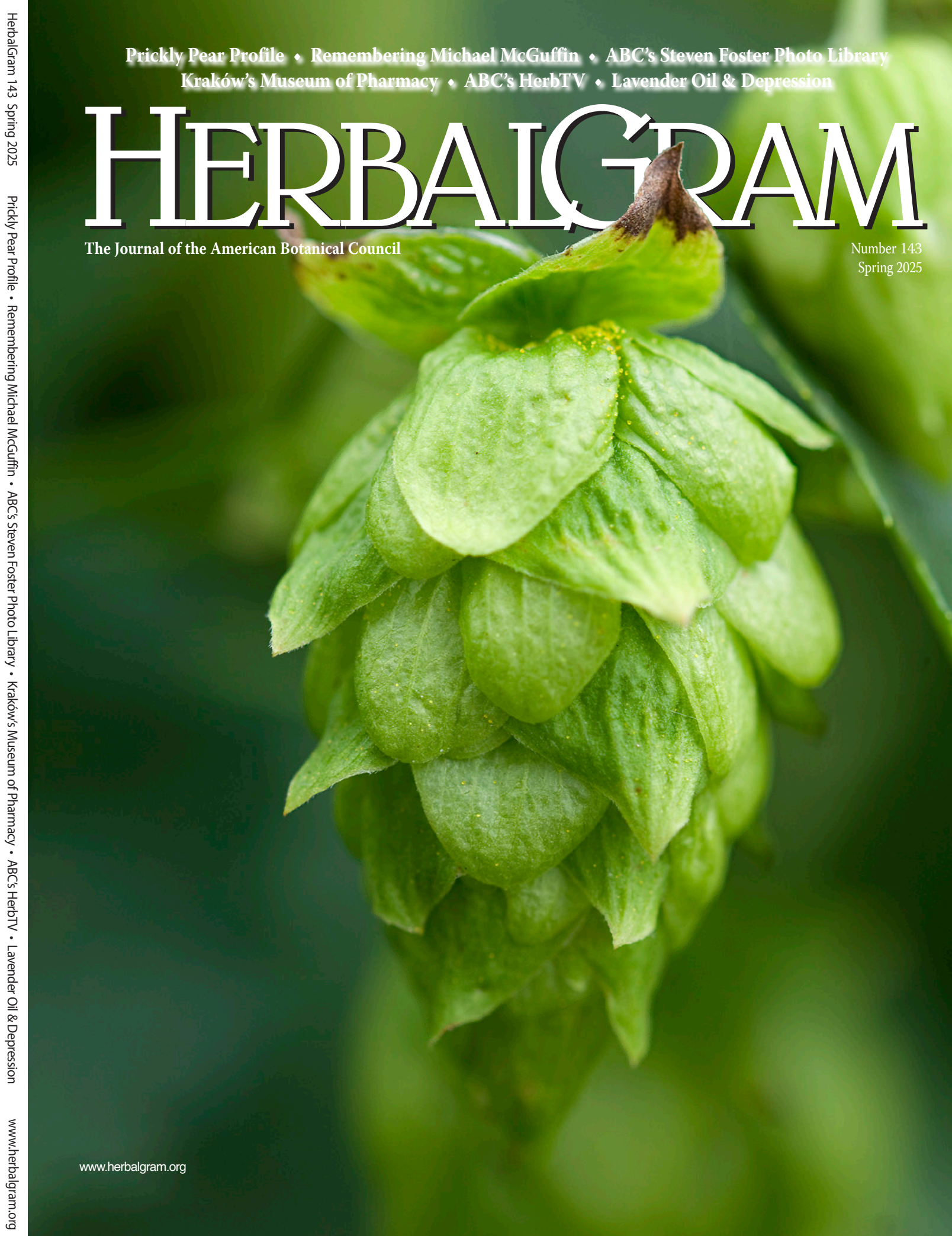
Prickly Pear Profile • Remembering Michael McGuffin • ABC's Steven Foster Photo Library
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# HERBALGRAM

The Journal of the American Botanical Council

Number 143
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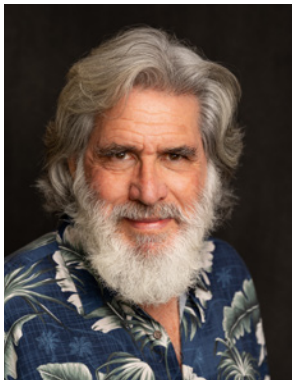
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# dear *reader*

The news of the passing of American herb industry leader Michael McGuffin in February 2025 sent shock waves of grief and sadness throughout the US and international herbal community. Michael was president of the American Herbal Products Association (AHPA) for more than 25 years, since 1999, and was a highly effective leader of the US herbal products industry. As I have said before, when the history of the American herbal industry is written, Michael will no doubt be remembered as one of the key people — if not *the* key person — responsible for much of the growth and development of the industry. He was a tireless worker and deeply dedicated to promoting the safety, value, and responsible use of herbs and medicinal plants in general and AHPA's mission in particular. We pay tribute to him and his legacy in this issue.

We express our deep gratitude to Marisa Williams, ND, RH (AHG), and Aaron Jenks, PhD, for this issue's Herb Profile on prickly pear (*Opuntia ficus-indica*), commonly known by its Spanish name, *nopal*. I was surrounded by this cactus growing up in far West Texas in the Chihuahuan Desert, and it has been a favorite of mine ever since. A traditional food and medicine, nopal is native to the Western Hemisphere but is now growing wild in many other areas. Indigenous peoples in Mexico and the Southwestern United States have used both the green *nopales* (the pads, or flattened leaf-like stems) and the purple *tunas* (fruits) for millennia.

We are truly happy to announce that ABC has purchased the rights to the extensive photographic library of our dear friend, the late Steven Foster (1957–2022). We have been fortunate to have access to Steven's compelling photography throughout most of the history of *HerbalGram*. We have featured his photos in many other ABC publications and communications, on ABC's website, in ABC's Herbal E-Cards, and more. The collection contains over 150,000 of Steven's images of more than 1,700 accurately identified species of medicinal and aromatic plants. We will continue to use them to help promote ABC's nonprofit research and educational mission and to ensure that Steven's remarkable visual legacy lives on.

In July 2024, I had the opportunity to give a lecture in beautiful Kraków, Poland, at the International Congress on Natural Products Research. During our brief visit in Kraków, ABC Chief Science Officer Stefan Gafner, PhD, and I were able to visit the historic Kraków Museum of Pharmacy — one of the largest and oldest museums of its kind in the world. As herbalists already know, much of the history of pharmacy (and medicine) is based on herbs and medicinal plants. In this issue, we include Stefan's narrative, co-authored with Agnieszka Szopa, PhD, and Agnieszka Rzepiela, PhD, and photos of many of the botanically oriented items in this extensive and engaging museum.

Our good friend, Chris Kilham, botanical medicine hunter, author, educator, and yogi, has created one of his popular travelog-style articles about a hops (*Humulus lupulus*) harvest in southwest France. Of course, the hop plant, botanically related to cannabis, is one of Europe's most treasured medicinal plants. Our grateful appreciation to Chris for sharing his experience and photos from his journey. Chris' many editorial and multimedia contributions to ABC, including this article, have earned him the ABC Champion Award for 2025. (More on ABC's 2025 Botanical Excellence Awards in our next issue.)

In addition to the passing of Michael McGuffin, we honor the lives of other colleagues who made significant contributions to the world of medicinal plants and fungi: Oregon herb farmer Randy Buresh; English ethnopharmacologist and pharmacognosist Peter Houghton, PhD; psychopharmacologist, Johns Hopkins professor, and psychedelic pioneer Roland Griffiths, PhD; and natural products chemist and Sami-Sabinsa Group President of R&D Kalyanam Nagabhushanam, PhD. May their memories be a blessing.




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**34** **A Visit to the Museum of Pharmacy in Kraków, Poland**

*By Stefan Gafner, PhD, Agnieszka Szopa, PhD, and Agnieszka Rzepiela, PhD*

The Museum of Pharmacy in Kraków, Poland, tells the story of pharmacy from medieval times to the 20th century and has about 22,000 items on display. The museum's exhibits include recreations of proto-laboratories with restored tools and artifacts, such as barrels, distilling equipment, cabinets, containers, and more, which were involved with processing and compounding herbal materials. These exhibits display the evolution of the profession of pharmacy, with an emphasis on its roots in botanical remedies.

**42** **American Botanical Council Acquires Full Rights to Steven Foster Photo Library**

*By ABC Staff*

In a deal with the estate of the late photographer, botanist, and author Steven Foster (1957–2022), the American Botanical Council (ABC) has purchased the rights to his extensive photo library of more than 150,000 images of medicinal and aromatic plants. Foster's photos capture the beauty and detail of these plants, often in their natural habitats, and they have enriched ABC's publications and nonprofit educational mission for decades. With the acquisition of these images, ABC can continue to share Foster's beautiful and accurate images of medicinal and aromatic plants from around the world.

**56** **Close Encounters of the Hops Kind**

*By Chris Kilham*

Medicine hunter, author, and educator Chris Kilham describes the harvest of organically grown hops that he experienced during his recent travels through the southwest of France. Though best known, and most widely used, as a flavoring and preserving agent of beer, hops are growing in popularity in the fragrance and nutraceutical markets as well. Hops contain powerfully aromatic terpenes and resins that are being investigated for their effects on chronic inflammatory conditions, psychiatric disorders, cancer, and more.



**Soapwort** *Saponaria officinalis*
Photo by Steven Foster ©2025 ABC



**Hops** *Humulus lupulus*
Photo ©2025 Chris Kilham

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Photo by Steven Foster ©2025 ABC




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**Nopal** *Opuntia ficus-indica*
Photo by Steven Foster ©2025 ABC

# Nopal/Prickly Pear

## *Opuntia ficus-indica* (L.) Mill.

Family: Cactaceae

**By Marisa Williams, ND, RH (AHG), and Aaron Jenks, PhD**

### INTRODUCTION

*Opuntia ficus-indica* is a large, tree-like species of cactus that is commonly known as nopal and prickly pear. It is widely cultivated in warm, arid parts of the world, primarily as a food crop. Both the sweet fruits and the flat, pad-like stem segments are eaten, prepared in various ways,[1,2] and the medicinal uses of *O. ficus-indica* have recently received increased attention. It is the most widely cultivated and economically important of all cacti species.[1,3]

*Opuntia ficus-indica* has many common names. The word nopal is of Nahuatl origin and derives from *nopalli*.[4] The name prickly pear refers to the plant's sweet, edible fruit, which has small clusters of prickly spines. This species is also called Indian-fig prickly pear, mission prickly pear, tuna cactus,[5] Barbary-fig,[6] smooth prickly-pear,[2] and mission cactus.[7] "Mission cactus" refers to nopal being commonly grown as a food source at Spanish missions in southwestern North America.

*Opuntia ficus-indica* is widely cultivated for its sweet fruits, which are most commonly called *tunas* (Spanish) and prickly pears (English), explaining many of the common names for the cactus. This species also is cultivated for the production of its edible stems, which are most commonly called *nopales* or *nopalitos*. Both the fruit and the stems are used medicinally but not interchangeably. The *American Herbal Products Association's Herbs of Commerce*, 3rd edition (2023), lists "nopal" as the Standardized Common Name (SCN) for *O. ficus-indica* and "prickly pear" as an alternate SCN. Three other species in the genus *Opuntia* (*O. phaeacantha*, *O. polyacantha*, and *O. streptacantha*) also have SCNs of "nopal" and "prickly pear."[8] Of these four species, only *O. ficus-indica* is a widely cultivated agricultural crop and has significant commercial value.[1,7,9]

Like all species of the genus *Opuntia*, *O. ficus-indica* is made up of many branching stem segments known as cladodes.[1] The cladodes of this species are flat, wide, and obovate (25–43 cm) and may either be spineless or have clusters of up to six spines that each grow up to 3 cm in length. *Opuntia ficus-indica* grows to 4–5 m in height, becoming large and tree-like with age. The floral perianth parts (petals and sepals, which are essentially indistinguishable in the Cactaceae family) are yellow to orange, while the style is white to pale pink, and the stigma is green. The fruits are yellow-orange to purple, 6–9 cm long, spotted with 43–71 areoles (clusters of tiny spines), juicy, and contain many small seeds (4.5–5 mm).[5,7,10,11]

*Opuntia ficus-indica* is a domesticated species that is known only from cultivation. It is not known to have any truly wild

populations. However, based on morphological and molecular phylogenetic research, the species' center of diversity and probable geographic origin are in central Mexico.[1] The utility of this species as a food source and its ease of propagation by stem cuttings have propelled its transport and cultivation around the world. It was brought to Europe in the late 15th century and later carried around the world by European explorers.[1] These early introductions explain its current distribution in warmer areas around the globe.

Although *O. ficus-indica* is known for its adaptability and hardiness across many warmer temperate and drier tropical climates around the world, it requires more water than many desert-dwelling native species. This moisture is obtained via high water table (groundwater close to the surface), subirrigation (watering from below the soil), or microclimates that are more moist than the surrounding desert. Nopal naturalizes easily and can spread quickly, often forming large stands at sites of old homesteads, missions, and other places where humans have planted it. In some cases, these naturalized populations have become invasive and difficult to control or eradicate, such as in Australia and parts of South Africa.[1,7]

Classification and species delimitation of domesticated species in general are frequently difficult, given the long history of cultivation and artificial (human-mediated) selection, and *O. ficus-indica* is no exception.[1,7] It exhibits high variability in terms of spininess and fruit coloration, and it easily and readily cross-pollinates and hybridizes with other species of *Opuntia*.[7] For these reasons, identification of *O. ficus-indica* can be challenging, but its large, colorful, nearly-spineless esculent (edible) fruits are somewhat distinctive.[9] Human-originated populations of nopal are commonly encountered throughout Mexico, the southwestern United States, and elsewhere.[1,7,9]

The genus *Opuntia* includes 145 accepted species. All are native to the Western Hemisphere, but many have been introduced for food or as ornamentals and can now be found on all continents except Antarctica.[11] *Opuntia ficus-indica* is by far the most widely cultivated of all species of *Opuntia,* grown primarily as a human food crop and secondarily as an ornamental.[1,9] While the medicinal properties of this species have long been known,[1] historically, the commercial value of its flower, fruit, and cladodes for medicinal use has been relatively insignificant. Nonetheless, topical and internal medicinal uses of all plant parts have been reported, and there appears to be an increased interest in, and perhaps market for, the use of this plant as an herbal medicine, as evidenced by recent publications of clinical research on nopal.[12]

Nearly all the commercial supply of *O. ficus-indica* is from large, monocrop agricultural enterprises managed for the production and resale of nopal as a food crop. According to the nonprofit organization CAB International, approximately 100,000 hectares (ha) of *O. ficus-indica* are commercially cultivated for fruit production worldwide. This includes an increased number of large-scale nopal plantations in Asia (primarily China), which have been established recently.[9] In addition, the fruit and, to a lesser extent, cladodes are cultivated on small farms for sale at local markets in Mexico, Africa, the Middle East, Central and South America, and southern Europe.[1,9]

Mexico is reported to produce about 400,000 tons of fresh *O. ficus-indica* fruit per year on more than 70,000 ha in the states of Zacatecas, San Luis Potosí, Aguascalientes, Jalisco, Hidalgo, Mexico, Tlaxcala, and Puebla. Sicily, Italy, is the second largest producer of the fruits, producing about 70,000 tons annually, most of this from approximately 3,500 ha of intensively managed nopal plantations.[9] Other countries with significant *O. ficus-indica* fruit production include Argentina, Chile, South Africa, and Tunisia, and to a lesser degree, Algeria, Bolivia, Brazil, Colombia, Egypt, Ethiopia, Greece, Israel, Jordan, Morocco, Peru, Spain, Türkiye, and the United States.[9,13] Certified organic production is based primarily in Mexico, but organic production also is reported in Peru and Brazil.[14] Information on cultivation volumes for medicinal purposes is unavailable, although Mexico is known to produce *O. ficus-indica* for medicinal purposes in addition to producing fruit and cladodes as food crops.[15]

## HISTORY AND CULTURAL SIGNIFICANCE

Swedish botanist Carl Linnaeus (1707–1778) published the names *Cactus opuntia* and *Cactus ficus-indica* in *Species Plantarum* in 1753.[16] In 1768, in his work *The Gardeners Dictionary*, Scottish-English gardener, botanist, and Fellow of the Royal Society Philip Miller (1691–1771) considered these taxonomic entities to be conspecific and described them as a single species, *Opuntia ficus-indica*.[17] The genus *Opuntia* was named for the ancient Greek region Locris Opuntia[2] and the capital of that region, Ὀποῦς or Opus.[18] The Greek word "opus" also refers to spiny plants that grew near Opus, and early (pre-Linnaean) authors may have made a connection to *O. ficus-indica*, a similarly spiny taxon.[2,19] Alternatively, the Greek word "opus" may have referred to *O. ficus-indica* itself, given that it was introduced early on and quickly naturalized in that region. It was so plentiful that some early authors erroneously believed that *O. ficus-indica* was native to the Mediterranean and may have thought that the species originated there, giving it the name *Opuntia*.[1]

The specific epithet *ficus-indica* means "Indian fig" in Latin, and the name *Ficus indica* has been applied to the species since its earliest introduction to Europe.[1,2] There are several explanations for why it was called Indian fig. It is thought to be called *Ficus* (Latin for "fig") because the fruits are sweet and loosely call to mind fig (*Ficus carica*, Moraceae) fruits. The name *indica* ("of India") actually refers to the Western Hemisphere, which explorer Christopher Columbus (1451–1506) called *Indias*, due to his having believed in error that his ships had arrived in the "India of the East." It is believed that Columbus brought *O. ficus-indica* specimens back to Europe on return from his first voyage.[1,2,20] Early authors commented on the dissimilarity between *O. ficus-indica* and the true Indian figs of the genus

*Ficus*, but the name *Ficus indica* continued to be applied to *O. ficus-indica* and was eventually codified by Linnaeus and Miller.[2]

Regardless of its name, this species has been known since the earliest European contact with North America because it was taken back to Europe in the late 15th century due to its utility as a food[9] and, later, as a source of dye.[2] It is easily propagated vegetatively by stem cuttings, and, in the following centuries, European explorers transported *O. ficus-indica* around the world to ensure ample food supply in the colonies and settlements they established.[1,7]

Human cultivation of *O. ficus-indica*, however, began long before Europeans arrived in North America. For thousands of years in what is now central Mexico, nopal has been propagated and cultivated by humans who have selected for desirable morphological traits, most importantly ease of handling (few to no spines on cladodes) and other preferred fruit characteristics, such as larger size, greater sweetness, and near-spinelessness. While the invention of novel spineless varieties was claimed in the early 20th century, such traits were documented much earlier and arose over many centuries (or more) of human selection.[7] As with other species with long, intimate relationships with humans, *O. ficus-indica* is considered a domesticated species, known only from human-introduced populations,[1,2] and although no truly wild populations have ever been documented or known to exist, molecular evidence points to its ancestral area of origin and center of genetic diversity in central Mexico[1] or perhaps what is now Oaxaca state.[11]

Nopal's cultural history is closely tied to this region as well. Mexican legend states that in 1325, as the Aztec people were being beleaguered and pursued by their enemies, they came upon an eagle on top of an *O. ficus-indica* plant, strangling a snake in its talons. This was taken as an auspicious omen. It was here that they founded their empire at Tenochtitlan, now Mexico City. This legend was memorialized, and the plant is still seen on Mexico's national flag, coat of arms, and currency.[21] According to some sources, the etymology of Tenochtitlan includes a reference to nopal via a Nahuatl word for nopal, *nuchtli*.[4]

In the early colonial period (beginning in the 16th century), Spanish chroniclers depicted *Opuntia* in their



**Nopal** *Opuntia ficus-indica*
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reports. Codex Mendoza (ca. 1541) depicts what appears to be *O. ficus-indica* as an Aztec trade and probable tribute item.[1] The graphical depictions of *Opuntia* in these early Spanish codices also illustrate the production of cochineal dye, which, coupled with the high value placed on the fruit as food, strongly influenced pre-Columbian, human-mediated dispersal and distribution of the species.[1]

Cochineal dye is a culturally and commercially important product linked with *O. ficus-indica*. It is not a direct product of the plant but is produced by both wild and domesticated cochineal insects belonging to the genus *Dactylopius*.[1,2,7] These insects parasitize *O. ficus-indica* and other species of *Opuntia* and secrete carminic acid, which evolutionarily served as a feeding deterrent against predatory ants that would eat the cochineal insects.[2] The carminic acid extracted from the insects produces a vivid red dye.

The Aztecs (and perhaps others before them) cultivated large plantations of *Opuntia* and intentionally infested the cacti with the domesticated cochineal insects for the large-scale production of the red dye.[1,2] Aztec emperors wore robes of deep royal red, and rulers demanded large bags of the insects as a tax or tribute. It is reported that, by weight, the value of cochineal dye was even greater than that of gold.[2]

By no later than the middle of the 16th century, production of cochineal dye began in Europe (as a monopoly by the Spanish, who kept the source of the dye a carefully guarded secret) and later in North America. Eventually, in 1704, Dutch naturalist and inventor Antonie van Leeuwenhoek (1632–1723) discovered through his microscope that the dye was produced by an insect, and this discovery helped to break the Spanish monopoly on cochineal dye.[2]

Although the societal and cultural importance of *O. ficus-indica* as a source of food and dye perhaps overshadows its traditional use as a medicine, it has a long history of medicinal use across North America that significantly predates European arrival.[1,2] Medicinal properties of *O. ficus-indica* were known and documented as early as 1552.[1] It has been used for conditions such as diabetes, nose bleeds, prostate problems, and rheumatism.[2] Historically, the cladodes were split open and used topically for cuts, infections, and burns. A poultice of warm fruit and juice was rubbed on the skin for rheumatism and boils and to reduce swelling and pain. Boiled roots were used as a laxative for children and babies but also as an antidiarrheal. The decocted roots also were used for urinary complaints and to facilitate childbirth.[22]

Medicinal use of *O. ficus-indica* was not restricted to Mexico, where it was first grown and domesticated. Across much of North America, Indigenous peoples used it for food and medicine, and where *O. ficus-indica* was not grown, other hardier species of *Opuntia* were used in similar ways.[22] As cultivation of *O. ficus-indica* spread, so did knowledge of the many medicinal uses for this species. In Sicily, where nopal is commercially grown for fruit production (and, previously, for cochineal dye), a tea made from the flowers is consumed for kidney problems. Dried flowers are also used in Sicily as a paste that is applied topically for treating measles.[2]

Many other uses are attributed to the plant, including, most significantly, its use as livestock feed (including for poultry). Throughout Mexico and the southwestern United States, *O. ficus-indica* and related species have long been used in times of drought to supply cattle with a source of food. Range cattle and many wild animals will eat *Opuntia* fruit and cladodes, which provide both nutritive sustenance and hydration in landscapes and seasons with limited food and water.[1,7,9,20]

Nopal also was promoted as a lucrative cash crop, and in the early decades of the 20th century, farmers and investors planted it en masse in California. Perhaps the most vocal proponent of nopal cultivation was American botanist and horticulturist Luther Burbank (1849–1926). Burbank, who claimed to have invented spineless varieties of *O. ficus-indica* and offered cuttings of his selections for sale, also promoted its many other uses. It was claimed that it made a useful whitewash and paint and was an "excellent substitute for rubber and a superb article for automobile tires."[7] The veracity of these claims is uncertain and largely untested, but there can be no doubt that this species is highly useful.[9]

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

In the United States, the US Environmental Protection Agency (EPA) regulation 40 CFR §180.1, which concerns pesticide chemical residues in food, defines two plant parts — "pricky pear pads" ("*Opuntia ficus-indica* (L.) Mill., *Opuntia* spp.") in the " Stalk, Stem and Leaf Petiole Vegetable" crop group and "prickly pear fruit" ("*Opuntia ficus-indica*") in the "tropical and subtropical fruit, inedible peel" crop group — providing evidence of use of this species as conventional food in the United States.[23] Additionally, "prickly pear fruit" is listed in 21 CFR §150.140 as a permitted fruit juice ingredient for fruit jelly.[24]

In Canada, "Opuntia ficus-indica" is listed as a pre-cleared "fruit and leaf" ingredient in the monograph for antioxidants. "Opuntia Ficus-Indica Flower Extract," "Opuntia Ficus-Indica Fruit Extract," and "Opuntia Ficus-Indica Seed Oil" are permitted for use as non-medicinal components of licensed Natural Health Products (NHPs) as topical skin-conditioning agents. Additionally, "Opuntia Ficus Indica Extract" and "Opuntia Ficus Indica Stem Extract" are listed for non-medicinal purposes as flavor enhancers and skin-conditioning agents.[25]

In the European Union (EU), *O. ficus-indica* appears in the EU Novel Food status Catalogue with the status of "Not Novel in Food" and the description for "use of juice from fruits and platiclades [*sic*]" (i.e., cladodes).[26] It is not found on the European Medicines Agency's website.[27] For use in cosmetic products, the European Commission's CosIng-Cosmetics Ingredients database lists "Opuntia Ficus-Indica Fruit Extract," "Opuntia Ficus-Indica Extract," and "Opuntia Ficus-Indica Flower Extract" for skin-conditioning functions. "Opuntia Ficus-Indica Stem" is listed for hair conditioning, humectant (a substance that promotes retention of moisture), and skin-conditioning functions, and "Opuntia Ficus-Indica Fruit Juice" for antioxidant and skin-conditioning functions.[28]

## Table 1. Selected Clinical Studies on Nopal/Prickly Pear

| Publication and Year | Study Design | Interventions | Outcome |
|---|---|---|---|
| Godard et al 2010[41] | R, DB, PC<br><br>N = 29<br><br>Evaluated the acute and chronic effects of OpunDia™[a] in adults (20-50 years old) with obesity and pre-diabetes | Two groups: OpunDia treatment group (n = 15) or placebo group (n = 14)<br><br>Acute intervention: 400-mg capsule of OpunDia (or placebo: 200-mg capsule of microcrystalline cellulose) given 30 min before an oral glucose tolerance test (OGTT)<br><br>Chronic intervention: 200-mg capsule of OpunDia (or placebo) daily for 16 weeks<br><br>Acute test phase evaluated OGTT 30 minutes before ingestion of 75 g of glucose solution<br><br>Chronic tests evaluated glucose, insulin, hsCRP, adiponectin, proinsulin, HbA1C, cholesterol, comprehensive metabolic panel, and body composition at baseline and post-16 weeks | Acute results: significant improvements in blood glucose levels in the treatment group compared to placebo at 60 min, 90 min, and 120 min<br><br>Chronic results: lowered blood glucose concentrations compared to baseline; however, changes were not significantly different between groups. No significant differences in OGTT, other labs, or body composition between groups<br><br>No differences in safety parameters between groups; authors reported no adverse effects |
| Aguilera Barreiro et al 2013[44] | Quasi-experimental, R, B<br><br>N = 181<br><br>Evaluated the effects of calcium from nopal on BMD and calciuria (calcium in the urine) in pre- and postmenopausal women (35-55 years old) with hypercalciuria and low bone mass over a two-year period | Four groups: (1) women with normocalciuria and minimum dose of dehydrated nopal (DH) (n = 66); (2) women with hypercalciuria and a minimum dose of DH (n = 29); (3) women with hypercalciuria and a maximum dose of DH (n = 36); and (4) normal BMD group (n = 50)<br><br>Intervention groups were provided with minimum dose of DH (2.5 g) or maximum dose of DH (9-15 g) to add to food or mix with water or juices<br><br>At baseline and at time points in the study, BMD was measured using dual-energy X-ray absorptiometry scan to determine total hip and lumbar spine areas; calcium and creatinine levels were assessed (urine samples) | Weight, height, and BMI did not differ among groups<br><br>BMD increased significantly in lumbar region area in the higher-dose group; authors reported improvement of BMD in LBM for the total hip and lumbar spine regions<br><br>Adverse effects were not reported |
| López-Romero et al 2014[45] | Two small studies evaluated the effects of nopal on metabolic health<br><br>Study 1 evaluated nopal's effects on glycemic index in healthy individuals (average age of 26 years old)<br><br>Study 2 evaluated the effects of nopal dietary consumption on people with type 2 diabetes taking metformin, who consumed different breakfasts (40-60 years old) | Each study participant fasted for 12 hours and was given the assigned test meal per instructions<br><br>Study 1: participants consumed 50 g of available carbohydrates from glucose or DH, as the test meal (n = 7)<br><br>Study 2: participants with type 2 diabetes consumed a high-carbohydrate breakfast (HCB) or high-soy-protein breakfast (HSPB) with or without steamed nopal (300 g) (n = 14)<br><br>In both studies, tests assessed glycemic index, insulinemic index, glucose-dependent insulinotropic peptide (GIP) index, and glucagon-like peptide-1 (GLP-1) index | Study 1: nopal consumption compared to glucose demonstrated significant reductions in glycemic and insulinemic index<br><br>Study 2: for participants with type 2 diabetes who consumed HCB and nopal, there was significantly lower area under the curve for glucose compared to those who consumed HCB only, and lower incremental area under the curve for insulin; those with type 2 diabetes who consumed the HSPB avoided postprandial blood glucose peaks<br><br>Participants with type 2 diabetes who consumed HCB and nopal had significantly lower glucose compared to those who consumed HCB only<br><br>Participants with type 2 diabetes who consumed HSPB only did not present with postprandial blood glucose peaks; HSPB with nopal significantly reduced postprandial peaks of GIP index concentration at 30 and 45 min<br><br>No adverse effects reported |
| Attanzio et al 2018[46] | Crossover, R, C<br><br>N = 28<br><br>Evaluated prickly pear fruit short-term supplementation in healthy participants (30-60 years old) to assess plasma inflammatory parameters and antioxidant status for two weeks | Treatment group: supplementation with prickly pear fruit pulp (Sicilian Surfarina cultivar), 200 g twice per day (n = 14)<br><br>Control group: supplementation with fresh fruit substitution of similar caloric value (n = 14)<br><br>Hematologic, pro-inflammatory, and anti-inflammatory markers were assessed at baseline and at two weeks. Both groups had equivalent and controlled diets during the study | Beneficial dietary improvements noted in the treatment group, decreased pro-inflammatory markers (tumor necrosis factor-α, interleukin [IL]-1β, interferon-γ, IL-8, C-reactive protein, and erythrocyte sedimentation rate), and increased anti-inflammatory marker IL-10. Increased anti-oxidant biomarker (skin carotenoid score) in the treatment group<br><br>No adverse effects in either group |
| Sánchez-Murillo et al 2020[47] | Experimental, C<br><br>N = 69<br><br>Evaluated nopal powder in women (40-60 years old) to assess changes related to bone health over 24 weeks | Treatment group: 5 g of nopal powder (n = 56) derived from nopal cladodes (dehydrated and pulverized) mixed in drinks in morning, before breakfast<br><br>Control group: No treatment and continued with regular diet (n = 13)<br><br>BMD of the hip, BMI, body fat percentage, and calcium serum levels assessed at baseline and at 24 weeks | No significant changes were reported from baseline and at 24 weeks between the two groups<br><br>Digestion symptoms were reported at the start of the study from diarrhea, constipation and bloating. In contrast, there were also reports of improved digestion symptoms (e.g., decreases in constipation and gastritis symptoms)<br><br>No serious adverse effects were reported |

## Table 1. Selected Clinical Studies on Nopal/Prickly Pear (continued)

| Publication and Year | Study Design | Interventions | Outcome |
|---|---|---|---|
| Giglio et al 2020[48] | Experimental<br><br>N = 49<br><br>Evaluated if supplemented pasta with 3% *O. ficus-indica* (OFI) extract would improve metabolic parameters in individuals with one or two criteria for metabolic syndrome for one month | Participants consumed 500 g of pasta supplemented with a 3% soluble extract of OFI cladodes for one month (no control group). The pasta supplement replaced 500 g of regular pasta in the participants' normal diets, with no other major dietary changes<br><br>Primary outcome evaluated was a full low-density lipoprotein (LDL) profile. Secondary outcomes included body weight, waist circumference, BMI, and other lab markers (glucose, triglycerides, creatine, urea, aspartate transaminase) | After one month, significant reductions in two LDL types (LDL-2 and LDL-3). For secondary outcomes, significant decrease in waist circumference and no significant changes in body weight or BMI<br><br>Authors did not report any adverse effects |
| Corona-Cervantes et al 2021[49] | Experimental<br><br>N = 36<br><br>Evaluated the effects of nopal as part of dietary and physical exercise intervention modifications in obesity group (22-59 years old) compared to normal weight group (18-27 years old) over 30 days | Two groups: women with obesity (n = 25) and women with normal weight (n = 11)<br><br>Dietary intervention: 2 cups (300 g) of boiled fresh nopal cladodes supplemented each day with a personalized diet plan based on 2,000-kcal diet, including calorie restriction, based on individual energy-expenditure dietary needs<br><br>Physical exercise intervention: brisk walking for 30 minutes each day<br><br>Biochemical labs, anthropometric markers, and microbiota stool samples were assessed in both groups | Addition of nopal to the diet with dietary and physical exercise interventions demonstrated microbiota modifications of the stool analysis in the obesity group similar to the normal weight group<br><br>Adverse effects not reported |
| Remes-Troche et al 2021[50] | R, DB, PC<br><br>N = 60<br><br>Evaluated the effects of nopal fiber in three different doses in individuals (24-68 years old) with irritable bowel syndrome over one week | Treatment groups: 10 g/day, 20 g/day, or 30 g/day of powdered dehydrated nopal fiber (Nopal Export; Morelos, Mexico) mixed in water (n = 15 each)<br><br>Placebo group: dextrose mixed in water (n = 15)<br><br>Tests of Global Symptom Question, Irritable Bowel Syndrome Severity Scoring System (IBS-SSS), GSRS, stool frequency and consistency (Bristol Stool Form Scale), hydrogen breath test, and stool short-chain fatty acids (SCFAs) were assessed at baseline and end of study | 20 g/day and 30 g/day subgroups reported significant differences in symptom relief compared to placebo. In the IBS-SSS evaluation, the 20 g/day subgroup had approximately 50% reduction compared to placebo<br><br>No differences in hydrogen gas breath and SCFA stool tests<br><br>Unpleasant taste was reported in all four groups, and one event of diarrhea reported in 20 g/day group and two subjects in the 30 g/day group. No differences in moderate bloating between the groups |
| Abedelmalek et al 2022[51] | Experimental<br><br>N = 20<br><br>Evaluated the effects of nopal juice on biochemical and cardiovascular markers in people with type 2 diabetes using six-minute physical walking tests | Two groups: 70 mL of *O. ficus-indica* juice (OFIJ) (n = 10) or placebo (n = 10) for four days at each walking test session<br><br>Cardiovascular tests: heart rate max, systolic and diastolic blood pressure, lipid profile<br><br>Hormone tests: cortisol, insulin, and glucagon<br><br>Muscle-damage markers: creatine kinase, lactate dehydrogenase, and lactate<br><br>Liver and metabolic parameters: oxidative stress marker, gamma-glutamyl transferase (GGT), total bilirubin, HbA1c, and glucose | OFIJ supplementation demonstrated a small increase in performance and decreased RPE after walking test<br><br>OFIJ reduced glucose levels and two muscle-damage markers (creatine kinase and lactate dehydrogenase)<br><br>Other tests were not altered or did not demonstrate significant differences between placebo and OFIJ group<br><br>Adverse effects not reported |
| Mellai et al 2024[52] | R, DB, PC, PG<br><br>N = 80<br><br>Evaluated efficacy of nopal prebiotic supplementation in people (25-50 years old) with gut dysbiosis (an imbalance of microbiota) over eight weeks | Treatment group: 300 mg daily intake of Odilia™[b] capsule (n = 40)<br><br>Placebo group: maltodextrin capsule (n = 40)<br><br>Primary outcome assessed intestinal flora by microbial analysis at baseline, four, and eight weeks. Secondary outcome assessed validated questionnaires to evaluate digestive health by GIQLI and GSRS. Body weight, BMI, waistline, and hip circumferences also monitored | Primary outcomes of the intestinal flora reported significant reduction in *Firmicutes* to *Bacteroidetes* ratio, significant increase of beneficial bacteria (*Bacteroides* and *Clostridium* cluster XIVa), which represents improved microbial biodiversity and significant decrease of pro-inflammatory and bacteria. Secondary outcome reported improvement with the GIQLI and GSRS questionnaires scores<br><br>Authors reported the treatment was well-tolerated |

B = blinded; BMD = bone mineral density; BMI = body mass index; C = controlled; DB = double-blind; DH = dehydrated nopal; GGT = gamma-glutamyl transferase; GIQLI = Gastrointestinal Quality of Life Index; GSRS = Gastrointestinal Symptom Rating Scale; HbA1c = hemoglobin A1c; HCB = high-carbohydrate breakfast; hsCRP = high-sensitivity C-reactive protein; HSPB = high-soy-protein breakfast; IBS-SSS = Irritable Bowel Syndrome Severity Scoring System; LBM = low bone mass; LDL = low-density lipoprotein; OFI = *Opuntia ficus-indica*; OGTT = oral glucose tolerance test; PC = placebo-controlled; PG = parallel-group; R = randomized; RPE = rate of perceived exertion; SCFAs = short-chain fatty acids

[a] OpunDia™ (Martin Bauer North America; Secaucus, New Jersey), a blend of *O. ficus-indica* cladode and fruit skin extract. The product is 75% cladode (water extract, DER 2-4:1, 70% native extract, 30% microcrystalline cellulose) and 25% fruit skin extract (water extract, DER 2-4:1, 70% native extract, 30% microcrystalline cellulose).

[b] Odilia™ (Bionap S.r.l.; Piano Tavola, Sicily, Italy), a powder extract from *O. ficus-indica* cladode juice (standardized in polysaccharides and piscidic acid). The product also contains pregelatinized corn (*Zea mays*, Poaceae) starch (87.75 mg), vegetable magnesium stearate (1.35 mg), talc (0.45 mg), and colloidal silica (0.45 mg).

## MODERN RESEARCH

Two plant parts, the cladodes and fruits, each have unique and specific medicinal attributes. The cladodes are eaten as a vegetable and contain fibers, gums, pectin, mucilage, cellulose, hemicellulose, lignin, carbohydrates, and minerals and have a water content of approximately 88-95%.[29-31] The age of the cladodes influences their nutritional and phytochemical content, with values changing as they mature.[29,30] Nopalitos, the younger and fresher cladodes, are preferred for culinary preparations in Latin America and the United States.[29,30] Younger cladodes contain higher amounts of soluble fiber, including mucilage and pectin polysaccharides. As the cladode ages and the pad grows bigger, the overall fiber content increases due to higher amounts of insoluble fiber (e.g., cellulose, lignin). The content of tannins and oxalic acids also increases, which produces an unsavory and tough texture.[29] Additionally, calcium increases with age and maturation of the cladodes.[30,32,33] Calcium carbonate and calcium oxalate have been reported in the cladodes, in both insoluble and soluble fiber content portions.[33]

The fruit's nutritional composition also varies in relation to maturity, harvesting times, eco-region, fruit preparation type, climate, and soil conditions.[31,34] The fruit consists of the juice, pulp, peel, and seeds.[34,35] The fruits contain up to 85% water, 15% sugar (predominantly glucose and fructose),[35] 0.3% ash, and less than 1% protein.[34] The fruits contain ascorbic acid (vitamin C), carotenoids, phenols, flavonoids, organic acids (e.g., citric acid, malic acid), natural color pigments of red,



**Nopal** *Opuntia ficus-indica*
Shutterstock Photo by Grizanda

yellow, and orange (e.g., betalains, betanin, indicaxanthin), and micronutrients of potassium, calcium, and magnesium.[31,34-37] Additionally, fatty acids (e.g., linoleic, oleic, and palmitic acids) are noted in the fruit pulp, peel, and seed oil.[35]

Safety data for *O. ficus-indica* are limited. However, it is important to recognize its long history as a traditional food crop; the pads and fruits are listed in 40 CFR §180.1.[23] The cladodes may contain clusters of spines, and the fruit surface has clusters of tiny spines. Therefore, caution is warranted when harvesting and preparing this food crop.[38] The species is not listed in the National Institutes of Health (NIH) LiverTox® database[39] or the *American Herbal Products Association's Botanical Safety Handbook*, 2nd edition (2013).[40]



In a small, 16-week clinical study of participants taking OpunDia™ (Martin Bauer North America; Secaucus, New Jersey) — a blend of *O. ficus-indica* cladode and fruit skin extract — the authors reported no negative effects based on blood, kidney, and liver tests at the end of the study.[41] However, no long-term safety information is available for *O. ficus-indica*. When using it as an ingredient in dietary supplements, consulting with a health care practitioner may be prudent. Table 1, which reviews current clinical research on nopal's potential health benefits, lists some relatively minor adverse effects (digestive symptoms) reported in the literature.

*Clinical Studies*

A few systematic reviews[42,43] summarize randomized controlled trial (RCT) data on *O. ficus-indica* supplementation. One review reported preliminary beneficial effects on body fat percentage, total cholesterol, and blood pressure.[42] Another systematic review focused on the impact of specific plant parts from species in the genus *Opuntia*. The review authors reported that the fruit did not show significant anti-hyperglycemic effects. However, the cladodes or the combination of cladodes and fruit may have potential anti-hyperglycemic effects. Both reviews concluded that more studies are needed to enable more robust conclusions. They also noted that the reviewed studies had small sample sizes and inconsistent designs.[42,43]

Clinical studies primarily have focused on assessing metabolic and digestive health. The studies in Table 1 evaluated both the cladodes and fruit, singly or combined, as supplement ingredients. Several studies assessed nopal/prickly pear's potential health benefits and nutritional value as a functional food (e.g., fruit pulp juice, steamed or dehydrated cladodes).


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## ADULTERATION AND SUBSTITUTION

*Opuntia ficus-indica* is widely cultivated, and no available data show that other species are used as substitutes. The commercial availability of *O. ficus-indica* is not lacking, and it is unlikely to be adulterated or substituted with other rarer and less available species of *Opuntia*. However, substitution is possible, and other species could be available on the market and sold as nopal or prickly pear, especially considering that nopal and prickly pear are the SCNs of four species in the genus *Opuntia*.[8] In the early 2000s, *O. ficus-indica* was used as an adulterant ingredient and implicated in a relatively high-profile case of adulteration of hoodia (*Hoodia gordonii*, Apocynaceae), a slow-growing succulent from South Africa.[53,54]

## SUSTAINABILITY AND FUTURE OUTLOOK

Some species of the genus *Opuntia* are subject to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and listed in Appendix II, which includes species that are not necessarily threatened with extinction but for which trade must be controlled to avoid use that is incompatible with their survival.[55] While some *Opuntia* species are CITES listed and should not be harvested or collected, the status of *O. ficus-indica* is less clearly defined. This species is assessed as "Data Deficient" according to the International Union for Conservation of Nature (IUCN) Red List categories and criteria.[56] The nonprofit organization NatureServe, a source for North American biodiversity data, assessed and ranked the conservation status of *O. ficus-indica* in the United States as "No Status Rank."[57]

Given that *O. ficus-indica* is an agricultural crop that is grown in many countries around the world and is a domesticated species unknown to exist in a truly wild state, it is unlikely that concerns about sustainability or regulatory hurdles would prevent further commercial development of this species as food or medicine. Rather, the concern historically has been the ease with which nopal naturalizes. It rapidly self-propagates and becomes thoroughly invasive in certain climates and conditions.[1,7,9]

During the mid-19th century and perhaps earlier, the invasiveness of *O. ficus-indica* became extremely problematic in Australia as it escaped cultivation and outcompeted many native species, creating monoclonal populations of itself across large tracts of land.[1,7,9] An expensive and protracted battle against this invasive plant lasted into at least the 1920s. Control was finally achieved with the introduction of biological agents, especially the cactus moth (*Cactoblastis cactorum*) larvae and, to a lesser degree, cochineal insects. The insects overwhelmingly feed on the plant, killing the cacti and reducing invasive populations.[58] The use of the cactus moth for biological control creates potential concerns, however, because the larvae indiscriminately consume any species of *Opuntia*, thus negatively affecting other *Opuntia* populations in their native ranges, as well as animal species that depend on *Opuntia* for food.[59]

In 2022, the Government of Mexico, with support from other organizations, started a cactus moth monitoring program to prevent moth outbreaks and protect native *Opuntia* species.[60] In the United States, the cactus moth is known to occur in Florida and, more recently, Texas.[61] The ecological impact of *O. ficus-indica* on native plant species should be assessed and conservation measures adopted as needed.

The outlook for cacti, in general, is good regarding climate change and the climate crisis since they can grow in very dry conditions, at higher temperatures, and with limited water. Given these characteristics and the value of *O. ficus-indica* as a medicinal and edible food crop, the species may become more important in the face of climate change.[62] HG



**Nopal** *Opuntia ficus-indica*
Photo by Steven Foster ©2025 ABC

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# HerbTV from the American Botanical Council Officially Launches on YouTube

## *With more than 1.3 million views, HerbTV is positioned to become the leading international online portal for videos on botanicals and herbal medicine*

**By ABC Staff**

**In February 2025, the American Botanical Council (ABC) launched its HerbTV channel on YouTube as part of its ongoing educational mission for consumers, academia, industry, media, and government.**

HerbTV is the home of more than 190 educational videos on medicinal herbs and related health and wellness topics. It includes interviews and field tours with renowned herbalists, botanists, ethnobotanists, and more. The channel already has more than 21,000 subscribers and nearly 1.4 million views.

HerbTV features playlists organized by category (e.g., Food as Medicine, Medicinal Mushrooms, etc.) and by health conditions. The channel includes recorded webinars, videos on herbal sustainability, and other media from sources outside of ABC, such as the public television series Healing Quest, "The Medicine Hunter," and others. New content will be added regularly.

In February, ABC added its first Adopt-an-Herb video — "Milk Thistle [*Silybum marianum*, Asteraceae]: A Tonic for Modern Times"[1] — which was made possible by an educational grant from Euromed SA (Barcelona, Spain). Less than one month later, the video had approximately 2,000 views. ABC plans to release additional Adopt-an-Herb videos on its HerbTV channel in 2025.

"The American Botanical Council has been working to expand its educational mission through videos for a number of years," said ABC Founder and Executive Director Mark Blumenthal. "We are happy to finally release HerbTV, an online portal that we hope will greatly expand the interest in and understanding of numerous herbs and botanical medicines."

As of April 2025, YouTube had more than 2.7 billion active users worldwide.[2] In 2022, 62% of internet users in the United States accessed YouTube daily, and 92% used it weekly.[3]

"The statistics around online video viewing are staggering, and it's clear that people increasingly flock to social media outlets for educational videos, with YouTube leading the way," Blumenthal said. "This presents a huge opportunity for ABC and its botanicals-based educational content.

"We encourage interested and curious consumers, health care practitioners, academics, researchers, media, and natural health products industry representatives to visit HerbTV, explore the channel, and subscribe," he added.

David LaLuzerne, a pharmacist, videographer, and former herb shop owner, created HerbTV in 2008 and donated it to ABC in 2018. ABC reimagined and refreshed HerbTV as part of the 2025 relaunch, adding new content and updating, rebranding, and reorganizing the channel.




For more information about HerbTV from ABC, including how to have vetted, science- and botanical-based content included on the channel, please contact HerbTV Program Manager Frank Lampe at frank@herbalgram.org. HG

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# The American Botanical Council's Year in Review: 2024

**By ABC Staff**

**For the American Botanical Council (ABC), 2024 was filled with accomplishments, positive changes, and strategic preparations for a bright future. As a nonprofit research and educational organization, ABC works to advance its unique mission of fostering meaningful social and cultural change that promotes health through the responsible use of medicinal plants, fungi, and other natural substances.**

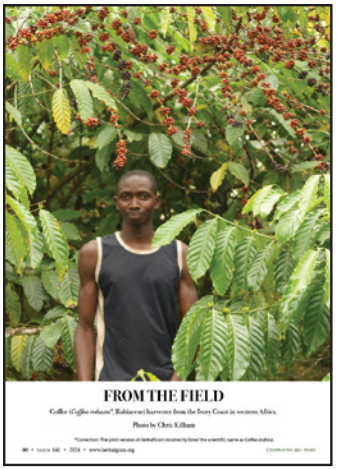
To produce its science-based educational content, ABC uses a rigorous peer-review process and relies on the efforts of many committed individuals who make up its staff and network of contractors, editors, compilers, writers, and consultants. The organization has members in more than 80 countries and delivers vital, reliable, authoritative information to the herb and medicinal plant community, academia, educators, consumers, the media, and others.

ABC accomplishes this through its informative website, thoroughly researched publications (including its quarterly journal, *HerbalGram*), the award-winning Botanical Adulterants Prevention Program (BAPP), the Adopt-an-Herb Program, lectures, webinars, media interviews, and much more.

## Activities and Accomplishments

In 2024:

- *HerbalGram* completed a four-part timeline series in honor of *HerbalGram*'s 40th anniversary in 2023. Each issue highlighted ABC milestones and notable articles from one of the magazine's four decades in print.
- *HerbalGram* launched a "From the Field" photo series, which features photography from Medicine Hunter Chris Kilham and gives a behind-the-scenes look at the sources of medicinal plants in the herbal value network.




- ABC Founder and Executive Director Mark Blumenthal was named one of "30 People Who Shaped the Natural Products Industry" by ABC's late friend, journalist James Gormley (1963–2024), and the editors of *Vitamin Retailer* magazine.
- BAPP published its 92nd peer-reviewed document. BAPP publications are freely available and include Botanical Adulterants Prevention Bulletins, Laboratory Guidance Documents, Botanical Adulterants Monitor e-newsletters, and other related information designed to support industry members in producing products with authentic botanical ingredients.
- Stefan Gafner, PhD, ABC's chief science officer and BAPP director, co-authored two in-depth papers that were published in peer-reviewed scientific journals.
- At its annual Celebration and Botanical Excellence Awards ceremony, ABC presented eight Botanical Excellence Awards to individuals, organizations, and companies for their valuable contributions to the herbal and botanical community.
- ABC's popular Food as Medicine initiative published its 81st article on the health benefits of specific plant-based foods. These articles are featured in ABC's monthly HerbalEGram e-newsletter for ABC members.
- ABC hosted approximately 500 people at its annual HerbDay event in May 2024. The event featured Ecuadorian ethnobotanist Rocio Alarcón, PhD, and others at ABC's historic headquarters in Austin, Texas.
- The 94th herb was adopted through the ABC Adopt-an-Herb Program. These adoptions support ABC's robust HerbMedPro database.
- ABC gave 25 presentations, including in Brazil, France, Poland, and Türkiye.
- ABC issued 24 press releases. As a reliable third-party educational resource, ABC helps mainstream and industry trade media better understand and/or interpret scientific, regulatory, and market information on medicinal plants.
- ABC published 384 HerbClips, 51 issues of Herbal News & Events, 12 issues of HerbalEGram, seven peer-reviewed BAPP publications, and four Food as Medicine articles.
- And much more.

### HerbalGram40 Project and Fund Progress

In 2024, ABC also continued to make progress on the HerbalGram40 Project and Fund, named in honor of *HerbalGram*'s 40th anniversary in 2023. HerbalGram40 is an opportunity for members of the medicinal plant and natural medicine community to help set the course for ABC's next decades of service to the herbal community. This involves inviting input from stakeholders, assessing organizational goals and accomplishments, and reevaluating priorities. It is also an opportunity for the community to invest financially in ABC's nonprofit successes, helping ABC address current challenges and reach new levels of service.

In the first year of the HerbalGram40 Project and Fund, supporters enabled ABC to:

- Improve its digital infrastructure, including member and communication databases. (These improvements will reduce redundant work, increase ABC's efficiency, and facilitate communications.)
- Improve communications and marketing efforts. (ABC hired a Communications and Marketing Specialist, Riane Roldan, after nearly a year with this position vacant. The impact on our social media and ability to reach supporters has been invaluable.)
- Spin off the Sustainable Herbs Program into its own self-directed initiative called the Sustainable Herbs Initiative under the continued vision and commitment of founder Ann Armbrecht, PhD.

### Looking to the Future

With highly valued donor support, in 2025 and beyond, ABC will continue to:

- Increase efficiency by preparing for retiring staff — ABC has multiple staff members who have been with the organization for more than 30 years — and improving our technology to make ABC even more responsive to the needs of our community.
- Evaluate, adjust, and expand its programs and services, including BAPP, HerbTV (ABC's new educational video channel on YouTube), and a forthcoming webpage on botanical conservation, sustainability, and regeneration.
- Increase the community's involvement in ABC by soliciting feedback. ABC community stakeholders are invited to comment on the HerbalGram40 webpage and participate in upcoming Zoom meetings. ABC is also planning to create a new International Committee to help evaluate and further ABC's worldwide presence and impact.

ABC invites members and others to consider expanding their support of ABC in 2025 through participation in the HerbalGram40 Project and Fund, donations (including stock), membership, program underwriting, herb adoptions, and/or planned giving by adding ABC to your will. To learn more about different ways to support ABC's nonprofit research and educational mission, visit www.herbalgram.org or contact ABC Development Director Denise Meikel at denise@herbalgram.org. HG


## HerbalEGram
### *ABC's Monthly eMagazine*

**Featuring timely, original articles and a review of the month's most important herbal happenings**

- An ABC membership benefit published monthly
- Exclusive excerpts from the latest herbal medicine-related books
- All previous issues going back 20+ years available on ABC's website at: https://herbalgram.org/resources/herbalegram



# 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.

CELEBRATING 40+ YEARS OF HERBALGRAM
AMERICAN BOTANICAL COUNCIL

## Herbal Adopters

EUROMED — Video Feature
- **Milk Thistle** — *Silybum marianum*
- **Fig** — *Ficus carica*

HERB PHARM® — NEW ADOPTER!
- **Reishi Mushroom** — *Ganoderma lucidum*
- **Echinacea** — *Echinacea* spp.

Loomis® ENZYMES
- **Dandelion** — *Taraxacum officinale*
- **Rose Hip** — *Rosa canina*
- **Alfalfa** — *Medicago sativa*

now® — NEW ADOPTER!
- **Valerian** — *Valeriana officinalis*

Soladox® BOTANICALS — NEW ADOPTER!
- **American Elder Berry** — *Sambucus canadensis*
- **Black Chokeberry** — *Aronia melanocarpa*
- **Stinging Nettle** — *Urtica dioica*

Monteloeder by SUANNUTRA
- **Lemon Verbena** — *Aloysia citrodora*

THE WORLD'S No.1 GINSENG BRAND
- **Asian Ginseng** — *Panax ginseng*

Symphony NATURAL HEALTH
- **Maca** — *Lepidium meyenii*

CONTAINS Zembrin
- **Sceletium** — *Sceletium tortuosum*

Nature's Way®
- **Ginkgo** — *Ginkgo biloba*

nexira — Innovation Inspired by Nature
- **Acacia Gum** — *Acacia senegal* (syn. *Senegalia senegal*), *Acacia seyal* (syn. *Vachellia seyal*)

natural™ REMEDIES
- **Holy Basil** — *Ocimum tenuiflorum*
- **Andrographis** — *Andrographis paniculata*

iff Health
- **Oat** — *Avena sativa*

PHARMACTIVE BIOTECH PRODUCTS
- **Saffron** — *Crocus sativus*

H&AD HERBAL & ANTIOXIDANT DERIVATIVES
- **Bergamot** — *Citrus bergamia*

BEEHIVE BOTANICALS
- **Propolis**

biotropics MALAYSIA — Video Feature
- **Kesum** — *Persicaria minor*
- **Tongkat Ali** — *Eurycoma longifolia*

Terry Naturally
- **Turmeric** — *Curcuma longa*

# Visit us at herbalgram.org/adopt-an-herb

**Contact Denise Meikel at 512-926-4900 x120**
**or by email at denise@herbalgram.org**

## Herbal Adopters

NEW ADOPTER! CATSPRING YAUPON — **Yaupon** *Ilex vomitoria*

NEW ADOPTER! DAVINES GROUP — **Yarrow** *Achillea millefolium*

NEW ADOPTER! VIVAZEN — **Kratom** *Mitragyna speciosa*

NEW ADOPTER! Nutraland — **Reindeer Lichen** *Cladonia rangiferina*

NEW ADOPTER! NATURE'S ANSWER — **Mullein** *Verbascum thapsus*

ECOSO DYNAMICS — **Devil's Claw** *Harpagophytum spp.*

RFI — **Hibiscus** *Hibiscus sabdariffa*

JIAHERB essentials of nature — **Kava** *Piper methysticum*

**Rhodiola** *Rhodiola rosea*

ANI America Natural Ingredients — **Nopal/Prickly Pear** *Opuntia ficus-indica*

layn Natural Ingredients — **Sophora Japonica** *Styphnolobium japonicum*

**Monk Fruit** *Siraitia grosvenorii*

NAHA — **Lavender** *Lavandula angustifolia*

VERDURE SCIENCES® — **Pomegranate** *Punica granatum*

KSM-66® Video Feature — **Ashwagandha** *Withania somnifera*

NEW ADOPTER! iprona ARTEMIS INTERNATIONAL — **European Elder Berry** *Sambucus nigra*

ARTEMIS INTERNATIONAL — **Tart Cherry** *Prunus cerasus*

**Black Currant** *Ribes nigrum*

**Purple Corn** *Zea mays*

PLT HEALTH SOLUTIONS GROWTH THROUGH INNOVATION — **Indian Frankincense** *Boswellia serrata*

KDP Nutrient & Botanical Extracts — **Senna** *Senna alexandrina*

Pharmatoka — **Cranberry** *Vaccinium macrocarpon*

Video Feature — **Broccoli** *Brassica oleracea* Broccoli Group

Aromatics INCORPORATED — **Peppermint** *Mentha x piperita*

THE ACTIVES FACTORY — **Birch** *Betula spp.*

indena® — **Bilberry** *Vaccinium myrtillus*

eurofins | Botanical Testing — **California Poppy** *Eschscholzia californica*

FOUR ELEMENTS — **Lemon Balm** *Melissa officinalis*

valensa Video Feature — **Saw Palmetto** *Serenoa repens*

Gaia Trading Company, Inc. — **Hops** *Humulus lupulus*

# Visit us at: herbalgram.org/adopt-an-herb

# The Top 10 HerbalEGram Articles of 2024

**By ABC Staff**

**Each January, the editorial staff of the American Botanical Council (ABC) compiles a list of the 10 most popular HerbalEGram articles from the previous year, as determined by the number of individual link clicks. The list reflects the topics that interested the nonprofit organization's diverse audience of researchers, educators, health care professionals, industry members, the media, and other members of the public.**




The most-clicked article of 2024 was a pictorial by ABC Chief Science Officer Stefan Gafner, PhD, and colleagues Agnieszka Szopa, PhD, and Agnieszka Rzepiela, PhD, about the Museum of Pharmacy in Kraków, Poland. After Gafner's visit to the museum in July 2024, this article gives readers a glimpse of the more than 22,000 items on display and recounts the importance of herbal medicine in the history of pharmacy. The museum houses recreations of historical pharmacies and educates visitors on the practices of extracting or distilling medicinal plants, compounding and selling botanical medicines, preserving plant specimens, notable historical figures in the field, and more.

Legal and regulatory matters related to the quality of botanical ingredients and publishing are common themes in 2024's top 10 list. These include articles on: (1) the undisclosed presence of excipients and diluents in processed materials; (2) the retraction of the 2013 *BMC Medicine* article by Newmaster et al, which was the basis for the New York attorney general's investigation into botanical dietary supplement identity in 2015; (3) recalls of botanical weight-loss supplements that were adulterated with yellow oleander (*Cascabela thevetia* syn. *Thevetia peruviana*, Apocynaceae); and (4) an antitrust complaint filed against six major academic publishers.

## The Top 10 List for 2024

### 1. A Visit to the Museum of Pharmacy in Kraków, Poland

*By Stefan Gafner, PhD, Agnieszka Szopa, PhD, and Agnieszka Rzepiela, PhD* (November)

The Museum of Pharmacy in Kraków, Poland, tells the story of pharmacy from medieval times to the 20th century and has about 22,000 items on display. The history of pharmacy overlaps with the history of herbal medicine, as early pharmacies processed and compounded mainly botanical mixtures, and the museum includes recreations of these protolaboratories with restored equipment and artifacts, including barrels, distilling equipment, cabinets, containers, and more. These exhibits display the evolution of the profession of pharmacy with a strong emphasis on its roots in herbal and botanical remedies. (See pages 34-41 in this issue for the full article.)

### 2. The Undisclosed Presence of Excipients and Diluents in Botanical Extracts

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

Published literature and analytical reports suggest that some commercial herbal extracts in the food, dietary supplement, and cosmetic industries contain little of the declared ingredient. Typically, this is the result of suppliers' excessively diluting extracts or — less commonly — powdered plant materials with undeclared excipients or using previously extracted botanical raw material. In addition to reporting on this topic, the authors discuss suitable analytical methods to detect these diluted extracts and provide relevant figures and charts. This article is part of the ABC-AHP-NCNPR Botanical Adulterants Prevention Program's (BAPP's) research and reporting on ways to detect and prevent adulteration and fraud in the global botanical industry.

### 3. *BMC Medicine* Retracts Flawed 2013 Article by Newmaster et al on DNA Barcoding to Authenticate Ingredients in Herbal Products

*By ABC Staff* (August)

A 2013 paper that used DNA barcoding to authenticate herbal dietary supplements reportedly found that many of the analyzed finished products contained none of the active ingredients on the labels. At the time of the publication, ABC issued a press release noting major problems in the paper and suggesting its retraction by the journal *BMC Medicine*. In 2015, then-New York Attorney General Eric Schneiderman cited the flawed study during his well-publicized but scientifically inaccurate investigation into herbal supplements. After numerous complaints and calls for retraction, an investigative committee at the University of Guelph concluded that the journal article was based on fabricated and falsified data, and the journal retracted the paper in July 2024.

### 4. Standardized Shatavari Root Extract May Improve Menopausal Symptoms throughout Menopause

*By Samaara Robbins* (November)

Shatavari (*Asparagus racemosus*, Asparagaceae) has been used in the Ayurvedic traditional medicine system of India for hormonal and metabolic balance and as an alternative to hormone therapies prescribed to treat the symptoms of menopause. A randomized, double-blind, placebo-

controlled, parallel clinical trial published in 2024 investigated the effects of a standardized shatavari root extract on people with peri- and post-menopausal symptoms and measured self-reported quality of life scores as well as outcomes on depression and anxiety.

### 5. Food as Medicine: Eggplant (*Solanum melongena*, *S. aethiopicum*, and *S. macrocarpon*, Solanaceae)

*By Hannah Bauman* (November)

Eggplants come in a variety of shapes, sizes, and colors, and their phytochemical makeup is nearly as diverse. A staple of Eastern Mediterranean and Asian cuisines, eggplant also has had many uses in traditional Chinese medicine and Ayurvedic practices. Modern research shows that eggplant holds potential as a functional food for people with metabolic syndrome, to support cardiovascular health, and to prevent blood sugar spikes. These potential benefits may be due to the presence of anthocyanins, carotenoids, and chlorogenic acid-derived compounds in the plant. Preliminary research also shows that eggplant alkaloids exhibit cytotoxic activity toward cancer cell lines in vitro.

### 6. FDA Recalls Alert Consumers to Potentially Harmful Weight-loss Supplements Adulterated with Yellow Oleander

*By Stefan Gafner, PhD* (May)

In 2023 and 2024, the US Food and Drug Administration announced recalls for some dietary supplements marketed for weight loss due to adulteration with yellow oleander seeds. These supplements, which were labeled to contain Mexican hawthorn (*Crataegus mexicana*, nom. illeg. *C. pubescens*, Rosaceae) root, candlenut (*Aleurites moluccanus*, Euphorbiaceae) seeds, or Brazil (*Bertholletia excelsa*, Lecythidaceae) seeds, reportedly caused severe adverse effects, including nausea, dizziness, and changes in cardiac rhythm. Laboratory analyses confirmed the presence of yellow oleander in many of these products.

### 7. Remembering Muhammed Majeed: 1948–2024

*By Connor Yearsley* (August)

Muhammed Majeed, PhD, founder and chairman of the Sami-Sabinsa Group, whom some have called the "Father of Indian Nutraceuticals," died peacefully in Chennai, India, on March 13, 2024, at age 75. Majeed pioneered the development of standardized extracts of Ayurvedic herbs and helped establish a global market for these products. He focused on combining traditional Ayurvedic knowledge with modern science, created evidence-based botanical products, and emphasized innovation, standardization, and value addition. In this tribute, those who knew him remember his determination, passion, forward-thinking leadership, good nature, and more.

**Eggplant** *Solanum melongena*
Photo by Steven Foster ©2025 ABC



### 8. Sustainable Herbs Program Learning Journey: Listening in Appalachia

*By Ann Armbrecht, PhD* (May)

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

### 9. Six Academic Publishers and Trade Association Named in Antitrust Lawsuit

*By Hannah Bauman* (December)

In September 2024, Professor Lucina Uddin, PhD, filed a complaint against six major academic publishers and the trade association to which they all belong, requesting a class-action lawsuit. In the complaint, Uddin alleges that the defendants conspired to fix peer review prices, stymie competition among publishers, and institute a "gag order" that hampers scientific advancement and knowledge sharing.

### 10. New Employee Profile: Riane Roldan

*By Hannah Bauman* (August)

In March 2024, Riane Roldan joined the ABC staff as its new marketing and communications specialist. With a background in journalism, Roldan brings a storytelling approach to her work promoting ABC, its activities, and its programs to members and the public. Roldan began studying herbalism before working at ABC and is excited to combine her botanical knowledge and communications experience in her new role. HG

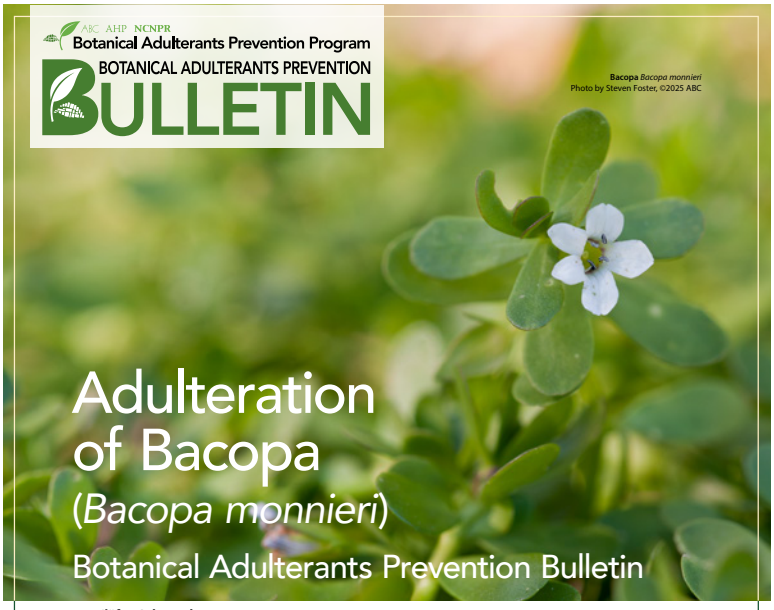
# BAPP Publishes Bulletin on Bacopa Mislabeling and Adulteration

## *New bulletin summarizes mislabeling due to nomenclatural confusion between two increasingly popular Indian herbs*

**By ABC Staff**

**In March 2025, the ABC-AHP-NCNPR Botanical Adulterants Prevention Program (BAPP) announced the publication of a new Botanical Adulterants Prevention Bulletin (BAPB) on bacopa (*Bacopa monnieri*, Plantaginaceae).**

Bacopa is a revered herb in Ayurveda and is known for its ability to enhance concentration, memory, and visual processing. The aerial (above-ground) parts of the plant are used as an ingredient in dietary supplements to improve focus, cognitive function, and memory recall. Bacopa preparations have also shown benefits for insomnia, stress, and anxiety. In the United States, bacopa-based supplements ranked 34th among the top-selling herbal dietary supplements in the natural retail channel and 35th in the mainstream retail channel in 2023, with more than $13.5 million in combined sales.




**By Nilüfer Orhan, PhD**

*American Botanical Council, PO Box 144345, Austin, TX 78714*

*Correspondence: email*

Citation (JAMA style): Orhan N. Adulteration of bacopa (*Bacopa monnieri*). *Botanical Adulterants Prevention Bulletin.* Austin, TX: ABC-AHP-NCNPR Botanical Adulterants Prevention Program. 2025.

**Keywords:** Adulteration, bacopa, *Bacopa monnieri*, brahmi, *Centella asiatica*, gotu kola, *Hydrocotyle asiatica*, Indian pennywort, mandukaparni

Goal: The objective of this bulletin is to give a summary of general information on the aerial parts and extracts of bacopa (*Bacopa monnieri* (L.) Wettst.), including an overview of adulteration and mislabeling of bacopa raw material and its products, with some emphasis on gotu kola (*Centella asiatica*) as the most common potential substitute. Additionally, it aims to describe the trade dynamics and market trends, as well as laboratory techniques useful for detecting mislabeling and adulteration, while also addressing the economic and safety implications for both consumers and industry stakeholders. This bulletin may serve as a useful resource for quality control professionals as well as members of the international phytomedicine and botanical supplement sectors by providing guidance and awareness within the natural products community.



In India, bacopa shares the common Sanskrit name of *brahmi* with another popular herb from India, gotu kola (*Centella asiatica*, Apiaceae), and Ayurvedic literature acknowledges the two plant species as legitimate substitutes for each other when used medicinally. Although *B. monnieri* and *C. asiatica* have overlapping therapeutic uses, their phytochemical constituents, modes of action, and some of their pharmacological effects differ. Nevertheless, due to the use of the same common name, accidental mislabeling of bacopa and gotu kola materials and products in the market is reported on a regular basis.

"Such mislabeling is readily detected by analytical laboratory testing," said Stefan Gafner, PhD, chief science officer of the American Botanical Council (ABC) and director of BAPP. "However, manufacturers should be aware of the nomenclatural confusion and take appropriate steps to ensure the correct botanical identity of their materials."

Nilüfer Orhan, PhD, an expert in natural products chemistry and pharmacology, wrote the new BAPP bulletin. She previously authored or co-authored BAPP's nigella (*Nigella sativa*, Ranunculaceae) and boswellia (*Boswellia serrata*, Burseraceae) BAPBs and St. John's wort (*Hypericum perforatum*, Hypericaceae) laboratory guidance document, as well as a BAPP-sponsored paper, which was published in 2024 in the peer-reviewed journal *Natural Product Reports*, estimating the extent of adulteration of five popular botanical ingredients.

The new BAPP bulletin summarizes scientific data on adulteration and mislabeling of the aerial parts of bacopa, discusses analytical methods to detect adulteration, and provides information about the plant's taxonomy, uses, supply, and market status. Nineteen international experts in quality control of medicinal plants from nonprofit organizations, contract analytical laboratories, and the herb industry reviewed the bulletin before publication.

"The primary purpose of our bacopa bulletin was to clarify a nomenclatural issue," said Mark Blumenthal, founder and executive director of ABC and founder of BAPP. "Nevertheless, as

the bulletin documents, bacopa can also be subject to intentional adulteration and fraud for economic reasons, and this adds further value to our publication."

The bacopa bulletin is the 30th publication in the series of BAPBs and BAPP's 94th peer-reviewed document. As with all BAPP publications, the BAPBs are freely accessible on BAPP's homepage on the ABC website (registration required).

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

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

**Bacopa** *Bacopa monnieri*
Photo by Steven Foster ©2025 ABC



# Lavender Essential Oil Preparation Shows Beneficial Effects in People with Mild-to-Moderate Depression

**Reviewed:** Kasper S, Volz HP, Möller HJ, et al. Lavender oil preparation Silexan is effective in mild-to-moderate major depression: A randomized, placebo- and reference-controlled trial. *Eur Arch Psychiatry Clin Neurosci.* April 1, 2024. doi: 10.1007/s00406-024-01783-2.

**By Gavin Van De Walle, MS, RD**

**Depression affects an estimated 5% of the adult population globally, according to the World Health Organization. This condition is associated with a range of symptoms, including depressed mood, concentration problems, sleep disturbances, weight or appetite changes, low energy, and others. Effective pharmaceutical treatments are available, but some of these are associated with disruptive adverse effects (AEs).[1] Researchers have investigated the potential antidepressive effects of various lavender (*Lavandula* spp., Lamiaceae) preparations in human clinical trials. Although systematic reviews have reported positive effects of lavender preparations on symptoms of depression, the quality of included trials can vary.[2,3]**

Silexan® (Dr. Willmar Schwabe GmbH & Co. KG; Karlsruhe, Germany) is an essential oil preparation derived from lavender (*L. angustifolia*) flowers and is primarily used to manage anxiety disorders and depressive symptoms. This randomized, double-blind, placebo- and reference-controlled, parallel-group clinical trial aimed to assess the antidepressant efficacy and safety of Silexan in people with mild-to-moderate depressive disorders. The conventional antidepressant sertraline was used as the active comparator.

## Included Participants

The trial was conducted between October 2020 and April 2023 in various psychiatric or neurological practices across Germany and Poland. Patients with diagnosed mild-to-moderate major depressive disorder (MDD) were eligible for study inclusion. Patients with severe MDD, other "clinically important" psychiatric or neurological diagnoses, recent use of psychotropic drugs, or who were in psychotherapy within two weeks of randomization were excluded. Also excluded were patients with suicide risk indicators and those who were non-responsive to previous antidepressant treatments. Use of psychotropic medication and psychotherapy during the study was prohibited. The study adhered to the quality and ethical standards outlined in the 1964 Declaration of Helsinki and the Good Clinical Practice guidelines from the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use.

| Study Details: At a Glance | |
|---|---|
| **Study Design** | Randomized, double-blind, placebo- and reference-controlled, parallel-group clinical trial (a "double-dummy" design) |
| **Duration** | Eight weeks |
| **Participants** | 446 adults with mild-to-moderate depression |
| **Interventions** | Silexan® (Dr. Willmar Schwabe GmbH & Co. KG; Karlsruhe, Germany), an essential oil preparation derived from lavender flowers, and sertraline (an active comparator) |
| **Controls** | Placebo versions of Silexan (matched for scent) and sertraline, and a regular placebo |
| **Disclosures** | Authors SS and SK are employees of Schwabe, the study's sponsor. SKa has consulted for, HPV and HJM have received support and speaking fees from, and ES has received grants and honoraria from Schwabe. |

Of the initial 500 subjects who were randomized, 498 were treated, and 446 completed the trial as planned. AEs were the most frequently reported reason for premature withdrawal among the groups. The participants were primarily white, two-thirds female, and divided almost equally between those experiencing mild (46.2%) and moderate (53.8%) episodes of MDD. More than half had recurrent depression, with a median of three prior episodes. The average duration of the participants' current depressive episode was 3.4 months. Pre-existing conditions necessitating pharmacological treatment were reported in about half of the Silexan group, about a third of the sertraline group, and less than half of the placebo group.

## Study Design and Outcome Measures

Participants were randomly assigned to take one 80-mg capsule of Silexan, one 50-mg tablet of sertraline, or a placebo. Both active treatments had identical placebo versions, with the placebo for Silexan also matched for scent. Subjects were instructed to take a total of two capsules daily for eight weeks (a "double-dummy" design) — one capsule of their assigned treatment (Silexan, sertraline, or placebo) and one placebo capsule. This resulted in three study groups: Silexan plus sertraline-placebo (the Silexan group; n = 154), sertraline plus Silexan-placebo (the sertraline group; n = 151), and Silexan-placebo plus sertraline-placebo (the placebo group; n = 141). Overall compliance with treatment after eight weeks was high, averaging above 98% for all groups.

The primary outcome was the intraindividual change from baseline in the observer-rated Montgomery-Åsberg Depression Rating Scale (MADRS) total score after eight



**Lavender** *Lavandula angustifolia*
Photo by Steven Foster ©2025 ABC

weeks. Secondary outcome measures included the self-rated Revised Beck Depression Inventory (BDI-II); the nine-item, self-rated depression module of the Patient Health Questionnaire-9 (PHQ-9); the Clinical Global Impressions (CGI) scale, an observer-rated measure of mental illness severity; and the Sheehan Disability Scale (SDS), a self-rated tool used to assess functional impairment in three areas: work/school, social life, and family life/home responsibilities.

Safety and tolerability were assessed through various means, including AE reports, physical examinations, electrocardiograms (ECGs), vital signs, and other laboratory measures.

## Results

After eight weeks, the average MADRS total scores decreased significantly in the Silexan and sertraline groups ($P < 0.01$ for both) compared with the placebo group.

The Silexan and sertraline groups also had higher "response" and "remission" rates compared to the placebo group, but these differences were not significant. A treatment response was defined as a "MADRS total score decrease by at least 50% of the baseline value" after eight weeks. Remission was defined as having a MADRS total score of less than 10 at the end of the study. After eight weeks, 53.5% of the Silexan group, 54.0% of the sertraline group, and 41.5% of the placebo group were considered responders. The authors reported remission in 44.4% of the Silexan group, 45.2% of the sertraline group, and 32.6% of the placebo group.



**Lavender** *Lavandula angustifolia*
Photo by Steven Foster ©2025 ABC

Regarding secondary outcomes, the authors reported that the Silexan group had "notable" symptom relief according to BDI-II and PHQ-9 scores, but these improvements were not statistically significant. By the eighth week, more subjects in the Silexan and sertraline groups were rated as not depressed or significantly improved on the CGI scale compared to the placebo group, but these results were not significant. The Silexan group, but not the sertraline group, showed significant improvements in functional impairments related to MDD compared to placebo, according to SDS scores, with noted improvements across work, social, and family domains.

## Adverse Effects

Fifty-six subjects (32.9%) in the Silexan group experienced 92 potentially treatment-related AEs, while 49 (28.7%) in the sertraline group had 91 events, and 43 subjects (27.4%) in the placebo group reported 69 events. Serious AEs were similarly low across all groups, with two instances of suicidal ideation in each group. The most common AEs for Silexan were eructation (belching/burping) and nasopharyngitis (nasal passage inflammation), while sertraline was associated with headache, nausea, and diarrhea. Treatment discontinuation due to intolerability or lack of efficacy was reported by 8.2% of subjects in both the Silexan and sertraline groups, compared with 4.5% in the placebo group. Overall, physical and ECG examinations, vital signs, and routine laboratory measures showed no significant differences among the groups.

## Conclusion

In this study, 80 mg of Silexan administered daily for eight weeks effectively reduced symptoms of mild-to-moderate MDD, with severity reductions greater than placebo and comparable with sertraline. Silexan also significantly improved functional impairments in work, social life, and family responsibilities, "indicating that treatment with Silexan had an important beneficial effect on the subjects' disease-associated quality of life," the authors wrote. HG

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# Clinical Study Shows Nigella Oil Is Safe and Effective in Managing Seasonal Allergies

**Reviewed:** Majeed A, Majeed S, Parameswarappa AK, et al. A randomized, double-blind, placebo-controlled study to evaluate the benefits of a standardized *Nigella sativa* oil containing 5% thymoquinone in reducing the symptoms of seasonal allergy. *Medicine (Baltimore)*. 2024;103(32):e39243. doi: 10.1097/MD.0000000000039243.

**By Shari Henson**

**Symptoms of allergic rhinitis (AR), also known as hay fever, can include sneezing, nasal congestion, runny nose, and itchy nose and eyes, among others. AR is commonly treated with antihistamines, decongestants, and corticosteroid nasal sprays. Some of these treatments can produce adverse effects such as local burning, dryness of mucous membranes, and nosebleeds, and, less often, systemic effects such as headaches, abdominal pain, laryngitis, and susceptibility to infections.**

Nigella (*Nigella sativa*, Ranunculaceae), also known as black cumin, has been used to help manage metabolic disorders and infectious diseases, hypertension, allergies, asthma, respiratory symptoms, and other illnesses. Nigella oil contains various bioactive compounds, including thymoquinone (TQ), thymohydroquinone, dithymoquinone, thymol, carvacrol, nigellidine, nigellicine, and α-hederin, to which its therapeutic benefits have been attributed. In this randomized, double-blind, parallel, placebo-controlled clinical trial, the authors investigated the effects of a standardized nigella oil in people with seasonal AR.

The study was conducted in Bengaluru, India, at MEDSTAR Specialty Hospital and BGS Global Institute of Medical Sciences from August 5, 2022, to September 8, 2022. Eligible participants were 18–60 years old and had at least two symptoms of AR lasting longer than one hour daily.

The treatment consisted of capsules containing 250 mg of nigella oil (Nigellin® Amber; Sami-Sabinsa Group Limited; Bengaluru, India), obtained via supercritical fluid extraction and standardized for 5% TQ, and 2.5 mg of 95% piperine (BioPerine®; Sabinsa Corporation; East Windsor, New Jersey), a standardized black pepper (*Piper nigrum*, Piperaceae) extract, to enhance absorption. The placebo capsules contained microcrystalline cellulose.

Participants were randomly assigned to the nigella group (n = 33) or the placebo group (n = 32). For 15 days, they took a treatment capsule or a placebo capsule twice daily with food. Participants were evaluated at baseline and on days 5 and 15. On days 21 and 30, they were asked by phone about their overall well-being

| Study Details: At a Glance | |
|---|---|
| **Study Design** | Randomized, double-blind, parallel, placebo-controlled clinical trial |
| **Duration** | 15 days plus follow-ups on days 21 and 30 |
| **Participants** | 65 men with at least two symptoms of allergic rhinitis lasting longer than one hour daily |
| **Intervention** | Capsules containing nigella oil (Nigellin® Amber; Sami-Sabinsa Group Limited; Bengaluru, India) and piperine (BioPerine®; Sabinsa Corporation; East Windsor, New Jersey) |
| **Control** | Placebo capsules containing microcrystalline cellulose |
| **Disclosures** | Authors A. Majeed, S. Majeed, A.K. Parameswarappa, A. Murali, S. Gudimallam, and L. Mundkur are Sami-Sabinsa Group Limited or Sabinsa Corporation employees. The other authors declared no conflicts of interest. |



**Nigella** *Nigella sativa*
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and the occurrence of any adverse effects. Each participant was instructed to record daily allergy symptoms in a diary.

The study's primary outcome measures were the mean change in Total Nasal Symptom Score and the mean change in duration of AR symptoms from baseline to day 15. Secondary endpoints were the mean change in Total Ocular Symptoms Score, duration of AR symptoms within 24 hours, symptom severity, serum levels of immunoglobulin E (IgE, an antibody that is involved with allergic reactions and infections), and scores on the Patient Global Impression of Change (PGIC) scale. Safety assessments included changes in pulse rate, body temperature, biochemical parameters, and urinalysis results, assessed at baseline and on day 15.

The included participants (N = 65, all males) were 22–44 years old, and all completed the study. Improvements in nasal symptoms observed in the nigella group were significantly more pronounced compared to baseline and compared to the placebo group, for which a smaller change was noticed from baseline to day 5 and from baseline to day 15 ($P < 0.001$ for all measures). Improvements in ocular symptoms were also more significant in the nigella group compared to the placebo group at days 5 and 15 ($P < 0.001$ for both time points).

At the beginning of the study, all participants rated their symptoms as severe or very severe. At the end of the study, people in the nigella group considered their symptoms to be moderate (48.4%), mild (33.3%), very mild (9.9%), or nonexistent (6.1%). In the placebo group, participants described their symptoms as moderate (34.4%) or severe (65.8%) on day 15.

More significant improvements in the duration and frequency of AR symptoms within 24 hours were observed in the nigella group compared to the placebo group at the end of the study ($P < 0.001$). PGIC scores revealed significant improvements from baseline to the end of the study in the nigella group compared to minor improvements in the placebo group ($P < 0.001$).

IgE levels decreased significantly in the nigella group ($P = 0.03$) but only slightly in the placebo group; the between-group difference was not significant. In both groups, the percentage of eosinophils (a type of white blood cell) in peripheral blood decreased from baseline, but not significantly. Because no significant changes were observed in hematological parameters, the nigella oil was considered well-tolerated.

In this study, nigella oil standardized for 5% TQ was found to be safe and effective in reducing the symptoms and duration of AR in adult males after 15 days. Among the limitations of this study were the small number of participants, the absence of women in the study (which was unintended, according to the authors), and the relatively small geographic area in southern India from which participants were recruited.

The authors suggested that future studies compare the standardized extract used in this study with conventional nigella oil to better understand its comparative efficacy and evaluate inflammatory markers associated with AR to better understand the mechanism(s) of action. HG

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Dried herbs hanging in the Kraków Museum of Pharmacy.

# A VISIT TO THE MUSEUM OF PHARMACY IN KRAKÓW, POLAND

**By Stefan Gafner, PhD, Agnieszka Szopa, PhD, and Agnieszka Rzepiela, PhD**

All photos by Stefan Gafner unless otherwise noted

**The 2024 International Congress on Natural Products Research (ICNPR) was held in Kraków, Poland, in July 2024. With more than 1,000 participants from 68 countries in 2024, ICNPR, which is held every four years, is probably the largest conference worldwide that focuses on many aspects of research regarding medicinal plants and isolates from natural sources. Besides the ability to listen to the latest discoveries in medicinal plants and natural products and to discuss topics of interest (scientific and others) with friends and colleagues from around the globe, one of the joys of participating in this conference is the opportunity to explore an interesting new location. As the former capital of Poland, Kraków is one of the oldest and largest cities in the country. Unlike many other large cities in Europe, Kraków was mostly spared from bombing raids during World War II, and most of its historic buildings have been preserved. One of these buildings, located at 25 Floriańska Street, is home to the Museum of Pharmacy.**

Kraków's Museum of Pharmacy is one of the oldest and largest museums of its kind in the world. Established in 1946, it is now affiliated with the Jagiellonian University Medical College. With about 22,000 items on display, the museum is a treasure trove for those interested in the history of pharmacy, especially for people who want to learn more about the historical use of herbal medicine in Europe from medieval times to the 20th century.

Honoring the traditional setup of a pharmacy, the floor plan of the three-story museum represents historic space allocations in a pharmacy from the basement to the attic. Exhibits featuring laboratory equipment and ingredients that need to be stored at a cooler temperature are located in the building's 15th-century basement. The first and second floors include recreations of several beautifully restored historical pharmacies with furniture mostly from the 19th century. Paintings and photographs of prominent Polish pharmacists are exhibited, and numerous storage vessels dating back to the 16th century are shown in the rooms. The third floor represents the attic of a pharmacy, which

historically was used to dry and store medicinal plants due to good ventilation and the warmer conditions under the roof.

Similar to what was found in 16th- to 19th-century pharmacies, the basement includes old stoneware and copper containers used to store oils, distilled water, vinegars, syrups, elixirs, and other items. The room also includes several wine barrels, the contents of which were used, among other applications, to prepare medicinal wines. Wine itself is considered to be the oldest documented medicine for humans. It has been used as an antiseptic and to help with digestion, among other therapeutic indications, since 2000 BCE.[1] Centuries ago, pharmacists prepared medicinal wines by using wine to extract plant material and as a solvent for other medicinal substances. In medical and pharmaceutical literature, numerous medicinal wine recipes, which date back to antiquity, can be found, such as in *De Materia Medica* by Greek physician, botanist, and author Dioscorides (ca. 40–90) from the 1st century CE.[2] Examples include rose (*Rosa* spp., Rosaceae) wine (*oinos rodites*) and mandrake (*Mandragora officinarum*, Solanaceae) wine (*oinos mandragorites*).

In the 12th century, the German mystic Hildegard of Bingen (1098–1179) recommended lungwort (*Pulmonaria officinalis*, Boraginaceae) wine for lung diseases and cough, and wormwood (*Artemisia absinthium*, Asteraceae) and verbena (*Verbena officinalis*, Verbenaceae) wines for toothache.[3] Since the 18th century, official pharmacopeias have listed around 160 types of medicinal wines. The composition of medicinal wines has evolved with the introduction of new ingredients into medicine, including some from South America. In 19th- and 20th-century pharmacies, quinine (obtained from *Cinchona* spp., Rubiaceae) wines, such as *vinum cinchonae*, were popular and recommended for anemia and chlorosis (a condition related to anemia), and condurango wine, which contains an extract of the bark of the South American vine *Ruehssia cundurango* subsp. *cundurango* (syn. *Marsdenia cundurango*, Apocynaceae), was recommended for stomach issues. *Vinum colae*, made with an extract of the seeds of various African cola tree species (*Cola* spp., Malvaceae), was suggested as a calming, strengthening, and refreshing agent, particularly for travelers.[4]

Figure 1 shows an image of the Kraków Museum of Pharmacy's cellar with old wine barrels with wine from Hungary and Greece, and tools used in wine production.

The basement exhibits also include equipment from a former alchemic pharmacy laboratory of the 16th and 17th centuries. The room contains a furnace with a large hearth used to provide heat for distillations and other processes. It also features copper and glass alembics (distillation apparatus), filters, mortars, crucibles for melting metals, table and screw presses for squeezing juices and oils, and other items.

**Figure 1.** Old wine barrels from various European regions, and — behind the barrel from 1663 — a set for tasting wine from the first half of the 20th century. Photo courtesy of Muriel Cuendet.





**Figure 2.** 17th-century graphite retorts with clay containers.

Many herbal medicines were produced in alchemic pharmacies. The use of alchemy (i.e., the art of transforming, mixing, or purifying matter), a precursor of modern chemistry, is evidenced by two 17th-century graphite retorts (Figure 2) for dry distillation. Retorts consist of a spherical vessel and a downward-facing beak and are similar in shape to an alembic, a two-vessel apparatus used for early distillations. It is highly likely that these retorts belonged to the renowned Polish alchemist and physician Sendivogius Polonus (Michał Sędziwój in Polish; 1566–1636).

Dry distillation was used to convert dry materials from the solid state into the gaseous state. An example is the production of sulfuric acid from mineral sulfates. Upon exposure to heat, the sulfates release gaseous sulfur dioxide and sulfur trioxide, which can be dissolved in water to obtain sulfuric acid.

The ground floor exhibit includes a beautiful recreation of a dispensation room (dispatch room) from various monastic pharmacies in Poland, such as the Benedictine pharmacy in Płock, the Pauline pharmacy in Częstochowa, and the Jesuit pharmacy in Kraków. Figure 3 shows an 18th-century Gothic cabinet with shelves and drawers from the Benedictine pharmacy.

Most exhibits in this room come from former pharmacies in monasteries. The ceilings and walls of some pharmacies were decorated with animals and animal parts, including crocodiles,

**Figure 3.** Bottom left: An 18th-century Gothic cabinet of the Benedictine pharmacy in Płock (central Poland) featuring wooden containers.

Bottom right: Details of a wooden container used to store hemoglobin.





deer antlers, shark jaws, turtle shells, fish, and snakes. Historians hypothesize that these animals were used in pharmacies to give consumers a sense of prestige, as people with access to such animals may have been considered more likely to have access to exotic and hence more powerful medicines.[5] The placement of exotic animals or their parts as distinctive decorations in old pharmacies also reflected the use of animal-derived materials for medicinal purposes, a practice dating back to ancient times.

A beautiful glass door (Figure 4) can be admired on the way to the first floor. The door depicts a mortar and pestle and four medicinal plants: purple foxglove (*Digitalis purpurea*, Plantaginaceae), aconite (*Aconitum napellus*, Ranunculaceae), opium poppy (*Papaver somniferum*, Papaveraceae), and deadly nightshade (*Atropa belladonna*, Solanaceae).

These four plants have a long history of use as herbal medicines but have fallen out of favor due to their toxicity. However, the cardiac glycosides digoxin and digitoxin (isolated from *D. lanata* and purple foxglove, respectively), as well as the alkaloids codeine, morphine, and papaverine isolated from opium poppy, are still in use as conventional drugs in current medical therapy. And atropine (found in deadly nightshade and several other plants in the nightshade family) is used by ophthalmologists to dilate patients' pupils during eye exams and surgeries.

The combination of these plants in the stained glass at the Kraków Museum of Pharmacy is symbolic. It indicates that poisonous substances can become medicines through the knowledge and work of pharmacists, symbolized by the mortar and pestle.

Near the stained glass, Konstancja Studzińska's (1787–1853) Master of Pharmacy diploma is displayed. In 1824, two sisters (both nuns), Konstancja and Filipina Studzińska (1797–1877), from the pharmacy of the General Hospital of St. Lazarus in Kraków, became

**Figure 4.** A stained glass door (ca. 1900) from the workshop of artist Adolf Seiler in Wroclaw, Poland.[6] Photo courtesy of Muriel Cuendet.



the first women to each receive a Master of Pharmacy degree, which they obtained from Jagiellonian University in Kraków. As part of the practical exam, Sister Filipina prepared, among other things, marshmallow (*Althaea officinalis*, Malvaceae) root ointment (*Unguentum althaeae*), which is known for its soothing, anti-inflammatory, and antibacterial properties. Sister Konstancja made compound Diachylon plaster (*Emplastrum diachylon compositum*), a resinous adhesive plaster. A recipe for *Emplastrum diachylon compositum sive cum gummi* is detailed in the Württemberg Pharmacopoeia of 1754.[7] The compound Diachylon plaster is made of *Emplastrum diachylon simplex* to which a solution of gum ammoniac (a gum obtained from *Ferula ammoniacum*, Apiaceae) and galbanum (another gum from *Ferula* spp.) in vinegar and saffron (*Crocus sativus*, Iridaceae) powder are added. *Emplastrum diachylon simplex* is a mixture of mucilages of fenugreek (*Trigonella foenum-graecum*, Fabaceae), flax (*Linum usitatissimum*, Linaceae), marshmallow, and litharge (lead oxide) in vegetable oil.[7,8] The plaster was used to soften and heal abscesses.[7] (The toxicity of widely used heavy metals like lead, mercury, and arsenic was not apparent at the time.)

**Figure 5.** A Biedermeier pharmacy cabinet typical of the 19th century.



The rooms on the first floor show the interiors of pharmacies from the 18th and 19th centuries. Figure 5 features a wooden cabinet in the Biedermeier (a period that began after the end of the Napoleonic Wars in 1815) style, with a symmetrical arrangement, angular shape, and intricately carved design. In front of the cabinet are bronze and marble mortars from the period. The cabinet contains drawers and containers for mainly dried herbs, but also minerals and other ingredients such as "lapis cancr," presumably indicating *lapis cancrorum* (Latin for "crab stone"). French pharmacist Pierre Pomet (1658–1699), in his *A Complete History of Drugs*, writes that *lapis cancrorum* is "a little white Stone, made in form of eyes, from whence they take their name lapides cancrorum … which are found in the head of the large river crab," but that "what we sell now under the denomination of crabs eyes, was nothing but a white earth wash'd, and made into little pastiles or troches."[9]

From a medicinal plant perspective, one of the more interesting exhibits is a collection of 83 tin-glazed storage containers (*maiolica*) from the 16th to 19th centuries donated by the London-based Polish pharmacist Mateusz Grabowski (1904–1976). The collection, professionally gathered through antiquarian purchases, consists of ceramic pharmacy vessels, including pharmacy jars (albarelli), jugs, canisters, and apothecary vases, made in European workshops and manufactories from tin-glazed pottery (*faience*), porcelain, and its Italian variant *majolica*.[10]

Most of these vessels originate from England, Italy, and the Netherlands. The basic forms of these vessels are known by their Italian names, such as *albarello*, a cylindrical container with a slightly concave waist (Figure 6A); *boccale*, a small jug; and *orciuolo*, a teapot-shaped container with a spout on one side and a handle on the other.[11]

The Württemberg Pharmacopoeia of 1754 includes a recipe for St. John's wort (*Hypericum perforatum*, Hypericaceae) syrup, such as the one contained in the albarello in Figure 6A. The preparation is made with equal parts of fresh St. John's wort flowers and water, to which a sufficient amount of sugar is added to make a syrup. It was indicated to treat gastric pain, kidney stones, and intestinal worms.[7]

Rose oil (Figure 6B) is described as the oil obtained by distillation of roses in the Strasbourg Pharmacopoeia of 1725.[8] Contrarily, the Württemberg Pharmacopoeia describes rose oil as a macerate of five parts of castor (*Ricinus communis*, Euphorbiaceae) seed oil and four parts of Damask rose (*Rosa* × *damascena*, Rosaceae) essential oil. The preparation was used to soothe and heal burns.[7]










**Figure 6.** A: An albarello for St. John's wort syrup, Castelli, Italy (1787)[12]; B: An orcio biansato-type maiolica for rose oil (olio rosato), probably made in Rome, Italy (17th century)[11]; C: An albarello for bryony syrup, Castelli, Italy (18th century).

**Figure 7.** Below: An albarello used to store the Alkermes confection, made by the Three Bells pottery in Delft, the Netherlands (17th or 18th century). Photo courtesy of Agnieszka Rzepiela.




The third vessel was used to store bryony (*Bryonia dioica* or *B. alba*, Cucurbitaceae) syrup, although a recipe for this syrup could not be found in the 18th-century pharmacopeias that were consulted. However, the 19th-century English chemist William Bateman included a formula for *Aqua Bryoniae Composita* in his book *Magnacopia*.[13] Besides half a pound of bryony root, the recipe included four ounces of valerian (*Valeriana officinalis*, Caprifoliaceae) root, half a pound of pennyroyal (*Mentha pulegium*, Lamiaceae), half a pound of rue (*Ruta graveolens*, Rutaceae), one ounce of savin (*Juniperus sabina*, Cupressaceae), and two ounces of orange (*Citrus* × *sinensis*, Rutaceae) peel. The materials were "steeped in three gallons of spirit" for one week.[13] Bateman did not provide any medicinal use for the mixture,[13] but bryony root had numerous reported medical indications and even more ritual and folklore uses in ancient times and was popular until the 19th century. Medicinal uses include the treatment of stitches in the side, hysteria, constipation, and inflammatory diseases such as gout and pneumonia.[14] *Bryonia alba* was also historically used in cosmetics. The use of its sap as a skincare treatment is mentioned, for example, in the medieval treatise *De ornatu mulierum* by the physician Arnaldus de Villanova (ca. 1235–1311) from the 14th century.[15]

Among the more obscure medicines for which an albarello (Figure 7) is exhibited is the "*Conf. Alkermes Compl.*" (*Confectum Alkermes Completum*) — a preparation of the insect *Kermes vermilio* (Kermesidae) and other ingredients. The origin of kermes-based medicines dates back at least to Dioscorides in the first century, who recommended a preparation in vinegar for external use to heal wounds and other bodily injuries. Arab physicians later treated patients with a confection that included "alkermes" as a cardiac remedy, mainly to alleviate heart palpitations.[16]

The formula eventually made its way from the Middle East to Europe and was found in medieval herbal textbooks and many of the earlier pharmacopeias. According to Jean de Renou (1568–1620), the mixture contained apple (*Malus domestica*, Rosaceae) juice, rose water, silkworms, kermes insects, grey amber, and the powders of cinnamon (*Cinnamomum* spp., Lauraceae), aloe (*Aloe* spp., Asphodelaceae) wood, lapis lazuli, pearl, gold, and







**Figure 8.** Top left: Medicinal plants, including red clover (*Trifolium pratense*, Fabaceae), lavender (*Lavandula angustifolia*, Lamiaceae), and chamomile (*Matricaria chamomilla*, Asteraceae), hung in bushels to dry.

Left: Medicinal plants dried in stacks, boxes with glass vials containing small amounts of herbal materials (used for display, as well as educational purposes), baskets woven with grass leaves used to store large quantities of plants like oregano (*Origanum vulgare*, Lamiaceae), and harvesting and processing tools such as the double-handle multi-blade curved cutting device on the left.

**Figure 9.** Top right: A panoramic view of the attic at the Kraków Museum of Pharmacy, with visitors Funda Nuray Yalçin, PhD (Hacettepe University; Ankara, Türkiye), and Rudolf Bauer, PhD (University of Graz; Graz, Austria).

musk.[17] He claimed that "It is very efficacious for many things; for it cures the palpitation of the heart, woundings, doting, and sadness without a manifest cause; and much helps such as are languid, wearied with long sickness, and newly recovered."[17] A similar formula was included in the Strasbourg Pharmacopoeia of 1725[8] and Württemberg Pharmacopoeia of 1754,[16] although the formula in the latter also included cochineal, another insect-based colorant.

For those with an interest in herbal medicines, the museum is like a good movie in which the best part comes at the end. In the Kraków Museum of Pharmacy, this means the best is at the top. The attic exhibits tools to harvest and process medicinal plants, wooden chests with drawers, baskets, containers to store dried or cut plants, and many plants in bushels hanging to dry (Figures 8 and 9).

The attic provides not only a glimpse into medicinal plant harvesting, processing, and storage of bygone days but also an amazing array of visual and organoleptic impressions that are part of working with herbal medicines.

For pharmacists, the museum is a trip down memory lane and beyond, a site to learn about the origin of the profession and how it has evolved over time. For those with a love of medicinal plants, it is a place to discover obscure and forgotten therapies, ingredients the healing properties of which are based on myths rather than evidence, as well as plants that have kept their importance in the therapeutic arsenal for centuries and are still in use today. While the Kraków Museum of Pharmacy is not solely dedicated to the history of medicines of natural origin, it is a unique place to experience the importance of plants as a source of medicines and well worth the visit if you happen to have some time in Kraków. HG



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**Tart cherry** *Prunus cerasus*
Photo by Steven Foster ©2025 ABC

# AMERICAN BOTANICAL COUNCIL ACQUIRES FULL RIGHTS TO THE STEVEN FOSTER PHOTO LIBRARY

## ABC now owns more than 150,000 images of 1,700+ species of medicinal and aromatic plants taken by famed photographer and herbal expert

**By ABC Staff**

**In April 2025, the American Botanical Council (ABC) announced that it had obtained ownership rights to the entire collection of medicinal and aromatic plant photographs taken by the late botanist, author, and preeminent photographer Steven Foster (1957–2022).**

Foster was well-known and widely respected as the author or co-author of 21 books on herbs and medicinal plants. He also wrote more than 800 articles and reviews on herbal medicine, ethnobotany, sustainable sourcing, conservation, and related subjects, including more than 100 in ABC's peer-reviewed journal *HerbalGram*.

His extensive photographic library contains over 150,000 images of more than 1,700 accurately identified medicinal and aromatic plant species. This includes Foster's photos of many native American medicinal plants, as well as other plants he encountered during his travels in countries around the world, such as Argentina, Armenia, Belize, China, Costa Rica, Egypt, England, Germany, Guatemala, Japan, Montenegro, the Netherlands, Peru, Switzerland, Trinidad and Tobago, Vietnam, and elsewhere.



Steven Foster

Foster was a member of ABC's Board of Trustees for more than 20 years and president for 10 years. He provided frequent and instrumental support for *HerbalGram* and served as a contributing editor, peer reviewer, and author of dozens of feature-length articles. He also contributed hundreds of medicinal plant photos from his extensive library, including at least 60 photos that appeared on the magazine's cover. His photography has filled nearly every issue of *HerbalGram* since issue 24 in 1991.

After Foster's untimely death in January 2022, ABC continued to have access to and permission to use his photos in a variety of ABC publications and communications through a special arrangement with his estate. Now, ABC has finalized the purchase of Foster's entire digital photo library, including full rights to all



**Lotus** *Nelumbo nucifera*
Photo by Steven Foster ©2025 ABC



**Cinnamon** *Cinnamomum aromaticum*
Photo by Steven Foster ©2025 ABC

images. Credits to Foster's photographs now read: "Photo by Steven Foster ©2025 ABC."

"For more than 40 years, Steven was a close personal friend and colleague and a primary contributor to ABC's nonprofit research and educational mission, publications, and programs," said ABC Founder and Executive Director Mark Blumenthal. "Steven's intelligence, botanical knowledge, writing, and photography were an integral part of the development and evolution of *HerbalGram* and ABC.

"It has been ABC's goal not only to provide valid, reliable, science-based information on herbs and medicinal plants, but also to show the beauty of these plants, which we have done for decades thanks in large part to Steven's incredible photos," Blumenthal added. "Now, ABC has the opportunity to continue its nonprofit mission with Steven's photos and to help expand the herb community and general public's awareness of and appreciation for Steven's remarkable photographic legacy."

ABC Art Director Matt Magruder said: "Securing the ownership of Steven Foster's photography library is an exciting new chapter for *HerbalGram* and all of ABC's various programs and publications. Steven's photography has been a foundational — and visually stunning — part of the organization from early on. As a fellow photographer, I am grateful to be able to honor Steven and to continue to share his quintessential photographic legacy through ABC's stewardship moving forward."

Michael J. Balick, PhD, member of ABC's Board of Trustees and vice president for botanical science, director and senior philecology curator of the Institute of Economic Botany at the New York Botanical Garden, said: "I was delighted to learn that ABC has acquired the Steven Foster Photo Library. Steven's 'plant's eye view' was nothing short of extraordinary, and this is reflected in all of his artistic and scientific work over so many decades. He was enthusiastic and generous about sharing his talents as a photographer and providing his guidance to anyone who asked for his advice, regardless of their level of botanical sophistication.

"When I invited him to illustrate the third edition of the *Handbook of Poisonous and Injurious Plants* (Springer, 2020), he provided his best work," Balick continued, "and the photos that grace the pages of this reference book are not only useful for identification in cases of suspected poisoning, but also works of beautifully composed botanical art. We all miss Steven, who left us prematurely, and I am grateful to ABC and its donors for ensuring that this part of his legacy will endure, educating and captivating us all for many more decades."

Blumenthal noted that, at a time when people are beginning to use artificial intelligence as a source for botanical images, one primary benefit of Foster's photographs is the reliable and accurate identification of the depicted plant species. As an expert botanist, Foster properly identified the botanicals in his photos — a key feature of ABC's Steven Foster Photo Library, aside from the beauty of the photos.

In addition to continuing to use Steven Foster's remarkably gorgeous, accurately labeled botanical photos for ABC's nonprofit educational purposes, ABC is investigating how to make those photos available to ABC supporters at the Gold and above Sponsor Membership levels to continue Steven's extraordinary legacy.

ABC featured a tribute to Steven Foster in *HerbalGram* issue 133 and a pictorial of some of his medicinal plant photography in issue 134. In addition, ABC has named its newest botanical excellence award, the ABC Steven Foster Botanical Conservation and Sustainability Award, in his honor. The award is announced each spring at the annual ABC Celebration at the Natural Products Expo West conference and trade show in Anaheim, California. HG



**Passionflower** *Passiflora incarnata*
Photo by Steven Foster ©2025 ABC



**Hibiscus** *Hibiscus* × *rosa-sinensis*
Photo by Steven Foster ©2025 ABC



Aspen trees (*Populus* spp.)
in the Wasatch Mountains, Utah.
Photo by Steven Foster ©2025 ABC



**Sundew** *Drosera intermedia*
Photo by Steven Foster ©2025 ABC



A rainbow over Iowa corn (*Zea mays*) fields.
Photo by Steven Foster ©2025 ABC



**Marshmallow** *Althaea officinalis*
Photo by Steven Foster ©2025 ABC



Tansy (*Tanacetum vulgare*) near a lighthouse in Portland, Maine. Photo by Steven Foster ©2025 ABC



**Gotu kola** *Centella asiatica*
Photo by Steven Foster ©2025 ABC



**Ginkgo** *Ginkgo biloba*
Photo by Steven Foster ©2025 ABC



**Dogwood** *Cornus florida*
Photo by Steven Foster ©2025 ABC



**Stingless bees** *Tetragonisca angustula*
Photo by Steven Foster ©2025 ABC



**Ylang-ylang** *Cananga odorata*
Photo by Steven Foster ©2025 ABC



**Hops** *Humulus lupulus*
Photo ©2025 Chris Kilham

# Close Encounters of the Hops Kind

## *A hops harvest exploration in southwestern France*

**By Chris Kilham**

**Driving along picturesque country roads toward Castelculier in the Nouvelle-Aquitaine region of southwestern France, it's easy to become enchanted with the place. Verdant forested hills adorn a rural landscape featuring immaculately kept crops of strawberries (*Fragaria* spp., Rosaceae), kiwis (*Actinidia* spp., Actinidiaceae), hazelnuts (*Corylus avellana*, Betulaceae), melons (*Cucumis* spp., Cucurbitaceae), wheat (*Triticum* spp., Poaceae), corn (*Zea mays*, Poaceae), tomatoes (*Solanum lycopersicum*, Solanaceae), and the famous Agen prunes (*Prunus domestica*, Rosaceae), which even have their own museum in Lafitte-sur-Lot. The forests are renowned for their abundant wild porcini mushrooms (*Boletus edulis*, Boletaceae). The air is clean and fresh. Streams ramble along here and there. You could imagine leaving your worldly cares behind, living in one of the many tidy stone houses scattered throughout the quaint villages of the area, and wandering the local outdoor farmers markets on sunny days, while finally writing your novel. It's that kind of place.**

My travel partner, Nebil Bourguiba, and I are on our way to witness the harvest of hops (*Humulus lupulus*, Cannabaceae). We're there to gather information on behalf of Groupe Berkem, a botanical extraction company based in Blanquefort, France. It's September 2024, and the scenery is superb. Nebil, Berkem's plant sourcing manager, and I head up the company's Global Plant Exploration program, investigating plants and the people who work with them in the places from where they derive. This is ethnobotany in trade, diving deeply into the agricultural, cultural, economic, social, phytochemical, historical, and health details of various botanicals. We are not the only people doing this work.

Savvy botanical suppliers all over the globe send buyers, agricultural experts, and ethnobotanists into the field to understand different aspects of botanical value chains from field to finished product and to become familiar with the people, conditions, and factors involved with specific plant crops. This kind of on-the-ground understanding cannot be gleaned via phone calls, websites, conferences, or Zoom calls. If you wish to truly know the plants in the botanical trade, you must get into the field, and if you wish to discover new botanicals and meet new sources, you need to roam.

On this road trip, we are headed to meet Lucie Le Bouteiller, president of Hopen-Terre de Houblon (Hopen), a hops manufacturer and supplier based in nearby Nérac, at a farm run by one of Hopen's 10 suppliers, the hop farm and brewery known as Houb's in Castelculier. In 2018, with degrees from AgroParisTech, Lucie and her friend Fanny Madrid started Hopen, excited by the growth potential of a sustainable, high-quality hops business.

Based on inaccurate weather forecasts, we prepared for a rainy and overcast day with hats and anoraks, but the sun is out and bright. Still, recent heavy rains have soaked the area, and our boots will be thoroughly weighed down by sticky mud in no time at all. It's always something on the medicine trail!

Pulling into the Houb's farm, we see more than 20 long rows of hop plants on their last day of cultivation. Lucie and a Bordeaux video crew consisting of Catya, Alexandre, and Matteo are waiting for us to document the scene. A harvesting truck is moving into position to begin pulling down seven-meter-high hop vines that are trellised on slender ropes attached to wires spanning between wooden poles. There's a husky aroma in the air reminiscent of cannabis (*Cannabis sativa*, Cannabaceae), a botanical cousin of hop.

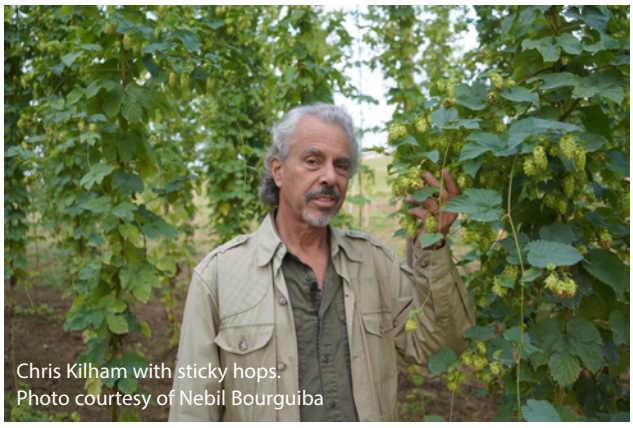
## In the Midst of Hops

In preparation for our journey to the hops harvest, I took a deep dive into the plant, its history and uses, current science, and phytochemistry, as well as agricultural and historical information about the Nouvelle-Aquitaine region. I come bearing maps, two helpful guidebooks, a notebook, and two cameras. Nebil is prepared as well. He has sought out information on supply, costs, and quality control, and he carries a drone for aerial filming. The more you know about a botanical before investigating it in the field, the better you can understand what you witness and experience. This greatly enriches the experience.

"Hops" refers to the cone-shaped female inflorescences of *Humulus lupulus* L. The species name *lupulus* is Latin for "small wolf." In his *Naturalis Historia* (77 CE), the Roman naturalist Pliny the Elder (23–79 CE) explains that this name refers to the way hop vines climb and cling, often suffocating other plants, similar to the way wolves cling to their prey. Hop is one of two plants of significant economic value in the Cannabaceae family, the other of which is *Cannabis sativa*.* Hop is an herbaceous perennial liana (woody vine) that yields a dense profusion of cone-shaped inflorescences. These cones, botanically known as strobiles, are composed of soft, light green resinous petals. When mature, hop strobiles are covered with lupulin glands, which yield resins and essential oils that contribute to the distinctive flavors and aromas of hop varieties. Native to Eurasia and likely originating in China, hop reached what is today the European continent approximately one million years ago. As far as we know, hop has been cultivated for more than 1,000 years.[1] Though climbing hop plants are generally referred to as vines, they are technically bines. While vines use tendrils and suckers to grip and grow upward, bines grow in a clockwise helix, binding to a central support, which in the case of cultivation is a slender rope. Still, I've never heard anybody refer to them as bines. So, vines it is.

Nebil and I greet Lucie and the video crew in front of several long rows of fresh green hops. A light breeze blows, making a soft shushing sound as tens of thousands of strobiles flutter against each other. It's the kind of sound that, if you played a recording of it beside your bed, would gently lull you to sleep. After exchanging greetings, Lucie tells us about the hops-growing industry in southwestern France and the burgeoning demand. In 2023, France ranked first in Europe in the number of craft breweries, with the craft beer market worth an estimated €300 million in France alone.[2] Hopen's business is thriving and is based on collective success along the whole hops value chain — ensuring fairness and justice for all participants, supporting a healthy ecology, and staying local. Lucie is enthusiastic about hops and about the success of her company. Hopen

* Hop was previously classified in Moraceae, the mulberry family, for reasons that may have been more about politics than taxonomy.



Chris Kilham with sticky hops.
Photo courtesy of Nebil Bourguiba



Nebil Bourguiba delights in the scent of hops.
Photo ©2025 Chris Kilham



Hopen co-founder Lucie Le Bouteiller among cultivated hop plants. Photo ©2025 Chris Kilham

pelletizes hops for the brewing industry and makes hops available in other forms for extraction.

Hopen offers 17 varieties of hops to the market and emphasizes organic cultivation. The hops they offer vary according to alpha and beta acid values, with the AlphAroma variety being the most concentrated in these. (These acids are largely responsible for the bitter flavor of some beers.[3]) The difference between yields of organic and conventional cultivation of this plant is significant, with organic methods yielding approximately 1,600 kg of dried strobiles per hectare and conventional methods yielding approximately 2,200 kg per hectare annually. But organic cultivation, with its superior soil-enrichment methods, results in hops with higher concentrations of desirable compounds. Even in a competitive and price-driven botanical market, there is room for well-positioned ultra-fine-quality organic botanicals.

Several varieties of hops grow on Houb's property, including Chinook, Cascade, Centennial, Galena, Crystal, and Willamette, with more rows of Cascade hops than any others, as this variety is one of the most popular. These varieties look very much the same as one another, but their flavor and aroma profiles differ. For example, Cascade hops possess floral, citrus, resinous, and grapefruit (*Citrus* × *paradisi*, Rutaceae) notes, as compared with Galena hops, which possess

Harvesting hops on a truck. Photo ©2025 Chris Kilham





Hops pride.
Photo ©2025 Chris Kilham

spicy, fruity, and blackcurrant (*Ribes nigrum*, Grossulariaceae) notes. Since 2021, Houb's has increasingly converted production to organic, with an emphasis on yielding higher concentrations of alpha acids and aromatic essential oils in their hops.

Most of the dried hops and hops pellets produced and supplied by Houb's and Hopen go to the beer brewing industry, where brewmasters require the flavors and aromas of different hops varieties for unique brews. The proliferation of brewpubs, microbreweries, and artisanal beer makers has driven demand for more tonnage of hops with more unique characteristics. Demand from the nutraceutical and fragrance sectors also is pushing production.

As soon as we exchange greetings with Lucie and the video crew, the idling harvesting truck gets into gear. A man stands on the back of the truck as it maneuvers between two lines of hop vines, and the harvest begins. As the truck rumbles along, the man on the back pulls down strings of hops, which have been snagged by the front of the truck and disengaged from the wire lines that hold them, dropping the hops onto the truck bed. Rolling ahead slowly in first gear, the truck is filled with high stacks of hops in a very short time. When the truck bed is filled higher than the man pulling the strings, the hops are taken to a large industrial shed nearby, where drying and sorting take place. There, the unwieldy piles of hops are deposited on the shed floor and fed by hand onto a conveyor belt. The truck returns to the hops field and harvesting resumes.

As the harvesting truck moves down long rows of hop vines, I take dozens of photos, Nebil flies a drone, and the video crew captures the harvest in 4K resolution. Images and video footage are valuable tools not only for documentation of what we experience, but also for educational presentations and social media. Today's digital landscape offers a great range of platforms to share ethnobotanical research. Not everyone can get out into the field to investigate botanicals, but through digital media, we can at least partially bring the field to others. Sharing these types of images and information helps to bridge worlds and foster better understanding between suppliers and customers who may be geographically distant from one another.

## Hops in Beer

The oldest known beer recipe, which does not include hops, dates to 1800 BCE in Sumer in a paean to the beer goddess Ninkasi (whose name means "you who fill my mouth so full"). Translated from clay tablets by University of Chicago Sumerian scholar professor Miguel Civil, PhD (1926–2019), the "Hymn to Ninkasi" contains specific enough brewing instructions that Fritz Maytag, former owner of San Francisco's Anchor Brewing Company, made beer from this recipe for the 1989 meeting of the American Association of Micro-Brewers. Served in huge jars, Maytag's Sumerian beer was a big hit. In March 1993, Maytag took the Sumerian beer on the road and served it to the public at a beer seminar at the University of Pennsylvania Museum of Archaeology and Anthropology (now the Penn Museum). A few days later, *The New York Times* published a feature article about Maytag's crafting of this brew, titled "The Beer That Made Sumerians Famous."[4]

"When you pour out the filtered beer of the collector vat,
It is like the onrush of the Tigris and the Euphrates."

*—From the "Hymn to Ninkasi"*[5]

Beer changed in Germany in 1079, when hops were added to beer recipes for the first time. Some people have suggested that beer brewing with hops was practiced in present-day Finland during prehistoric times, but this claim has yet to be substantiated. The bitterness, complex flavors, and aromas of hops won over beer drinkers, and today the primary industrial use of approximately 98% of all cultivated hops is for the beer brewing industry, with the United States being the world's largest producer. More than 170 varieties of hops are cultivated globally, offering a profusion of flavor notes from citrus to floral to piney and much more.[1]

According to the US Department of Agriculture, more than 52,000 tons of dried hops were produced in the United States in 2023, valued at approximately $562 million.[6] Dried hops are feather-light, so this tonnage is virtually mountainous in volume. Hops serve a dual purpose of preserving beer and imparting bitterness. In fact, there is a standardized unit of measurement for the bitterness of beer called the International Bitterness Unit (IBU). The "hoppiest" style of beer is the IPA, or India Pale Ale. This style was developed by British brewers in the 1700s to preserve beer during long shipping voyages to India. Today, "Hoo Lawd" beer from



Hops in hand. Photo ©2025 Chris Kilham

Dogfish Head Craft Brewery in Delaware is reportedly the most heavily hopped beer ever documented.[7]

But Nebil and I are not at Houb's meeting with Lucie Le Bouteiller and observing the hops harvest for the brewing industry. Rather, our venture concerns nutraceuticals that harness the broad potential health-promoting properties of hops in extracts.

## An Organoleptic Feast

Hops appeal to the senses in an enticing manner. I previously described the pleasing shushing sound made by strobiles fluttering together in a breeze. Hops are beautiful to behold and delicate in appearance, with pretty shades of light green. In sunlight, the strobiles sparkle due to the resinous lupulin glands that cover them when they are mature. They appear anodized, almost bioluminescent in their sheen.

Approaching a string of hop vines, I take several in my hand. They are sticky with resin, tacky to the touch. Hops are covered with both soft and hard resins. The soft fraction consists of the bitter acids humulones, lupulones, humulinones, hulupones, waxes, and fats, while the hard fraction contains 4'-hydroxy-allohumulinones and tricyclooxyisohumulones and various phenolic compounds. Resins make up 10% to 30% of dried hop cones, with both resin fractions, in addition to the phenolic constituents, contributing to the flavor and aroma of beer.[8] The resin covering the hops reminds me of late-stage cannabis when flowering buds become tacky with resinous, cannabinoid-rich trichomes.

I lean in closely and smell the hops. These botanical cousins of cannabis, which diverged evolutionarily an estimated 28 million years ago, both have sticky inflorescences and somewhat similar fragrances.[9] This is due to their common aromatic terpenes. Myrcene, linalool, geraniol, limonene, caryophyllene, and humulene are found in the resins of both plants. The aroma is pleasing and may also be therapeutic for the brain and mood.[10] A significant body of evidence shows that various terpenes, including those from hops and cannabis, can permeate the blood-brain barrier, reportedly protecting nerves, providing anti-inflammatory protection to the brain, and reducing oxidative stress.[11] Essences of hops are used in perfumery to impart a "green" aroma. At least 22 hops-containing fragrances are on the market today, 16 of them unisex, according to the perfume website Fragrantica.[12]

The next organoleptic venture is taste. Hops stand out as titans of flavor. I pick some petals, pop them in my mouth, and roll them around a bit. The bitterness comes on instantly and strongly. But it is not a flat bitterness. Instead, it tastes complex. The bitter principles in hops include the alpha acids humulone, cohumulone, and adhumulone, and the beta acids lupulone, colupulone, and adlupulone. Additional flavor agents in hops include sulfur compounds, aldehydes, alcohols, esters, ketones, lactones, phenols, and terpenoids.[13] In hops, these compounds yield a broad range of flavors and aromas reminiscent of fruits, flowers, woods, grasses, must, tobacco (*Nicotiana* spp., Solanaceae), spices, leather, nuts, and vegetables.

Among the varieties of hops cultivated around the world, the flavors and aromas can and do vary greatly. The variety, place of cultivation, soil fertility, overall composition, sun, rain, and other agricultural and environmental factors determine which flavors and aromas — fruity, woody, smoky, floral, earthy — are expressed.

## Health-Promoting Hops

Hop strobiles comprise an impressive natural medicine chest, including compounds that demonstrate anti-inflammatory, cardioprotective, antioxidant, sedative, estrogenic, antibacterial, and anticancer properties. More than 1,000 compounds have been found in hops, a dazzling array of phytoconstituents.[14]

The first known reference to hop as a medicine is attributed to the Persian physician Mesue the Elder, or Abu Zakariya Yuhanna ibn Masawaih (ca. 777–857), who noted the anti-inflammatory activity of the plant. Virtually every chronic health disorder involves inflammation, and hops antioxidants inhibit the proinflammatory factors NF-κB (nuclear factor-kappa B), TNF-α (tumor necrosis factor-alpha), and COX-2 (cyclooxygenase-2) and inflammatory cytokine events. Beer, too, demonstrates protective activity against oxidative damage of DNA. This protection appears directly proportionate to the amount of phenolic hops constituents in the beer. The "hoppier" the beer, the greater the protection, making IPAs the most protective style of brews. However, beer makes a poor medicine for regular use due to the detrimental health effects of alcohol.[14,15]

Hops are powerhouses of cellular protection and rich in biologically active beneficial antioxidants, including catechin, epicatechin, quercetin, kaempferol, rutin, astragalin, myricitin, flavonol glycosides, flavanol dimers, oligomeric flavonols, tannins, ferulic acid, prenylflavonoids (including xanthohumol), multifidol glucosides, and resveratrol. These compounds not only protect hop inflorescences from premature destruction due to exposure to heat, light, air, moisture, and time, but also act as protective factors in the human body to combat ongoing cellular-corrosive effects of reactive oxygen species. Antioxidants in hops also have cardioprotective benefits, reducing oxidation of cholesterol and lipids in the blood, inhibiting platelet aggregation, and enhancing the strength and integrity of the heart and blood vessel walls.[13]

The European Scientific Cooperative on Phytotherapy (ESCOP) confirms the sedative properties of hop strobile and lists its therapeutic indications as "Tenseness, restlessness and sleep disorders."[16] Germany's Commission E monograph does the same, giving indications for hops for calming and sleep.[17] Hops pillows are an old approach to harnessing the tranquility-promoting effects of hops aroma. Hops tea before bed is a traditional remedy for promoting sleep. Reportedly, the sedative properties of hops became better known during the early days of cultivation in the Middle Ages, when it was observed that people who worked

A worker loading hop vines onto a conveyor for sorting and drying. Photo ©2025 Chris Kilham



in hop fields became drowsy. Whether by airborne aromatic compounds activating the olfactory bulb or hypothalamic sleep center of the brain, or by absorption via the skin, or all of the above, workers found themselves in the soothing thrall of hops.

Containing 8-prenylnaringenin, one of the most potent phytoestrogens known in the plant kingdom, hops preparations are used by women as natural, plant-based estrogen replacements during menopause and provide relief from hot flashes, insomnia, and mood swings. In one study of 63 women, administration of a vaginal hops preparation proved as effective as vaginal estradiol for reducing menopause-related vasomotor symptoms and hot flashes.[18]

Hops have been used to preserve food since ancient Egypt. The antimicrobial effects of hops are well-established thanks to the beer-brewing industry. The bitter alpha and beta acids demonstrate antimicrobial activity and have been shown to inhibit the growth of several microbes, including *Staphylococcus aureus*, *Enterococcus faecalis*, *Staphylococcus epidermidis*, and *Streptococcus mutans*, as well as species of *Micrococcus*, *Mycobacterium*, *Listeria*, and *Clostridium*, among others.[19]

Hops extracts of different types have also demonstrated significant antitumor properties in vitro by interfering with the biological pathways of various types of cancer cells. Hops extracts have been shown to inhibit the growth and development of cancers of the skin, colon, bones, prostate, alimentary tract, and lungs. Much of this activity appears to be due to the presence of xanthohumol and isoxanthohumol, which are especially abundant in European varieties of hops.[15,20]

## Into the Dryer

In the field, the hops are harvested one variety at a time from their respective rows and then hauled a short distance to the drying facility in a large, galvanized aluminum shed. Large piles of hop vines are fed onto a conveyor belt that takes them up into a shaking area where the strobiles are separated from the stems and growing ropes. From there, any other unwanted materials are shaken out. I climb some steps beside the first conveyor belt and watch hop cones fall through the holes in the shaker to another conveyor belt below. From this point, the hops go through hand inspection and cleaning, and from there into warm air drying. The drying process is similar to that of tea (*Camellia sinensis*, Theaceae) drying, applying warm, circulating air that gently dries but does not brown or burn the plant material.

With the strong connection between hops and beer, it only makes sense that at Houb's there is a boutique brewery just feet away from the drying facility. After a stimulating tour of the hop fields, a beer seems the perfect bever-

Workers cleaning and sorting hops by hand. Photo ©2025 Chris Kilham





Loading hop vines onto a conveyer. Photo ©2025 Chris Kilham



Hops tumbling from a conveyer. Photo ©2025 Chris Kilham



Rows of hop vines at Houb's farm in Castelculier, France.
Photo ©2025 Chris Kilham

age. Neat and bright, the facility proudly displays several types of beers, including pale ales and golden blond ales, made with hops from the farm. The brewery attracts locals and tourists alike, as does the brasserie run by Houb's just uphill from the drying area. Tour, drink, eat — a recipe for an enjoyable visit.

Over the course of several hours, Nebil and I go back and forth the few hundred yards between the harvest and drying. We glean more valuable information from Lucie, take photos, fly the camera drone, and keep out of the way of the video crew as they capture the scene. I walk along rows beside the tractor, taking photos and paying close attention to the way the harvester in the truck pulls down the hop vines. It is a practiced art, no doubt. In the late afternoon, Nebil and I pack our gear back into our car and bid adieu to Lucie, the people at Houb's, and the videographers. More than two-thirds of the hops have been harvested in one day. It never rained. We did have to pick gooey clods of mud out of our boot lugs with sticks. As we head out of the farm, the air is redolent with a delightful profusion of aromatic hops terpenes, and the sun is dipping behind the green forested hills of Aquitaine. HG




Houb's artisanal beers.
Photo ©2025 Chris Kilham

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Sorted and cleaned hops. Photo ©2025 Chris Kilham


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***Healing Plants of South Asia: A Handbook of the Medicinal Flora of the Indian Subcontinent***, Volumes 1 and 2, by John A. Parrotta. Boca Raton, FL: CRC Press; 2025. Hardcover, 1,956 pages. ISBN: 9781032896151. $600.00.

**By Sebastian John Adams, PhD**

*Healing Plants of South Asia* is a comprehensive and informative exploration of medicinal plants used in this region. The two-volume book was authored by John A. Parrotta, PhD, who has worked with government agencies and other organizations throughout his career to support international efforts related to the study of tropical forest ecology, biodiversity conservation, ecological management, and forest landscape restoration. He is also the author of *Healing Plants of Peninsular India* (CABI Publishing, 2001) and co-editor of *Traditional Forest-Related Knowledge: Sustaining Communities, Ecosystems and Biocultural Diversity* (with Ronald L. Trosper, PhD; Springer, 2012).

The text is thoughtfully organized into four chapters and contains colorful photographs of beautiful landscapes, habitats, and medicinal plants of the Indian subcontinent. It gathers information on 1,928 plant species — 1,849 angiosperms, 20 gymnosperms, and 59 pteridophytes (i.e., vascular plants that reproduce by means of spores) — within the South Asian systems of medicine, including Ayurveda, Siddha, and Sowa-Rigpa, as well as various folk traditions.




Volume 1 contains the first three chapters and the beginning of the longer fourth chapter, which concludes in the second volume.

Chapter 1 lays a solid foundation by exploring the connection between South Asia's plant wealth and human health. It offers an overview of the region's traditional medicine systems and highlights the varied medicinal applications of plants. The chapter also discusses the historical trade of Asian plants with the Middle East and Europe and South Asia's diverse ecosystems, environmental conditions, and various soil types that influence its rich biodiversity.

The first chapter notes the many languages spoken across South Asian countries and how linguistics can be instrumental in aiding people's comprehension of vernacular names associated with medicinal plants. The author explains in detail the four codified systems of medicine (Ayurveda, Siddha, Unani Tibb, and Sowa-Rigpa) and provides a brief overview of the non-codified traditional systems of medicine, such as Desheeya Chikitsa in Sri Lanka and Dhivehi Beys in the Maldives. Thus, the first chapter sets the stage for a deeper understanding of the significance of both the diversity of medicinal plants and the cultural contexts.

Although the descriptions and introductions for each traditional system in Chapter 1 are generally clear and well-articulated, there are some minor exceptions. For example, the assertion that pulse diagnosis — a practice used to determine the balance of the three *doshas*: *vata*, *pitta*, and *kapha* — "did not appear in Ayurvedic practice until the late 13th century" (page 6) is not accurate. Some published literature, such as the Ayurvedic text *Nadi Vijnanam* by Maharsi Kanada, notes that pulse diagnosis was carried out in the third century BCE.[1,2]

Chapters 2–4 provide details on plant species used in different systems of medicine. Chapter 2 covers pteridophytes ("Ferns and Lycophytes"), Chapter 3 features gymnosperms ("Conifers, Cycads, Ginkgo, and Gnetophytes"), and Chapter 4 focuses on angiosperms ("Flowering Plants"). The entries in each chapter include botanical information, common synonyms, vernacular names, taxonomical descriptions, distributions across South Asian countries, geographical habitats, the International Union for Conservation of Nature (IUCN) status, and medicinal uses. However, there are some discrepancies. A few examples are highlighted in the following paragraphs.

Some plant species are mentioned with their medicinal uses, yet the text does not specify which system of medicine has documented these uses, or lists some traditional medicine systems but not all, such as in the entry for *Crepidium acuminatum* (D.Don) Szlach. (Orchidaceae) in Chapter 4. This species, referred to as *jeevaka* in Ayurveda, is an important member of the Astavarga group in the Rasayana (rejuvenation) group of plants. Unfortunately, the book merely mentioned that jeevaka is an ingredient in the Ayurvedic tonic *Chyawanprash*. The Chapter 4 entries for *Vincetoxicum flexuosum* (R.Br.) Kuntze (Apocynaceae) and *Coscinium fenestratum* (Gaertn.) Colebr. (Menispermaceae) — the latter known as *maramanjal* in the Tamil language and used in Siddha medicine — lack similar details.

Plant species such as *Sesbania grandiflora* (L.) Pers. (Fabaceae), commonly known as *agathi*, and *Nardostachys jatamansi* (D.Don) DC. (Caprifoliaceae), known as *caṭāmāñjil/jadamanji*, are used widely in Siddha medicine. However, their medicinal uses are listed from Ayurveda and other traditional medicine systems like Myanmar's *taing-yin hsay pyinnya*. As a reader, I would expect the book to also mention that these two species have similar therapeutic uses in Siddha medicine. Consequently, the text lacks consistency in how the medicinal values of different plants are attributed across various systems of medicine.

Several important medicinal plants used in Ayurveda and other traditional medicine systems of South Asia were overlooked in chapters 2–4. *Allium stracheyi* Baker (Amaryllidaceae) and *Apium leptophyllum* (Pers.) F.Muell. (Apiaceae) — a synonym of *Cyclospermum leptophyllum* (Pers.) Sprague ex Britton & P.Wilson — known in Ayurveda as *jambu* and *ajamodā*, respectively, and *Selinum vaginatum* (Edgew.) C.B.Clarke (Apiaceae), known as *Bhutakesi* in Sanskrit, are used in Ayurveda, but these are absent from this book. Well-known medicinal plant species used in Ayurveda were not classified as such but were mentioned as being used in folk or other traditional medicines, such as the Unani system and Tibetan and Bhutanese practices. These species include *Berberis aristata* DC. (Berberidaceae), *Scindapsus officinalis* (Roxb.) Schott (Araceae), *Polygonatum verticillatum* (L.) All. (Asparagaceae), *Polygonatum cirrhifolium* (Wall.) Royle, and *Garcinia gummi-gutta* (L.) N.Robson (Clusiaceae), to name a few.

The use of accepted names is considered the current standard — for example, using *Pleurolobus gangeticus* (L.) J.St.-Hil. ex H.Ohashi & K.Ohashi for a homotypic synonym, *Desmodium gangeticum* (L.) DC. (called *shalparni* in Ayurveda) — but some plant species mentioned in this book still do not adhere to the latest nomenclature guidelines. According to Plants of the World Online, a taxonomy database managed by the Royal Botanic Gardens, Kew, *Plectranthus barbatus* Andrews (Lamiaceae) is a homotypic synonym for *Coleus barbatus* (Andrews) Benth. ex G.Don (Lamiaceae), but in the book, it is mentioned the other way around. *Gynandropsis gynandra* (L.) Briq. (Cleomaceae) is recognized as a synonym of *Cleome gynandra*, the latter being referred to as *ajagandhā* in Ayurveda. However, this book considers this vice versa. Some species, like *Symplocos racemosa* Roxb. (Symplocaceae) and *Garcinia mangostana* L., do not contain any information on synonyms.

The book states that *Gynandropsis gynandra* is significant in Ayurveda, where the root is used to treat ascites (fluid in the abdomen), tumors, ulcers, pain, earaches, spleen enlargement, and bilious fevers. However, the *Ayurvedic Pharmacopoeia of India* identifies the genuine part as the seeds of *Cleome gynandra* (the accepted name for *G. gynandra*).[3] Including the specific plant part used under a separate subtitle/section in each plant profile would be beneficial. This is crucial for proper identification. This information is necessary for all plant profiles since the author clearly states in the introductory chapter that most physicians, pharmacists, and other stakeholders in the region rely on plant-based drugs, which are sometimes adulterated with other plants or parts of the same plant. It may be beneficial for the reader to know the genuine parts used as per the traditional system of medicine, as well as any information on the adulterants and recognized substitute species, due to plants with similar names or appearances.

Finally, I found the references difficult to understand because the text does not follow proper citation practices for each plant description. Instead, all references are grouped at the end of each plant profile. Some references were listed without the publication year (see *Polygonatum hookeri* Baker on page 273).

Although this book may not serve as a comprehensive reference for pharmacognosists or advanced researchers due to some flaws and inconsistencies in a few plant profiles, it still offers a unique exploration of South Asian medicinal plants that makes the book stand out compared to other available texts.

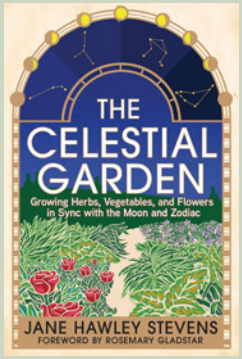
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## New Book Profiles

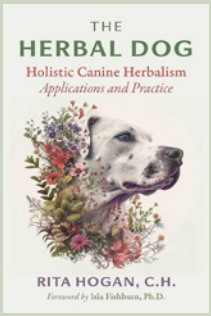
***The Celestial Garden: Growing Herbs, Vegetables, and Flowers in Sync with the Moon and Zodiac*** by Jane Hawley Stevens. White River Junction, VT: Chelsea Green Publishing; 2023. ISBN: 9781645022138. Softcover, 240 pages. $29.95.

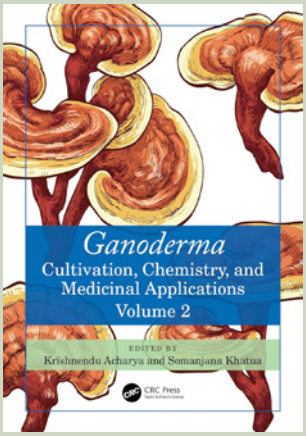



In *The Celestial Garden*, author Jane Hawley Stevens, a gardener and herbalist who owns and operates Four Elements Organic Herbals (a 130-acre fully organic farm in Wisconsin), provides insights and advice on planting and harvesting according to the lunar cycle. For gardeners guided by heavenly bodies, *The Celestial Garden* includes a calendar of optimal times for planting seeds, roots, and transplants, as well as for pruning, weeding, harvesting, and starting new garden projects. Hawley Stevens believes that gardening by the moon and learning about astrological cycles can affect and improve plant growth and development, a topic explored in *HerbalGram* issue 85's cover article "Lunar Influence: Understanding Chemical Variation and Seasonal Impacts on Botanicals." The book features color photography and illustrations and covers a variety of plants, including herbs, vegetables, flowers, and fruit trees. It also includes a foreword by herbalist and author Rosemary Gladstar.

***The Herbal Dog: Holistic Canine Herbalism Applications and Practice*** by Rita Hogan. Rochester, VT: Healing Arts Press; 2025. ISBN: 9781644119594. Softcover, 464 pages. $24.99.

In this comprehensive review of holistic care for dogs, clinical canine herbalist Rita Hogan explains how to look at a dog's personality, needs, and physiology to select effective and personalized herbal remedies to support their constitutions and provide relief from many ailments. She includes a *materia medica* of canine-specific herbs used in her practice. Hogan, who has spent more than two decades working with these animals, uses energetic principles (cool, warm, dry, damp) to discuss how herbs are not "one size fits all" and how to find the root causes of chronic imbalances. The book covers a dog's main organ systems, how they are connected to each other, and how to understand them when choosing specific herbs and foods.



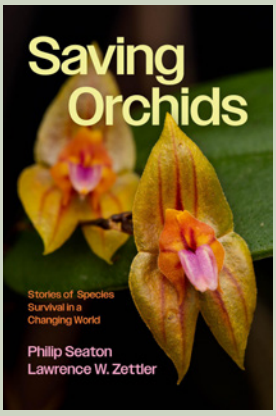




***Ganoderma: Cultivation, Chemistry, and Medicinal Applications***, Volume 2, by Krishnendu Acharya and Somanjana Khatua, eds. Boca Raton, FL: CRC Press; 2025. ISBN: 9781032790336. Hardcover, 244 pages. $160.00.

*Ganoderma*, the genus of fungi that includes reishi mushroom (*Ganoderma lucidum*, Ganodermataceae), is a celebrated source of medicine in traditional systems throughout Asia. This second volume focuses on the bioactivities of various species of *Ganoderma*, including antibacterial, antiviral, cardioprotective, immunomodulatory, and neuroprotective activities. The book also includes a thorough exploration of the chemical compositions and structures of *Ganoderma* polysaccharides. The authors and editors seek to bridge the gap between traditional practice and evidence-based knowledge of *Ganoderma* fungi and inspire further research on the potential uses of these medicinal mushrooms.

***Saving Orchids: Stories of Species Survival in a Changing World*** by Philip Seaton and Lawrence W. Zettler. Chicago, IL: University of Chicago Press; 2025. ISBN: 9780226839417. Softcover, 320 pages. $35.00.

Orchids, which belong to the family Orchidaceae, are a priority for plant conservation because they have been hunted to near extinction in many of their native areas for decorative or medicinal uses. *Saving Orchids* tells stories of people from around the world who are dedicated to preserving wild populations of these beautiful plants and saving them from extinction. The authors believe that the story of orchids is also the story of the planet: From swamps of Florida to grassy banks of southern England to tropical forests of Taiwan, orchids are an integral part of their natural environment, and removing them can cause unforeseen consequences. Efforts to reintroduce wild orchids entail evaluating human impacts on biodiversity and the environment and how these damages may be reversed. HG

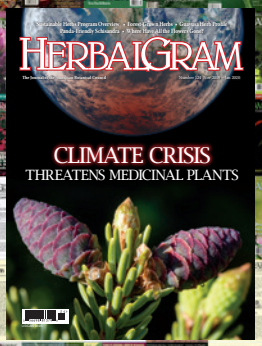


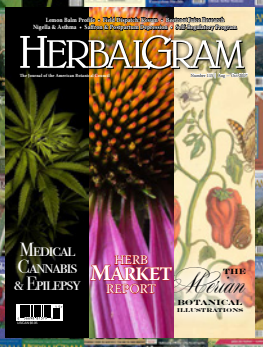
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# Michael Dennis McGuffin 1951–2025

**By Hannah Bauman**

***Editor's note:*** *An earlier version of this tribute was sent as an American Botanical Council (ABC) Member Advisory on February 19, 2025, and published online in the February 2025 issue of HerbalEGram.*

Michael McGuffin, president of the American Herbal Products Association (AHPA) for 25 years, died at his home in the Venice neighborhood of Los Angeles on February 17, 2025, at age 73 from cancer. McGuffin's leadership cemented AHPA as one of the leading trade associations for herbal and botanical products in the United States. He was a trailblazing advocate for access to botanical products, industry self-regulation, and the safety and efficacy of herbal medicines.

McGuffin was born on September 19, 1951, in Louisville, Kentucky, to Rocco and Kathleen McGuffin. He later recalled making gallons of sassafras (*Sassafras albidum*, Lauraceae) tea during his youth in Maryland suburbs. He moved to California in 1973, after a brief stint at Johns Hopkins University in Baltimore, Maryland, and entered the herbal and natural products community in 1974 as the co-founder of Venice Fruit Tramps, a retail co-op store that sold fresh fruits and vegetables and bulk dried herbs on the Venice Beach Boardwalk in Los Angeles.[1]

In 1979, with Janet Zand, OMD, LAc, McGuffin co-founded the herbal products manufacturing business McZand Herbals, which later rebranded as Zand Herbal Formulas. In 1985, McZand Herbals joined AHPA as a member, marking McGuffin's first official involvement with the organization.

AHPA, which grew from the dissolution of the Herb Trade Association in 1981, was founded in 1982 to advocate and provide resources for the development of a responsible herb industry in the United States. McGuffin joined the AHPA Board of Trustees in 1990 after a conversation with Shel Weinberg of Trout Lake Farm. "When I told Shel I was just too busy with my company to take on a volunteer role, he replied: 'We're all too busy, Michael. But it's your turn,'" McGuffin was quoted as saying in *Nutritional Outlook* in 2019.[2] "This message somehow resonated with me."

During his time on the AHPA board, McGuffin was involved in the drafting of the legislation that eventually became the Dietary Supplement Health and Education Act of 1994 (DSHEA). The act provides a separate regulatory framework for dietary supplements, including herbal products, as a subset of foods distinct from conventional food or drug ingredients and products. Working with the late Senator Orrin Hatch (R-UT, 1934–2022), Senator Tom Harkin (D-IA), and the late Representative Bill Richardson (D-NM, 1947–2023) on DSHEA, McGuffin and other industry activists advocated for the act to improve public access to supplements that were produced according to current Good Manufacturing Practices (cGMPs) regulated by the US Food and Drug Administration (FDA).



Michael McGuffin

McGuffin became the first full-time president and CEO of AHPA in 1999, succeeding Jeff Hinrichs in a position that was formerly voluntary and known as president of the board. Lynda LeMole, former president of AHPA's board from 1986 to 1990, was quoted in *HerbalGram* as saying that McGuffin was "absolutely a remarkable champion for AHPA and the herb industry. I think that we couldn't ask for better."[3]

Under McGuffin's leadership, AHPA produced numerous works intended to increase the safety and quality of herbal products. He was the managing editor of the second edition of AHPA's *Herbs of Commerce* (2000), a nomenclature guide that establishes standardized common names of medicinal plants in the United States to help prevent confusion or adulteration in the market. The third edition was published in 2023. He also served as the managing editor of an expanded and revised second edition of AHPA's *Botanical Safety Handbook* (2013), which provides safety information on more than 500 species of herbs.

In 2003, AHPA petitioned the FDA to establish adverse event reporting requirements for dietary supplements and nonprescription drugs. This later became federal law as the Dietary Supplement and Nonprescription Drug Consumer Protection Act in 2006, which McGuffin considered one of AHPA's crowning achievements.[2,3]

McGuffin continued AHPA's advocacy for a responsible, self-regulated herbal products industry by establishing guid-

## Friends and Colleagues Remember Michael McGuffin

**Mark Blumenthal**, founder and executive director of the American Botanical Council (ABC), wrote (email, February 18, 2025):

> Michael was tireless, dedicated, passionate, very effective, and often the "smartest guy in the room." He had an extensive institutional memory of the herb industry in the United States, going back to the days of his own herb company in the 1970s and early 1980s, when the fledgling industry was much smaller and less complex and sophisticated than it is today.
>
> He was a master of key information on a wide spectrum of significant topics necessary for the success of small, medium, and large herb businesses. He had the ability to deal with both the forest and the trees: While being able to attend to the fine points and nuances of state and federal regulation, Michael also had a wide, strategic vision. His leadership in numerous key industry areas — such as common names for plants in commerce (via AHPA's *Herbs of Commerce* books) and establishing credible information for rational and responsible safety labeling of herbal products (AHPA's *Botanical Safety Handbook*) — has contributed enormously to responsible practices in the herb trade and the vibrancy of the herbal products industry.
>
> All companies that sell herbs and botanical ingredients in the United States owe a debt of gratitude to Michael (and AHPA), and they should be supporting AHPA and Michael's laudable work and legacy.
>
> When the history of the herb industry in the United States is written — perhaps 50 or 100 years from now — Michael will be at the top of the list of people who have been instrumental in building it.

**The Consumer Healthcare Products Association**, a trade association for consumer access to safe and reliable over-the-counter treatments, wrote:

> Michael dedicated boundless energy and enthusiasm to advancing the dietary supplement industry, and he was known for his unwavering commitment to consumer health. Michael's contribution is acknowledged and admired by the entire professional community he helped to build, and his wisdom and counsel will be missed. As a fitting tribute to his legacy, we are certain that the colleagues Michael worked with inside and outside AHPA will continue to carry forward the values that he championed throughout his life and career.[8]

**The Council for Responsible Nutrition**, a trade association for the dietary supplement and functional food industry, wrote:

> His deep expertise and meticulous approach helped set standards that strengthened the credibility and trustworthiness of the herbal products industry. Whether dissecting policy nuances or guiding his members on compliance, Michael's thoughtful and precise insights were invaluable. His passion for herbal medicine and dedication to the industry leave an enduring legacy.[9]

**Rosemary Gladstar**, the "Godmother of Modern Herbalism" and founder of United Plant Savers (UpS) wrote (email, February 20, 2025):

> Michael was the great weaver. He gifted often without anyone knowing and fought on behalf of herbalists. He worked quietly behind the scenes making magic happen for us, the troublemakers. He spoke his truth, and it opened doorways. I loved working with him at UpS. We often sat on opposite sides of discussions, but I learned the most from Michael. So smart, non-judgmental of others, and humble. I think he wished he had remained a rockstar playing in his community garden that he started in Venice, but he went to Washington to serve and worked in his office hour upon hour, completely devoted to the plants and an herbal community who … may not have known him or the importance of his work to their work. That is Michael.

**Loren Israelsen**, founder and president of the United Natural Products Alliance (UNPA), wrote in an email sent to UNPA members on February 18, 2025:

> He walked with equal confidence the halls of Congress, the great herb gardens of the world, and his own quiet paths known to few of us. And for a good number of years, our paths joined in cause and purpose. Herbs were his delight. AHPA was his stewardship. His garden will miss him, as will I.

**Roy Upton, RH (AHG), DipAyu**, president of the American Herbal Pharmacopoeia, wrote (email, February 20, 2025):

> Michael had one of the sharpest minds of anyone I have ever known … and he did not flaunt his brilliance. He just did what he had to do. There was no fluff with Michael — never any self-aggrandizing. He was always focused on the task at hand; very much solution-oriented…. Based on my observations and in my 29 years as an AHPA member, AHPA has been the most effective of the trade associations in representing issues of importance to herbal healthcare to virtually all stakeholders.

**Janet Zand, OMD, LAc**, traditional Chinese medicine specialist, author, and former business partner of McGuffin at their former company McZand Herbals, wrote (email, February 18, 2025):

> Many people know Michael from his extraordinary service at AHPA, but Michael was elevating the herbal industry for 20 years before his epic tenure [as president and CEO] at AHPA. He was able to grow just about anything — his delicious garden, our company, AHPA — anything. Michael set an extraordinary bar wherever he went. He and his legacy will remain in our hearts and minds forever.

ance for quality standards for microbial contamination of herbal products in 2003, launching the AHPA New Dietary Ingredient (NDI) Database in 2006, and continuing to implement trade requirements for its members and specific standards for the label "organic" on herbal products produced by its members. McGuffin and other AHPA representatives frequently met with lawmakers and their staffs on Capitol Hill to discuss these and other topics affecting the industry.

McGuffin edited many AHPA publications and authored articles that were published in journals including the *Food and Drug Law Journal* and *Clinical Pharmacology & Therapeutics*. He also authored AHPA's Annotated Final Rule on Dietary Supplement cGMP in 2007, a 21-page document that provided the supplement industry with the most important takeaways from the FDA's regulations on cGMPs. He was interviewed for (and the subject of a chapter in) the book *Herbal Voices: American Herbalism Through the Words of American Herbalists* (Haworth Press, 2005) by Anne Kathleen Dougherty.

He served as a member of the FDA Food Advisory Committee's Working Group on Good Manufacturing Practices for Dietary Supplements (1998–1999) and Dietary Supplements Subcommittee (2003–2005), California's Office of Environmental Health Hazard Assessment (OEHHA) Food Warning Workgroup (2008–2010), and the Advisory Board of the University of Southern California School of Pharmacy and Pharmaceutical Sciences' Regulatory Science master's degree program. He also served on the boards of the American Herbal Pharmacopoeia, the American Association of Acupuncture and Oriental Medicine, and United Plant Savers (UpS).

McGuffin was awarded the Cliff Adler Heart in Business award in 1994 and the *Nutrition Business Journal* Award for Efforts on Behalf of Industry in 2004 and 2012. New Hope Natural Media inducted him into its Hall of Legends in 2013, and *Nutritional Outlook* awarded him its "Best of the Industry" award in the Industry Leader category in 2019. Also in 2019, *Natural Foods Merchandiser* included him on its list of "40 Unforgettable Founders of the Natural Products Industry." In 2021, he received the American Botanical Council's (ABC's) Mark Blumenthal Herbal Community Builder Award, which is given annually to individuals who have played a significant role in creating a sense of connection and community among those who work with medicinal and aromatic plants. In 2024, he received the NutraIngredients-USA NutraChampion Award, which celebrates those who leave a lasting impact on nutrition and the nutrition industry, and was named one of "30 People Who Shaped the Natural Products Industry" by *Vitamin Retailer* magazine.

McGuffin was an avid gardener and maintained a community garden in Venice Beach for many years, growing annual and perennial crops and fruit trees. He was famous for his homegrown tomatoes (*Solanum lycopersicum*, Solanaceae). Friends and colleagues remember his intelligence, energy, generosity, and eclectic tastes and interests. According to his partner Staci Eisner, vice president of quality and regulatory affairs at Cortex Scientific Botanicals, he marked every Presidents' Day by reciting the US presidents in order, with facts about many of them.[4]

In a press release announcing McGuffin's death, AHPA wrote: "For 25 years, Michael served as AHPA President, leaving an indelible mark on the natural products industry through his steadfast advocacy for reasonable regulations and proactive self-governance. Beyond his professional contributions, he was a trusted mentor, a cherished friend to many, and a pillar of the herbal community. We will deeply miss his humor, his encyclopedic knowledge of the herbal industry, his wise counsel — and, of course, his expert tomato-growing skills. While we mourn his passing, we also celebrate his remarkable legacy, which will continue to shape AHPA and the broader industry for years to come."[5]

On March 4, 2025, AHPA's Board of Trustees announced the selection of natural products executive Graham Rigby as AHPA's new president and CEO.[6] Rigby, whose selection McGuffin approved, has served on the AHPA board for more than a decade, including as board chair and chair of the Finance and Governance Committee. Rigby previously held executive leadership roles at Care/of, Organic India, and New Chapter. He will succeed Jane Wilson, who served as interim executive director beginning on February 14, 2025.[7]

Michael McGuffin is survived by his partner, Staci Eisner; siblings, Karen (Don), Tony (Abby), and Patrick (Diane); and many nieces and nephews. A memorial is being planned for late May 2025 in Los Angeles, and those interested in attending should visit his memorial page and sign up for updates: https://everloved.com/life-of/michael-mcguffin/. AHPA is in the process of establishing an endowment fund in McGuffin's honor, and details on how to contribute will be shared on AHPA's website.

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# Roland Redmond Griffiths 1946–2023

**By Connor Yearsley**



Roland Griffiths
Photo courtesy of
Johns Hopkins University

When he died at his home in Baltimore, Maryland, on October 16, 2023, scientist Roland Griffiths, PhD, who is widely credited with playing a pioneering role in launching the current "psychedelic renaissance,"[1-3] left behind a prolific body of research that has been cited in the scientific literature more than 50,000 times and counting, according to Google Scholar.

A psychopharmacologist, professor at Johns Hopkins University School of Medicine in Baltimore for more than 50 years, and internationally recognized researcher of psychedelics and other mind- and mood-altering substances, Griffiths was 77 years old.

His research investigated the effects of many substances, including opioids, cocaine, nicotine, caffeine, alcohol, psilocybin (a psychedelic compound from "magic mushrooms" primarily in the genus *Psilocybe* [Hymenogastraceae]), and more. He authored or co-authored more than 500 research papers and trained more than 60 postdoctoral research fellows.

At Johns Hopkins, Griffiths was the inaugural Oliver Lee McCabe III, PhD Professor in the Neuropsychopharmacology of Consciousness, which was established in 2020 and is the first Johns Hopkins endowed professorship devoted principally to psychedelic research.[4]

Griffiths brought credibility to the controversial study of psychedelics and helped reintroduce mystical and transcendental experiences into neuroscience research. His research garnered significant scientific and philanthropic interest, including $17 million in gifts from a group of private donors that, in 2019, led to the formation of the Johns Hopkins Center for Psychedelic and Consciousness Research, which is believed to be the first psychedelic research center in the United States and the largest of its kind in the world. Griffiths helped establish the center and was its founding director.[1,5]

His team conducted studies that found that psilocybin occasioned experiences that led to substantial and sustained personal meaning, could help treat depression and anxiety symptoms, and had beneficial effects in people with substance-use disorders (smoking, alcohol, etc.) and existential distress associated with life-threatening diseases including cancer.[1]

Griffiths was a consultant for the US National Institutes of Health (NIH) and for numerous pharmaceutical companies in the development of new psychotropic drugs and was a member of the World Health Organization's (WHO's) Expert Committee on Drug Dependence.[1] He is a featured expert in the 2019 documentary film *Fantastic Fungi*.

He was born on July 19, 1946, in Glen Cove, New York, to William and Sylvie (Redmond) Griffiths. Around 1951, the family moved to El Cerrito, California, when William, a trained psychologist and public health specialist, accepted a job as a professor of public health at the University of California, Berkeley. There, Sylvie successfully pursued a master's degree in psychology.[2]

Griffiths earned a bachelor's degree in psychology at Occidental College in Los Angeles in 1968 and a PhD in psychology at the University of Minnesota in 1972. After graduation, he became an assistant professor in behavioral biology at the Johns Hopkins University School of Medicine and a research associate in the Department of Psychiatry at Johns Hopkins Bayview Medical Center, then called Baltimore City Hospitals. He became research chief in 1975.[1]

Before he began researching psychedelics, Griffiths was already respected in the field of psychopharmacology partly because of his work on the psychoactive properties and dependence potential of caffeine. For example, he co-authored a 1994 study, published in the *Journal of the American Medical Association*, showing that caffeine is addictive and withdrawal can be difficult. "It is valuable to recognize caffeine dependence as a clinical syndrome," the study concluded.[6]

His research improved understanding of caffeine as a model for studying drug dependence, and it helped lead to the inclusion of caffeine withdrawal and other caffeine-related disorders in the American Psychiatric Association's (APA's) 2013 *Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition* (DSM-5), an authoritative guide for the diagnosis and treatment of mental disorders.[1]

In 2008, Griffiths wrote a letter, which was signed by almost 100 scientists, urging the US Food and Drug Administration (FDA) to regulate the labeling and caffeine content of energy drinks.[1] The same year, he co-authored a study that noted increasing reports of caffeine intoxication from energy drinks and that caffeine withdrawal and dependence would also likely increase.[7] Advocacy, including Griffiths', helped lead to improved FDA regulations when caffeine is combined with other products, including in 2010, when the FDA banned products combining caffeine and alcohol.[1]

In 1994, Griffiths began meditating regularly, which "profoundly shifted my worldview and got me very curious about the nature of spiritual experiences," he was quoted as saying. His experience was so transformative that he reportedly considered leaving science to devote himself to spiritual practice. Around that time, however, he was introduced to Bob Jesse, a former vice president of the software company Oracle, who, in 1993, founded the nonprofit Council on Spiritual Practices, which encourages research on mystical and spiritual experiences.[2]

In 1999, with funding from Jesse's organization, Griffiths and colleagues started recruiting healthy volunteers for a study. Psilocybin mushrooms had been used for religious

and spiritual purposes in various cultures for centuries or millennia, and Griffiths wondered if similarly meaningful experiences could be achieved in a controlled, scientific setting, although he initially had a "healthy skepticism."

The study, published in 2006 in the journal *Psychopharmacology*, has been called a "landmark." It showed that a single high dose of psilocybin in medically and psychiatrically healthy participants, who had no previous psychedelic experience, elicited experiences that had substantial personal meaning and spiritual significance and led to sustained positive changes in attitudes and behavior.[1,8]

This study is considered the beginning of a renaissance in psychedelic research, which had stopped in the United States after the Controlled Substances Act (CSA) of 1970 placed these substances into Schedule I, the most restrictive and punitive schedule of the CSA.

Griffiths' 2006 study was the first double-blind, placebo-controlled study since the 1970s to assess the effects of a psychedelic on healthy normal volunteers, according to *The New York Times*.[2] It involved trained medical professionals, who administered high doses of psilocybin in a controlled, living room-like setting and who carefully monitored participants. Most participants rated their experience among the most revelatory and spiritually meaningful events of their lives, comparing it with the birth of a child or the death of a parent, as Griffiths often said.

The participants' experiences "had all the attributes of a mystical event," according to *The New York Times*.[2] "They described profound feelings of joy, love and, yes, terror, along with a sense of interconnectedness and even an understanding of a sublime, sacred and ultimate reality."

Around the same time, other prominent academic institutions, including New York University (NYU) and the University of California, Los Angeles (UCLA), began their own psychedelic research initiatives due to restored interest and financial support from similar funding sources.

"The fact that psychedelic research was being done at Hopkins — considered the premier medical center in the country — made it easier to get it approved here," Anthony P. Bossis, PhD, a clinical assistant professor who specializes in palliative care and conducts studies on psychedelics at NYU, was quoted as saying.[2]

A series of subsequent psilocybin studies that Griffiths and colleagues conducted in healthy volunteers included beginner meditators, long-term meditators, and religious leaders. Therapeutic studies that Griffiths' team conducted with psilocybin included treatment of psychological distress in people with cancer, cigarette smoking addiction, major depression, anorexia nervosa, and Alzheimer's disease.[9] A 2020 paper he co-authored reportedly was the first rigorous controlled study showing that psilocybin-assisted psychotherapy can effectively treat major depressive disorder (MDD).[10]

Studies by Griffiths' team also investigated other psychoactive substances, such as dextromethorphan, ketamine, and salvinorin A (from *Salvia divinorum*, Lamiaceae), which produce altered states of consciousness that have some similarities to psilocybin. Brain imaging studies by Griffiths'

## Friends and Colleagues Remember Roland Griffiths

**William "Bill" A. Richards, PhD**, a psychologist, former research affiliate at the Johns Hopkins Center for Psychedelic and Consciousness Research, and senior advisor for Sunstone Therapies, wrote (email, February 14, 2024):

> Sometime probably in 1998, Roland and I met one another when we were invited to dinner in the apartment of Dan Perrine, the author of *The Chemistry of Mind-Altering Drugs* (American Chemical Society, 1996). Bob Jesse from San Francisco, the founder of the Council on Spiritual Practices, organized the meeting and was present. The question we addressed was, "Could we relaunch psychedelic research?," which essentially had been dormant for more than two decades. At that time, Roland was recognized as an international expert on caffeine. He had no experience with psychedelics but was open and curious, as he had encountered some profoundly meaningful states of consciousness during Buddhist meditation. He also was a full professor in the Johns Hopkins School of Medicine and had well-established connections with the FDA. I could contribute my clinical expertise, having worked with psychedelics in research contexts from 1963 until 1977.
>
> We decided to draft a protocol for a double-blind study[8] with psilocybin and Ritalin, with normal healthy volunteers who had no history of psychedelic use. It was reviewed by two Hopkins institutional review boards, a Hopkins legal committee, and the FDA. With green lights from all reviewers, we suddenly had psilocybin in our pharmacy, and the clinical rebirth began in 1999.
>
> Though not a clinician by training, Roland became progressively intrigued and impressed by the experiences our research volunteers reported and their claims of life-enhancing aftereffects. Our modest beginning has now mushroomed into the Johns Hopkins Center for Psychedelic and Consciousness Research, with a current staff of close to 60 people. Roland indeed was a disciplined scientific researcher but also a courageous visionary.

**Mary Cosimano, LMSW**, founder of Psychedelic Support and Integration, LLC and former psychedelic session facilitator at the Johns Hopkins Center for Psychedelic and Consciousness Research, wrote (email, February 19, 2024):

> For more than 20 years, Roland and I worked together every day while conducting our psilocybin clinical trials. Individually, we met with most every participant in some capacity throughout their time with us. At the end of our day, Roland and I would meet and talk about them. It was one of my greatest joys to have someone as excited and as interested about them and their experiences as I was.

team examined pharmacological and neural mechanisms of action of psilocybin in both healthy and clinical populations.[9]

His research group also conducted a series of surveys characterizing various naturally-occurring and psychedelic-occasioned experiences including: near-death experiences; "entity encounters" caused by N,N-dimethyltryptamine (DMT, a psychedelic compound found in many plants); "God encounter" experiences; challenging, psychologically insightful, or belief-change experiences; and experiences to which reduced anxiety, depression, and substance-use disorders are attributed.[9]

In November 2021, after a routine colonoscopy, Griffiths was diagnosed with stage 4 colon cancer. The diagnosis, which he eventually came to consider a blessing, inspired him to create the Roland R. Griffiths, Ph.D. Professorship Fund in Psychedelic Research on Secular Spirituality and Well-Being to advance research on psychedelic substances and their effects on human spirituality, well-being, worldview, and prosocial behavior. The $24-million endowed professorship is the largest ever at the Johns Hopkins University School of Medicine.[1]

"For me, the psychological off-ramp from potential emotional misery has been the cultivation of gratitude for the precious gift of life itself, of being conscious, awake to the mystery of this present moment," Griffiths said in 2022 in a video about the professorship.[1]

Roland Griffiths is survived by his wife, Marla Weiner; his three children, Sylvie Grahan, Jennie Otis, and Morgan Griffiths; five grandchildren; and his siblings, Kathy Farley and Mark Griffiths.[1,2] HG

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> Roland was a steadfast, intense, and meticulous researcher, which is why we were able to have our first psilocybin study approved by the FDA. Early every morning and late most evenings, he could be found in his office, hunched over his computer, helping one of our team members with a paper or meeting with one of our participants. Roland had a deep love for his family and occasionally liked to travel, but it seemed he was in his element when he was in his office. He loved this work and everything about it, and his legacy will live on. I will always be grateful to Roland for the opportunity I have had to be part of this powerful and meaningful research.

**Jimmy Potash, MD, MPH**, the Henry Phipps Professor and director of the Department of Psychiatry and Behavioral Sciences at Johns Hopkins University, wrote (email, February 8, 2024):

> Roland Griffiths was a giant in the field of psychedelics and just who was needed to help restart it after [about] 30 years of quiescence. He had the mind and habits of a meticulous experimentalist, coupled with boundless curiosity and an unwavering determination. It was one of the great joys and honors of my career to be able to work with him over the last six years of his career and his life (he worked until his last day) and to provide some support and guidance as he established the first center for psychedelic research in the United States in the modern era.
>
> As he faced a terminal cancer diagnosis, he handled himself with inspiring grace and surprising energy and goodwill. It was clear that he lived the positivity and altruism that he wanted to promulgate in others.

**Rick Doblin, PhD**, the founder and executive director of the Multidisciplinary Association for Psychedelic Studies (MAPS), wrote (email, February 17, 2024):

> Roland and I were on opposite sides of the risk tolerance scale, yet we shared a passionate interest in advancing psychedelic science. We fully supported each other's research. Roland's conservatism was an asset in moving this field forward since he had earned a great deal of respect from his colleagues for his careful research and cautious conclusions. It was somewhat ironic that the most controversial and potentially impactful research in the entire field of psychedelics was started by Roland at Johns Hopkins and Anthony Bossis, PhD, at New York University and looked at the role that psilocybin could play in catalyzing spiritual, mystical experiences in religious leaders from different religions…. Roland was a pioneer whose work was so productive that it will take decades for other scientists to follow up on the leads he created.

# Randal Ray Buresh 1950–2024

**By Wendy Brinkley and Brittany Hixson**

A dear friend to many and co-founder of Oregon's Wild Harvest herbal products company, Randy Buresh died on August 4, 2024, at age 73. He was a teacher, student, father, grandfather, husband, caretaker, lover, dreamer, and leader. With sparkly, mischievous eyes, dirt on his hands, and a wide-open heart, Randy would often say, "Without love, no mission is possible." Randy's life could be defined as love in action.



Randy Buresh

Randal Ray Buresh was born in Nebraska on September 1, 1950. After graduating from high school in Missouri, he went back to work on his family's farm in Nebraska in 1968. He noted the regular uses of conventional herbicides and other pesticides and knew there had to be a more beneficial, less harmful way to grow plants. Little did he know at the time that this knowledge would be tucked away for his future in organic and biodynamic farming.

In the early '80s, Randy went back to school to become a registered surgical nurse, and he practiced for almost 20 years. During this time, Randy uncovered another crucial truth in his life's journey: He could see that medical professionals were largely treating symptoms and diseases with pharmaceuticals instead of looking at root causes. With his background in human physiology, Randy was determined to find more natural, wiser ways of healing, which led to his studies in traditional herbal medicine. The time-honored, historical uses of medicinal plants within various cultures immediately resonated with him, and he was humbled by the energy and capacity of the plants to heal the body — naturally.

This devotion to botanicals, along with his background in farming, prompted Randy and his wife, Pam, to start their first organic herb farm in Troutdale, Oregon, in 1994. It was a modest five acres, which they soon outgrew as a growing number of people felt the impactful results of their herbal products.

Vertical integration was the goal, and Randy understood that the only way to ensure the highest quality standards was to take ownership of every step of the process, from seed to bottle. By elevating standards in every aspect of the business, from harvesting to drying, encapsulating, manufacturing, testing, and shipping, every step was modified for excellence. Oregon's Wild Harvest became well-respected in the herbal products industry through its commitment to quality control and meticulous manufacturing processes.

The business continued to grow, and the five-acre farm quickly turned into a lush, certified organic 20-acre farm in Sandy, Oregon, where Randy and Pam lived and worked happily for years, hosting many herb walks for budding herbalists and plant aficionados alike. Randy loved to walk people through the most magical parts of the farm, pointing out where they carefully cultivated threatened goldenseal (*Hydrastis canadensis*, Ranunculaceae) or where native plants, like western red cedar (*Thuja plicata*, Cupressaceae) and horsetail (*Equisetum* spp., Equisetaceae), were growing wild in their habitat. He was a naturalist at heart and was passionate about sharing traditional herbal knowledge with others.

These herb walks became a beloved tradition, and several students from the National University of Natural Medicine (NUNM) in Portland, Oregon, and Bastyr University in Kenmore, Washington, would visit the farm throughout the years, creating lifelong relationships. Randy began speaking at these universities and others, sharing botanical knowledge. Oregon's Wild Harvest was happy to donate medicinal plant material to various NUNM-affiliated free clinics around Portland, providing botanicals that were in demand by specific patient populations. In the spirit of learning, raw medicinal plant material was also donated to the school's herbarium, where it was used in several studies.

In 2014, the business moved to a 600-acre historical farm in central Oregon, providing more room to continue growing certified organic and biodynamic plants supported by Randy's years of regenerative farming experience. From the beginning, Randy understood that the quality and efficacy of the plants were only as good as the quality of the soil. This hard work was a labor of love, but the end product was something of which Randy was very proud. He would say: "We want to make products that you'd feel good about offering to your own mother or grandmother. Anything less isn't good enough."

Steven Dentali, PhD, an industry consultant at Dentali Botanical Sciences and former vice president of botanical sciences at Herbalife, wrote (email, November 4, 2024):

> I was fresh out of grad school and into a new job when Randy took me under his wing. I had the privilege of seeing him and Pam start up Oregon's Wild Harvest with a commitment to biodynamic and organic farming practices. Overflowing with sincere, empathetic kindness, Randy was a constant reminder of life's dependence on love and nature and the constant hard work and commitment required to promote health and healing through action. Some of his happiest moments probably included riding a tractor in that service. He was truly a guiding light of a man and a lovely human being.

Although Randy's earthly figure is no longer here, the seeds he planted will continue to grow. Peace, love, and hard work would be his message to us all. Love each other, love the earth, and don't be afraid to dig in and make things happen, he would say. Randy is survived by his wife, Pamela; his children, Jeremiah Buresh, Adam Buresh, Dylan Elmer, and Brigitt Palmer; his six grandchildren; and his three younger brothers, Rick Buresh, Rodney Buresh, and Reggie Buresh. HG

***Wendy Brinkley*** *is the director of marketing at Oregon's Wild Harvest.*

***Brittany Hixson*** *is the digital marketing specialist at Oregon's Wild Harvest.*

# Peter John Houghton 1947–2024

**By Hannah Bauman**



Peter Houghton

Professor Peter Houghton, PhD, died on April 25, 2024, in Hereford, England, at age 77, after a stroke. He previously had recovered from melanoma. Houghton was an ethnopharmacologist and pharmacognosist who spent his career lecturing at King's College London (KCL), where he mentored numerous PhD students and was active in the field through leadership positions and botanical research.

Houghton was born on March 2, 1947, in Lowestoft, England, to William and Barbara Houghton. He completed secondary school at Sir William Romney's School in Tetbury, England. In 1968, he graduated with a bachelor's degree in pharmacy from Chelsea College in London, which was incorporated into KCL in 1985. After graduation, he trained as a pharmacist in Cambridge before returning to Chelsea and earning his doctorate in pharmacognosy in 1973.

During and after his doctoral studies, he lectured in pharmacognosy and ethnopharmacology at Chelsea. In 1999, he became a full professor, and in 2008, he retired from KCL and was named Emeritus Professor in Pharmacognosy. After retirement, he remained active in the field by working as an honorary research associate at the Royal Botanic Gardens, Kew.

Houghton then followed his calling and became ordained as a minister for the Church of England. He served as an assistant curate at the Church of the Ascension in Balham Hill from 2008 to 2012 and as a vicar at the south rural parishes in Wye, Kent, from 2013 to 2018.

Before his retirement, Houghton's research focused on the implementation of biochemical and pharmacological in vitro test methods for plant extracts. He co-authored more than 250 research papers on the biological activities of plants and their metabolites, with a particular interest in plants with potential use in treating central nervous system disorders, cancer, and wounds.

In his early career, his research focused on plants in the genus *Buddleja* (Scrophulariaceae), which grow on disturbed ground and are considered invasive weeds in the United Kingdom. Some species of *Buddleja* have been used in traditional Chinese medicine to treat fever, muscle aches, diarrhea, and rheumatism.

He edited or co-edited several books, including *Valerian: The Genus Valeriana* (Harwood Academic Press, 1997), a genus of particular interest to Houghton, and *Evaluation of Herbal Medicinal Products: Perspectives on Quality, Safety, and Efficacy* (with Pulok Mukherjee, PhD; Pharmaceutical Press, 2009).

Houghton had a global approach to his research. His mentorship of PhD students from West Africa, including Ghana and Nigeria, ignited an interest in traditional African medicinal plants and longstanding partnerships with West African universities. He served as an external examiner for multiple universities, including the University of Ibadan in Nigeria, and traveled throughout Africa, from Egypt to South Africa, giving lectures and consulting on the development of phytopharmaceutical study programs. He also contributed to the *African Herbal Pharmacopoeia* (Association for African Medicinal Plants Standards [AAMPS], 2010) as a consultant, recommending sources and local experts to the editors.

Houghton actively promoted the field of pharmacognosy. He was the first British board member of the Society for Medicinal Plant and Natural Product Research (GA), beginning in 1999, and he stayed on the board until his retirement in 2008. In 2001, he was a founding board member of the Academy of Pharmaceutical Sciences (APS) and the first chair of the APS' Drugs from Natural Sources Focus Group. From 2004 to 2006, he served as the president of the International Society for Ethnopharmacology and as the society's treasurer. He organized workshops and symposia through the British Pharmaceutical Conference and the Academy of Pharmaceutical Sciences of Great Britain. He also held many editorial board memberships for scientific journals, including *Journal of Ethnopharmacology*, *Journal of Pharmacy and Pharmacology*, *Pharmaceutical Biology*, *Phytochemical Analysis*, and *Planta Medica*.

Friends and colleagues remember Houghton's kindness, mentorship, knowledge, energy, and enthusiasm. He often brought his students to botanical gardens for hands-on demonstrations with the plants themselves and encouraged them to see the "big picture" instead of a series of constituents. Though his retirement in 2008 came as a surprise to many, his calm and thoughtful nature made him a natural fit for the clergy.

Peter Houghton is survived by his wife, Joan. HG

# Kalyanam Nagabhushanam 1950–2024

**By Connor Yearsley**



Kalyanam Nagabhushanam
Photo courtesy of the Sami-Sabinsa Group

Kalyanam Nagabhushanam, PhD, president of research and development (R&D) of the Sami-Sabinsa Group, passed away in East Windsor, New Jersey, on June 2, 2024, at age 73.[1-3] He was a dedicated scientific advisor to the late Muhammed Majeed, PhD (1948–2024), the founder and chairman of the Sami-Sabinsa Group, and, until Majeed's death in March 2024, helped Majeed develop the company's wide range of botanical ingredients. (A tribute to Majeed was included in *HerbalGram* issue 141).[4]

An accomplished chemist, Nagabhushanam specialized in organic synthesis (a branch of chemical synthesis that involves the construction of organic compounds), natural product chemistry, and screening of botanical extracts for novel pharmacological activities.

Nagabhushanam's primary responsibilities at Sabinsa included developing efficient and novel scientific routes for xenobiotics (substances that are foreign to the body) and intermediates, as well as exploring new business areas. He was a co-inventor of multiple Sami-Sabinsa Group patents around the world.

Nagabhushanam co-authored two book chapters and more than 150 peer-reviewed research papers in leading scientific journals. He also authored or co-authored eight books and a few that were still in progress when he passed away. His books, many or most of which were co-authored with Majeed, describe the history, ethnobotany, phytochemistry, and pharmacological activities of multiple herbal extracts and research on their beneficial compounds.

His many contributions to the Sami-Sabinsa Group over 25 years in the areas of synthetic methodology (a branch of organic chemistry that focuses on new methods and techniques for synthesizing organic compounds), chiral chemistry, and natural products were recognized internationally.

Born in Pattukkottai, a town in the southeastern coastal state of Tamil Nadu, India, on August 10, 1950, Nagabhushanam was the son of S.V. Nagabhushanam and N. Sellammal and was one of 12 children, having eight sisters and three brothers. Growing up in a large family in post-independence India, resources were scarce, and he faced significant challenges.

Despite limited access to books and educational materials, his thirst for knowledge was insatiable, according to his family. He attended middle school in Pattukkottai and high school in Tanjore (now called Thanjavur), Tamil Nadu. He then attended Ramakrishna Mission Vivekananda College in Chennai, Tamil Nadu, where he completed his bachelor's degree in chemistry in 1971 and master's degree in chemistry in 1973.

After graduating at the top of his class, Nagabhushanam sought to continue his education abroad. His academic record and passion for organic chemistry earned him a full-time Welch Foundation fellowship to pursue a PhD at Baylor University in Waco, Texas.

Studying at Baylor allowed him to work with various researchers, especially his PhD advisor, Professor Albin Pinkus, PhD (1919–2011). He earned his PhD in chemistry in 1978 and then completed a two-year postdoctoral research program with Professor David Lightner, PhD, at the University of Nevada, Reno. This period was instrumental in shaping Nagabhushanam's future career and contributions to chemistry.

He then returned to India and worked for companies including IPCL (Indian Petrochemicals Corporation Limited, now part of Reliance Industries Limited), Ciba-Geigy (now Novartis), and SPIC Pharma (a division of Southern Petrochemical Industries Corporation), where he was the head of R&D and Bulk Drug Divisions.

He joined the Sami-Sabinsa Group as president of R&D in 1999. At Sabinsa, Nagabhushanam was highly involved in various product development stages, including isolating new compounds, preparing applications for patents, and understanding regulatory requirements. He established research collaborations between Sabinsa and numerous universities, hospitals, and clinics. These included Auburn University, University of Rochester, University of Florida, University of Illinois Chicago, University of Iowa Hospitals & Clinics, San Francisco Research Institute, University of Southern California, and Mexico's National Institute of Cancer (INCan), among others.

He also developed research collaborations with various dietary supplement ingredient and other companies. According to a Sami-Sabinsa Group press release, Nagabhushanam's research partnerships and scientific contributions were significant to the organization's growth into a successful and leading multinational health and life sciences company.[1]

As president of R&D, Nagabhushanam worked with scientists at the Sami-Sabinsa Group as well as intellectual property (IP) and regulatory teams for current and new products. He led several independent divisions at the company, including Natural Drugs, Phytochemistry, Synthetic Chemistry, Tissue Culture, Biotechnology, Analytical R&D, Biological Research, Microbiology, and Formulation R&D, all of which collaborate to produce ingredients that adhere to various international standards.

In 2023, when the Sabinsa Corporation received the American Botanical Council's (ABC's) Varro E. Tyler Commercial Investment in Phytomedicinal Research Award, Nagabhushanam accepted the award on behalf of the company. "All of us at Sabinsa consider being chosen to receive the ABC Varro E. Tyler Award a great honor," he said.[5] "This is a meaningful tribute to Sabinsa's 35-year history of using modern scientific research methods to expand upon traditional Ayurvedic knowledge [on] the health benefits of botanicals. We realize that along with this honor comes the responsibility to maintain that position by continued fruitful research into phytomedicines."

In his personal life, Nagabhushanam had a profound appreciation for nature and loved immersing himself in the beauty of the natural world. Before the COVID-19 pandemic, he drove around Iceland on the Ring Road in three days, reflecting his adventurousness and love for travel. He also enjoyed solving Sudoku puzzles and *The New York Times* games, reflecting his love for intellectual challenges. His commitment to fitness was also an important part of his lifestyle.

Nagabhushanam's native language was Tamil, a Dravidian language of South Asia. He was also fluent in English and loved English literature. Despite growing up with little access to books, he could quote Shakespeare, Tennyson, Wordsworth, and others from memory. He also could understand and speak Hindi and Sanskrit.

"Kalyanam was a man of multitudes: a loving husband, father, son, brother, grandfather, friend, and much more," Nagabhushanam's son, Karthik Kalyanam, was quoted as saying.[3] "He generously shared his wisdom, inspiring many family members to excel in chemistry and research. His love for nature fueled his explorations of state and national parks. Rising from poverty, he became an accomplished chemist, driven by a curious mind. Kalyanam's legacy of love and knowledge continues to inspire his children to be dedicated professionals and affectionate family members."

Kalyanam Nagabhushanam is survived by his wife Vijayalakshmi, son Karthik, daughter Janani, and four grandchildren. HG

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## Friends and Colleagues Remember Kalyanam Nagabhushanam

**Anurag Pande, PhD**, vice president of scientific affairs at Sabinsa, wrote (email, October 14, 2024):

> What I admired most about Dr. Kalyanam was his wealth of knowledge about chemistry and his deep understanding of various scientific disciplines. He always made time to listen carefully to any challenges we faced and would respond thoughtfully. One thing I learned from him was his organized approach to solving problems. His methodical way of tackling any challenge was remarkable.
>
> I had the privilege of getting to know him better during our travels, especially on "Sabinsa on Wheels" trips. One memorable instance was when we were casually feeding seagulls at Manly Beach in Sydney, Australia. Before we realized it, we had attracted more birds than we could handle and ended up being chased down the street. (Lesson learned: Feeding seagulls is like solving a problem in the lab — once you start, you'll end up with more than you bargained for.) He was always staying active and encouraging others to do the same. Dr. Kalyanam had a great sense of humor, despite his serious and focused demeanor. He was always encouraging. His energy, wisdom, and kindness will be deeply missed.

**Sreeram Krishnan, PhD**, senior manager of scientific affairs/IP management at Sabinsa, wrote (email, October 14, 2024):

> It was a great honor to work with Dr. Kalyanam, who was not only a mentor to me but also a father figure. A truly down-to-earth person, he is a perfect example of the saying, "A mentor is someone who sees and brings out the best in people when they themselves can't." His calm and composed approach to difficult situations and dedication to work left a lasting impact on many, including me. He often said, "If work demands you to dive, just ask how deep." A fitness enthusiast, he remained young at heart and disliked being reminded of his age.

**Shaheen Majeed, MBA, DLitt**, global CEO and managing director of the Sami-Sabinsa Group, wrote (email, October 21, 2024):

> The news of Dr. Kalyanam's passing left me without words. It was a tragic year, with this loss coming so soon after the death of Sabinsa's founder, my father. Dr. Kalyanam was with us at Sabinsa for 25 years, and he was deeply devoted to his work, to my father, and to the intention to benefit overall health. I am forever grateful for his wisdom, the insights he brought forth, and the help he gave to all of us. He challenged my father, he challenged me personally, and we all achieved more because of it. What he did to help grow Sabinsa will be etched in stone.

**Asha Ramesh, MBA**, CEO of Sabinsa USA, wrote (email, October 14, 2024):

> Dr. Kalyanam's legacy of scientific brilliance, innovation, and commitment to integrity will continue to influence our company and products. Through his mentorship, we have set high standards for ourselves, which will be honored for years to come through our scientific staff. It has been my honor and privilege to have worked with Dr. Kalyanam closely for more than 20 years, and I have been inspired by his rigor and dedication to quality, which helped elevate Sabinsa's reputation globally. I will always cherish his knowledge, guidance, wisdom, and pursuit of excellence. Dr. Kalyanam was a kind and genuine person from whom I have learned many life lessons, including to constantly educate oneself and never stop learning, to be righteous, make time to travel to new places, hike, and enjoy the serenity of nature.


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# FROM THE FIELD

Above: A devil's claw (*Harpagophytum procumbens*, Pedaliaceae) harvester in Namibia.

Below: Freshly harvested devil's claw tubers.

Photos by Chris Kilham





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