Research shows relationship between trophic type and latent period in fungal pathogens

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Through a meta-analysis of biotrophs, hemibiotrophs, and necrotophs, four scientists set out to find if the latent period of leaf fungal pathogens reflects their trophic types. The answer? Yes, there is a strong relationship between the trophic type and the latent period, an important functional trait of pathogenic fungi.

"There are three major trophic types of plant pathogens that correspond with strategies for host exploitation," explains plant pathologist Pierre-Antoine Précigout. "Biotrophic pathogens colonize and reproduce in living tissues. Necrotrophic pathogens kill their host soon after infection and complete their whole infectious cycle on dead tissue. Hemibiotrophic pathogens have a rather intermediate life cycle: they infect and develop while the tissue is alive, and then kill it to reproduce."

Précigout and his colleagues believed that the trophic type of a fungi is related to its latent period, which is the duration of the host colonization phase before reproduction. To test this hypothesis, they analyzed 2,542 latent periods covering 53 pathogen species and found a significant link between latent period and trophic type. On average, necrotrophs have the shortest latent period at about 100 degree-days (DD), followed by biotrophs at about 170 DD, and then by hemibiotrophs that have the longest latent periods at about 270 DD.

When considering why hemibiotrophs have such a long latent period, Précigout and his colleagues propose an eco-evolutionary hypothesis based on the milker versus killer theory (van Baalen and Sabelis, 1995).

They hypothesize that the long biotrophic phase corresponds to a milker strategy by delaying the virulence related to the switch to necrotrophy.

Their research also shows that host resistance, which results in an increase in the latent period, may be due to an increase in the incubation period alone (for hemibiotrophs), the symptom development period alone, or both periods simultaneously. For biotrophs and necrotophs, resistance also increased the period of symptom development.

"The link between the manifestation of host resistance and the trophic type of the pathogen, through an increase of the incubation period or via an increase of the period of symptom development (or both) may be of interest for crop protection," says Précigout. "More specifically, it can offer guidance for selecting resistant varieties by taking trophic type into account in plant breeding strategy."

Surprisingly, the environment in which the studies were conducted seemingly had little impact on the latent period. Also of note, the effect of the trophic type on the latent period was quantitatively as important as the effect of host resistance.

"Our article proposes an ecological vision of the latent period of pathogenic fungi, which may be of interest to the world of plant pathology. In particular, if pathogens are to adapt to environmental changes through their latent period, then the different trophic types shall have different adaptive capabilities," says Précigout. Read more about this research in "Does the Latent Period of Leaf Fungal Pathogens Reflect Their Trophic Type? A Meta-Analysis of Biotrophs, Hemibiotrophs, and Necrotrophs," published in the February issue of *Phytopathology*.

More information: M. G. Roth et al, Fluopyram Suppresses Population Densities of Heterodera glycines in Field and Greenhouse

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