CONFERENCE ABSTRACTS

Standard Session Themes:
Transport, fate and exposure modelling of chemicals in the environment
Environmental analysis and monitoring
Metal toxicity and environmental chemistry
Bioavailability and toxicity of organic and emerging chemicals
Nano-risk research: toxicity of micro pollutants
Toxicity of mixtures and multiple stressors
Terrestrial ecotoxicology
Biomarkers and biosensors
Environmental 'Omics'
Emerging ecotoxicological techniques and test methods
Advances in analytical chemistry
Life cycle assessment
Groundwater and salinity issues
Human health issues associated with environmental contaminants
Pharmaceuticals and personal care products in the environment
Biological monitoring of endocrine disrupting chemicals
Ecological risk assessment
Environmental management

Special Session Themes:
Marine and estuarine water quality
Marine ecotoxicology
The role of natural organic matter in environmental toxicology and chemistry
Per- and poly-fluorinated alkyl substances (PFAS): fate and effects

Effects of Herbicide Degradation Products on Growth and Photosynthetic Efficiency in a Benthic Jellyfish

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Theme - Marine Ecotoxicology and Chemistry

ABSTRACT

Photosystem II (PSII) herbicides are persistent in marine water with half-lives in excess of 100 days in simulated experiments. These herbicides also persist in tropical coastal systems year-round, raising the possibility that coastal habitats may also be chronically exposed to herbicide degradation products. Despite this likelihood, there is little understanding of the toxicity of PSII herbicide degradation products, which may be more toxic than their parent compounds and/or contribute to the overall toxicity of the coastal water.

To assess the toxicity of the PSII herbicides diuron and hexazinone including their degradation products, the symbiotic benthic jellyfish Cassiopea maremetens was exposed to either fresh or degraded herbicides for six days. The exposure effects on photosynthetic efficiency (effective quantum yield) of symbionts, symbiont density, and jellyfish growth were assessed.

There were contrasting effects on both the symbiont and host following exposure to the fresh and degraded herbicides. Photosynthetic efficiency of the symbionts was significantly decreased by exposure to all herbicide products; however, there were contrasting effects on yield between fresh and degraded diuron compared to fresh and degraded hexazinone exposure. Aged diuron (EC50=0.49 µg/L) affected photosynthetic efficiency more than fresh diuron (EC50=1.35 µg/L). The difference in toxicity between aged and fresh hexazinone was not as pronounced with the EC50 for fresh hexazinone 18.7 µg/L and aged hexazinone 24.3 µg/L. The effects of herbicide exposure on the host jellyfish growth were more equivocal but could potentially be explained by their capacity to switch the balance between phototrophic and heterotrophic energy sources in the presence of herbicides.

The outcomes of this study suggest there is the potential for degradation products from some PSII herbicides to be more toxic to marine biota than the parent compound. Accordingly, it may be necessary to consider the contribution of degradation products along with the parent herbicide compounds when setting protection criteria for high value marine systems.