Predicting sublethal effects of herbicides on terrestrial non-crop plant species in the field from greenhouse data

The assessment of the risk posed by herbicides to non-target terrestrial higher plants is required to help protect biodiversity both within the plant kingdom as a whole and in agro-ecosystems. Several tiered approaches to assess these risks are proposed. However, a number of factors that require consideration during risk assessments are not discussed in these proposals: plant development stage, reproduction and recovery of plants, but also differences in sensitivity between monocotyledons and dicotyledons, field and greenhouse grown plants, and individuals and vegetations. Furthermore, these risk assessment protocols are based on single species experiments in greenhouses and may therefore under- or overestimate risks.

The focus of this study was to gain more insight in these factors and especially in the possibility of predicting effects under field conditions based on greenhouse data. A relationship between the effects on greenhouse and field grown plants was found in this study. When assessing the risk of a compound in non-target areas, predicting the amount of deposited product in such an area is of great importance. We propose a methodology that combines dose response curves, the relationship between greenhouse and field grown plants and a droplet drift model to estimate the risk of herbicides on higher terrestrial plants in non-target areas. The methodology is called Effects of Pesticides on Plants model (EPOP) and can make use of several endpoints such as biomass, seed production and species composition. The model can be used as an extension of the tiered standard for risk assessment as proposed by EPPO.