

Invertebrates are exposed to many pathogens and parasites during their life cycle. Host immune responses are sensitive to changes in resource quality due to trade-offs between life-history traits and immune defenses. However, we lack a full understanding of how trade-offs play out in the presence of pathogens and varying resource environments. In this study, we investigated whether resource quality in conjunction with bacterial infection alters the immune system of the insect species, *Plodia interpunctella*, commonly known as the Indian meal moth. We used a factorial design with food quality and pathogen presence varied for a total of eight treatment combinations. Larvae in the infected condition were infected by *Bacillus thuringiensis*, a soil-dwelling, natural pathogen of *Plodia interpunctella*. Total haemocyte count was determined across all treatment conditions. We found significant differences in the total number of haemocyte cells between larvae reared in different food quality conditions, in both infected and uninfected larvae. Moreover, we found a significant difference in total haemocyte counts between infected and uninfected larvae, throughout food quality conditions. Finally, our results show a significant difference in the body mass of the larvae reared under varying food quality conditions. This work provides a deeper understanding of how insect immunity responds to bacterial pathogen infection across food-quality environments. Specifically, how food quality and pathogen conditions interact to affect host immune responses. Furthermore, this information helps us understand and predict host-pathogen dynamics under changing environments.