

Ecotoxicological Test Protocol for the Assessment of Reproductive Endpoints in Non-Target Terrestrial Plants under Greenhouse Conditions

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Introduction

Ecotoxicological testing to assess the effects of plant protection products on non-target terrestrial plants (NTPs) under greenhouse conditions is conducted according to standard guidelines (e.g. OECD 208 and OECD 227). EFSA's Scientific Opinion of 2014 on the risk assessment of plant protection products (PPP) for NTPs raised awareness of a potential need to assess effects on plant reproduction, e.g. seed production. However, currently no established test method for this study type is available.

Literature reviews and experimental studies evaluated the feasibility and relevance of plant reproductive endpoints (e.g. Christl et al. 2020, Duffner et al. 2020). In summary, they concluded that (a) assessment of reproductive endpoints in selected plant species is in principle feasible, (b) there is no clear trend that reproductive endpoints are more sensitive than vegetative ones and (c) specific cases may exist where reproductive endpoints appear to be more sensitive depending on e.g., mode of action of a plant protection product and/or test species.



Fig. 1: Overview small-scale NTP test to assess reproductive endpoints

Objectives & Goal

- Potential effects on reproductive endpoints may need to be assessed for regulatory purposes. In such cases, a standard test protocol would be required.
- Thus, a working group within the SETAC Plant Interest Group was launched to collect and analyze relevant and available data and experiences in order to provide guidance for a plant reproduction protocol.

Fig. 2: Example replicates of an NTP test to assess reproductive endpoints in *Agrostemma githago* below: 21 days after application at the 2-4 leaf stage (BBCH 12-14), right: at the test end (harvest stage, BBCH 89)

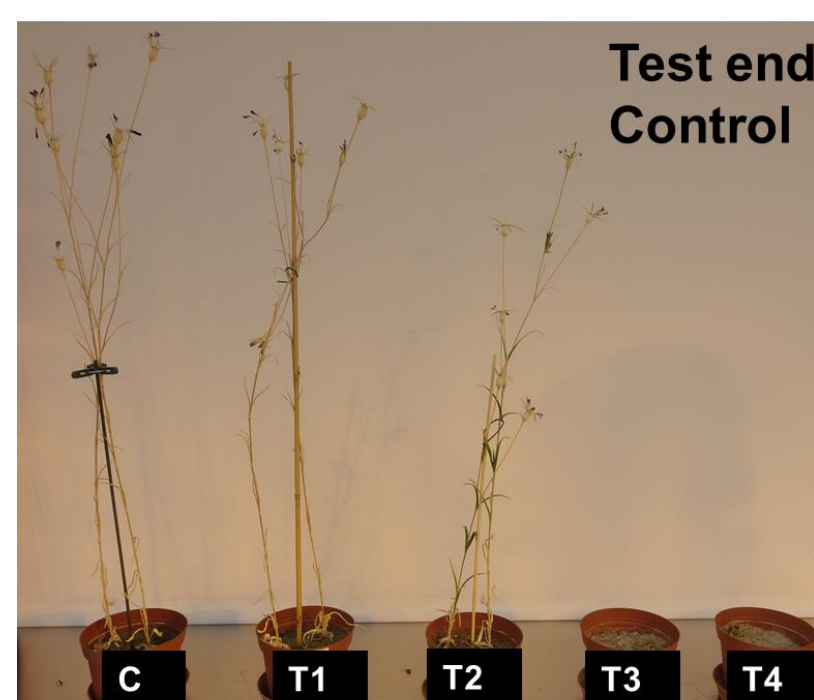


Fig. 3: Example for delay in ripening



Fig. 4: Example for inhomogeneous seed quality



Challenges

- Pest and disease control: A greenhouse study of such duration increases the likelihood of requiring the use of adequate control methods
- Treatment rates and Effect level: ER_{25} and corresponding test rate setting appears to be more suitable than ER_{50}
- Study duration: Time point of study termination if a delay in ripening occurs in the treated plants
- Optional germination test F1 generation: Selection of (subset of) seeds, delayed seed ripening in treated plants, etc.
- Validity criteria: Ensure generation of meaningful results while making allowances for the challenges of a long-term plant study

Next steps / Outlook

- Finalization and publication of the protocol
- Potentially establishing a small-scale ring-test, based on the agreed protocol
 - in case of interest, please contact us

Contact

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References

Christl H, Hoen T, Zumkier U. Comparative Assessment of Vegetative and Reproductive Terrestrial Plant Species Endpoints from Exposure to Herbicides and Potential Environmental Implications: A Review. Integrated Environmental Assessment and Management. 2020;16(2):166-83.
Duffner A, Moser T, Candolfi MP. Feasibility of assessing vegetative and generative endpoints of crop- and non-crop terrestrial plant species for non-target terrestrial plant (NTP) regulatory testing under greenhouse conditions. PLOS ONE. 2020;15(3):e0230155.
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OECD 227 (2006): Terrestrial Plant Test: Vegetative Vigour Test, OECD Publishing, Paris.

Accomplishments

- **Draft protocol** was prepared based on OECD 227 and adapted to meet the needs for the assessment and evaluation of reproductive endpoints
- **Review** of the Draft protocol by different stakeholders (Academia, Authority, Industry)

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