**BACKGROUND**

PPPs containing inorganic active substances are widely used to treat important EU crops. The use of standard FOCUS models for inorganic compounds is difficultly accepted by regulators since they are mainly designed for organic substances. Among the inorganic substances, the case of copper fungicides, which are widely used on several crops, especially tomato, vines and fruit trees, is of great interest. Copper has raised concerns in view of its persistence and potential harmful impacts to non-target organisms (EFSA, 2013). Copper compounds have been included in the list of substances candidate for substitution (Reg. EU 2013/408). At EU level, the maximum application rate of copper fungicides has been set at 6 kg a.i./ha/year by the Directive 88/85/EEC.

**MODEL DESCRIPTION**

**SUBSTANCE PARAMETRISATION**

- **Water-soil**
  - 2.25E-05
  - logn(gm=3.2E-05,gsd=50.0)

- **Water-soil composition**
  - 784.03
  - logn(gm=0.0079,gsd=50.0)

- **Water-soil composition**
  - 5.00E-02
  - logn(gm=0.0079,gsd=50.0)

**RESULTS AND DISCUSSION**

**Soil**

Concentration in soil surface -10 years

![Graph showing concentration in soil surface](image)

**Surface water**

Concentration in surface water - Entry routes

![Graph showing concentration in surface water](image)

Comparison of MERLIN-expo outputs with the standard FOCUS Step 1 & 2 Ecov (FOCUS, 2001): FOCUS Step 1 is highly conservative compared to MERLIN-expo estimation. In the FOCUS Step 2 modelling, peaks due to spray drift entrainment are constant, whereas peaks in MERLIN-expo increase in subsequent applications. The first peak in MERLIN-expo is lower than the maximum Step 2 estimation, on the contrary, the following peaks exceed Step 2 prediction. With regards to the plateau, MERLIN-expo concentration stands in between Step 1 and 2 outputs.

**CONCLUSIONS**

MERLIN-expo is a new tool potentially suitable to predict environmental concentrations of inorganic active substances (metals). It allows to calculate actual concentrations and accumulation in years. The sensitivity analysis allows to understand which are the most critical parameters and processes driving copper contamination. The MERLIN-expo soil-water model has shown results comparable with FOCUS Step 2.

Features to improve the use of MERLIN-expo for pesticides exposure assessment

The typical pesticides application model is not specifically included within the scenario description. However, the flexibility of the model has made it possible to overcome this limitation. Mitigation measures are not yet implemented. Groundwater compartment at the moment is not available in the tool.

**SCENARIO DEVELOPMENT**

**OBJECTIVE**

Can MERLIN Expo be used for environmental exposure of inorganic pesticides?

**MERLIN Expo - The EU 4FUn project**

Integrates in a common software:

- a library of models for full-chain assessments
- all the functionalities for generic and/or site-specific uncertainty/sensitivity analysis

- Exposure behaviour model
- PBPK model and dose response model

**Soil and surface water body parametrisation**

SW FOCUS stream scenarios

**Soil concentration in sediment - first year**

![Graph showing soil concentration in sediment](image)

**Surface water**

Concentrations in dissolved water refer to the first year of application: The contributions of each entry route are illustrated. Peaks are caused by spray drift inputs that occur the day of application. The maximum actual concentration occurs in the day of the last application. Wash-off is modelled within MERLIN Exp through a transfer function (using a global wash-off rate constant). This process is responsible of the plateau concentration.

**Sediment**

Concentrations in sediment refer to the first year of application. Mean and conditional intervals (25th and 95th percentiles) are shown. The probabilistic assessment takes into account the probability density functions (PDF) associated to the partition coefficients of copper. The uncertainty associated to these parameters leads to a high variability of the results.

**Soil concentration in sediment - first year**

![Graph showing soil concentration in sediment](image)

**RESULTS AND DISCUSSION**

**Soil**

Concentration in soil surface -10 years

![Graph showing concentration in soil surface](image)

**Surface water**

Concentration in surface water - Entry routes

![Graph showing concentration in surface water](image)

Comparison of MERLIN-expo outputs with the standard FOCUS Step 1 & 2 Ecov (FOCUS, 2001): FOCUS Step 1 is highly conservative compared to MERLIN-expo estimation. In the FOCUS Step 2 modelling, peaks due to spray drift entrainment are constant, whereas peaks in MERLIN-expo increase in subsequent applications. The first peak in MERLIN-expo is lower than the maximum Step 2 estimation, on the contrary, the following peaks exceed Step 2 prediction. With regards to the plateau, MERLIN-expo concentration stands in between Step 1 and 2 outputs.

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**REFERENCES**


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