Epidemiology of cereal rusts in the presence of their alternate hosts

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Cereal rusts (*Puccinia* spp.) are among the most studied plant pathogens. Most research focuses on the uredinial stage, since that is the spore stage that infects the crop and cause disease. However, the possibility for the fungi to complete their full life cycle has implications for the epidemiology of the disease. My research predominantly focuses on two pathosystems, the fungi causing stem rust, *Puccinia graminis* and crown rust, *Puccinia coronata*, their grass hosts and alternate hosts barberry (*Berberis* spp.) and common buckthorn (*Rhamnus cathartica*) respectively. The presence of aecia on the alternate host dramatically increases the genetic diversity of the pathogens and also affects the epidemiology of the diseases. The presence of the alternate host represents a local source of initial inoculum. This, in turn, leads to local populations that show evidence of some genetic isolation, although individuals from other locations will contribute to the genetic diversity of the local population. This may have implications in the generation of new gene combinations, which would in turn be reflected in a large number of different races. Rust fungi are mainly transported by wind, and to understand the impact of air-borne inoculum, the fungal community in the air has been studied using a variety of different spore traps, and compared with field observation to obtain a better understanding of the frequency of air-dispersed spores in different locations. To control cereal rusts reproducing sexually, measures such as removal of the alternate host (to minimize genetic variation and initial inoculum) together with a focus on durable resistance breeding (to cope with the variation in races) are necessary.