



Evaluation of epoxiconazole bioavailability in soil to the earthworm *Aporrectodea icterica*

Sylvie Nelieu, Ghislaine Delarue, Elodie Ollivier, Pierre Awad, Christian Mougin, Céline Pelosi

► To cite this version:

Sylvie Nelieu, Ghislaine Delarue, Elodie Ollivier, Pierre Awad, Christian Mougin, et al.. Evaluation of epoxiconazole bioavailability in soil to the earthworm *Aporrectodea icterica*. SETAC Europe 26th Annual Meeting, May 2016, Nantes, France. , 2016. hal-01532561

HAL Id: hal-01532561

<https://hal.science/hal-01532561>

Submitted on 29 Mar 2023

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Evaluation of epoxiconazole bioavailability in soil to the earthworm *Aporrectodea icterica*



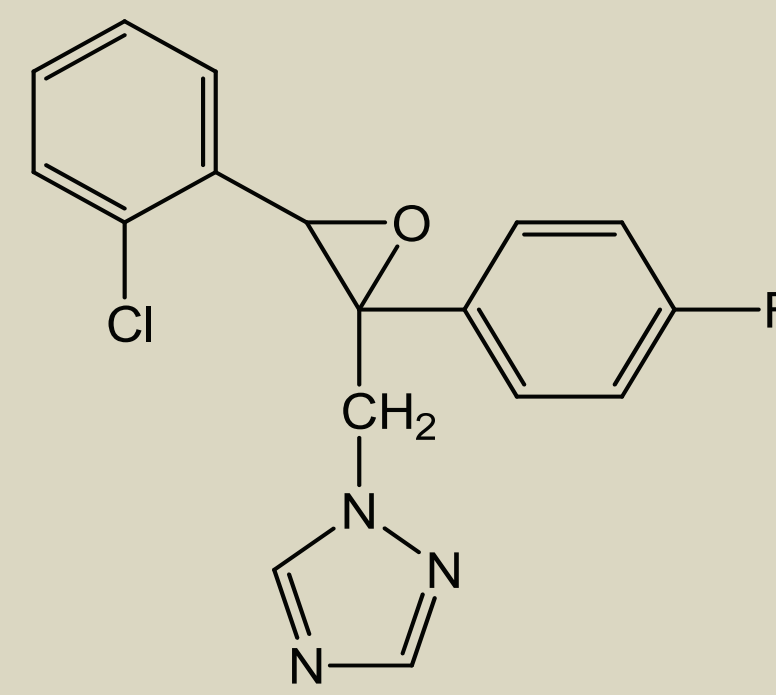
S. Nélieu¹, G. Delarue¹, E. Ollivier^{1,2}, P. Awad¹, C. Mougin^{1,2}, C. Pelosi¹

1. INRA – AgroParisTech – Univ. Paris-Saclay, UMR 1402 ECOSYS, 78026 Versailles, France
2. Plateforme Biochem-Env, INRA, UMR 1402 ECOSYS, 78026 Versailles, France



Context

- In soils, sorption processes limit the bioavailability of organic contaminants to organisms. This bioavailability restriction depends on the target organism, soil properties and several processes varying with time [1].
- Little attention has been paid to this bioavailability to earthworms even if they are key-organisms for the health of terrestrial ecosystem, as they influence soil structure and chemistry.
- Earthworms can be threatened by contaminants such as the persistent fungicide epoxiconazole (EPX), which has a chronic toxicity towards the resistant earthworm *Eisenia fetida* at a concentration close to the recommended dose. It could thus affect sensitive earthworm species found in cultivated fields, such as *Aporrectodea icterica* [2].



Epoxiconazole
Water solubility 7.1 mg/L
Log K_{ow} 3.3
DT50 (soil) 120-354 days

Objective and approach

➔ **Propose and apply a mild extraction method to estimate the environmental (bio)availability of epoxiconazole (EPX) for earthworms *A. icterica*.**

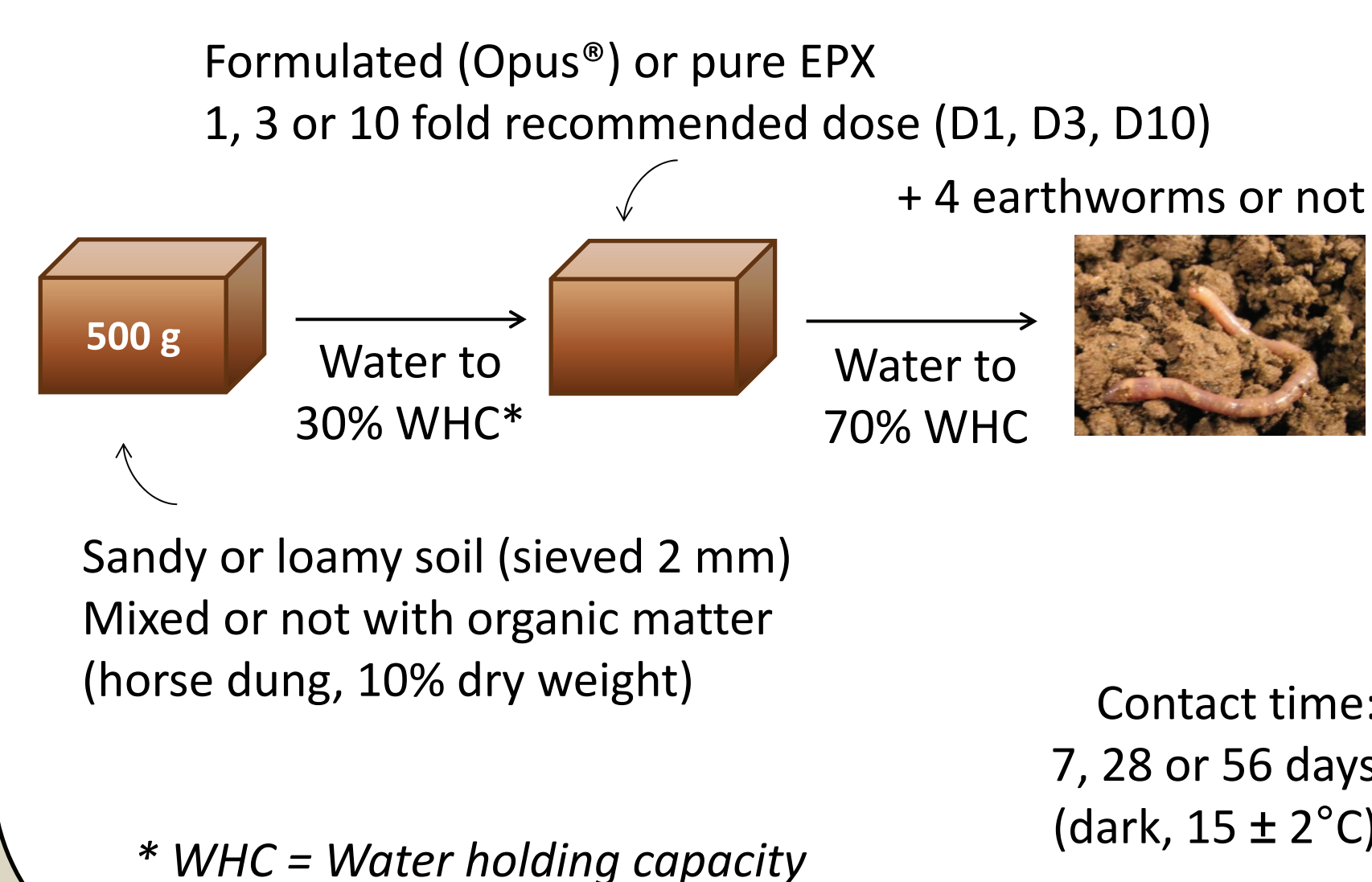
Step 1. Test of the **method sensitivity** to soil sorption capacities: the mild extraction yield should vary with organic matter content, soil texture and aging.

Step 2. Exploration of the **relationship between EPX concentration in exposed *A. icterica* and available in soil**: the relation should be linear, with a slope close to 1.

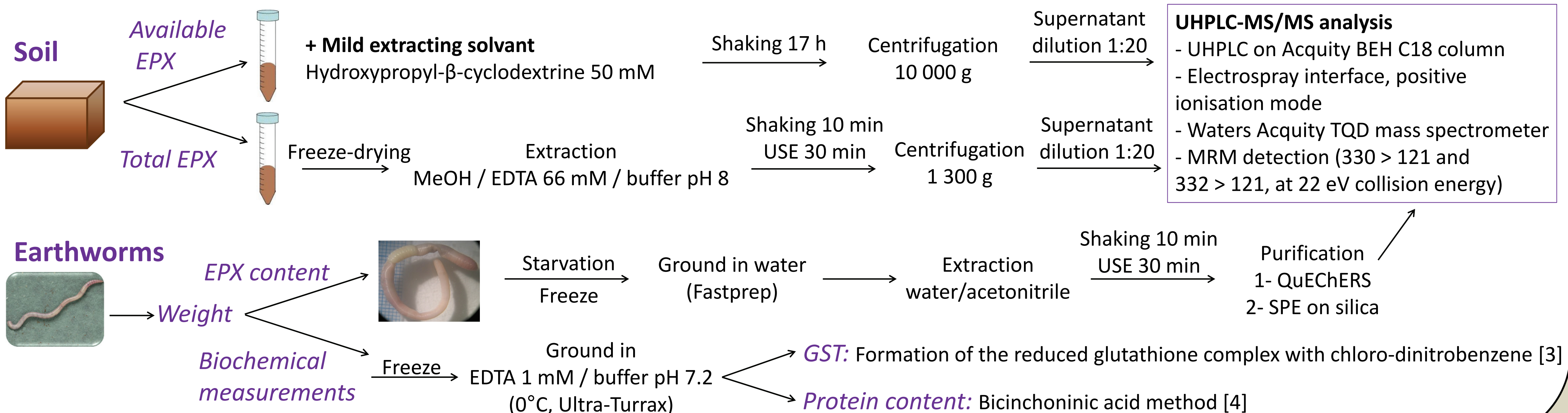
Step 3. Determination of **EPX effects on *A. icterica***: sublethal effects should be observed.

Experimental

Preparation of incubations

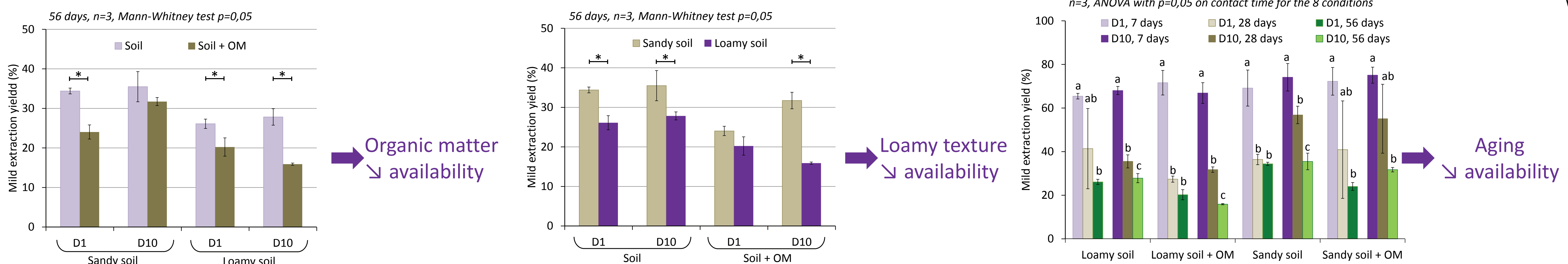


Extraction and analysis

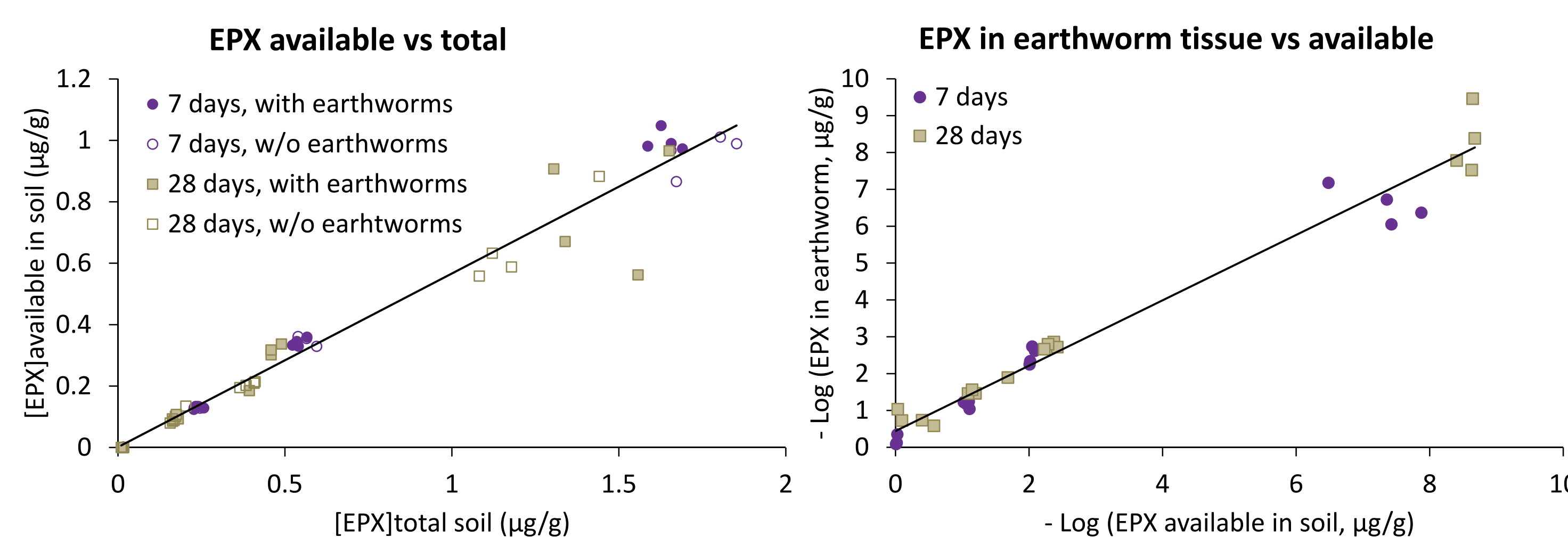


Results & discussion

1 – Soil sorption capacities and aging effects on the epoxiconazole availability



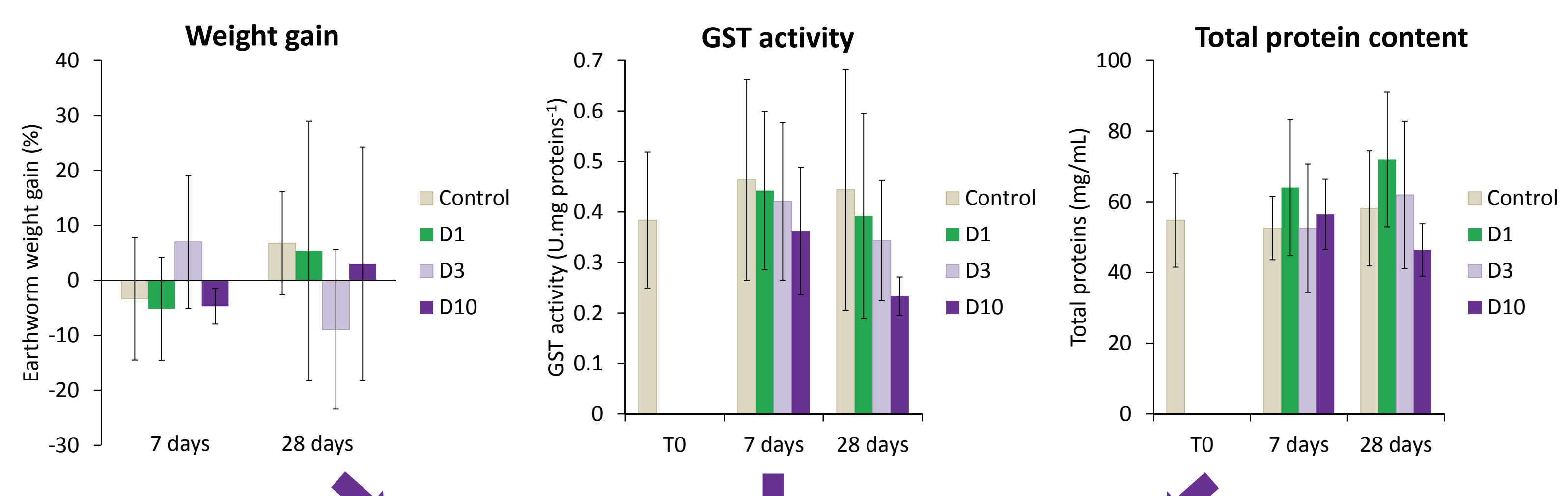
2 – Relationship between concentrations in soil and in earthworms



The mild extraction method allowed determining an EPX available concentration proportional to the total one, in all tested conditions.

Linear relation (R^2 0.98)
Slope close to 1 (0.96)
➔ EPX bioavailability for earthworm is efficiently determined by the mild extraction method.

3 – Sublethal effects of epoxiconazole on earthworms



In this study EPX did not caused significant effects on earthworms, in contradiction with previous experiments [5, Poster MO258]. EPX toxicological bioavailability for earthworms could not be correlated to chemical determinations of environmental availability or environmental bioavailability.

Conclusions

- The mild extraction method based on hydroxypropyl-β-cyclodextrine, chosen to evaluate epoxiconazole availability in soil, fulfilled the criteria of the ISO 17402 norm [6].
- Extraction yields were demonstrated to be sensitive to soil sorption capacities and to aging.
- The mild extraction method mimicked efficiently the earthworm's uptake.
- In these experiments, the earthworms *A. icterica* were not sensitive to the presence of epoxiconazole.

References

1. J. Harmsen, J. Environ. Qual. 36, 1420-1428 (2007)
2. C. Pelosi, S. Joimel, D. Makowski, Chemosphere 90, 895-900 (2013)
3. W.H. Habig, M.J. Pabst, W.B. Jakoby, J. Biol. Chem. 249, 7130-7139 (1974)
4. P.K. Smith, R.I. Krohn, K.C. Jones, P. Burauel, A. Craven, H. Harms. Environ. Sci. Technol. 38, 228A-231A (1985)
5. C. Pelosi, M. Lebrun, L. Beaumelle, N. Cheviron, G. Delarue, S. Nélieu, Environ. Sci. Pollut. Res. 23, 3053-3061 (2016)
6. ISO 17402 (2008) Soil Quality

Acknowledgments

This work was supported by INRA, Department Environment and Agronomy (Pari Scientifique AdVerPe), and by grants from Région Ile-de-France for UHPLC-MS-MS analyses. Biochemical analyses were achieved on the platform Biochem-Env, a service of the « Investissement d'Avenir » infrastructure AnaEE France, overseen by the French National Research Agency (ANR) (ANR-11-INBS-0001).