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Effects of water temperature and light intensity on the acute toxicity of herbicide thiobencarb to a green alga, Raphidocelis subcapitata

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Abstract

The present study investigated how principal environmental factors such as temperature and light intensity change the toxicological properties of thiobencarb (TB) herbicide to the green alga, Raphidocelis subcapitata. At first, we investigated the inhibitory effect of TB (0, 15.6, 31.2, 62.4, and 125 μgL−1)ongrowthof R. subcapitata at five temperatures (10, 15, 20, 25,or 30 °C) for 144 h exposure and calculated 72- and 144-h effective concentration values (EC10, 20, and EC50) for growth rate. All EC values significantly decreased with an increasing temperature. The maximum quantum yield of photosystem II in R.subcapitata exposed to 125 μgL−1 of TB was also significantly inhibited with increased temperature. These physiological effects could explain the lower EC values at high temperatures. Then, single and interactive effects of TB, temperature, and light intensity on growth rate were investigated by three-way of analysis of variance. As a result, single and interactive effects were detected in all explanatory variables. These results suggest that temperature and light intensity change the acute toxicity parameter in R. subcapitata exposed to TB and must be considered in evaluating the risk of TB.