Zeitschrift für Feldherpetologie 19: 1–20 März 2012

Akut-toxische, subletale und indirekte Wirkungen von Glyphosat und glyphosathaltigen Herbiziden auf Amphibien – eine Übersicht

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Acute and sublethal toxicity and indirect effects of glyphosate and its formulations on amphibians – a review

The world wide and continuously increasing contamination of aquatic and terrestrial ecosystems with pesticides and other agrochemicals is considered as a main factor causing global amphibian declines. Glyphosate, the most commonly used non-selective systemic herbicide, is sold under a variety of commercial names (e. g. Roundup® and Vision®), and is promoted by the introduction of genetically modified glyphosate-resistant crops. Glyphosate and its metabolites were detected in low concentrations in soil, rainwater, and natural surface waters. The toxicity of glyphosate and its formulations to amphibian larvae and other aquatic organisms has been proven in a variety of laboratory experiments; Roundup® concentrations of less than 1 mg acid equivalent per litre resulted in increased larval mortality in anurans. The active herbicide ingredient (glyphosate) is itself toxic but surfactants such as polyethoxylated tallowamine (POEA) are even more so; other components of glyphosate formulations probably also contribute to toxicity. Sublethal concentrations of glyphosate and glyphosate-based herbicides can cause teratogenic effects, abnormal behaviour, and developmental failures such as a prolonged larval period or accelerated growth of tadpoles and reduced size at metamorphosis. Until recently, little attention has been paid to indirect effects of herbicide exposure on amphibians. Among such effects are reduced growth of algae and water plants and thus a limited food supply for tadpoles. An impoverished vegetation also reduces the number and spectrum of invertebrates as a food resource for adults. Only little is known about synergistic, additive, and antagonistic effects resulting from interactions between glyphosate formulations and other agrochemicals. We also do not know whether glyphosate applications over a longer period of time influence the immune system of amphibians, perhaps by impairing the microbial communities of the skin, making their hosts susceptible to parasites and infections. Despite the huge number of questions still unanswered, our current knowledge is sufficient to justify tightening the application guidelines for glyphosate herbicides, particularly in the interest of human health. In addition, as an important protection measure for amphibians and many other organisms, all pesticide applications should be banned within 300 m of the edge of all aquatic sites.

Key words: Amphibian decline, herbicides, glyphosate, Roundup®, surfactants, tallowamine (POEA), toxicity.