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

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The yellow mealworm *Tenebrio molitor* 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 entomopathogens used as biocontrol agents, like bacterial spores/toxins of *Bacillus thuringiensis* or conidia of the fungus *Metarhizium brunneum*, that could impact *T. molitor* survival and growth. Therefore, as for other animal livestock, the possible benefits of addition of living or tantalized probiotic bacteria to the insect feed are investigated. Two probiotic strains, *Pediacoccus pentosaceus* KVL B09-1 and *Lactobacillus plantarum* WJB were added to wheat bran (WB) or wheat bran added with dried egg white (WE) during development from the egg to larvae weighing 20 mg, after which larvae were exposed during 72 h to *B. thuringiensis*, *M. brunneum* or their combination in simulated optimal rearing conditions. Larval survival and weight gain were recorded for 14 days and the bacterial microbiota composition was analyzed by 16S rDNA sequencing at day 0, 3 and 14 after contact with the pathogens, to define the impact of feed composition and probiotics on *T. molitor* survival, growth and microbial composition. Results show evidence of increased weight gain and differences in microbial community in larvae fed with WE diet. Positive effects on growth and increased survival rate on *T. molitor* larvae reared on feed supplemented with probiotics, conferring increased survivability and weight gain case of co-infections and suggesting a role of probiotic-host-microbiota interactions in maintenance of insect health. At the end of the experience, all individuals presented a comparable microbial community composition, highlight the inability of the probiotic strains to persist in the larvae after probiotic removal from the diet.