Poison Them with Kindness, Not Plants

—Peter Stekel

There's the Brian DePalma school of nailguns and chainsaws, the Agatha Christie school of blunt objects, and the Dashiell Hammett school of guns. Consider the morbid school of writers who always find a way for a character's demise to coincide with the speciality of their amateur sleuth. The creativity of these writers in bumping off their characters is amazing. There are detectives who always find a corpse on their vacations to B&Bs, while selling homes, or making their parish rounds. Why not utilize a few botanical twists instead and add poisonous plants to the lexicon of murderous intent?

Poisonous plants and drug plants are ideal subjects for mystery novelists. As the Harvard economic botanist Richard Evans Schultes wrote, "Man saw, experimented with and came to know thousands of different plants in his surroundings. He tried ingesting them all. Most were innocuous; a few pleased his taste; some nourished him; a goodly number of them made him ill; sundry ones relieved pain and suffering; a few killed him outright; but a very few had weird and unearthly effects on his body and mind." Plants offer so much to mystery writers and plot lines if only more was known about them. With over 300,000 plants known to science from across the globe, about 700 are suspected of causing illness or death in humans or animals. Very few, actually, affect people directly.

In North America the number of deadly poisonous plants can be counted on less than ten fingers. Not many are native; the remainder are weeds or horticultural introductions. If you add the plants that are found naturally or cultivated for drug use, then the list grows slightly. It would seem then that poisonous plants, like serpents, are more a literary cliché than reality. Still, they leave many possibilities for use by writers and there are numerous members of the vegetable kingdom that can lend clues to a story due to their toxic properties and affects on domestic livestock or pets.

But first, what is the difference between poisonous and drug plants. What are their chemical properties and biological actions? What is the dose that leads to toxicity? How were drug plants used in native cultures and does that use differ from cultures like our own? Finally, what are some examples of poisonous and drug plants which can be effectively used in fiction?

The first rule of toxicology is that everything is toxic. What matters is the dose. When toxicity reaches a high enough point, the substance in question can be considered a poison. Poisons work on the body by interrupting or halting important functions such as breathing, the liver and kidney's ability to filter toxic compounds, or retarding the actions of cells. The manner in which this occurs can be by chemically inhibiting these functions, by the poison blocking a function by accumulating in an organ, or by stimulating the production of a body chemical which leads to organ, tissue, or cellular failure.

Drugs work in a similar manner but without killing. Some drugs, like the psychotomimetic or psychoactive magic mushrooms, work by simulating brain chemicals like serotonin. Others, like morphine from the opium poppy, act as neurosuppressors to block pain. Still others, like antibiotics, function by destroying disease pathogens. The actual mechanisms whereby these actions occur are much more complicated than this simplistic outline and readers are encouraged to make deeper research into the matter.

A poisonous plant is one which has produced serious illness or loss of life. This eliminates poison oak and ivy which cause allergic reactions. Leafy spurge (Euphorbia sp.) causes dermatitis too, but it is due to a toxic principle in the sap, and they certainly aren't worth considering here because they won't kill anybody.

Some plants are considered poisonous and though they don't kill, they can make you extremely ill. Most members of the tomato family (Solanaceae) like tomatoes, potato, and eggplant, are toxic but such huge amounts are necessary that we needn't be concerned with them in our context. The same is true of members of the pea family. Lima beans are a common food that contains prussic acid (cyanide) but you have to eat a ton to be affected. Even onions are toxic and can lead to fatal anemia if you eat enough of them over an excessively long period of time. Once again, hardly appropriate for our needs as it would take a huge leap of faith amongst readers to make death by these plants believable in

a story.

Primitive hunters knew the properties of toxic plants that could be used as arrow poisons and passed this knowledge down to their descendants. Dioscorides, a student of Plato and Socrates wrote a compendium of poisonous plants in the first century A.D. During the Middle Ages poisons were known so well that they were normal tools of diplomacy and politics. Battles were won by poisoning an enemy's drinking water and second sons inherited wealth by poisoning their older siblings. Arsenic was the preferred method but we can be sure some plant poisons were used as well though the record is scant in this regard.

Knowledge of poisonous plants in the U.S. came about chiefly due to concerns about domestic livestock. In 1862, the United States Department of Agriculture was founded and one of its chief duties was identifying those plants which could cause widespread harm to farmers. An outbreak of ergotism in Kansas in 1884 sparked the beginning of scientific investigation into livestock poisonings that continues to this day and served as the impetus for study in this field.

Ergotism is caused by a fungus (Claviceps purpurea) that parasitizes seed heads of wheat and rye. Poisoning causes capillaries to constrict and the decrease in blood supply causes tissues to die. If this occurs in the feet and hands, these appendages can become gangrenous or fall of. Extreme cases lead to losing ears, the tongue, and even the arms and legs.

Ergotism is responsible for the famous "St. Anthony's Fire," a mediaeval malady in which entire villages were known to go on crazy, murderous, rampages after eating flour unknowingly infected with the fungus. Death was slow and painful, attended with psychotic hallucinations. Before legislation required routine agricultural inspections, ergot poisoning was frighteningly common in Europe. Ergot is a source of LSD, one of the more psychoactive chemicals known to man. A smooth muscle relaxant, used during childbirth, is also synthesized from the ergot fungus.

Among wild plants found in North America, the following are considered to be highly poisonous and will lead to death if ingested in small amounts.

Precatory bean or rosary pea (Abrus precatorius) was introduced from the tropics to Central America and Florida. The red seeds are attractive and have been used as jewelry in Mexico, Puerto Rico, and elsewhere. In India the seeds have been used for killing cattle and for homicide. If throughly chewed, one seed is purportedly sufficient for fatal poisoning in human beings. The active principle is a very similar to that which is found in bacteria (such as Clostridium botulinum, the bacterium which causes botulism) and to snake venom.

Fly agaric (Amanita muscaria) and Death Angel (A. Phalloides) are some of the deadliest plants known to man. Mortality ranges between 50 to 90% of those who are unlucky enough to eat these mushrooms. Symptoms appear after 6-15 hours during which the patient has no feelings of illness. Suddenly, abdominal pain, vomiting, and diarrhea begin. Pain and vomiting alternate with periods of remission over 6-8 days before death or spontaneous recovery. There is no known cure for the poisoning which severally injures the liver.

The damage is caused by alkaloids. Alkaloids are nitrogen-rich compounds. All living things need nitrogen but too much of a good thing can be bad. For example, the main role of our kidneys is to extract nitrogen out of our systems and excrete it. Alkaloids are most toxic to the central nervous system but also attack and damage the liver.

A common misconception about the Fly agaric is that it can be rendered harmless by peeling off its red skin. This is no more correct than the tale of old wives that holds that a silver spoon will darken if placed into a pan of cooking mushrooms which are poisonous. Another tale that can get you into trouble is believing that mushrooms are edible and toadstools are not. The terms are used interchangeable.

Another poisonous plant high in alkaloids is False hellebore (Veratrum californicum). This is a common poison of free ranging cattle and is unlikely to affect people since large quantities of it must be eaten. However, an extract has been made and medicinal use has been investigated. The method of action is to cause blood pressure to drop by making the arteries expand and veins contract. It also slows the heart rate. Cows and lambs are born with "Monkey Face" disease from mothers eating the plant during gestation. The malformed heads, no nose, and one eye, are some of the hideous results of poisoning. If James Herriot wrote mysteries, he certainly would have found a use for False hellebore.

Death camas (Zigadenus elegans) alkaloids act on the stomach, causing abdominal pains, vomiting, and diarrhea. This onion look-alike is common in the west in high elevation and dry meadows. It picked up its rather nasty reputation and stand-offish name during the 19th century when hungry pioneers ate the large bulbs in hope of obtaining a nutritious meal of Quamash, a staple food of the western Indian tribes. It would serve nicely in a period-piece as an agent provocateur involving switched plates at dinner time!

Jimsonweed (Datura sp.) a member of the potato (deadly nightshade) family causes spectacular poisonings. All plant parts are highly toxic. Symptoms include thirst, disturbed vision, incoherence, hallucinations, convulsions, and coma. This is all due to the action of alkaloids on central nervous system functions. Death is common. Jimsonweed was used as a shamanist drug by Central and South American Indians when they couldn't find anything less toxic.

The most infamous alkaloid known is from the opium poppy (Papaver somniferum). It works on the central nervous system by blocking the pain centers. Before being made illegal, this poppy was popular as a garden plant and as

a constituent in 19th century patent medicines and even soft drinks. What better way to assure return customers than to make your drinks addictive? Alkaloids refined from opium include morphine, codeine, and laudanine from which laudanum is made. Laudanum was a popular recreational drug of the early 20th century and many dissipated characters in Black Mask fiction were users.

Most hallucinogens are alkaloids, the most famous of which is LSD (d-lysergic acid diethylamide). Very simply stated, this class of compounds works by mimicking serotonin, a naturally occurring chemical found in the brain. Serotonin accumulates in brain tissue where it serves to regulate central nervous systems functions. Besides being manufactured, LSD is found naturally in several plants: the ergot fungus and in morning glories (Ipomoea violacea) to name two.

Marijuana (Cannabis sativa) is another alkaloidal drug plant. Its long and checkered past includes a form of the drug, hashish, being smoked by paid killers in India. From this comes the word, "assassin," from, "hashishin." Herodotus (5th century B.C.) wrote of the Scythians throwing Cannabis seeds on glowing coals inside tents, "and the steam makes the Scythians howl for joy."

Popular culture has seized upon marijuana as a cause celebre and perhaps the "man-on-the-street" knows more about the drug and non-drug uses of this plant than any other. Until made illegal during the 1930s, marijuana was cultivated as the prime source of hemp rope. Famous for its weedy properties, the plant is naturalized throughout the "corn belt." The active principle, tetrahydrocannabinol, is exceedingly weak in these ruderal plants. Marijuana is closely related, and shows a strong resemblance, to commercially grown hops (Humulus sp.).

White snakeroot (Eupatorium urticaefolium.) is rarely a killer anymore but it was greatly feared prior to modern dairy practices. Nancy Hanks, the mother of Abraham Lincoln is believed to have died from White snakeroot poisoning, a condition known as "milk sickness."

In the mid-19th century milk sickness was so greatly feared that entire towns would be abandoned and the livestock moved elsewhere when the condition exhibited itself. Cows would eat the plant which in turned tainted the milk. Poisonous plants were known to be the cause but it took generations of patient study to discover it was the White snakeroot. Then the toxic molecule was found to be fat soluble (dissolved in the fat of milk), an inhibitor of metabolism, and thus the cause of the peculiar odor of acetone found emanating from the people suffering the disease.

Another class of chemicals which are found in poisonous plants are the glycosides. These are compounds that have been chemically bound to sugar molecules. Digitalis from foxglove (Digitalis purpurea) is an example. In small amounts it stimulates the heart and in large amounts it can kill. Foxglove is a common garden plant and is naturalized in pastures and burned-over woodlands on the Pacific coast. Cattle are frequently poisoned by the plant but toxicity in humans is related to abusing the refined drug. Gastro-intestinal irritation, nausea, slow but stronger pulse, and contracted pupils are the usual symptoms.

An Asiatic shrub, Oleander (Nerium oleander) is commonly cultivated in southern California and other warm climes. The poisonous principle is a glucoside similar to digitalis. In Victorian times, a flowering oleander would be kept indoors to sweeten and refresh the house. The leaves and particularly the stems contain a toxin that has been reported to cause fatalities. It would be wise to use commercial skewers when roasting marshmallows instead of the stems of this plant.

Water hemlock (Cicuta sp.) is one of the most poisonous plants known from the Old World. There are many plants that resemble water hemlock such as wild carrot and Queen Anne's Lace, and it is best recognized by the chambers within the stem at the base of the plant.

A cut or bruised root will leak a fragrant yellowish sap. The poison is violently convulsant, causing severe abdominal pains and death within the hour. Whereas injections of morphine have been used to ease the convulsions in patients, it is generally assumed that nothing can be done to ward off death. Not all poisonings are fatal and many people and animals have been known to exhibit spontaneous recovery. In any case, it is important to remember that nothing much can be done to aid recovery.

Unpopular for his political views, Socrates drank an infusion made from poison hemlock (Conium maculatum) when the politicians of Athens decreed he should die. Legend has it that he went gently into that good night. Poison hemlock is a naturalized weed in North America and is well known to most rural dwellers who see it growing alongside highways and irrigation ditches. Death is caused by paralysis of the central nervous system. Symptoms are similar to poisoning from an overdoes of nicotine. Death comes when the diaphragm, the muscle used for breathing, is paralyzed and the person suffocates.

Cyanide is a glycoside used frequently in mysteries and the smell of bitter almonds is always the clue given. But cyanide itself has no odor. What you smell is benzaldehyde. In plants there is a compound know as amygdalin found in such things as wild cherries, peaches, and almonds. When these plants are injured, or the seeds are eaten, amygdalin is broken down into sugar, cyanide, and benzaldehyde. Amygdalin is present enough in wild cherries that you can obtain the odor of bitter almonds by crushing the leaves and putting them into a closed bottle. The fragrance will fill the bottle but evaporates quickly unless sealed. Thus, to be detected in animals, you must be on the scene immediately. Cyanide kills by destroying the enzymes which are responsible for carrying oxygen to individual body cells. It's as if the individual cells have been asphyxiated.

Remember that the first rule of toxicology states that everything is toxic; what matters is the dose. There are many plants found both in nature and in the garden that are benign to people but highly toxic to animals. The difference is that people are not likely to be eating these plants. The amount needed to cause sickness or death in people is normally high enough to preclude their use in a story unless your readership is accustomed to gigantic leaps of faith.

However there are two exceptions. The first is that small children are more susceptible to poisoning than adults. This truth is borne out by the yearly poisonings by castor bean and oleander. However it isn't likely that an adult will eat these plants unless forced to. They taste horrible.

The other exception is the category of drug plants which are eaten, smoked, or drunk intentionally by people in order to become intoxicated. The use of mind altering, plant-based, substances goes back into prehistory and many researchers believe that mankind's belief in a deity is tied to them.

The historic narcotic use of Fly agaric (Amanita muscaria) or Soma, extends to India and the Vedas, holy hymns written some 3500 years ago, and thus makes this fungus the oldest mind altering plant known to man. Muscimole, the active compound, collects undiminished in the urine and was ceremonially collected from mushroom eating high priests to be drunk by lesser clergy. Some researchers believe that the ancient Scandinavian berserkers, who went on periodic killing binges, were intoxicated by Fly agaric. Until the Russians introduced alcohol in the early 18th century, Fly agaric was the sole intoxicant for Siberian peoples.

Amanita muscaria is a frequent cause of poisoning in North America by Asians who are familiar with the plant's more benign chemical variants collected from central Asia. Poisoning is accompanied by confusion, disorientation, hearing and visual disturbances, macropsia, muscle twitching, and sleep. Death is caused by liver failure as toxins accumulate in this organ. Once a person begins experiencing symptoms, there is no known cure.

The use of psychotomimetic mushrooms (Psilocybe, Panaeolus, and Stropharia) by the New World Indians was problematic for the Conquistadores. The Teonanacatl cult had deep roots, dating back to at least 300 A.D. and was used to commune with the Gods. Researchers believe that the Spaniard's mycophobia, coupled with religious fanaticism, drove the cult underground where it survived for centuries amongst a people who found the supernatural power of the mushroom far exceeded the promises of a Christian heaven. Intoxication is caused primarily by psilocybin which acts to excite the sympathetic nerves.

Antidotes to poisonous plants present an interesting problem since not many are known and also because people are normally ignorant of what plant they have consumed. To the untrained eye, many plants look like so many others. A good example is poisoning by poison hemlock (looks like wild carrot) and death camas (looks like Quamash). Add to this that the US Public Health Service says, "No generally accepted antidotal agents are available," for most poisonous plants.

In some cases, as with cyanide poisoning, a nitrite antidote is available. It works by countering the action of the poison to inhibit enzymatic transport of oxygen to the cells. The problem is that the cure is as toxic as the cause of poisoning and so the nitrite antidote must be counteracted as well. It takes timing and training to do it right. Add to this the quickness (within an hour) with which cyanide poisoning from plants works and you may appreciate the problem.

Once you learn their identifying characteristics, these plants are easy to find in nature or growing in people's gardens. Authors should avoid giving too much information about dosage in order to discourage any copy-cat crimes. In the interests of portraying an accurate and realistic scenario using these plants, it's recommended that the reader spend some time in a university library pouring over the many fine books on poisonous plants, the Journal of Economic Botany, and any of the legion of treatises on aboriginal use of drug plants. With these resources the writer will find many interesting topics to fill out the pages of fiction. For, after all, the fiction which is most convincing is that which is based upon fact.Δ

Botanist, educator, and writer, Peter Stekel is the author of *Collateral Damage, a crime-thriller dealing with salvation, redemption and the abuse of power.*