

**ECOTOXICITY ELEMENTS**  
**TOXICITY TO TERRESTRIAL ORGANISMS**  
**Soil invertebrates: *Folsomia fimetaria***

**PAPER REVIEWED**

Jensen, J, Sverdrup, L.E. 2002. Joint toxicity of linear alkylbenzene sulfonates and pyrene on *Folsomia candida*. *Ecotoxicology and Environmental Safety*, 52, 75-81.

**TEST SUBSTANCE**

- (C<sub>11.6</sub>) LAS (Condea Augusta, Milan, Italy).

Remarks: The neat material was 20.3 % (w/w) active C<sub>11.6</sub> LAS in an aqueous sodium salt solution, average molecular weight = 342 g/mol, distribution of the linear alkyl chains: C<sub>10</sub> 14 %, C<sub>11</sub> 34 %, C<sub>12</sub> 31 %, C<sub>13</sub> 21 %. All data expressed in mg LAS (active substance) / kg d.w. soil.

**METHOD**

- Objectives To determine the effects of LAS on survival (adults) and reproduction of the soil invertebrate *Folsomia fimetaria* (springtail).  
Additional objectives not reviewed in this summary:
  - to examine the effects of pyrene on *F. fimetaria*;
  - to examine the joint toxicity of pyrene and LAS.
- Method/guideline followed No internationally accepted guideline available. Test performed according to a previously described method (Løkke & Van Gestel 1998). Important deviations from ISO 11267: adult springtails instead of juveniles were used; 20 individuals instead of 10 per test container; 21 days exposure instead of 28 days (ISO 1999).
- Test substrate/application A natural sandy loam soil was used (collection site not mentioned). Defaunation by sieving (2 mm mesh) and heating at 80 °C (24 h).  
LAS was dissolved in water (type not mentioned) and added to the test soil.
- GLP Likely not.
- Year (study performed) ≤ 2002.
- Species/strain/supplier Laboratory bred animals. Supplier or collection site not mentioned. Acclimation to the test soil not mentioned.

- Analytical monitoring                      Nominal LAS concentrations not measured.
- Exposure period                              21 days.
- Endpoints                                      Mortality, reproduction.
- Statistical methods                          The LC50 was calculated with probit analysis.  
The NOEC was calculated with ANOVA and Dunnet's test.  
EC10 and EC50 for reproduction were estimated by logistic regression. For EC50:  $juv = k(1 + (conc / EC50)^c)^{-1}$ , for EC10:  $juv = k(1 + (1/9)*(conc / EC10)^c)^{-1}$ . Parameters k and c not explained in the reviewed paper (see 'Remarks').

🚫 Remarks: As the parameters were not explained in the reviewed paper, k = response of measured endpoint at concentration = 0, c = slope parameter.

## RESULTS

- Nominal concentrations                      LAS experiment: 0, 50, 100, 200, 400, 800 mg LAS / kg d.w.
- Measured concentrations                      Nominal LAS concentrations were not measured.
- NOEC, EC50, EC10, LC50                      See Table 1.

Table 1: NOEC, LOEC, ECx and LCx values (mg LAS / kg d.w.) for *F. fimetaria* exposed to LAS.

Parameter	NOEC	LOEC	EC10 or LC10	EC50 or LC50
Adult survival	N.A.	N.A.	N.A.	> 800
Reproduction	200	N.A.	161	803

N.A. Data not given in reviewed paper and not sufficient raw data to calculate NOEC, LOECs or LC10.

- Other endpoints                              LAS did not enhance the toxicity of pyrene to *F. fimetaria*, i.e. mixture toxicity did not differ from additivity.

🚫 Remarks: According to ISO 11268-2 too few replicates were used for the ECx approach (less than 5 in the controls) (ISO 1998). LOECs and raw data were not given in the reviewed paper.

## CONCLUSIONS

ECx calculations were not withdrawn although only 4 instead of 5 replicates for the control were used (e.g. ISO 1998).

The most sensitive parameter was reproduction (EC10 = 161 mg LAS / kg d.w.), but no evidence was found for LAS enhancing the toxic effects of pyrene.

## RELIABILITY

Klimisch score (Klimisch *et al.* 1997). 2c (comparable to guideline study with acceptable restrictions): origin and acclimation of test species not fully described, nominal concentrations not measured.

## REFERENCES

- ISO. 1998. Soil quality – Effects of pollutants on earthworms (*Eisenia fetida*) – part 2: Determination of effects on reproduction. ISO 11268-2, Geneva, Switzerland.
- ISO. 1999. Soil quality – Inhibition of reproduction of Collembola (*Folsomia candida*) by soil pollutants. ISO 11267, Geneva, Switzerland.
- Klimisch, H.-J., Andreae, M., Tillmann, U. 1997. A systematic approach for evaluating the quality of experimental toxicological and ecotoxicological data. *Regulatory Toxicology and Pharmacology*, 25, 1-5.
- Løkke, H., Van Gestel, C.A.M. (eds.) 1998. Handbook of soil invertebrate toxicity tests. John Wiley & Sons, Chichester.