

Leaves of three, let it be? Wide variability among poison ivy plants makes identification more challenging

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Poison ivy leaves. Credit: Tim Skiles for Virginia Tech

We've all heard the classic saying "leaves of three, let it be," which means don't touch the poison ivy. But just how accurate is that timeless phrase? While this specific mnemonic device exists to deter people from touching poison ivy, it turns out there are also many harmless three-leaf

native plants. How is one to tell the difference between itchy poison ivy and those harmless three-leaf native plants?

Unfortunately, accurate [poison ivy](#) identification is quite challenging because poison ivy does not hold true to form.

Virginia Tech researchers found that poison ivy leaves show a lot of variability that likely confounds accurate poison ivy plant identification and significantly undermines a longstanding poison ivy avoidance strategy. Therefore, there is an ongoing need to develop preventive medical procedures to prevent poison ivy rash that do not depend on plant identification.

"Based on the research, poison ivy had enormous amounts of leaf variation," said John Jelesko, associate professor in the School of Plant and Environmental Sciences. "There was no clear poison ivy look. It was quite astonishing, especially since the data set included poison ivy plants from all over the geographic United States."

The researchers used approximately 2,000 poison ivy photos submitted to [iNaturalist.org](#) to compare leaf shape variability across the United States. The [research](#) was published recently in the journal *Plants, People, Planet*.

The research began during the height of the COVID-19 pandemic, when there was a rash of poison ivy diagnoses from people exploring the outdoors. A project such as this was also a fantastic way for undergraduates to continue [research](#) projects during the pandemic.

Kyla Thompson, Noah Magerkorth, Elizabeth Verteramo, and Hannah Becker, former undergraduates in the department within the College of Agriculture and Life Sciences as well as Joy G. Flowers from the College of Science also worked on the project. Jyotishka Datta, assistant

professor in the Department of Statistics, and Jordan Metzgar, Herbarium curator in biological sciences, also helped make the study possible.

The records from iNaturalist for poison ivy and American hog peanut, a three-leaflet plant commonly confused with poison ivy, were analyzed for seven attributes related to the shape of their compound leaves. These attributes were used to calculate a total leaf complexity score.

It was found that the average and the range of the total leaf complexity scores for poison ivy were significantly higher than those for American hog peanut, which had minimal variability. Further analyses confirmed that the spread of poison ivy's leaf shape variability was much greater compared to American hog peanut. Additionally, a specific poison ivy specimen, characterized by often producing palmate penta-leaflet compound leaves, was examined.

The total leaf complexity of poison ivy showed a high degree of variation across its native range in North America. Despite this variability, there was a noticeable, but small, trend of increasing total leaf complexity in poison ivy from east to west. More serrated edges might appear on the leaves further west.

Poison ivy plants with five leaves were also identified in the study. Just to make things even more confusing: the five-leaflet poison ivy plants came in two orientations: pinnate and palmate compound leaves. The palmate, or palm-like, five-leaflet poison ivy specimen was found to be significantly correlated with a random, multipart process in the development of its leaflets. Geographic clusters were not seen.

"Whatever this [variable leaf shape] phenomenon is, it is widespread and inherent to the plant," Jelesko said. "Our ultimate recommendation is that avoidance by identification is not going to work well because the

basic step of identification is problematic at best."

What could help with poison ivy plant identification? Training an artificial intelligence model to account for the large variability of [leaf](#) shape, Jelesko said.

He added that if you can't identify poison ivy, the next best way to avoid it is by wearing protective clothing and by cleaning any potentially exposed area thoroughly with soap and water.

More information: John G. Jelesko et al, Poison ivy (*Toxicodendron radicans*) leaf shape variability: Why plant avoidance-by-identification recommendations likely do not substantially reduce poison ivy rash incidence, *Plants, People, Planet* (2023). [DOI: 10.1002/ppp3.10439](https://doi.org/10.1002/ppp3.10439)

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