

What's in your weed? You might be surprised

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Labels like indica, sativa and hybrid—commonly used to distinguish one category of cannabis from another—tell consumers little about what's in their product, and could be confusing or misleading, suggests a new

study of nearly 90,000 samples across six states.

Published May 19 in the journal *PLOS One*, the research constitutes the largest analysis to date of the chemical composition of [marijuana products](#). It finds that commercial labels "do not consistently align with the observed chemical diversity" of the product. The authors are now calling for a [weed](#) labeling system akin to the Food and Drug Administration's "nutrition facts panel" for food.

"Our findings suggest that the prevailing labeling system is not an effective or safe way to provide information about these products," said co-author Brian Keegan, an assistant professor of Information Science at CU Boulder. "This is a real challenge for an industry that is trying to professionalize itself."

The year 2022 marks the 10-year anniversary of the legalization of recreational marijuana in Colorado and Washington, the first two U.S. states to permit adult use. Over that time, the industry has grown into a multi-billion dollar one, in which [sativa](#) strains are generally associated with an energetic high while indica strains are associated with a relaxing effect.

Yet no standardized labeling system exists.

What's in a name

Commercial strain names like Girl Scout Cookies, Gorilla Glue and Blue Dream abound, giving consumers the impression that if you buy it in one place, you'll get the same product, or at least the same effect, if you buy it elsewhere.

While marketers generally must disclose dosage of the psychoactive compound THC (tetrahydrocannabinol) and CBD (cannabidiol) on the

label, they are not obliged to include information about other compounds, including terpenes, which can influence not only the smell but also—via a hypothesized synergistic effect called the entourage effect—the way a product makes you feel.

They are also free to name their product what they want.

"A farmer can't just pick up an apple and decide to call it a Red Delicious. A beer manufacturer can't just arbitrarily label their product a Double IPA. There are standards. But that is not the case for the cannabis industry," said co-author Nick Jikomes, director of science and innovation for the e-commerce cannabis marketplace Leafly.com.

To get a sense of how similar same-named products around the country truly are, Keegan teamed up with Jikomes and two other cannabis scientists to apply cutting-edge data science tools to a massive database of chemical analyses Leafly has compiled from cannabis testing centers.

After sorting about 90,000 samples from six states according to their cannabinoid and terpene make-up, the researchers found, not surprisingly, that the vast majority of the cannabinoids in recreational cannabis are the psychoactive THC.

And when they looked more closely at the samples, including terpene content, they found products do tend to fall into three distinct categories: Those high in the terpenes caryophyllene and limonene; those high in myrcene and pinene; and those high in terpinolene and myrcene.

But those categories do not neatly correspond to the indica, sativa and hybrid labeling scheme.

"In other words," the authors wrote, "it is likely that a sample with the label [indica](#) will have an indistinguishable terpene composition as

samples labeled sativa or [hybrid](#)."

Inconsistency within strains

How biochemically similar are products with the same commercial names?

That depends on the strain, the study found.

Some strains, such as one called White Tahoe Cookies, were surprisingly consistent from product to product, while others, such as one called Durbin Poison, were "consistently inconsistent," said Jikomes.

"There was actually more consistency among strains than I had expected," he said. "That tells me that the cultivators, at least in some cases, may not be getting enough credit."

The study also found that the existing recreational cannabis available in the United States is quite homogenous, with plenty of room to innovate new breeds with different chemical profiles. That could be useful for both recreational and medicinal use, said Keegan.

"The founding fathers of cannabis research call it a pharmaceutical cornucopia because it produces so many different chemicals that interact with our bodies in different ways," Keegan said. "We are only scratching the surface."

As consumers increasingly use [cannabis](#) for specific purposes, including health purposes, precision in [labeling](#) will become even more critical, Keegan said.

He envisions a day when products are categorized based on a more comprehensive understanding of their chemical make-up and labeled

with details on not only their THC and CBD, but on their [terpenes](#), flavonoids and other compounds.

"It's like if your cereal box only showed calories and fat and nothing else," said Keegan. "We as consumers need to be pushing for more information. If we do that, the industry will respond."

More information: Christiana J. Smith et al, The phytochemical diversity of commercial Cannabis in the United States, *PLOS ONE* (2022). [DOI: 10.1371/journal.pone.0267498](https://doi.org/10.1371/journal.pone.0267498)

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