 2010)

Article Highlights

"The Rich History, Current State, and Possible Future of Natural and Traditional Medicine in Cuba"

Lindsay Stafford Mader, who briefly lived in Cuba, explores the history of Cuban traditional medicine and the current state and future direction of plant medicines in the country.

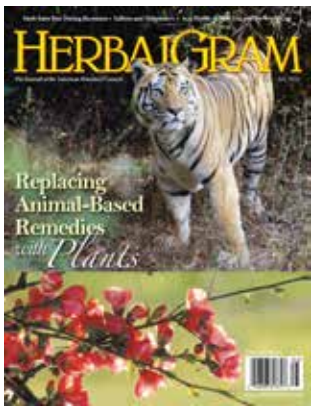
"Lunar Influence: Understanding Chemical Variation and Seasonal Impacts on Botanicals" by Ian Cole and Michael J. Balick, PhD

"'Cinderella' Schisandra"

Anthony Cunningham, PhD, and Josef Brinckmann describe a schisandra (*Schisandra* spp., Schisandraceae) conservation project in China that may also help improve local livelihoods.

"US Government Stimulus Money Funding New Herbal Research on Cancer and in Other Areas" by Kelly Lindner

"The State of Clinical Cannabis Research in the United States" by Lindsay Stafford Mader



Issue 86

#86 HerbalGram (Summer 2010)

Article Highlights

"Medicinal Use of Threatened Animal Species and the Search for Botanical Alternatives" by Courtney Cavaliere

This article breaks new ground in discussing potential plant alternatives to the medicinal uses of animal parts from threatened animals in some Asian systems of traditional medicine.

"Ensuring the Specific Identity and Quality of Herbal Products by the Power of DNA"

Matthew Cimino, PhD, describes the promise of then-emerging technology that uses DNA sequence data for plant identity testing.

"European Union Prepares for Full Enforcement of Traditional Herbal Medicine Regulations" by Lindsay Stafford Mader

"Herbal Apps for the iPhone and iPod Touch" by Kelly Lindner

"Herbal and Traditional Medicine in Post-Earthquake Haiti" by Lindsay Stafford Mader

Issue 87

#87 HerbalGram (Fall 2010)

Article Highlights

"Plants of Semillas Sagradas"

Herbalist Rafael Ocampo and Michael J. Balick, PhD, review the traditional uses and conservation status of selected plants from Semillas Sagradas, the Sacred Seed Sanctuary at Finca Luna Nueva in Costa Rica.

"Hops (*Humulus lupulus* [Cannabaceae]): A Review of Its Historic and Medicinal Uses" by Uwe Koetter, PhD, and Martin Biendl, PhD

"Bars and Restaurants Introduce Herbal Cocktails" by Kelly Lindner

"Efforts to Increase Sustainability of Ayurvedic Plants in India" by Courtney Cavaliere

Issue 72

#88 HerbalGram (Winter 2010)

HerbalGram Happenings

- Ashley Lindstrom becomes managing editor after Courtney Cavaliere, who served as *HerbalGram*'s managing editor for issues 82-87.

Article Highlights

"Using Essential Oils against Drug-Resistant Bacteria: New Treatment Possibilities for a Global Health Priority?" by Lindsay Stafford Mader

"Ethical Trading and Fair Trade Certification"

Josef Brinckmann and Kerry Hughes describe the growing market for botanicals with ecological and social certifications.

"Chinese Herbal Medicine Clears US FDA Phase II Trials"

Lindsay Stafford Mader reports on Compound Danshen Dripping Pill, a cardiotonic TCM patent medicine that entered Phase II clinical trials in the United States.

Issue 88

2011

- ABC announces the formation of the ABC-American Herbal Pharmacopoeia (AHP)-National Center for Natural Products Research (NCNPR) Botanical Adulterants Program (now the Botanical Adulterants Prevention Program [BAPP]).
- Tyler Smith, currently the managing editor of *HerbalGram*, joins the editorial staff.

Issue 89

#89 HerbalGram (Spring 2011)

Article Highlights

"The Safety of Bitter Orange (*Citrus aurantium* [Rutaceae]) and p-Synephrine" by Sidney J. Stohs, PhD, and Harry G. Preuss, MD

"The Genus *Ligusticum* in North America"

Christina Turi and Susan Murch, PhD, review the ethnobotany of *Ligusticum* species, including oshá, in North America.

"Regulating Herbal Products: An Historical Canadian Perspective"

Dennis Awang, PhD, explores the history of herbal product regulation from a Canadian perspective.

"The Plant List: The First Comprehensive Inventory of Most Known Plant Species"

Lindsay Stafford Mader reports on the progress of The Plant List by the Royal Botanic Gardens, Kew, and the Missouri Botanical Garden.

#90 HerbalGram (Summer 2011)

Article Highlights

"UK Herbalists to Be Licensed" by Michael McIntyre and Simon Mills

"Impact of WHO's Upcoming Traditional Medicine Classification" by Lindsay Stafford Mader

Issue 90

"Phytopharm Returns *Hoodia gordonii* Rights to South African R&D Company" by Lindsay Stafford Mader

Phytopharm, a plant-oriented research and development company, returns all development and commercialization rights for hoodia to South Africa's Council for Scientific and Industrial Research.

"Adaptogens: A Review of Their History, Biological Activity, and Clinical Benefits" by Alexander Panossian, PhD, and Hildebert Wagner, PhD

#91 HerbalGram (Fall 2011)

Article Highlights

"The Paris Kitâb al-Diryâq: Book of Theriac"

Ashley Lindstrom highlights a little-known medieval Arabic manuscript, which describes a classic herbal formula.

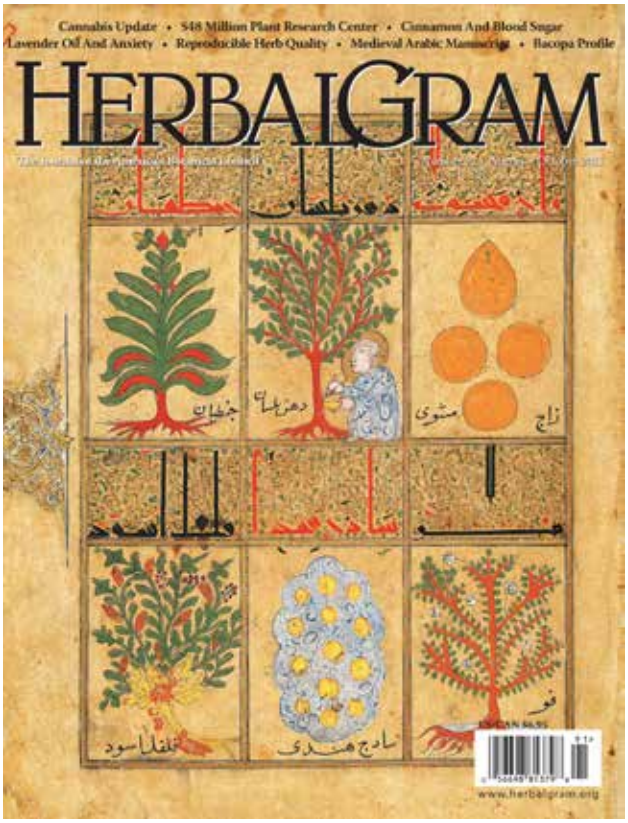
"Reproducible Efficacy and Safety Depend on Reproducible Quality"

Josef Brinckmann explains that reproducible herb quality is essential for safety and efficacy.

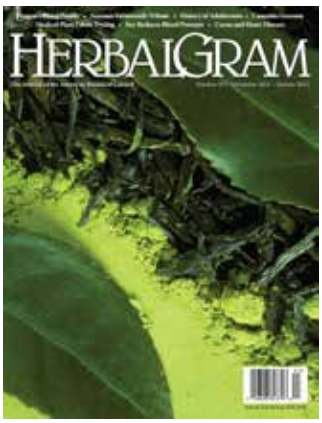
"Update: US Government Institution Acknowledges Medicinal Uses of Cannabis" by Lindsay Stafford Mader

"Botanical Research Institute of Texas Unveils $48 Million Research Center" by Ashley Lindstrom

Issue 91



#92 HerbalGram (Winter 2011)



Issue 92

Article Highlights

"Norman R. Farnsworth: Renowned Medicinal Plant Researcher Dies at 81"

Mark Blumenthal remembers Farnsworth (1930–2011), a founding Trustee of ABC, and explores his impressive impact on international medicinal plant research.

"A Brief History of Adulteration of Herbs, Spices, and Botanical Drugs"

In BAPP's first published article, and in an attempt to provide historical perspective on the forthcoming research and publications of program, Steven Foster presents a 16-page account of 2,000 years of adulteration and fraud since Greco-Roman times.

"Sacred Seeds Nonprofit Establishes Garden Network" by Tyler Smith

2012

- ABC launches "Herbal News & Events" weekly online newsletter.
- ABC publishes 5,000th HerbClip.
- ABC introduces digital "page-flip" and PDF versions of *HerbalGram*.
- Tom Newmark joins ABC's Board of Trustees.

#93 HerbalGram (Spring 2012)

Issue 93

HerbalGram Happenings

- *HerbalGram* updates its layout with new department headers and adjustments to the borders and gutter spacing to create a more spacious layout.

Article Highlights

"The Regulated Dietary Supplement Industry: Myths of an Unregulated Industry Dispelled"

R. William Soller, PhD, Holly J. Bayne, and Christopher Shaheen present a history of US herb regulation and describe

the extensive regulations and safeguards currently in place. This is an update of an article by Soller in *HerbalGram* issue 49 in 2000.

"The Medicinal Plant Names Index"

Lindsay Stafford Mader introduces readers to new database of medicinal plant names from the Royal Botanic Gardens, Kew.

"Herbal Experts Say CSPI [Center for Science in the Public Interest] Petition for St. John's Wort Warning Inaccurate" by Lindsay Stafford Mader

#94 HerbalGram (Summer 2012)

Issue 94

Article Highlights

"Sausage Tree — *Kigelia pinnata* [Bignoniaceae]: An Ethnobotanical and Scientific Review" by Simon Jackson, PhD, and Katie Beckett

"The Adulteration of Commercial 'Grapefruit Seed Extract' with Synthetic Antimicrobial and Disinfectant Compounds"

John H. Cardellina II, PhD, documents the adulteration of commercial grapefruit seed extract (*Citrus* × *paradisi*, Rutaceae).

"Medicinal Chinese Teas"

Tiffany Weir, PhD, and colleagues review the health benefits of medicinal Chinese teas, with an emphasis on fermented teas.

"Procter & Gamble Buys New Chapter, Inc." by Tyler Smith

#95 HerbalGram (Fall 2012)

Article Highlights

"Reading Rumphius"

Susan J. Murch, PhD, highlights an English translation of *The Ambonese Herbal*.

"Eu Yan Sang: 'Caring for Humankind' with Traditional Chinese Medicine for 133 Years"

In this installment of *HerbalGram*'s Herbal Legacy Company series, Lindsay Stafford Mader profiles Singapore's oldest TCM manufacturer.

"New Research Supports Synthetic Origin of DMAA in Supplements"

Tyler Smith explains that the source of the supposedly plant-derived stimulant DMAA was found to be synthetic in some tested supplements.

"Is CBD the Answer? Analyzing the Role of Cannabidiol in Medicinal Cannabis" by Lindsay Stafford Mader

#96 HerbalGram (Winter 2012)

Article Highlights

"Turkish Rose"

K. Hüsnü Can Başer, PhD, and colleagues review the history, ethnobotany, and modern uses of Turkish rose (*Rosa* spp., Rosaceae) and other rose products.

"Federal Action against Medicinal Cannabis Businesses Continues" by Lindsay Stafford Mader

"Dietary Supplements and Botanicals in Sports"

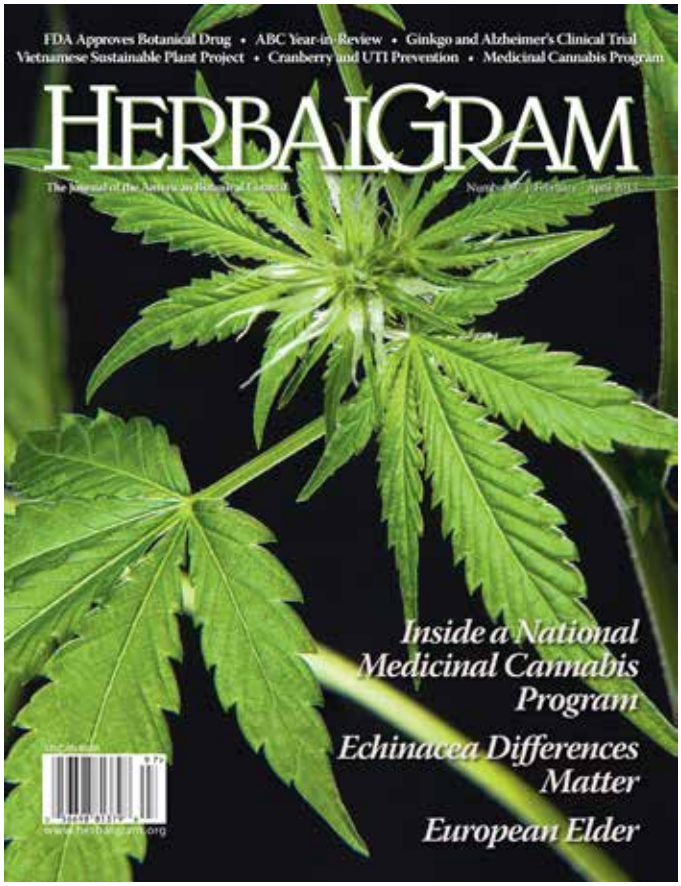
Lindsay Stafford Mader reports on the use and misuse of herbal dietary supplements in sports and the related regulations and doping controversies.

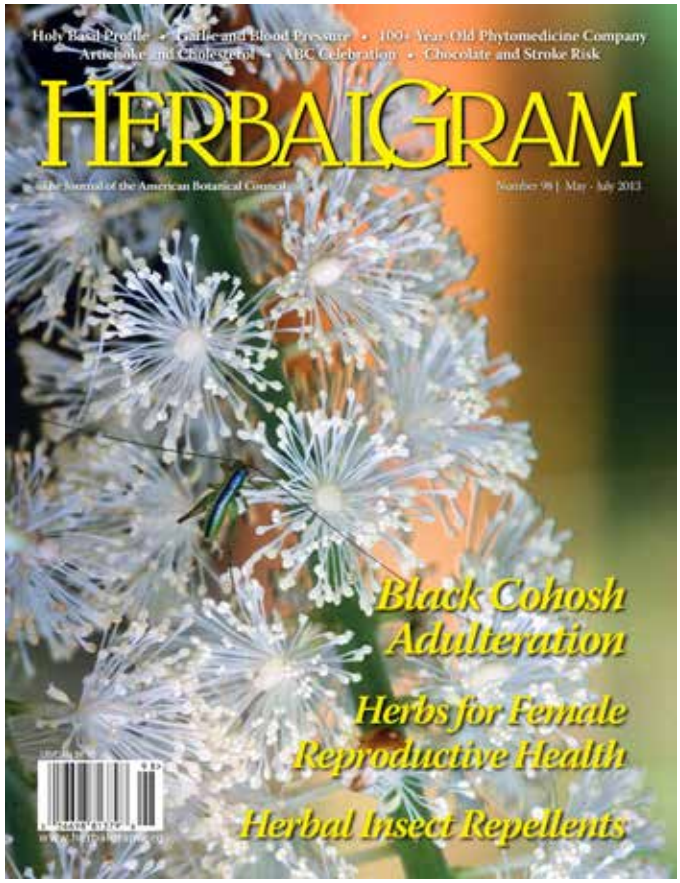
"UK and Irish Governments' Echinacea Warning Criticized" by Lindsay Stafford Mader

Issue 96

Issue 95

Issue 97





Issue 98

2013

- Stefan Gafner, PhD, joins ABC as its first chief science officer. Gafner is also the director of BAPP and *HerbalGram*'s science editor.
- ABC celebrates Accounting Coordinator Margaret Wright's 25 years of service.

#97 HerbalGram (Spring 2013)

HerbalGram Happenings

- The cover of *HerbalGram* depicts cannabis for the first time.

Article Highlights

"Update: FDA Approves Crofelemer as First Oral Botanical Drug" by Lindsay Stafford Mader

The compound from the sap of the Amazonian dragon's blood tree is the first FDA-approved oral botanical drug for the treatment of HIV-related diarrhea.

"The Quiet Giant: Israel's Discreet and Successful Medicinal Cannabis Program" by Lindsay Stafford Mader

"Echinacea Differences Matter" by Francis Brinker, ND

The author compares traditional uses of *Echinacea angustifolia* to those assessed in modern trials of *E. purpurea* extracts.

"Enhancing Quality Control of Botanical Medicine in the 21st Century from the Perspective of Industry"

Yuan-Chun Ma, PhD, and colleagues discuss the use of chemical profiling and DNA barcoding to ensure accurate botanical identity.

#98 HerbalGram (Spring 2013)

Article Highlights

"Exploring the Peripatetic Maze of Black Cohosh Adulteration"

Steven Foster reviews the nomenclature, distribution, chemistry, market status, adulteration, and safety of this native American medicinal plant.

"Dr. Willmar Schwabe Pharmaceuticals: An Herbal Legacy Company"

In another Herbal Legacy Company article, Tyler Smith profiles the leading German phytomedicine manufacturer, which was founded in 1866 and introduced many consumers to ginkgo leaf extract. HG

The final installment of the "40 Years of *HerbalGram*" timeline series — Part 4: The Fourth Decade (2013–2023) — will appear in *HerbalGram* issue 141 (Fall 2024).

HerbalGram Is 40!

We're Announcing ABC's

HERBALGRAM40

A yearlong celebration of *HerbalGram*'s 40th anniversary and ABC's robust future.

Learn more and join us in envisioning and creating the next 40 years of *HerbalGram* and ABC's unique nonprofit mission.

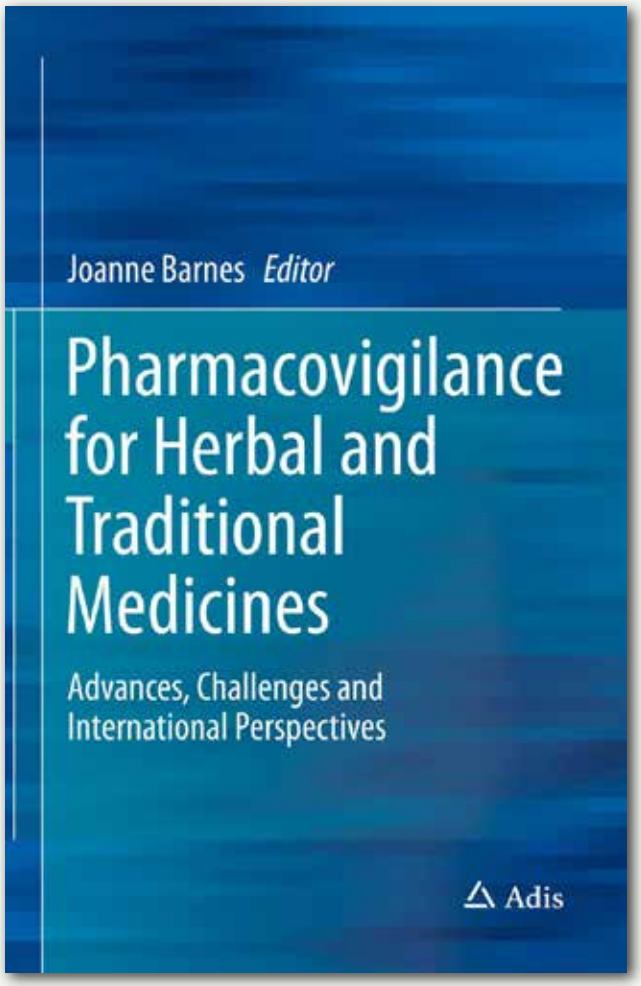
For more information, scan the QR code or visit:

www.herbalgram.org/get-involved/herbalgram-40th-anniversary/

CELEBRATING 40 YEARS OF HERBALGRAM
AMERICAN BOTANICAL COUNCIL

Pharmacovigilance for Herbal and Traditional Medicines: Advances, Challenges and International Perspectives by Joanne Barnes, ed. Cham, Switzerland: Springer Nature Switzerland; 2022. ISBN: 978-3-031-07273-4. Hardcover, 409 pages. $129.99.

By Thomas Brendler, PhD



The increasing worldwide popularity of herbal products both as medicine and supplements creates an urgent need to monitor their side effects and adverse reactions. Pharmacovigilance is the science and process relating to the detection, assessment, understanding, and prevention of adverse events or adverse drug reactions (ADRs), or any other medicine-related problem.[1] The concept of pharmacovigilance, as well as activities and tools associated with it, was originally developed for conventional medicines. Applying the concept to the safety monitoring of herbal medicines and supplements creates unique challenges linked to their nature, use, and regulation.

Joanne Barnes, PhD, the editor and co-author of this volume, is an associate professor of herbal medicines in the School of Pharmacy at the University of Auckland, New Zealand. She has been a trailblazer for the awareness, regulatory incorporation, and application and development of a pharmacovigilance toolkit for herbal products since the early 2000s.[2] In 2006, I had the opportunity to attend the "Pharmacovigilance of Herbal Medicines: Current Status and Future Directions" symposium organized by Barnes in London. At that time, we discussed how to report and classify herbal products and related ADRs and organize and integrate an international signaling system to disseminate correct information about the risks and benefits of herbal products.[3] By 2023, interest in the term pharmacovigilance had increased by 25%, according to Google Trends, driven by Central and South America, Africa, and India.[4] The academic output related to pharmacovigilance is even more impressive: It doubled every five years, from approximately 800 publications for 2003–2007 to approximately 6,300 for 2018–2023.[5]

A follow-up meeting in April 2023, once again organized by Barnes, looked back on two decades' worth of advances but also highlighted the persistent challenges in identifying, assessing, monitoring, and managing safety concerns. So does the volume presented here. As such, it is the first book solely dedicated to the topic of pharmacovigilance for herbal and traditional medicines, providing current knowledge, innovations, and an analysis of international case reports. In her preface, Barnes describes her aspirations as "a desire to draw together current knowledge and practices with respect to pharmacovigilance for herbal medicinal products, as well as to identify, showcase and celebrate advances and innovation in monitoring the safety of this unique and complex category of products and preparations" and for the book to be "informative, interesting and inspiring." I wholeheartedly concur with her that the "vision for this book has been realized, and with such excellent contributions from an outstanding, diverse set of authors."

Indeed, in two parts, the text covers the current status of pharmacovigilance for herbal products and provides international perspectives on how pharmacovigilance of herbal products has become anchored in national regulations of countries as diverse as Canada, China, and Iraq. Chapters 1–15 in Part I: Advances and Challenges in Pharmacovigilance for Herbal Medicines focus on a broad range of topics, from specific botanical toxins like pyrrolizidine alkaloids and the safety of herbal products in pregnancy, methods, and techniques such as causality assessment and coding reports, all the way to the significance of botanical nomenclature and communication with the consumer.

Part II: International Perspectives in Pharmacovigilance for Herbal Medicines, comprising chapters 16–27, introduces means and methods of both global (VigiBase*) and national ADR reporting from Europe, the Middle East, North and South America, India, Asia, and North Africa. Additional perspectives from the more populous and regulatorily advanced nations in other regions of Africa would have been desirable to complete the picture. However, this

* VigiBase is the World Health Organization's global database of Individual Case Safety Reports.

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should not be misconstrued as a deficit; rather, it reflects the ongoing challenge to create a truly global vigilance system, the ultimate value of which lies in everybody's participation.

For the time being, it is safe to say that Barnes' efforts have paid off: This volume at once provides an almost inclusive state-of-affairs perspective as well as the foundation for the next decade of efforts to firmly establish pharmacovigilance of herbal products on a global scale. It is hoped that this publication will further enhance awareness and participation from both industry and the medical community, as these are key stakeholders in providing safe herbal products to the consumer. I highly recommended this book. HG

***Thomas Brendler, PhD**, is the founder of botanical consulting firm PlantaPhile and principal scientist, research and development, at Traditional Medicinals, Inc.*

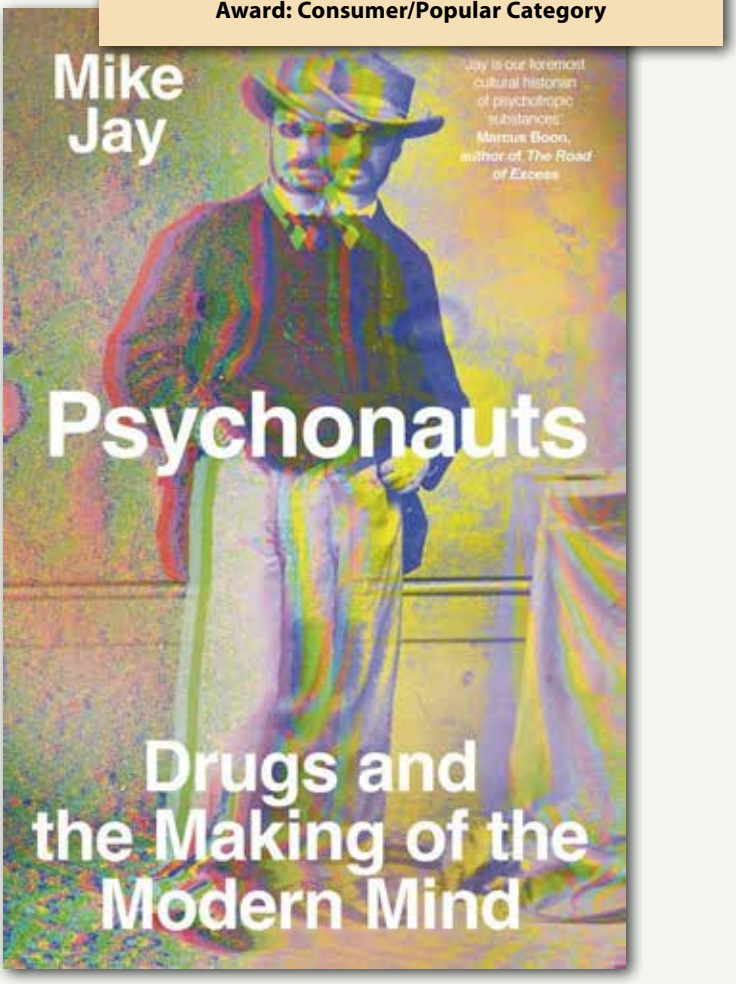
References

1. What is pharmacovigilance? World Health Organization website. Available at: www.who.int/teams/regulation-prequalification/regulation-and-safety/pharmacovigilance. Accessed January 30, 2024.
2. Barnes J. Pharmacovigilance of herbal medicines: A UK perspective. *Drug Saf*. 2003;26(12):829-851. doi: 10.2165/00002018-200326120-00001.
3. Firenzuoli F, Gori L, Menniti-Ippolito F. Symposium on pharmacovigilance of herbal medicines, London, March 28, 2006. *Evid Based Complementary Altern Med*. 2008;5(1):117-118. doi: 10.1093/ecam/nem022.
4. Pharmacovigilance. Google Trends website. Available at: https://trends.google.com/trends/explore?date=all&geo=US&q=pharmacovigilance&hl=en-GB. Accessed January 30, 2024.
5. "Pharmacovigilance" "herbal". Google Scholar website. Available at: https://scholar.google.com/scholar?hl=en&as_sdt=0%2C44&as_ylo=2018&as_yhi=2023&q=%22pharmacovigilance%22+%22herbal%22&btnG=. Accessed January 30, 2024.

Psychonauts: Drugs and the Making of the Modern Mind by Mike Jay. New Haven, CT: Yale University Press; 2023. Hardcover, 384 pages. ISBN: 9780300257946. $32.50.

By Mark Plotkin, PhD, LHD

Recipient of the 2024 ABC James A. Duke Excellence in Botanical Literature Award: Consumer/Popular Category



Mike Jay occupies a special niche in the ever-expanding universe of psychedelic literature: He consistently produces well-written, incisive, and accurate histories and analyses of human interaction with mind-expanding plants, fungi, and even animals. Along the way, he also has penned pieces on the history of asylums, anatomy, and books bound in human skin.

In his newest book, *Psychonauts*, he casts his net still wider, endeavoring to explain how experimentation with psychoactive drugs by a wide and diverse array of Westerners directly contributed to the birth of psychology and helped expand the frontiers of art, medicine, music, and science. In these pages, one encounters Honoré de Balzac, Charles Baudelaire, Samuel Taylor Coleridge, Wade Davis, Humphry Davy, Thomas De Quincey, Benjamin Franklin, Sigmund Freud, Johann Wolfgang von Goethe, Robert Hooke, Alexander von Humboldt, Thomas Huxley, Immanuel Kant, Isaac Newton, Joseph Priestley, Henry Rusby, Joe Rogan, Mike Tyson, and Andrew Weil — all before the second chapter.

The author's central thesis is that self-experimentation with entheogens — outside of the Indigenous societies that first discovered them — did not begin in the 1960s with Timothy Leary, PhD, and the Beatles, but rather had a long

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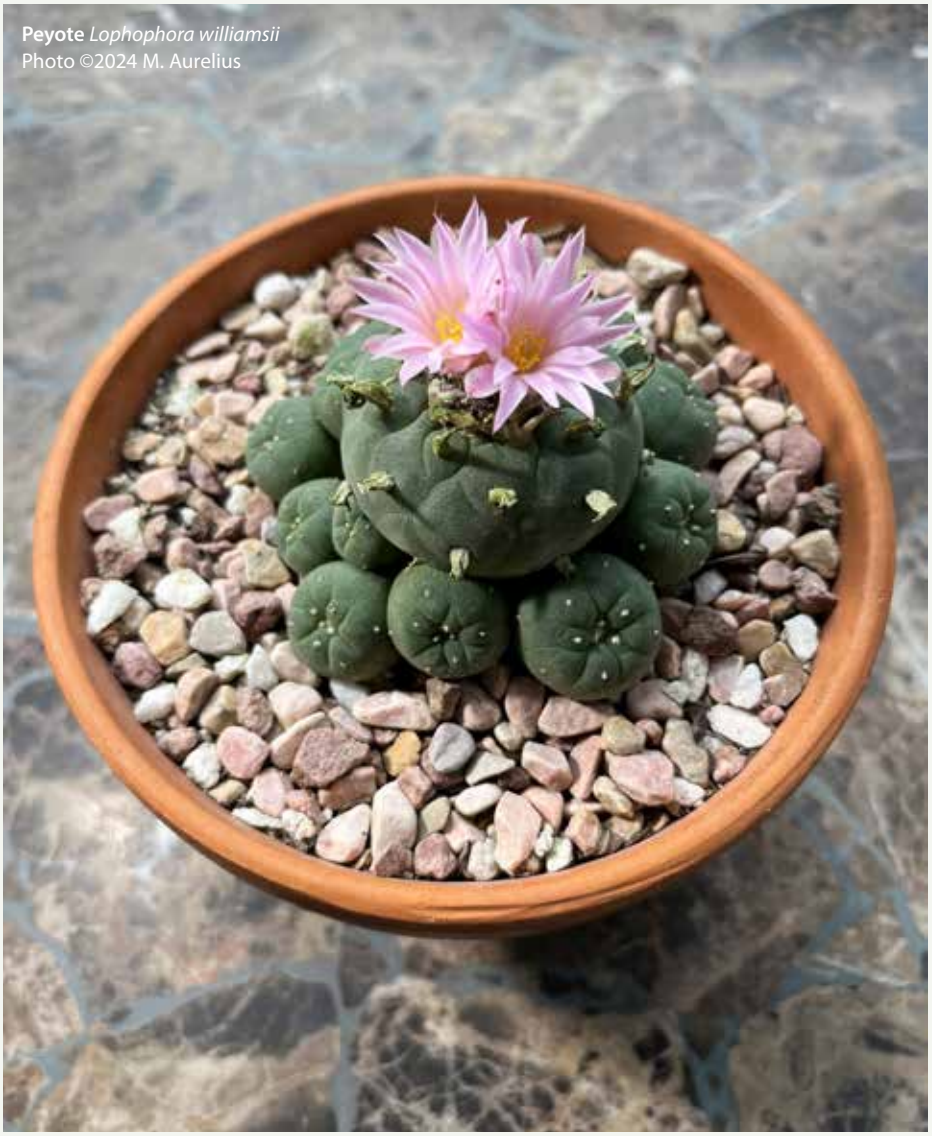
and esteemed tradition in Western circles, particularly in the 19th century. The book provides ample and detailed support for this conclusion.

Jay covers well-trodden ground when writing about Sigmund Freud and cocaine. Freud was addicted to two mind-altering plant products from the New World: cocaine (from the coca [*Erythroxylum* spp., Erythroxylaceae] plant) and nicotine (from tobacco [*Nicotiana tabacum*, Solanaceae]). He began experimenting with cocaine in his early 30s and made the classic error of over-promoting a plant's therapeutic properties. Freud recognized its utility not only as an analgesic and a stimulant, but also for a myriad of mental and physical problems. And he went further, as Jay explains on page 65: "… as part of [Freud's] case that [cocaine] was a remedy for nervous weakness and depression, he relayed the claim with which Parke-Davis had originally launched the drug in the USA that it was 'an antidote to the opium habit', removing the cravings and pains of withdrawal."

Freud soon was disabused of this last notion. His colleague Ernst von Fleischl-Marxow suffered chronic pain resulting from a botched amputation of his thumb, and the resulting nerve damage and chronic pain led to morphine addiction. Freud treated von Fleischl-Marxow with cocaine, which initially reduced and then eliminated his morphine addiction. However, the end result was the worst of both worlds: The cravings for opiates returned and von Fleischl-Marxow died in agony at age 45 in 1891, addicted to both cocaine and morphine.

(While Freud's dalliance with cocaine is detailed extensively in the book, it was his other addiction that proved fatal. A lifelong cigar smoker, he died of cancer of the jaw in 1939.)

Perhaps the second best-known scientist who appears in *Psychonauts* is William James, widely regarded as the "father of American psychology." The wealthy and erudite James, brother of the novelist Henry, was a pillar of the Boston establishment but had a lesser-known wild side. Just a week before the end of the American Civil War in April 1865, medical student James joined his college mentor Louis Agassiz on a natural history collecting expedition in Brazil. There, the aristocratic James spent almost a year in the Amazon rainforest working shoulder to shoulder with local peasants and Indigenous peoples, certainly a mind-expanding experience in and of itself.



Peyote *Lophophora williamsii*
Photo ©2024 M. Aurelius

James' experiences outside the mainstream did not begin and end in the tropical rainforest. Encouraged by the renowned neurologist Silas Weir Mitchell, James experimented with peyote (*Lophophora williamsii*, Cactaceae), which he did not like. As Jay recounts, however, James was enraptured by nitrous oxide, going so far as to say that until he inhaled nitrous, he didn't really understand Hegel. (Disclosure: This reviewer inhaled heroic quantities of nitrous as a college student, yet he still does not understand Hegel.)

The least known and most fascinating character in psychedelic history brought to life in Jay's book

Cannabis *Cannabis sativa*
Photo ©2024 Matthew Magruder

is Paschal Beverly Randolph. Born and raised in the notorious Five Points slum of Manhattan in 1825, this self-educated Afro-American — remotely related to both Thomas Jefferson and John Marshall — was a lecturer, physician, trance medium, and writer. He was one of the first Black novelists, played a leading role in recruiting African soldiers for the Union Army during the Civil War, and upon the war's end moved to New Orleans to educate Freedmen.

Abandoned by his father and left destitute as a small child by his mother when she perished during a cholera epidemic, Randolph went to sea as a cabin boy where, like the extraordinary ethnobotanist and British spy Edward Bancroft a century before him, he learned enough medicine to eventually become a physician. Before that, however, he returned from his oceanic travels and settled in New England where he worked as both a barber and a dyer. Embedding himself in the spiritualist community of the northeast, Randolph began penning works on birth control, health, magic, sex, and spiritualism. He also became a prodigious promoter and consumer of hashish, an oleoresin made from cannabis (*Cannabis sativa*, Cannabaceae).

Jay introduces him thusly on page 201: "The hashish vogue of mid-century Paris diffused across the globe in surprising ways. It would have been hard to predict, for example, that by the 1860s the largest importer of hashish to the United States would be a Black Rosicrucian sex magician."

While Randolph employed hashish for better understanding of himself and as a treatment for his patients, it also inspired him to pen dazzling descriptions of its power and potential: "[It has enabled us] to pass through eternal doors, forever closed to the embodied man save by this celestial key, and passing through them, in holy calm, to explore the ineffable and serene mysteries of the human soul, and attain unto a conviction of immortality" (page 205).

Randolph was not the only figure celebrating the power and mystique of hashish. Intrigued by reports of this substance brought to France by soldiers in Napoleon's army returning from Egypt, leading intellectuals formed the "Club des Hashischins," who met regularly in the Hotel Pimodan on the Île Saint-Louis to consume *dawamesc*, a paste of hash, honey, and pistachios (*Pistacia vera*, Anacardiaceae). Participants included Charles Baudelaire, Honoré de Balzac, Alexandre Dumas, and Arthur Rimbaud, an all-star team of French poets and writers. It was their belief that hashish could inspire creativity while also enhancing their comprehension of the human psyche.

A major contention of Jay's book, that entheogenic substances deeply impacted the minds and creativity of a number of great artists, is exemplified in overlooked passages in two of the 19th century's greatest novels: when the adventurer Epinay visits the Count of Monte Cristo, he is fed a sweet green paste (presumably the aforementioned dawamesc), and when Dr. Jekyll takes an intoxicating white powder (presumably cocaine) before turning into Mr. Hyde.

Another theme threading through *Psychonauts* is the role of self-experimentation. When the 20-year-old chemist Humphry Davy created a novel gas in the laboratory, he inhaled it and experienced "a highly pleasurable thrilling in the chest and extremities." A colleague notes that Davy "leapt violently around the laboratory, shouting for joy" (page 40). Davy christened this compound "laughing gas."

The role of serendipity in scientific discovery is not overlooked. Nitrous oxide consumption became something of a parlor trick. It featured in traveling medicine shows as

something to be … well, laughed at. A "medical" lecturer named Gardner Quincy Colton would allow audience members to come onstage and inhale the nitrous, claiming that it would "reveal the true character of anyone who inhaled it" (page 115). At a performance in Hartford, Connecticut, in 1844, a young druggist inhaled the proffered gas, fell, and cut himself but exhibited no pain. A dentist in the audience named Horace Wells decided to employ the gas on his patients and in so doing launched the age of anesthesia, one of the greatest medical discoveries and advances of all time.

In one of the book's more memorable sentences, using phrasing that could be applied to many of the other drugs in the book, Jay writes: "Nitrous oxide, for Davy and his circle, collapsed the distinction between the intellect and the passions: it stimulated both, with equal intensity" (page 41).

To place the drug consumption in context, it is important to mention the breadth of interest and intellectual curiosity of the thought leaders of the time. Unlike the career silos that characterize modern science, in which a biologist can spend her career focusing on a single species of fruit fly or lizard, scholars could be polymaths whose interests and contributions could be much more wide-ranging. In addition to his famous experiments with electricity, Benjamin Franklin helped invent bifocals, studied ocean currents and weather patterns, and was a world-class diplomat and statesman. Englishman Christopher Wren was not only the architect of St. Paul's Cathedral, but also an astronomer, a physicist, and a cofounder of the Royal Society, one of Britain's most prestigious scientific organizations.

Also featured in *Psychonauts* is Robert Hooke. Hooke was an astronomer, biologist, physicist, microscopist, and urban planner. He is best remembered today as the fellow who, when looking at cork under a microscope, "discovered" the cell. More to our point, he was quite the fan of "Indian Bengue" (cannabis), reporting in 1689 that it made him "very merry … and exceeding[ly] hungry" — likely the first documented scientific account of the munchies (page 37).

One of Humphry Davy's lab assistants went on to achieve greater renown, but not in the field of science. Samuel Taylor Coleridge, despite his early efforts pursuing a career as a scientist, attained fame as a poet, philosopher, and theologian and is widely considered one of the most influential figures in English literature. He was also addicted to opium, which he took as treatment for a variety of physical ailments and — in the words of Jay — to find "a novel and introspective language to capture feelings and states of mind never previously described" (page 42). So prodigious was his consumption of opium that one reviewer described him as the "Keith Richards of Romanticism."[1]

(Coleridge penned two stanzas of "Kubla Khan," one of the most famous poems ever written, after coming out of an opium reverie. However, he paused to answer the door, and upon returning to his desk had forgotten the rest of his dream, such that the conclusion was never written. This incident reflects how these entheogens can both inspire and distract.)

Another friend of Davy's who had participated in some of the nitrous oxide experiments became Coleridge's secretary and, subsequently, a man of letters in his own right: Thomas De Quincey. A writer, essayist, and literary critic, he was also an opium addict. In fact, his best-known work, *Confessions of an English Opium Eater* (1821), is one of the most insightful and important books on addiction ever written.

Jay explains why De Quincy's work lives on: "His originality, and the reason for his tremendous influence over the following decades, was in the way he used the drug as a device for exploring the hidden recesses of his mind…. De Quincey dredged up from these hidden depths not merely details that had been beyond his conscious recall, but entire worlds whose existence the rational intelligence never suspected" (page 49).

In passages like these, Jay proves himself a peer of writers like De Quincey in conjuring lost times and mysteries of the mind and the cosmos.

In conclusion, I have two minor quibbles. Mike Jay's *High Society: The Central Role of Mind-Altering Drugs in History, Science, and Culture* (Park Street Press, 2010) was the most strikingly illustrated volume on entheogens since Schultes, Hofmann, and Rätsch's classic *Plants of the Gods: Their Sacred, Healing, and Hallucinogenic Powers* (Healing Arts Press, 2001), yet *Psychonauts* provides only black-and-white illustrations. For a $32 book detailing visions of "living arabesques ... an orgy of vision … thick glorious fields of jewels … flower-like shapes … [turning] into gorgeous butterfly forms or endless folds of glistening, iridescent, fibrous wings" (in the words of Havelock Ellis on page 225), these dull illustrations represent a missed opportunity. In addition, the subtitle of the book — *Drugs and the Making of the Modern Mind* — is a bit puzzling. Nowhere does the author detail what the modern mind is, and how it differs from the pre-modern one.

Nonetheless, these criticisms are minor compared to book's marvelous scope and scale. *Psychonauts* is a feast for the heart, soul, and mind — modern or otherwise. HG

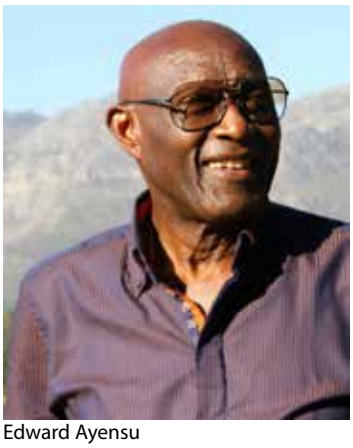
***Mark Plotkin, PhD, LHD**, is an ethnobotanist who serves as president of the Amazon Conservation Team (www.amazonteam.org) and host of the popular podcast "Plants of the Gods: Hallucinogens, Healing Culture and Conservation."*

Reference

1. Green D. 'Psychonauts' review: Playing a 'forbidden game.' *The Wall Street Journal*. April 20, 2023. Available at: www.wsj.com/articles/psychonauts-review-playing-a-forbidden-game-bcfc35e2. Accessed February 20, 2024.

Edward Solomon Ayensu 1935–2023

By Connor Yearsley


Edward Ayensu

Edward Ayensu, PhD, a Ghanaian scientist, longtime botanist and former chair of the Smithsonian Institution's Department of Botany, prolific author, photographer, histologist (one who studies microscopic anatomy of cells and tissues), conservationist, and economist, died in Accra, Ghana, on April 22, 2023, at age 87. He made significant contributions to the fields of botany, photography, environmental science, biodiversity conservation, sustainability, and more.[1,2]

He authored, co-authored, or edited more than 20 books, including *Medicinal Plants of West Africa* (Reference Publications, 1978), *Medicinal Plants of the West Indies* (Reference Publications, 1981), and *Medicinal Plants of China* (Reference Publications, 1985).[3] His many scientific articles cover diverse topics and have been cited more than 5,900 times, according to Google Scholar.

Ayensu traveled extensively around the world for field research in biological sciences and for workshops, meetings, and conferences on the environment and other topics, and as a consultant on science and technology for development, especially in agro-industries, energy and mining in developing countries, and promotion of private sector initiatives in Africa.[3]

His interests included tropical biology and ecology, economic botany and ethnobotany, comparative anatomy and phylogeny (evolutionary history) of flowering plants (including yams [Dioscoreaceae]), behavior of fruit-eating bats, nature photography, science administration, biomedical research on medicinal plants, threatened plant and animal species, environmental assessments for large infrastructural works, development of biomass plantations for bioenergy and low-carbon growth plans, and retroviruses, especially HIV.[3]

Ayensu was born on August 28, 1935, in Ghana in western Africa. His mother, Grace Ayensu (d. 1975), was a member of parliament in Ghana and a leader of Ghanaian women's organizations. He attended the Methodist School in Sekondi, Ghana, and the Achimota Secondary School in Accra, Ghana, and came to the United States as a government scholar.[3]

Ayensu received a bachelor's degree in liberal arts from Miami University in Oxford, Ohio, in 1961, a master's degree in biological sciences from The George Washington University in Washington, DC, in 1963, and a PhD in botany from the University of London in 1966. He joined the Smithsonian Institution as an associate curator of botany in 1966 and was the chair of the Smithsonian's Department of Botany from 1970 to 1976.[3]

In 1973, an exhibit at the Hunt Institute for Botanical Documentation at Carnegie Mellon University in Pittsburgh, Pennsylvania, featured Ayensu's photography, along with artwork of botanical illustrator Frederick A. Walpole (1861–1904). "The Ayensu photos … are dazzling and exotic," according to a 1973 *Pittsburgh Post-Gazette* art critique of the exhibit.[4] "Dr. Ayensu, an authority on tropical biology, has a good eye for interesting subjects and color. There are many orchids, mostly curious botanicals. The photographer is particularly successful with various red subjects — cattleyas, pentas, bougainvillea."

As chair of the Smithsonian's Department of Botany, Ayensu oversaw the preparation of the 1975 *Report on Endangered and Threatened Plant Species of the United States: Presented to the Congress of the United States of America by the Secretary, Smithsonian Institution*. This list, which the US Endangered Species Act of 1973 directed the Smithsonian to prepare, included about 10% of the flora of the continental United States, or 2,099 species, with 100 of those species recently extinct or possibly extinct, 761 species endangered, and 1,238 species threatened.

Ayensu served as secretary general of the International Union of Biological Sciences (IUBS) from 1976 to 1985 and president of the Association for Tropical Biology (now called the Association for Tropical Biology and Conservation) from 1977 to 1979. In 1978, the Smithsonian Office of Biological Conservation was established with Ayensu as the director. The responsibility of this office was to coordinate the various environmental conservation activities already in progress at the Smithsonian and encourage new conservation projects.

Ayensu's book *Endangered and Threatened Plants of the United States* (Smithsonian Institution/World Wildlife Fund, 1978), which he authored with Smithsonian botanist Robert Anthony DeFilipps, PhD (1939–2004), was a revised and expanded version of the report that was assembled for Congress in 1975. This compilation involved input from plant specialists across the country. Some plant species previously considered rare in the 1975 report were found to be abundant and vice versa, and more than a half-dozen species considered extinct were rediscovered.

Ayensu was also highly interested in the orchid family (Orchidaceae). On some explorations in his native Ghana and West African tropical rainforests, he cruised lakes and rivers in a dugout canoe, searching banks for orchids growing on trees or shrubs. Because many people in West Africa believe that large trees hold divine powers, Ayensu sometimes brought a priest so that local people would not believe he was angering the gods. When Ayensu found a tree with an interesting orchid, the priest would pour gin or whiskey on the ground and ask the gods for blessing and protection before the orchid was collected.

Photography was an important complement to his laboratory and field studies. At the Smithsonian, he developed a system to observe and understand the internal structure of orchids and other flowers by photographing thousands of transparently thin stem cross-sections and then sequentially superimposing the images over one another to produce motion pictures that follow the movement of plant fluids along the interior of the stem.

"Most of our concern about endangered wildlife has been directed toward animals," Ayensu was quoted as saying in an undated document titled "Orchids" from the Smithsonian's archives. "Now, for the first time we are beginning to understand that plants are in trouble also. Some plants are dying natural deaths, some will go extinct no matter what we do, but man's activities will certainly trigger the deaths of many vital species unless we take immediate steps. We must not forget that these plants are the life-support system for all organisms on earth, including man. Many plants, like orchids, are too beautiful for their own good."

Ayensu's book *Medicinal Plants of West Africa* includes botanical characteristics, names, and traditional medicinal uses of 187 species of West African plants. He also edited the book *Jungles: An Exploration of the Most Mysterious of All Natural Worlds* (Crown Publications, 1980), which

Friends and Colleagues Remember Edward Ayensu

L. Denzil Phillips, the co-founder and director of the Association for African Medicinal Plants Standards (AAMPS) and co-editor of the first *African Herbal Pharmacopoeia*, wrote (email, June 11, 2023):

> Edward Solomon Ayensu has always been a slightly larger-than-life character for me: A big, tall man with a big brain and a warm heart. We first met in his office at the Council for Scientific and Industrial Research in Accra, when I was beginning work on the first *African Herbal Pharmacopoeia* in 2007 or so. He invited me to his comfortable house in the Accra suburbs…. Over the next perhaps 10 years, Edward and I often met for lunch or tea in London or Accra…. Edward was a very humble man, yet his insights on global politics, economics, and our environment, particularly the role of Africa and Africans in shaping them, were exceptional. His wisdom and gentle advice will be greatly missed by those of us privileged enough to have spent time with him.

Michael J. Balick, PhD, vice president, director and senior philecology curator of the Institute of Economic Botany at the New York Botanical Garden and member of the American Botanical Council's (ABC's) Board of Trustees, wrote (email, June 20, 2023):

> Dr. Ayensu contributed much to our knowledge of conservation, and its urgency, and was a leading figure in ethnobotany, particularly plants used in healing. A prolific writer, he produced seminal works on medicinal plants of West Africa, China, and the West Indies, along with general interest books on the tropical forest that he knew so well. A skilled plant anatomist, he was a specialist in several monocotyledon families (i.e., flowering plants with an embryo that has a single cotyledon, or seed leaf).

Gunter Pauli, a sustainability expert, chairman of the board of Novamont (a compostable and biodegradable bioproducts company), and founder and director of ZERI (Zero Emissions Research and Initiatives), wrote (email, June 22, 2023):

> Edward Ayensu and I worked closely together to transform the mining industry in Ghana between 2005 and 2015. He was a man with a great vision on science and technology and a botanist with insights on medicinal plants like few others. We traveled to Obuasi, Ghana, the center of the mining controlled by AngloGold Ashanti at the time, and we made an extraordinary effort to bring the mining world to terms with artisanal mining and the pollution created. We jointly proposed a different mining — one that provides an engine in the local economy, starting by putting an end to malnutrition and increasing the role of women in the community. While we did not succeed in Obuasi, we successfully set up mushroom (mainly *Pleurotus* spp., Pleurotaceae) farms in 26 villages in northern Ghana between 2015 and 2017, achieving exactly the same objectives: getting food on the table and creating jobs for women. Few people persevered as Eddie did, while enjoying a good glass of wine after a hard day's work.
>
> In 2012, when Eddie learned about the Songhai Centre, a sustainable farming research, teaching, and production center, in Porto-Novo, Benin, he immediately got into the car with all of us and crossed from Ghana through Togo to Benin. He was not worried about visas and lodging. He was convinced that all would run smoothly, so we drove through rivers and crossed borders without a hitch, because when Eddie was on the road, the Administration always obliged.

Dieter Wasshausen, curator emeritus of the Smithsonian's Department of Botany, wrote (email, June 24, 2023):

> Eddie and I undertook field work in Dominica in the Caribbean. We spent a month together

examines many jungle plants and animals and how humans depend on the survival of jungles. The book *The Rhythms of Life* (Crown Publishers, 1982), which Ayensu edited with Philip Whitfield, explores biological clocks and aspects of life including reproduction, growth, feeding, sleeping, and moving.

With botanists Vernon Heywood (1927–2022), Grenville Lucas (1935–2022), and DeFilipps, Ayensu wrote *Our Green and Living World: The Wisdom to Save It* (Smithsonian Institution Press/Cambridge University Press, 1984), which highlights the roles of plants, threats to their survival, and conservation initiatives. With ethnobotanist James A. Duke, PhD (1929–2017), Ayensu also wrote *Medicinal Plants of China*, a two-volume work that features a chapter comparing Chinese and North American medicinal plants.

The book *HIV/AIDS: Knowledge Protects* (J. Strauss Verlag, 2001), which Ayensu wrote with Heinrich Repke, PhD, DSc, includes a foreword by former United Nations Secretary-General Kofi Annan (1938–2018) and presents a comprehensive action plan for containing the spread of HIV/AIDS in developing countries.

After he retired from the Smithsonian in 1985, Ayensu's positions included director of the Central Projects Department of the African Development Bank (1989–1990); presi-

> making botanical collections on the island. At that time, he was very interested in floral pollination and would spend hours waiting for suitable pollinators to visit showy plants. The photographs he took are still in exhibition in the Department of Botany. During our stay, we established a wonderful rapport, and this was due entirely to Eddie's cool, level-headed demeanor. He made our stay a pure delight. Later, Eddie's interest diverged into habitat and species conservation efforts, which he correctly determined as being vital.

Ameenah Gurib-Fakim, PhD, medicinal plant scientist, former and first female president of Mauritius, co-editor of the *African Herbal Pharmacopoeia*, and ABC Advisory Board member, wrote (email, June 26, 2023):

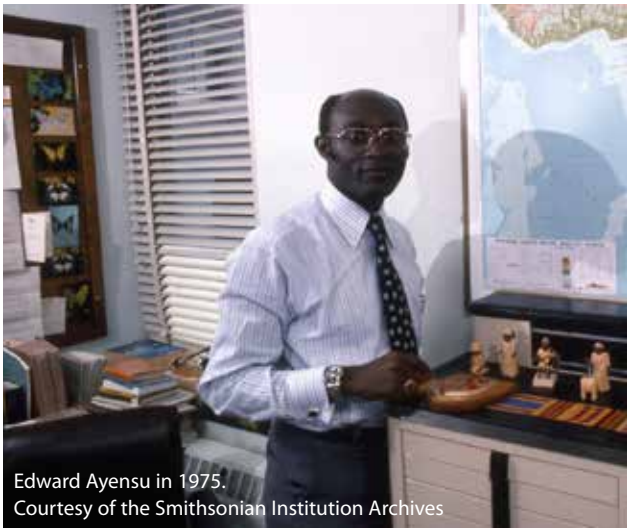
> I bought Eddie's book *Medicinal Plants of China* years before I met him, after he retired from the Smithsonian. He impressed me with his vast knowledge, not just on medicinal plants but also on the history of Ghana. He gifted me with one of his books, *Ashanti Gold* (Marshall Publishing, 1997). His rectitude was such that he was made chairman of the World Bank Inspection Panel…. He has served and represented his country admirably. Africa has lost a giant.

Susan Stern Fennell, whose father William "Bill" L. Stern (1926–2021) was the chair of the Smithsonian's Department of Botany in the 1960s, wrote (email, June 26, 2023):

> I met Eddie Ayensu in my father's office in early 1960. I was five years old. Eddie was a student of my father while my father was a curator of the herbarium at the Smithsonian. Soon, Eddie introduced us to Dinah, and we became family very quickly. They attended Thanksgiving dinner and Passover Seders at our home and we, in turn, were frequently at their home for dinners and fabulous parties: A sharing of culture and food. What could be better?
>
> Eddie was like a father to me in many ways. One of my fondest memories is sitting on his lap and learning to read using a book about Ghana that Dinah brought from the embassy. He was very patient…. I attended Eddie and Dinah's wedding, and they came to my wedding almost exactly 20 years later. Eddie was a perfectionist and instilled how important it is to be the best you can be, no matter what you do. It takes a village to raise a child. How lucky I am that both Eddie and Dinah were part of my village.

Beryl B. Simpson, PhD, professor emerita in the Department of Integrative Biology and director emerita of the Billie L. Turner Plant Resources Center at The University of Texas at Austin and former ABC Advisory Board member, wrote (email, June 28, 2023):

> Eddie was a very decisive person. He decided that the [Smithsonian] National Museum of Natural History's Department of Botany needed to hire women, so, in 1971, he hired me and Dr. Joan Nowicke, a palynologist (i.e., scientist who studies pollen, spores, etc.). He was more forward-looking at that time than the leaders of many other departments/institutions. His appreciation of women's ability may have stemmed in part from his mother, Grace, who was a member of parliament in Ghana. Eddie was a striking figure — always perfectly dressed in a suit and shirt with real gold cufflinks. When he traveled, to make sure his shirts were in perfect condition, he often ordered new ones delivered to his hotel room.
>
> One of his primary botanical interests was the Velloziaceae, a tropical family with species in Africa and South America. This led to a seminal book, *Tropical Forest Ecosystems in Africa and South America: A Comparative Review* (Smithsonian Institution Press, 1973), which he edited with Betty Meggers and Donald Duckworth. He also worked with Dioscoreales [yams]. His more lasting loves, however, were conservation and useful, primarily medicinal, plants, on which he published extensively.


Edward Ayensu in 1975.
Courtesy of the Smithsonian Institution Archives

dent of the Pan-African Union for Science and Technology (beginning in 1990); vice chairman of the Scientific and Technical Advisory Panel of the Global Environment Facility (GEF, 1991–1997); chairman and member of the World Bank Inspection Panel (1998–2003); chairman of the Council for Scientific and Industrial Research (CSIR, 2001–2010); chairman of Haber Mining Ghana, Ltd. (2005–2009); chairman of Sustainable Forestry Management Ghana Limited (2007–2009); chairman of Africa Practice, Ghana (beginning in 2009); vice president and then president of Energy Globe Foundation (beginning in 2012); and chairman of the African Institute for Mathematical Sciences (AIMS) Ghana (beginning in 2012).[3]

In 2003, as chairman of the World Bank Inspection Panel (an independent mechanism for people and communities who believe that they have been, or are likely to be, adversely affected by a World Bank-funded project), Ayensu emphasized the need for the Bank "to be more forthcoming about articulating its role in promoting rights within the countries in which it operates." He also encouraged the Bank to study "the wider ramifications of human rights violations as these relate to the overall success or failure of policy compliance in future Bank-financed projects." To address the panel's findings, the Bank's management developed an action plan that included economic and poverty-reduction issues.[5]

Ayensu was a fellow of the Ghana Academy of Arts and Sciences, the Linnean Society of London, the Washington Academy of Sciences, and The World Academy of Sciences (TWAS); foreign fellow of the Indian National Science Academy; visiting fellow of Wolfson College at the University of Oxford; and founding fellow of the African Academy of Sciences. He also received the US National Museum of Natural History (Smithsonian) Award, Ghana National Book Award (1984), Ghana Science Association Deserving Scientist Award (1985), Outstanding Statesman Award in Ghana during the millennium celebrations, and the 2004 TWAS Medal for Biological Sciences.[3]

Edward Ayensu is predeceased by his wife Dinah and survived by his children Grace Aba Ayensu, Elaine Ayensu Mensah, and Edward S. Ayensu Jr., and grandchildren. HG

References

1. Celebrating the life and contribution of Professor Edward Ayensu. The African Academy of Sciences website. Available at: http://aasciences.africa/news/Celebrating%20the%20life%20and%20contribution%20of%20Professor%20Edward%20Ayensu. Accessed March 6, 2024.
2. Edward S. Ayensu (1935–2023). *The Plant Press*. 2023;26(3):12. Available at: http://nmnh.typepad.com/files/vol26no3.pdf. Accessed March 6, 2024.
3. Curriculum Vitae. The World Academy of Sciences website. Available at: http://twas.org/sites/default/files/cv_2.pdf. Accessed March 6, 2024.
4. Miller D. Dual art exhibit intrigues critic. *Pittsburgh Post-Gazette*. October 8, 1973.
5. Accountability at the World Bank: The Inspection Panel 10 Years On. Inspection Panel website. Available at: www.inspectionpanel.org/sites/default/files/publications/InspectionPanelAt10YearsEnglish.pdf. Accessed March 6, 2024.

Winston Fitzgerald Tinto 1956–2023

By Hannah Bauman

Natural products researcher Winston Tinto, PhD, died on September 28, 2023, in Lisbonville, Christ Church, Barbados. Tinto was a professor of organic chemistry at the University of the West Indies (UWI) at Cave Hill in Barbados and worked to advance the study and understanding of the chemistry of plants native to the Caribbean, create connections between the Caribbean and the rest of the world, and investigate the potential of sugarcane (*Saccharum officinarum*, Poaceae) as a source of green biofuel. He was 67 years old.


Winston Tinto

Tinto was born on March 29, 1956, in the valley of Maracas-St. Joseph in Trinidad and Tobago to Phyllis Marcelin Tinto and Fitzgerald Sonny Charles. Tinto often spoke of his upbringing in a poor household and his experiences watching his friends get arrested, addicted to drugs, and murdered. His determination to escape his circumstances led to an increased focus on his education, and he earned a bachelor's degree in chemistry in 1983 and a doctorate in organic chemistry in 1986 from UWI at St. Augustine. After earning his

bachelor's degree, he studied under Wilfred Chan, PhD, one of the leading organic chemists in the Caribbean.

From 1986 to 1987, Tinto lectured at UWI at St. Augustine. From 1987 to 1990, he held dual positions as a visiting scientist at the University of Toronto and director of the Centre for Natural Products Chemistry at the University of Guyana. In 1991, he returned to UWI at Cave Hill as a lecturer and held this position until 1993, when he left to serve as the deputy director of research at the Institute of Marine Affairs (IMA) in Trinidad and Tobago until 1995. The IMA, formed in conjunction with the Trinidadian government and the United Nations, is a marine and environmental research organization that is mandated to collect, analyze, and release information regarding marine affairs in the Caribbean and formulate and implement specific policies and projects.[1]

In 1996, Tinto rejoined the Department of Biological and Chemical Sciences at UWI at Cave Hill as a lecturer. He was quickly promoted to senior lecturer and, eventually, professor of organic chemistry, which he remained until his retirement in 2021. Tinto served as head of the Department of Biological and Chemical Sciences at UWI at Cave Hill from 1999 to 2005 and he continued to conduct research at the University of Toronto during the summers from 1995 to 2006.

As a professor, Tinto's research with his students focused on isolating novel bioactive compounds from natural products native to the Caribbean, including local flora, corals, and sponges. Beginning in 2011, his research included the study of bacteria capable of degrading sugarcane bagasse (the dry, fibrous material left behind after processing the cane for juice) into biofuel. Tinto encouraged a global mindset in his students and used his connections to give them opportunities to study outside the Caribbean and present their research at international conferences. Tinto and some of his students collaborated in the labs of William Reynolds, PhD, and Stewart McLean, PhD (1931–2023), at the University of Toronto and Russell Kerr, PhD, and Brad Haltli at the University of Prince Edward Island's Kerr Marine Natural Products Laboratory.

Tinto was also a project director at Shire Pharmaceuticals (formerly the Tanaud Research Unit) from 1997 to 2007. In 2008, Tinto advocated for UWI at Cave Hill to acquire a nuclear magnetic resonance (NMR) spectrometer for his lab. This was the first NMR machine in Barbados, though two other UWI campuses, Mona and St. Augustine, already had NMR machines. From 2015 to 2016, he visited the Federal University of Mato Grosso in Cuiabá, Brazil, to assist the school in setting up its own NMR facility to further study sugarcane-derived biofuels.

Tinto held several esteemed positions and received multiple recognitions for his work. In 1990, he served as a research associate for the Natural Sciences and Engineering Research Council of Canada. He was a Fellow of the Royal Society of Chemistry and a member of the American Association for the Advancement of Science, the American Chemical Society, and the American Society of Pharmacognosy. He authored or co-authored more than 80 research papers and was a reviewer for the *Journal of Natural Products* and a member of the editorial advisory board for *Natural Products Communications*. In 2004, he was awarded the UWI's Vice-Chancellor's Award for Excellence and received the international designations of Chartered Scientist (CSci) from the Science Council and Chartered Chemist (CChem) from the Royal Society of Chemistry in acknowledgement of his significant contributions to the sciences.

Joanne Simmons-Boyce, PhD, Joy Roach, PhD, and Jamila Jones, PhD, studied under Tinto as postgraduate students and graduated in 2002, 2005, and 2018, respectively. They wrote (email, March 18, 2024):

> As a person, Prof. Tinto was unpretentious [and] straightforward while being quite humble about his accomplishments. He had a passion for research and was always scouting for students to join his research group. At the height of his career, his group consisted of more than 10 students, and he looked out for us, ensuring that we had demonstratorships, were teaching assistants, or had some other form of financial income to support us through our studies. Whenever opportunities arose, he knew exactly which one of us was best suited for the post and was more than happy to make a recommendation. He was a good judge of character and was quite proud when we excelled. He ensured that his students [gained exposure] by encouraging us to present at regional and international meetings. He remained very hands-on in the lab and was excellent with using instrumentation such as the HPLC [high-performance liquid chromatography] and NMR to acquire and process research data. He was not afraid to dabble in research areas outside of traditional natural products chemistry.

Friends and family remember Tinto as a good cook who enjoyed socializing, a good party, and spending time with his family. As a mentor, Simmons-Boyce described him as "brilliant, scholarly …, not the type of supervisor who coddled his students."

Winston Tinto is survived by his wife, Michelle Tinto; daughters Yulya Tinto and Nyssa Tinto; stepson Vernal Hall; one grandchild; and his sister, Merle Franklin. He is predeceased by his brothers Wendel Tinto and Reynolds Franklin. HG

Reference

1. About. The Institute of Marine Affairs website. Available at: www.ima.gov.tt/#. Accessed April 9, 2024.

Luigi Della Beffa 1928–2022

By Indena Staff


Luigi Della Beffa

Luigi Della Beffa, born in Milan, Italy, on May 5, 1928, was the owner and head of Indena, a global leader in the identification, development, production, and sale of extracts and pure active ingredients, mainly derived from medicinal plants, for use in the pharmaceutical, health food, cosmetics, and veterinary industries. He died at his home in Milan on August 11, 2022, at age 94.

During his long life, he was both an innovative entrepreneur and a pioneer in the global medicinal plant industry. As a father, he engaged his sons in the company by sharing his vision for the business, always future-oriented.

Della Beffa graduated with a degree in law in 1951 from the University of Milan. In the 1950s, he entered the company, which was founded in 1921 by his father, Colonel Biagio Alberto Della Beffa, and Carlo Boccaccio Inverni. Biagio was one of the first executives in the medicinal plant industry to promote a scientific-oriented culture of quality with a focus on research, safety, and sustainability, which are still values of Indena today.

When Luigi Della Beffa joined the company, it was already at the forefront of natural extracts production through the application of rigorous scientific standards and innovative processes. It was under his leadership that, in the immediate aftermath of World War II, when the concept of globalization was still nascent, the company widened its local (northern Italian) Lombard and national Italian identity and adopted a more cosmopolitan outlook. Thanks to his vision, Indena was transformed from a regional business into a global company.

Della Beffa traveled all over the world laying the foundations for international development, which, in a few years, helped turn Europe and the United States into the main markets for the company. His pioneering spirit also led him to explore opportunities in India and China, countries with long traditions of herbal medicine.

"My father, a very curious man, always loved widening his knowledge, and this attitude encouraged him to travel all over the world, both for personal and business interest," said Biagio Della Beffa, son of Luigi and current president of Indena SpA. "At the beginning of the 1950s, he visited many countries in the Far East, including Japan, where, at that time, it was difficult to communicate since only a few people spoke English. But he always faced these challenges with great determination to build business relationships. He also traveled across Africa on the first flights to the continent out of Italy, reaching countries like Madagascar and Zimbabwe. In those countries, he had the opportunity to study the properties of local medicinal plants and design some of the extracts Indena would develop in the following years."

Benedetto Della Beffa, Luigi's son and vice president of IdB Holding SpA, the parent company of Indena, added: "I remember my father not just as a businessman but also as a very passionate person, who, for a large part of his life, cultivated great interests, such as reading and writing, horseback riding, tennis, and bridge. He was an important example for his sons and family, because of his ability to dedicate himself both to work and to great passions. This made him a great man: smart, ironic, visionary, and concrete at the same time."

From the 1970s onward, with Luigi Della Beffa's guidance, Indena continued to modernize the production of botanical extracts and derivatives. At that time, the laboratories at Indena's main extraction plant, located in Settala, near Milan, already had research and quality control laboratories using mass spectrometers and instruments for measuring nuclear magnetic resonance (NMR). Investment in and use of this modern and innovative analytical equipment enabled Indena's research to surge ahead, which led to new opportunities in therapeutic sectors, leading to notable industrial success.

The story of taxanes represents a milestone for Della Beffa and Indena. In the 1990s, the promising anticancer properties of paclitaxel became known. This compound, contained in the bark of the yew tree (*Taxus brevifolia*, Taxaceae), was identified years earlier by the National Cancer Institute in the United States. However, the problem arose of how to produce it without sacrificing the small tree, which could not survive if stripped of its bark. The laboratory technicians of Indena found an alternative solution, working on samples initially taken from a yew tree in Della Beffa's garden. Alongside their scientific curiosity, researchers enjoyed the freedom to act, which led them to discover a sustainable process for producing the compound from the leaves rather than the bark. At that point, Indena entered into agreements with several major pharmaceutical companies and became the main global supplier of paclitaxel, the first widely available, plant-derived chemotherapy drug. This worldwide success enabled Indena to enter the highly specialized field of oncology, which proved fundamental to Indena's continued development.

Thanks to the pioneering approach of Luigi Della Beffa, Indena looks at nature believing that botanical-based solutions exist for many health care concerns people face today. A significant innovation that emerged from his leadership and his philosophy is technology to make the active ingredients contained in plants, which are often difficult to absorb orally, more assimilable. At the turn of the millennium, Indena laboratories developed Phytosome™, a multi-talented technology platform that optimizes the performance of many natural actives in multiple ways, positively affecting the absorption, effectiveness, and target reach of a wide range of natural compounds. Numerous rigorous scientific studies support Phytosome's actions.

"I had the privilege of working with Luigi Della Beffa for more than 20 years, and I'm proud to be inspired by his vision and guidance," said Daniele Giavini, CEO of Indena. "Thanks to his long leadership, his belief in the potential of plants, and his will to continue investing in innovation and research, today, Indena is ready for future development that takes into account a more holistic approach to personal wellbeing, working on the principle of greater prevention and less treatment. Innovation and implementation of the most advanced technologies, research on new products and personalized applications, quality and sustainability: this is Indena's vision today, carried forward every day by the people who lead it and work in it, inspired by the thought and tenacity of Luigi Della Beffa." HG

Cecilia Kaienes Mitchell 1937–2023

By Martha Mathews Libster, PhD, and John Snyder

Cecilia Kaienes Mitchell, a Mohawk Wisdomkeeper, journeyed back to the Spirit World on December 4, 2023, from Tsiionkwanonhso:te on Cornwall Island in Ontario, Canada, at age 86.

She was born in Akwesasne, a Mohawk Nation territory on the New York/Canada border, on September 30, 1937, the daughter of Michael "Tehonikonnratha" and Mary (Thompson) "Wenniseriosta" Mitchell. She was raised in the St. Regis Mohawk Tribe and lived in her home "where the five rivers meet."

Cecilia Mitchell

Cecilia was a medicine woman who taught traditional herbal medicine. She also was an invited speaker at diverse national and international conferences, from biomedical conferences on oncology to traditional medicine conferences such as Rosemary Gladstar's New England Women's Herbal Conference and the International Herb Symposium.

Author Steve Wall wrote a powerful and beautiful tribute to Native women elders titled *Wisdom's Daughters: Conversations with Women Elders of Native America* (HarperCollins, 1993). Cecilia's words and stories are included in this book about matriarchs from Turtle Island (the name some Indigenous people use for North America) who are described in the book as "carriers of life, transmitters of sacred knowledge, the keepers of ancient ways, and the hearts of the nations. Through them the generations pass and the wisdom of the ages [flows]. Highly venerated in their culture as the conduit connecting the worlds of the past with the now, they are revered for giving life, both physically and spiritually, to the world to come." That is the spirit that was embodied as Cecilia Mitchell.

Cecilia loved the land. To her, it was sacred. She said to me (MML) once, "The land is like a mother because she gives us everything, like medicine. Anything we hold dear is sacred to us, like our land because that's where our medicine comes from. You take care of the land, it takes care of you. That's why we call it Mother Earth." She was a steward of the land and the spiritual path and teachings of the Mother.

My (MML's) first meeting with Cecilia was on the phone sometime around 2004. She said, "Do you have red hair?" I answered, "In fact, I do." She said, "We've been waiting for you." And a friendship was born. She was a wise Mother, teacher, and confidant, who was equally knowledgeable about practical life skills and so many sweet things of the spirit. She has given us and countless others opportunities to find our true life path, which she referred to as "being in your own canoe."

Here is just one example: One time, I (MML) was lodging with Cecilia and, after we had a cup of tea together, she read the pattern in the tea leaves left at the bottom of my cup. She said, "A big bear is coming into your life." That afternoon, a large man literally the size of a bear came to Cecilia's house for counsel. She introduced him to me as the Chief of the Oneida people. After their meeting, he taught me some things about his journey and about Native peoples that have informed my work in cultural diplomacy ever since. We have witnessed Cecilia do a lot of her loving Mother work for people of all cultures.

Cecilia lived a life full of sacred ceremony. She loved the longhouse and followed the rhythms of Mother Earth. She loved the corn (*Zea* spp., Poaceae) and picking plant medicines in her "apothecaries" and gathering sweetgrass (*Hierochloe* spp., Poaceae) — "Mother Earth's hair" — to "stay in the nature of things." Cecilia often said, "Oh Creator, that's why I love you!" We send love and thanks to the Creator for the presence of Cecilia with us in the physical plane for 86 years and now in spirit.

Cecilia is survived by her sons, Jim, John, and Joe Snyder; her grandchildren, Brogan, Bram, Chydon, Joe Jr., and Andy; three great grandchildren; her sister, Minnie Garrow; and many nieces and nephews, as well as hundreds of students to whom she has imparted her knowledge of traditional Mohawk language and stories of Native culture, specifically herbal medicine. HG

***Martha Mathews Libster, PhD**, is the founder and executive director of Golden Apple Healing Arts, LLC, and has been honored by Cecilia Mitchell as "Carrier of the Five Arrows of Hiawatha — The Story of the Peacemaker" since 2009.*

***John (Tim) Snyder** of the Mohawk Nation is the son of Cecilia Mitchell and an herbal medicine teacher.*

FROM THE FIELD

Tea (*Camellia sinensis*, Theaceae) harvesters in Hunan province, China.

Photo by Chris Kilham

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