

Food, Drug, or Poison?

Cultivating a taste for 'toxic' plants

By KATHY A. FACKELMANN

Beautiful lily, in bloom this morning,
guard me. Drive away sorcery. Make me
grow old. Let me reach the age at which I
have to take up a walking stick. I thank
thee for exhaling thy fragrance there,
where thou art standing.

A Mexican Indian healer chants this prayer to enlist the lily's help in fighting off an evil spell. The medicine man believes the flower's perfume can repel malevolent beings that cause human illness.

To ethnobiologist Enrique Salmón, the song illustrates the reverence that his people, the Tarahumara Indians of northern Mexico, bestow on sacred or powerful plants. Before harvesting medicinal herbs, healers often sing prayers to placate the spirits that live within the plant, Salmón says.

The Tarahumara routinely use potentially harmful plants to treat ailments ranging from headaches to chest pain. All told, these healers rely on a bounty that consists of about 300 species of medicinal plants, many of which contain compounds that pharmacologists consider highly toxic.

"By Western standards it's either a poison or a drug," Salmón says. The Tarahumara, however, have no word for poison. To their medicine men, many plants harbor both wicked and beneficial spirits. The trick is to harness the healing power of the plant's good side, Salmón says.

The Tarahumara aren't the only people with a yen for plants with a dark side, as ethnobotanists and anthropologists such as Deborah A. Duchon have increasingly learned. Duchon has been studying a group of Asian refugees, known as the Hmong, now living near Atlanta. Surprisingly, these people have traditionally sought out and consumed black nightshade, a plant most Westerners consider poisonous.

Salmón and Duchon presented their research findings at the 16th annual meeting of the Society of Ethnobiology, held in Boston in March.

For eons, humans foraged for roots, berries, and other parts of edible wild plants. What ancient humans seemed to know — and modern humans forget from time to time — is that virtually all substances are toxic in large enough amounts. "Water has been known to be toxic in excessive quantities," notes Mark Blumenthal, executive director of the American Botanical Council in Austin, Texas. At the same time, he says, "a potentially toxic plant in small quantities can sometimes be therapeutic."

It's crucial that anthropologists and ethnobiologists study the way native peoples turn to plants for food and medicine, Blumenthal says. The vast store of knowledge about such plants is often lost as the elders of the community die and very few young people take their place as herbalists, he says. Details about traditional plant preparation can sometimes give pharmaceutical companies a boost in their efforts to develop better remedies for cancer, heart disease, and other ailments, he adds.

For Salmón, now at Arizona State University in Tempe, the lesson that plants can contain both healing and potentially toxic compounds came early in life. Salmón, who grew up near San Diego, Calif., spent long stretches of his childhood in Tarahumara territory, the rugged highlands about 200 miles south of Chihuahua City. There, detailed conversations with his grandmother and other family members taught him a profound respect for plants that heal. In his research, he has interviewed Tarahumara healers and has compiled existing scientific data on a variety of plants used by the tribe.



In the wilderness of the Sierra Madre, where the Tarahumara live, modern medical clinics are few. So the Tarahumara often turn to nature for their cures.

One toxic plant with a healing side is *Ricinus communis*. The Tarahumara — along with earlier generations of U.S. adults and children — have a healthy respect for this plant, whose seeds yield the laxative castor oil. Salmón says *Ricinus* contains one of the most toxic naturally occurring substances known, yet the Tarahumara use the plant to make a poultice for bruises, boils, and headaches.

Like many tribal peoples, the Tarahumara imbue their practice of medicine with a spiritual component. For example, Tarahumara shamans, who serve as liaisons with the spirit world, sometimes use hallucinogenic peyote during healing rituals aimed at casting evil spirits from people's bodies. In the same ceremonies, some shamans also use a hallucinogenic species of *Tillandsia*, popularly known as "peyote's companion." For more mundane complaints, tribal healers prepare *Tillandsia* teas that act as

The castor-oil plant has giant fan-like leaves and spiky clusters of reddish-orange fruits. In the tropics this plant can grow 30 to 40 feet in height, but it reaches more modest proportions in cooler climates. The bean-like seeds contain the toxic compound ricin.



Salmón

Above: Although jimsonweed is widely considered poisonous, the Tarahumara Indians of Mexico use it to treat asthma and a variety of other ailments. Jimsonweed grows to a height of about 6 feet. Right: Kenyans use black nightshade to lower fever and treat stomach ailments. This plant is also valued by many other indigenous groups around the world.



Salmón



Johns

laxatives or purgatives.

One particularly "evil" plant serves as an all-purpose drug in Tarahumara culture. It is an annual with trumpet-shaped white or violet flowers, called *Datura* or jimsonweed.

The Tarahumara believe jimsonweed originated in the lowermost region of the universe—a hellish place complete with a devil and other malevolent beings. Legend holds that jimsonweed can cast a powerful spell on an unsuspecting forager, and only people of great spiritual authority, such as a renowned shaman, can collect this plant without rousing its dangerous spirits.

Robert A. Bye Jr., who directs Mexico City's Botanical Gardens, says the Tarahumara have repeatedly warned him that he would go insane and die if he harvested jimsonweed on his plant-collecting trips. Bye has gathered numerous specimens without suffering any ill effects, but the link between *Datura* and insanity may not be entirely farfetched, says Salmón. "It's a very powerful hallucinogen [when ingested]," he explains.

Tarahumara shamans, most of whom are male, turn to jimsonweed's hallucinogenic effects for help in communicating with the spirit world. Village herbalists, often women, rely on a more pedestrian treatment for bodily aches and pains. These healers fashion a different species of jimsonweed into a poultice to relieve swellings and headaches.

Another culture, this one from Southeast Asia, extols the virtues of a plant widely viewed in the United States as a poisonous weed. The Hmong have long lived in the mountains of Laos, but many emigrated to the United States after the Vietnam war. A large group of Hmong settled in the hills near Atlanta, a region that supports many of the same species of plants that flourish in Laos.

Duchon, an anthropologist at Georgia State University in Atlanta, stumbled across the Hmong penchant for a "dangerous" plant while gathering edible and medicinal herbs with a Hmong friend.

"I was picking pokeweed and she ignored it. I picked lamb's-quarters and she ignored it," Duchon recalls. "Then we came to black nightshade and I ignored it and she said, 'Oh, zhao-ia!' and started picking it like crazy."

No wonder Duchon ignored this plant: U.S. field guides list it as poisonous. Toxicologists say that black nightshade, *Solanum nigrum*, contains several glycoalkaloids, which depress the central nervous system. Chief among these compounds is solanine, whose ingestion can lead to drowsiness, paralysis, cramps, vomiting, unconsciousness, and even death.

But Duchon's observations of the Hmong revealed a startling use for this plant. Hmong women pick the tender

young leaves and stems, boil them in water, and serve the spinach-like greens at mealtime.

And, although the Hmong view zhao-ia primarily as a food, they also consider it a tonic for elderly hearts. Duchon speculates that solanine's damping effect on the central nervous system might help slow the fast, inefficient heartbeat that plagues many elderly people.

After months of watching her Hmong friends eat *S. nigrum* with no apparent ill effects, Duchon finally decided to try some. She gingerly accepted a small portion of this "vegetable" at lunch. She thought she had weathered her experiment without incident, but as the day wore on, she became unusually fatigued.

"I was so tired I could barely make it home," says Duchon, who recalls going to bed and sleeping for 14 hours.

When she mentioned this reaction to her Hmong friends, they dismissed the incident, telling her that zhao-ia is beneficial and harmless. Indeed, the Hmong themselves never seemed fatigued after eating even generous portions of the plant. Was Duchon's unusual sleepiness that day just a coincidence?

Months later, she stumbled across a reference suggesting that it wasn't. A literature search revealed that the Rappahannock Indians once used the leaves of the black nightshade to treat insomnia.

While Duchon's apparent reaction to the plant — and the Hmong's apparent lack of a reaction — remains unexplained, she advises against trying black nightshade as a spinach substitute or sleeping pill. "I can't recommend it," she says emphatically.

The genus *Solanum* comprises more than 1,700 species, many of them toxic. Well-known members include the common white potato, *S. tuberosum*, and the Jerusalem cherry, *S. pseudo-capsicum* — whose berries are also favored by the Hmong, according to Duchon.

A plant known as deadly nightshade, *Atropa belladonna*, belongs to a different genus altogether. Renaissance ladies used the juice from this plant to dilate their pupils, achieving a look considered fashionable at the time. Today, deadly nightshade serves as the source of the pupil-dilating drug atropine.

Whether people view a potentially toxic plant as a poison, a drug, or a food often seems to depend on their cultural experiences with it. Consider, for example, the potato. Although people in the United States consider the potato completely harmless, it can have a rather nasty chemical makeup. In fact, potato breeders check potatoes to make sure they don't contain too much solanine; those with more than 20 milligrams of solanine per 100 grams are considered unfit to eat.

Most domesticated potatoes in the United States have no trouble meeting that standard. Many wild potatoes, how-

ever, contain far greater concentrations of solanine. Yet Indians in Peru and Bolivia routinely eat these high-solanine spuds without seeming to suffer any ill effects, says Timothy Johns, an ethnobiologist at the Macdonald College of McGill University in Ste. Anne de Bellevue, Quebec.

It turns out the Hmong aren't the only people to favor black nightshade at dinnertime. Johns has observed that the Luo-speaking tribes of Kenya routinely consume *S. nigrum* as a part of their diet.

"It is one of the most important species of leafy vegetables [in the Luo diet]," he says. "It is also extremely bitter, which intrigued me. You'd think they'd like the less bitter plants. In fact, [the Luo] people will tell you they prefer the bitter types."

That was a surprising observation,

there's a long tradition of carefully handling poisonous plants that become edible once cooked, sliced, or diced, he says.

On the other hand, Duchon speculates that the Hmong gradually develop a physical tolerance for solanine. Toxicologists call this process induction. During induction, chronic exposure to small amounts of a poison spurs the liver to manufacture enzymes needed to metabolize the threatening compound, she explains.

Duchon notes that Hmong children profess an active dislike for *S. nigrum*. If asked, they say that zhao-ia is for adults only. Yet these same children get small quantities of it chopped up and mixed into rice dishes eaten by the whole family, Duchon says. In this way, Hmong youngsters may slowly acquire an ability to break down the poisons in the plant. By the time they reach adulthood, they have a built-in capacity to metabolize solanine, she speculates.



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— Mark Blumenthal

Johns says, because bitterness often serves as a sign of toxicity. But like the Hmong, the Luo believe that along with the bitterness, *S. nigrum* offers some health benefits.

At last year's Society of Ethnobiology meeting, Johns reported that the Luo eat black nightshade to combat gastrointestinal ills. In test-tube studies, he found that solanine kills diarrhea-causing *Giardia* parasites, which are common in this region of Africa.

The Luo do, however, take steps to protect themselves from the plant's toxic compounds. Women boil the leaves and stems several times, throwing away the remaining liquid — and presumably some of the solanine — each time. Finally, when they've reduced the bitter taste to an acceptable level, the vegetable is ready for consumption. The Luo eat it plain or stewed with milk, Johns says.

In many cases, notes Blumenthal, people who have traditionally consumed dangerous plants manage to escape poisoning because they've learned from their elders how to detoxify the plants during preparation. In Asia, for instance,

Hmong people don't seem to experience any of the symptoms associated with black nightshade poisoning, she says. For people unaccustomed to this dish, however, even a small taste might have dramatic effects — as Duchon's own experience suggests.

The Hmong, the Tarahumara, the Luo, and many other tribal cultures follow a long tradition in which people turn to plants both for sustenance and for relief from physical and spiritual ills. Through centuries of trial and error, their ancestors gathered a vast amount of knowledge about edible and medicinal plants, says Johns. They also learned preparation techniques that helped take the poisons out of potentially useful plants.

"In this exposure to toxins in our diet, we've not only found ways to overcome them, but we've also found ways to use them in a positive way," Johns adds. Such knowledge, he says, provides the underpinning for the field of herbal medicine as we know it today. □