EXPLORING THE IMPACT OF STANDARD AND NANOTECHNOLOGY-BASED SIMAZINE ON *Caenorhabditis elegans*

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INTRODUCTION: Simazine (SMZ) is a triazine herbicide that inhibits photosystem II to control weeds but can negatively impact the environment and human health when overused. Nanoencapsulation of SMZ using zein nanoparticles (NPs) offers a promising strategy to enhance its safety and efficacy by reducing the concentrations applied and, therefore, its potential toxicity. **OBJECTIVE:** This study investigates the toxicological effects of SMZ on *Caenorhabditis elegans* and explores the safety of a zein NPs loaded with SMZ (SMZNPs). **MATERIAL AND METHODS:** Wild-type N2 worms were exposed for 48 hours (L1-L4 stages) to concentrations of SMZ, empty NPs, and SMZNPs (0.0005–0.1 mg.mL^{-1}) on live vs PFA-killed OP50-seeded NGM. L4 survival rate, brood size and severe heat resistance (LFASS) on the first day of adulthood, were assessed. **RESULTS AND CONCLUSION:** Both SMZ and SMZNPs caused mortality at high concentrations, whereas empty NPs did not. SMZ and SMZNPs but not NPs reduced reproduction rates at higher concentrations (0.05 and 0.1 mg.mL^{-1}). Zein NPs improved adult severe heat resistance at all concentrations tested, while SMZNPs did so at the lowest concentrations (0.0005–0.02 mg.mL^{-1}). Finally, SMZ and SMZNPs toxic effects where enhanced on PFA-killed bacteria, suggesting that live OP50 provide some protection. As SMZNPs are expected to be more potent than SMZ solutions and revealed less toxic, future research will explore their herbicidal efficacy at subtoxic concentrations. That live OP50 partially shield worms against SMZ toxicity further warrants investigation of soil bacterium impact on SMZ efficacy.

Keywords: nanotoxicology; environment; nematode.

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