The background of the cover is a detailed botanical illustration in a light green, stippled style. It features various plants, including what appears to be a belladonna (Atropa belladonna) with its characteristic bell-shaped flowers and clusters of berries, and other leafy plants with different flower shapes. The illustration is dense and covers the entire page.

# DEVIL'S GARDEN

An Encyclopaedia  
of  
**Toxic &  
Poisonous  
Plants**

Mariah Arden King

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of  
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1916

# INTRODUCTION

The physiology of plants has been studied since ancient times. Many plants have been found to be healthful and medicinal. But some have been found to be toxic and/or poisonous, many lethal.

Experts over the past two centuries have written books on the subject of toxicology. Those who made great impacts on the study of toxic and poisonous plants include: the illustrious Mathieu Joseph Bonaventure Orfila (1787-1853), the author of "Treatise of General Toxicology" (1813), and long considered to be the father of modern toxicology as a result of developing a method to detect and remove poisonous substances from the human body in order to study them and confirm that their chemical properties were the cause of a death; Rudolph August Witthaus, M.D. (1846- ), an American physician, chemist, and toxicologist, author of several books on forensic toxicology, and chair and professor of chemistry and physics at Cornell University Medical College since 1898; and, William A. Guy and David Ferrier, who devoted a full 280 pages to poisonings in their book "Principles of Forensic Medicine" (1888).

Now joining their esteemed ranks is Mariah Arden King, a plant scientist-phytologist specializing in poisonous and toxic plants. In 1897, Mrs. King earned her degree in botany

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from Oberlin College in Ohio, graduating with honors. She became interested in medicinal and poisonous plants, and spent almost three years traveling throughout North America performing field studies of these plants under the guidance and support of experts in that specialized field, including indian medicine men from 23 tribes.

Mrs. King then returned to Ohio, and in 1902 left to settle in Monterey, California, where she works as the greenhouse manager for the prestigious 125-acre Hotel Del Monte.

In 1913, she began assembling her years of hands-on research into this book, "Devil's Garden," a small but important work. It contains a wealth of toxic and poisonous plant information with a succinct yet comprehensive history of poisonous plants, followed by their physiology, toxicity, and poisonous effects. And, it includes an encyclopaedia of 63 of the most common plants found to be toxic and/or poisonous.

Lastly, Mrs. King is not only an expert in dangerous plants. She is also an expert in other common types of toxic and poisonous substances. A brief explanation of those is included at the very end of this book.

Gregory M. Harden, M.D., Ph.D.  
Society for the Study of Plant Physiology  
1916

# A BRIEF HISTORY OF TOXIC AND POISONOUS PLANTS

Since ancient times, many plants have been recognized for their poisonous properties. Many caused accidental poisoning and even death. But people have also used them to commit murder, causing immense suffering to their victims in the process. Plant poisons are fairly common; even seeds from the common apple (*Malus sylvestris*) have the potential to kill if ingested in large doses. Apple seeds contain a substance called amygdalin which, when chewed, swallowed, and then metabolized by the body, turns into hydrogen cyanide, a known killer for which there is no antidote. Fortunately, the human body can detoxify this cyanide if the seeds are ingested only in very small amounts, and if they are ingested intact (not chewed), they usually pass through the digestive system without any ill effect.

Sometime between 3100 and 3000 BC, Menes, possibly the first pharaoh of upper and lower Egypt, studied poisonous plants and learned of the cyanide contained in the leaves and pits of the peach (*Prunus spp.*) and in the pits of cherries, apricots, bitter almonds and, as previously stated, in apples. The Egyptians knew of many other plant poisons as well, including opium (*Papaver somniferum*) and mandrake (*Mandragora officinarum*), the latter belonging to the Solanaceae or nightshade family.

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In 399 BC, the 70-year-old Greek philosopher Socrates was sentenced to death by suicide by drinking a concoction of poison hemlock (*Conium maculatum*), of the family Apiaceae, also known commonly as cowbane).

The ancient Romans made use of plant poisons as well. Nero's official poisoner was Locusta, who helped wealthy women eliminate their husbands, usually using the leaves and berries of belladonna (*Atropa belladonna*), also known as "deadly nightshade," another member of the Solanaceae family.

One of Locusta's alleged clients was Agrippina, the sister of Caligula, who hired Locusta to kill her third husband, Claudius, so that her son Nero could become emperor. Around 331 BC, to make sure the road was clear for Nero, Locusta likewise killed Claudius' son Britannicus (Nero's half-brother), this time using cyanide.

Between about 132-83 BC, Mithradates VI Eupator, King of Pontus, an ancient area on the south coast of the Black Sea, sought protection from poisoning by taking small amounts of poisons to generate a resistance to them. It is from this practice that we get the word "mithridatize," meaning to render a person immune to a poison.

According to Aulus Cornelius Celsus in "De Medicina," Mithradates is said to have created a daily antidote of poisonous plants to protect himself from such poisons. Mithradates was also said to have tested many plant poisons on condemned criminals.

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In the middle ages, the works of ancient scholars formed the basis for most knowledge of poisonous plants, including “The Book of Venoms” written by Magister Santes de Ardoynis in 1424. Such treatises were comprehensive but often confusing due to the use of so many different names for the same plants, a problem that still exists to this day, since many plants share the same common names.

As light dawned in the renaissance, plant poisons came into even more widespread use, particularly in the area of Naples, where the poisoners favored aconite (*Aconitum*, also known as wolfbane and monkshood), belladonna, hemlock (*Cicuta maculata*), jimson weed (*Datura stramonium*), and strychnine (*Strychnos nux vomica*).

The notorious Borgia family used them for their own nefarious reasons, primarily to advance their political goals. Rodrigo and his son Cesare were adept at poisoning with a variety of deadly substances. Cesare’s younger sister Lucrezia was close to her brother and was accused of many poisonings that were far more likely to have been committed by her brother.

In 1589, Giovanni Battista Porta wrote “Neopoliani Magioe Naturalis,” a treatise on poisoning with plant substances, including aconite (*Aconitum napellus*), bitter almonds (*Prunus dulcis amara*), and yew seeds (*Taxus baccata*).

In the 17th century England, there were several failed attempts to poison Queen

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Elizabeth, one with opium (*Papaver somniferum*). Elizabeth - whose mother Anne Boleyn once tried to poison her father, Henry VIII - took action against possible poisonings by having her food tasted, her clothing checked for poisons, and by being mitridatized.

In early 19th century London, Thomas Wainewright used strychnine (*Strychnos nux-vomica*). to remove several heirs, including his own uncle, so that he could inherit large sums of money. He was eventually caught and sent to a penal colony in Tasmania.

By the latter part of the century, strychnine was relatively easy to obtain, and poisoning had become a fashionable crime of the rich, who now had their lives insured, making them easy targets for their less than loving heirs. Strychnine was a favorite, and Thomas Cream of England was executed in 1892 for using it to poison prostitutes.

In 1888, a German scientist, Peter Hermann Stillmark, discovered ricin (*Ricinus communis*), the most deadly poison known.

More recently, in 1910 in England, Dr. Harvey Crippen, a homeopath, was having an affair with Ethel Le Neve. His wife disappeared, and Ethel moved into his home, raising suspicions about the whereabouts of Mrs. Crippen. Scotland Yard intervened, and Crippen was ultimately found guilty and hanged for murdering his wife with hyoscine, the plant alkaloid found in henbane (*Hyoscyamus niger*) and various other plants of the Solanaceae or nightshade family.

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So far this century, we have seen scientific advances that make the processing of poisons much easier. As a result, almost any educated person can learn about plant poisons, obtain the plants (sometimes in their own back yards), manufacture the poisons, and commit murder.

Cyanide, hyoscine, and strychnine are still popular and widely used, but newer poisons and more obscure plant poisons have been appearing as well, forcing toxicologists to find new ways to detect these toxic substances.

Some plants that are normally used for medicinal purposes are toxic when administered in large doses, and another doctor in England, Dr. Shipman, was found guilty of murdering 15 patients with diamorphine, an opium derivative (*Papaver somniferum*) used to alleviate pain.

It is interesting to note that the highly legally-obtainable tobacco (*Nicotiana tabacum*), which has been snorted, chewed, and smoked for centuries, is a member of the deadly Solanaceae family. It is probably one of the most deadly of plant poisons. In addition to the diseases it causes to the human body when used recreationally, it is also a poisonous plant in its own right. Smoking and chewing tobacco can result in optic neuropathy (vision deterioration and blindness), and ingesting parts of the plant can result in coma and death.

# PHYSIOLOGY OF TOXIC & POISONOUS PLANTS

All plants are composed of various chemical substances, but some are toxic or poisonous only to humans, some only to animals, and others to both. The difference between being toxic and being poisonous, is simply this: a toxic plant can cause harm, but a poisonous plant can be harmful or lethal if ingested.

The poisonous aspect of a plant is primarily due to the presence of one of the following organic compounds: alkaloids, glycosides, organic acids, resins, and phytotoxins. In addition, there are minerals other substances that can cause a plant to be poisonous, such as nitrates and selenium.

## Alkaloids

Alkaloids have a nitrogen-containing organic base. Alkaloids are colorless, odorless, nearly insoluble in water, and very bitter in taste. Alkali-like poisons - of which more than 5,000 types have been found in plants - all contain nitrogen which forms salts with acids. Sources of all alkaloids are flowering plants. Notable alkaloids are:

- 1) Opiates and codeines of the opium poppy;
- 2) Atropine-nicotine groups in the Solanaceae (nightshade family);
- 3) Curines (curare poisons) in tropical members of several plant families.

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Alkaloids generally produce physiological reactions in the nervous system. These reactions may be violent and acute or may be chronic.

### Glycosides

Glycosides (which are part glucoside) are complex carbohydrates which, on hydrolysis and in the presence of amino acids or enzymes, produce one or more simple sugars and non-sugar end products called aglycon. These carbohydrates are water soluble, bitter, often odor-producing and may be colored or colorless. Three primary groups of plant glycosides yielding toxic products on hydrolysis are:

1) Cyanogenetic glycosides in which the poisonous by-product is hydrocyanic acid or prussic acid such as that found in the species of *Sorghum*, *Prunus* (wild cherries, almonds) and *Linum* (flax), and which leaves an odor of almonds on the breath and body tissues after death (from benzaldehyde);

2) Saponin glycosides which can dissolve red blood cells and which are produced in the species of *Agrostemma* (cockle), *Digitalis* (foxglove), and *Actinea* (rubberweed); and,

3) Solanine glycosides produced in members of the nightshade family, especially berries of *Solanum*.

4) Cardiac glycosides are sugar compounds that act on the heart. These sugars are chemically bonded to another molecule. There are approximately 400 different ones in plants.

Among the common names for glycosides are digitoxin and oleandrin. The hydrocyanic

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acids cause death by asphyxiation, within minutes to an hour, by blocking the oxygen from the red blood cells to the tissues.

### **Organic Acids**

Only a few organic acids commonly found in plants are toxic in the amount or in the form in which they occur naturally.

The family of nettles (Urticaceae) gets its irritating properties from formic acid in the hairs of the leaves and stems of most species.

The toxic properties of the *Prunus* species (leaves, bark, and seeds) depend on the generation of hydrocyanic acid. Oxalic acid – the most common organic acid poison – usually occurs in the form of oxalates, which are present in considerable amounts in the leaves of rhubarb, in *Oxalis* and *Rumex* species, and in the rhizomes of the Jack-in-the-pulpit.

Oxalic acid poisoning results in colic, depression, coma, kidney failure, and death. Other organic acids include amino acid compounds such as those found in the amanita mushroom (*Amanita muscaria* or fly agaric).

### **Resins**

Resins are the toxic resins or resinoids which occur in poisonous members of the heath family (Ericaceae), water hemlock (*Cicuta*) of the carrot family, and in the milkweeds (Asclepiadaceae). For the most part, these resins are an insoluble gummy material of complex organic structure, localized in the resin- or latex-

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containing ducts of the plant. Their poisonous effects occur in the nerves and muscles.

### **Phytotoxins**

Phytotoxins are the toxic proteins in plants which become non-toxic when they are heated. They are readily absorbed without being broken down in the digestive system, and that is what makes them so very dangerous when they are eaten.

# POISONING & TOXICITY

Poisoning and/or toxicity from a plant can take the form of:

- 1) Blood poisons such as those found in Prunus, or in the seeds of the castor bean (*Ricinus*) and rosary pea (*Abrus*);
- 2) Nerve poisons such as those found in poisonous mushrooms, Jimson weed (*Datura*), and henbane (*Hyoscyamus*);
- 3) Neuromuscular poisons such as those found in the ergot fungus (*Claviceps*), and in foxglove (*Digitalis*), and curare poisons (*Chondrodendron*, *Strychnos*); and,
- 4) Muscular poisons such as those found in false hellebore (*Veratrum*).

A poisoning can be either acute or chronic. When there is a single dose of poison immediately followed by symptoms that imperil the victim, the poisoning is considered to be acute. However, when a person has been consuming a poison in low dosages for weeks or months and gradually begins to notice symptoms such as indigestion, a rash, or some form of nerve problems, then the poisoning would be considered to be chronic.

It is difficult to diagnose poisoning from other types of health problems unless there is a history from a patient that indicates what they ate or with what they came in contact. A victim of poisoning can only be treated properly

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if the exact type of poison is known. Also, the dose of poison needed to kill differs from one person to another depending on the health and condition of the person.

In some cases, vomiting can be induced with water or milk to remove the poisons from the system. In more severe cases, the stomach may need to be pumped, particularly if the poisoning victim is unconscious. However, induced vomiting should not be used as a routine procedure, since it can cause additional corrosive damage to the mouth and throat, as well as the rest of the upper gastrointestinal system, and it could also force the toxic substances into the bronchi and lungs.

If the suspected poisoning victim is not breathing (the most common result of acute poisoning), or if they are in shock or having convulsions, they should be immediately transported to a doctor or hospital.

While most plant poisonings do not kill immediately, some, such as the cyanides, can kill within a few minutes. So, if in doubt, head for the nearest doctor or hospital.

You probably have at least one toxic or poisonous plant growing in your garden, and probably several in your neighborhood. The substances found in these plants can be deadly.

# ENCYCLOPAEDIA OF TOXIC & POISONOUS PLANTS

The following is a brief encyclopaedia of some of the most common toxic and poisonous plant species, along with their plant family names, common names, and symptoms of toxicity and/or poisoning.



*Abrus precatorius* [Fabaceae]  
(precatory bean/pea, rosary pea).

A single seed can kill an adult. Symptoms may not appear for one to three days. Phytotoxins are abrin and the tetanic glycoside, abric acid, which are chemically related to the toxins produced by bacteria and snake venoms. Abrin is a toxalbumin

that inhibits protein synthesis causing cell death. Symptoms of poisoning may not appear immediately. They include anemia, circulatory collapse, cold sweat, coma, convulsions, diarrhea, drowsiness, fast pulse, general weakness, kidney failure, labored breathing, nausea, severe stomach pain, trembling, vomiting, and weak pulse. May cause death if ingested in quantity. The seeds are large and used as beads on Mexican necklaces. The plant is grown in the south and central parts of Florida.

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*Aconitum napellus*, *A. columbianum* [Ranunculaceae] (monkshood, wolfsbane, aconite, buttercup).

Grows in cool, damp, mountainous areas. Has blue or yellow flowers. A. ferox roots are the source of the Nepalese poison "bikh" (a.k.a. "bish" or "nabee"). Aconitum's toxic properties come from pseudoaconitine, one of the deadliest poisons. It causes a tingling sensation in the mouth, skin, and stomach, followed by vomiting, diarrhea, muscular weakness, spasms, weak pulse, respiratory failure, dimming vision, low blood pressure, and convulsions. There is no antidote. Even a small drop of the plant can be fatal. The roots and seeds are most toxic, containing aconine and aconitine, and are at their most toxic when the plant is in its pre-flowering stage. The roots can be mistaken for horseradish.



*Actaea rubra* [Ranunculaceae] (red baneberry).

All plant parts are toxic, especially the roots and berries. The plant contains cardiogenic toxins. The berries, when ingested, have a sudden sedative effect on the heart and can lead to cardiac arrest. Symptoms include vomiting, delirium, and stomach cramps, and children are most susceptible. Many Indian tribes use the baneberry medicinally and also to poison their arrows.

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*Amanita phalloides*, *A. muscaria* [Amanitaceae] (destroying angel, deadly amanita, death cap, fly agaric). The most dangerous species of mushroom. Accounts for almost all mushroom poisonings. One or two mushrooms can kill, even cooked. One-third of the cap can kill a child. Symptoms occur from six to 24 hours after ingestion: intense abdominal pain, profuse vomiting, diarrhea, circulatory failure, coma, liver damage/jaundice, death. Often ingested as *Agaricus campestris*, which it resembles when young and not yet poisonous.



*Anemonoides nemerosa*,  
*Anemone nemerosa* [Ranunculaceae] (wood anemone, moonflower).

Medicinally, it is used to treat gout, headaches, rheumatism, and leprosy. But all parts contain the toxic glycoside protoanemonin. Contact causes blistering rashes and dermatitis.

Tastes bitter but ingestion can cause dizziness, spasms, nausea, vomiting, hepatitis, jaundice, and paralysis.

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*Astragalus spp.* [Leguminosae] (locoweed). Contains alkaloids that are toxic. There are hundreds of species, all toxic, even when they are dried out. All are capable of causing immediate death or chronic poisoning which ultimately leads to death.



*Atropa belladonna* [Solanaceae] (deadly nightshade). This plant is an ornamental in the southwest part of the United States. The bulbs contain the toxic alkaloids, which cause respiratory paralysis. A mere three berries can kill a child.



*Buxus longifolia* [Buxaceae] (box tree). This plant's black glossy seeds can be fatal when eaten, particularly by children.



*Caladium spp.* [Araceae] (elephant ears). The parts of these plants all contain calcium oxalate raphides which cause burning and intense irritation of the lips, mouth, and pharynx.

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*Chelidonium majus* [Papaveraceae] (greater celandine, swallow wort). This herbaceous plant of the poppy family grows up to 2' in height. It contains isoquinoline alkaloids, with sanguinarine being the most harmful. It also contains chelidonine, chelerythrine, berberine, and coptisine. All plant parts are harmful if eaten. The yellowish-orange sap is a skin and eye irritant and is highly toxic if ingested, especially to the liver. But the sap is also used to treat warts.

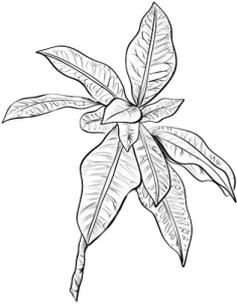


*Cicuta maculata*, *C. douglasii*, *Cicuta spp.* [Apiaceae, Umbelliferae] (water hemlock, cowbane). This is probably the most violently poisonous plant in the northern temperate zone of the world. At least 30% of all poisonings are fatal. The roots and new growth are the most toxic, as is the fruit. The toxin, cicutoxin, acts on the central nervous system causing frothing at the mouth, spasms, tremors, dilated pupils, intestinal distress and pain, diarrhea, convulsions, delirium, respiratory failure, paralysis, and death. A single mouthful or two bites of the root is enough to kill an adult male within 30 minutes.

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*Claviceps purpurea*  
[Clavicipitaceae] (ergot). This is a dark fungus that grows on grain plants such as wheat and rye. It produces alkaloids that cause seizures and hallucinations in humans and other mammals that ingest the contaminated grain.



*Codiaeum tiglium*, *Codiaeum*  
*spp.* [Euphorbiaceae] (croton). Ingestion of the seeds, which contain "oil of croton," cause a burning pain in the mouth and stomach, rapid heartbeat, bloody diarrhea, coma, and in severe cases, death. A lot of seeds have to be ingested by an adult to be fatal.



*Colchicum autumnale*  
[Colchicaceae] (autumn crocus). The toxin in this plant is an alkaloid called colchicine, which is present in all parts of the plant. When ingested, symptoms of poisoning include a burning in the mouth, nausea, vomiting, severe diarrhea, respiratory problems, muscle weakness, kidney failure, circulatory collapse, shock, and often death.

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*Conium maculatum* [Apiaceae, Umbelliferae] (poison hemlock). The leaves are often mistaken for parsley. The seeds and the roots are the most toxic, as they contain the alkaloid conine and other related alkaloids. The plant has a very unpleasant taste, so voluntary ingestion is unlikely.



*Convallaria majalis* [Convallariaceae, Liliaceae, Ruscaceae] (lily of the valley). Contains a glycoside, convallotoxin, which is similar to the action of digitalis. It acts as a stimulus to the heart and also contains irritating saponins. The water in which lily of the valley is kept is poisonous and can kill if accidentally ingested. Symptoms of poisoning include mouth pain, nausea, vomiting, abdominal pain, cramping, diarrhea, headache, dizziness, hallucinations, depression, heart failure, and death.



*Cotoneaster* spp. [Rosaceae] (cotoneaster). Berries are toxic to humans. They contain cyanogenic glycosides which can release cyanide into the body. Even small amounts can cause gastrointestinal distress in humans and animals. Larger quantities can be fatal to small animals and children.

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*Datura meteloides, D. wrightii* [Solanaceae] (devil's weed, jimson weed, moonflower). The seeds are toxic, and only 20 can cause poisoning in an adult. Symptoms of poisoning include dry mouth, thirst, redness of skin, disturbed vision, pupil dilation, nausea, vomiting, headache, hallucinations, excitement, rapid pulse, delirium, incoherent speech, convulsions, elevated temperature, high blood pressure, coma and, in severe cases, death.



*Dieffenbachia maculata* [Araceae] (dumb cane). Leaves contain water-insoluble calcium oxalate raphides and protein-based toxins. There is immediate and intense pain on contact with the mouth. The mucus lining swells and speech may become intelligible or impossible. Contact dermatitis and inflammation of the cornea and the conjunctiva are also common.



*Digitalis purpurea* [Plantaginaceae] (foxglove). All plant parts contain cardiac glycosides, mainly digitoxin. They are toxic if ingested, inhaled, or in contact with the skin. Ingestion, in particular, can cause severe poisoning. Digitalis is used to treat heart ailments.

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*Epipremnum aureum* [Araceae] (golden pothos, devil's ivy). The leaves contain calcium oxalate raphides. These cause burning and swelling of the tissues in the mouth. Skin contact may result in dermatitis. Ingestion may cause diarrhea.



*Euphorbia* spp., *E. myrsinites* [Euphorbiaceae] (euphorbia, donkey tail). The milky sap contains terpenes. It is a skin and eye irritant, causing dermatitis, and inflammation of the eye. If ingested it may cause nausea, vomiting, and diarrhea. *E. pulcherrima* (poinsettia) does not contain the toxic terpenes common to other species.



*Fritillaria persica* [Liliaceae] (Persian lily). All parts contain toxic alkaloids. Ingestion causes nausea, vomiting, and diarrhea. Skin contact can cause irritation and dermatitis.



*Galanthus nivalis* [Amaryllidaceae] (snowdrop). The bulb contains lycorine which affects the heart and nervous system. Symptoms of poisoning include nausea, vomiting, and diarrhea.

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*Gelsemium sempervirens* [Loganiaceae, Gelsemiaceae] (yellow jasmine). The roots and nectar contain the alkaloids gelsemine and gelseminine. Symptoms of poisoning include profuse sweating, nausea, vomiting, muscle weakness, double vision, convulsions, respiratory problems, paralysis of motor nerves, and death.



*Gloriosa spp.* [Colchicaceae, Ruscaceae] (gloriosa lily). The tubers are the most toxic. They contain colchicine and other alkaloids that result in death within four hours of ingestion. Oral contact results in numbness and burning of the lips, tongue, and throat. Ingestion results in burning of the stomach, vomiting, diarrhea, difficulty breathing, shock, convulsions, respiratory failure, and death.



*Hedera helix, H. canariensis* [Araliaceae] (English ivy, Algerian ivy). The leaves and berries are poisonous, containing hederin. Symptoms of poisoning include burning in the throat, gastroenteritis, vomiting, and diarrhea.

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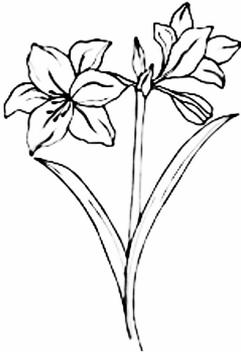


### *Helleborus niger*

[Ranunculaceae] (Christmas rose). Entire plant contains

digitalis-like glycosides, saponins, and irritants.

Symptoms of poisoning include pain in mouth and abdomen, nausea, vomiting, cramping, and diarrhea. Toxicity of the digitalis glycoside can result in rhythmic disturbances in the heart.



### *Hippeastrum spp.*

[Amaryllidaceae] (amaryllis).

The bulb contains emetic lycorine and small amounts of related alkaloids. Ingestion in large amounts results in nausea, vomiting, and diarrhea.



### *Hydrangea spp.* [Hydrangeaceae] (hydrangea).

The flower buds are extremely toxic containing a glycoside which reacts with water or saliva to release cyanide ions. The symptoms of poisoning include abdominal pain, vomiting, lethargy, sweating, and sometimes coma.

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*Hyoscyamus niger* [Solanaceae] (henbane). This is an herb that produces a fetid odor when crushed. Seeds and pods contain the alkaloids hyoscyine (scopolamine) and hyoscyamine, which can be fatal when ingested in large quantity, but in lesser amounts acts as a muscle relaxant. Toxicity results in delirium, agitation, confusion, tachycardia, arrhythmia, vertigo, and low blood pressure.



*Ilex aquifolium* [Aquifoliaceae] (holly). Holly contains illicin and saponic glycosides. The berries and leaves are toxic, but the leaves are spiny so less likely to be eaten. The berries lack taste but if ingested can cause vomiting, diarrhea, dehydration, and drowsiness. Fatalities are possible if ingested by small children.



*Iris spp.* [Iridaceae] (iris). The roots of some species are toxic. They contain an irritant resin. Symptoms of poisoning include stomach and intestinal pain, nausea, vomiting, and diarrhea.

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*Lantana spp.* [Verbenaceae] (lantana). This plant is found all over the United States. It's green berries are the most toxic part. Symptoms of poisoning include stomach and intestinal irritation, bloody diarrhea, vomiting, muscular weakness, jaundice, circulatory collapse and, in severe cases, death.



*Lilium longiflorum* [Liliaceae] (Easter lily). Lilies, in general, are toxic. All parts of the plant, including any water in a vase, are poisonous. Housecats are particularly susceptible to being poisoned from drinking the water in a lily's vase, which causes kidney failure and possible death. Small children are also at risk. Early symptoms include vomiting, dehydration, and lethargy.



*Lobelia cardinalis, Lobelia spp.* [Campanulaceae, Lobeliaceae] (lobelia). All parts of the plant are poisonous and contain lobeline, lobelamine, and other alkaloids. Can be fatal. Symptoms of poisoning include nausea, vomiting, dizziness, headache, sweating, exhaustion, weakness, lowered temperature, prostration, feeble pulse, dilated pupils, abdominal pain,

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stupor, tremors, convulsions, respiratory failure, and coma.



***Lupinus argenteus*** [Fabaceae] (lupin). Lupin contains quinolizidine alkaloids which is toxic to humans and animals, including livestock (such as sheep and cattle), when ingested. It is especially toxic to small children. Seeds and pods are the most toxic parts. Symptoms of poisoning include neurological effects such as dizziness, imbalance, and a general lack of coordination. Death can occur in severe cases.



***Mahonia aquifolium*** [Berberidaceae] (Oregon grape). The berries are not toxic, but the rest of the plant is. The leaves, stems, and roots contain berberine, which can cause dizziness, headache, muscle aches, and abdominal problems such as nausea, constipation, gas, and diarrhea. Some indian tribes eat the tart berries and also use them medicinally for heart ailments.

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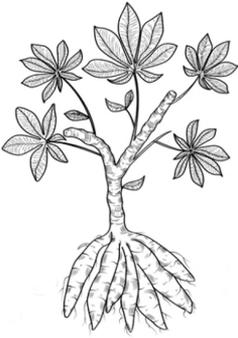


*Malus sylvestris* [Rosaceae] (apple and also plums, cherries, apricots, peaches, nectarines, and bitter almonds). The seeds and pits contain amygdalin, which when chewed, swallowed, and then metabolized by the body, turns into hydrogen cyanide (prussic acid). Kills in large doses. A single cup of crushed seeds or pits is sufficient to be fatal. If a person swallows them whole (intact, unchewed), the body can detoxify the cyanide. Symptoms of poisoning include nausea, vomiting, abdominal pain, diarrhea, muscle tremors, difficulty breathing, bluish skin, convulsing, general paralysis and, in severe cases, death.



*Mandragora officinarum* [Solanaceae] (mandrake, nightshade family). The plant contains tropane alkaloids, which are poisonous. The root contains hyoscyine. It is used by some cultures as a narcotic, sedative, or emetic. Some people have used it for its hallucinogenic properties.

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*Manihot spp.* [Euphorbiaceae] (cassavas, tapiocas, manioc). The roots are toxic when raw. They contain amygdalin, a soluble cyanogenetic glycoside that breaks down into hydrocyanic acid (cyanide). Symptoms of poisoning include muscular incoordination, convulsions, coma, and death, usually within minutes of ingestion.



*Menispermum canadense* [Menispermaceae] (moonseed, yellow parilla). All plant parts are poisonous, the principal toxin being dauricine, an alkaloid. The fruit, often called "moon berries," is most toxic and ingestion can be fatal. This plant is often confused with wild grapes. A simple way to know the difference is that grape vines have forked tendrils and the moonseed plant does not. Some indian tribes use moonseed as a laxative, and the root in a salve for skin diseases.

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*Monstera deliciosa* [Araceae] (split-leaf philodendron, Swiss cheese plant). Contact between the leaves and the mouth results in burning of the lips and mouth, acute inflammation, blistering and swelling of the tissues, hoarseness, and difficulty swallowing.



*Narcissus* spp. [Amaryllidaceae] (daffodil, jonquil, narcissus). The bulbs contain lycorine, which can paralyze the heart and number the central nervous system. The bulbs also contain alkaloids. Symptoms of poisoning include nausea, vomiting, and diarrhea.



*Nerium oleander* [Apocynaceae] (oleander). Ingestion of a leaf can be fatal to an adult in as little as a day. The cardiac glycosides oleandrin and nerioside have effects similar to those of digitalis. Symptoms of poisoning include nausea, vomiting, stomach pain, bloody diarrhea, dizziness, slowed pulse rate, cold extremities, irregular heartbeat, dilated pupils, drowsiness, unconsciousness, lung paralysis, convulsions, coma, and death.

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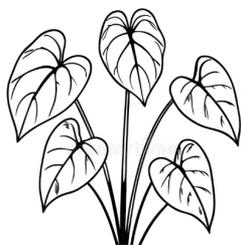


*Nicotiana tabacum* [Solanaceae] (tobacco). This substance, which has been snorted, chewed, and smoked for centuries, is a member of the deadly Solanaceae family. It is probably one of the most deadly of plant poisons. In addition to the diseases it causes to the human body when used recreationally, it is also a poisonous plant in its own right. Smoking and chewing tobacco can result in optic neuropathy (vision deterioration and blindness), and ingesting parts of the plant can result in coma and death.



*Papaver somniferum* [Papaveraceae] (common poppy, opium). The opium poppy should not be confused with a garden poppy. The poison is in the morphine and other plant alkaloids found in the dried milky sap and fruits (not the seeds like those used on top of pastries). Symptoms of poisoning include shallow and slow breathing, stupor, respiratory distress, circulatory depression, coma, and death. Heroin, a derivative, is used in treating severe cancer pain, and can cause death in large doses.

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*Philodendron scandens* [Araceae] (heartleaf philodendron). Leaves contain raphides containing calcium oxalate (oxalic acid) in addition to irritant proteins. Symptoms of poisoning on contact with the mouth include pain and burning of the lips, mouth, and tongue, and on ingestion, pain and burning of the throat. Contact with the plant juices can result in dermatitis.



*Prunus caroliniana* [Rosaceae] (laurel cherry, Carolina cherry). Seeds and leaves contain the cyanogenic glycoside amygdalin, which breaks down into the prussic acid (cyanide) when water is added. Seeds are the most toxic. Symptoms of poisoning include dizziness, stupor, headaches, spasms, twitching, paralysis of vocal cords, excessive salivation, difficulty swallowing and breathing, convulsions, coma, and sometimes death.

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*Pyracantha spp.* [Rosaceae] (firethorn). The seeds and leaves contain cyanogenic glycosides and are toxic, especially for pets and other animals (except birds), and especially if eaten in large quantities. Symptoms of poisoning include nausea and vomiting. The tasteless red-orange berries are generally safe for consumption.



*Ricinus communis* [Euphorbiaceae] (castor bean). The entire plant is toxic owing to the phytotoxin ricin, the most toxic substance known. The seeds are especially toxic. Ingesting only 2-8 can be fatal to an adult in one to twelve days. Symptoms of poisoning include burning of the mouth, nausea, vomiting, stomach pain, bloody diarrhea, excessive thirst, prostration, dullness of vision, convulsions, kidney failure, circulatory collapse, and death.

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*Ruta graveolens* [Rutaceae] (rue). Rue is used by the indians to treat heart problems and cancer, and bacterial and fungus infections. It is also used as an anti-venom for snake bites. But, it is also toxic. It can cause infertility, miscarriages, and abortions. Ingestion of the leaf sap can cause gastrointestinal irritation, fainting, sleepiness, weakened pulse, swollen tongue, vomiting, and kidney and liver damage.



*Solanum nigrum*, *S. dulcamara*, *S. tuberosum* [Solanaceae] (black nightshade, bittersweet nightshade, potato). Unripe berries contain the glyco-alkaloid solanine, which affects the nervous system. The indians use nightshade to treat fevers, stomach ailments, and skin diseases. But ingestion can be fatal. In potatoes, the solanine is concentrated in the green layer next to the skin and in the “eyes” or sprouts. Symptoms of poisoning include headache, stomach pain, vomiting,

diarrhea, dilated pupils, below normal body temperature, shock, circulatory and respiratory depression, loss of sensation, paralysis, and death.

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*Sophora secundiflora*, *Sophora* spp. [Fabaceae] (mescal bean). The seeds are most toxic and contain the cytisine alkaloid and other poisonous alkaloids. The seeds have to be crushed or chewed to be poisonous. A single seed chewed by a child can be fatal. Symptoms of poisoning include nausea, vomiting, diarrhea, excitement, delirium, hallucinations, coma, and death.



*Spathiphyllum* spp. [Araceae] (peace lily, white anthurium). All parts of the plant contain water insoluble raphides of calcium oxalate. Contact with the mouth results in burning, irritation, and swelling of the lips, mouth, tongue, and pharynx. Ingestion causes gastroenteritis. Root juices can cause contact dermatitis.



*Strychnos* spp., *S. nux vomica* [Loganiaceae] (poison nut). This tree from India is the primary source of strychnine, which is found mainly in the bark and seeds. It has a very bitter taste due to the monoacid base causing an alkaline reaction. It rapidly enters the blood stream where it then acts on the central nervous system. Symptoms of

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poisoning occur within 15-20 minutes and include stiffness at the back of the neck, muscle twitching, a feeling of impending suffocation, whole body convulsions alternating with relaxation periods, and death.



*Taxus spp., T. baccata*  
[Taxaceae] (**yew**). The entire plant is poisonous, but the berries and seeds contain the highest levels of the taxine alkaloid. About 1/3 cup of needles can be fatal. Symptoms include nausea, vomiting, and dizziness. A lethal dose results in cardiogenic shock, which includes rapid breathing and shortness of breath, tachycardia, low blood pressure, sweating, and loss of consciousness.



*Thevetia peruviana*  
[Apocynaceae] (**yellow oleander**). The fruit is the most toxic. It contains the toxic cardiac glycosides thevetin and peruvoside, and it has effects similar to those of digitalis. A single fruit can be fatal to an adult. Symptoms of poisoning include nausea, vomiting, diarrhea, dilated pupils, drowsiness, irregular pulse and heartbeat, high blood pressure, convulsions, heart failure, and death.

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*Triglochin maritima* and *T. palustris* [Juncaginaceae] (sea arrowgrass, marsh arrowgrass). This is not really a grass. It is a plant that grows in areas with very moist soils. It becomes its most toxic to humans and animals when it is stressed and dry due to lack of moisture, often in hot summers. The toxin is hydrocyanic acid (hydrogen cyanide in water, also known as prussic acid). Poisoning causes rapid breathing, cyanosis, seizures/convulsions, pulmonary congestion, coma, death.



*Veratrum* spp. [Melanthiaceae] (false hellebore, cow cabbage, bittersweet). Rhizomes and roots are more toxic than the leaves and stems. They contain steroidal alkaloids. Grazing livestock (cows, sheep, goats, etc.) are most affected, and ingestion can lead to deformities in unborn animals or dystocia (inability to deliver normally). Symptoms of poisoning include excessive salivation, frothing at the mouth, vomiting, loss of balance, fast or irregular heartbeat, shallow breathing, convulsions, and coma.

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*Viscum album* and *Phoradendron* [Santalaceae] (mistletoe). The toxic ingredient, phoratoxin, is found in all parts of the plant. The berries are the most toxic. They contain the amines beta-phenylethylamine and tyramine which can be fatal within a few hours if ingested.

They can affect any or all parts of the body, especially the ears, eyes, nose, mouth, throat, stomach, and intestines. Symptoms of poisoning include blurred vision, delirium, convulsions, difficulty breathing, slowed pulse, weakness, drowsiness, stomach and intestinal pain, diarrhea, nausea, vomiting, heart failure, collapse, and death.



*Zantedeschia spp.* [Araceae] (calla lily). The leaves contain raphides of calcium oxalate. When ingested, these cause burning in the mouth and lips, sometimes with inflammation and swelling.

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*Zigadenus venenosus*,  
*Z. paniculatus* [Liliaceae] (death  
camas). The seeds and bulbs are  
the most toxic plant parts. The  
main alkaloid is zygacine, but  
esters of zygadenine develop  
when the seed pods are ripe.  
Two bulbs are enough to kill an  
adult human. The toxins are not  
degraded by cooking and can  
remain for many years.

Symptoms occur from one to  
eight hours after ingestion.

They begin with watering of  
the mouth and numbness of the  
lips and mouth. Following that

are thirst, nausea, stomach pain, vomiting, and  
diarrhea. After that, symptoms include  
headache, muscular weakness, confusion, slow  
or irregular heartbeat, low blood pressure, below  
normal temperature, difficulty breathing,  
convulsions, coma, and possible death.

# NON-PLANT TOXINS & POISONS

There are other forms of toxins and poisons that are not found in plants. These are mostly bacterial or venomous, but there are also inorganic elements found in the earth itself that can be equally dangerous.

How dangerous poisonings are is mainly dependent on a person's age, their general health, and any other conditions they might have. Most poisonings are acute, happening suddenly and immediately causing symptoms. Others may be chronic due to longterm exposure to an inorganic toxic substance, sometimes not manifesting symptoms for many years.

Symptoms of poisoning vary with the type of toxin and the person being poisoned. Those symptoms include, but are not limited to, gastrointestinal pain, nausea, vomiting, headache, trouble breathing, elevated temperature, heart rate slowed or raised, dizziness, confusion, fainting, and seizures (convulsions).

## **Bacteria**

The bacterial toxins are single-celled pathogenic organisms that multiply or release toxins in the body. They can affect the entire body or just certain body parts depending on what kind of bacteria is involved. Bacterial

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poisonings are most often found in foods that are stored or prepared under unsanitary conditions.

***Bacillus anthracis***. This is the bacteria that causes the serious infectious disease anthrax. It mainly affects animals, but it is zoonotic, which means it can be transmitted from animals to humans through direct contact or through contaminated animal products. Anthrax can affect the skin, the lungs, or the gastrointestinal system. It occurs with different symptoms and levels of severity.

***Clostridium botulinum*** (botulism). This is a neurotoxin and is one of the most toxic bacterial poisons. It causes food poisoning and can be fatal, even in microscopic amounts. Symptoms include paralysis and respiratory failure.

***Cyanophyta* [Nostocaceae, Oscillatoriaceae]** (blue green algae). This is a cyanobacteria found in water, but it is difficult to determine if it is the ordinary blue green algae or the toxic variety. If the water is infected with it and is swallowed or someone swims in it with its dense blooms, symptoms of poisoning can occur within 15-45 minutes, and death in 1-24 hours. Symptoms include nausea, vomiting, abdominal pain, diarrhea, muscle tremors, difficulty breathing, bluish skin, convulsing, general paralysis, and death.

***Escherichia coli* (E. coli)**. There are different strains of E. coli, and they can cause severe to fatal illness. It is most frequently found in

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undercooked meat, raw vegetables, and contaminated water. Symptoms of poisoning may include diarrhea, stomach cramps, vomiting, fever, fatigue, and kidney failure.

***Salmonella***. This bacteria causes food poisoning (and one species of this bacteria causes typhoid). Poisoning occurs by ingesting water or raw or undercooked food, in particular, eggs, pork, poultry, and beef. Animals, including pets, can also carry the bacteria. Salmonella causes inflammation of the stomach and intestines. Symptoms can occur up to 48 hours after exposure and include diarrhea, fever, stomach cramps, nausea, vomiting, chills, headache, and muscular pain or cramping.

***Staphylococcus aureus* (staph)**. There are a variety of staph infections. It is spread through touching infected surfaces or eating contaminated food. Skin infections are most common, but infections can occur anywhere on or in the body. When it infects the lungs or heart, it can damage valves and lead to heart failure. In the bloodstream it can cause blood poisoning. In the digestive system, it can cause vomiting and diarrhea. As with all bacterial poisonings, the severity of the infection is largely determined by the health of the infected person.

***Vibrio cholerae***. This bacteria is the cause of cholera, a serious and often fatal disease caused by ingesting undercooked or raw marine animals or drinking contaminated water.

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### **Venoms**

Venoms are produced for protection by some animals, including certain kinds of snakes, spiders, scorpions, bees, wasps, hornets, jellyfish, Portuguese Man of Wars, and some fish such as the Pufferfish (blowfish), stonefish, lionfish, scorpion fish, and stingrays. These venoms are highly specialized and complex mixtures of toxins, mainly proteins and peptides, that have a wide variety of poisonous effects:

1) Neurotoxic: affects the nervous system. May cause paralysis or other neurological damage;

2) Hemotoxic: affects the cardiovascular system. May alter blood clotting and cause internal bleeding;

3) Cytotoxic: can cause localized damage to tissues at the site of the bite or sting;

4) Myotoxic: affects muscle tissue.

Venoms are actively injected into other organisms (animals or humans), usually through a bite (fangs) or sting, or by contact with the skin. Venoms can be harmful or lethal depending not only on the venom itself, but on the health of the human victim, especially so if the victim happens to be allergic to the substance.

### **Inorganic Substances**

Toxic inorganic substances are salts of such metals as copper, silver, lead, gold, nickel,

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chromium, zinc, cadmium, mercury, and the metalloid arsenic. Many of these are toxic even in low concentrations of less than 1 milligram. Most are waste from factory processing or mining, such as those caused by oxidation of sulphide minerals.

**Arsenic.** This is a naturally occurring metalloid element that is sometimes called a semi-metal as it contains properties between metal and non-metal substances. Arsenic comes in two forms: inorganic and organic, with inorganic being the more toxic, and often found in contaminated watersupplies, soil, and some foods such as rice and grains. Organic arsenic is found in seafood and is less toxic. Exposure to arsenic, especially the inorganic, contributes to health problems such as skin discoloration, cancers, and death. Short-term exposure in high doses causes nausea, vomiting diarrhea, and sometimes organ damage or death. Long-term exposure at low to moderate levels over time, can cause skin discoloration, lesions, and increased risk of cancers (bladder, lung, skin).

**Asbestos.** The link between asbestos exposure and lung diseases has been observed for centuries. The dust produced in working with or around it is inhaled, resulting in chronic breathing difficulties.

**Lead.** This is a heavy metal found in the earth's crust, has been used for centuries, and it's toxic effects have been well-documented as early as the 2nd century BC. It is currently still in use in plumbing and paint, and medical journals have

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been noting that exposure and poisoning at low-levels is particularly prevalent in children. Some countries in Europe are currently considering banning its use.

**Mercury.** Poisoning by mercury is due to exposure to different forms of mercury. In America the most common are vapor inhalation and ingestion of contaminated water or food.

1) Inhalation of vapors and absorption into the bloodstream causing respiratory distress, kidney damage, nervous system damage, and often death. Symptoms include headaches, sleeplessness, muscle weakness, twitching, irritability, nervousness, and breathing difficulties. This is the most common means of exposure through broken items that contain mercury, such as old-style thermometers.

2) Ingestion of contaminated water or food, such as fish or shellfish with methylmercury in their tissues produced by bacteria in the food chain. It is a neurotoxin and exposure can lead to developmental problems in children, neurological damage, and other health issues.

**Polonium.** The most toxic element, first discovered by Pierre and Marie Curie when they extracted it from the uranium ore pitchblende and identified it by its strong radioactivity (about 300 times more radioactive than uranium). While it has practical uses, the particles are dangerous to human beings.