# Fungal genetics could help develop novel biotechnologies

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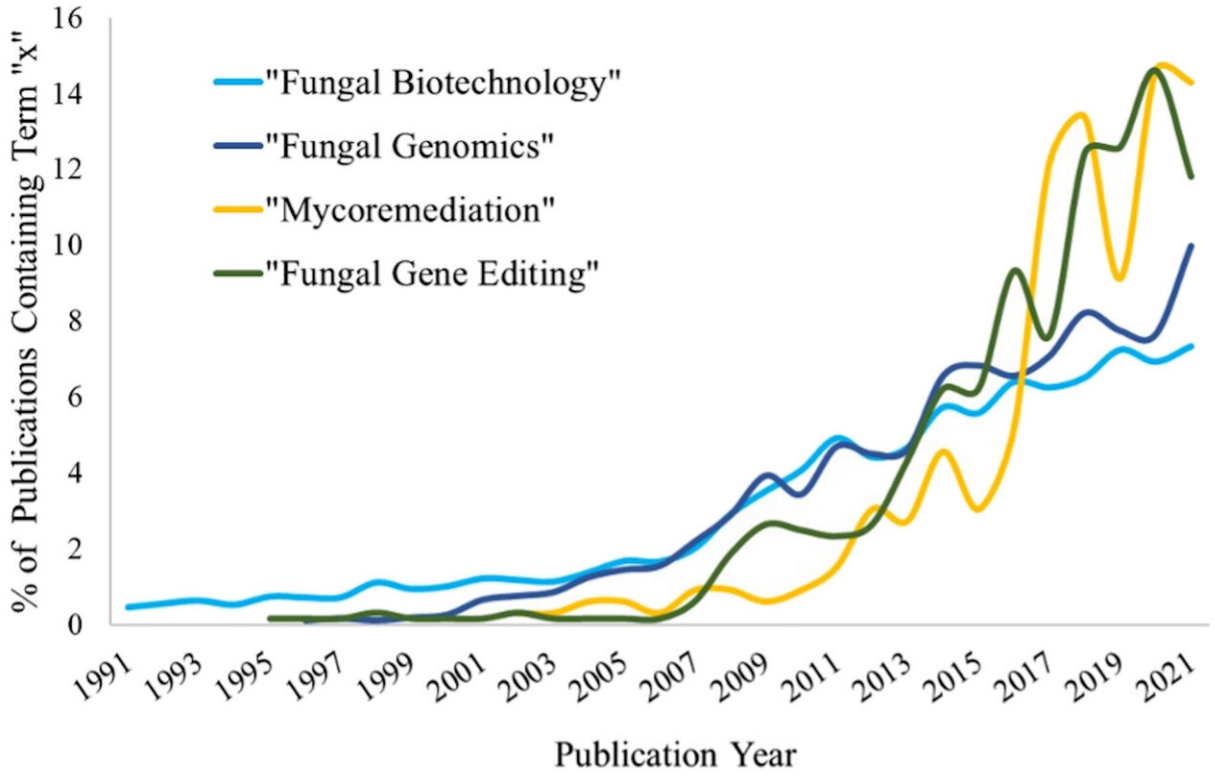


Representation of publication trends for given terms between 1991-2021. Publication numbers represent all documents found within the given years by Web of Science. Credit: *Frontiers in Fungal Biology* (2023). DOI: 10.3389/ffunb.2023.1135263

An essential pillar of Earth's ecological system, fungi have long been

used to better the lives of humans. While these organisms are still vastly understudied, a new review paper suggests that their unique genomes could be used to make progress in the biotech industry.

"The wonderful thing about fungi is they fulfill so many niches," said Mitchell Roth, lead author of the review and an assistant professor of plant pathology at The Ohio State University. "They can be found everywhere, and a lot of times you'll find fungi that have already adapted to survive in unlikely environments."

Recently, scientists have made incredible breakthroughs in the field, and thanks to the popular HBO adaptation The Last of Us, fungi may finally be getting the recognition they deserve, said Roth. "There's so much potential in fungal biotechnology that we haven't tapped into," he said. "We've only just scraped the surface of fungal biotechnology, so this paper is a little bit of a call to action."

Fungal advancements have already led to breakthroughs in a variety of industrial and domestic settings, most notably in medicine via the development of new drugs (such as penicillin or lovastatin) as a biological control against pathogens, and in society when used to ferment certain food and drink.

The paper, published in the journal *Frontiers in Fungal Biology*, highlights how further research into the field of mycology—the study of fungi—could aid in the discovery and application of many newly emerging biotechnologies.

For example, intertwining biotech and mycology could stimulate the development of bioinformatic tools and sustainable biomaterials, such as machine learning algorithms for predicting mycological patterns, or the creation of fungal batteries. Additionally, because fungi are so common, promising biotechnologies could likely be produced on a large scale.

But Roth, who works at the Wooster campus of the College of Food, Agricultural and Environmental Sciences at Ohio State, is focused on how some fungi become pathogens and spread disease. He said that many of these potential leaps have only become possible due to advances in scientists' ability to sequence their DNA.

"By comparing the genomes of different fungi, you can really start to understand what genes are involved in which processes," he said. "Now you can go into the lab, study them, change a few genes around, and make a fungus even better at performing a specific task."

But that's not to say researchers won't run into any challenges in their quest to develop uses for fungi. Due to ranging sizes of fungal genomes and their repetitive genetic sequences, the study notes that it's been difficult to identify and study them in their entirety. It's only due to the advent of long-read sequencing technologies like Nanopore and PacBio, which currently enable the sequencing of longer fragments of DNA, that fungal genetics research has become so broad, said Roth.

Still, while being able to manipulate fungal genomes would be beneficial for a number of tech industries, such advancements are unlikely to occur without a significant amount of time, funding and technological support.

"Scientists can have all these ideas and curiosities about fungi and want to study them further, but it's really challenging and it's very expensive," said Roth. "And unfortunately, people aren't always aware of what we can do with them."

**More information:** Mitchell G. Roth et al, Fungal biotechnology: From yesterday to tomorrow, *Frontiers in Fungal Biology* (2023). DOI: 10.3389/ffunb.2023.1135263

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