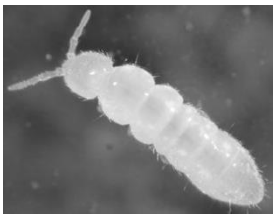
Zentrum für Umweltforschung und nachhaltige Technologien (UFT)
Allgemeine und theoretische Ökologie

THERE IS NO PLANET B – Chemical Mixtures Endanger our Environment

Bachelor Thesis | Master Thesis | Research Project



Acute mixture toxicity of pesticides and surfactants on aquatic model organisms

Pesticide formulations on the edge: toxicity of pesticide formulations on soil organisms in liquid environments

Community composition of flying insects with aquatic larval stages exposed to pesticide mixtures

Life history patterns of aquatic model organisms after exposure to pesticide mixtures in mesocosms

Insect – decline

Biodiversity decline

Soil degradation

Mixture Toxicity

Pollution of groundwater, surface waters and the sea

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It is currently undisputed that the actions of humanity leave long-lasting and potentially irreversible negative impacts on our planet. While the effects of increasing CO_2 emissions in the form of climate change are well known to the public and a frequent topic of discussion, other forms of environmental damages are often overlooked. One of these is chemical pollution of our ecosystems. In most samples taken from the environment, a wide range of chemical pollutants can be detected, including pharmaceuticals and pesticides. Pesticides are a special case of pollutants, because they are designed to target certain plants, insects or fungi and are released into the environment on purpose. This is problematic because in many cases non-target organisms are also affected by these pesticides. In addition, due to the persistency of the pesticides, mistakes in their application, or natural processes such as climatic fluctuations, several pesticides can be detected in samples of aquatic water bodies at the same time. This poses a big problem, as mixtures of toxic substances can be unpredictable in their effects. Previous experiments revealed that some mixtures of pesticides caused stronger effects than the sum of effects from the single pesticides. Another level of complexity to this problem is the fact that pesticides consist not only of the toxic substance itself, but also of additives to change solubility or surface tension. However, the regulatory framework for approval of chemicals only considers single substances. Mixture effects are ignored. This caused a huge knowledge gap concerning the effects of chemical mixtures on the environment. In my PhD thesis, I aim to decrease this knowledge gap by testing mixtures of pesticide products in different settings. This includes conducting acute toxicity tests of mixtures of pesticides and surfactants on aquatic model organisms such as *Daphnia magna*. It will also be possible to assess effects of these mixtures onto the terrestrial model organism *Folsomia candida*. Usually this organism lives on and in the soil, however it is possible to conduct the test in a liquid environment, copying the conditions in capillaries filled with water in the soil. Besides laboratory experiments, I am also conducting experiments with small scale aquatic ecosystems (mesocosms) that are being exposed to a mixture of a Glyphosate-containing herbicide and a copper-nanoparticle containing fungicide. That includes an assessment of the community composition of flying insects, whose aquatic larval stages are exposed to this pesticide mixture. If you are interested in these topics, feel free to contact me! The projects can be adjusted to fit the time frame of Bachelor's and Master's theses. Of course, you are also welcome to bring your own ideas and inputs into these projects.

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Further ongoing projects in the group:

- Copper-based agrochemicals in relation to multiple stress in soils
- Mixture toxicity in terrestrial environments: Relevance of substance group and soil type
- Effect of climatic extremes on pesticide toxicity to terrestrial organisms

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