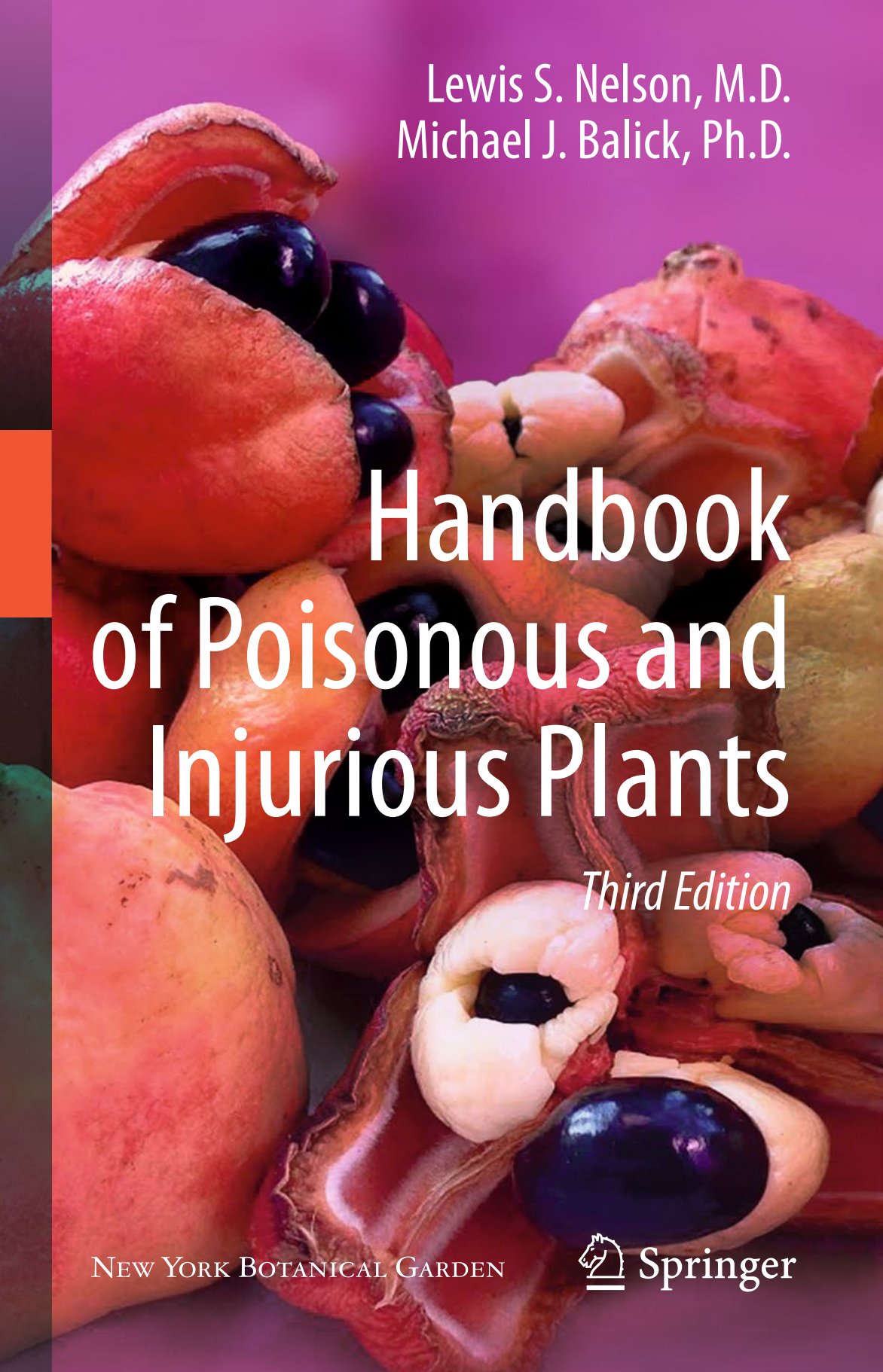
Lewis S. Nelson, M.D.
Michael J. Balick, Ph.D.

Handbook of Poisonous and Injurious Plants

Third Edition



New York Botanical Garden

Springer

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HANDBOOK OF POISONOUS AND INJURIOUS PLANTS

Lewis S. Nelson, M.D.
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Foreword by Richard D. Shih, M.D.
Introduction by Andrew Weil, M.D.

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In cases of exposure or ingestion, contact a Poison Control Center (1-800-222-1222), a medical toxicologist, another appropriate healthcare provider, or an appropriate reference resource (see Disclaimer on page 307)

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Contents

Foreword

The third edition of the *Handbook of Poisonous and Injurious Plants* is an excellent and welcome update to an extremely useful reference for clinicians, botanists, and plant enthusiasts. Since the publication of the second edition a decade ago, there has been an increased recognition and interest in poisonous plants. In addition, the availability of different varieties of indoor and outdoor plants has increased, expanding the risk of potential exposures to plant toxins. This edition serves as an easy-to-use poisonous plant reference that is concisely written and well organized. It is the most useful and thorough handbook of its type presently available.

The two authors of this third edition handbook combine medical toxicology and botany. Their collaboration is what makes this handbook unique and extremely useful. Dr. Lewis Nelson is an academic emergency physician who is a leader in the field of medical toxicology. Dr. Michael Balick is a renowned botanist who focuses his work on ethnobotany and toxic plants. Their collaboration provides precise botanical descriptions, professional photographs, and up-to-date medical information and recommendations.

Although this book is designed for clinicians, it is organized to assist users who may not be familiar with botanical or medical terms and is written in a familiar manner for ordinary readers. The first two chapters describe botanical terms and nomenclature. There is a chapter that discusses the different types of poisons, poisoning syndromes, and treatments associated with poisonous plants. The largest chapter involves specific botanical and medical information on several hundred individual plants along with beautiful color photographs taken by noted plant photographer Steven Foster.

This third edition of the *Handbook of Poisonous and Injurious Plants* provides updated botanical descriptions and management strategies as well as many new color botanical photographs. The authors combine botanical and medical information in a manner that is scientifically rigorous to be used by clinicians. However, it is also written and presented in a manner that is useful for everyone. This handbook will be of great value to physicians, veterinarians, parents, gardeners, horticulturists, hikers, outdoor lovers, and plant enthusiasts.

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Acknowledgments

Many people contributed to the production of this book. It is a revision of the wonderful work of Kenneth F. Lampe and Mary Ann McCann, originally published in 1985 by the American Medical Association (AMA) as the *AMA Handbook of Poisonous and Injurious Plants*. A number of years ago, that organization solicited a revised version of the book, and when this revision was completed, we learned that it was no longer within the subject matter published by that organization. Given our interest in seeing this volume appear in print, we requested that it be released for publication elsewhere, and the AMA was kind enough to agree to the release of a second edition to be published in partnership with The New York Botanical Garden and Springer. One significant difference in the second edition was that toxic mushrooms were not discussed, and this format is continued in the third edition. Since the original publication in 1985, many fine books on mushrooms and their toxicity and management have appeared, such as *Mushrooms: Poisons and Panaceas—A Handbook for Naturalists, Mycologists, and Physicians* (Denis R. Benjamin, W.H. Freeman & Company, 1995); *Hallucinogenic and Poisonous Mushrooms: Field Guide* (Gary P. Menser, Ronin Publishing, 1996); and *National Audubon Society Field Guide to North American Mushrooms* (Gary A. Lincoff, Knopf, 1981), and given their depth and scope, we decided not to include this topic in subsequent editions.

The subject matter in this book reflects a partnership between botany and medicine, and many specialists were consulted from each area. At the New York Botanical Garden, we are grateful to Willa Capraro and Tom Zanoni for their contributions to the botanical side of the original manuscript, updating some of the nomenclature and taxonomy used in the book. Irina Adam and Rebekka Stone worked diligently to secure and organize the photographs and drawings that appear in the book. The United States National Herbarium at the National Museum of Natural History (NMNH) kindly provided elements of the newly accessioned photographic collection of the late Harvard Professor Richard A. Howard, noted international authority on the botany of toxic plants, in order that they be available for this book. We thank George F. Russell of the NMNH for the collaboration in that endeavor. Elizabeth Pecchia produced manuscript copy of the original book, and it was through her patient and capable labors that we were able to work from a typewritten copy of the original text. Some of the plant descriptions were based on information from Steven Foster and Roger Caras' book *Venomous Animals & Poisonous Plants* (The Peterson Field Guide Series, Houghton Mifflin Company, New York, 1994), *Hortus Third* (L.H. Bailey and E.Z. Bailey and The Staff of the Liberty Hyde Bailey Hortorium, Macmillan Publishing Co., New York, 1976), and *Manual of Vascular Plants of Northeastern United States and Adjacent Canada*, Second Edition (Henry A. Gleason and

Arthur Cronquist, The New York Botanical Garden, Bronx, New York, 2004), and we are most grateful to the authors of these important works. In contemporary times, websites are also valuable scholarly resources, and in working on this book, botanical data were gathered from Tropicos of the Missouri Botanical Garden (http://www.tropicos.org/), IPNI—The International Plant Names Index (http://www.ipni.org/index.html), The Plant List: A Working List of All Plant Species (http://www.theplantlist.org/) and The New York Botanical Garden's C. V. Starr Virtual Herbarium (http://sweetgum.nybg.org/science/vh/), as well as from numerous other sites on individual plants or images as necessary.

We are grateful to the photographers who provided material for this book; in particular, we acknowledge with deep gratitude the wonderful photographs contributed by Steven Foster, as well as Richard W. Lighty, Irina Adam, and the late Richard A. Howard; this group collectively contributed the bulk of the photographs used in the book. Others who provided photographs include Scooter Cheatham, Peter Goltra, Hans-Wilhelm Gromping, Flor Henderson, Andrew Henderson, Fredi Kronenberg, George K. Linney, John Mickel, Michael Nee, Kevin Nixon, Thomas Schoepke, and Dennis Wm. Stevenson and the second author. As a collection, these images have greatly enhanced the third edition, making it much more user-friendly. We are grateful for Bobbi Angell's wonderful botanical illustrations that make the glossary so much more understandable. We turned to the excellent bibliographic resources of The LuEsther T. Mertz Library of The New York Botanical Garden in the search for plates of specific plants that were otherwise not available from the photographers we queried and are grateful to the entire staff, in particular, Stephen Sinon and Marie Long, for their patient assistance in our search for appropriate illustrations. We thank the Archives of The New York Botanical Garden for the use of photographic images from its collections. The New York Botanical Garden's living collections were an important resource for illustrating this book and for understanding the plants we discuss herein, and we are grateful to Carlo Balistrieri, Margaret Falk, Francesca Coelho, Todd Forrest, and Kim Tripp for their help and interest in this project. Dennis Wm. Stevenson was generous in providing information on cycad toxicity and images, and William Buck, Gregory M. Plunkett, Scott Mori, Rob Naczi, and Michael Nee were kind enough to provide their insight on some of our botanical questions. Richard Schnall and the staff of Rosedale Nurseries allowed us to wander in their nursery and photograph interesting cultivars. Tom Newmark very kindly made his beautiful Costa Rican farm, Finca Luna Nueva, available to us for photography.

Lewis Nelson acknowledges Lewis Goldfrank, MD, who spurred his initial interest in the toxic properties of poisonous plants during the years of medical training under his tutelage. Dr. Goldfrank would regularly bring to the workplace examples of poisonous plants that he found in his garden and enlighten us on the clinical implications of such exposure.

Michael Balick wishes to thank two of the mentors who helped guide him through his graduate and undergraduate studies of useful and harmful plants, the late Richard Evans Schultes at Harvard University and Richard W. Lighty at the University of Delaware. He also wishes to acknowledge the support of the Philecology Trust.

Finally, we thank our families for their patience and support during the research and writing of this book. Lewis Nelson is grateful to his wife Laura, children Daniel, Adina, and Benjamin as well as his parents Myrna and Irwin. Michael Balick thanks Emily, Daniel, Tammy, Boris, Jackie, Alexander, Miles, and Margot. They have each given us the most precious contribution—time and understanding—which ultimately resulted in the volume you have before you. We hope you will find it worthy of their sacrifice.

Lewis S. Nelson, M.D.
Michael J. Balick, Ph.D.

Introduction

I studied botany before I studied medicine, having had the good fortune to pursue an undergraduate degree under the direction of the late Dr. Richard Evans Schultes, longtime director of the Harvard Botanical Museum and godfather of modern ethnobotany. Schultes was an expert on psychoactive and toxic plants, especially of the New World tropics. Initially, through his stories of the indigenous lifestyle of Amazonian peoples, and later by helping me undertake fieldwork in this region, he awoke in me a keen interest in the botany of useful plants that led me to become, first, an investigator and, later, a practitioner of botanical medicine.

When I moved on to Harvard Medical School, I was dismayed to find that none of my teachers, even of pharmacology, had firsthand knowledge of the plant sources of drugs. Since then, I have been continually struck by the lack of awareness of the medicinal and toxic properties of plants in our culture. Examples are unfounded fears of poisoning by common ornamentals such as the poinsettia, exaggerated fears of herbal remedies such as Chinese ephedra, ignorance of the vast medicinal importance of such spices as turmeric and ginger, and lack of awareness of the toxic and psychoactive properties of other spices, for example, nutmeg and mace.

At the root of this problem is the distance that exists between plant scientists and health scientists. Because I am trained in both worlds, I have been very conscious of it all my professional life. This intellectual gap creates difficulties for botanists who want to learn the medical significance of plants with pharmacological effects and for physicians, nurses, and pharmacists who want to learn how plants influence health, whether for good or ill.

By bringing together specialists from both sides of this divide, the present book does a great service. It gives different perspectives on poisonous and injurious plants while remaining grounded in the integrative science of modern ethnobotany. I wish it had been available when I was first practicing medicine and, because of my background in botany, was often asked questions about the harmful potentials of plants and products derived from them.

I meet many people who imagine that most wild plants are dangerous, who would think that if you pick and eat plants at random in the backyard or woods you will die. In fact, the percentage of plants that are really harmful is quite small, as is the percentage that are really beneficial. If you wish to get to know plants, a good place to start is to learn

about those that can kill or cause serious harm. This handbook will be an invaluable resource in that educational process.

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Authors' Note

"DOSE MAKES THE POISON" (paraphrased from Theophrastus von Hohenheim, known as Paracelsus, 1493–1541)

Plant poisonings are common. Poison Control Centers across the United States received nearly 42,500 calls relating to plant exposure in 2018 (Gummin, 2019; Table 1), accounting for about 1.84% of all exposure calls. Of these, approximately 60% involved children age 5 years or younger. Plants account for the tenth most common form of potentially toxic exposures in children. This demographic is consistent with the ready availability of plants at home and other public locations and highlights that most plant exposures are unintentional. Similarly, the vast majority of these exposures result in no toxicity, an important fact that should be both comforting and unsettling. Although it is likely that the majority of these plant exposures are nontoxic per se, it is certainly likely that the vast majority of these "exposures" were simply that…exposures. That is, no toxin was ingested, or if a small piece of plant was ingested, it was in a quantity insufficient to cause clinical effects. However, the possibility of disregarding as nontoxic the rare patient with a substantial exposure is ever-present. For this reason, a solid understanding of the types of toxins present in a plant and the likely clinical manifestations following exposure is critical and the focus of this work.

Specific identification of a plant may guide management by placing the risk in context and provide a time frame for the development of clinical findings. Care should be taken to avoid misidentification, a particular problem especially when plants are reported or discussed by their common, rather than by their botanical, name. Although management of a patient with an identified exposure is generally preferable to managing a patient with an "exposure to an unknown plant," poor outcomes may result by the attempted management of a misidentified plant (Chen, 2016). The assistance of management algorithms and plant identification books (such as field guides or Internet websites) is always appreciated, though unlikely to replace the assistance of a trained professional who is able to correctly identify plants. This may typically be a botanist or a horticulturist; an alternative is to contact plant nurseries that may have adequate expertise for identifying plants, particularly for common species (Rondeau, 1992). Many poison centers have relationships with the botanical community when the need for expert plant identification arises.

Given the generally good outcomes following plant exposures in young children, the initial management of children who are asymptomatic should be expectant. This includes observation, at home or in the hospital as appropriate depending on the nature of the exposure, and the provision of supportive care. For example, patients with several episodes of vomiting may benefit from an antiemetic agent and perhaps intravenous or

oral rehydration. The situation is quite reversed in adults, who rarely suffer an inadvertent exposure to a plant. Rather, older children and adults attempt self-harm, extract chemicals (or use extracts), attempt to abuse for psychoactive purposes, take "therapeutic doses," and even intentionally poison one another. The substantially higher exposure dose highlights the reason that exposures in adults must be taken seriously until proven otherwise.

Perhaps the greatest paradigm shift since the publication of earlier editions of this book is the current de-emphasis of aggressive gastrointestinal decontamination (see Chap. 4). Syrup of ipecac, for example, is nearly removed from our therapeutic regimen, and orogastric lavage should be reserved for those patients with a significant likelihood of developing consequential clinical effects of poisoning. It is important to understand that this group should clearly be the minority of patients with suspected plant poisoning. Although oral activated charcoal is effective at reducing the absorption of many chemicals, its benefits following plant exposure have never been specifically studied. However, given the extremely low risk of administration of oral activated charcoal to an awake patient who is able to drink spontaneously, its use should be considered in the majority of patients with potential plant exposures.

In the section entitled "Poisoning Syndromes" are descriptions of the clinical findings and limited management strategies for the care of patients with plant poisonings. Although we can only speculate on why plants contain these chemicals, there are predictable syndromes produced by exposures to plants with similar evolutionary backgrounds; for example, different genera of plants in the same plant family often contain similar compounds. One example would be plants in the family Solanaceae, such as *Atropa belladonna*, and the various species of *Datura*—plants from both of these genera contain atropine and scopolamine. These chemicals share common effects on the various receptors, channels, and systems in our bodies and produce predictable and recognizable constellations of findings, which we can readily categorize into syndromes (e.g., antimuscarinic). Several suggested readings are provided below that add additional insight into the important role of clinical evaluation and management, and many more are available through an Internet search engine and through PubMed.

Much of our understanding of plant toxicology derives from the study of purified plant toxins, which are often being studied for therapeutic use as pharmaceuticals (e.g., morphine from *Papaver somniferum*). As mentioned in the opening quote, the only difference between a medicine and a poison is dose, so the study of plant pharmacology and plant toxicology overlaps greatly. Although there is generally a lower concentration of drug in the plant than in a tablet, this by no means should minimize the clinical concern in certain situations, such as following exposure to a particularly toxic plant (e.g., *Colchicum autumnale*, which contains colchicine).

As suggested above, there is little adequate evidence to fully direct the management of a patient with any specific plant poisoning. The limited knowledge relates to the wide diversity of available plants and the low quality of the available case data (e.g., did they eat it?). The cost and effort associated with proving an exposure (e.g., toxin levels in blood) makes this task, unfortunately but appropriately, of low priority to the physician involved with the care of the exposed patient.

Plants produce many diverse chemicals that we have turned into important medications. However, since "dose makes the poison," these same chemicals, when delivered in large quantities, are poisonous. Understanding this distinction, and how the chemicals affect the human body, and what we can do about it…that is where this book is meant to assist.

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TABLE 1. Top Ten Plant Exposures Called to US Poison Centers in 2018[a]

Botanical name or category (toxin)	Common name	No. of exposures
Capsicum species (capsaicin)	Pepper	2103
Prunus species (amygdalin)	Cherry	2079
Phytolacca americana L. (phytolaccatoxin)	Pokeweed	1733
Mitragyna (mitragynine)	Kratom	1146
Toxicodendron species (urushiol)	Poison ivy	1028
Oxalate (not otherwise specified)	Various (e.g., Dumbcane)	1020
Berry (not otherwise specified)	Various (e.g., Yew)	924
Spathiphyllum species (oxalates)	Peace lily	715
Cardioactive steroids (not otherwise specified)	Various (e.g., Foxglove)	655
Ilex species (irritant)	Holly	538

Note that there is some overlap between categories identified by the toxin
2018 plant exposures total 42,495

[a]Adapted from Table 20, in Gummin (2019)

SECTION 1.

Botanical Nomenclature and Glossary of Botanical Terms

Botanical Nomenclature

Before the work of Carolus Linnaeus (1707–1778), the botanist who established the binomial system of plant nomenclature, a plant sometimes had a name that consisted of many descriptive words. Linnaeus helped to standardize botanical nomenclature by establishing a genus and species name for each plant, followed by its designator. A clinical report involving a plant must always include the plant's botanical (binomial) name, which consists of both the genus and the species, for example, *Duranta repens*. By convention, both are italicized or underlined. *Duranta* is the name of the genus and the first letter is always capitalized. A genus (the plural of which is genera) may be composed of a single species or several hundred. The second part of the binomial, in this case *repens*, is the particular species within the genus, and it is always in lowercase letters. It is important to include the name of the person (often abbreviated) who named the particular species, as part of the scientific name, to minimize confusion between similar or related plant species. For example, in the case above, the complete name, which would allow the most precise identification, is *Duranta repens* L.; L. is the accepted abbreviation for Carolus Linnaeus.

Over time, as botanists continue to revise the classification systems of their specific plant families or groups to reflect additional knowledge and a more natural, evolutionarily based system, plants are periodically moved into different genera or sometimes different families. A species may be split into several species or varieties, or lumped together with plants of other species to comprise a single species, all based on the expertise of the taxonomist utilizing characteristics from other specialties ranging from gross morphology to molecular biology. One shortcoming of this fluid system is that scientists can have differing opinions as to how to classify a specific plant. To limit confusion with regard to nomenclature, when previously employed names are changed as part of a more recent taxonomic study, they become recognized as synonyms. In this book, the most common current synonyms are included in parentheses with an equal sign, for example, *Duranta repens* L. (= *D. plumferi* Jacq.). Some species are divided further into subspecies (ssp.), varieties (var.), cultivated varieties (cultivars (cv.)), and forms (fo.); for example, *Philodendron scandens* C. Koch & H. Sello ssp. *oxycardium* (Schott) Bunt. In this instance, the plant was first named *Philodendron oxycardium* by Heinrich Schott, but was reevaluated and then transferred to become a subspecies of *Philodendron scandens* by George Bunting. Hybrid names are indicated by an × (multiplication symbol), as in *Brugmansia* × *candida*. Horticultural names are not italicized but are capitalized and set in single quotation marks, for example, *Ilex glabra* cv. 'Compacta.' A printed work can never be fully up to date from a taxonomic standpoint because taxonomists are constantly refining the classification systems of the groups on which they work. At the same time, there may be a significant volume of medical literature based on an "older" name and not linked to the updated name, and thus, for most efficient and rapid use of the information in this volume, some of the older names are retained.

Associations of like genera are placed in a family. The family name is not italicized, but the initial letter is always capitalized. Botanists have changed the status of some families to reflect a more natural evolutionary lineage, either by incorporating them into other families and dropping their original designation or by creating entirely new families. Since the publication of the original edition of this *Handbook*, family names for some of the genera have been changed, but in this new edition the older name has been maintained to facilitate rapid consultation of the toxicological literature, and the new name is added in parentheses, for example, Umbelliferae (= Apiaceae). Updated family names for plants can be found on the Angiosperm Phylogeny Website which is continually updated with new information (http://www.mobot.org/MOBOT/research/APweb/). We also head many of the poisoning syndromes in Section 5 with the name of the genus followed by the word "species" (spp.) to indicate that there are several to many species in this genus having toxic properties.

If an individual species cannot be found, but the genus is listed, it should be assumed, conservatively, that the species has a potential for toxicity similar to another member of that genus. To a lesser extent, such an association may exist for members of the same family (Table 2). These relationships are far from exact, and inconsistencies in the clinical presentation or therapeutic response of an exposed patient should prompt immediate consultation with a Poison Control Center or other expert source. The botanical nomenclature used in this book has been derived from various sources, as well as the opinions of specialist reviewers.

TABLE 2. Examples of Plants Producing Systemic Poisoning in Humans Arranged by Family and Genus

Amaryllidaceae	**Araceae**	**Berberidaceae**
Amaryllis	*Alocasia*	*Caulophyllum*
Clivia	*Anthurium*	*Podophyllum*
Crinum	*Arisaema*	
Galanthus	*Arum*	**Boraginaceae**
Hippeastrum	*Caladium*	*Echium*
Hymenocallis	*Calla*	*Heliotropium*
Lycoris	*Colocasia*	
Narcissus	*Dieffenbachia*	**Calycanthaceae**
Zephyranthes	*Epipremnum*	*Calycanthus*
	Monstera	
Anacardiaceae	*Philodendron*	**Campanulaceae**
Schinus	*Raphidophora*	*Hippobroma*
	Spathiphyllum	*Lobelia*
Apocynaceae	*Symplocarpus*	
Acokanthera	*Xanthosoma*	**Caprifoliaceae**
Adenium	*Zantedeschia*	*Lonicera*
Allamanda		*Sambucus*
Nerium	**Araliaceae**	*Symphoricarpos*
Pentalinon	*Hedera*	
Thevetia		**Celastraceae**
	Asclepiadaceae	*Celastrus*
Aquifoliaceae	*Calotropis*	*Euonymus*
Ilex	*Cryptostegia*	

TABLE 2. Examples of Plants Producing Systemic Poisoning in Humans Arranged by Family and Genus, *Continued*

Compositae
Senecio

Coriariaceae
Coriaria

Cornaceae
Aucuba

Corynocarpaceae
Corynocarpus

Cucurbitaceae
Momordica

Cycadaceae
Cycas

Ericaceae
Kalmia
Leucothoe
Lyonia
Pernettya
Pieris
Rhododendron

Euphorbiaceae
Aleurites
Euphorbia
Hippomane
Hura
Jatropha
Manihot
Pedilanthus
Ricinus

Ginkgoaceae
Ginkgo

Guttiferae
Calophyllum
Clusia

Hippocastanaceae
Aesculus

Iridaceae
Iris

Leguminosae
Abrus
Baptisia
Caesalpinia
Cassia
Crotalaria
Gymnocladus
Laburnum
Leucaena
Pachyrhizus
Robinia
Sesbania
Sophora
Wisteria

Liliaceae
Allium
Aloe
Bulbocodium
Colchicum
Convallaria
Gloriosa
Ornithogalum
Schoenocaulon
Scilla
Urginea
Veratrum
Zigadenus

Loganiaceae
Gelsemium
Spigelia
Strychnos

Loranthaceae
Phoradendron
Viscum

Meliaceae
Melia
Swietenia

Menispermaceae
Menispermum

Myoporaceae
Myoporum

Oleaceae
Ligustrum

Palmae
Caryota

Papaveraceae
Chelidonium

Phytolaccaceae
Phytolacca
Rivina

Polygonaceae
Rheum

Ranunculaceae
Aconitum
Actaea
Adonis
Anemone
Caltha
Clematis
Helleborus
Pulsatilla
Ranunculus

Rhamnaceae
Karwinskia
Rhamnus

Rosaceae
Eriobotrya
Malus
Prunus
Rhodotypos

Rutaceae
Poncirus

Sapindaceae
Blighia
Sapindus

Saxifragaceae
Hydrangea

Scrophulariaceae
Digitalis

TABLE 2. Examples of Plants Producing Systemic Poisoning in Humans Arranged by Family and Genus, *Continued*

Solanaceae	**Taxaceae**	**Verbenaceae**
Atropa	*Taxus*	*Duranta*
Brugmansia		*Lantana*
Capsicum	**Thymelaeaceae**	
Cestrum	*Daphne*	**Zamiaceae**
Datura	*Dirca*	*Zamia*
Hyoscyamus		
Lycium	**Umbelliferae**	
Nicotiana	*Aethusa*	
Physalis	*Cicuta*	
Solandra	*Conium*	
Solanum	*Oenanthe*	

There are no rules for establishing common names of plants. Common names can be highly misleading and may erroneously suggest toxicity or the lack of toxicity. For example, a plant known as a "pepper" plant could be the sweet pepper commonly eaten as a vegetable (*Capsicum annuum* L. var. *annuum*); or one of the extremely hot, virtually "inedible" peppers (particularly when eaten in quantity and certainly depending on the person's palate) used as a decorative houseplant in that same species but containing significant quantities of capsaicin; or the spice plant from which we derive black pepper (*Piper nigrum* L.); or the pepper bush (*Leucothoe* species) containing grayanotoxins; or the pepper tree (*Schinus molle* L.) with triterpene-containing berries; or any number of other species with "pepper" as part of its common name. Another problem associated with common names is that they can sometimes lead to the assumption that plants are related—either botanically or toxicologically. For example the "hellebore," *Helleborus niger* L., is in the family Ranunculaceae, but it bears no relationship to the "false hellebore," *Veratrum viride* Aiton, a member of the family Liliaceae; the former species contains toxic glycosides and saponins and the latter contains toxic alkaloids. The botanical (binomial) nomenclature is essential for ensuring proper plant identification.

Common names are included throughout this book only to facilitate in the identification of a particular plant in question. Many common names are no longer in use and others have been developed, but there is no way to verify contemporary use except by interviewing the inhabitants of a region and recording their responses. Thus, for a compilation of common names in this text we depended on the literature. The common names of native species from the United States and Canada are taken from Kartesz and Kartesz (1980). Names for West Indian species and Guam were selected from the floras listed in the references. Common names for cultivated plants were taken primarily from *Hortus Third*. In addition to floras, Hawaiian names are from Neal (1965), Cuban names from Roig y Mesa (1953), and Mexican names from Aguilar and Zolla (1982). Many less-common, older names for plants in the United States were selected from Clute (1940). When bolded, the common name connotes the most widely employed name in contemporary use in the United States.

Care must be exercised when evaluating poisonous plant literature. In some instances, information on the toxicity of plants in grazing animals is extrapolated to predict that which may occur in humans. Unsubstantiated plant lore has passed through generations of textbooks; we have attempted to remove as much lore as possible. Even evaluations based on human case reports, which act as the foundation for this book, may be flawed by erroneous identification of the plants or inappropriate attribution of the clinical effects to the plant.

Glossary of Botanical Terms

This list of botanical and horticultural terms is provided to aid in understanding the plant descriptions found in the text. The terms have mostly been taken from two primary references, *Manual of Vascular Plants of Northeastern United States and Adjacent Canada,* Second Edition (Henry A. Gleason and Arthur Cronquist, 1991) and *Hortus Third: A Concise Dictionary of Plants Cultivated in the United States and Canada* (Liberty Hyde Bailey and Ethel Zoe Bailey, Revised and Expanded by The Staff of the Liberty Hyde Bailey Hortorium, 1976). Some definitions have been modified from the original for ease of use and understanding by the nonbotanist, and the reader is urged to consult a botanical textbook if greater detail is required. The botanical illustrations are by Bobbi Angell.

Alternate: Arranged singly at different heights and on different sides of the stem— as in alternate leaves.

Annual: Yearly; a plant that germinates, flowers, and sets seed during a single growing season.

Anther: The portion of the stamen of a flower that contains the pollen, usually having two connected pollen sacs.

Aril: A specialized, usually fleshy outgrowth that is attached to the mature seed; more loosely, any appendage or thickening of the seed coat.

Bark: Outer surface of the trunk of a tree or woody shrub.

Bearded: Bearing a tuft or ring of rather long hairs.

Berry: The most generalized type of fleshy fruit, derived from a single pistil, fleshy throughout, and containing usually several or many seeds; more loosely, any pulpy or juicy fruit.

Biennial: Living 2 years only and blooming the second year.

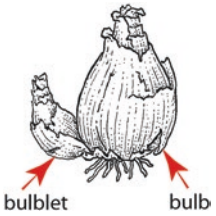
Blade: The expanded, terminal portion of a flat organ such as a leaf, petal, or sepal, in contrast to the narrowed basal portion.

Bony: Hard surface as in a bone.

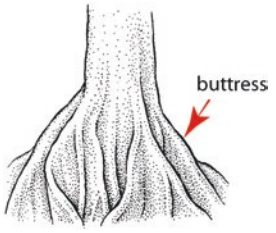
Bract: Any more or less reduced or modified leaf associated with a flower or an inflorescence that is not part of the flower itself.

Bulbil, bulblet: Diminutive of bulb; one of the small new bulbs arising around the parent bulb; a bulblike structure produced by some plants in the axils of leaves or in place of flowers.

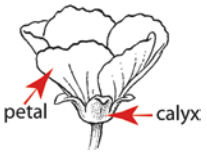
Bulb: A short vertical, underground shoot that has modified leaves or thickened leaf bases prominently developed as food-storage organs.



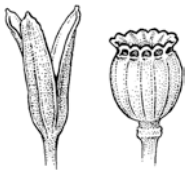
Buttress: Flattened support structures at the base of the trunk of certain types of trees, particularly in the tropics.



Calyx: All the sepals of a flower, collectively.



Capsule: A dry, dehiscent fruit composed of more than one carpel.

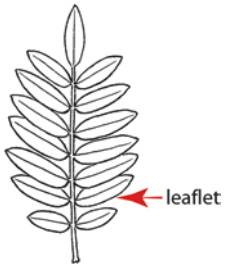


Carpel: The fertile leaf of an angiosperm that bears the ovules. The pistil (female part of the flower) is made up of one or more carpels, where the seeds normally are found.

Climbing: Growing more or less erect without fully supporting its own weight, instead leaning, scrambling, twining, or attaching onto some other structure such as a tree or wall.

Coarse: Rough, as in the texture of a leaf.

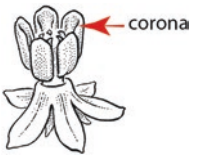
Compound leaf: A leaf with two or more distinct leaflets.



Cone: A cluster of sporophylls or ovuliferous scales on an axis; a strobilus, as in pine or cycad cones.

Corolla: All the petals of a flower collectively.

Corona: A set of petal-like structures or appendages between the corolla and the androecium (male element of the flower).



Creeping: Growing along (or beneath) the surface of the ground and rooting at intervals, usually at the nodes.

Cultivar: A horticultural variety originating from a cultivated plant, possessing interesting or important characters such as color, smell, taste, or disease resistance that make it worthy of distinction through naming.

Cuttings: Small pieces of stems or roots that can be put in soil to develop into a complete plant.

Cyme: A broad class of inflorescences characterized by having the terminal flower bloom first, commonly also with the terminal flower of each branch blooming before the others on that branch.

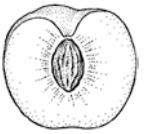
Deciduous: Falling after completion of the normal function. A deciduous tree is one that normally loses its leaves at the approach of winter or the dormant season.

Dehiscent: Opening when mature, exposing or releasing the contents, as in a fruit releasing it seeds.

Dicotyledons: One of the two major divisions of the angiosperms (a group characterized by having ovules borne in ovaries) bearing two (or rarely more) cotyledons or seed leaves, comprising most of the familiar seed plants.

Divided: Cut into distinct parts, as a leaf that is cut to the midrib or the base.

Drupe: A fleshy fruit with a firm endocarp ("pit" or "stone") that permanently encloses the usually solitary seed, or with a portion of the endocarp separately enclosing each of two or more seeds.



Ellipsoid: Elliptical in long section and circular in cross section (applied only to three-dimensional bodies).

Elliptic: With approximately the shape of a geometric ellipse (applied only to flat bodies).

Erect: Upright.

Escaped: As in an introduced plant species that has escaped from cultivation into the wild.

Evergreen: Remaining green throughout the winter, as in a tree that keeps its leaves throughout the year.

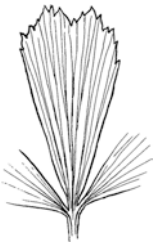
Feathery: Feather shaped in outline, as in leaves.

Female flowers: Referring to flowers that are pistillate, having pistils but no stamens.

Filament: The stalk of a stamen, that is, the part that supports the anther.

Finely toothed leaves: Leaves with small serrations on the edges.

Fishtail-shaped: As in leaflets of some palms that have a somewhat irregularly triangular or "fishtail" outline.



Fleshy: Thick and juicy; succulent.

Floral bracts: Greatly reduced leaf associated with a flower, usually at its base.

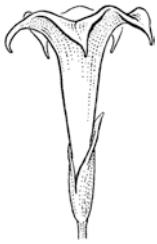
Floral branches: Branches or axes on which flowers are formed.

Flower: An axis bearing one or more pistils or one or more stamens or both.

Fruit: A ripened ovary along with any other structures that may ripen with it and form a unit with it.

Fruit pulp: Fleshy material inside of a fruit, often the part that is eaten by humans or animals.

Funnel-form: Shaped like a funnel, as in a flower.



Furrowed (stems): Having longitudinal channels or grooves along the stem.

Glaucous: Covered with a fine, waxy, removable powder that imparts a whitish or bluish cast to the surface, as in a prune or a cabbage leaf.

Globose: More or less spherical.

Glossy: Shiny.

Head: A cluster of flowers crowded closely together at the tip of a floral stem.

Herb: A plant, either annual, biennial, or perennial, with the stems dying back to the ground at the end of the growing season, and without woody stems.

Herbaceous: Adjectival form of herb; also, leaflike in color or texture, or not woody.

Hilum: The scar of the seed at its point of attachment.

Horticultural varieties: As in cultivars.

Hybrid: A plant that results from a cross between two parent species that are genetically different.

Indehiscent: Remaining closed at maturity.

Inflorescence: A flower cluster of a plant; the arrangement of the flowers on the axis.

Juvenile leaves: A younger form or shape of the leaves of a plant, which change when the plant reaches maturity.

Lacy leaves: As in the shape of leaves with many tears or cuts.

Lance-shaped: As in leaves that are several times longer than broad and widest below the middle, tapering with convex sides upward to the tip.

Latex: A colorless, white, yellow, or reddish liquid, produced by some plants, characterized by the presence of colloidal particles of terpenes dispersed in water.

Leaflet: An ultimate unit of a compound leaf. (see **Compound leaf**).

Leathery: Thick and leatherlike in texture, as in a leaf.

Lobe: A projecting segment of an organ, too large to be called a tooth, but with the adjoining sinuses usually extending less than halfway to the base or midline.

Mature fruit: A fruit that has ripened; often a different color from when it was young.

Midrib: The main rib or longitudinal vein (an externally visible vascular bundle) of a leaf or leaflet.

Milky latex: White-colored sap of a plant.

Monocotyledons: One of two major divisions of the angiosperms (a group of plants characterized by having ovules borne in ovaries), bearing only one cotyledon or seed leaf, for example, the grasses, lilies, bromeliads, orchids, and palms.

Native: Having its origins in a particular geographic area, as in a plant native to the Western United States.

Naturalized: Thoroughly established in a particular geographic region, but originally coming from another geographic area.

New World: Pertaining to the Western Hemisphere, particularly the Americas, as in a plant native to that region.

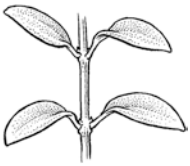
Nut: A relatively large, dry, indehiscent fruit with a hard wall, usually containing only one seed.

Oblong: Shaped more or less like a geometric rectangle (other than a square).

Obovate: Similar to ovate but larger toward the tip of the leaf.

Old World: Pertaining to Europe, Asia, and Africa, as in a plant native to that region.

Opposite: Situated directly across from each other at the same node or level, as in the leaves or leaflets of some plants; situated directly in front of (on the same radius as) another organ, as stamens opposite the petals.



Ovate: Shaped like a long section through a hen's egg, with the larger end toward the base.

Ovule: A young or undeveloped seed.

Palmately compound: As in a leaf with three or more lobes arising from a common point.

Panicle: A branching indeterminate inflorescence, usually broadest near the base and tapering upwards.

Pantropical: Found throughout the tropical regions.

Pedicellate: Borne on a pedicel (stalk of a single flower in an inflorescence).

Pendant: Hanging, as in pendant racemes of flowers.

Perennial: A plant living more than 2 years.

Petal: A member of the inner set of floral leaves, usually colored or white and serving to attract pollinators.

Pistil: The female organ of a flower, ordinarily differentiated into an ovary, style, and stigma.

Pit: Hardened covering enclosing seed or seeds in a fruit, as in a peach.

Pleated: When young, as in a leaf, folded several times along the length.

Pod: Any kind of dry, dehiscent fruit.