Plant Pathology Seminar Series

"Novel plant diseases and their potential threats"

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Abstract

Novel plant-pathogen interactions have the potential to develop into new diseases when the pathogens or plant species are introduced to regions outside their native range (9). Human induced factors like introduction of planting materials or pathogens, changes in the natural landscape, and farming techniques influence the natural equilibrium between host-pathogen interactions and facilitate the emergence of new diseases (1,11). Different groups of plant pathogens (i.e. fungi, bacteria, viruses, and nematodes) respond differently to these factors and may emerge as the causal agents of new diseases (1). Many economically important diseases such as rice blast and potato late blight are thought to result from the interactions of the pathogens on new hosts during different historic time periods (4,11). Many novel plant diseases have become economic problems as the result of the expansion of agriculture and the advent of international trade (7,9). In addition, pathogens have adapted different evolutionary mechanisms to infect new hosts (6,8,10,11). Three different models, host shift, hybridization, and horizontal gene transfer, have been suggested as the evolutionary mechanisms of novel plant diseases (11). Recently, the rice blast pathogen (*Magnaporthe grisea*) was demonstrated to be pathogenic to wheat through host shift in Brazil (4,12,13). Subsequently, the wheat blast pathogen has spread to all wheat growing areas and caused severe yield losses in Brazil (12,13). Utilizing the mechanism of horizontal gene transfer, *Pyrenophora tritici-repentis* that was previously described as a saprophyte or weak pathogen of wheat became more virulent around 1940 and has caused tan spot on wheat. The fungal pathogen acquired a host specific toxin gene, *ToxA*, from *Stagonospora nodorum*, the causal agent of wheat glume blotch (5). Hybridization between *Phytophthora cambivora* and a close taxon of *P. fragariae* resulted in a new species that causes Phytophthora disease of alder, a new disease first reported in 1993 in Great Britain (2,3). Agro-ecosystems homogenize the environment, which is favorable not only for more frequent disease epidemics but also for the development of new diseases as compared to natural ecosystems. These new diseases can pose serious threats to food security, biodiversity, and human health and welfare (1,9,11).

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