

Abstract

Aurelia aurita jellyfish blooms have been occurring globally more frequently and in larger magnitudes than previously observed, with disastrous consequences ranging from the disruption of fisheries to the shutdown of power plants. These blooms have been observed to occur at the highest frequency and largest scale along coastlines that are chemically rich from wastewater runoff. Despite this, there is a significant lack of published research regarding the effects of wastewater chemicals, such as caffeine and estradiol, on *A. aurita*. This study aimed to determine whether caffeine and estradiol affect the polyp life stage of *A. aurita*. We hypothesized that estradiol would decrease polyp reproduction and strobilation due to hormonal disruption, caffeine would increase polyp reproduction and strobilation due to increased enzyme activity, and combined caffeine and estradiol would increase polyp reproduction and strobilation because caffeine is present in a much higher concentration, so its positive effects will overshadow any negative effects of estradiol. We exposed *A. aurita* polyps to caffeine, estradiol, and combined caffeine and estradiol over a twelve day period. To monitor polyp strobilation and reproduction, the number of elongated polyps, ruffled polyps, asexual buds, and the total number of polyps in each treatment were counted. Treatment response variables were compared to a control through GAMLSS models, and Spearman's Rank-Order test of correlation was used to determine the effect of time on all response variables. We found that estradiol had no effect on *A. aurita* polyps, caffeine caused an increase in *A. aurita* polyp strobilation, and the combination of caffeine and estradiol caused an increase in both polyp strobilation and reproduction. This indicates that caffeine, and the combination of caffeine and estradiol, may play a role in the harmful *A. aurita* blooms that occur along polluted coastlines worldwide.

Keywords

Jellyfish Blooms, Environmental Toxicology, Strobilation, Caffeine, Estradiol,
Interactive Effects