Integrated disease management of soilborne pathogen complexes: a complicated but achievable management challenge

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Although soilborne diseases of forage and crop legumes are often considered to be caused by a single oomycete or fungal pathogen, a complex of pathogens are associated to these diseases (Lamichhane et al 2017). However, management of soilborne diseases is generally targeted to a single pathogen (You et al 2017a; 2017b). Because each pathogen within a soilborne complex is differentially affected by environment, variety, cultural and chemical control practices, failures of management are frequent. The complexity of soilborne pathogens x environment interactions is highlighted by the multifaceted and contrasting interactions in relation to temperature, moisture, type of soil, nutrition and variety, even for individual pathogens (You and Barbetti 2017a,b; You et al. 2017a,b, 2018). The unpredictable and ever-changing proportions of different pathogens within complexes further challenges their management. Hence, identifying all soilborne pathogens operating within disease complexes remains a prerequisite to their effective management. Management challenges, including chemical control, are illustrated by a recent study showing how fungicides that are effective against single pathogens are ineffective against pathogen complexes (You et al. 2020). Consequently, there is a need to refocus away from reliance on fungicide options in managing soilborne disease complexes. Because no host resistance is available for all pathogens within a complex, You and Barbetti (2017a, 2019) highlight the need for and benefits of manipulating the ecosystem to better manage disease complexes, including crop sequence adaptation with less frequent legumes, adjusting tillage, plant density and crop variety. Although all these help improve productivity and persistence of legume systems adversely affected by soilborne pathogen complexes, a more important added value could be to integrate host tolerance within an integrated disease management framework. Current studies on forage legumes highlight huge potential benefits through such an approach to better manage soilborne disease complexes.

Keywords: forage legumes, crop legumes, soilborne pathogens, pathogen complexes, damping-off, root disease

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