JRF GLOBAL

Detecting Endocrine-Active chemicals in Aquatic Environment: An OECD TG 253 approach

Daphnia magna, commonly known as the water flea, is a freshwater cladoceran widely used in aquatic toxicology and environmental safety assessments. Due to its short life cycle, high reproductive rate, and sensitivity to environmental contaminants, *Daphnia magna* has become one of the most important model organisms for evaluating the ecological effects of chemicals.

Juvenile hormones play a critical role in regulating growth, development, and reproduction in crustaceans. Exposure to chemicals exhibiting juvenile hormone agonist activity can alter normal reproductive processes, resulting in reduced fecundity and induction of male offspring production. Because of its sensitivity to these hormonal changes, *Daphnia magna* serves as an ideal test organism for the OECD TG 253 Juvenile Hormone Activity Screening Assay (JHASA). Details of reproduction cycle of *Daphnia magna* and critical period of sex determination are depicted in Figure 1.

At JRF, We Successfully Validated OECD TG 253: Juvenile Hormone Activity Screening Assay (JHASA) Using *Daphnia magna*

The validation study was conducted in the Ecotoxicology Laboratory of Jai Research Foundation (JRF) using *Daphnia magna* and the reference standard Diofenolan, a known juvenile hormone agonist.

Gravid female daphnids were exposed under semi-static conditions to different concentrations of Diofenolan for seven days. Diofenolan showed concentration dependent reduction in reproduction, delayed second brood release, and induced high male production, indicating strong juvenile hormone–like activity in *Daphnia magna* and has a strong impact on both reproductive output and sex determination.

Key Findings of the validation are:

- No parent mortalities and abnormal behaviour were observed in controls and treatment groups.
- Reproductive output decreased with increasing test concentrations.
- During the study aborted eggs were observed at concentrations of 87.5, 175.0 and 350.0 µg/L.
- Male offspring were observed in all treatment groups.

Result of Reference Standard (Diofenolan)

The results confirmed the responsiveness of *Daphnia magna* to juvenile hormone agonists and validated the successful implementation of OECD TG 253 at JRF.

Concentration (µg/L)	Live Male Offspring Ratio (%)
Control	0
Vehicle Control	0
43.8	98.86
87.5	100
175.0	100
350.0	100% aborted eggs

Scientific Significance

The successful validation of OECD TG 253 expands JRF's Ecotoxicology testing capabilities and strengthens its support for endocrine disruption assessment programs. This achievement enables JRF to provide internationally accepted screening data for regulatory submissions and environmental safety evaluations.

References

OECD, 2024: The Organisation for Economic Co-operation and Development (OECD) Guideline for the Testing of Chemicals, OECD 253, Short-term Juvenile Hormone Activity Screening Assay using Daphnia magna (JHASA), adopted by the Council on 25 June 2024.
OECD (2024), Validation report for the Test Guideline on Short-term Juvenile Hormone Activity Screening Assay using Daphnia magna (JHASA), OECD Series on Testing and Assessment, No. 395, OECD Publishing, Paris. https://doi.org/10.1787/7b633310-en.

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