

Abstract

Feed contamination with deoxynivalenol (DON) poses a significant threat to animal health and food safety. In response to the need for sustainable protein sources and the utilization of low-quality raw materials, insects-particularly yellow mealworm larvae (*Tenebrio molitor*) are considered a potential tool for bioconverting contaminated feed into safe and valuable biomass.

The aim of this study was to assess the impact of DON on *T. molitor* larvae and to identify detoxification mechanisms. In a two-week experiment, larvae were fed diets containing DON at concentrations of 663 and 919 µg/kg (groups A and B) and a control diet (K). Survival, weight gain, DON content and its metabolites in the biomass, as well as amino acid and fatty acid profiles, were analyzed after the 1st and 2nd week of exposure. No significant effect of DON on larval survival or growth was observed. DON accumulation in the biomass was low ($\leq 32,18$ µg/kg), whereas high concentrations were detected in frass (> 860 µg/kg), indicating efficient excretion.

Metabolites such as DON-sulfonate, DON-3-glucuronide, DON-3-sulfate, DON-3-glucoside, and de-epoxy-DON (DOM-1) were identified in larvae, confirming the activity of detoxification pathways including sulfonation, glucuronidation, sulfation, glycosylation, and de-epoxidation. The amino acid profile revealed a decrease in most essential and non-essential amino acids (e.g., aspartic and glutamic acids, lysine, methionine), accompanied by an increase in tryptophan, suggesting adaptive changes in protein metabolism. The lipid profile was dominated by oleic and linoleic acids, with a significant increase in linoleic acid after two weeks of exposure. These findings indicate that *T. molitor* larvae effectively metabolize DON through multiple detoxification mechanisms; however, this process entails metabolic costs, reflected in alterations of amino acid and fatty acid metabolism.

Keywords: deoxynivalenol; *Tenebrio molitor*; feed bioconversion; detoxification; metabolic profile