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Comparative Effect of Nanoparticles of Silver, Europium Doped ZnO and CaF₂ on *Aedes aegypti* and *Daphnia magna*

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Aedes aegypti mosquitoes are responsible for transmitting dengue fever. Using nanoparticles is a better suggestion to combat vector mosquito spread. *Daphnia magna* is the keystone species in freshwater food webs. The sensitivity of *Daphnia magna* to low metal concentrations underscores its importance in evaluating the impact of nanoparticles on the ecosystem. This study examined the impact of Silver, ZnO, CaF₂, Europium-doped ZnO, and CaF₂ nanoparticles on *Aedes aegypti* larvae and adult *Daphnia magna*. The batch of 25 third instar larvae of *Aedes aegypti* and the batch of 25 adult *Daphnia magna* were exposed to each nanoparticle in a concentration series for 24 and 48 hours. For *Aedes aegypti*, nanoparticles of ZnO and CaF₂ at 20 mg/L, 40 mg/L, 60 mg/L, 80 mg/L, and 100 mg/L; nanoparticles of Europium-doped ZnO and CaF₂ at 50 mg/L; and Silver nanoparticles at 1 mg/L, 2 mg/L, 3 mg/L, 4 mg/L, and 5 mg/L. For the *Daphnia magna*, ZnO nanoparticles at 0.2 mg/L, 0.4 mg/L, 0.6 mg/L, 0.8 mg/L, and 1 mg/L; Europium-doped ZnO nanoparticles at 0.5 mg/L; CaF₂ nanoparticles at 1 mg/L, 2 mg/L, 3 mg/L, 4 mg/L, and 5 mg/L; Europium-doped CaF₂ nanoparticles at 4 mg/L; and Silver nanoparticles at 2.36 mg/L. The percentage mortality of *Aedes aegypti* larvae and *Daphnia magna* was calculated for each nanoparticle. The study revealed that nanoparticles of ZnO and CaF₂ did not affect *Aedes aegypti* larvae but caused significant mortality in *Daphnia magna*. LC₅₀ value at 24 hours for ZnO nanoparticles was 0.51 mg/L, while for CaF₂ nanoparticles, it was 4.44 mg/L. The study also revealed that increasing europium doping in ZnO and CaF₂ nanoparticles led to higher *Daphnia magna* mortality. The study revealed that exposure to silver nanoparticles for 24 hours significantly increased *Aedes aegypti* larvae mortality rates. LC₅₀ value was 2.36 mg/L. All *Daphnia magna* were dead within 24 hours of exposure to silver nanoparticles. The study concludes that ZnO and CaF₂ nanoparticles did not affect *Aedes aegypti* larvae. Silver nanoparticles showed lethal effects but cannot be recommended for *Aedes aegypti* control due to being toxic to *Daphnia magna*, a keystone species in aquatic ecosystems.

Keywords: *Aedes aegypti*, *Daphnia magna*, Nanoparticles, LC₅₀ value, Europium doping

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