Entomopathogenic fungi infecting non-pest insects

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PROGRAM and ABSTRACTS

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Nosemosis in western honey bees (Apis mellifera) is caused by the microsporidians Nosema apis and N. ceranae. Pathology associated with N. apis, the historical parasite of western honey bees, is well understood, and includes increased winter mortality and poor spring build-up of surviving colonies. Conversely, pathology associated with recently-detected N. ceranae, historically of Asian honey bees (Apis cerana), is not well-described. N. ceranae was associated with increased winter mortality and reduced honey yields in Spain, and was highly pathogenic when inoculated experimentally. The antibiotic fumagillin dicyclohexylammonium (hereafter, fumagillin) is used to control Ascosphaera apis. By contrast, asexual reproduction has never been described in A. apis, although it is a widespread form of propagation in Ascomycetes. Since asexual reproduction does not require mating, it allows rapid production of large numbers of conidia (mitospores), and their subsequent dispersal into new areas. This study thus fills an important gap in current understanding of the developmental cycle of an important fungal honey bee pathogen. Herein we describe asexual reproduction in A. apis and discuss its potential role in host pathogenesis and in the dissemination of this infectious bee disease in the environment. Considering the worldwide spread of chalkbrood disease and the lack of EPA approved drugs to cure it, an understanding of the A. apis life cycle is an important factor in the design of a disease management program.

Among the social insects, honeybees Apis mellifera have an exceptionally diverse set of parasites and pathogens. In this study two species of fungal diseases have been investigated: one is the common brood diseases, chalkbrood (Ascosphaera apis) and another opportunistic, but less common pathogen in honeybees, the stonebrood (Aspergillus flavus). Using the honeybee larvae as host and these two pathogens we investigated in vitro temperature impacts on the infected larvae. Temperature is known to have a crucial role in mediating the outcome of the host – parasite interactions; however there is limited information on the possible competition among fungal pathogens within the honeybee host. In addition, we investigated within-host competition among different fungal pathogens within a single larva and the role temperature plays in mediating these interactions.
Entomopathogenic fungi infecting non-pest insects: Implications for ecosystem services and relevance of behavioural ecology

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Abstract

Entomopathogenic fungi infect a wide array of insects from most orders and they are among the natural enemies that contribute to the regulation of insect populations. However, only a limited number of studies have focused on the impact of fungal pathogens on populations of non-pest insects. Effects of entomopathogenic fungi on non-pest host populations should receive more attention based on the increasing interest in conservation biological control. In this strategy, founded on competition theory, non-pest host populations adjacent to cropping systems will in principle affect pest populations through shared natural enemies. We present examples of selected non-pest host-fungus systems from temperate ecosystems that are relevant for the expected ecosystem service provided by entomopathogenic fungi. Predators are among the non-pest hosts that are infected by fungi. Recent advances in our understanding of the effect of pathogens on the behaviour of predators may shed light on the significance of entomopathogenic fungi for the regulation of predator populations. We discuss what we can learn about host-pathogen interactions from behavioural ecology and which life history parameters in the host that may be important for the impacts of fungal pathogens on their host populations.