

**BIOCIDES ENHANCE THE SEVERITY OF PARASITE INDUCED
ABNORMALITIES IN THE HOURGLASS TREE FROG (ANURA: RANIDAE)**

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Trematode infections and biocide exposure have been shown to cause abnormalities, growth retardation and increased mortality in the common hourglass tree frog *Polypedates cruciger*, under laboratory conditions. This study investigates the synergistic effect of trematode infections and biocide exposure on survival, growth and development of abnormalities in *P. cruciger*. Egg clutches from natural populations were reared in the laboratory and five days post-hatch tadpoles were exposed to monostome type cercariae released by the snail species *Thiara scabra* (Gastropoda: Prosobranchia: Thiaridae), in the presence of biocides. Four biocides, including two herbicides (glyphosate and 3, 4-dichloropropionamide) and two insecticides (chlorpyrifos and dimethoate), were used at a low, ecologically accepted dosage (0.5 ppm). Each tadpole was exposed to 48 cercariae in four equal doses for four consecutive days (12 cercariae \times 4 days) by placing the tadpole in a small plastic container containing 5 ml of different biocide solutions. Tadpoles were then transferred into separate glass tanks (n= 20 per treatment) containing 2 l of the respective biocide, fed with commercial fish feed and raised until metamorphosis. Survival was recorded weekly and growth and development were assessed at metamorphosis by measuring their snout-vent length, weight and the time required for forelimb emergence in 50% of the tadpoles (TE₅₀) in a given treatment. Abnormalities were recorded at 10, 30 days post-hatch and at metamorphosis. The observed abnormalities were mainly; tail bending, vertebral column curvature and lumps (almost everywhere on the body). A significant decline in the survival ($\chi^2= 28.014$, df = 3, p < 0.000) was observed for all the treatments in the presence of both biocides and cercariae. Moreover, synergistic effect caused significant lengthening of TE₅₀ value ($\chi^2 = 14.130$, df = 3, p = 0.003) compared to all other treatments. Abnormality percentage was significantly higher ($\chi^2=24.983$, df=3, p<0.000) in both biocide and cercariae exposed groups compared to biocide only groups at early stages of the development, but it gradually declined with the age of the tadpole except in those placed in chlorpyrifos. Tadpoles in the control had normal development and low mortality levels. Exposure to biocide compounded the effects of trematode infections, enhancing the growth retardations and abnormalities. It appears that the synergism between trematode infection and biocide exposure significantly affected the survival, growth and development of abnormalities in *P. cruciger*, under laboratory conditions. Field studies are required to assess the effects of trematode infections and biocides in natural populations.

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