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The Journal of the American Botanical Council

Number 141 Fall 2024

2023 HERB MARKET REPORT

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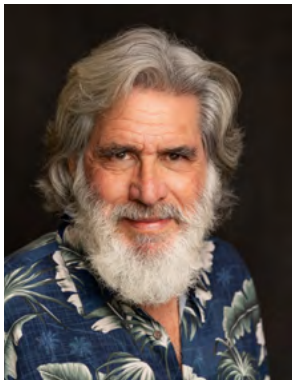


dear *reader*

In this issue, we present our annual *HerbalGram* Herb Market Report for 2023, written by *HerbalGram* Managing Editor Tyler Smith in collaboration with co-authors Carly Lang of SPINS and Erika Craft of *Nutrition Business Journal* (NBJ). Total retail sales of herbal dietary supplements in the United States in 2023 increased by an estimated 4.4% compared to 2022, when sales decreased (by 1.8%) for the first time in nearly 20 years. This extensive 15-page report contains six main tables and explores the growing body of clinical trial data for some of the top-selling herbs in 2023. Each year, the Herb Market Report is one of our most-cited articles. As always, we are grateful to SPINS and NBJ for generously providing the data in this report.

As part of the American Botanical Council's (ABC's) HerbalGram40 Project & Fund, which celebrates *HerbalGram*'s 40-plus-year history, we present the fourth and final installment in our series of timelines of each of the publication's first four decades in print. Through the HerbalGram40 Project & Fund, we are improving ABC for a robust future that addresses many of the varied needs of the burgeoning international medicinal plant community.

Readers will find interest in the ABC Sustainable Herbs Program's (SHP's) Six-Year Impact Report. In November 2018, the then-named Sustainable Herbs Project became a program of ABC under the new name Sustainable Herbs Program. In this report, SHP Founder and Director Ann Armbrecht, PhD, writes about the significant development, growth, and accomplishments of SHP, including the publication of the SHP Sustainability & Regenerative Practices Toolkit Version 2.0, a series of more than 40 webinars with more than 50,000 views, and the SHP Learning Labs and Learning Journeys. SHP has evolved into a highly collaborative program that has helped increase consciousness about the need for sustainable practices in the botanical industry and so much more. SHP has now transitioned to become the independent Sustainable Herbs Initiative (SHI), and ABC will continue to report on and support Ann and SHI in their service to the global herb community.

One of my favorite songs was introduced to me by folk singer and songwriter Kate Wolf, who sang about the "golden rollin' hills of California" in the lilting song "The Redtail Hawk," written by George Schroder. Although California is replete with golden hills of dried grasses in the summer and fall, I would like to think that he was probably acknowledging the beauty of the golden California poppies that blanket many of the state's hillsides, particularly in high desert areas in late spring and early summer when they are in bloom. This issue features an in-depth profile on this traditional native American medicinal plant by authors Marisa Williams, ND, RH (AHG), Erin McKinsey, MS, and Aaron Jenks, PhD, from Traditional Medicinals.

We also honor the lives and accomplishments of three luminaries in the medicinal plant community: pharmacognosy professor John Staba, PhD, Indian botanical extract producer and entrepreneur Muhammed Majeed, PhD, and cannabis and cannabinoid researcher Mary Abood, PhD.

I first met Staba in the late 1970s at the second international Herb Trade Association symposium in Santa Cruz, California. I had the honor of giving a guest lecture to his pharmacognosy class at the University of Minnesota College of Pharmacy, dining and staying at his home on numerous occasions with his wife, Joyce, and building and maintaining a friendship over the years. Staba was soft-spoken and had a wide range of eclectic intellectual interests that went beyond herbs and medicinal plants, including Native American culture and spirituality and other spiritual traditions and world religions. A tip of the hat to our friend Cindy Angerhofer, PhD, one of Staba's former students, for her tribute.

The international herb industry lost a major figure in March 2024 with the passing of Majeed, founder and chairman of the Sami-Sabinsa Group and the so-called "Father of Indian Nutraceuticals." Through his leadership and determination, Majeed helped establish a global market for standardized extracts of Ayurvedic herbs, and he emphasized innovation and standardization throughout the supply chain, or value network. His company also helped expose the sale of synthetic curcuminoids in turmeric extracts. I attended several scientific conferences with him in the 1980s and 1990s, and he was a supporter and member of ABC since then. Our thanks to *HerbalGram* Assistant Editor Connor Yearsley for his tribute to Majeed.

We also acknowledge Abood, a highly respected pharmacologist and professor who made significant contributions to cannabinoid and endocannabinoid pharmacology. She was an important early member of the International Cannabinoid Research Society and is remembered fondly by her many friends and colleagues.

We will feature tributes to author, aromatherapist, and herbalist Jeanne Rose and herbal-oriented dermatologist Alan Dattner, MD, in an upcoming issue. Recently, we also learned of the deaths of biodynamic herb grower Randy Buresh of Oregon's Wild Harvest and natural product industry journalist and advocate James Gormley, who also will be memorialized in future issues.

Mark Blumenthal

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.

ABC Advisory Board

Each issue of *HerbalGram* is peer reviewed by members of the ABC Advisory Board and other qualified experts before publication.

HERBALGRAM
The Journal of the American Botanical Council

40 40 Years of *HerbalGram* — Part 4: The Fourth Decade (2013–2023)

By ABC Staff

As part of the American Botanical Council's (ABC's) yearlong celebration of the 40th anniversary of its flagship publication *HerbalGram*, recent issues have included a series of timelines of each of the magazine's first four decades in print. In this final installment, the *HerbalGram* editorial staff explores the publication's 100th issue (Winter 2013), the beginning of HerbalEGram's "Food as Medicine" series, and *HerbalGram*'s themed issue on botanicals for women's health (issue 121, Spring 2019). The timeline also highlights travelogues from frequent ABC contributor Chris Kilham, coverage of COVID-19-related impacts on the botanical supply chain, and obituaries for notable figures in the organization and medicinal plant community, such as longtime ABC Trustee Fredi Kronenberg, PhD, ABC's first managing editor Barbara "BJ" Johnston, and noted herb expert, author, and photographer Steven Foster.

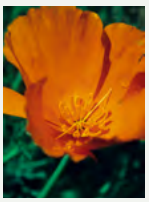
Ginkgo *Ginkgo biloba*
Photo ©2024 Steven Foster

54 US Sales of Herbal Supplements Increase 4.4% in 2023

By Tyler Smith, Carly Lang, and Erika Craft

Retail sales of herbal dietary supplements in the United States totaled an estimated $12.551 billion in 2023, a 4.4% increase from the previous year. After two years of record sales growth in 2020 and 2021 and the first sales decline in almost two decades in 2022, the 4.4% increase in 2023 may be a sign that the market is continuing to normalize after pandemic-related changes in spending. As discussed in this annual Herb Market Report, consumers in 2023 appeared to prioritize herbal supplements marketed for cardiovascular and cognitive health, and sales of cannabidiol (CBD) and ingredients commonly used for immune health continued to decline. The data in this report were generously provided by SPINS, a market research and data technology firm based in Chicago, Illinois, and *Nutrition Business Journal*, a natural products industry publication based in Boulder, Colorado.

departments



On the Cover
California poppy
Eschscholzia californica
Photo ©2024 Steven Foster

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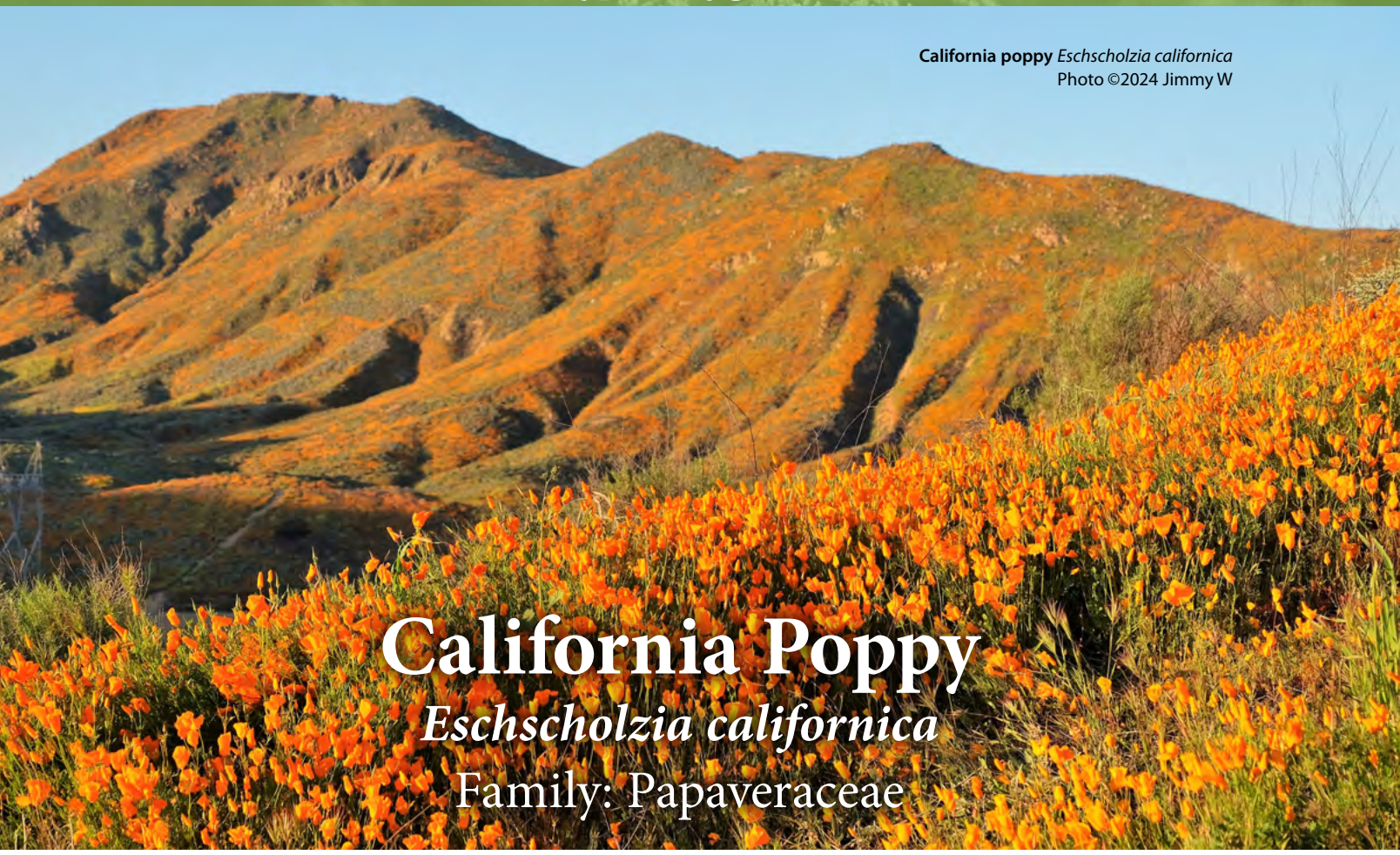

California poppy *Eschscholzia californica*
Photo ©2024 Jimmy W

California Poppy

Eschscholzia californica

Family: Papaveraceae

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

INTRODUCTION

California poppy (*Eschscholzia californica*, Papaveraceae) is a well-known wildflower which grows with seasonal abundance across much of western North America, blanketing hillsides with vivid orange and golden flowers. While it is widely cultivated for its beauty and has become naturalized in temperate climes around the world,[1] it is also an important medicinal species which features prominently in the Indigenous healing traditions of California[2-4] and is the adopted symbol and state flower of the Golden State.[5,6]

California poppy is the standardized common name (SCN) according to the *American Herbal Products Association's Herbs of Commerce*, 3rd edition.[7] Other English common names include California golden poppy and flame flower.[5,8] The large number of Native American names is indicative of the many languages once spoken in California and the importance of California poppy in their lives and cultures. The Tongva people of the San Gabriel Valley area call it *Mekachaa*,[6] and in other languages it is known as *ataushanut* (Luiseño),[5,9,10] *Tes-an-aht* (Serrano),[5,11] *Tesebal* (Cahuilla),[5] *cululuk* (Rumsen Ohlone),[12] *qupe* (Chumash),[4] *ta'-pu* (Nisenan),[13] *hui-con'-il* (Yuki),[10,14] *do-slū-tit'-is-dō* (Yuki),[14] *tso-tă-tă-sit'-chö* (Wailaki),[14] *tă'-sha-lē* (Little Lake Pomo),[14] *shidocho kale* (Pomo),[10], *co ci-lin' ka-li* (Potter Valley Pomo),[15] *sinvanahich* (Karuk),[16] and many others. Spanish names include *calce de oro* ("shoe of gold"),[5] *dedal de oro* ("thimble of gold"),[8] *copa de oro* ("cup of gold"),[5,8] *la amapola* ("the poppy"),[5,12] *dormidera* (referring either to the drowsiness that comes from ingesting the poppy or to the habit of the flowers to close up at night in a sleepy fashion),[5] and *torosa* (deriving either from *toroso*, meaning "robust," or from *antorcha*, referring to their torch- or flame-like color).[4,5]

California poppy is an herbaceous annual or often a short-lived perennial that grows from a taproot. It is low-growing to erect, up to two feet tall, with both basal and cauline foliage that is light gray-green, glabrous, and often glaucous. The leaves are finely divided into many lobes, and the growth habit of the plant is typically mounding, with the flowers rising above on upright, sometimes branching stems. The flowers have four satin-textured, yellow-to-orange petals, which, like a cup, enclose the reproductive structures that are similarly colored and bright. Before the petals open, they are held within a set of fused sepals that is conical. This structure is unique to the genus *Eschscholzia* and is called a calyptra. When the flower opens and

the petals begin to unfurl from within, the calyptra comes free from the flower as a single structure that is somewhat akin in form to a gnome's hat. Each flower grows from a rimmed, receptacular cup, and this rim, called a torus, is the primary feature that allows differentiation between *E. californica* and the rest of the species in the genus, the receptacles of which are torus-free. The flowers close when the sun is not visible, such as during a cloudy day or at night, and open again when the sun reappears. After pollination occurs indiscriminately by wind or insects, a cylindrical seed capsule elongates from the receptacle and grows to a length of 3 to 9 cm. The seed capsule, which contains up to 100 or more seeds, dehisces (bursts open) from the base to disperse the mature seeds.[8,17-19]

California poppy is native to grassy or open areas, foothills, and deserts in the western United States and northwestern Mexico, as far north as Washington state, and east to New Mexico and Texas.[17,19] It is naturalized throughout much of the rest of the United States and into Canada, as well as in Argentina, Australia, Chile, Europe, and South Africa.[19] The species has two accepted subspecific taxa: *E. californica* subsp. *californica* and *E. californica* subsp. *mexicana*. *Eschscholzia californica* subsp. *mexicana* can be differentiated by its smaller torus, unlobed cotyledons, and difference in general habit and distribution (i.e., it is a short-lived, desert annual).[17,18] *Eschscholzia californica* subsp. *californica* is much more widely known and cultivated and, within its natural range, is distributed across a much greater diversity of habitats and ecosystems.[8,18] The genus *Eschscholzia* is monophyletic (descended from a common evolutionary ancestor)[20] and consists of 12 accepted species with a distribution across western North America and northwestern Mexico.[17,19,21]

California poppy's herbal actions historically have been considered soporific (sleep-inducing) and analgesic.[10] Many Indigenous groups throughout California used the plant widely, both internally and externally as food, medicine, and cosmetic.[3,5,14] Spanish and other settlers often adopted these traditional medicinal uses.[5] Now, California poppy is typically used as a sedative or hypnotic with anti-anxiety, antispasmodic, and pain-relieving properties and is considered safe for use in children.[22-24] The entire plant has been used historically,[3,5,14] but the dried aerial parts (or extracts thereof) are the most common therapeutic agent today.[23,25-27]

Commercial cultivation of California poppy for use in herbal products primarily occurs in the United States and France. However, it is also cultivated in Australia, Canada, Croatia, Germany, and Italy.[28] In the United States, California poppy is most commonly cultivated organically in California, Oregon, and Washington, but also in Colorado, Georgia, Illinois, Massachusetts, Minnesota, North Carolina, Pennsylvania, West Virginia, and Wisconsin. However, in some instances, only nursery stock or seedlings are cultivated.[28,29] Cultivation is also reported from Idaho, Maine, and Vermont (personal communication with J. Brinckmann, May 21, 2024).[30] Although California poppy is typically cultivated for commercial purposes, it is possible that, due to its abundance across its native range and naturalization elsewhere, it may be wild-harvested for retail. However, the American Herbal Products Association did not include this data in its Tonnage Survey of Select North American Wild-Harvested Plants (2011–2017),[31] so it is difficult to determine what percentage of California poppy, if any, is wild-harvested.

HISTORY AND CULTURAL SIGNIFICANCE

California poppy was first collected by Scottish botanist and surgeon Archibald Menzies (1754–1842) in California in 1792. Although it is unclear whether he sent seeds to England in 1793 or took seeds back himself in 1795, they germinated at the Royal Botanic Gardens, Kew, but the plants were sickly and died shortly thereafter.[32] On October 2, 1816, the Russian ship *Rurik*, under command of Imperial Russian Navy Captain Otto von Kotzebue (1787–1846), entered the San Francisco Bay. Aboard were the expedition's botanist and the ship's surgeon-naturalist. Respectively, these were the French-Prussian botanist and writer Adelbert von Chamisso (1781-1838) and the Russian (Estonian) physician and naturalist Johann Friedrich Gustav von Eschscholtz (1793-1831). They collected California poppy on dry, barren sands at the port of San Francisco[33] and, over one month, collected this and other species in and around the hills and valleys near the Presidio and during at least one expedition further south on the San Francisco Peninsula.[32,34] It was not until later, after his return to England, that von Chamisso published the species description in 1820.[33] He named it *Eschscholzia californica* in honor of his friend and colleague, von Eschscholtz; however, in the publication of this description, the "t" in Eschscholtz's last name was mistakenly left out. The species epithet, "*californica*" recognizes the location of its first collection.[17,33] Von Chamisso's specimens of California poppy reportedly were the first to reach Europe,[5] and although he brought seeds back from California, they, like Menzies' seeds, did not grow satisfactorily.[34]

In 1826, Scottish botanist and plant collector David Douglas (1799–1834) collected California poppy seeds from a southern Oregon population for the Royal Botanic Society. This was probably the first successful introduction of California poppy to Europe and the one from which European cultivation and horticultural distribution began.[5,32] Interestingly, the first known cultivated specimens in North America were in the Atlantic states, and these originated from plants cultivated in Europe, not from California.[5] California poppy has been grown extensively in gardens worldwide for nearly 200 years, and many cultivars with striking colors and unusual forms have been selected for and made available in horticultural trade.[1,5] In the late 1800s, in Sonoma County, California, American botanist and horticulturist Luther Burbank (1849–1926) began breeding trials to improve upon the natural beauty of the California poppy. In 1901, Burbank reported from Santa Rosa that, through selective breeding, he had created a pure crimson variety that produced flow-

ers more abundantly than the wild type and had selected for other "curious" forms as well.[5]

Mid-19th-century reports from around Ventura and the Channel Islands of California state that Indigenous groups in that area used California poppy for its analgesic properties and for colic and that a "hypnotic extract" was made from it.[35] A more recent treatment of Chumash ethnobotany does not indicate any Chumash medicinal uses of California poppy,[4] but California poppy was used by many Indigenous Californians. The Yuki and seemingly other groups in Mendocino County used an "extract" of the fresh root internally to cause vomiting, as a "cure" for stomachaches, and "to some extent, as a cure for consumption [tuberculosis]." An "extract" of the leaves was used to stop stomachaches, although it was reportedly less effective than a potion prepared from the root.[14] The fresh root was placed into the cavity of a tooth to stop toothache,[14] and the leaves were also used for toothache.[36]

The Cahuilla used California poppy as a sedative for babies,[37] and the Costanoan people of coastal northern and central California placed one or two flowers under children's beds to make them fall asleep.[12] Early Spanish settlers also claimed it had sedative properties, and decocted leaves were a common remedy for "children's troubles."[5] California poppy also was used topically, and, in Mendocino County, the Yuki and others used an "extract" of the fresh root as a wash or liniment for headaches and to wash suppurating sores.[14] Costanoan peoples and other Ohlone groups rubbed a decoction of the flowers into hair to kill lice.[12]

Significant lore relates to California poppy use by pregnant or lactating women. Lactating women of the Yuki and other groups in Mendocino County used an "extract" of the fresh root topically to stop milk secretion.[14] Breastfeeding Pomo and Kashaya Pomo women applied a decoction of mashed seed pods, or mashed seed pods themselves, to their breasts to dry up their milk.[38] Adams and Garcia (2006),[39] who cited Strike (1994),[2] report that the Pomo refer to California poppy as "milk disappear plant" and question whether this was based on a pharmaco-physiological action or simply because the bitter taste deterred infants from breastfeeding.[39] The Southwestern Pomo call California poppy shidocho kale, which translates to "breast" (shido) "die away" (cho) "[poppy] flower" (kale),[10] which perhaps indicates more than a bitter deterrent. Women from Mendocino and southern Humboldt counties have a "superstition" that nursing mothers must not touch it or allow their infants to do so, or their milk will dry up.[5] Pregnant and lactating women of the Costanoan/Ohlone people also avoided the plant, and the smell was believed to be toxic.[12] This proscription against touching California poppy also was reported among the Yuki, who believed that a nursing mother should not touch the plant lest her milk dry up. To "purify" the mother's milk, the Yuki would place a small quantity of California poppy on a hot stone as a symbolic rite.[10]

While a few Indigenous groups may have considered the plant generally poisonous,[11] a far greater number considered it edible and valued it both as medicine and food. The fresh leaves and aerial parts of the plant were extensively eaten as greens, often steamed or boiled, and, according to one second-hand report, groups from Placer County claimed to have been "addicted" to this food,[5] which perhaps indicates that it was delicious and utilitarian.

An informant from Banning, California, stated that California poppy is an early spring food and is ready to eat when the first green leaves come out of the ground and are three or four inches high. However, this person also reported that as the plant matures, the leaves and flowers are better used as medicine and not food.[5] The Luiseño also ate the leaves and stems as greens.[9,40] The Nisenan of Bear River ate the poppy as greens, either boiled or roasted with hot stones and then placed in hot water.[13] One informant from Mendocino County reported that he ate the leaves as greens but was careful to throw away the water in which they had been boiled.[14] The Luiseño also chewed the flowers with chewing gum, which originally was made from sap of *tokmut* (*Asclepias eriocarpa*, Apocynaceae). [9,40]

California poppy was also used cosmetically to enhance appearance. Cahuilla women used the brightly colored pollen of *Eschscholzia* species as a facial cosmetic.[37] A hair oil was made by melting bear fat and adding poppy flowers. This was heated for a while and then the plant material was strained out. Reportedly, this product greatly increased hair growth and gave it luster. An olive (*Olea europaea*, Oleaceae) oil extraction of California poppy flowers, to which perfume was added, was made in the same way and used for the same purposes as a hair oil.[5]

Two reports describe more underhanded California poppy uses. According to Chesnut (1902), some people in Mendocino County, when gambling, secretly used the root for its stupefying effect,[14] although it is not specified how this was achieved. Romero (1954)[11] recounts that medicine men of Indigenous groups of southern California used California poppy in compounding poisons and gives this example: If a woman became enamored with a man, and he did not respond to her advances, the medicine man would make an herbal preparation with California poppy as one of the primary ingredients. Another person would give this, in solid or liquid form, to the unwitting object of her affections. In less than 24 hours, the man reportedly would become mentally foggy and powerless to resist the woman.[11]

While California poppy does not appear to be used much, if at all, in the traditional healing practices of the Chumash, it does appear frequently in their stories, legends, and myths.[4] Timbrook (2004),[4] citing Blackburn (1975),[41] recounts: "According to Fernando Librado [a Chumash informant], people used to say that poppies were the ruin of girls. Boys would take girls out gathering poppies, and the flowers' beauty would overcome the girls and cause them to yield to the boys." Blackburn[4,41] recorded many other oral Chumash narratives. In one myth, Lizard looks from the

California poppy *Eschscholzia californica*
Photo ©2024 Steven Foster

California coastline across to the Channel Islands covered with blooming poppies and says to Coyote, "When you see it, it is as if the sun itself is on the ground, so beautiful is the flower." In another, California poppy played a part in the journey of the soul to the afterlife:

> After death, as the soul journeys to *Shimilaqsha*, the Land of the Dead, it must pass a place where two ravens peck out its eyes. There are many poppies growing there in the canyons on each side. The soul quickly reaches out its arms to each side, picks two of these poppy flowers, and puts one into each eye socket. Thus it is able to see again immediately. When the soul finally gets to *Shimilaqsha*, it is given eyes of blue abalone.[4,41]

It was not only the Indigenous peoples of California whose imagination and myths featured the poppy. Spanish legend recounts that an early Spanish explorer in California, which by some accounts was Father Junípero Serra (1713–1784), when confronted with a field of poppies in bloom at midday, said, "at last I have found the Holy Grail." After saying this, he reverently raised a flower to his lips in admiration and honor.[5] In Los Angeles County, legend tells of an annual spring amapola (poppy) dance, a type of "sun worship" not endorsed by the early Spanish mission efforts. Women wearing California poppy crowns, wreaths, and boas reaching to the ground performed this dance at midday. While the origin of this legend is obscure, it had been recited and sung about enough that it was considered local history as recently as 1902.[5]

Smith (1902) relates a native Californian legend from the time of the California Gold Rush in the mid-19th century.[5] In the legend, the petals of the "Great Spirit flower," as they dropped to the ground and sank into the earth each year, became the gold ore itself. From the time of the Gold Rush, which peaked in 1849, to when California became a state in 1850 and onward, California poppy increasingly became associated with the rich gold ore and the Golden State itself. While this association between flower and state no doubt originated in the imaginations of those living within its bounds, surrounded by orange covered hills, California poppy gradually became a widely recognized public representation and an idealized symbol of California identity and way of life. This sentiment was formalized in 1903, when California poppy was voted to be the state flower,[6] corresponding to a surge of public fervor and flood of California poppy-centric arts, crafts, written word, and songs in the late 1800s and early 1900s.[5,6]

It is a persisting myth that it is illegal to pick California poppies, a notion that is widely circulated as fact in California. No laws directly prohibit this, and the only basis for this belief is the general law against harvesting any plants, animals, or fungi from land one does not own without prior approval of the landowner or governing agency.[42]

California poppy was adopted somewhat slowly into Western medical and herbal practice. Although it was available as a fluid extract from Parke, Davis and Company in the late 19th century[24,43] and was briefly mentioned in the 1918 edition of *The Dispensatory of the United States of America*,[44] there has never been an official monograph published in either the *United States Pharmacopoeia* or *National Formulary*.[45] Even though California poppy has not been adopted into an official monograph in the United States, it began to be used therapeutically by the mid-to-late 20th century due to the revival of Western herbalism.[22,23,46] California poppy continues to be used in herbal medicine as a gentle nervine and sedative with antispasmodic and anxiolytic properties,[22,23,46] often formulated with other nervines.[24,47]

CURRENT AUTHORIZED USES IN COSMETICS, FOODS, AND MEDICINES

California poppy is an herbal dietary supplement ingredient in the US market. For an herbal ingredient to be used in the United States in a dietary supplement product, the marketer must submit a notification letter to the US Food and Drug Administration (FDA) within 30 days of marketing the product if a structure-function claim[48] (a non-therapeutic, non-disease-related claim) is made on the package and/or marketing materials. The product must comply with FDA-mandated current Good Manufacturing Practices (cGMPs).[49]

In Canada, preparations of dried California poppy herb can be used as active ingredients in licensed natural health products (NHPs), if the product is approved and authorization is granted from the Natural and Non-prescription Health Products Directorate (NNHPD). The authorized plant part is "dry herb top," and the accepted preparation dosage formats are dry, powder, or non-standardized extracts (which include dry extract, tincture, fluid extract, herbal tea decoction, or infusion).[25] The licensed NHP's labeling standards list traditional therapeutic indications as: "Traditionally used in herbal medicine to help relieve restlessness and/or nervousness (calmative)"; "Traditionally used in herbal medicine as a sleep aid (during times of mental stress)"; and "Traditionally used in herbal medicine as an analgesic."[25]

In the European Union (EU), California poppy herb may be used as an active ingredient of registered traditional herbal medicinal products (THMPs). The European Medicines Agency (EMA) EU herbal monograph provides two authorized therapeutic indication statements for product labeling: "Traditional herbal medicinal product for relief of mild symptoms of mental stress" and "Traditional herbal medicinal product to aid sleep." Powdered herb is the preparation form listed.[27]

Regarding quality of the herbal substance, the EMA labeling monograph states that in the absence of a quality monograph in the *European Pharmacopoeia* (PhEur), a national pharmacopeia or national codex that is currently official in an EU Member State may be used as the basis of a specification. The "Eschscholziae herba" monograph of the *French Pharmacopoeia* (PhFr),[26] first published in 1996, may therefore be used for quality specifications until a superseding PhEur monograph comes into force, which may occur by 2025. In April 2023, the European Directorate for the Quality of Medicines & HealthCare published a draft California Poppy PhEur monograph for public comment.[50] The new draft PhEur monograph requires the dried flowering aerial parts to contain a minimum of 0.2% for the sum of the alkaloids californidine and eschscholtzine, expressed as californidine.[50] For use in cosmetic products in the EU, the defined ingredient "Eschscholzia Californica Flower/Leaf/Stem Extract" is authorized for skin-conditioning functions.[51]

MODERN RESEARCH

Constituents and Pharmacological Effects

California poppy contains a diverse group of alkaloids, the most prominent class of which is the benzylisoquinoline alkaloids, which include the distinctive pavine alkaloids (e.g., californidine, eschscholtzine).[52-54] Other isoquinoline alkaloids include benzophenanthridines (e.g., chelerythrine, chelirubine, chelilutine, sanguinarine), aporphines (e.g., N-methyllaurotetanine, glaucine), protopines (e.g., allocryptopine, protopine), and (*S*)-reticuline.[53,55,56] Additionally, quercetin and isorhamnetin glycosides are present,[52] and the flowers contain carotenoids (e.g., eschscholtzxanthin, (3*S*,5*R*,3'*S*)-4'5-*retro*-β, β-*carotene*-3,5,3'-*triol*).[56,57]

The alkaloid content of the aerial parts has varied significantly in analytical studies that have quantified these compounds.[55,58] For example, Tomé et al (1999) reported significant differences in the quantitative pattern of alkaloids in the aerial parts of California poppy grown from seed under controlled conditions.[59] The variation was especially evident for eschscholtzine (0.2-1% dry weight) and californidine (0.1-1% dry weight), two of the major alkaloids found in the plant.[59]

Pharmacological studies on California poppy have reported modulation of gamma-aminobutyric acid (GABA) receptor activity,[60] serotonin receptor binding,[54] benzodiazepine receptor affinity,[60] and catecholamine metabolism through inhibition degradation.[58,61] An ethanol extract (70%) of California poppy demonstrated the ability to bind to serotonin receptors 5-HT_{1A} and 5-HT_7, which may be associated with sedation and anxiolysis at a 100 µg/mL concentration,[54] with the most activity attributed to the aporphine alkaloid N-methyllaurotetanine.[54]

California poppy has demonstrated sedative, anxiolytic, and analgesic biological activity in a few in vivo studies.[60,62,63] In a rodent model, an aqueous extract (1 g of dried extract was produced from approximately 9.7 g of dried plant material) of California poppy aerial parts demonstrated dose-dependent anxiolytic and sedative effects, with lower doses (25 mg/kg) correlating to anxiolytic effects and higher doses (100 mg/kg) with sedative effects.[63] A follow-up study by Rolland et al (2001)[60] using a 60% hydroalcoholic extract (1 g of dried extract produced from approximately 5 g of dried California poppy aerial parts) demonstrated sedative and anxiolytic properties through behavioral changes in open-field tests, and these effects were partially reversed by 10 mg/kg flumazenil (a benzodiazepine antagonist), suggesting benzodiazepine receptors may be involved. Peripheral analgesic effects also were reported at 200 mg/kg.[60]

Toxicity

While there are a very limited number of relevant toxicological studies on both the individual alkaloids and herbal preparations of California poppy, traditional preparations are perceived to be safe with recommended intake preparations, instructions, and dosage levels, as California poppy has been on the European market for approximately 40 years.[53] Several authoritative sources contraindicate the use of California poppy while pregnant.[25,53,64] Safety information on the use of California poppy during lactation has not been identified in the literature due to the lack of clinical safety data in this population,[64] but authoritative sources state that women who are lactating should not use it[27] or should ask a health care practitioner before use.[25] Consuming products that contain California poppy may affect mental alertness tasks, such as driving, and may potentiate drowsiness when taken with other products that have analgesic or sedative properties.[25,53]

A study evaluating California poppy safety reported no toxicity symptoms with an aqueous extract at doses up to 8 mg/kg in mice.[63] Also, neither an aqueous extract nor a 60% hydroalcoholic extract, when administered over four weeks, caused acute or subacute toxicity, even at a high dosage of 2,000 mg/kg.[53]

An ethanolic extract of California poppy and its major alkaloids inhibited several cytochrome P450 enzymes (CYPs) in vitro and reduced activity of the transcription factor (PXR) regulating expression of these enzymes, indicating potential interactions with drugs that are processed by these major metabolic pathways. In the same study, California poppy tea did not show any significant effects

California poppy *Eschscholzia californica*
Photo ©2024 Steven Foster

on these enzymes, indicating that lower concentrations of California poppy and its constituents are unlikely to interfere with drugs processed by these pathways.[65]

Human Clinical Studies

Clinical studies substantiating California poppy's efficacy and safety are limited. The few available studies include California poppy as a combined ingredient in polyingredient preparations. These studies typically have evaluated effects related to anxiety and sleep disorders.[66-68]

A randomized, double-blind, placebo-controlled trial evaluated the anxiolytic effects of a combination product in individuals diagnosed with mild to moderate anxiety disorder.[66] For three months, study participants (N = 264, average age of 44 years) were provided either two tablets twice daily of placebo or Sympathyl® (Laboratoire Innotech International; Arcueil, France), a tablet containing 75 mg dry hydroalcoholic hawthorn (*Crataegus oxyacantha*, Rosaceae) flowering head extract, 20 mg of dry aqueous California poppy extract, and 75 mg elemental magnesium (124.35 mg of heavy magnesium oxide).[66,69] The ingredients' extraction composition details (e.g., Drug-to-Extract ratio, excipients, solvent system, etc.) were not listed in the original study. Efficacy outcomes were evaluated based on Hamilton Anxiety Rating Scale scores (total and somatic scores), subjective self-assessment score via visual analog scale (VAS), and the physician's clinical global impression (CGI) rating.[66]

The researchers reported reduced anxiety in both groups, with the treatment group demonstrating a greater decrease in the Hamilton anxiety total and somatic score, compared to the placebo. VAS scores also decreased in both groups, with more of a decrease observed in the treatment group, indicating participants felt less anxious after treatment. The combination product demonstrated improvement in mild to moderate anxiety disorder, as determined by the difference in final and pre-treatment scores. For the treatment and placebo groups respectively, the score changes were: –10.6 and –8.9 on the total anxiety score, –6.5 and –5.7 on the somatic score, and –38.5 and –29.2 for subjectively assessed anxiety. Safety was monitored through reporting of undesirable events throughout the study. Approximately 11.5% of the treatment group and 9.7% of the placebo group reported adverse effects. Events reported by the authors were categorized as mild to moderate and included digestive symptoms, psychological disorders, or "morning sluggishness."[66]

A 14-day, single-arm study with 20 children (ages 3–6, average age of 4.7 years) evaluated the effects of an herbal combination product on sleep disturbances and restlessness at night. Study participants were provided the product, called Vagostabil® Junior (Cristalfarma Srl; Milan, Italy), which contained honey, water, glycerol, California poppy aerial parts dry extract (0.8% in total alkaloids, expressed as protopine), and passionflower (*Passiflora incarnata*, Passifloraceae) aerial parts dry extract (4% in total flavonoids, expressed as vitexin), with additional ingredients of citric acid and potassium sorbate. Instructions were provided, with a dosage of 0.5 mL per kg of body weight 30 minutes before bedtime for 14 days. Parents assessed the children using the 10-question Tayside Children's Sleep Questionnaire designed to gauge the severity of the sleep problem. The Tayside total score significantly improved ($P < 0.001$) from 23.58±5.77 to 14.11±6.72 after treatment based on the questionnaire. Overall, sleep improved for the children. Examples noted include the children fell asleep more quickly, woke up less often, and were more willing to fall asleep alone. On average, children slept an extra hour per night. No adverse events were reported.[67]

A one-month, single-arm, observational, longitudinal study evaluated a combination product in adults with adjustment insomnia (which is also called acute insomnia or short-term insomnia and is usually caused by a source of stress). The combination tablet (Phytostandard® d'Eschscholzia et de Valeriane, PiLeJe Laboratoire; Paris, France) contained both 80 mg California poppy flowering aerial parts extract and 32 mg valerian (*Valeriana officinalis*, Caprifoliaceae) root extract, though the extraction composition details (e.g., drug-to-extract ratio, excipients, solvent system, etc.) were not listed in the original study. A total of 26 participants completed the study. Participants were instructed to take a maximum of four tablets each night for the study duration. The authors reported an approximately 30% decrease in the Insomnia Severity Index score. Sleep efficiency also increased, and a 25% reduction in the number of awakenings was observed. No adverse events were reported.[68]

ADULTERATION AND SUBSTITUTION

In *Medicinal and Aromatic Plants of North America*, the author concluded that "no known adulterants occur" for California poppy.[45] In the 1996 edition of the *French Pharmacopoeia*, botanical identification methods using plant morphology (macroscopic and microscopic characteristics) and thin-layer chromatography (TLC) are available for California poppy.[26] Additionally, the European Directorate for the Quality of Medicines & HealthCare's published draft monograph on California Poppy PhEur provides botanical identification methods using macroscopic and microscopic characteristics and high-performance thin-layer chromatography (HPTLC).[50]

SUSTAINABILITY AND FUTURE OUTLOOK

The California poppy is well-adapted to arid conditions and considered a drought-tolerant species. It is seasonally abundant within its native range, and, in some years, a localized profusion of flowers, called a "super bloom," occurs with other wildflower species.[70] These spectacular displays blanket hillsides with vibrant gold and yellow hues and occur when dormant seeds germinate after sufficient annual precipitation.[70] The abundance of California poppy within its native range, and its general hardiness and adaptability that have allowed its widespread naturalization around the world, underscore a future outlook of ready availability and ease of sourcing. Successful cultiva-

tion is documented, and total cultivation area could be expanded if market demand grows.

California poppy is not subject to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and not listed in the US Endangered Species Act.[71] It has not been assessed according to International Union for Conservation of Nature (IUCN) Red List categories and criteria.[72] The nonprofit organization NatureServe, a source for North American biodiversity data, assessed and ranked the conservation status of California poppy in the United States as G4 (Apparently Secure, "at a fairly low risk of extirpation in the jurisdiction due to an extensive range and/or many populations or occurrences, but with possible cause for some concern as a result of local recent declines, threats, or other factors").[30] In the California Native Plant Society's Inventory of Rare and Endangered Plants, California poppy is not listed.[24,73]

The FairWild Foundation does not list any suppliers that currently provide FairWild®-certified California poppy ingredients.[74] However, it is cultivated organically within the United States,[29] France, and elsewhere. California poppy currently is being researched as an indicator species for the California Conservation Genomics Project, which is collecting genomic data to better understand conservation science and the impacts of climate change.[75,76] HG

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Natural Remedies Adopts Holy Basil through ABC's Adopt-an-Herb Program

By ABC Staff

In April 2024, the American Botanical Council (ABC) welcomed Natural Remedies' adoption of holy basil (*Ocimum tenuiflorum* syn. *O. sanctum*, Lamiaceae) through ABC's Adopt-an-Herb botanical research and education program. Natural Remedies, located in Bengaluru, India, is a supplier of extracts of Indian traditional medicinal plants.

Ocimum tenuiflorum, commonly called holy basil, has many other common names in India, including tulsi, and is a member of the mint family (Lamiaceae). It is native to India and parts of northern and eastern Africa, Hainan Island (China), and Taiwan, although it is grown in temperate climates throughout the world.

Holy basil is one of the principal herbs used in India in the traditional medicine systems of Ayurveda, Siddha, and Unani, as well as in other Indian medicine practices. It is credited with being adaptogenic, analgesic, antibacterial, antiseptic, antispasmodic, carminative (relieves intestinal gas), diaphoretic (promotes sweating), an expectorant (helps clear mucus), a nervine, and a stimulant. Holy basil is used for acute rhinitis, shortness of breath, asthma, hiccups, improving immunity, lowering blood sugar, and helping to relieve generalized anxiety disorder.

Holy basil *Ocimum tenuiflorum*
Photo ©2024 Steven Foster

"We believe that through this adoption, we can contribute significantly to a deeper understanding of holy basil's potential health benefits," said Suresh Lakshmikanthan, Natural Remedies' chief business officer. "We aim to raise awareness of holy basil's medicinal properties and potential applications in modern health care, from its antioxidant and stress-relieving properties to its anti-inflammatory and immune-boosting effects. We also aim to provide evidence-based information on its potential medicinal applications, empowering consumers to make informed decisions about their health and wellness."

Natural Remedies' adoption of holy basil 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 a wide variety of scientific and clinical research data on the uses and health effects of more than 265 herbs, spices, medicinal plants, and fungi.

"Natural Remedies' mission is to harness the power of nature to enhance well-being," added Lakshmikanthan. "ABC's Adopt-an-Herb program directly aligns with this mission by supporting ongoing research on holy basil's medicinal properties. Promoting responsible sourcing and production practices and helping to educate the industry about the safe and effective use of herbal remedies are paramount to our mission."

ABC Founder and Executive Director Mark Blumenthal said: "ABC is deeply grateful to Natural Remedies for adopting holy basil on ABC's HerbMedPro database. Natural Remedies' adoption enables ABC

natural™ REMEDIES

ADOPT-AN-HERB
HerbMedPro™ PROGRAM

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 Natural Remedies

Natural Remedies is a research-driven botanical health care company with a global footprint. The company's core competency lies in discovering novel phytocompounds and manufacturing standardized herbal extracts. Natural Remedies is committed to producing innovative branded ingredients that are clinically studied and scientifically supported. Known as a leader in scientifically based botanical extracts, Natural Remedies has contributed to various international pharmacopeias, including more than 100 monographs, and isolated more than 220 purified phytocompounds for global reference standards to be used in analytical laboratories. The company's vision is to harness nature and apply science for health and happiness.

The company started in the 1950s as part of the animal health care industry. In 1998, the organization was renamed Natural Remedies and transformed into a professionally managed company. In 2000, Natural Remedies entered the human health care business.

Within the past two decades, Natural Remedies has focused on melding traditional knowledge with modern expertise. The company's inspiration continues to be mining the depth of traditional Ayurvedic knowledge and then applying state-of-the-art science and human clinical trials. Natural Remedies develops branded ingredients that epitomize the company's philosophy and mission to provide botanical extracts built on a platform of sturdy science, documented safety, and sustainable development.

About Adopt-an-Herb and HerbMedPro

Natural Remedies is one of 76 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 human clinical studies, on herbs, medicinal plants, and other botanical- and fungal-based ingredients through the Adopt-an-Herb program. This program encourages companies, organizations, and individuals to "adopt" one or more specific herbs for inclusion and ongoing maintenance in the HerbMedPro database. To date, 90 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 of herbs from the larger HerbMedPro database, along with all the adopted herbs. 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

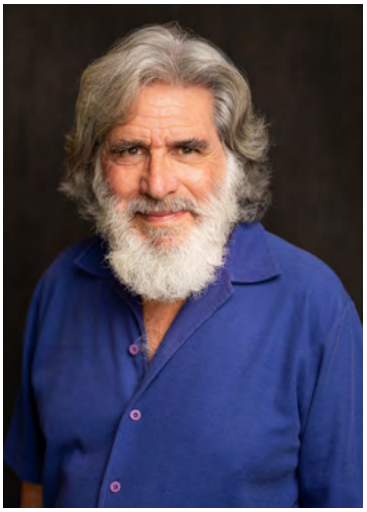
Vitamin Retailer Recognizes ABC's Mark Blumenthal as One of '30 People Who Shaped the Natural Products Industry'

By Hannah Bauman

In its January 2024 issue, *Vitamin Retailer* (VR) magazine published the article "30 People Who Shaped the Natural Products Industry" to coincide with the publication's 30th anniversary and the 30th anniversary of the passage of the Dietary Supplement Health and Education Act of 1994 (DSHEA).[1] Among the many leaders past and present who "shaped, built, and defended the natural products industry over the [past] 30 years," VR included American Botanical Council (ABC) Founder and Executive Director Mark Blumenthal, in recognition of his career of more than 50 years in the herbal medicine community.

The late VR Contributing Writer James J. Gormley (1963–2024) wrote that Blumenthal "has been a leader in the herb movement in areas such as quality control of herbal products, ethics in labeling and marketing, legal and regulatory issues, and research and education" and that he and ABC are also "major sources of information for journalists, editors and freelance writers."

The article highlights other notable figures in the natural products community, including Emanuel Bronner (1908–1997), founder of the popular personal care company Dr. Bronner's®; author, botanist, and photographer Steven Foster (1957–2022); ethnobotanist and author James A. Duke, PhD (1929–2017); Loren Israelsen, president and founder of the United Natural Products Alliance; Terry Lemerond, founder of Enzymatic Therapy and EuroPharma; integrative medicine expert Tieraona Low Dog, MD; John Mackey, co-founder of Whole Foods Market; Michael McGuffin, president of the American Herbal Products Association; author and advocate Michael Murray, ND; supplement researcher Alex Schauss, PhD; attorney and advocate Jim Turner (1940–2022); and integrative practitioner Janet Zand, OMD, LAc, among many others.



Mark Blumenthal

Gormley noted that "for every person we included, there were two-to-three other people we would have liked to also include."[1] The full list of 30 people is available on VR's website.

"I am deeply grateful and humbled that James Gormley and Dan McSweeney chose to include me with so many iconic people in the natural products community, particularly Dr. Bronner," said Blumenthal. "I had the opportunity to meet Bronner several times at natural food industry trade shows in the 1970s, when he sold his soap from a humble tabletop display.

"Of the 30 people whom *Vitamin Retailer* has honored in this article, about half of them are no longer alive," Blumenthal added. "I am grateful that I had the opportunity to meet many of these creative, energetic, and impressive people. I have long appreciated my choice to pursue a career in the fascinating world of herbs and herbal medicine, and, in a larger context, the natural food and natural products industries. The people I've met in this field, including many on VR's list of 30, have inspired me in my work and have contributed to the natural health of millions of Americans and many others around the world."

About *Vitamin Retailer*

VR is a leading publication in the dietary supplement industry and keeps retailers, manufacturers, suppliers, and consumers up to date with in-depth and reliable information. It is published by East Brunswick, New Jersey-based VRM Media, which was founded in 1993 by Daniel McSweeney, who remains the company's president and VR's publisher and editorial director. McSweeney was the editor and associate publisher of *WholeFoods Magazine* before founding VRM Media. HG

Reference

1. Gormley J. 30 people who shaped the natural products industry. *Vitamin Retailer*. January 3, 2024. Available at: https://vitaminretailer.com/30-people-who-shaped-the-natural-products-industry/. Accessed March 21, 2024.

New Employee Profile: Riane Roldan

By Hannah Bauman

In March 2024, Riane Roldan joined the staff of the American Botanical Council (ABC) as its communications and marketing specialist. Roldan is responsible for ABC's social media accounts on LinkedIn, Instagram (@herbalgramabc), and Facebook (@HerbalGram); communicating with members and others through press releases and email blasts, appeals for donations, and other communications; and raising overall awareness of ABC and its activities and mission.

"We have all these amazing programs and things that we do at ABC," she said (oral communication, July 25, 2024). "We want people to know about them and for ABC content to be more accessible."

Originally from Miami, Florida, Roldan attended Miami Dade College for a few years before earning her bachelor's degree in journalism at Emerson College in Boston. She then moved to Texas to pursue a career in journalism. She interned at *The Texas Tribune*, a nonprofit news organization, and the *Austin American-Statesman*, the major newspaper in Austin, Texas. Roldan then became the Hays County reporter for KUT News, the National Public Radio news affiliate run by The University of Texas at Austin (UT), and moved to San Marcos, Texas.

"I got to tell a lot of stories that I was really proud of, and it taught me how much I enjoy telling stories about the environment," she said. After a few years in the news industry, she pivoted in her career and worked as a communications specialist at the Butler School of Music, part of the College of Fine Arts at UT, before joining ABC.

Roldan's journalism experience gives her insights into storytelling and engaging audiences from different backgrounds, and she said she is excited about the opportunities to extend ABC's reach.

"I like the process of coming into a place and trying to improve things," she said. "My ABC team has been receptive to things I've noticed as a newcomer. I want to improve the way we tell stories."

Roldan also has previous knowledge of medicinal herbs and natural healing modalities, as she began studying herbalism after her career shift. She became connected with ABC through ABC's former education assistant Caroline Caswell. "I ended up going to see an herbalist [Caswell] and worked with her," Roldan said. "The things she made for me improved my physical and emotional health. That was the bug that bit me, and I started to study herbalism…. I've been studying for only a year, and I'm excited for all the things that there are to learn." When ABC posted a job listing for a communications position, Caswell informed Roldan, who was eager to apply.

Roldan is excited about having access to the instructional gardens at ABC's historic 2.5-acre Case Mill Homestead in East Austin. "It's great to have access to information, but it's also about practicing it in the real world with the actual plants," she said." It's so important to spend time with the plants that you're learning about."

Roldan also enjoys film photography and interior design. She has filled her home with thrifted furniture pieces that have "cool histories" and enjoys practicing photography on interior shots.

ABC Development Director Denise Meikel said: "We're very excited to have Riane as part of the ABC team. She brings experience, skills, insight, compassion, humor, an eye for design, and a passion for herbs and herbalism that help her understand and promote ABC's mission and content effectively. She has hit the ground running and is already making noticeable progress. I'm looking forward to working with her for years to come." HG

Riane Roldan

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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Symphony Natural Health	**Maca** *Lepidium meyenii*
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RFI From Field to Formula	**Hibiscus** *Hibiscus sabdariffa*

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	Stinging Nettle *Urtica dioica*
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biotropics MALAYSIA	**Kesum** *Persicaria minor*
	Tongkat Ali *Eurycoma longifolia*
PLT Health Solutions Growth through Innovation	**Indian Frankincense** *Boswellia serrata*
KP Authentic Botanical Extracts	**Senna** *Senna alexandrina*
FOUR ELEMENTS	**Lemon Balm** *Melissa officinalis*
Brassica Protection Products	**Broccoli** *Brassica oleracea* Broccoli Group
Aromatics International	**Peppermint** *Mentha x piperita*
THE ACTIVES FACTORY	**Birch** *Betula* spp.

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Piper methysticum

Rhodiola
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Nopal/Prickly Pear
Opuntia ficus-indica

layn Natural Ingredients
Sophora Japonica
Styphnolobium japonicum

Monk Fruit
Siraitia grosvenorii

Natac Science to Market
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Olea europaea

Grape
Vitis vinifera

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Sambucus nigra

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Andrographis
Andrographis paniculata

indena®
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

BAPP Publishes Bulletin on Damask Rose Essential Oil Adulteration

Bulletin summarizes information on Damask rose oil adulteration with lower-cost essential oils, essential oil fractions, and natural or synthetic chemicals

By ABC Staff

In June 2024, the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP) published a new Botanical Adulterants Prevention Bulletin (BAPB) on Damask rose (*Rosa* × *damascena*, Rosaceae) essential oil.

Damask rose essential oil is obtained by distillation of the flowers of *R.* × *damascena*, a shrub that grows throughout temperate and subtropical regions of the Northern Hemisphere. The oil is used in traditional medicine systems to treat depression and anxiety, to relieve stress, and as an ingredient in personal care, home care, cosmetic, and aromatherapy products. Additionally, jams, beverages, and sweets such as rose *loukoums* (gel-like confections that are prepared from Damask rose petals) are available.

It takes approximately 2 hectares (ca. 5 acres) of Damask rose fields to harvest 4 metric tons of roses (ca. 1.6 million rose flowers) and produce 1 kilogram of essential oil. The high production costs and low oil yield make Damask rose essential oil expensive, hence substitution with other, lower-cost ingredients labeled as "Damask rose oil" is not uncommon. Reported adulterants include natural or synthetic isolates, enriched fractions from lower-cost essential oils (e.g., β-citronellol, geraniol, geranyl acetate, rose oxide, and 2-phenylethanol), and undeclared diluents such as vegetable oils or glycols. Additionally, geranium (*Pelargonium graveolens*, Geraniaceae) and palmarosa (*Cymbopogon martinii* syn. *Andropogon schoenanthus*, Poaceae) essential oils are sometimes fraudulently labeled as Damask rose oil.


ABC AHP NCNPR
Botanical Adulterants Prevention Program
BOTANICAL ADULTERANTS PREVENTION
BULLETIN

Botanical Adulterants Prevention Bulletin on

Rose
(*Rosa* × *damascena*)
Essential Oil

By Olha Mykhailenko, PhD

UCL School of Pharmacy, University of London, 29–39 Brunswick Square, London, WC1N 1AX United Kingdom; National University of Pharmacy, 53, Hryhorii Skovoroda St., 61002 Kharkiv, Ukraine

Correspondence: email

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"Red roses cool, bind, strengthen both vital and animal virtue, restores such as are in consumptions, strengthen." (Nicholas Culpeper, 1653. *The London Dispensatory*)

Keywords: Adulteration, *Rosa* × *damascena*, damask rose oil, rose oil, essential oil

Goal: The main aim of the current bulletin is to provide modern and up-to-date information on the possible falsification/adulteration of the essential oil (EO) of damask rose (*Rosa* × *damascena* Mill.) flowers by synthetic and natural components. The EO, rose water (hydrosol), concrete (produced by extracting fresh rose blossoms with hexane), and absolute (the ethanol extract of rose concrete) are the main products of the damask rose. This bulletin may serve as a guide for quality control personnel, the international herbal products, cosmetic, perfumery, food, and EO industries, and the extended natural products community in general. It is also intended to present a summary of the scientific data and methods on the occurrence of species substitution, adulteration, the market situation, and economic and safety consequences for the consumer and the industry.

Rose (*Rosa* × damascena) Essential Oil - Botanical Adulterants Prevention Bulletin • June 2024 • www.botanicaladulterants.org

1

Rose *Rosa x damascena*. Photo ©2024 Steven Foster Group

Stefan Gafner, PhD, chief science officer of the American Botanical Council (ABC) and director of BAPP, explained: "The more affordable personal or home care products and food and beverages that have a rose scent are unlikely to contain authentic Damask rose oil. This is acceptable as long as the ingredients are transparently labeled. Unfortunately, some suppliers and manufacturers sell all kinds of mixtures that have a rose-like aroma but no actual rose oil. These mixtures are labeled as 'authentic rose oil' and sold at a premium price for financial gain. This bulletin is meant to raise awareness of this longstanding issue."

Olha Mykhailenko, PhD, an assistant professor in the Department of Botany at National University of Pharmacy in Kharkiv, Ukraine, authored the Damask rose essential oil bulletin, and 18 experts from academia, contract analytical laboratories, government agencies, and the botanical and essential oil industries reviewed it before publication. The bulletin includes a review of available literature on Damask rose oil adulteration, data on its adulteration frequency, and analytical approaches to detect adulterants. It also provides information about the production and market importance of Damask rose oil and its therapeutic use and safety.

"It should be no surprise to anyone familiar with perfumery and the essential oil market that many items sold as 'rose oil,' 'attar of rose,' 'rose absolute,' 'Damask rose oil,' etc., are frequently mislabeled and contain adulterants," said Mark Blumenthal, founder and executive director of ABC and founder of BAPP. "Authentic rose oils, like other high-cost essential oils, have been subject to adulteration and fraud for centuries. The new BAPP Damask rose essential oil bulletin is probably the most concise and up-to-date publication that documents this historical and current practice and provides members of the industry with reliable guidance on this ingredient."

The Damask rose essential oil bulletin is the 28th publication in the series of BAPBs and BAPP's 88th peer-

reviewed document. All BAPP publications are freely accessible on the BAPP homepage on ABC's website (registration required). Other essential oils that BAPP has confirmed to be subject to adulteration and fraud include those of English lavender (*Lavandula angustifolia*, Lamiaceae), oregano (*Origanum vulgare*, Lamiaceae), and tea tree (*Melaleuca alternifolia*, Myrtaceae).

About the ABC-AHP-NCNPR Botanical Adulterants Prevention Program

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

Damask rose *Rosa* × *damascena*
Photo ©2024 Steven Foster

Sustainable Herbs Program Begins New Era as Independent Sustainable Herbs Initiative

By ABC Staff

The American Botanical Council (ABC) has announced a new era in the evolution and activities of the Sustainable Herbs Program (SHP). In June 2024, SHP became the independent Sustainable Herbs Initiative (SHI) and will continue under the direction of Founder and Director Ann Armbrecht, PhD.

In 2015, Armbrecht started SHP, which was then called the Sustainable Herbs Project, as a web-based educational effort. The website's homepage asked and answered important questions, including "Do you know where your herbs come from?" and "Do you know why it matters?"

In 2018, at Armbrecht's request, SHP became part of ABC alongside other ABC educational programs and publications, such as *HerbalGram*, HerbClip, the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP), HerbMedPro, and more.

At ABC, under Armbrecht's leadership, SHP grew, added more video-rich educational content to its website, and produced a monthly newsletter, a blog, 42 compelling and popular free webinars that explore many aspects of plant-people relationships, and other educational resources that are relevant to sustainable and regenerative sourcing of herbs and medicinal plants.

Of particular interest to members of the botanical industry is SHP's free 89-page "Sustainability & Regenerative Practices Toolkit Version 2.0." This document provides a wide variety of resources to help herb businesses of any size become more aware of sustainability challenges and enhance their ability to implement sustainable and regenerative practices in sourcing and processing herbs and medicinal plants into finished consumer health products.

SHP also initiated pre-competitive conversations among members of the herb and medicinal plant industry as well as other collaborations to increase sustainable and regenerative consciousness and practices. This shift, from creating educational materials to embracing and expanding collaborative efforts to effect change, led to the evolution of SHP to the new SHI.

This exciting new development represents the increasingly collaborative model that SHP has been using. ABC has been a wonderful home to incubate and help grow SHP and has provided a platform from which this work has transformed from an idea into a fully developed program with support and recognition in the botanical industry.

— Ann Armbrecht, PhD

"Ann Armbrecht and SHP have made an enormous, unparalleled contribution to the awareness and consciousness in the herb and medicinal plant industry about the global imperative of operating businesses in a sustainable and regenerative manner," said Mark Blumenthal, ABC founder and executive director. "SHP's focus has been not only on the value and importance of plants, but also on the value and importance of the people who are involved in producing botanical materials for health products."

Armbrecht said: "This exciting new development represents the increasingly collaborative model that SHP has been using. ABC has been a wonderful home to incubate and help grow SHP and has provided a platform from which this work has transformed from an idea into a fully developed program with support and recognition in the botanical industry. We could never have gotten to where we are without this home.

"I am deeply grateful to Mark Blumenthal, the late Steven Foster, and the ABC staff for their trust in and support of my vision," Armbrecht added. "I am also deeply grateful to the inaugural underwriters who believed in this vision from the outset and provided the financial support needed for it to be developed. Thanks also to the whole community of SHP supporters as well as the individuals who have joined me for the many webinars and conversations we have organized over the past five years.

"As SHI moves more fully into the collaborative work that the next five years will focus on, I look forward to continuing to explore ways to work together with ABC in our shared mission to support the sustainable and ethical sourcing of the medicinal plants on which this industry depends," Armbrecht concluded.

ABC will continue to engage with and support the new SHI and report on its progress and collaborations in ABC publications. ABC is grateful to the ABC Sponsor Member companies that formed the inaugural underwriters who helped launch SHP under the aegis of ABC in 2018 and other underwriters and donors who have supported SHP since then. ABC encourages interested parties to contact Armbrecht at ann@herbsinitiative.org to discuss options and opportunities to support SHI. HG

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The Sustainable Herbs Program Six-Year Impact Report

By Ann Armbrecht, PhD

***Editor's note**: The Sustainable Herbs Program is now known as the Sustainable Herbs Initiative. For more information, see the article on page 24 in this issue.*

INTRODUCTION

A quotation by farmer and writer Wendell Berry inspired me to begin the journey that led to the Sustainable Herbs Program (SHP):

> As a nation, we are struggling with a profound lack of imagination. We don't see the forests being cut down to build our homes, the lakes being drained as we fill our tub. We live on the far side of a broken connection. Healing this broken connection begins with seeing beyond what the market wants us to see.

Several things from this quotation stand out to me: Our disconnection from the processes behind the products we depend on allows us to ignore the impacts of our ways of living. Healing begins with reconnection. And reconnection begins with imagination. These points have guided the direction SHP has taken over the past six years.

I have worked to build connections among people in the industry who are otherwise not easily connected and to bring in the voices and perspectives of people who are not always heard. I have tried to think beyond what we know is needed to bring about change — traceability, transparency, long-term relationships, etc. — and help create the conditions for those connections and practices to be possible. These conditions include listening, mutual respect, honesty, and treating people as people and plants as alive. In this article, I outline what we have been doing to put these ideas in practice.

Over six years, the American Botanical Council's (ABC's) SHP created a solid foundation from which to help change

Dear ABC Members and Other Friends of SHP,

I am pleased to join SHP Founder and Director Ann Armbrecht, PhD, in presenting SHP's Six-Year Impact Report, which is compelling evidence of the timeliness, relevance, and successes of SHP. Ann contacted me in early 2018 to propose that SHP (then known as the Sustainable Herbs Project) become a program of ABC. At that time, Ann was seeking opportunities that could be afforded by becoming part of an established organization with 30 years of demonstrated commitment to medicinal and aromatic plant conservation and sustainability, as evidenced by the many articles on these topics in ABC's peer-reviewed journal *HerbalGram*.

In 2018, SHP officially became a part of ABC and was renamed the Sustainable Herbs Program to denote its longer-term stability. At that time, the vision for SHP also included the insightful participation of our good friend, the late botanist, author, photographer, and longtime ABC Trustee Steven Foster (1957–2022). Acting as the primary point person for ABC, Steven worked with Ann to develop new educational content and projects for SHP, from the time SHP became a program of ABC until his unexpected and untimely death in January 2022.

When we decided to accept Ann's offer for SHP to become part of ABC, it was a virtual "no-brainer" for members of ABC's Leadership Team and Trustees, since Ann's vision for SHP and its engaging, content-rich website reflected much of the existing vision and commitment of ABC. After about six years, SHP has had a remarkable impact on the North American herb industry and extended community by increasing the consciousness and awareness of industry decision-makers regarding the need for increased attention to issues related to conservation, sustainability, and regenerative agricultural practices in the growing and evolving herb industry.

ABC is deeply grateful for the opportunity to have played the role of "incubator" for SHP in its six-year association with ABC. As SHP evolves into a more collaborative program and continues its important and necessary educational activities, ABC looks forward to continuing to support and help enhance its mission and successes.

—Mark Blumenthal, ABC Founder and Executive Director

the ecosystem in which the herb industry works. SHP's goal is to create a space for collaborative relationships that are built on transparency and trust and to work together to build systems for sourcing medicinal plants used in the herbal products industry in ways that honor all life.

The first step in any systems change is seeing the system more clearly to explore the actors and forces that influence decision making. This has been a key focus of SHP's work since I created the Sustainable Herbs Project in 2015. SHP was launched with a focus on storytelling, through video and writing, and bringing in voices that help us see the system from various perspectives. My book, *The Business of Botanicals: Exploring the Healing Promise of Plant Medicines in a Global Industry* (Chelsea Green Publishing, 2021), continues with this work, following herbs from the field to the shelf and outlining a vision for an industry that is rooted in respect for plants, people, and the planet. This vision, which centers on care and stewardship rather than extraction and exploitation, guides SHP.

SHP also has worked to build relationships needed for collaboration. This has been done through three online Learning Labs, co-facilitated with faculty from the Presencing Institute, and two in-person Learning Journeys, as discussed later. These SHP initiatives bring in voices and perspectives of stakeholders from around the world and lay the groundwork needed to develop precompetitive collaborative partnerships.

SHP continues to create and share tools and resources that companies and others can use at any stage of their sustainability journey. These include the SHP webinar series, an SHP supporters-only Brown Bag Discussion series, an updated SHP Toolkit of best practices, and a half-day conference in the spring of 2023 with experts talking about the critical connections between quality and sustainability.

The coming years will build on SHP's work to deepen relationships and facilitate collaboration, because we believe that this is essential for creating the conditions for long-term change.

VISION AND THEORY OF CHANGE

Together, SHP Learning Lab participants developed this mission statement for SHP:

We are committed to:

- Pushing the boundaries of partnerships in the botanical industry;
- Nurturing relationships based on trust, honesty, respect (for people, plants, and planet), and cooperation;
- Supporting companies that source high-quality botanicals in ways that enhance biodiversity, help smallholder farmers and wild-collector communities, and reduce our carbon impact;
- And sharing resources and ideas, asking challenging questions, and exploring out-of-the-box solutions around the values of "earthcare" and ethical partnerships along the value network.

The principles that guide SHP's approach to this work include:

- Changing the system begins with seeing the system. To this end, we work to create educational resources directed at both a general audience and those specific to the herbal products industry.
- Collaboration is key to making the long-term changes needed. It can inspire individuals and companies to take greater risks in addressing the seemingly intractable issues the industry faces and can bring more creativity to the work.
- Many companies know what needs to happen to create ethical and sustainable supply networks. They do not always know how to do it. Examples and case studies can help provide pathways for companies to act.

EDUCATIONAL WORK

SHP Website

SHP's multimedia website follows medicinal plants from their point of origin through the value network and supply chain to the consumer. Through videos, photo essays, and much more, SHP brings the herbal supply chain to life with stories from collectors, processors, traders, and finished-product producers. SHP documents what is required to produce high-quality herbal supplements and other herbal products and outlines the challenges related to quality, sustainability, and economic fairness in the botanical industry.

Since 2018, SHP has produced:

- Short video segments (2–5 minutes) that explore different sectors of the value network through the voices of those who are directly involved in this work. These segments highlight companies working to develop sustainable and fair value networks/supply chains and produce high-quality herbal ingredients.
- In-depth videos (10–12 minutes) that explore specific issues in the herb industry in greater detail and from various perspectives.
- "Exploring Regenerative Herb Farming in Costa Rica," a 21-minute exploration of herb farmers, growing operations, processing facilities, and regenerative farming practices.
- Photographs and background information on the value network/supply chain overall, as well as on issues of quality and sustainability, including the impact of climate change, the growing movement around regenerative agriculture, sourcing plants from the wild, and the importance of relationships through the supply chain.
- A "Take Action" section of SHP's website, with specific steps that consumers, health practitioners, industry companies, and others can take to help support responsible sourcing and processing.
- The SHP Blog, which contains short pieces about various issues that relate to sustainability and the herbal products industry.

Conference: "Why Using Sustainable Herbs Matters"

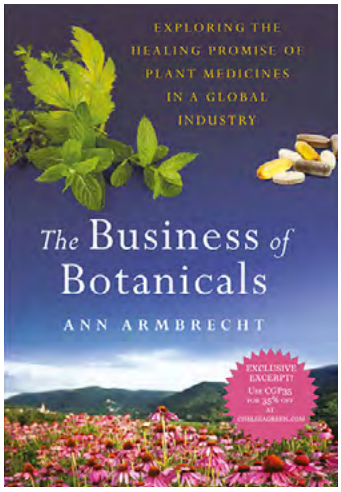
In April 2023, SHP and the Herbal Alliance (UK) co-sponsored a half-day conference titled "Why Using Sustainable Herbs Matters," which was geared primarily to health practitioners. This event had approximately 350 attendees and brought together experts in sourcing and quality to discuss why ethical sourcing is important, not only because it is the right thing to do, but also because it helps ensure the quality of finished herbal products. A recorded version of the conference is available online.

Forest Botanicals Week

In May 2021, SHP collaborated with the Appalachian Harvest Herb Hub to run a week-long public awareness program focusing on the issues around Appalachian forest botanicals. SHP produced nine videos for this program and developed a section on SHP's website dedicated to Appalachian forest botanicals, including the history of trade from this region, key species, and action steps that consumers can take to make a difference. SHP has been invited to be part of a joint grant proposal promoting Appalachian forest botanicals. If awarded, SHP will host three more Forest Botanicals Weeks.

The Business of Botanicals

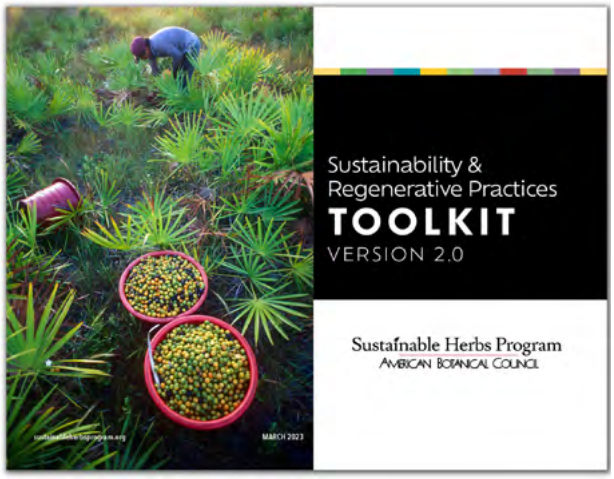
My book, published by Chelsea Green Publishing in 2021, follows herbs from source to shelf to tell the stories of the people and places behind finished herbal products.



TOOLS AND RESOURCES

The SHP Sustainability & Regenerative Practices Toolkit Version 2.0

Released in March 2023, this online toolkit revises the previous version published in 2020 and offers a map to help companies, regardless of size or where they are on their sustainability journey, move forward successfully. The expanded 89-page, information-rich document includes a self-assessment, videos, and resources organized by key topics, along with discussion questions to reflect on the examples and how they apply to the unique challenges of individual companies, along with action steps to deepen the learning experience and other relevant resources.



SHP Webinar Series

In late 2020, SHP began a series of webinars on key issues related to sustainability and the botanical industry. They feature conversations with leaders in the botanical, ethnobotanical, and sustainability communities. As of March 2024, these 40-plus webinars have had more than 50,000 views in total.

SHP Brown Bag Discussion Series

This series encourages presentations and informal discussions among SHP underwriters on important issues. Topics have included risk assessments, measuring Scope 3 carbon emissions, public-private partnerships, and other issues in the global medicinal plant trade. The brown bag discussion on Scope 3 emissions was a follow-up discussion with the presenters for an SHP webinar on the same topic. This brown bag talk in turn led to the formation of the Scope 3 Working Group, as discussed later, which continues to meet.

COLLABORATION

SHP Learning Lab

In September 2021, I developed the SHP Learning Lab, an online multi-stakeholder initiative. Based on practices of the Presencing Institute, a model of awareness-based systems change, the Learning Lab explores how to create an herbal industry that enhances the wellbeing and prosperity of everyone involved in the process, from seed to shelf, not just the end users. Issues raised include: What systemic changes are needed so that this industry is truly rooted in respect for the plants, people, and planet? How can we, as a group of committed stakeholders from around the world, begin to make those changes?

Scope 3 Working Group: A collaboration of seven botanical companies, the group has contracted with Sustainable Ag, a Germany-based consulting group, to collaboratively map Scope 3 emissions for 21 herbs and help identify projects to reduce those emissions. Members of this working group presented on this collaboration at Natural Products Expo West's 2024 Climate Day.

Joint Site Visit to Ginger Farms: This site visit, by Martin Bauer, Pukka Herbs, and Yogi Tea, took place in western Nepal in October 2022. These companies cited their participation in the SHP Learning Lab as what helped establish the trust needed for them to be able to take this trip with competitors, which was unprecedented for each of them.

Selected SHP Presentations and Talks

2024

- "Relationships in Sourcing Medicinal Plants," panel. Natural Products Expo West. Anaheim, California. March 2024.
- "Navigating Scope 3 Data Challenges Through Collaboration," Climate Day panel. Natural Products Expo West. March 2024.

2023

- "We Can't Be Well Until the Planet Is Well: The Role of the Botanical Industry in a Time of Environmental Crisis," keynote presentation. Reimagining Botanicals: Mastering the Market, Naturally Informed. Online. February 2023.
- "Embodied Learning: From Thin Places to the Business of Botanicals." International Conference on the Built Environment. Jindal School of Art and Architecture, India. Online. April 2023.
- "Solving the Supply Chain, Q-and-A with Todd Runestad," SupplySide East. Secaucus, New Jersey. April 2023.
- "From the Business of Botanicals to the Medicine of Place," keynote presentation. Spices and Herbs Global Expo. Rimini, Italy. May 2023.
- "The Role of the Botanical Industry in a Time of Environmental Crisis." Herbal Alliance. Online. July 2023.
- "Precompetitive Collaboration: Scaling Sustainability in the Botanical Industry," keynote presentation; "Not Just a Buzzword: The Keys to Making Sustainability an Actualized Business Practice," session. SupplySide West. Las Vegas, Nevada. October 2023.
- "The Business of Botanicals." Rotary Club of Charleston, West Virginia. November 2023.

2022

- "Medicine of Place and the Business of Botanicals," invited guest lecture. ArborVitae School of Traditional Herbalism. Online. January 2022.
- "Sourcing Botanicals: Elder berry, Ashwagandha, and Boswellia," invited guest lecture. Wintergreen Botanicals. Online. February 2022.
- "Social Equity and Sourcing Botanicals." Emblossom Herbal Business Conference. Online. March 2022.
- "Building Transparency & Sustainability into Supplement Ingredient Supply," panelist; "Plant Intelligence with Gaia Herbs," moderator. Natural Products Expo West. March 2022.

Community Capitals Case Studies: Members of the SHP Learning Lab shared a series of case studies using the community capitals framework to assess the impact of sourcing herbs on broader community values and as a foundation for developing species and country-wide risk assessments. The first case studies were presented as a PDF and a video presentation. Subsequent case studies were presented live to SHP members via Zoom (links to recordings are available to SHP members):

- "Doselva & Gaia Herbs Partnership in Nicaragua" by Ann Armbrecht; Jefferson Shriver, Doselva; and Stephanie Kane, Gaia Herbs
- "The Impact of Devil's Claw [*Harpagophytum procumbens* and *H. zeyheri*, Pedaliaceae] on Indigenous People in Namibia" by Gero Diekmann, EcoSo Dynamics
- "Gotu Kola" [*Centella asiatica*, Apiaceae] by Tyler Wauters, Banyan Botanicals
- "*Pelargonium sidoides*" [Geraniaceae] by Finn Rautenbach and Steve Hurt, Afrigetics Botanicals
- "Rhodiola" [*Rhodiola* spp., Crassulaceae] by Nate Brennan, Pacific Botanicals
- "Regenerative Farming Practices and Fennel [*Foeniculum vulgare*, Apiaceae] in Turkey" by Marin Anastasov, Pukka Herbs

SHP Learning Journeys

SHP hosted its first Learning Journey on herb sourcing in September 2023, bringing together 23 international participants from the botanical industry to experience the people, places, and plants that are central to the herb trade in Appalachia. Though rooted in Appalachia, the issues explored are not unique to the herb trade in that region. The goal of the Learning Journey was to offer a foundation for exploring other elements of sustainability and ethical trade beyond the harvest of Appalachian botanicals.

In June 2024, we held the second Learning Journey in southwest Oregon to experience the roots of organic herb farming in the United States. The journey highlighted the relationship between how herbs are grown and handled and the quality of the finished product. Forty participants joined for four days to listen to the stories of people working to grow, harvest, and manufacture herbal products in this region.

Our goal during the Learning Journeys was to approach seemingly intractable challenges in the botanical industry in a new way. We hoped to inspire change by listening to the voices of the people at the edges of the system, the natural environments in which the herbs grow, and the plants themselves. Unlike most site visits by representatives of herb companies, we were not there to "fix" things or make recommendations — we were there to learn. 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. The biggest outcomes of the Learning Journeys were deepening relationships among participants, experiencing firsthand the challenges facing the industry, and having time to explore ways to address those challenges with others.

The third Learning Journey will take place in Nicaragua in 2024.

Learning Journey participants at Bigelow Lakes, Oregon
Photo by Ann Armbrecht

Group Initiatives and Projects

The Learning Labs and Learning Journeys have helped SHP supporters and collaborators identify key leverage points to bring about systemic change in the herbal products industry and outline areas in which participants can focus. Some current initiatives that have emerged from the SHP Learning Labs and Learning Journeys include:

Ongoing SHP Learning Lab Meetings: The general group of SHP underwriters and other interested parties meet every six weeks to discuss case studies on specific species and issues related to sourcing herbs.

Beyond Certifications Working Group: Certifications have been an important tool for developing and implementing best practices regarding fair and sustainable sourcing. However, there is now an abundance of certifications that are often confusing to consumers and expensive and time consuming for many in the supply network, with the heaviest burden falling on producers. This group is gathering information and identifying ways to best support the continued evolution of certifications as a tool to support high-quality and sustainably, ethically sourced herbs.

Wild Harvesting Plants Working Group: The goal of this working group is to research and identify how to build a prosperous and sustainable wild-collector model that can be applied across regions around the world. The group gathers best practices from different regions to help create a model that ensures the health and longevity of plants and ecosystems and establish viable and long-lived green economies for all wild-collector communities. After conducting research and gathering stories of these wild-harvesting communities, SHP will hold a virtual summit to share best practices and develop and deepen relationships among industry stakeholders working with wild-collection communities around the world. SHP submitted a pilot study proposal to the American Herbal Products Association's Foundation for Education and Research on Botanicals in January 2024.

Primary Processing Working Group: In this group, primary producers can discuss challenges and best practices with each other and first buyers. The objectives of this group are: (1) to share information in an open way, (2) to strengthen the voices of primary processors in the value network, and (3) to share a guide to buyers and brands about how they can best support primary processing companies.

Appalachian Non-Timber Forest Botanicals: SHP is part of "Accelerating Forest Farming in Central Appalachia: Strengthening Market Connections and Collaboration for Long-Term Sector Impact and Sustainability," a planning project of the Appalachian Regional Commission through its Appalachian Regional Initiative for Stronger Economies (ARISE) program to develop a five-year implementation proposal to accelerate the Appalachian non-timber forest product economy.

CONCLUSION

ABC has been a wonderful home to incubate and help grow SHP. The nonprofit has provided a platform from which this work has transformed from an idea into a fully developed program with support and recognition in the botanical industry. We could never have gotten to this point without this partnership. I am deeply grateful to Mark Blumenthal for his trust and support of my vision.

I am also deeply grateful to the inaugural underwriters who believed in this vision from the outset and provided the financial support needed for it to be developed. Thanks also to the whole community of SHP supporters, as well as the individuals who have joined us for the many webinars and conversations we have organized over the past six years.

As SHP moves more fully into the collaborative work that the next years will focus on, I look forward to continuing to explore ways to work with ABC in our shared mission to support the sustainable and ethical sourcing of the medicinal plants on which this industry depends. HG

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

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

Botanical Adulterants Prevention Program

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

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

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Consumer Healthcare Products Association (US)
Council for Responsible Nutrition (US)
Global Curcumin Association (GCA)
International Alliance of Dietary/Food Supplement Associations (IADSA)
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Nonprofit/Professional Associations
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BMC Medicine Retracts Flawed 2013 Article by Newmaster et al on DNA Barcoding to Authenticate Ingredients in Herbal Products

Investigative committee concluded that the journal article was based on fabricated and falsified data

By ABC Staff

***Editor's note**: The lead author of the 2013 article, Steven Newmaster, PhD, did not respond to multiple requests for comment before press time.*

On July 4, 2024, the scientific journal *BMC Medicine*[1] retracted a 2013 paper titled "DNA barcoding detects contamination and substitution in North American herbal products"[2] by Steven Newmaster and colleagues. The retraction is based on a new investigation by the University of Guelph (UG) in Ontario, Canada, where Newmaster has been a botany professor for more than 20 years. The university's investigation found evidence for data fabrication related to the 2013 article. Four of the five authors have contested the investigation's findings. As of July 9, 2024, the Newmaster et al paper had been cited 640 times.

When it was published in October 2013, the DNA barcoding paper created much media interest due to results suggesting that a high percentage (59%) of the 44 tested herbal products, which were sold in North America, contained ingredients not listed on their labels and that 32% were composed solely of adulterating ingredients. After the article's publication, organizations like the nonprofit American Botanical Council (ABC) and the American Herbal Products Association (AHPA), the leading trade association for the herb industry in the United States, criticized the use of DNA barcoding, a relatively new analytical method at the time, without the journal article authors' verifying the results using established compendial analytical methods, such as those in official pharmacopeias.[3-5]

ABC issued a press release[3] on November 5, 2013, two days after an article in *The New York Times* reported on the publication of the flawed paper.[4] Leading the charge for the paper's retraction, the ABC press release headline read, in part, "Article on DNA Barcode Analysis of Herbs Is Flawed, Contains Errors, Creates Confusion, and Should Be Retracted." The ABC release noted that the article had methodological issues, statistical inconsistencies, taxonomic anomalies, and unreliable conclusions.

AHPA issued its highly critical release on the same day.[5] ABC expanded the information in its press release and increased its critique with additional botanical experts as co-authors of an article published in ABC's monthly newsletter HerbalEGram in November 2013.[6]

According to ABC, some of the results reported in the paper did not seem logical or consistent with known information about the herb market in North America. Such illogical information included the asserted substitution of ginkgo (*Ginkgo biloba*, Ginkgoaceae) leaves with black walnut (*Juglans nigra*, Juglandaceae) leaves, or the adulteration of burdock (*Arctium lappa*, Asteraceae) root with a member of the buttercup family (Ranunculaceae). ABC found numerous additional errors in the paper, which strongly suggested that neither the peer reviewers of the paper nor the journal editors had adequate familiarity with medicinal plant science and/or the market and regulations for products containing medicinal plants.

ABC's HerbalEGram critique strongly suggested that the journal article, given its errors and limitations, be "retracted and corrected, revised, and resubmitted for appropriate peer review prior to possible republication."[6]

The New York Times' high-profile coverage of the controversial *BMC Medicine* paper caught the attention of staff members of then-New York Attorney General Eric T. Schneiderman and resulted in his decision to initiate an investigation into the authenticity of botanical dietary supplements sold in the state of New York. Schneiderman's investigation used the same flawed and limited genetic analytical approach.

Schneiderman's scientifically inaccurate and now-discredited investigation led to his office's sending cease-and-desist letters to four major retailers — GNC, Walgreens, Walmart, and Target — claiming that 79% of their store-brand products were "adulterated." In the letters, Schneiderman wrote that "Of late, the topic of purity (or lack thereof) in popular herbal dietary supplements has raised serious health and safety concerns, and also caused this office to take steps to independently assess the validity of industry representations and advertising" and cited the now-retracted paper by Newmaster et al as the basis for the investigation.[7]

Allegations of scientific misconduct by Newmaster, a professor in the Department of Integrative Biology at UG, were first voiced by his former undergraduate student Ken Thompson, PhD, who asserted that Newmaster had, without disclosing, used records from an unrelated study (rather than original data) in a separate 2014 paper that assessed plant diversity using DNA barcoding.[8]

In 2021, eight experts in DNA barcoding and related fields also accused Newmaster of scientific misconduct.

This situation could have been prevented if the UG researchers had used appropriate scientific rigor in their testing protocol and if they had consulted with appropriate botanical science experts before submitting the paper for publication.

The group charged that data essential to the 2013 DNA barcoding paper and two other papers that Newmaster co-authored were "missing, fraudulent, or plagiarized." However, in 2022, a panel consisting of three UG faculty members — an economist, a psychologist, and a veterinary researcher — concluded that Newmaster did not commit scientific misconduct in these three papers, but rather exhibited a pattern of poor judgment.[9]

The eight experts who accused Newmaster, however, appealed the decision to the Secretariat on Responsible Conduct of Research (SRCR), a Canadian federal agency that oversees scientific misconduct matters. A second UG investigative committee, this time including subject experts, eventually concurred with the accusers, except on the issue of plagiarism. The second investigation also suggested that the 2013 paper published in *BMC Medicine* should be retracted,[8] which eventually happened on July 4, 2024.[1] A statement on the *BMC Medicine* website reads that "Steven Newmaster, Dhivya Shanmughanandhan, Subramanyam Ragupathy and Sathishkumar Ramalingam [four of the five co-authors] disagree with this retraction. Meghan Grguric has not explicitly stated whether they agree with this retraction."

In a NutraIngredients-USA article published on July 5, 2024,[10] ABC Founder and Executive Director Mark Blumenthal recalled a few of ABC's original concerns about Newmaster's 2013 paper:

> It would have been simple for Newmaster et al to use microscopy to confirm the [identity] of the powdered materials from the herbal capsules — i.e., to the extent that the material was dried herbal powders, not extracts. And, going a small step further, it would have been very easy … for the researchers to subject these herbal materials to chemical testing via HPLC [high-performance liquid chromatography] and/or HPTLC [high-performance thin-layer chromatography] … to confirm their DNA results. But they didn't do this…. We found this to be astonishing, and very poor science.

According to ABC, this situation could have been prevented if the UG researchers had used appropriate scientific rigor in their testing protocol and if they had consulted with appropriate botanical science experts before submitting the paper for publication. ABC also emphasizes that scientific and medical journals, especially when contemplating publishing articles with such controversial results, should use a more robust and appropriate level of peer review. HG

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Meta-analysis of Clinical Trials Finds Black Cumin Effective in Blood Pressure Management

Reviewed: Kavyani Z, Musazadeh V, Safaei E, et al. Antihypertensive effects of *Nigella sativa* supplementation: An updated systematic review and meta-analysis of randomized controlled trials. *Phytother Res*. August 2023;37(8):3224-3238. doi: 10.1002/ptr.7891.

By Gavin Van De Walle, MS, RDN

Hypertension, or high blood pressure (BP), is a risk factor for heart disease, stroke, and renal failure. In addition to healthy lifestyle changes, various antihypertensive drugs can help manage BP. However, there is growing interest in complementary interventions such as medicinal plants. Black cumin (*Nigella sativa*, Ranunculaceae), also known as nigella, has been used for centuries for various health conditions, including hypertension. Several clinical trials have demonstrated the antihypertensive effects of black cumin, but the data remain inconsistent. As such, this systematic review and meta-analysis of randomized controlled trials (RCTs) aimed to better assess the efficacy of black cumin for lowering BP.

Study Details: At a Glance	
Study Design	Systematic review and meta-analysis
Included Studies	22 randomized controlled trials
Participants	1,527 total participants
Interventions	Various preparations of black cumin seed, seed powder, or oil
Controls	Various placebos
Disclosures	The authors reported no conflicts of interest.

The authors searched for articles on PubMed, Cochrane Library, Scopus, Web of Science, Embase, and Google Scholar from inception until August 20, 2022, using relevant keywords. RCTs that compared the efficacy of black cumin with a control and had a parallel or crossover design with a treatment period of at least two weeks were eligible for inclusion. The authors also evaluated the included trials' risk of bias and the quality and certainty of evidence.

The authors' search initially yielded 2,231 studies. After the removal of duplicates and irrelevant or ineligible articles, 22 studies (1,527 total participants) remained and

were analyzed. The studies were published between 2008 and 2022. Among them, 19 were parallel studies and three were crossovers. The number of participants per study ranged from 32 to 200. Black cumin was administered as seed or seed powder (0.5 to 3 grams/day [g/d]) or oil (0.1 to 4.2 g/d) for four to 16 weeks, and all studies included a placebo. Participants were of a healthy weight, overweight, or obese. Half of the studies were conducted in Iran (n = 11), and the others were based in Indonesia, Pakistan, Saudi Arabia, Malaysia, or Bangladesh. The included trials were rated "moderate" for quality of evidence using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) guidelines.

The pooling of the 22 studies with 29 arms suggested that black cumin supplementation correlated with significantly lowered systolic blood pressure (SBP; weighted mean difference [WMD]: –3.06 mmHg; $P < 0.001$), especially when black cumin oil was administered to participants aged 50 years or older at a dose of at least 2 g/d for eight weeks or less. The authors also found that black cumin supplementation significantly lowered diastolic blood pressure (DBP; WMD: –2.69 mmHg; $P < 0.001$), particularly when black cumin seed or seed powder was administered to participants older than 50 years with a body mass index (BMI) between 25 and 30 kg/m^2 at a dose of 1.5 g/d or lower for eight weeks or less. From the sensitivity analysis, the exclusion of any study did not affect these results, and meta-regression analysis did not reveal a linear relationship between sample size, duration, or dosage and an absolute change in outcomes.

Based on these data, the authors concluded that black cumin supplementation may be useful for controlling both SBP and DBP, particularly when administered daily for eight weeks or less to adults 50 years or older with a BMI of 25-30 kg/m^2. According to the authors, the observed antihypertensive effects of black cumin may be related to its ability to enhance endothelial function by inhibiting angiotensin-converting enzyme (ACE), preserving nitric oxide, blocking calcium channels, and other mechanisms. The authors were unable to determine which black cumin form (seed, seed powder, or oil) was most efficacious. Regarding the studies in which seed powder and oil products were compared, the authors noted that seed powder was found to significantly decrease SBP and DBP compared to controls, but the evidence was "not solid enough" to draw the same conclusion for oil products.

The authors cited limitations related to the heterogeneous clinical status of the participants (i.e., healthy people and people with diabetes, metabolic syndrome, etc.) and that most of the studies were conducted with normotensive individuals. Perhaps the greatest recognized limitation is the uncontrolled presence of various confounding factors related to the duration and stage of hypertension, medications used, treatment adherence, nutritional status, body composition, and physical activity. The authors recommended further trials to help clarify the potential antihypertensive effects of black cumin. HG

Black cumin *Nigella sativa*
Photo ©2024 Steven Foster

Systematic Review and Dose-response Meta-analysis on Use of Psilocybin-assisted Therapy

Reviewed: Perez N, Langlest F, Mallet L, et al. Psilocybin-assisted therapy for depression: A systematic review and dose-response meta-analysis of human studies. *Eur Neuropsychopharmacol.* August 2023;76:61-76. doi: 10.1016/j.euroneuro.2023.07.011.

By Mariann Garner-Wizard

Depression, a mental health condition that is characterized by low energy, mood, and self-esteem, affects more than 300 million people worldwide. A recent resurgence of clinical research has investigated the effects of psychedelics on various conditions, including mood and anxiety disorders. The most-researched psychedelics in psychological treatment are psilocybin (from psilocybin mushrooms, primarily in the genus *Psilocybe*, Hymenogastraceae) and lysergic acid diethylamide (LSD). The pathophysiology of depression is not fully understood, but dysregulation of monoamine neurotransmitters (e.g., serotonin and dopamine) likely contributes to affective symptoms. Conventional antidepressants, LSD, and psilocybin all modulate serotonin transmission.

Randomized controlled trials (RCTs) have shown that psilocybin has promising effects in mood disorders. A meta-analysis (MA) published in 2022 found that psilocybin had a small effect on acute and long-term symptom reduction in people with major depressive disorder (MDD) and those with secondary anxiety and depression after cancer diagnosis.[1] A 2021 meta-analysis determined that the optimal therapeutic dose of psilocybin was 30–35 mg/70 kg body weight for people with MDD or secondary depression.[2]

Study Details: At a Glance	
Study Design	Systematic review and meta-analysis
Included Studies	7 randomized controlled trials
Participants	489 total adults with primary or secondary depression
Interventions	Fixed doses of psilocybin
Controls	Various placebos
Disclosures	Three authors received honoraria and/or consulting fees from pharmaceutical companies, and the rest reported no financial conflicts.

Eligibility and Assessments

Perez et al performed the first dose-response MA to determine near-maximum effective doses of psilocybin for people with primary or secondary depression (i.e., depression associated with a separate medical condition) and relative risks of adverse events (AEs). Eligible RCTs were double-blind, lasted more than one week, compared any fixed dose of psilocybin and any form of placebo, and included adults who were 18–65 years old and had primary or secondary depression. Studies with healthy participants or those lacking control groups were excluded. A search of electronic databases yielded 5,196 initial results. After the removal of duplicates and elimination by title and abstract, seven RCTs (489 total participants) were included in the systematic review and MA.

The authors compared mean changes between baseline and endpoint mean scores on the Hamilton Depression Rating Scale, Montgomery-Åsberg Depression Rating Scale, and other valid scales used in the RCTs. Doses used were converted to total mg/70 kg body weight. The dose-response relationship was calculated using a restricted cubic spline model. Estimates of 50% and 95% effective doses (ED50 and ED95) were extracted from dose-response curves. Separate analyses were conducted for primary and secondary depression.

Risk of bias was assessed using the Cochrane Risk of Bias 2 (RoB2) tool, and most RCTs were found to be of "good" quality. Heterogeneity was quantified using the variance partition coefficient (VPC), a multivariate extension of the I^2 value.

Included Studies

The seven included RCTs were conducted between 2011 and 2023 and had follow-ups of 33 weeks or less (mean 14.1 weeks). Across RCTs, 53.2% of participants were women. The mean age was 44.1 (± 12.8) years overall, and 39.2 (± 11.6) and 56.3 (± 5.3) years in primary and secondary depression subgroups, respectively.

Four RCTs included people with primary depression (n = 366), and one of those studies also included people with treatment-resistant depression and compared different doses of psilocybin. The three remaining studies focused on people with secondary depression (n = 123), including people with acute stress disorder, generalized anxiety disorder (GAD), anxiety disorder due to cancer, or adjustment disorder with anxiety (1 study); with dysthymic disorder, adjustment disorder with anxiety and depressed mood, or an anxiety disorder (1 study); and with adjustment disorder or GAD (1 study).

Psilocybin was manufactured by pharmaceutical companies and taken orally in capsules, with doses ranging from

1.5–50 mg/70 kg. In the RCTs of people with primary MDD, two used two doses of psilocybin and two used one dose. Each of the three RCTs that focused on secondary depression and anxiety used two doses. In RCTs using two doses of psilocybin, time between doses was 2 to 8 weeks (mean 3.54 weeks). In RCTs using one dose, the mean dose was 16.5 mg/70 kg; in those using two doses, the mean was 31.5 mg/70 kg.

Across RCTs, 26.3% of participants had prior experience with psychedelics. One RCT reported time since last use: a mean of 30 years. In all RCTs, participants had not taken antidepressants for at least two weeks before the study began, and psilocybin was given to one person at a time in an individual psychedelic-assisted psychotherapy setting. RCTs provided non-directive psychotherapy support, with one delivering psychedelic psychotherapy training.

Results

Across RCTs, there was a significant dose-response association ($P < 0.0001$) with considerable heterogeneity ($I^2 = 80\%$). According to the authors, ED95 was reached at 41.14 mg/70 kg and ED50 at 10.13 mg/70 kg "when considering both primary and secondary depression" (i.e., for both subgroups combined). Results suggest that doses higher than the ED95 may not be more effective in reducing depressive symptoms. Sensitivity analyses did not detect any significant change in results.

Primary depression and secondary depression subgroup analyses revealed significant dose-responses in favor of reduced anxiety, with considerable heterogeneity (I^2 = 80–95%) and clear differences in ED50 and ED95. For primary depression, the ED95 was found to be 24.68 mg/70 kg and the ED50 was 8.856 mg/70 kg. For secondary depression, the ED95 was 11.4 mg/70 kg and the ED50 was 4.08 mg/70 kg.

In six RCTs that assessed anxiety symptoms (n = 258), with psilocybin doses of 1.5–50 mg/70 kg, there was a significant dose-response association ($P < 0.0001$). Results with the highest doses were associated with considerable heterogeneity ($I^2 = 85\%$). ED95 was reached at 22.78 mg/70 kg and ED50 at 7.58 mg/70 kg.

Adverse Events

To assess AEs, associations between the dose and logarithm of risk ratios (RRs) for somatic and psychological AEs were estimated across RCTs. For somatic AEs, there was a significant dose-association for physical discomfort ($P = 0.023$) with an increasing curve. The RR was +2.35%, suggesting that risk of physical discomfort increased by 1.0235 times with each 1 mg/70 kg psilocybin ingested. There was a similar curve for increased blood pressure (BP; $P = 0.042$) with an RR of +1.04%. However, the threshold at which increased BP was considered an AE differed among RCTs. Visual inspection of the curve suggested a similar association for tachycardia, but it was not significant ($P = 0.09$) and presented a major uncertainty. (RR was +2.02%.) For nausea/vomiting and headache/migraine, bell curves showed significant dose-response associations ($P < 0.001$ and 0.05, respectively), with

Psilocybin mushroom *Psilocybe* sp.
Photo ©2024 Coleman Mullins

respective RRs of +1.25% and +1.42%. Vomiting and migraine were rare; nausea and headache were more common.

Regarding psychological AEs, for the combined risks of prolonged psychosis (> 24 h) and hallucinogen persisting perception disorder, there was a significant dose-response association with a curve that plateaued (P = 0.001) with considerable heterogeneity. (RR was +2.15%.) However, these AEs occurred rarely, and definitions of psychological AEs differed among RCTs, with a total of 12 cases reported among the 465 participants with available data. Panic reactions, paranoid ideation, and general anxiety were transient and "easily handled with immediate psychological support."

Conclusions

In this MA, for both subgroups combined, half of psilocybin's antidepressant effect occurred at doses of 10.13 mg/70 kg, and 95% occurred at 41.14 mg/70 kg. Results should be viewed cautiously, as omitting the one RCT that included treatment-resistant participants reduced the ED95 for depressive symptoms to 24.05 mg/70 kg, suggesting that resistant participants responded most to higher psilocybin doses. The authors hypothesized that people with comorbid or primary anxiety disorders are likely to respond only to lower doses of psilocybin. The optimal psilocybin dose for depression clearly varies depending on the patient population, and caution should be exercised for people presenting any psychiatric condition other than depression.

According to the authors, the antidepressive mechanism of psilocybin therapy may lie in global increases in brain network integration. However, more RCTs, especially in people with secondary and treatment-resistant depression, are needed. As is always the case with psychedelic research, the problem of adequate blinding persists in these RCTs. HG

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1. Li N-X, Hu Y-R, Chen W-N, Zhang B. Dose effect of psilocybin on primary and secondary depression: A preliminary systematic review and meta-analysis. *J Affect Disord*. 2022;296:26-34. doi: 10.1016/j.jad.2021.09.041.
2. Galvão-Coelho NL, Marx W, Gonzalez M. Classic serotonergic psychedelics for mood and depressive symptoms: A meta-analysis of mood disorder patients and healthy participants. *Psychopharmacology (Berl)*. 2021;238:341-354. doi: 10.1007/s00213-020-05719-1.

Review Shows that Traditional Use of Uzara Supports Further Clinical Investigation

Reviewed: Brendler T, Cameron S, Kuchta K. Uzara (*Xysmalobium undulatum*) — An underutilized anti-diarrhoeic and spasmolytic herbal remedy. *J Ethnopharmacol*. January 2024;318:116999. doi: 10.1016/j.jep.2023.116999.

By Samaara Robbins

Uzara (*Xysmalobium undulatum*, Apocynaceae) has a long history of use as a medicine in southern Africa and as a phytopharmaceutical in Germany, but it is little known elsewhere. The authors of a 2024 literature review searched multiple databases (PubMed, Scopus, Web of Science, Science Direct, and Google Scholar) for relevant publications "to corroborate Uzara's status as a safe and efficacious botanical medicine." They also describe the plant's history, traditional uses, and commercialization.

Study Details: At a Glance	
Study Design	Literature review
Purpose	To describe the history, traditional uses, and commercialization of uzara
Disclosures	The authors declared no conflicts of interest.

Uzara, also known as milk bush or milkwort, is a perennial herb in the genus *Xysmalobium*, which includes about 40 species and is endemic to Africa. The species' habitat extends from areas in southern Africa north into eastern Africa, and it grows at altitudes up to 2,000 meters (roughly 6,562 ft). Historical records suggest that uzara may have been first collected around 1673, and it was described in botanical literature about 15 years later. The species' nomenclature has been revised multiple times, most recently in 1999. The word "uzara" does not appear to be derived from any Indigenous languages of the region. Thus, the common name may be invented ("a not uncommon practice of the time," the review's authors note).

Uzara traditionally was used internally as a purgative, emetic, and bitter tonic. Historical records also describe its diaphoretic (sweat-inducing) and diuretic properties. Infusions were used to treat dysentery, diarrhea, stomach dysfunction, and gastrointestinal upset. Tubers were ground and used as snuff to treat headaches. Stem infusions were used as emetics and to treat malaria, fever, typhoid fever, and poisoning. Dry powdered roots were used to treat menstrual cramps. Flower and seed decoctions were used to treat colic. The milky sap was used topically to treat hemorrhoids, warts, rashes, wounds, and corns. The authors note that the common names bitterwortel and, more recently, uzara, were used for a group of plant species with similar properties.

A German soldier, Heinrich Wilhelm Adolph Hopf (ca. 1887–1929), is believed to have introduced uzara to Germany in the early 20th century. Hopf, who contracted severe dysentery while in South Africa, reportedly was cured by chewing uzara roots that he received from a local healer. He brought the roots back to Germany, where he founded Uzara-Werke GmbH in 1910. During World War I, uzara became particularly popular with the German military. Hopf, who adopted British citizenship while in Africa, was quickly interned in 1914, and he left Germany in poor health toward the end of the war. In 1924, Rudolf Braun (1889–1975), who became a prominent Nazi functionary, took ownership of Uzara-Werke and ran the company until the 1970s, when he sold the business to Stada Arzneimittel AG (Bad Vilbel, Germany). Braun formed an unlikely relationship with a South African Jewish family who supplied uzara to the German company. The herb's identity remained undisclosed until 1951. Records also indicate its use in Italy, Sweden, and the Netherlands. Uzara is still sold as a Stada-brand over-the-counter drug to treat diarrhea in the German and eastern European markets.

The root contains multiple cardenolides and glycosides (specifically uzarigenin, uzarin, xysmalogenin, and xysmalorin), which have been linked to uzara's pharmacological effects. Animal studies have shown that uzara extracts can elicit a relaxation response in the gastrointestinal tract, inhibit peristalsis, and constrict the organs. Further studies have demonstrated similar spasmolytic effects on the uterus.

Uzara's efficacy and safety are supported by dozens of clinical trials, observational studies, and case reports. While cardiac glycosides are generally known to be toxic, those in uzara have been shown to be safe, so much so that the modern phytopharmaceutical is considered suitable for use in children.

The authors conclude that based on historical evidence, "uzara research offers a plethora of opportunity for further investigation." Modern studies could provide an opportunity for new drug therapies. While more clinical studies are needed to corroborate historical and traditional uses, sufficient evidence supports uzara's use as an antidiarrheal medication. HG

Uzara *Xysmalobium undulatum*
Photo ©2024 SA Plants

40 YEARS of HERBALGRAM

PART 4: The Fourth Decade (2013–2023)

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 *has included a series of timelines of each of the magazine's first four decades in print. This issue's timeline explores the fourth decade of* HerbalGram *— from 2013 to 2023 — 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.*

2013

- ABC marks its 25th anniversary.
- ABC celebrates 30 years of *HerbalGram*.

#98 HerbalGram (Summer 2013)

Issue 98

Article Highlights

"Exploring the Peripatetic Maze of Black Cohosh Adulteration"

In one of the first articles for the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP), herb expert Steven Foster reviews the nomenclature, distribution, chemistry, market status, and safety of this native American medicinal plant (*Actaea racemosa*, Ranunculaceae) and its adulteration with lower-cost species of *Actaea* from China.

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

In this Herbal Legacy Company article, Tyler Smith profiles the German phytomedicine manufacturer, which was founded in 1866 and pioneered the first clinically tested, standardized herbal extract made from ginkgo (*Ginkgo biloba*, Ginkgoaceae) leaf.












#99 HerbalGram (Fall 2013)

HerbalGram Happenings

- *HerbalGram* introduces "Photo Finish," which features a reader-submitted plant photo with a brief description on the last page of the magazine. The first winning image depicts pulsatilla (*Pulsatilla vulgaris*, Ranunculaceae).

Issue 99

Article Highlights

"Botanical New Drug Applications: The Final Frontier" by Freddie Ann Hoffman, MD, and Steven R. Kishter, MD, DDS

Experts in food and drug law review the US Food and Drug Administration (FDA) policy for abbreviated procedures for the approval of new drugs from chemically complex botanical preparations.

"Cannabis and Schizophrenia" by Lindsay Stafford Mader

"Herbs and Erectile Dysfunction: A Review of Traditional Use and Modern Clinical Evidence" by Linda Woolven and Ted Snider

#100 HerbalGram (Winter 2013)

HerbalGram Happenings

- At 104 pages, the 100th issue of *HerbalGram* is the biggest issue to date.

Article Highlights

"Dr. Sanjay Gupta's *WEED* Documentary: A Critique"

Lindsay Stafford Mader reviews the strengths and shortcomings of *WEED*, a television special that Sanjay Gupta, MD, hosted on CNN.

"A Preliminary Analysis of the Botany, Zoology, and Mineralogy of the Voynich Manuscript"

Arthur O. Tucker, PhD (1945–2019), and Rexford H. Talbert propose a geographic origin for the cryptic Voynich Manuscript, linking identification of plants and animals to species found primarily in Mexico. Their analysis reveals potential new research directions for the manuscript.

"Reflections on 100 Issues of *HerbalGram*"

In this retrospective, Steven Foster explores the evolution and impact of ABC's flagship publication. The feature also includes a timeline of important events in the history of ABC and the herbal medicine community and notable articles from each of the magazine's first 100 issues.

"Rooted in History: The Story of ABC's Case Mill Homestead"

Tyler Smith tells the story of ABC's historic Case Mill Homestead, created by land grants by the Republic of Texas in the 1840s. The feature is illustrated with original 8x10 wet plate collodion photographs by *HerbalGram* Art Director Matthew Magruder.

2014

- ABC Finance Coordinator Cecelia Thompson celebrates 25 years at ABC.
- Hannah Bauman, currently the associate editor of *HerbalGram*, joins the editorial staff.
- ABC publishes the 500th issue of HerbClip.

#101 HerbalGram (Spring 2014)

HerbalGram Happenings

- ABC receives *Nutrition Business Journal*'s (NBJ's) 2013 Education Achievement Award. NBJ notes that the "100th issue of *HerbalGram* marks a long-term commitment to advancing education in the herb and botanicals industry."

Article Highlights

"Notes on the Ethnobotany of Warfare"

Ethnobotanist Mark Plotkin, PhD, discusses the role of plants as both boon and bane in warfare since ancient times.

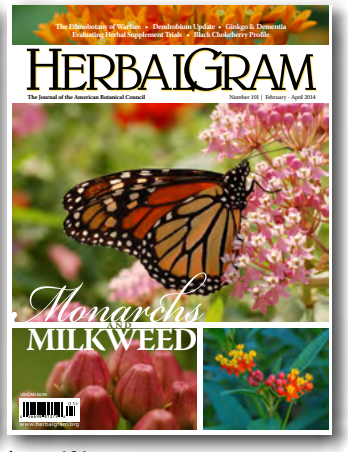
"Milkweed: Medicine of Monarchs and Humans"

Lindsay Stafford Mader explains the importance of milkweeds (*Asclepias* spp., Apocynaceae) as a food and medicine to monarch butterflies and humans.

"Evaluating the Botanical Dietary Supplement Literature" by Joseph Betz, PhD and Mary Hardy, MD

"New Analyses Fuel Controversy over 'Dendrobium Extract'-Containing Sports Supplements" by Tyler Smith

Issue 100



Issue 101

Issue 102

#102 HerbalGram (Summer 2014)

Article Highlights

"Ethnobotanical Records from a Corporate Expedition in South Africa in 1685"

South African ethnobotanist Nigel Gericke traces a 17th-century expedition of the Dutch East India Company and the plants they encountered and documented during the journey.

"How Do We Save Wild American Ginseng?" by Robert Beyfuss

Beyfuss (1950–2023), an American ginseng (*Panax quinquefolius*, Araliaceae) aficionado and county extension agent, makes the case for ensuring the viability and sustainability of this wild North American medicinal plant.

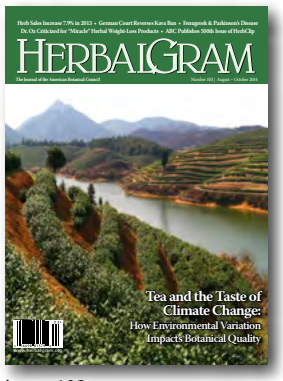
"2013 Efforts to Improve Sustainable Management of Wild American Ginseng Harvest"

Haley Chitty, the American Herbal Products Association's (AHPA's) director of communications at the time, describes efforts by the US Fish and Wildlife Service and state regulatory changes that were designed to help conserve wild American ginseng.

#103 HerbalGram (Fall 2014)

Article Highlights

"Tea and the Taste of Climate Change: Understanding Impacts of Environmental Variation on Botanical Quality"



Issue 103

In this cover article, professor and author Selena Ahmed, PhD, documents the effects of climate change on the taste and quality of tea (*Camellia sinensis*, Theaceae) in China and, by extension, potential effects on other medicinal plants.

"German Court Ruling Reverses Kava Ban" by Mathias Schmidt, PhD

#104 HerbalGram (Winter 2014)

Article Highlights

"Perspectives on the Potential Hepatotoxicity of Various Herbs, Including Green Tea Extract"

ABC Chief Science Officer Stefan Gafner, PhD, and ABC Founder and Executive Director Mark Blumenthal report on the incidence of and assessment process for herbal dietary supplement-induced liver injury and the safety profile of herbal products such as green tea extract.

"Star-crossed: The Rise and Fall of Anatabloc®"

Tyler Smith describes the legal troubles surrounding a former Virginia governor who promoted a donor's company that sold dietary supplements containing anatabine, a minor alkaloid found in small quantities in tobacco (*Nicotiana* spp., Solanaceae).

"Crafting Dietary Supplement Warnings" by Paul D. Rubin, Lee S. Gayer, Esq., and Jessica M. Band, Esq.

Rubin, a veteran food and drug attorney, and co-authors comment on the challenges faced by industry in disclosing potential safety risks on herbal dietary supplement labels.

Issue 104












"Residual Methanol in Botanical Dietary Ingredients: Perspectives of a Manufacturer" by Deepak Mundkinajeddu, PhD, and Amit Agarwal, PhD

Botanical experts provide perspective on naturally occurring levels of methanol in various herbal ingredients and note concerns raised by some regulators.

2015

- Connor Yearsley, currently the assistant editor of *HerbalGram*, joins the editorial staff.
- HerbalEGram (HEG) debuts its popular "Food as Medicine" article series under the direction of Hannah Bauman, now the managing editor of HEG.
- Thomas Newmark becomes president of ABC's Board of Trustees.
- ABC celebrates 10th annual HerbDay.

#105 HerbalGram (Spring 2015)

Issue 105

Article Highlights

"*Helichrysum italicum* [Asteraceae]: The Sleeping Giant of Mediterranean Herbal Medicine"

Giovanni Appendino, PhD, and colleagues explore the curry plant, a Mediterranean herb with potential applications in perfumery, aromatherapy, and dietary supplements.

"Maca [*Lepidium meyenii*, Brassicaceae] Madness: Chinese Herb Smugglers Create Chaos in the Peruvian Andes" by Tyler Smith

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

In *HerbalGram*'s second Tea Market Report, ABC's Ashley Lindstrom and Mark Blumenthal worked with market analysts Brian Keating (1956–2018) and Mary Ellen Lynch to assess the state of the US market for the world's second-most-consumed beverage.

Guest Editorial: "Sources of Data for Botanical Classification and Identification" by Arthur O. Tucker

#106 HerbalGram (Summer 2015)

HerbalGram Happenings

- This issue includes several articles that focus on the New York attorney general's controversial and scientifically flawed investigation of herbal supplements.

Issue 106

- Tyler Smith becomes managing editor after Ashley Lindstrom, who served as *HerbalGram*'s managing editor for issues 88–105.

Article Highlights

"The Supplement Saga: A Review of the New York Attorney General's Herbal Supplement Investigation" by Tyler Smith

"Botanical Integrity: The Importance of the Integration of Chemical, Biological, and Botanical Analyses, and the Role of DNA Barcoding"

In the first of two articles, scientists from the University of Illinois Chicago (UIC)/National Institutes of Health (NIH) Center for Botanical Dietary Supplements Research explore the potential benefits and pitfalls of DNA barcoding analysis.

"Understanding DNA Barcoding" by Stefan Gafner

"Safety and Quality Marks Are the Goal after UK Cracks Down on St. John's Wort [*Hypericum perforatum*, Hypericaceae] Products"

This is the first article by guest contributor Karen Raterman.

#107 HerbalGram (Fall 2015)

HerbalGram Happenings

- Managing Editor Tyler Smith becomes lead author of *HerbalGram*'s annual Herb Market Reports.

Article Highlights

"Past and Future Research at National Center for Complementary and Integrative Health with Respect to Botanicals" by Craig Hopp, PhD

"The Biochemical System Controlling the Effects of Cannabis: An Introduction"

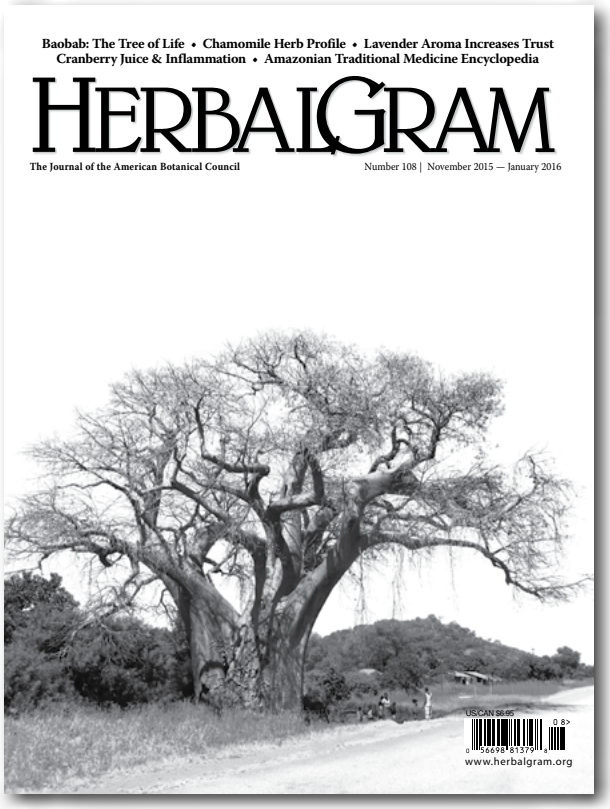
Jahan Marcu, PhD, then the senior scientist of Americans for Safe Access, reviews the endocannabinoid system and the role it plays in human health.

"Medicinal Plant Scientist Becomes President of Mauritius" by Hannah Bauman

"Assessing Potential Herb-Drug Interactions in the Use of Herbal Dietary Supplements" by Amy Roe, PhD, DABT

Issue 107

Issue 108



#108 HerbalGram (Winter 2015)

HerbalGram Happenings

- *HerbalGram* features its first black-and-white cover photo (of a baobab [*Adansonia digitata*, Malvaceae] tree) since the publication first introduced color in the late 1980s.

Article Highlights

"Amazonian Tribe Compiles 500-Page Traditional Medicine Encyclopedia" by Connor Yearsley

"Baobab: The Tree of Life — An Ethnopharmacological Review"

African medicinal plant expert Simon Jackson, PhD, and Anabel Maldonado address the significant nutritional and health benefits of the once-overlooked baobab tree.

"Big Island, Small Planet: Challenges and Failures in Conserving Hawaiian Sandalwood Trees"

Ethnobotanist Susan Leopold, PhD, describes the history, ecological threats, and regulation of threatened sandalwood (*Santalum* spp., Santalaceae) trees.

Guest Editorial: "Commercial Labeling of Medicinal Mushroom Products" by Jeff S. Chilton

A veteran mycology expert discusses different stages of the life cycle of fungi and how these differences may affect product labeling.

2016

- ABC launches a complete digital archive of *HerbalGram* issues on its website.
- ABC launches "Herbal MediaWatch" online news feed.

#109 HerbalGram (Spring 2016)

Article Highlights

Issue 109

"Tainted Tea: The Abysmal Conditions on Assam's Tea Estates" by Connor Yearsley

"Iboga [*Tabernanthe iboga*, Apocynaceae] Root: Dynamics of Iboga's African Origins and Modern Medical Use" by Jonathan Dickinson

"Yaupon Holly: A North American Plant Source of Caffeine"

Herbalist and author Vickie Shufer reviews the history, nomenclature, and market status of yaupon (*Ilex vomitoria*, Aquifoliaceae), an increasingly popular herbal source of caffeine.

"Flax for Fido and Seaweed for Spot: The Growing Market for Herbal Pet Care in the United States"

In *HerbalGram*'s second Pet Supplement Market Report, Hannah Bauman highlights the growing natural medicine market for pets and includes sales figures for the top-selling herbal supplements, treats, and snacks for companion animals.

"Botanical Integrity: Part 2" by the UIC/NIH Center for Botanical Dietary Supplements Research

"Ginkgo Extract Adulteration in the Global Market: A Brief Review" by Stefan Gafner

Produced under the aegis of BAPP, this article documents the growing body of scientific literature that indicates relatively widespread adulteration of ginkgo leaf extract materials.

#110 HerbalGram (Summer 2016)

Article Highlights

Issue 110

"Artemisinin: A Nobel Prize-Winning Antimalarial from Traditional Chinese Medicine"

Connor Yearsley provides an in-depth review of the history, chemistry, sustainability,












and therapeutic potential of artemisinin, an antimalarial compound produced by the traditional Chinese medicinal herb *qinghao* (*Artemisia annua*, Asteraceae). Half of the 2015 Nobel Prize in Physiology or Medicine was awarded to Chinese phytochemist Tu Youyou for her role in artemisinin's discovery.

"Cannabis Taxonomy: The 'Sativa' Vs. 'Indica' Debate"

Cannabis experts Robert C. Clarke and Mark D. Merlin, PhD, explore a controversial topic in *Cannabis* taxonomy: Should *C. sativa* and *C. indica* be considered separate species?

"Saffron: The Salubrious Spice" by Linda Woolven and Ted Snider

This cover story by the Canadian husband-and-wife herbalist team reviews the clinical trial data on saffron (*Crocus sativus*, Iridaceae), including for mild-to-moderate depression.

"Interactive Map of Amazonian Travels of Noted Ethnobotanist Richard E. Schultes" by Mark Plotkin

#111 *HerbalGram* (Fall 2016)

Article Highlights

"Toward an Understanding of Ginseng Adulteration: The Tangled Web of Names, History, Trade, and Perception"

In this in-depth cover article, which spans 22 pages and includes 112 references, Steven Foster explores the nomenclature, taxonomy, and trade history of Asian ginseng (*Panax ginseng*) and American ginseng.

Issue 111

"Kew's *State of the World's Plants* Report: A Review" by Connor Yearsley

"The Rise and Fall of Maca in China" by Eric Brand, LAc

Brand, an expert on traditional Chinese medicine, reports on the market for the Peruvian herb maca in China.

#112 HerbalGram (Winter 2016)

Issue 112

Article Highlights

"Kratom: Medicine or Menace?"

In this cover article, Connor Yearsley describes proposed US regulatory actions against kratom (*Mitragyna speciosa*, Rubiaceae) and summarizes the clinical evidence, addiction potential, nomenclature, and chemistry of the leaves of this Southeast Asian tree.

"Value Chains of Botanicals and Herbal Medicinal Products: A European Perspective"

Professors Anthony Booker, PhD, and Michael Heinrich, PhD, discuss the need for botanical value chains, the benefits of vertical integration, and the process of traditional herbal registration in the European Union.

"Traditional Medicinals Foundation's Social Initiatives Empower Botanical Farmers" by Hannah Bauman

"Adulteration of Pomegranate [*Punica granatum*, Lythraceae] Products — A Review of the Evidence" by John H. Cardellina II, PhD, and Mark Blumenthal

2017

- Bethany Davis, Richard Kingston, PharmD, and Holly Shimizu join ABC Board of Trustees.

#113 HerbalGram (Spring 2017)

Issue 113

Article Highlights

"Medicinal Fungi: Chemistry, Activity, and Product Assurance"

Before the so-called "shroom boom" of the 2020s, Christopher Hobbs, PhD, explored the history, clinical evidence, and therapeutic potential of medicinal fungi.

"*Census of Greek Medical Manuscripts* Illuminates Centuries of Herbal Medicine Practice" by Hannah Bauman

"NASC Preferred Supplier Program Focuses on Quality Standards in Animal Supplement Industry" by Connor Yearsley

This article reviews the National Animal Supplement Council's (NASC's) program to raise standards for supplements produced for companion animals.

#114 HerbalGram (Summer 2017)

Article Highlights

"Fredi Kronenberg (1950–2017)"

Hannah Bauman pays tribute to longtime ABC Board of Trustees member Fredi Kronenberg, PhD, whose life was dedicated to improving women's health through botanical research.

"The Venus Flytrap: Conserving the Carnivorous Curiosity"

Connor Yearsley describes the conservation status of the Venus flytrap (*Dionaea muscipula*, Droseraceae), a native US plant with potential medicinal compounds.

"A Snapshot of the Modernization of Traditional Chinese Medicines in Hong Kong: A Fulbright Scholar's Perspective" by Clara B.S. Lau, PhD, and Edward J. Kennelly, PhD

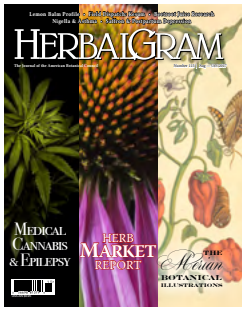
Issue 114

#115 HerbalGram (Fall 2017)

Article Highlights

"The Illustrious Life of Maria Sibylla Merian"

In this pictorial, Betsy Kruthoffer of the Lloyd Library and Museum shares plant illustrations from the influential but little-known 17th-century artist Maria Sibylla Merian, whose work focused on relationships between insects and plants.



Issue 115

"In the Land of Kesum [*Persicaria minor*, Polygonaceae]" by Chris Kilham

"The Use of Medical Cannabis Preparations to Treat Epilepsy"

Connor Yearsley discusses clinical evidence of cannabis preparations for treatment-resistant epilepsy, including a then-new study of Epidiolex® for Dravet syndrome.

Guest contributor Karen Raterman highlights new research related to two trending herbal ingredients:

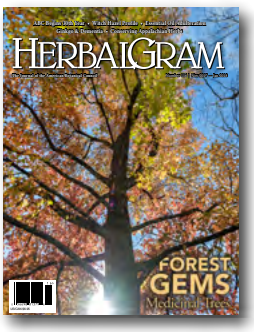
- "New Buzz about Beets [*Beta vulgaris*, Amaranthaceae]: Enhancing Sports Performance and Cognitive Function"
- "New Research Bolsters Evidence of Hot Chili Peppers' [*Capsicum* spp., Solanaceae] Health Benefits"

#116 HerbalGram (Winter 2017)

Article Highlights

"Forest Gems: Exploring Medicinal Trees in American Forests"
In this cover article, Steven Foster profiles six medicinal trees that are native to eastern North America. The pictorial features 20 of Foster's photographs.

"New United Plant Savers Center Seeks to Conserve Medicinal Plants of Appalachia"
Connor Yearsley reports on plans for the then-new Center for Medicinal Plant Conservation at the United Plant Savers Sanctuary in Rutland, Ohio.



Issue 116

2018

- ABC begins its 30th year.
- Botanical Adulterants Program changes name to Botanical Adulterants *Prevention* Program.
- July: ABC celebrates 20 years of its headquarters at the historic Case Mill Homestead in East Austin.







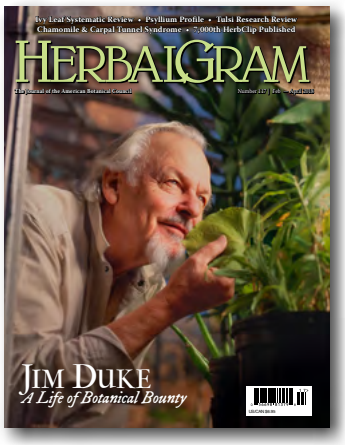





- November: ABC announces its new relationship with the Sustainable Herbs Program (SHP), which was founded in 2015 by Ann Armbrecht, PhD.

#117 HerbalGram (Spring 2018)

Article Highlights



Issue 117

This issue features multiple tributes to esteemed ethnobotanist James A. Duke, PhD, who was also a founding member of ABC's Board of Trustees:

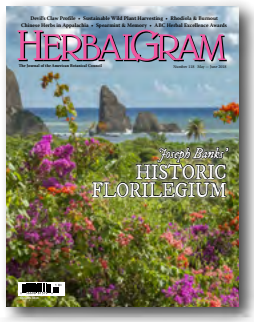
- "James A. Duke — A Diverse Life of Botanical Bounty" by Steven Foster
- "From the Desk of James A. Duke" by Helen Lowe Metzman
- Dear Reader: "Remembering Jim Duke" by Mark Blumenthal

"Ivy Leaf Extracts for the Treatment of Respiratory Tract Diseases Accompanied by Cough"

German scientists Ann Katharin Reckhenrich, PhD, Andrea Klüting, PhD, and Markus Veit, PhD, review the evidence of ivy (*Hedera helix*, Araliaceae) leaf extracts for respiratory tract infections.

#118 HerbalGram (Summer 2018)

Article Highlights



Issue 118

"The Botanical Endeavour of Sir Joseph Banks: Historic Prints from His Florilegium Now Available Like Never Before"

This 20-page cover article by Connor Yearsley features stunning botanical prints that resulted from the work of English botanist and naturalist Sir Joseph Banks and his team during Captain James Cook's first voyage around the world in the 18th century.

"Appalachian Herb Growers Consortium: Fostering Chinese Herb Cultivation in the United States" by Karen Raterman

"Sustainable Harvest of Wild Plant Populations" by Charles M. Peters, PhD

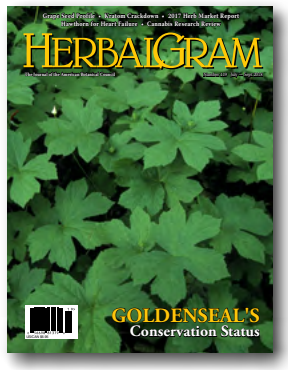
"AHPA's Self-Regulatory Initiatives in the US Herb Industry"

Karen Raterman describes AHPA's challenges, successes, and lessons learned regarding industry self-regulation over the organization's history.

#119 HerbalGram (Fall 2018)

Issue 119

HerbalGram Happenings



- *HerbalGram* celebrates 35 years of publication.

Article Highlights

"Protecting Goldenseal: How Status Assessments Inform Conservation"

Leah E. Oliver and Danna J. Leaman, PhD, describe two conservation ranking methods and the criteria used to assess goldenseal's (*Hydrastis canadensis*, Ranunculaceae) conservation status. The expansive article includes more than 90 references.

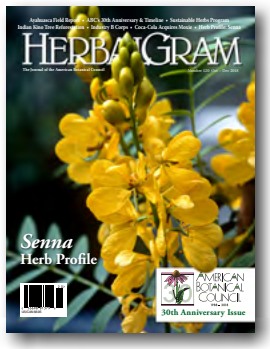
"Herb Profile: Grape Seed (*Vitis vinifera*, Vitaceae)"

This is the last Herb Profile by ABC Special Projects Director Gayle Engels, who co-authored more than 50 Herb Profiles, beginning with a profile of pine (*Pinus* spp., Pinaceae) in issue 65.

"Kratom Crackdown: FDA Intensifies Warnings with Limited, Inconclusive Data" by Connor Yearsley

#120 HerbalGram (Winter 2018)

HerbalGram Highlights



Issue 120

- ABC publishes 30th anniversary issue of *HerbalGram*.
- For the first time, *HerbalGram* includes a special pullout section of the magazine with a timeline of ABC's 30-year history.

Article Highlights

"Ayahuasca Vine Harvesting in the Peruvian Amazon"

In this field report, herbal expert Chris Kilham assesses the state of the ayahuasca vine (*Banisteriopsis caapi*, Malpighiaceae) supply in Peru based on his recent travels.

"Committed to Higher Standards: Natural Products Companies Turn to B Corp Certification" by Karen Raterman

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

Connor Yearsley dives into Coca-Cola's acquisition and the unusual history of Moxie®, a soda flavored with gentian (*Gentiana* spp., Gentianaceae) root extract and one of the oldest bottled soda brands in the United States.

"Indian Kino Tree [*Pterocarpus marsupium*, Fabaceae] Reforestation: Sami-Sabinsa Group Funds Major Conservation Project in India" by Connor Yearsley

#121 HerbalGram (Spring 2019)

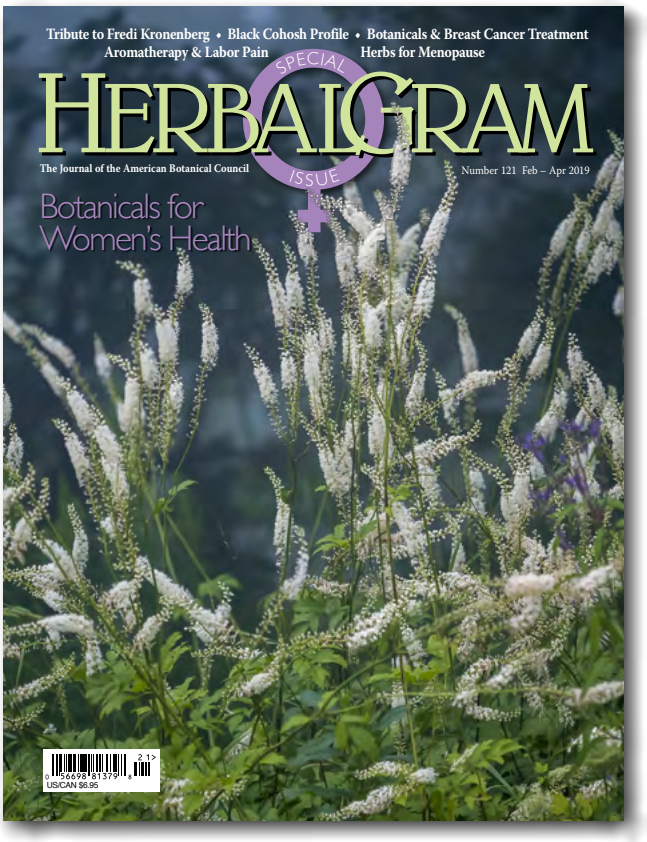
HerbalGram Happenings

- Issue 121 focuses on botanicals for women's health.
- Aviva Romm, MD, and Tieraona Low Dog, MD, serve as guest editors.
- Thomas Brendler, PhD, joins longtime Herb Profile co-author Josef Brinckmann as the new co-author of the series. They profile black cohosh in this issue.

Article Highlights

"A Botanical Approach to Symptom Management During and After Breast Cancer Treatment" by Lise Alschuler, ND

"Fredi Kronenberg: An Enthusiastic Scientist and Faithful Friend" by Adriane Fugh-Berman, MD, and Christine Wade, MPH



Issue 121

"Ancient Medicine for Modern Women: A Q&A with Herbal Physicians" by Aviva Romm and Tieraona Low Dog

"Barbara 'BJ' Johnston: 1932–2018"

Hannah Bauman memorializes Johnston, the first managing editor of *HerbalGram*, who worked for the magazine for about 16 years.

#122 HerbalGram (Summer 2019)

Article Highlights

Issue 122

"A Modern State-Federal Framework for a Regulated US Cannabis Industry"

Josef Brinckmann and policy advisor Tami Wahl propose a new US framework for cannabis regulation that prioritizes state autonomy under the regulation of the US Department of Agriculture instead of the FDA.

"*The Ethnopharmacologic Search for Psychoactive Drugs*: Reflections on a Book that Changed My Life" by Dennis J. McKenna, PhD

"Kratom Research Grant: NIDA Gives University of Florida $3.5 Million to Study Southeast Asian Tree" by Connor Yearsley

#123 HerbalGram (Fall 2019)

Article Highlights

"The Potential of Blockchain for Herbal Supply Chain Management"

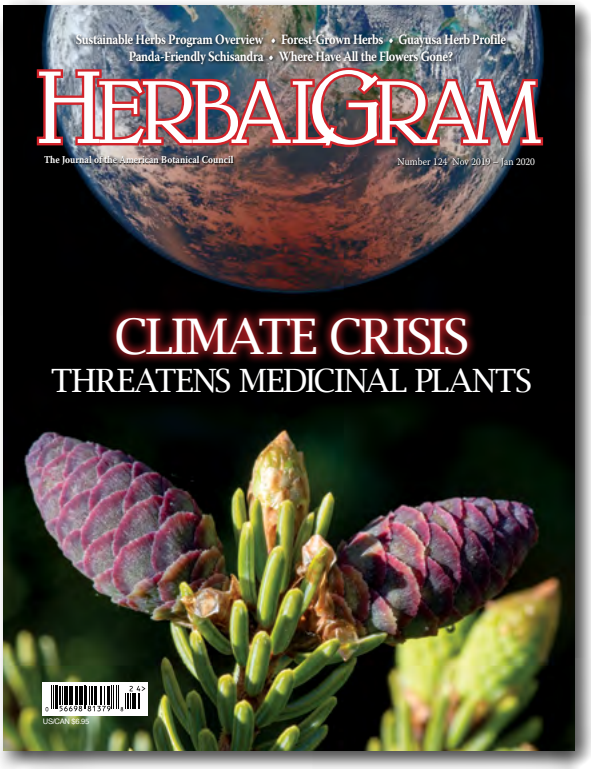
Karen Raterman writes about the growing interest in blockchain technology and how it may help the herbal industry track ingredients, verify certifications, and increase product transparency.

"FairWild Project in India Is a Win-Win-Win for *Terminalia* Trees, People, and Hornbills" by Connor Yearsley

"A Preliminary Sustainability Report of Ayahuasca Vine in the Peruvian Amazon" by Chris Kilham

Issue 123

Issue 124



#124 HerbalGram (Winter 2019)

HerbalGram Happenings

- This themed issue focuses on the effects of the climate crisis on medicinal and aromatic plants.

Article Highlights

"The ABC Sustainable Herbs Program: An Overview" by Ann Armbrecht

"Plants in Peril: Climate Crisis Threatens Medicinal and Aromatic Plants"

In this follow-up to *HerbalGram*'s 2009 cover article about climate change and medicinal plants, the current editorial staff reports on new data and insights that emerged since then and the increasingly dire situation for many species.

"Investing in Forests & Communities: A Pathway to a Sustainable Supply of Forest Herbs in the Eastern United States" by Holly Chittum, MS, Eric Burkhart, PhD, John Munsell, PhD, and Steven Kruger, PhD

"Schisandra [*Schisandra sphenanthera*, Schisandraceae] and the Panda: Sustainable Management and Trade in Wild-harvested Schisandra in China" by Mariann Garner-Wizard

2020

- ABC's Sustainable Herbs Program releases a Sustainability Toolkit on Earth Day's 50th anniversary.
- SHP launches new webinar series.

#125 HerbalGram (Spring 2020)

Article Highlights

"Can Fungi Ease Disease in Bees?" by Connor Yearsley

"Sustainable Harvesting of Dragon's Blood (*Croton lechleri*) in Peru"

Issue 125

Ethnobotanist Steven R. King, PhD, and colleagues discuss the sustainable management and use of the dragon's blood tree (*Croton lechleri*, Euphorbiaceae), a medicinal plant native to tropical forests in the Peruvian Amazon.

"Free Fire Cider: Traditional Remedy Remains Generic after Landmark Case"

Hannah Bauman reports on a legal win for herbalists after a court ruled that the name of the popular spicy remedy cannot be trademarked.

"Controversy in the Conservatory: Iboga Confiscation and Professor Suspensions at Ohio's Miami University" by Karen Raterman

#126 HerbalGram (Summer 2020)

Article Highlights

"Herbal Companies Brace for Supply Chain Impacts of COVID-19" by Karen Raterman

"Quality Standards for Botanicals — The Legacy of USP's 200 Years of Contributions"

Issue 126

Josef Brinckmann and colleagues provide an in-depth look at the United States Pharmacopeia, including its history, evolution, and impact.

"Preserving Peyote [*Lophophora williamsii*, Cactaceae]: Native American Church Leaders Ask that the Sacred Cactus Not Be Decriminalized" by Connor Yearsley

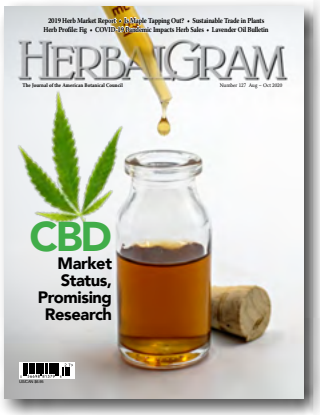
"*Fantastic Fungi* Film Explores the Magic and Mystery Underneath Your Feet" by Connor Yearsley

#127 HerbalGram (Fall 2020)

Article Highlights

"Cannabidiol: A Race to Relief"

Leading cannabis expert Ethan Russo, MD, and cannabis advocate Nishi Whiteley review the history of cannabidiol (CBD) and scientific and clinical evidence supporting its potential health benefits.



"Is Maple Tapping Out?"

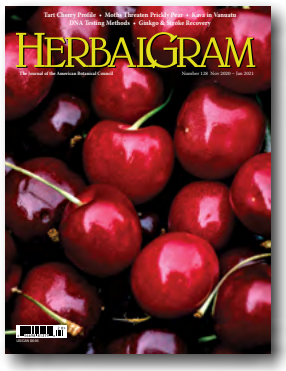
Issue 127

Connor Yearsley reviews the effects of climate change on sugar maple (*Acer saccharum*, Sapindaceae) trees and how maple syrup makers may be affected.

"Strengthening Sustainable International Trade in Medicinal and Aromatic Plants" by Patricia De Angelis, PhD, and Anastasiya Timoshyna

Issue 128

#128 HerbalGram (Winter 2020)



Article Highlights

"Prickly Pear [*Opuntia* spp., Cactaceae] Predicament: Cactus Moth Arrives in Texas" by Connor Yearsley

"The Rising and Falling Fortunes of Vanuatu Kava"

In this field report, Chris Kilham describes the state of the kava (*Piper methysticum*, Piperaceae) trade in Vanuatu in the South Pacific.

"DNA Testing Methodologies in Botanical Quality Control Programs" by David L. Erickson, PhD

"Four Elements Organic Herbals Receives USDA Value-Added Producer Grant" by Hannah Bauman

"*Kiss the Ground* Documentary Explores Promise of Regenerative Agriculture" by Ann Armbrecht

"Less Gas with Lemongrass?"

Connor Yearsley investigates the science and controversy behind Burger King's "reduced-methane" burger, sourced from cows that are fed lemongrass (*Cymbopogon citratus*, Poaceae).

"The Murder of Maya Healer Domingo Choc Che" by Connor Yearsley

2021

- ABC recognizes Gayle Engels' 25th anniversary with the organization.
- *HerbalGram*'s advertising representative Lance Lawhon retires after 17 years.
- BAPP celebrates 10th anniversary.

#129 HerbalGram (Spring 2021)

Article Highlights

"In It for the Long Haul: Herbal Companies Reflect on Lessons from the COVID-19 Crisis" by Karen Raterman

"The Ethnobotany of Wine as Medicine in the Ancient Mediterranean World"

Ethnobotanist Mark Plotkin traces the spread of wine grape cultivation and the medicinal history of the beverage since ancient times.

"The Evolution of the American Botanical Council Website: 1995 – 2021" by Gayle Engels

"Thailand Approves Asian Herb Andrographis [*Andrographis paniculata*, Acanthaceae] to Treat COVID-19" by Connor Yearsley

Issue 129







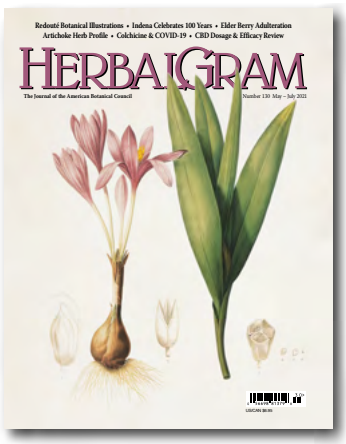





#130 HerbalGram (Summer 2021)

HerbalGram Happenings

- Marisa Williams, ND, of Traditional Medicinals, becomes the new co-author of Herb Profiles. Her first profile is on artichoke (*Cynara cardunculus*, Asteraceae).



Issue 130

Article Highlights

"Indena Centennial: Finding Quality in Nature and Science" by Karen Raterman

"Radiant Redouté"

Connor Yearsley shares the history and illustrations of Pierre-Joseph Redouté (1759–1840), who is considered one of the greatest botanical artists of all time.

"Tales from the Elder: Adulteration Issues of Elder Berry [*Sambucus* spp., Viburnaceae]" by Stefan Gafner et al.

This is the first known peer-reviewed article in the scientific literature that documents the intentional adulteration of this increasingly popular plant material.

"Olivia Newton-John Foundation to Fund Research on Herbal Therapies for Cancer" by Connor Yearsley

#131 HerbalGram (Fall 2021)

Article Highlights

"Lady's Slipper: Once a Commercial Conundrum, Now a Conservation Success Story"

Steven Foster explores the history of lady's slippers (*Cypripedium* spp., Orchidaceae) as medicine and describes how regulatory actions helped bring back these orchids from the brink of extinction in some areas.

"Rhodiola [*Rhodiola rosea*, Crassulaceae] Harvest in the 'Mountains of Heaven': The Uighur Traders of Xinjiang" by Chris Kilham

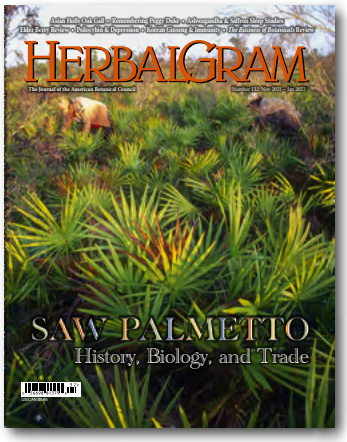
Issue 131

#132 HerbalGram (Winter 2021)

Article Highlights

"The Historical Interplay of Plant Biology, Trade, and Human Interactions with Saw Palmetto"

In his final article for *HerbalGram*, Steven Foster investigates the history, trade, conservation, and ecology of saw palmetto (*Serenoa repens*, Arecaceae). With 110 references and 27 of Foster's photographs, this 32-page feature is the longest article ever published in the magazine. Foster died unexpectedly shortly after publication of this article.



Issue 132

2022

- Tieraona Low Dog, Josef Brinckmann, and Christopher Hobbs join ABC's Board of Trustees.

#133 HerbalGram (Spring 2022)

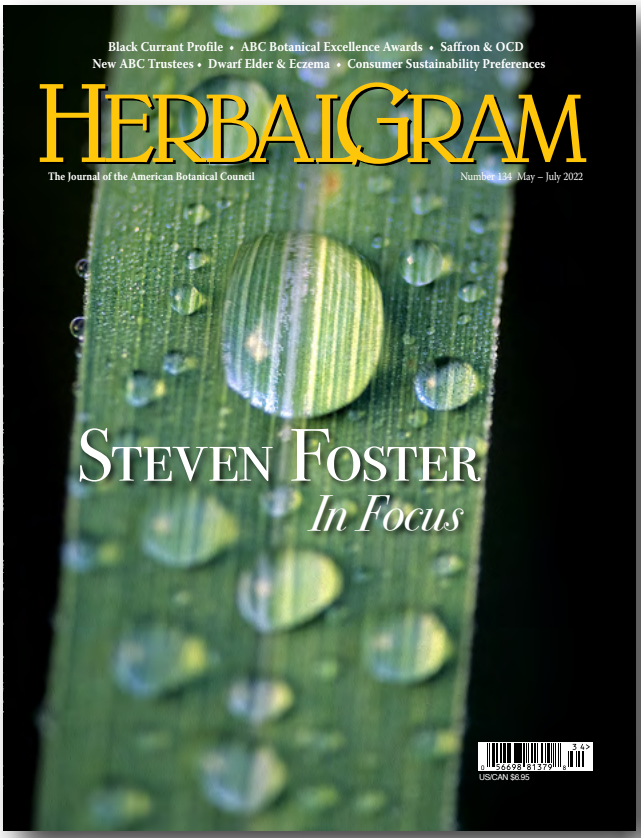
Article Highlights

"The Future of Frankincense [*Boswellia* spp., Burseraceae]: Understanding the Plant's Diversity Is Key to Its Conservation" by Sue Canney Davison, PhD, Frans Bongers, PhD, and Denzil Phillips, MSc

"Tribute to Steven Foster: 1957–2022"

After Foster's unexpected death in January 2022, Hannah Bauman paid tribute to his innumerable contributions to *HerbalGram*, ABC, and the larger herbal community in this 10-page obituary.

Issue 133



Issue 134

Issue 135

#134 HerbalGram (Summer 2022)

Article Highlights

"Climate-Conscious Consumers Prioritize Sustainable Herbal Products"

Karen Raterman reports on market data that suggest that consumers are increasingly willing to pay more for herbal products from environmentally responsible companies.

"In Focus: Steven Foster's Herbal Photography" by Connor Yearsley

"Christopher Hobbs Donates 1636 Edition of Gerard's Historic *Herbal* to ABC" by Tyler Smith

#135 HerbalGram (Fall 2022)

HerbalGram Happenings

- Hannah Bauman authors the Herb Profile on oat (*Avena sativa*, Poaceae) in this issue.

Article Highlights

"Floral Fluorescence: Medicinal Plants in a New, Ultraviolet Light"

In this photo feature, Connor Yearsley highlights the work of photographer Craig Burrows, who uses ultraviolet-induced visible florescence to capture striking images of plants, including some that are used medicinally.

"The American Herbal Products Association at 40" by Karen Raterman

"Regenerative Turmeric [*Curcuma longa*, Zingiberaceae] in Nicaragua: An SHP Case Study on Ethical Trade Partnerships" by Ann Armbrecht

"Brazil's National Policy on Medicinal Plants Prioritizes Citizen Participation and Social Justice" by Lilian Caramel and Pedro Crepaldi Carlessi

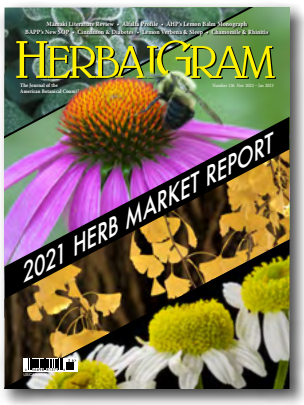
#136 HerbalGram (Winter 2022)

Issue 136

Article Highlights

"Māmaki: Past and Present"

Thomas Brendler reviews the traditional and modern uses of plants in the genus *Pipturus* (Urticaceae) and focuses on four species that are endemic to Hawaii and collectively known as "māmaki."














2023

- ABC publishes 9,000th HerbClip.
- Josef Brinckmann named president of ABC's Board of Trustees.
- Joseph Betz, PhD, joins ABC's Board of Trustees.

#137 HerbalGram (Spring 2023)

Article Highlights

"A Healthy Future for Natural Medicine: Empowered by Specific Evidence" by Nigel Pollard

Australian medicinal plant research advocate Pollard discusses his organization's new database of clinically tested botanical products.

"Israeli Company Uses Novel Approach to Create Proprietary Herbal Honeys" by Karen Raterman

"Reflections from Nepal" by Ann Armbrecht

"Community Ecology Institute Purchases Jim and Peggy Duke's 'Green Farmacy Garden'"

The nonprofit Community Ecology Institute purchased the Dukes's "Green Farmacy Garden" in Maryland after seeing an article by Connor Yearsley about the property in an earlier issue of ABC's HerbalEGram monthly newsletter.

Issue 137

#138 HerbalGram (Summer 2023)

HerbalGram Happenings

- *HerbalGram* celebrates 40th anniversary.
- ABC launches HerbalGram40 Project & Fund.
- Matthew Magruder is named publisher of *HerbalGram*.

Article Highlights

Dear Reader: "Reflecting on 40 Years of *HerbalGram*" by Mark Blumenthal

"BAPP's Standard Operating Procedure Receives 'Industry Initiative of the Year' Award from NutraIngredients-USA" by ABC Staff

"American Herbal Pharmacopoeia Publishes Yerba Santa [*Eriodictyon* spp., Boraginaceae] Monograph and Therapeutic Compendium" by Connor Yearsley

"SHP Launches Updated Sustainability and Regenerative Practices Toolkit Version 2.0" by ABC Staff HG

Issue 138

US Sales of Herbal Supplements Increase 4.4% in 2023

Modest sales increase suggests market is continuing to normalize after pandemic-related fluctuations; consumers in 2023 prioritize products for cardiovascular and cognitive health

By Tyler Smith,[a] Carly Lang,[b] and Erika Craft[c]

[a] American Botanical Council (Austin, Texas)
[b] SPINS (Chicago, Illinois)
[c] *Nutrition Business Journal* (Boulder, Colorado)

INTRODUCTION

Annual sales of herbal dietary supplements in the United States totaled an estimated $12.551 billion in 2023, according to data from the *Nutrition Business Journal* (NBJ). This 4.4% increase in sales corresponds to an additional $533 million spent on these products in 2023 compared to the previous year. Since the beginning of the COVID-19 pandemic, annual spending on herbal supplements has fluctuated, with record-breaking sales in 2020 and the first sales decline in nearly two decades in 2022. The 4.4% sales increase in 2023 is notably lower than the average annual sales increase of 8.2% from 2015 to 2019 but suggests that consumer sales may be returning to the previous upward trend (Table 1).

The US retail sales figures in this report were provided by NBJ, a natural products industry publication of Informa's New Hope Network based in Boulder, Colorado, and SPINS, a leading provider of retail consumer insights, analytics, and consulting for the natural products industry, based in Chicago, Illinois. NBJ supplied estimates of total annual sales of herbal supplements, as well as total sales in three market channels (mass market; natural, health food, and specialty; and direct sales) and sales by product type (single-herb supplements vs. combination formulas). SPINS provided sales data for the 40 top-selling herbal and fungal ingredients in the mainstream retail channel (i.e., the multi-outlet channel, powered by Circana) and the natural (now called "natural expanded") retail channel. Channel definitions are included in Table 2.

In 2023, annual sales of herbal supplements increased in each of NBJ's retail channels (Table 3). Mass market sales increased by 5.2% from the previous year, totaling $2.484 billion. Direct sales of herbal supplements, as discussed later in this report, increased by 5.3% to a total of $7.027 billion. The natural, health food, and specialty retail channel had the smallest sales increase of 1.9% and totaled $3.040 billion in 2023.

The SPINS data discussed in this report include sales of dietary supplements in which the herbal or fungal ingredient (or derivative thereof, such as quercetin) is the primary functional ingredient. This includes only products that meet the legal definition of a dietary supplement per the US Food and Drug

Total US Retail Sales of Herbal Supplements (2015-2023)

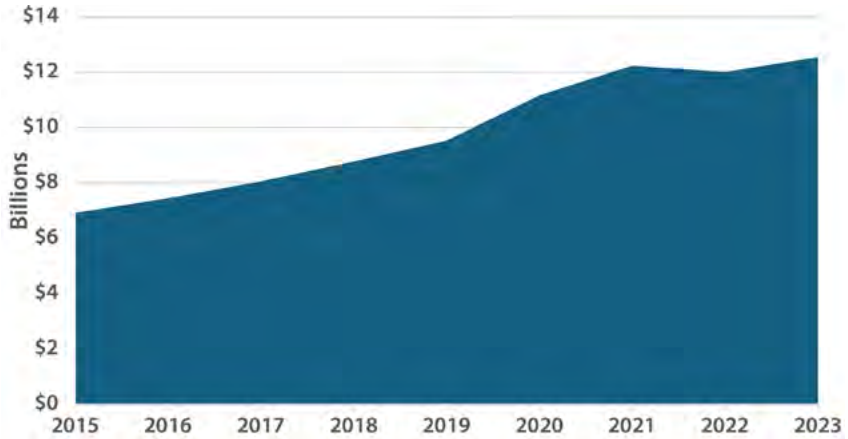


Table 1. Total US Retail Sales of Herbal Supplements*

Year	Total Sales	% Change
2023	$12.551 billion	4.4%
2022	$12.018 billion	–1.8%
2021	$12.241 billion	9.6%
2020	$11.168 billion	17.2%
2019	$9.530 billion	8.6%
2018	$8.778 billion	8.9%
2017	$8.057 billion	8.1%
2016	$7.452 billion	7.7%
2015	$6.922 billion	7.5%

Source: *Nutrition Business Journal* (NBJ)

* Includes sales in all channels. NBJ primary research includes NBJ surveys of supplement manufacturers, distributors, MLM firms, mail order, internet, and raw material and ingredient supply companies, as well as interviews with major retailers (Walmart, Costco, etc.), supplement manufacturers, suppliers, and industry experts. Secondary sources include IRI (Circana), SPINSScan Natural, Nielsen, *Natural Foods Merchandiser*, Insight, The Hartman Group, company data, and other published material.

Administration (FDA), except for products containing cannabidiol (CBD), a psychoactive but non-intoxicating compound in cannabis (*Cannabis sativa*, Cannabaceae). Sales of teas or cosmetics with botanical ingredients are not included. The dollar amounts are estimates of the total sales during the 52-week period that ended December 31, 2023. The mainstream and natural expanded channel sales discussed in this report refer to retail sales in the United States only.

MAINSTREAM CHANNEL

Top Sales: Psyllium

In 2023, for the second consecutive year, psyllium (*Plantago ovata*, Plantaginaceae) ranked first in mainstream retail sales. (In 2020 and 2021, during the first two years of the COVID-19 pandemic, elder berry [*Sambucus nigra*, Viburnaceae] was the top-selling herbal supplement ingredient in this channel.) Sales of psyllium grew by 2.7% in 2023, compared to the 9.8% growth seen in 2022.

Psyllium, also known as ispaghula, has been used for millennia in various traditional medicine systems, including Ayurveda, traditional Persian medicine, and traditional Chinese medicine (TCM). Psyllium has been used to treat constipation, diarrhea, dermatological conditions, and high blood pressure, among other issues. Its beneficial properties are attributed primarily to the high amounts of soluble and insoluble fiber in the seeds and seed husks, and the gel-forming properties of the seeds.[1]

Psyllium *Plantago ovata*
Photo ©2024 Steven Foster

Calculating Percentage Change

Percentage sales changes from 2022 to 2023 were calculated using updated 2022 sales data that SPINS provided for this report in late June 2023. Some of the updated sales figures for 2022 differ from those published in *HerbalGram*'s 2022 Herb Market Report. This is the case every year, as sales totals change when new data become available or if sales are reclassified.

The sales totals for individual ingredients published in the previous year's Herb Market Report usually differ by a relatively small amount from SPINS' updated figures. However, due to recent data coding and channel definition changes at SPINS, the updated 2022 sales totals for several ingredients differed significantly (> 10%) from those published in the 2022 Herb Market Report. As a result, the percentage changes for some ingredients in this report may be appear incorrect when comparing 2023 sales in this report with the sales listed in the 2022 Herb Market Report.

The ingredients with 2022 sales changes above 10% are noted below.

	Sales in 2022 Herb Market Report	Updated 2022 Sales Data	% Change
Mainstream Channel			
St John's wort	$28,905,466	$6,086,297	–78.9%
Saw palmetto	$22,579,760	$30,764,437	36.2%
Echinacea	$41,986,186	$30,209,717	–28.0%
Wheatgrass / Barley grass	$25,977,536	$32,144,370	23.7%
Horny goat weed	$15,451,919	$12,475,505	–19.3%
Ginger	$40,780,915	$46,226,503	13.4%
Red yeast rice	$12,952,243	$14,609,365	12.8%
Green coffee extract	$7,858,803	$6,890,607	–12.3%
Garlic	$27,753,977	$24,432,606	–12.0%
Natural Channel			
Psyllium	$10,571,193	$11,759,054	11.2%

Source: SPINS

Table 2. US Retail Channel Definitions*

	SPINS	*Nutrition Business Journal*
Mainstream Retail Channels	**Multi-Outlet Channel (powered by Circana)** Covers grocery outlets (stores with $2 million+ total annual sales), drug outlets (chains and independent stores, excluding prescription sales), and selected retailers across mass merchandisers, including Walmart, club, dollar, and military stores representing more than 105,000 retail locations.	**Mass Market Channel** Includes food/grocery, drug, mass merchandise, and club and convenience stores (e.g., Walmart, Costco, etc.).
Natural Retail Channels	**Natural Expanded Channel** Includes full-format stores with $2 million+ in annual sales and 30% or more of UPC-coded sales from Health and Wellness Index (HWI) and 15% or more from Natural Product Index (NPI) Universe. It includes co-ops, associations, independents, and large regional chains (excluding Whole Foods Market and Trader Joe's). This channel represents more than $31 billion in total sales and encompasses more than 2,000 stores.	**Natural, Health Food, and Specialty Channel** Includes supplement and specialty retail outlets, including Whole Foods Market (estimates), GNC, sports nutrition stores, etc.
Direct Sales		Includes direct-to-consumer sales from the internet (e.g., e-commerce websites such as Amazon.com and Walmart.com, among many others), direct-selling media (TV, radio, and print publications), health practitioners, and multilevel marketing (MLM) or network marketing firms (US sales only).

* The sales discussed in this article pertain to those involving herbal, fungal, and related dietary supplements. They generally do not include herbs sold as teas and beverages, as ingredients in conventional foods, or as ingredients in natural personal care and cosmetic products.

The FDA permits psyllium as an ingredient in dietary supplements as well as in some over-the-counter (OTC) drug products (e.g., OTC bulk laxative drug products), which have separate regulatory requirements.[1-3] Sales of OTC drugs that contain psyllium are not included in this report.

Cardiovascular health and digestive health were the two largest health focus categories of psyllium supplements sold in 2023 and made up 68.8% and 18.4% of total psyllium products sold, respectively. These percentages are roughly the same as in 2022. Sales of psyllium supplements for cardiovascular health grew by 2% in 2023, with sales totaling roughly $190 million. Sales of digestive health products, while still the second largest category of psyllium supplements, declined by 9% to $50.8 million. Products with "non-specific" health focuses (i.e., general statements such as "supports wellness") were the third largest category of psyllium supplements (6.2%) and increased by 10.2% in 2023.

Although psyllium may be best known for its use in digestive health products, its cardiovascular effects are also well documented. Published in June 2024, a systematic review of 29 randomized controlled trials (RCTs) assessed the effects of psyllium consumption on specific blood lipid parameters. The review, which included 2,769 total participants, found that consumption of psyllium seed or seed

Health Focuses and Label Statements

SPINS uses the term "health focus" to describe and categorize health-related statements on product labels. An herbal dietary supplement with the text "Can help support regularity" on its label, for example, would be placed in the "digestive health" category. Other health focus categories include immune health, cardiovascular health, cleanse and detox, weight loss, and blood sugar support, among many others.

Per US regulations, dietary supplement labels are not permitted to include any statements that suggest the product can diagnose, treat, cure, or prevent any disease. In a few cases, the US Food and Drug Administration (FDA) has authorized disease-prevention claims for herbal ingredients with supporting scientific evidence that meets specific criteria. (Such pre-approved health claims are authorized under the Nutrition Labeling and Education Act of 1990.) Dietary supplements that contain psyllium seed husk, for example, can mention an "association between [consumption of] soluble fiber from psyllium seed husk and reduced risk of coronary heart disease."[1]

So-called "structure/function" claims — a description of how an ingredient may affect the normal structure or function of the human body — are permitted on dietary supplements per the Dietary Supplement Health and Education Act of 1994, but only if the manufacturer submits documentation for the claim and notifies the FDA within 30 days of marketing the supplement with the claim.[1]

Reference

1. Label Claims for Conventional Foods and Dietary Supplements. US Food and Drug Administration website. Available at: www.fda.gov/food/food-labeling-nutrition/label-claims-conventional-foods-and-dietary-supplements. Accessed August 9, 2024.

Table 3. Total Herbal Supplement Sales in US by Retail Channel										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	% Change from 2022
Mass Market	$1.204 billion	$1.336 billion	$1.449 billion	$1.566 billion	$1.712 billion	$2.142 billion	$2.216 billion	$2.360 billion	$2.484 billion	5.2%
Natural, Health Food, and Specialty	$2.356 billion	$2.506 billion	$2.624 billion	$2.804 billion	$2.904 billion	$2.950 billion	$2.992 billion	$2.984 billion	$3.040 billion	1.9%
Direct Sales	$3.363 billion	$3.609 billion	$3.984 billion	$4.408 billion	$4.913 billion	$6.076 billion	$7.033 billion	$6.674 billion	$7.027 billion	5.3%
Source: *Nutrition Business Journal*										

husk was associated with significantly reduced total cholesterol (TC) and low-density lipoprotein (LDL) cholesterol levels, but not high-density lipoprotein (HDL) cholesterol or triglycerides. The authors determined that the observed decreases in TC and LDL cholesterol levels correlated to an estimated 7% reduction in the risk of experiencing a cardiovascular event.[4]

A larger systematic review published in December 2023 of 61 RCTs with 4,100 total participants examined a wider range of psyllium's potential cardiovascular effects. The analysis found that psyllium consumption correlated with significantly decreased fasting blood sugar, hemoglobin A1C, and systolic blood pressure, as well as TC and LDL cholesterol levels. Notably, some of the reviewed studies did not take into account the participants' diets, physical activity levels, or use of other dietary supplements. Given these potential limitations, the authors advised that "psyllium be taken into account as a possible option in [cardiovascular] disease management."[5]

The positive effects of fiber consumption on digestive health issues such as constipation are largely supported by clinical evidence. A 2022 systematic review of 16 RCTs of healthy adults with constipation concluded that psyllium was more effective than osmotic and stimulant laxatives in improving bowel movement frequency. Of the seven sources of fiber reviewed, the authors concluded that psyllium husk, at dosages of 10 grams or more per day, was the most effective ingredient for constipation relief.[6]

Psyllium's effects on other digestive health conditions are generally less established. Another systematic review published in 2022 assessed the effects of several sources of dietary fiber on symptoms of inflammatory bowel disease (IBD). The reviewed studies on psyllium had mixed results, and the authors concluded that evidence of the potential benefits of psyllium for IBD was "still too limited."[7]

Top Sales Growth: Beet Root

Among the 40 top-selling herbal supplement ingredients in the mainstream channel, beet root (*Beta vulgaris*, Amaranthaceae) had the highest percentage sales growth. (For the purposes of this report, any subsequent mention of sales growth refers to *percentage* sales growth.) Annual retail sales of these supplements more than doubled in 2023 compared to the previous year, with sales totaling $65,022,645 — a 108% increase, corresponding to an additional $33.7 million in sales in 2023.

Mainstream sales of beet root have increased each year since at least 2018, when it first appeared on the list of 40 top-selling ingredients in this channel with sales of roughly $8.29 million. Since then, annual sales have increased nearly eight-fold (by more than $56.7 million) from 2018 to 2023. During that time, beet root has risen to the eighth top-selling mainstream herbal supplement ingredient compared to its 30th-place rank in 2018.


Beet *Beta vulgaris*
Photo ©2024 Steven Foster

Beet root, the taproot of the beet plant, has long been used as both food and medicine. Ancient Greeks and Romans used beet root to detoxify the blood, as an aphrodisiac, and to cleanse the kidneys, liver, and bowels.[8] Today, beet root is used mostly as a food, but interest in its potential medicinal applications has increased in recent decades. The therapeutic use of beet root is based primarily on its high nitrate content. Many plants, including spinach (*Spinacia oleracea*, Amaranthaceae), arugula (*Eruca vesicaria*, Brassicaceae), and celery (*Apium graveolens*, Apiaceae), contain nitrates, which are a precursor to nitric oxide (NO).[9] NO is a gaseous signaling molecule that plays various essential roles in the body, including in muscle, metabolic, and vascular function.[10] For these reasons, beet root supplements first became popular for their performance benefits, particularly among athletes. However, in recent years, beet root supplements have become more widely used by both athletes and non-athletes for other purposes, such as cardiovascular and cognitive health.

More than half of the beet root supplements sold in mainstream retail outlets in 2023 were marketed for energy support (53%), according to SPINS. Sales of beet root products with this health focus increased by 145% in 2023 — the second-strongest sales growth of any category of beet root products. Products sold for performance benefits had the strongest sales growth of 372% in 2023. However, perhaps surprisingly, this category made up only a small percentage (0.01%) of beet root product sales. This may be due to perceived similarities in benefits provided by energy support and performance products.

After energy support, cardiovascular health was the second-highest-grossing health focus of beet root supplements sold in 2023 and made up roughly a third (32.0%) of overall sales. Sales of beet root products with this health focus nearly doubled from 2022 to 2023. Products marketed for cognitive health, a small but growing category of beet root supplements, also increased in 2023, by 11.3%.

The efficacy of beet root supplements for general energy support has not been established in the scientific literature. A PubMed search in late July 2024 found no human clinical trials on beet root products specifically for energy support or fatigue relief.[11] The authors of a 2019 narrative review attempted to summarize findings on beet root supplements for cancer-related fatigue but found no relevant clinical trials.[12]

Most human clinical trials on beet root products are related to effects on physical activity or sports performance and often include only healthy, young male participants. Studies of beet root that have energy and fatigue parameters therefore are usually exercise related. A systematic review and meta-analysis published in January 2024 concluded that beet root-based supplements can improve muscular endurance, modestly increase exercise time until exhaustion, and aid in the "recovery of muscular strength after a fatiguing task."[13] Performance-related studies of beetroot often focus on high-intensity or endurance activities such as cycling, sprinting, rowing, and weightlifting. A literature review of beet root's effects on exercise performance published in 2024 noted that beet root supplementation "had small but [statistically] significant positive effects on some performance outcomes during single and repeated bouts of high-intensity exercise, as well as endurance, high-power explosive, and high-intensity intermittent exercise."[14]

Dietary nitrates are known to enhance certain physiological actions in humans. They have been shown to reduce the amount of oxygen used by muscles during exercise, lower the energy cost of muscle function, and increase blood flow to muscles.[15,16] The International Olympic Committee has acknowledged that dietary nitrate supplementation has "good to strong evidence of achieving benefits to performance" with few side effects or limitations.[17]

Research into the potential cardiovascular benefits of beet root supplementation has increased in recent years. A 2020 literature review noted that NO, such as that produced after consuming nitrate-rich foods like beet root, "supports cardiovascular function, causes vasodilation, and decreases blood pressure."[18] Similarly, the authors of a systematic review published in 2020 concluded that "because of its effects on the cardiovascular system, [beet root juice] consumption could possibly be used as a supplement in different treatments for cardiovascular disease."[19]

Other Sales Increases

Among the 40 top-selling herbal supplement ingredients in the 2023 mainstream channel, six others had sales increases greater than 20%: wheatgrass/barley grass (*Triticum aestivum*/*Hordeum vulgare*, Poaceae; +103.6%), bacopa (*Bacopa monnieri*, Plantaginaceae; +71.7%), oats (*Avena sativa*, Poaceae; +57.7%), cinnamon (*Cinnamomum* spp., Lauraceae; +57.3%), ginkgo (*Ginkgo biloba*, Ginkgoaceae; +42.8%), and guarana (*Paullinia cupana*, Sapindaceae; +36.0%).

Notably, half of those ingredients are known for their cognitive health effects. Gingko leaf is commonly used to improve cognitive functions such as memory,[20] and in 2023, nearly 100% of bacopa and oat supplements sold in the mainstream channel were marketed for cognitive health support.

Sales Decreases

Only three of the top 40 ingredients in the 2023 mainstream channel experienced sales decreases greater than 20%: ivy leaf (*Hedera helix*, Araliaceae; –28.5%), elder berry (*Sambucus nigra* and *S. canadensis*; –27.7%), and CBD (–25.9%).

NATURAL EXPANDED CHANNEL

Top Sales: Turmeric

Turmeric was the top-selling herbal supplement ingredient in natural retail stores in 2023. Sales totaled $37,075,334 and were essentially unchanged from the previous year, differing by less than 0.02%. Turmeric supplements in the natural channel had annual sales growth greater than 10% throughout much of the 2010s and peaked in 2018, when

Turmeric *Curcuma longa*
Photo ©2024 Steven Foster

sales totaled roughly $51.2 million. Sales have declined each year since then, before increasing slightly in 2023. CBD overtook turmeric as the top-selling herbal supplement ingredient in the natural channel from 2018 to 2021, as turmeric sales declined. However, turmeric regained its first-place rank in 2022 and 2023, as CBD continued to experience sales decreases.

Turmeric has a long history of use as a spice and in the traditional medicine systems of India (e.g., Ayurveda and Unani) and other Asian countries such as China, Japan, and Korea. Historically, turmeric preparations have been used medicinally for a wide range of conditions, including asthma, dental problems, indigestion, skin infections, wounds, liver issues, and inflammation, among many others. Some health benefits of turmeric have been attributed to curcuminoids, a group of bioactive polyphenols found in turmeric, particularly the compound curcumin. Consumer turmeric products typically contain turmeric root extracts with high levels of curcumin or several curcuminoids and are available in various forms, including capsules, tablets, tinctures, and gummies.[21,22]

The top three health focuses for turmeric supplements sold in 2023 were pain and inflammation (56.6% of total sales), joint health (13.2%), and non-specific uses (11.7%). Sales of turmeric supplements in each of these categories were relatively stable from 2022 to 2023, with no fluctuations greater than 2.5%. Sales of turmeric-containing supplements marketed for pain and inflammation totaled approximately $21 million in 2023 (a 0.04% increase). Turmeric sales in the joint health category dropped slightly to roughly $4.9 million in 2023 (a 0.8% decrease), and sales of non-specific turmeric supplements totaled $4.3 million (a 2.1% increase).

In general, SPINS receives sales data that can be categorized into fewer than 10 health focuses for most ingredients, as many herbal supplements are used for specific or related purposes. However, the 2023 sales data for turmeric include 20 health focuses, most of which make up less than 1% of overall sales. This reflects the unusually wide variety of potential benefits attributed to turmeric, from hydration and sleep to performance and prostate support. Of the health focuses that each account for more than 1% of turmeric sales, cardiovascular health had the largest sales increase of 6.5% from 2022 to 2023.

As the anti-inflammatory effects of turmeric are well-documented in both pre-clinical and clinical studies, it is perhaps not surprising that the two best-selling health focuses of turmeric supplements in 2023 are closely associated with inflammation. Human clinical trials related to pain frequently are focused on specific conditions (e.g., arthritis, fibromyalgia, migraine, etc.[23]), but several scientific journal articles published in the past decade have attempted to summarize the effects of turmeric or curcumin on pain more generally. The authors of a 2018 literature review of the analgesic effects of turmeric and curcumin noted that "Turmeric has consistently been demonstrated to produce analgesic and anti-inflammatory effects in animal models and in clinical trials, and appears to have less serious adverse effects than many current analgesics."[24] Similarly, a literature review published in 2021 concluded that curcumin is a promising and safe polyphenolic molecule that targets "multiple molecular pathways in pain and can be beneficial in the treatment and management of pain and inflammation."[25]

The effects of turmeric and curcumin on conditions related to joint health have been the subject of numerous human studies. A 2023 meta-analysis of 23 RCTs with 2,175 total participants assessed the effects of "curcumin" (i.e., turmeric extracts and curcumin preparations) in people with knee osteoarthritis. The authors found that curcumin significantly reduced self-reported measures of pain compared to placebo and that curcumin alone and curcumin with non-steroidal anti-inflammatory drugs (NSAIDs) reduced the incidence of adverse events compared

Table 4. Top-Selling Herbal Supplements in 2023 — US Mainstream Channel

Rank	Primary Ingredient	Latin Binomial	Total Sales	% Change
1	Psyllium[a]	*Plantago ovata*	$276,124,315	2.7%
2	Elder berry	*Sambucus nigra* and *S. canadensis*	$176,953,924	–27.7%
3	Turmeric[b]	*Curcuma longa*	$133,300,417	3.7%
4	Ashwagandha	*Withania somnifera*	$120,445,117	8.7%
5	Apple cider vinegar	*Malus* spp.	$101,048,008	–19.8%
6	Cranberry	*Vaccinium macrocarpon*	$89,359,040	–0.8%
7	Wheatgrass / Barley grass	*Triticum aestivum / Hordeum vulgare*	$65,460,305	103.6%
8	Beet root	*Beta vulgaris*	$65,022,645	108.0%
9	Ginger	*Zingiber officinale*	$51,303,645	11.0%
10	Green tea	*Camellia sinensis*	$40,703,222	9.7%
11	Fenugreek	*Trigonella foenum–graecum*	$40,522,172	–8.9%
12	Ivy leaf	*Hedera helix*	$35,522,755	–28.5%
13	Ginkgo	*Ginkgo biloba*	$33,114,457	42.8%
14	Guarana	*Paullinia cupana*	$29,493,609	36.0%
15	Maca	*Lepidium meyenii*	$29,418,051	7.7%
16	Saw palmetto	*Serenoa repens*	$29,147,836	–5.3%
17	Cinnamon	*Cinnamomum* spp.	$25,559,120	57.3%
18	Echinacea[c]	*Echinacea* spp.	$24,665,527	–18.4%
19	Tribulus	*Tribulus terrestris*	$23,845,751	–4.3%
20	Pycnogenol®	*Pinus pinaster*	$23,130,138	6.7%
21	Garlic	*Allium sativum*	$23,103,285	–5.4%
22	Milk thistle	*Silybum marianum*	$20,937,232	10.1%
23	Black cohosh	*Actaea racemosa*	$19,885,112	–5.1%
24	Aloe	*Aloe vera*	$19,855,094	4.2%
25	Flax seed / Flax oil	*Linum usitatissimum*	$19,603,040	–7.6%
26	Valerian	*Valeriana officinalis*	$18,290,146	–12.5%
27	Pumpkin	*Cucurbita pepo*	$16,444,778	–12.8%
28	Goji berry	*Lycium* spp.	$15,497,248	–7.2%
29	Red yeast rice[d]	*Oryza sativa*	$15,382,466	5.3%
30	Yohimbe	*Pausinystalia johimbe*	$13,670,726	–16.8%
31	Horny goat weed	*Epimedium* spp.	$12,178,485	–2.4%
32	Cannabidiol (CBD)	*Cannabis sativa*	$11,147,381	–25.9%
33	Fennel	*Foeniculum vulgare*	$10,835,152	–0.1%
34	Oats / Oatstraw	*Avena sativa*	$10,643,718	57.7%
35	Bacopa	*Bacopa monnieri*	$9,997,966	71.7%
36	Senna[e]	*Senna alexandrina*	$9,721,771	–6.4%
37	Rhodiola	*Rhodiola* spp.	$9,381,370	1.0%
38	Dandelion	*Taraxacum officinale*	$9,220,759	19.3%
39	Rhubarb	*Rheum* spp.	$8,220,104	–15.5%
40	Ginseng	*Panax* spp.	$8,080,788	12.6%

Source: SPINS (52 weeks ending December 31, 2023)

[a] Excludes over-the-counter (OTC) drugs that contain psyllium.
[b] Includes standardized turmeric extracts with high levels of curcumin.
[c] Includes three *Echinacea* species: *E. angustifolia*, *E. pallida*, and *E. purpurea*.
[d] Red yeast rice is fermented with the yeast *Monascus purpureus*.
[e] Excludes OTC laxative drugs that contain senna or sennosides.

Table 5. Top-Selling Herbal Supplements in 2023 — US Natural Channel

Rank	Primary Ingredient	Latin Binomial	Total Sales	% Change
1	Turmeric[a]	*Curcuma longa*	$37,075,334	0.0%
2	Cannabidiol (CBD)	*Cannabis sativa*	$29,913,962	–13.8%
3	Elder berry	*Sambucus nigra* and *S. canadensis*	$24,073,035	–20.1%
4	Mushrooms (other)	—	$20,907,654	31.0%
5	Ashwagandha	*Withania somnifera*	$20,003,585	9.1%
6	Wheatgrass / Barley grass	*Triticum aestivum* / *Hordeum vulgare*	$15,809,494	–13.1%
7	Milk thistle	*Silybum marianum*	$13,530,678	26.0%
8	Aloe	*Aloe vera*	$13,216,209	–3.5%
9	Psyllium[b]	*Plantago ovata*	$12,975,125	10.3%
10	Oregano[c]	*Origanum vulgare*	$11,790,179	13.7%
11	Quercetin[d]	—	$11,771,740	–30.8%
12	Flax seed / Flax oil	*Linum usitatissimum*	$10,756,007	1.5%
13	Beet root	*Beta vulgaris*	$10,016,171	22.5%
14	Echinacea[e]	*Echinacea* spp.	$9,204,852	–1.2%
15	Barberry	*Berberis vulgaris*	$8,393,680	98.3%
16	Cranberry	*Vaccinium macrocarpon*	$8,169,361	1.0%
17	Saw palmetto	*Serenoa repens*	$8,154,055	0.7%
18	Spirulina / Blue-green algae[f]	*Arthrospira platensis* and *A. maxima* / —	$7,856,422	9.4%
19	Black cumin	*Nigella sativa*	$7,779,474	23.7%
20	Algae (other)	—	$7,589,904	24.4%
21	Valerian	*Valeriana officinalis*	$7,095,879	5.4%
22	Maca	*Lepidium meyenii*	$7,009,452	2.7%
23	Chlorophyll / Chlorella	— / *Chlorella vulgaris*	$6,541,624	4.1%
24	Garlic	*Allium sativum*	$6,177,988	–9.1%
25	Reishi mushroom	*Ganoderma lucidum*	$5,640,299	11.2%
26	Cordyceps mushroom	*Cordyceps* spp.	$5,225,915	19.5%
27	Kava	*Piper methysticum*	$5,132,392	22.5%
28	Echinacea-goldenseal combo	*Echinacea* spp. / *Hydrastis canadensis*	$5,123,563	–1.4%
29	Ginkgo	*Ginkgo biloba*	$4,822,172	–0.1%
30	Apple cider vinegar	*Malus* spp.	$4,254,662	–9.8%
31	Resveratrol[g]	—	$4,128,804	6.5%
32	Papaya	*Carica papaya*	$3,819,634	0.6%
33	Ginger	*Zingiber officinale*	$3,738,016	8.9%
34	Bacopa	*Bacopa monnieri*	$3,721,122	4.0%
35	Horsetail	*Equisetum* spp.	$3,659,752	–7.8%
36	Red yeast rice[h]	*Oryza sativa*	$3,657,690	3.2%
37	Cherry	*Prunus* spp.	$3,625,993	–0.1%
38	Fenugreek	*Trigonella foenum–graecum*	$3,475,049	2.8%
39	Boswellia	*Boswellia serrata*	$3,409,180	10.9%
40	Hawthorn	*Crataegus* spp.	$3,216,273	–0.9%

Source: SPINS (52 weeks ending December 31, 2023)

[a] Includes standardized turmeric extracts with high levels of curcumin.
[b] Excludes OTC drugs that contain psyllium.
[c] Includes products that contain oregano oil and oregano leaf tinctures.
[d] Quercetin is a flavonoid found in various plants, such as onions (*Allium cepa*) and berries.
[e] Includes three *Echinacea* species: *E. angustifolia*, *E. pallida*, and *E. purpurea*.
[f] Blue-green algae belong to the phylum Cyanobacteria.
[g] Resveratrol is an antioxidant found in various plants, such as grapes (*Vitis vinifera*), berries, and Japanese knotweed (*Polygonum cuspidatum*) roots.
[h] Red yeast rice is fermented with the yeast *Monascus purpureus*.

with NSAIDs alone. They suggested that "Drug combinations containing curcumin may have the dual effect of enhancing efficacy and reducing adverse reactions."[26]

A 2021 meta-analysis and systematic review of turmeric and curcumin for arthritic conditions included 29 RCTs with 2,396 total participants. The authors reported that turmeric extract and curcumin were safe and reduced the severity of inflammation and pain in people with each of the five types of arthritis assessed (i.e., ankylosing spondylitis, rheumatoid arthritis, osteoarthritis, juvenile idiopathic arthritis, and gout/hyperuricemia).[27]

Turmeric supplements for cardiovascular health are a small (1.9%) but growing segment of turmeric products sold in natural retail outlets. In vivo and in vitro studies suggest that curcumin may be able to help protect against certain myocardial injuries, and clinical studies have shown that curcumin can have a protective effect on blood vessels.[28] A systematic review and meta-analysis published in 2023 concluded that supplementation with turmeric or curcumin was associated with significant improvements in triglycerides and LDL, HDL, and total cholesterol levels. The review included 64 RCTs, but the authors noted that the evidence was considered to be low quality and the findings should be interpreted with caution.[29]

Barberry *Berberis vulgaris*
Photo ©2024 Steven Foster

Top Sales Growth: Barberry

Sales of barberry (*Berberis vulgaris*, Berberidaceae) supplements in natural retail stores nearly doubled in 2023, totaling $8,393,680. The 98.3% increase was the strongest sales growth of any of the 40 top-selling supplements in this channel. Consumers spent approximately $4.2 million more on these supplements in 2023 than in 2022, moving it from the 29th top-selling item in 2022 to the 15th in 2023. Sales of barberry supplements have been growing since at least 2020.

Barberry is a shrub with small, egg-shaped fruits that are red to purple. Native to Asia, the species has naturalized throughout Europe and escaped cultivation in North America, where it is now widely considered an invasive plant.[30] Various preparations of barberry and other *Berberis* species have been used extensively in Ayurveda and TCM dating back at least 3,000 years. In Ayurveda, *Berberis* species have been used traditionally for infections, wound healing, indigestion, and obesity, among other conditions.[31]

Many of barberry's potential health benefits have been attributed to berberine, a naturally occurring alkaloid in many species of *Berberis* and other genera, including *Coptis* (Ranunculaceae), *Eschscholzia* (Papaveraceae), *Hydrastis* (Ranunculaceae), and *Mahonia* (Berberidaceae). The genus *Berberis* is considered the "most widely distributed natural source" of berberine, with concentrations ranging from 1.6% to 4.3%, depending on plant part and species.[31] Sustainability concerns about berberine-containing species such as

goldenseal (*H. canadensis*) have increased the need for alternative sources of this compound, including barberry, goldthread (*C. trifolia*), and Oregon grape (*M. aquifolium*).

In 2023, interest in berberine for its potential weight-loss benefits sharply increased, according to data from Google Trends.[32] On social media platforms such as TikTok and Instagram, berberine was dubbed "Nature's Ozempic®," referring to the brand name of the popular diabetes drug semaglutide (Novo Nordisk; Bagsværd, Denmark), which is also widely used for weight loss. (Semaglutide prescribed for weight-loss purposes is sold under the brand name Wegovy®.) Berberine's association with Ozempic, prescriptions for which increased 40-fold in the United States from 2018 to 2023,[33] likely helped drive sales of barberry supplements in 2023.[34] While semaglutide has been shown in clinical trials to be remarkably effective for weight loss,[35] berberine's effects on body weight are less established. A 2020 systematic review of 12 RCTs with 849 total subjects found that berberine supplementation was associated with significant improvements in waist-hip ratio but not body weight, body mass index, or waist circumference.[36]

Based on overall sales, the top three health focuses for barberry supplements in 2023 were blood sugar support (72% of total sales), non-specific (16.1%), and "unknown" (8.8%). According to SPINS, the unknown category includes new products that have not yet been coded with a specific health focus. Barberry supplements in this category nearly doubled in 2023 (by 96.2%), which suggests that many new products entered the market. Products with non-specific health focuses grew by 39.2%. The strongest sales growth was for the cardiovascular health category (143.5%), but this health focus made up less than 2% of total barberry sales. Barberry products for blood sugar support, the largest category of products in terms of total sales, also had significant sales growth of 118.4% in 2023.

According to the US Centers for Disease Control and Prevention (CDC), diabetes affects an estimated 11.6% of the US population — roughly 38.4 million people — and nearly 30% of adults 65 years of age or older.[37] All forms of diabetes (type 1, type 2, and gestational) involve an impaired ability to produce or use insulin, an essential hormone that regulates the amount of glucose (a type of sugar) in the blood. High blood sugar levels can lead to significant health issues over time, including heart disease, vision loss, and kidney disease.[38]

The effects of berberine supplementation on measures of glycemic control (i.e., blood sugar regulation) have been the subject of hundreds of human studies. The large amount of clinical trial data has led researchers to conduct several umbrella meta-analyses (a meta-analysis of previously published meta-analyses) in recent years. One such paper, published in February 2024, reviewed 11 meta-analyses on berberine for glycemic control and inflammatory biomarkers in people with metabolic disorders such as diabetes. The authors found that berberine supplementation was effective in reducing levels of fasting blood glucose, hemoglobin A1C, and insulin, as well as several inflammatory biomarkers (e.g., interleukin-6 and C-reactive protein).[39]

A separate umbrella meta-analysis published in 2023 on a wider range of health outcomes similarly concluded that berberine could significantly affect blood glucose levels, insulin resistance, and inflammatory biomarkers, as well as other factors (e.g., blood lipids and body parameters). The authors of the review cautioned that berberine supplementation was associated with gastrointestinal side effects such as constipation and diarrhea and emphasized the need for additional, higher-quality studies to confirm the findings.[40]

Other Sales Increases

Six other top-selling ingredients in the 2023 natural expanded channel had sales increases greater than 20%: mushrooms – other (+31.0%), milk thistle (*Silybum marianum*, Asteraceae; +26.0%), algae – other (+24.4%), black cumin (*Nigella sativa*, Ranunculaceae; +23.7%), beet root (+22.5%), and kava (*Piper methysticum*, Piperaceae; +22.5%). SPINS data include sales of certain well-known mushroom (e.g., reishi; *Ganoderma lucidum*, Ganodermataceae) and algae (e.g., kelp; species in the taxonomic order Laminariales) ingredients. The "other" designation is a catch-all term that is used for sales of ingredients without their own category.

Sales Decreases

Only two of the top 40 ingredients in this channel had sales decreases greater than 20% in 2023: quercetin (–30.8%) and elder berry (–20.1%).

DIRECT SALES

Direct sales of herbal supplements increased by 5.3% in 2023, according to NBJ data. This follows a brief drop in direct sales in 2022 of 5.1% — the first decrease in this market channel since 2008. The 5.3% growth in 2023 is the second lowest sales increase in more than a decade (since 2011). Direct sales had double-digit growth from 2017 to 2021, with the largest sales increases of 23.7% and 15.7% occurring in 2020 and 2021, respectively.

NBJ's direct sales channel includes online sales from major retailers (e.g., Amazon and Walmart), as well as sales from health practitioners, multi-level marketing companies, and direct media (TV, radio, and print). Direct sales of herbal supplements have accounted for the largest percentage of sales in NBJ's three market channels since at least 2005, and in 2023, direct sales were more than the combined sales in both the mass market channel and the natural, health food, and specialty channel.

SALES BY PRODUCT TYPE: SINGLE VS. COMBINATION

Annual sales of combination herbal supplements have been growing at a higher rate than sales of single-herb supplements since 2011, with one exception in 2022 when sales of both product types declined. This general trend continued in 2023, with sales of combination formulas growing by 5.7% compared to the 3.3% sales growth of single-herb supplements.

Although sales of single-herb supplements previously accounted for a much higher percentage of overall sales, this is no longer the case. In 2023, the market shares of the two product types differed by less than three percentage points: 48.9% (totaling $6.134 billion) for combination formulas and 51.1% ($6.417 billion) for single-herb supplements.

As noted in previous *HerbalGram* Herb Market Reports, combination formulas contain multiple herbs that may work together to support a general health function or related functions. A combination supplement marketed for cardiovascular health, for example, may contain herbs with anti-inflammatory properties and other ingredients traditionally used for blood pressure support.[41] Single-herb supplements tend to have more specific uses and often more than one. For example, saw palmetto (*Serenoa repens*, Arecaceae) fruit supplements often are marketed for prostate health benefits and hair growth, among other uses.[42]

Table 6. Total US Retail Sales of Herbal Supplements by Type (Single vs. Combo)

	Total Sales	% Total Sales	% Change
2023			
Single Herbs	$6.417 billion	51.1%	3.3%
Combination Herbs	$6.134 billion	48.9%	5.7%
2022			
Single Herbs	$6.214 billion	51.7%	–2.3%
Combination Herbs	$5.803 billion	48.3%	–1.3%
2021			
Single Herbs	$6.360 billion	52.0%	5.8%
Combination Herbs	$5.881 billion	48.0%	14.0%
2020			
Single Herbs	$6.009 billion	53.8%	11.5%
Combination Herbs	$5.159 billion	46.2%	24.6%
2019			
Single Herbs	$5.390 billion	56.6%	6.3%
Combination Herbs	$4.139 billion	43.4%	11.7%
2018			
Single Herbs	$5.072 billion	57.8%	6.6%
Combination Herbs	$3.705 billion	42.2%	12.4%
2017			
Single Herbs	$4.759 billion	59.1%	5.6%
Combination Herbs	$3.298 billion	40.9%	11.9%
2016			
Single Herbs	$4.505 billion	60.5%	6.1%
Combination Herbs	$2.947 billion	39.5%	10.1%
2015			
Single Herbs	$4.245 billion	61.3%	5.5%
Combination Herbs	$2.677 billion	38.7%	10.7%

Source: *Nutrition Business Journal*

CONCLUSION

The US herbal supplements market has fluctuated, sometimes unpredictably, since the beginning of the COVID-19 pandemic. In just a four-year period, sales of these products experienced two years of the highest recorded growth in 2020 and 2021, the first decrease in spending in nearly two decades in 2022, and the weakest sales growth in more than a decade in 2023. The slight sales decrease in 2022 suggested that the market may be normalizing after two years of record-breaking sales, and the return to modest sales growth of 4.4% in 2023 appears to lend support to this idea.

Other signs of normalcy can be inferred from the 2023 sales figures. The top-selling herbal supplement ingredients in the mainstream and natural expanded channels in 2023 (psyllium and turmeric, respectively) remained the same as in 2022, as did most of the top 40 ingredients in both channels. Several recent sales trends also continued in 2023, including declining sales of CBD and immune health ingredients such as elder berry. Further, sales of products with certain health focuses such as cardiovascular and cognitive health saw additional gains in 2023, as consumers continue to prioritize products for healthy aging.[43]

As research into the health effects of medicinal plants and fungi continues, and mechanisms of action are better understood, some ingredients with established uses are being marketed for different, related uses and to a wider range of consumers. Beet root supplements, for example, once used primarily among athletes for potential performance benefits, are finding new marketing opportunities in the cardiovascular health and energy categories. Social media also continues to drive sales of some ingredients. The impact was perhaps most evident in the near-doubling of barberry supplement sales in the natural expanded channel in 2023, when berberine was promoted by some as the next "magic pill" for weight loss.[44]

The 4.4% increase of herbal supplement sales in 2023 was undoubtedly a welcome development in this industry. If annual sales continue to rise, it remains to be seen whether such growth will be reminiscent of the modest increases seen in the first decade of the 2000s or a return to the more robust sales growth of the 2010s. HG

Bacopa *Bacopa monnieri*
Photo ©2024 Steven Foster

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Dandelion *Taraxacum officinale*
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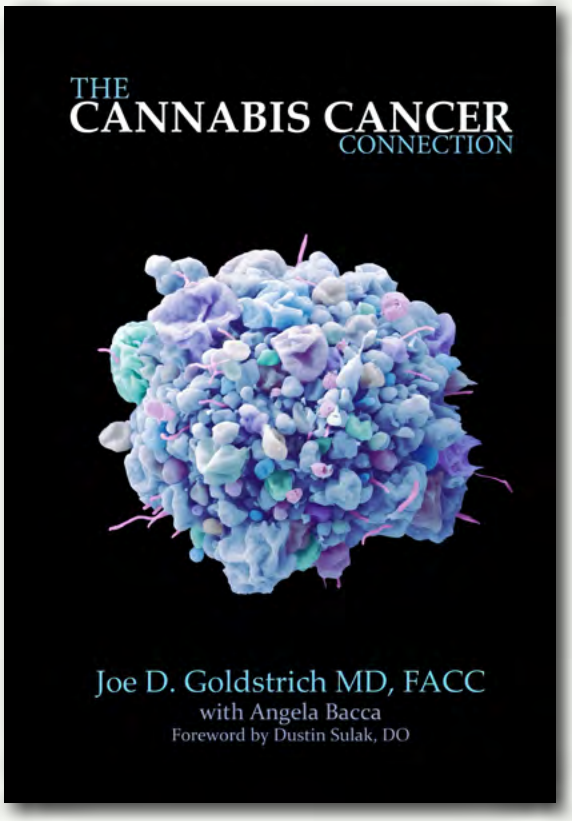
The Cannabis Cancer Connection by Joe D. Goldstrich with Angela Bacca. Lompoc, California: Flower Valley Press; 2023. Softcover; 229 pages. ISBN: 979-8-9890163-0-3. $19.99.

By Ethan B. Russo, MD

This book is a timely effort to address one of the many controversies surrounding cannabis (*Cannabis sativa*, Cannabaceae) as medicine: its ability to treat cancer primarily. That is, this book does not focus on the more familiar uses of cannabis for allaying nausea and vomiting associated with cancer chemotherapy or as an adjunctive medicine for pain, but rather, it explores cannabis' potential to eradicate the malignancy itself.

Historically, cannabis often was touted as a treatment for various tumors and growths, dating to the Egyptian Copts (a Christian ethnoreligious group) almost 2,000 years ago and extending to claims of Renaissance herbalists in Europe.[1] New claims of benefits for lung cancer emerged in 1975, only to remain quiescent until the discovery of the endocannabinoid system in the late 1980s and early 1990s spurred a torrent of new investigations. New research demonstrated that tetrahydrocannabinol (THC), cannabidiol (CBD), and a host of other phytocannabinoids have the ability to cause apoptosis (normal, programmed cell death) in various cancer cell lines that normally are immortal unless exposed to toxic chemotherapeutic drugs. A salient distinction was evident, however, in that these compounds from cannabis are preservative to normal cells and lack the associated adverse events of hair loss and sloughing of the gut lining and other chronic complications of chemotherapy.



As the book explains, this information became available to the public and prompted many people with cancer to attempt cannabis treatment. Many obstacles arose. THC-predominant cannabis was usually all that was available, and psychoactive side effects often prevented attainment of the high doses generally necessary to slow tumor growth. Above all, the Schedule I status of THC and cannabis as forbidden drugs in the United States hindered research and access. While obtaining a license to possess cannabis for research was possible, the process has been and remains excessively slow, bureaucratically onerous, and fabulously expensive. This resulted in an ongoing situation in which patients often feel forced to tackle the process themselves. Even if a cannabis dispensary is available, who is to advise as to what to take, how to prepare it, and in what amount? This book is a response to those questions.

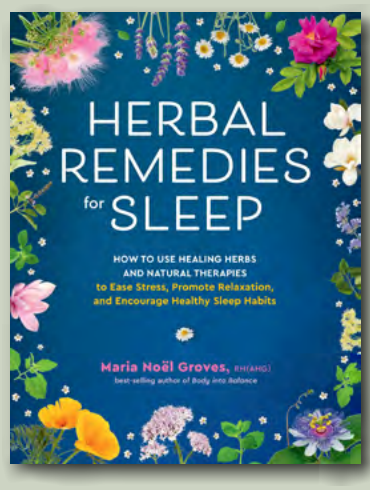
Author Joe Goldstrich, MD, is a highly experienced clinician with a background in cardiology and various aspects of nutrition, life extension, and complementary medicine. He is aided by co-author Angela Bacca, a journalist, businesswoman, cannabis industry maven, and founder of Flower Valley Press, the publisher of the book. They have addressed the myriad issues surrounding cannabis treatment for primary cancer (i.e., cancer that has not metastasized) in a compelling fashion. Despite very clear disclaimers that the book is not a treatment manual, the details in the text would certainly support the concept that it could be used as such. It is well referenced throughout, with up-to-date sources well into the 2023 literature. Its organization is sensible, with introductions to "Dr. Joe's" background and pilgrimage to cannabis care, the endocannabinoid system and its relation to carcinogenesis, cannabis compounds, and the sourcing and growing of cannabis. This is followed by specific mini-treatises on the most common cancer types, with descriptions of their particularities and details on available "conventional" treatments, as well as current data on cannabinoid effects and suggested dosing regimens.

For the most part, the information is quite accurate, but there are minor quibbles: The text has a good deal of redundancy, but this may be helpful in reinforcing the educational process, whether the reader is a patient, family member, or professional caregiver. Extensive coverage is provided on how to use "FECO" (multicomponent Full Extract Cannabis Oil) preparations that are the foundation of the suggested treatment approaches. However, the actual method to produce FECO was not included in the text, but solely online.[2] (Perhaps the book publisher's counsel feared legal repercussions.)

These processes can be accomplished in the home kitchen but may prove challenging logistically and financially for the ill, infirm, underprivileged, or elderly. Surely, the ideal situation would involve widespread access to the various neutral (decarboxylated) and acidic cannabinoids from high-quality dispensaries, rather than putting the responsibility on "kitchen chemists." Alas, politics intrudes at every corner, and a reliable, safe, and

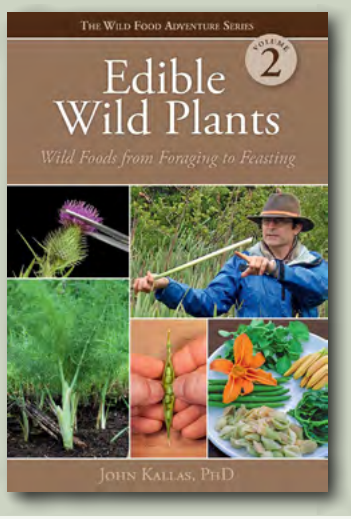
Article continues on page 72.

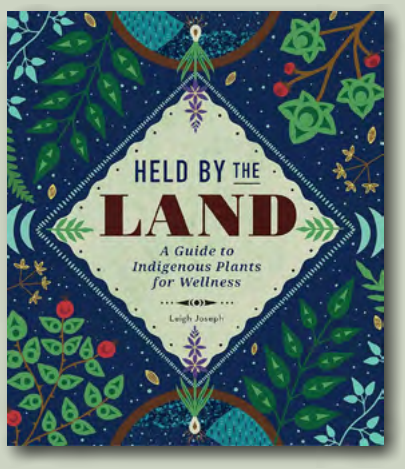
New Book Profiles



Herbal Remedies for Sleep: How to Use Healing Herbs and Natural Therapies to Ease Stress, Promote Relaxation, and Encourage Healthy Sleep Habits by Maria Noël Groves. New York, NY: Storey Publishing; 2024. ISBN: 9781635867749. Softcover, 192 pages. $19.99.

Herbal Remedies for Sleep introduces readers to common herbs for reducing stress and encouraging a good night's sleep, along with recipes for using them in homemade teas, tinctures, aromatherapy blends, glycerites (i.e., fluid extracts of herbs in glycerine), and more. The 16 plant profiles include three classes of herbs: nervines, which have a general calming and relaxing effect; adaptogens, which have grown in popularity for their ability to help the body adapt to stress; and sedative herbs. In the book, author Maria Noël Groves, RH (AHG), a clinical herbalist and teacher who previously authored *Grow Your Own Herbal Remedies* (Storey Publishing, 2019) and *Body Into Balance* (Storey Publishing, 2016), explains the science behind the physiology of sleep and offers natural strategies for overcoming sleeplessness.



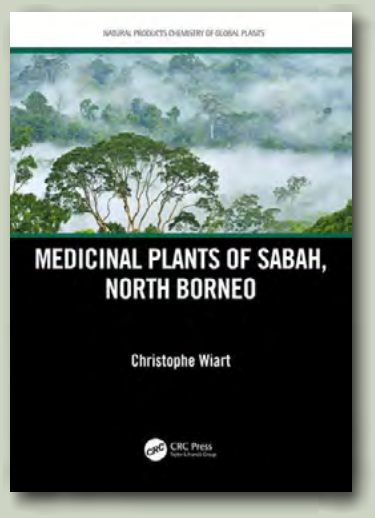


Held by the Land: A Guide to Indigenous Plants for Wellness by Leigh Joseph. New York, NY: Wellfleet Press; 2023. ISBN: 9781577152941. Hardcover, 192 pages. $24.99.

Held by the Land shares plant traditions of Indigenous peoples of North America. Author Leigh Joseph, an ethnobotanist and member of the Squamish Nation, gives readers an introduction to the uses of herbs and other plants for food and medicine, and she forges a connection to nature with recipes, stories, and her own traditions. The text includes 44 full-color illustrated plant profiles and guides on how to identify, responsibly harvest, and use plants. Plant profiles are arranged by plant type: trees, shrubs, flowering herbs, ferns, lichens, and seaweed.

Edible Wild Plants, Volume 2: Wild Foods from Foraging to Feasting by John Kallas. Layton, UT: Gibbs Smith; 2023. ISBN: 9781423641346. Softcover, 416 pages. $27.99.

The second book in "The Wild Food Adventure Series," *Edible Wild Plants*, Volume 2, is a picture-heavy foraging guide for both beginner and seasoned wild plant enthusiasts and builds on the concepts that John Kallas, PhD, introduced in *Edible Wild Plants*, Volume 1 (Gibbs Smith, 2010). Kallas, a botanist, nutritionist, and foraging instructor, profiles 18 North American plants and includes information such as common names, estimated geographic range, safety regarding harvesting or consuming the plants, lookalikes, nutritional information, sample recipes, and other facts. The book is written in a conversational style that draws from Kallas' years of experience in the field and is designed to teach practical information on the value and potential of wild foods.



Medicinal Plants of Sabah, North Borneo by Christophe Wiart. Boca Raton, FL: CRC Press; 2024. ISBN: 9781032514314. Softcover, 422 pages. $115.00.

Traditional plant medicine knowledge has sustained communities in North Borneo for generations, and the diverse array of plant life in this island territory may hold promise for new discoveries in the areas of natural products chemistry, functional foods, and pharmacology. The text, which is primarily for postgraduate students, academics, and pharmaceutical professionals, includes modern research on the botany, ethnobotany, and ethnopharmacology of the Asia-Pacific region, as well as an exploration of the healing traditions of the area. It also discusses potential toxicity concerns, local nomenclature, and distribution patterns, with profiles of 250 commonly used medicinal plants.

well-regulated market remains a distant goal, if not a "pipe dream," considering the people who make the rules.

In the text, warnings and disclaimers abound, but certain caveats deserve emphasis: (1) Cannabis should always be considered an adjunct to chemotherapy, radiotherapy, and surgery where available and supported by science; (2) Cannabis is not always the best option: A case in point is immunotherapy, where existing literature suggests possible worse outcomes when used in combination with cannabis treatment; (3) When cannabis treatment is successful in reducing tumor burden or even producing remission ("no evidence of disease"), it must be continued indefinitely, as clinicians in the field are aware of the many cases in which discontinuation has led to cancer recurrence, often in a more aggressive form; (4) The book contains suggestions on use of cannabinol (CBN), a non-enzymatic oxidative breakdown product of THC, but little literature supports its use for cancer and certainly not for its widely touted "benefits" for sleep, where the evidence is decidedly negative[3]; and (5) The use of cannabis rectal suppositories is also suspect, as available research does not support significant systemic absorption with this method. Such usage makes sense for rectal lesion treatment, but not for more remote disease.

Healthy or hyperbolic skepticism will continue to reign in the medical realm as to the safety and utility of cannabis for cancer, let alone for any other condition. This is mirrored by the authors' own statement on page 135: "The harsh reality is that nobody knows what works and what doesn't when using cannabis to treat cancer." Patients and their families facing the burdens of cancer treatment need help, and ideally this would occur in the context of bona fide doctor-patient relationships. An important resource would be the nonprofit Society of Cannabis Clinicians, which has a database of cannabis clinicians on its website.[4] For those without ready access to cannabis or a clinician, *The Cannabis Cancer Connection* certainly remains a hopefully viable alternative. HG

***Ethan B. Russo, MD**, is a board-certified neurologist, psychopharmacologist, researcher, and CEO of CReDO Science, which aims to understand how to apply components of cannabis to balance the endocannabinoid system and identify markers of endocannabinoid dysregulation for the treatment of disease.*

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E. John Staba

Emil John Staba
1928–2023

By Cindy Angerhofer, PhD

Emil John Staba, PhD, former professor of pharmacognosy at the University of Nebraska–Lincoln and professor emeritus of the University of Minnesota (UM), died in Saint Paul, Minnesota, on July 16, 2023, at age 95.

Staba was born on May 16, 1928, in New York City and served in the US Navy from 1946 to 1947. He received a bachelor's degree in pharmacy in 1952 from St. John's University in New York City and a master's degree in pharmacognosy in 1954 from Duquesne University in Pittsburgh, Pennsylvania. In 1957, he received a PhD in pharmacognosy from the University of Connecticut (UConn), having studied under renowned pharmacognosist Arthur E. Schwarting, PhD (1917–1996). From 1957 to 1967, he served on the faculty of the Department of Pharmacognosy at the University of Nebraska–Lincoln, rising to the rank of professor and serving as chairman of the department.

In 1968, Staba joined the UM College of Pharmacy, where he served as professor and chairman of the Department of Pharmacognosy until 1982 and professor of pharmacognosy and medicinal chemistry until his retirement in 1995, when he became professor emeritus.

Throughout his career, Staba was an enthusiastic teacher and took an active role in the administration of pharmacy education. From 1974 to 1976, he was an assistant dean for professional education at UM. He served on committees of the American Pharmacists Association, the Academy of Pharmaceutical Sciences, and the American Association of Colleges of Pharmacy. Staba, who had a hands-on teaching approach, keen listening skills, and gentle and kind demeanor, advised 33 graduate students and 12 postdoctoral fellows and was a mentor for many other students.

Along with Norman R. Farnsworth, PhD (1930–2011), Varro E. Tyler, PhD (1926–2001), and others, Staba was a founding member of the American Society of Pharmacognosy (ASP) in 1959. ASP was born as a formal organization from the annual Plant Science Seminar that began at UM in 1923. The stated purpose of the ASP was to "promote the growth and development of pharmacognosy, to provide the opportunity for association among workers in the science, to provide opportunities for presentation of research achievements, and to promote the publication of meritorious research."[1] Staba was highly active in supporting the young society. He organized scientific sessions, chaired an annual meeting, and served as president of the society from 1971 to 1972. His passion for the ASP helped increase visibility of the field of pharmacognosy and propel the society to national and international prominence.

Staba enthusiastically pursued many other appointments, collaborations, and fellowships to enrich his expertise and promote the field of natural products in the United States and around the globe. These achievements include: visiting professor at UConn (1966); National Academy of Sciences visiting scientist to Poland, Czechoslovakia, and Hungary (1969); Fulbright-Hays research fellow to Germany (1970); Council of Scientific & Industrial Research (CSIR) visiting scientist to India (1973); NASA/National Science Foundation (NSF) summer research fellow at General Electric, Philadelphia (1976); International Visiting Professor Award, Medical Research Council of Canada (1983); and UK visiting fellow to the University of Manchester (1989).

He was elected to the natural products subcommittee of the US Pharmacopeial Committee of Revision for four consecutive terms (1980–2000). Other services include membership of the NASA Advisory Council on Life Sciences (1984–1987); NSF projects in Pakistan and Egypt; three USAID projects in Indonesia (1985–1994); Indonesia Workshop on Steroid Biotechnology (1986); NATO Advanced Study Institute program, Portugal (1987); and a USAID visit to Thailand (1989). He also was elected as a fellow of the American Association for the Advancement of Science in 1982.

Staba's research spanned economically significant plant tissue cultures, aquatic plants, herbal remedies, and pharmacy education. He authored or co-authored more than 160 scientific papers, edited the book *Plant Tissue Culture as a Source of Biochemicals* (CRC Press, 1980), and held four patents. Plants of special emphasis in his research were ginseng (*Panax* spp., Araliaceae), ginkgo (*Ginkgo biloba*, Ginkgoaceae), and chamomile (*Matricaria chamomilla*, Asteraceae).

When Staba retired from UM in 1995, his contributions to pharmacognosy continued through his firm Plants Personified, Inc., and serving as the interim director of research and product development for Tom's of Maine, Inc., from 1996 to 1997.

With Staba's personal and professional interest in laboratory and scholarly research on *P. ginseng* and other ginseng species, he amassed a large, significant collection of books, papers, and general information about ginseng. His collection, however, was far deeper and broader than individual plants. It included historical *materia medica*, as well as books on medicine practices, including conventional, Eclectic, homeopathic, herbal, and home care; nutrition; and historical accounts of the traditional uses of herbs by peoples around the world.

In 2009, in a move to reclaim space in the home that he shared with his wife, Joyce, Staba donated much of his professional notes and papers to the Lloyd Library and Museum in Cincinnati, Ohio, as "The E. John Staba, Ph.D. Papers (1946-2006)" collection.[2] This collection includes reports, correspondence, conference brochures, publications, teaching materials, and research notes.

In 2016, he donated part of his collection of rare books to the Mishoomis Collection Library, located in the American Indian Learning Resource Center at the University of Minnesota Duluth (UMD).[3] (*Mishoomis* means "grandfather" in the Ojibwe language.) This library serves students studying American Indians and Alaskan Natives of North America. According to Matt Rosendahl, library director at UMD, Staba's collection on the history and culture of American Indians and Alaskan Natives in the United States and Canada is primarily nonfiction and includes information on history, culture, dance, music, art, and painting.[3]

"It's like giving away my children," Staba was quoted as saying.[3] "All my collections have given me much enjoyment over the years and much, much more information." Through his donations, he wanted these resources to be accessible to a new generation of scholars. When he offered 2,400 books to UMD, the Mishoomis Collection Library already had about 900 of them. Staba gave the duplicates to Fond du Lac Tribal and Community College in Cloquet, Minnesota; the community center library of the Fond du Lac Band of Lake Superior Chippewa in Cloquet; Red Cliff Band of Lake Superior Chippewa in Bayfield, Wisconsin; and the library system of Bayfield School District in Wisconsin.

In 2022, through Roy Upton, RH (AHG), of the American Herbal Pharmacopoeia (AHP), Staba was introduced to herbalist Bill Chioffi as Staba attempted to find a home for the remainder of his collection, including books on ginseng. Chioffi immediately thought of United Plant Savers (UpS) and the organization's Duke Ethnobotanical Archives and connected Staba to Susan Leopold, PhD, executive director of UpS. Staba donated more than 5,800 books to UpS, which is now in the process of incorporating these resources into the Duke Ethnobotanical Archives and plans to digitize the archives and make them more accessible.[4]

"John was a true scholar and a soft-spoken man who chose his words very carefully," said Mark Blumenthal, founder and executive director of the American Botanical Council (ABC). "I initially met him in the late 1970s at an Herb Trade Association symposium in Santa Cruz, California, and I kept up a relationship with him and his wife Joyce (who frequently traveled with him to various conferences) for more than 40 years. I spent hours in his basement library perusing his wide selection of books and talking about pharmacognosy, herbal medicine, native cultures, and even various forms of spiritual beliefs and traditions. His knowledge of a wide variety of subjects was extensive. I was honored to have been invited to lecture at his pharmacognosy classes at UM, and I will

always be grateful to him for introducing me to Rick Kingston, PharmD, who took over his class on pharmacognosy and natural products at UM and who became a close friend and, eventually, the president of ABC's Board of Trustees."

The last time this author visited John in his home, he was still happily surrounded by books of all kinds that were obviously being used and bringing him joy. This wonderful teacher and curious researcher never stopped learning and enjoying life through his last days. He is survived by his wife Joyce, five children, eight grandchildren, and two great-grandchildren. HG

***Cindy Angerhofer, PhD**, is an adjunct professor at the University of Illinois Chicago and was executive director of botanical research at Aveda/Estée Lauder for 20 years. She was a student of Professor Staba at UM.*

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Mary Ellen Abood 1958–2023

By Connor Yearsley

Mary Abood, PhD, a highly respected pharmacologist, researcher, and professor, died suddenly but peacefully in her sleep at her home in Emerald Hills, California, on February 19, 2023, at age 64. She was an expert on the endocannabinoid system (ECS), a biochemical signaling system that is involved with normal, critical physiological functions and mediates the effects of cannabis (*Cannabis sativa*, Cannabaceae) in the body.[1-3]

Mary Abood
Photo courtesy of Ellen Unterwald and Temple University

For more than 30 years, Abood was a leader in the cannabinoid field. She made significant contributions to cannabinoid biology and cannabinoid receptor cloning,* as well as the study of intracellular signal transduction (i.e., the process by which a signal is transmitted through a cell) in the ECS, and more. Abood's research has played a major role in advancing cannabinoid pharmacology.[1,2] Her many research articles have been cited more than 13,800 times in the scientific literature, according to Google Scholar.

Abood was born on April 14, 1958, in Oak Park, Illinois, to Leo and Lois (Wuchner) Abood and was exposed to science her entire life. Her father was a respected scientist and professor in the fields of pharmacology and biochemistry, and, as a child, she would visit him at work.[3,4]

She received a bachelor's degree in chemistry from Carleton College in Northfield, Minnesota, in 1979 and a PhD in pharmacology from the University of California, San Francisco in 1986. In 1989, Abood completed postdoctoral training in molecular biology at the Pritzker Laboratory, Stanford University in Stanford, California.

Her doctoral and postdoctoral research investigated the endogenous opioid system, but her attention shifted after the ECS was discovered in the late 1980s and early 1990s. "When I learned about the newly identified cannabinoid receptors (structurally similar to receptors for opiates) I was intrigued," she was quoted as saying in *The Cannabis Scientist* in 2021.[4] "I immediately wanted to understand this new system better."

Abood was an assistant professor in the Department of Pharmacology and Toxicology, School of Medicine, Medical College of Virginia (MCV) in Richmond (1990–1996); an associate professor with tenure in the Department of Pharmacology and Toxicology, Virginia Commonwealth University (VCU) in Richmond (1996–1999); and a scientist at the California Pacific Medical Center Research Institute (CPMCRI) in San Francisco (1999–2007).

She was an affiliate associate professor in the Department of Pharmacology and Toxicology, VCU (beginning in 1999); a senior scientist at CPMCRI (2007–2008); and an associate professor with tenure in the Department of Anatomy and Cell Biology and the Center for Substance Abuse Research, Temple University in Philadelphia, Pennsylvania (beginning in 2008). She retired from research in June 2021 and became a professor emerita.

* Cloning of cannabinoid receptors provides definitive proof of the receptors' independent existence and allows them to be studied directly in biochemical assays. Receptor cloning often has enabled scientists to determine the receptor structure and better research and understand the physiological functions of the receptor. It is easier and less expensive to study receptor interactions in cells with cloned receptors than in animal models. Receptor cloning also enables more reproducible results by eliminating epigenetic impact on receptor expression (i.e., the influence of other genes that may lead to slight modifications in a receptor's function).

Friends and Colleagues Remember Mary Abood

Brian F. Thomas, PhD, principal scientist of Empirical Pharmaceutical Services, LLC, wrote (email, February 15, 2024):

> I first met Mary in 1990 when she joined the faculty of the Department of Pharmacology and Toxicology at the Medical College of Virginia/Virginia Commonwealth University, where I was doing my graduate training and dissertation research. She quickly established the focus and expertise that led to a remarkable career, during which she made significant contributions throughout the endocannabinoid field. Also at that time, she began to train in belly dancing, a form of expression that fit well with her personality and professional endeavors. She was engaging and persuasive and clearly articulated her feelings and intentions. Combining these attributes with her genuine support of others and her relationship-oriented approach led to her becoming well-recognized and respected for developing successful collaborations and building engagement in her research. Family and focus on working with others were sources of her greatest happiness, and her penchant for teamwork was foundational in the tremendous success she earned throughout her career.

Jahan Marcu, PhD, cannabis researcher and co-founder and chief scientific officer of Aromarc Therapeutics, wrote (email, February 16, 2024):

> Mary was a beacon of inspiration for many and a catalyst for transformation in my own life. My journey under her mentorship began unexpectedly. I still vividly recall her suddenly appearing at my cubicle when I was an entry-level lab technician at the California Pacific Medical Center Research Institute (CPMCRI) in San Francisco. She told me she was moving her laboratory from CPMCRI to Temple University in Philadelphia and extended an invitation: "Why don't you move to Philadelphia and join my lab? You can get your PhD working for me."
>
> This wasn't just an offer. It was a challenge to leap into a future I had barely dared to envision. A few weeks later, after she moved to Philadelphia, the phone rang at my cubicle. I never received phone calls at my desk. It was Mary, beseeching me to drop everything, take the GRE, and apply to Temple University. She ended our call abruptly by saying, "Just take the GRE and get me those numbers!" About two months later, I had moved to Philly and was working in her lab. Working in Mary's lab wasn't just an education. It was the best experience of my professional career. As a pharmacologist, she was unparalleled in the cannabinoid field, combining scientific rigor with strategic brilliance.

Dow Hurst, former research scientist at the University of North Carolina at Greensboro, wrote (email, February 12, 2024):

> I met Mary in 1997 at the International Cannabinoid Research Society meeting in Stone Mountain, Georgia. She was starting her career as a primary researcher and was looking for a molecular modeling collaboration with Patricia Reggio, PhD. I had just started working with Patti on molecular modeling and drug design. Mary was bright, very polite, and excited about the possibilities in the cannabinoid field. Patti and Mary agreed to a CB1 receptor collaboration that lasted 25 years.
>
> Mary was a rare experimentalist. She allowed collaborators to see the not-so-great data along with the best data. She was always excited about new techniques and willing to look at ramping up new assays, even if it could take years to get right…. Mary truly cared about her students' success and allowed them autonomy, while fighting to keep funding coming. While she was good at her career, she really enjoyed time with family.

Jason B. Schechter, PhD, managing director of the International Cannabinoid Research Society (ICRS), wrote (email, February 19, 2024):

> It is with both joy and sadness that I'm brought to remember the life of Dr. Mary Abood. I met Mary at my first ICRS conference in Hunt Valley, Maryland, in 2000. She was then, as she always was, an extraordinarily personable, humble, and brilliant scientist. As her myriad students and colleagues will undoubtedly attest, Mary was just so kind and accessible. At the time, I had just started a postdoc in the Department of Pharmacology and Toxicology of Virginia Commonwealth University (VCU) and had moved into the same laboratory that she had just departed as a tenured associate professor on her way to CPMCRI in San Francisco. She left a veritable wake of research findings, grants, competitive renewals ... and posters! The walls of VCU were festooned with her hard work.
>
> The lab space I called home for three years had the name "ABOOD" in black Sharpie on every fridge, every centrifuge, lyophilizers, glassware, tube racks, everything. And after having met her, this nominal presence was always both as calming and supportive as was her actual friendship. Mary was a foundational member of the ICRS, and it was an honor to later serve with her. She is deeply missed.

Ellen Unterwald, PhD, chair and professor of the Department of Neural Sciences and professor in the Center for Substance Abuse Research at Temple University, wrote (email, June 21, 2024):

> Meeting Mary early in my career was a stroke of great fortune. At that time, we both were postdocs in laboratories researching opioids, thus we bonded over shared interests and often met up at scientific conferences around the globe. Despite her gentle demeanor, Mary possessed a spirited sense of humor and a thirst for adventure that made every moment with her memorable.
>
> In 2008, fortune struck again with Mary's arrival at Temple University, where her expertise in cannabinoid pharmacology was a notable addition to our research center. Despite her significant contributions to the field, Mary was eternally humble and always quick to credit her lab members and collaborators for their part in her achievements.
>
> In 2021, Mary surprised us with her retirement, a choice motivated by her commitment to spend more time with her family and return to California. Mary was more than a colleague. She was a loyal friend whose warmth and kindness touched us all. Her legacy of humility and dedication continues to inspire.

Most of Abood's research focused on the structure and function of cannabinoid receptors, including localization, characterization of downstream signaling pathways (i.e., cellular responses that come later in the signaling chain), and identification of additional biochemical receptors on which cannabinoids exert their actions.[1,2,5]

Her laboratory investigated the ECS with a focus on its cellular receptors. She and colleagues cloned the cannabinoid type 1 (CB1) receptor and cannabinoid type 2 (CB2) receptor and identified some of the structural and accompanying functional features of these proteins. These studies were designed to elucidate the molecular mechanisms of cannabinoid receptor action.[1,2,5]

Her work also focused on identifying novel cannabinoid receptor subtypes beyond the more familiar CB1 and CB2 receptors. This led to the characterization of the G protein-coupled receptor 55 (GPR55) and G protein-coupled receptor 18 (GPR18) as putative cannabinoid receptors, which may have significant clinical potential and may help regulate pain and inflammation, for example.[1,2,5]

Abood and colleagues also investigated allosteric modulators of the CB1 receptor (i.e., molecules that bind to a separate site, called the allosteric site, on the receptor and may help limit or avoid undesirable side effects of other cannabinoids that bind to the primary site, called the orthosteric site).[4]

"I'm very proud of the work that I did looking at the endocannabinoid system in amyotrophic lateral sclerosis (ALS)," Abood was quoted as saying in *The Cannabis Scientist*,[4] describing her work on what is commonly referred to as Lou Gehrig's Disease. "We found that THC [tetrahydrocannabinol, cannabis' main psychoactive compound] was able to — at least temporarily — slow disease progression in animal models. Those studies helped inspire others to start clinical trials … of cannabinoids to treat the symptoms of ALS. I know a neurologist who is using medical cannabis for her ALS patients. When I hear that it helps them, that's a big motivator to continue to learn more about cannabinoids and their medical potential."

Abood was an important member of the International Cannabinoid Research Society (ICRS) since before its formal incorporation in 1992. She served as ICRS secretary from 2001 to 2004 and ICRS treasurer from 2009 to 2011. In 2015, she was recognized with the ICRS's highest academic honor, the Mechoulam Award, which has been given annually since 2000 and was named for renowned cannabis researcher Raphael Mechoulam (1930–2023).[1]

"The Mechoulam award is given to a distinguished established scientist who has made continued meritorious, significant, and widely recognized contributions to cannabinoid and endocannabinoid research that have moved the discipline forward," according to the ICRS.[6]

Abood was also a member of the Society for Neuroscience, the American Society for Pharmacology and Experimental Therapeutics, The College on Problems of Drug Dependence, and the International Union of Basic and Clinical Pharmacology (IUPHAR) Committee on Receptor Nomenclature and Drug Classification, Subcommittee on Cannabinoid Receptors.

She was a US National Institutes of Health (NIH) study section member and served on the editorial board of the peer-reviewed journal *Cannabis and Cannabinoid Research*. In 2020, *The Cannabis Scientist* included Abood among 20 "R&D Trailblazers" on "The Cannabis Scientist Power List 2020,"[7] and, the same year, Project CBD included her on its list of "Women Pioneers in Cannabinoid Science."[8]

Abood also advised, mentored, and sponsored dozens of postdoctoral fellows, predoctoral trainees, and undergraduates from a diverse range of specialties and programs, including from CPMCRI, VCU, and Temple University, and she served on more than 30 thesis committees for students from all over the world.[1]

In *The Cannabis Scientist*, Abood was quoted as saying: "I have been very fortunate to work with many talented colleagues and students over the years. That really is my luckiest break."[9]

Mary Abood is survived by her husband Dave Bieber; son Zach Abood-Bieber; brother George Abood and his family; her stepchildren; and her grandchildren.

As a way to honor Abood's career-long commitment to supporting women in science, her family requested that the ICRS create the "Mary E. Abood ICRS Women in Cannabinoid Research Fund." This fund will support women trainees and junior-level women scientists to allow them to be part of the ICRS community through membership, conferences, and travel support. The fund will also support travel and accommodations for a yearly plenary speaker, who is a female scientist, at the annual ICRS conference.[10] HG

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Muhammed Majeed 1948–2024

By Connor Yearsley

Muhammed Majeed
Photo courtesy of the Sami-Sabinsa Group

Muhammed Majeed, PhD, founder and chairman of the Sami-Sabinsa Group, died peacefully surrounded by family and close friends in Chennai, India, on March 13, 2024, at age 75, after complications from surgery. He had more than 45 years of experience in the medicinal plant, pharmaceutical, biotechnology, molecular biology, nutritional, and cosmetic fields, and some have called him the "Father of Indian Nutraceuticals."[1,2*]

As a business leader, entrepreneur, researcher, and scientist, Majeed pioneered the development of standardized extracts of Ayurvedic herbs and helped establish a global market for these products. For 36 years, he guided the Sami-Sabinsa Group as it became a well-respected, multinational health and life sciences company. Those who knew him remember his determination, passion for innovation, forward-thinking leadership, risk tolerance, generosity, good nature, and more (see sidebar).

Born on September 25, 1948, into a Malayali (i.e., a Dravidian ethnolinguistic group) family, Majeed was one of six children. He was born and grew up in Kollam, a district in the southwestern coastal state of Kerala, India, and spoke Malayalam and English. After his father, Mohammed Kunju Majeed, died when Majeed was 12 years old, his mother, Fatima, did her best to ensure that he received a quality education. Her support encouraged him to keep studying instead of dropping out to continue the family's trade of working on a banana (*Musa* spp., Musaceae) plantation.

Majeed earned an undergraduate degree in pharmacy from Thiruvananthapuram Medical College (also called the Government Medical College, Thiruvananthapuram) in Thiruvananthapuram, Kerala, in 1973 and worked as a teacher before emigrating to the United States in 1975, reportedly with eight dollars in his pocket.

He initially worked in a pharmacy and, in 1980, earned a master's degree in industrial pharmacy at Long Island University in New York. In 1986, he completed his doctorate in industrial pharmacy at St. John's University in New York City. For more than 10 years, while earning his degrees, he gained research experience in positions at Pfizer and Carter-Wallace and as head of research at Paco Pharmaceutical Services in New Jersey.

Majeed recognized an underdeveloped opportunity to introduce Ayurveda-based products around the world and focused on combining traditional Ayurvedic knowledge with modern science. Through his companies, he created evidence-based botanical products and emphasized innovation, standardization, and value addition throughout the supply chain, or value network.

"Many new medicines and vaccines will come out of America and other countries, but they will not be affordable for the majority of Indians," Majeed was quoted as saying in an article on Sabinsa's website.[3] "So we should look into Ayurveda and find out what our sages have been doing in ancient times and create innovative products that prevent health problems and also meet the needs of the time."

In 1988, Majeed began operating the Sabinsa Corporation, which is based in East Windsor, New Jersey, and named after his wife. In 1994, he introduced a marketing concept called "Sabinsa on Wheels" in different locations in the United States and eventually elsewhere. This initiative invited dietary supplement companies to attend presentations about Sabinsa's ingredients and services. It was highly successful and increased the company's presence and visibility.

In 1991, Majeed started Sami Labs Limited (now known as Sami-Sabinsa Group Limited), a research and manufacturing facility in Bengaluru, India. Today, Sami-Sabinsa Group Limited and its global subsidiary Sabinsa operate seven manufacturing facilities and employ more than 1,400 people worldwide, mostly in India. This team includes more than 120 scientists, who delve into herbs' mechanisms of action and physiological effects and then share their research through articles published in peer-reviewed journals. Research and development are conducted in the areas of biochemistry, organic chemistry, phytochemistry, plant biotechnology, and tissue culture.

The Sami-Sabinsa Group now markets more than 120 standardized botanical extracts in 17 countries, and many of these products are patented. Majeed and Sabinsa have been granted more than 475 US and international patents.

Majeed and his team's development of products including Curcumin C3 Complex® (an extract of the rhizomes of turmeric [*Curcuma longa*, Zingiberaceae]), BioPerine® (a standardized extract of the dried fruits of black pepper [*Piper nigrum*, Piperaceae]), and ForsLean® (a standardized powdered extract of the roots of *Coleus forskohlii*, Lamiaceae) has helped establish the company's global identity.

Over the 36 years that Majeed led the Sami-Sabinsa Group, it expanded in the United States and India and established large-scale operations in Australia, Brazil, Canada, China, Germany, Japan, Poland, South Africa, South Korea, the United Arab Emirates (UAE), and Vietnam, as well as satellite offices in France, Hungary, Spain, Taiwan, and the United Kingdom.

In some markets, such as China and Japan, Sabinsa was an early entrant, when, according to the company, no other company had explored the potential of standardized Ayurvedic botanical ingredients in these regions. Now, according to Sabinsa, the company is a leader in the nutraceutical and "cosmeceutical"† ingredient industries in these places.

* Nutraceuticals are products that are derived from food sources and provide health benefits in addition to their nutritional value.

† Cosmeceuticals are cosmetic products with bioactive ingredients that have reported medical benefits.

In 1992, Majeed acquired America's Finest, Inc. (AFI), a dietary supplement company that offers ingredient-specific and condition-specific formulations. AFI uses many of Sabinsa's ingredients, ensuring these ingredients reach consumers without delay. This division was enhanced in 1999, when Sabinsa Manufacturing, the company's contract manufacturing arm, which offers contract services to both buyers of Sabinsa's ingredients and non-buyers, was established in Payson, Utah. Several years later, Sabinsa's Utah facility became a full-fledged contract manufacturing company that delivers capsules and tablets and services such as granulation, roll compaction, blending, and milling.

In 1999, Sami Labs launched a division called Sami Spices in Cochin, Kerala, to procure and market spices. The same year, Organica Aromatics, an affiliate company of Sabinsa Corporation, was founded to serve the flavor and fragrance industries by developing high-quality aromatic and perfumery compounds.

In 2001, Sabinsa Cosmetics was formed to market specialized ingredients for the personalized care and cosmetics industries. In 2010, Majeed started Sami Direct to market his company's ingredients through a direct-to-consumer business model. Now, Sami Direct offers 20 products, including those for weight management, joint health, bone strength, and skincare.

Majeed also recognized the need for, and potential of, contract farming for medicinal plants. In the early 2000s, he traveled extensively to meet with farmers and understand cultivation challenges in South India, including the states of Tamil Nadu and Karnataka, as well as the northeastern state of Odisha and outside of India, such as Vietnam, Africa, and Brazil. He encouraged many farmers to begin cultivating medicinal plants, promoted the concept of "herbal security" (i.e., financial and food security through ongoing support from the Sami-Sabinsa Group, ensuring farmers a steady stream of income), and helped address sustainability

Friends, Family, and Colleagues Remember Muhammed Majeed

Shaheen Majeed, global CEO and managing director of the Sami-Sabinsa Group, wrote (email, May 28, 2024):

> I grew up in the business, working for my father, and I know how many people admire him. What many people don't know are the incredible little stories that shaped who he was and what he would accomplish in his life. As he completed pharmacy school in India in the 1970s, he had the opportunity to go to either the United States or Dubai, which most of his classmates would do. It was a difficult decision, but his mother told him that if he went to the United States and failed, he could always come back to India or try another place. It was this risk tolerance, stemming from the assurance she gave him, that propelled his life and career forward. I could see the risks he took, knowing he created a safety net with his hard work during the day at major pharma companies and at night studying for his master's degree and PhD. His brilliance came from the risks he took, and it is with absolute admiration that I, and thousands the world over, will always look up to him for that.

Asha Ramesh, CEO of Sabinsa USA, wrote (email, May 28, 2024):

> Many of us saw Dr. Majeed almost as a parent. It is thanks to his mentorship, inspiration, and guidance through the years that many of us have been with the company for decades. It has been a once-in-a-lifetime honor and privilege to have had the opportunity to work for Dr. Majeed closely and to have known him personally. He was truly an outstanding and remarkable leader. Some of Dr. Majeed's words of wisdom were, "The organization is bigger than all of us," and he emphasized setting innovation and top quality as our benchmarks, along with execution excellence, steadily staying focused, working hard and efficiently, and teamwork. Adhering to that wisdom, plus believing that we can make a difference in the world, has set our company apart from the rest.
>
> Dr. Majeed's legacy will continue to steer our group to much loftier heights under the new leadership team of his children. All of us hope to continue to grow Dr. Majeed's world-class legacy along the same path of innovation and excellence he has laid before us.

Suzanne Shelton, founder of The Shelton Group and longtime Sabinsa publicist, wrote (email, May 16, 2024):

> Sabinsa was one of my first clients after I started The Shelton Group in 1990. In the early years, I worked directly with Dr. Majeed. He was truly a visionary and committed to confirming, with modern research, the significant health benefits of traditional Ayurvedic herbs. Back then, publishing research on branded ingredients was rare, although competitors' "borrowing" of Sabinsa's science happened all too often, much to Dr. Majeed's distress. He never gave ground when protecting the products that he and his scientists developed. In his view, safeguarding Sabinsa's intellectual property was protecting its customers as well.
>
> It was fascinating to watch Dr. Majeed's leadership in digging deeply into an herb or herbal product, such as with curcumin and the multiple variations of that material Sabinsa created. Over the years, he pioneered many herbal products that are industry staples now. While Dr. Majeed could be tough, he was also a dedicated mentor when he saw potential in someone and personally stayed in touch with many of his employees for years. It is an honor to have been working for so many decades with the company he created and a great source of professional pride and satisfaction to have been part of Dr. Majeed's team.

Mark Blumenthal, founder and executive director of the American Botanical Council (ABC), wrote (email, July 9, 2024):

> India has been a treasure trove of medicinal plants and spices for millennia. Dr. Majeed was a key pioneer who helped modernize and develop the Indian Ayurvedic and medicinal plant tradition to a point where clinically tested, pharmaceutically prepared standardized botanical extracts have become a major export item for the Indian economy, providing jobs for thousands of people. He and Sabinsa were the first to expose the marketing of synthetic curcuminoids as additives to "standardized turmeric extract" and prevailed in litigation against sellers of this fraudulent material. Dr. Majeed's strong commitment to scientific and human clinical research on his company's botanical ingredients is the reason why Sabinsa was the first Indian company to receive ABC's Varro E. Tyler Award in 2023.

Additional tributes to Majeed can be found in the expanded version of this article, which was published online in the August 2024 issue of HerbalEGram.[4]

challenges related to many rare medicinal herbs. He helped introduce the medicinal plant *C. forskohlii* from the wild to commercial cultivation, benefiting farmers and the industry.

Majeed believed that good supplements start with quality ingredients that are supplied sustainably. He and his team identified small farmers in the Salem district and surrounding districts in the southeastern coastal state of Tamil Nadu to cultivate key Ayurvedic herbs, including *C. forskohlii*, tulsi (*Ocimum tenuiflorum*, Lamiaceae), and amla (*Phyllanthus emblica*, Phyllanthaceae). Starting in 2006, Majeed provided training, plant material, and ongoing support for these farmers and their communities.

His company is committed to fair trade practices and signs long-term agreements with farmers. These contracts call for paying guaranteed prices, even if crops fail due to weather extremes, and farmers are paid more when market prices dictate. The Sami-Sabinsa Group works with about 6,000 farmers across more than 20,000 acres.

Majeed and his companies have demonstrated commitment to sustainability, including through long-term engagement with ecosystems, environmental considerations in their manufacturing facilities, operational excellence through resource optimization and production efficiency in manufacturing, and the Sami-Sabinsa Group's award-winning Indian kino tree (*Pterocarpus marsupium*, Fabaceae) reforestation project in the central state of Madhya Pradesh.[5]

In 2004, Majeed launched the Dr. Majeed Foundation, which is involved with many philanthropic initiatives and helps improve quality of life for the less fortunate. Among other activities, the foundation made significant financial contributions to state and central government aid programs and funded and organized food deliveries for underserved communities in India during the COVID-19 pandemic and natural disasters.

During his life, Majeed and his companies received many recognitions. He received the National Award for Quality and Innovation from the President of India in 1995, 1997, and 2008. In 2002, he was recognized with an award from India's Department of Scientific and Industrial Research (DSIR). In 2004, he received the Ellis Island Medal of Honor from the Ellis Island Honors Society in recognition of his leadership, commitment, and service to his heritage and the American community. In 2004 and 2005, Sabinsa received the Thomas Alva Edison Patent Award from the Research & Development Council of New Jersey.

In 2009, Sabinsa received the American Herbal Products Association's (AHPA's) Herbal Industry Leadership Award. In 2016, Majeed was inducted into New Hope Network's Hall of Legends for his pioneering contributions to the nutraceuticals industry in the United States. In 2018, he received the Shield of Honor from the Associated Chambers of Commerce & Industry of India (ASSOCHAM) for "Outstanding Achievements in the Nutraceuticals Space," and, the same year, he received NutraIngredients' Nutra-Champion award.

ASSOCHAM named Majeed the "Father of Indian Nutraceuticals Industry" in 2021 and the "Legend of the Millennium in Nutraceuticals Industry" in 2022. In 2023, he received a Lifetime Achievement Award at the 1st Kerala Pharmaceutical Congress, and, the same year, Sabinsa received the American Botanical Council's (ABC's) Varro E. Tyler Commercial Investment in Phytomedicinal Research Award.

Majeed authored or co-authored more than 250 peer-reviewed research articles, which have been cited more than 10,000 times in the scientific literature, according to Google Scholar. He also authored, co-authored, or edited at least 15 scientific books about the history and potential medicinal benefits of multiple herbal extracts and research on their constituents.

Muhammed Majeed is survived by his daughters Anju and Sami, his son Shaheen, and his grandchildren. Anju Majeed, PhD, assumed the role of group executive chairperson of the Sami-Sabinsa Group, and Shaheen Majeed became the company's global CEO and managing director to continue their father's legacy. HG

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FROM THE FIELD

Coffee (*Coffea arabica*, Rubiaceae) harvester from the Ivory Coast in western Africa.

Photo by Chris Kilham

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