LAY SUMMARY

Sample based on: Guillen-Otero et al. (2024), published in *Plant Symbiotic Interactions,* doi: 10.3389/fpls.2024.1402946

Title: Comparative analysis of mycorrhizal communities associated with *Struthiopteris spicant* (L.) Weiss across Europe and North America

Lay title: More than rain and light: How mycorrhizal fungi shape a fern population

Intended audience: Knowledgeable non-specialists, general public

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From surface to depth, how and why underground fungi in partnership with a common fern species are completely different depending on where in the world it grows.

THE PROBLEM

With about 11000 species worldwide, ferns play a vital role in numerous ecosystems. They protect the soil from erosion, improving its quality and providing shelter for diverse microorganisms and wildlife. Yet, we know little about the strategies they use to succeed in the harshest environments. The answer might lie underground. Mycorrhizal fungi are soil fungi that form physical bonds with most plants. This association is often beneficial for both parties: the plant “feeds” the fungus and the fungus helps the plant to have better access to water and nutrients, resist infections, and grow faster and stronger. In the case of ferns, we have limited data on whether they interact with specific fungi and under which climatic and soil conditions. This information is essential to predict if a fern population can survive in a given region or succeed despite climate change.

WHAT WE DID

We studied 36 populations of a single fern species (*Struthiopteris spicant)* to learn whether the type and number of mycorrhizal fungi in their roots changed depending on where they lived. *Struthiopteris spicant,* also known as the deer fern, grows naturally in both Europe and North America. We took root, leaf and soil samples from 105 plants in 11 countries and also made a smaller study across Switzerland.

We analyzed these samples to identify which fungi were present, measure their abundance, and assess nutrient levels in both soil and plant tissues. In addition, we recorded the size and health of each fern population and data on sunlight, rainfall, humidity, and temperature in each area since these factors influence the survival of plants and fungi.

WHAT WE FOUND

We discovered that even within the same fern species, different populations had very distinct mycorrhizal communities. The amount of light received by the plant, the acidity of the soil, and the amount of nitrogen accessible are the most important factors affecting the number of fungi. Yet, we found that environmental factors are not enough to predict which type of fungi would be associated with the deer fern in a given location.

WHY IT MATTERS

Our study highlights the importance of considering ferns and mycorrhizal fungi when developing ecological conservation programs. Even within a single fern species, mycorrhizal associations vary widely, impacting the health and survival of plant populations. Our findings show that fern-fungus relationships are influenced by much more than the climate. Because ferns facilitate forest regeneration and promote ecosystem functioning, understanding their underground partners helps us better protect entire ecosystems against rapid environmental changes.