

# Scientists examine toxicity of medicinal plants in Peru

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Many developing countries rely on traditional medicine as an accessible and affordable treatment option for human maladies. However, until now, scientific data has not existed to evaluate the potential toxicity of medicinal plant species in Peru. Scientists from the William L. Brown Center of the Missouri Botanical Garden in St. Louis led a study using brine shrimp to determine the toxicity of 341 Northern Peruvian plant species commonly ingested in traditional medicine. Their findings indicated over 24 percent of water extracts made from these plant species and 76 percent of alcoholic extracts from the plants contained elevated toxicity levels. The results reinforce the need for traditional preparation methods to take different toxicity levels into account when choosing the appropriate solvent for the preparation of a medicinal remedy. The study was funded by grants from the National Institutes of Health MHIRT program through San Diego State University and was published in the *Journal of Ethnopharmacology*.

Peru is a country rich in biodiversity with a millennia-old tradition of curers using the native flora in medicinal remedies. [Traditional medicine](#) is a common practice in the Andean region, where the same plants used years ago are still relied upon today for their healing powers.

"Traditional medicine is an important way to address health issues, but through this study wanted to show that remedies could contain potentially harmful ingredients and need to be prepared with correctly collected, identified and prepared ingredients," said Dr. Rainer Bussmann, William L. Brown Curator for Economic Botany and director

of the William L. Brown Center at the [Missouri Botanical Garden](#). "The William L. Brown Center focuses on this area because plant material used in traditional medicine is marketed in the U.S. more and more, whether direct or via the internet."

The plants used in this study were collected in the field, at public markets and at the homes of traditional healers, or curanderos, all in Northern Peru. Botanists gathered material from each of 341 traditional medicinal plant species, dried the material and processed it in an industrial grinder. Two samples of plant material were taken from each species. One sample was submerged in 96 percent ethanol for seven days, and the other in boiling distilled water for one day—both traditional preparations of plant extracts. The solvents were evaporated to complete dryness and a concentration of each extract was removed for testing. Plant extracts were then diluted to various concentrations in vials.

Brine shrimp (*Artemia* sp.), small invertebrates that dwell in sea water and other saline ecosystems, are frequently used in laboratory studies to evaluate [toxicity](#) values as a measure of median lethal concentration values, or LC50, as they offer a simple, quick and cost-effective way to test plant extracts. Brine shrimp larvae were submerged in 501 total vials of aqueous and ethanolic plant extract solutions, and scientists recorded their rates of mortality after 24 hours.

Testing of the aqueous extracts showed high toxicity values for 55 of the total plant species, with 18 species having median toxicity values and another 18 species having low toxicity. The alcoholic extracts proved exponentially more toxic, with 220 plant species showing high toxicity values, 43 having median toxicity and 23 showing low toxicity.

"Preparation methods by curanderos are taking this into account, and most traditional remedies such as medicinal teas are made with simple

water extracts instead of alcoholic ones, thus avoiding potential toxic effects in patients," said Bussmann. "However, traditional knowledge about medicinal plant use is rapidly eroding and many of these plant species are threatened with extinction. Roughly four out of five people in developing countries rely on plants for their primary health care, so studies such as this are vital to ensure that the knowledge base of [traditional healers](#) is reinforced and expanded for the benefit of future generations."

"Importantly, during this study, we also discovered that while most cases of extracts made from different collections of one plant species showed the similar toxicity levels, other [plant species](#) collected at different times varied from non-toxic to highly toxic," added Bussmann. "Future studies should investigate whether harvest time, collection locality or use of specific plant parts might contribute to a reduction of toxicity in these frequently-used plants."

Humans consume thousands of species of plants to meet their basic nutritional needs but only a handful of these plants have received significant study through international agricultural centers. Many remain poorly understood and largely undeveloped, and their wild relatives are threatened with extinction and in need of conservation attention. Stewardship of these valuable plant resources will require rigorous science combined with an approach that respects and values traditional knowledge systems; supports intellectual property mechanisms that equitably compensate all parties; and includes local participatory methods to ensure culturally-sensitive solutions.

Provided by Missouri Botanical Garden

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