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Probiotics impact on *Tenebrio molitor* performance, microbial composition and pathogen infection

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The yellow mealworm *Tenebrio molitor* L. (Coleoptera: Tenebrionidae) is an insect model for infection and immunity studies and is mass-produced as feed and food. The industrial rearing of *T. molitor* on agricultural by-products may expose larvae and adults to microbes applied as biocontrol agents, e.g. spores of *Bacillus* bacteria and fungal conidia that could impact the performance of *T. molitor*. The project deals with experiments analyzing different outcomes of single and co-infections of *Bacillus thuringiensis*, and the fungal pathogen *Metarhizium brunneum* on the larval stages of *T. molitor*. Furthermore, as for other animals, the possible benefits of addition of active and tantalized probiotic bacteria to the feed is investigated. The pathogenicity of *B. thuringiensis* serovar *tenebrionis* (Btt) and *Metarhizium brunneum* KVL 12-30 has first been tested by single infection of *T. molitor* to define LD25 and LD50. Then targeted co-infections were performed to determine additive, synergistic or antagonistic interactions between these pathogens. Alongside infections, growth rate and survival rate are recorded and insect microbiota composition will be analyzed by 16S rRNA Mi-sequencing to measure how the probiotics *Pediococcus pentosaceus* and *Lactobacillus plantarum* and the pathogens modify the microbial composition. The hypotheses are: 1) *M. brunneum* and *Btt* have different mechanisms of infection, therefore dose and timing of pathogen exposure will influence the outcome; 2) the presence of probiotics may help the insect to cope with the infection by improving immunity, by presenting a shorter period for pathogen clearance and by expressing higher performance; 3) the probiotics may help the insect by providing nutrients. Preliminary results show evidence of positive effects of adding a vital probiotics strain to the feed on *T. molitor* performance and survival highlighting the role of probiotic metabolites and microbiota relationship for maintaining host health.