GLOBAL SENSITIVITY ANALYSIS OF THE LEMNA MODEL BY SCHMITT ET AL. (2013) USING R

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The R script will be made available on request
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Introduction
- Lemma model by Schmitt et al. 2013 is considered ready for use in the risk assessment of plant protection products in EFSA SO TKTD 2018 but a more generic sensitivity analysis was requested
- General behavior of the model parameters is investigated by conducting a global sensitivity analysis

Materials & Methods
- Analysis is restricted to the simulation of laboratory growth tests (Tier 2C approach in EU risk assessment scheme)
- Different exposure patterns within the standard test duration of 7 days are covered:
  a. constant exposure
  b. two pulse exposure and
  c. one pulse exposure
- As relevant endpoint the inhibition of growth rate over 7 days is used
- Analysis is done in R and compatible with the original published model R code

Results & Discussions
1. Contribution to variance with respect to the considered growth, TK and TD parameters in sensitivity analysis
- Based on linear correlation of inhibition of growth rate (but: nonlinear model)
- Parameter EC50int contributes mostly to variance on the inhibition of growth rate
- Different exposure patterns within the standard test duration of 7 days are considered:
  a. constant exposure
  b. two pulse exposure
  c. one pulse exposure

2. Scatter plots: Parameter values are plotted with respect to the effect on growth rate after 7 days in % for all three exposure scenarios: constant exposure (a), 2 peak exposure (b), 1 peak exposure (c)
- At first sight, effect on growth rate is not sensitive to a change in TK parameters
- A sigmoid pattern for the TD parameter EC50int is observed
- Parameter b has an effect, however not a directed effect

3. Scatter plots: Parameter EC50int is plotted versus the model parameter with respect to the effect on growth rate after 7 days in % for all three exposure scenarios: constant exposure (a), 2 peak exposure (b), 1 peak exposure (c)
- For high permeability values, effect on growth rate is not sensitive for changes in P
- For small values of P, effect on growth rate is sensitive to changes in P
- Parameter b has an effect, however not a directed effect

Conclusions
- The by far most sensitive parameter in the global sensitivity analysis over a broad parameter space is EC50int which explained about 95 % of the variability of the inhibition of the growth rate in all three exposure scenarios
- Scatter plots show that permeability P and slope b also need to be considered
- The value of EC50int, P and b are obtained by calibrating the model to experimental data

References