ECOTOXICITY ELEMENTS
TOXICITY TO TERRESTRIAL ORGANISMS
Plants: *Lepidum sativum*, *Lactuca sativa*, *Helianthus annuus*, *Brassica rapa rapa*, *Sinapis alba*, *Trifolium pratense*, *Vicia sativa*, *Linum usitatissimum*, *Brassica chinensis*, *Sorghum vulgare*, *Brassica napus*, *Avena sativa*, *Raphanus sativus radicula*, *Lolium perenne*, *Triticum aestivum*, *Trigonella coerulea*, *Phaseolus aureus vigna radiata*

PAPER REVIEWED

Günther, P., Pestemer, W. 1992. Phytotoxicity of surfactants to higher plants. In: Hall, J.E., Sauerbeck, D.R., L'Hermite, P. (eds.). Effects of organic contaminants in sewage sludge on soil fertility, plants and animals. Proceedings of a seminar held at Braunscheig (D) on 6-8 June 1990. Office for Official Publications of the European Communities, Brussels, Belgium.

TEST SUBSTANCE

- LAS (Hüls, Marl, Germany).

✏ Remarks: No further details were given on LAS and it is not mentioned whether the data presented are given in mg neat LAS / kg d.w. soil for growth and mg neat LAS / L for germination and bioavailability.

METHOD

• Laboratory	Federal Biological Research Centre, Weed Research Institute, Braunschweig, Germany.
• Objectives	To determine the effects of LAS on germination (*in vitro*), growth (soil test and hydroponic test, short- and long-term), and on the effect of LAS on pesticide (lindane) availability for different plant species. Additional objectives not reviewed in this summary: • to assess the phytotoxicity of distearyldimethyl-ammoniumchloride and 4-nonylphenol; • to determine the availability of lindane in soil under influence of surfactant addition.
• Method/guideline followed	• Germination, radicle length: comparable to ISO 11269-3 (ISO 1993a). • Growth inhibition in soil: range-finding and dose-response tets: comparable to ISO 11269-2 (ISO 1993b). • Hydroponic culture (bioavailability): no internationally accepted guideline available. • Long-term growth inhibition: no internationally accepted guideline available.

- Test substrate/application
  - Germination: distilled water, paper (type not mentioned) in petri dishes.
  - Growth inhibition in soil: sandy loam soil. Supplier or collection site not given; pH, texture, maximum water holding capacity given in the reviewed paper.
  - Hydroponic culture: not mentioned in the reviewed paper but in Günther and Pestemer 1990.
  - Long-term growth inhibition (hydroponic test): not mentioned in the reviewed paper but in Günther and Pestemer, 1990.
- GLP
  Likely not.
- Year (study performed)
  ≤ 1990
- Species/strain/supplier
  - Germination: *Lepidum sativum* (garden cress): supplier not mentioned
  - Growth inhibition in soil:
    - Range-finding tests: *Lactuca sativa* (head lettuce), *Helianthus annuus* (sunflower), *Brassica rapa ssp. rapa* (turnip), *Sinapis alba* (mustard), *Trifolium pratense* (red clover), *Lepidum sativum* (garden cress), *Vicia sativa* (common vetch), *Linum usitatissimum* (flax), *Brassica chinensis* (Chinese cabbage), *Sorghum vulgare* (great millet), *Brassica napus* (rape), *Avena sativa* (oats), *Raphanus sativus var. radicula* (small radish), *Lolium perenne* (perennial ryegrass), *Triticum aestivum* (winter wheat), *Trigonella coerulea* (sweet trefoil), *Phaseolus aureus vigna radiata* (mung bean): supplier not mentioned.
    - Dose-response tests: *Avena sativa* (oats), *Brassica rapa ssp. rapa* (turnip), *Sinapis alba* (mustard).
  - Hydroponic culture: *Sinapis alba* (mustard): supplier not mentioned.
  - Long-term growth inhibition (hydroponic test): *Sinapis alba* (mustard): supplier not mentioned.
- Analytical monitoring
  Nominal LAS concentrations not measured.
- Exposure period
  - Germination: 72 hours.
  - Growth inhibition in soil: range-finding tests: not mentioned; dose-response experiments: 14 days.
  - Hydroponic culture: 14 days.
  - Long-term growth inhibition (hydroponic test): 6 weeks.

- Endpoints
  - Germination: radicle length.
  - Growth inhibition in soil: fresh weight (as % of the control).
  - Hydroponic culture: fresh weight (as % of the control).
  - Long-term growth inhibition (hydroponic test): fresh weight.
- Statistical methods: The EC50 values were calculated with nonlinear regression (logistic curve fitting) (Günther et al. 1989).

✏ Remarks: \

RESULTS

- Nominal concentrations
  - Germination: 0, 50, 100, 200, 400, 800, 1600, 3200, 6400, 12800 mg LAS / L.
  - Growth inhibition in soil:
    - Range-finding tests: 0, 100, 1000, 10000 mg LAS / kg d.w.
    - Dose-response tests: not mentioned in the reviewed paper.
  - Hydroponic culture: not mentioned in the reviewed paper.
  - Long-term growth inhibition (hydroponic test): 0, 10, 20, 50, 100, 200, 300, 600 mg LAS / L.
- Measured concentrations: Not available.
- EC50, EC10: See Table 1 (EC10 derived from graphs in the reviewed paper, since they were not mentioned in the text).

Table 1: EC10 and EC50 values (mg LAS / kg d.w.) for growth of the different endpoints in the different tested plant species.

Endpoint	Species	EC10	EC50
Fresh weight as % of the control (growth, dose-response test)	*Avena sativa*	80	320
	Brassica rapa	100	180
	Sinapis alba	200	300

✏ Remarks: No NOEC, LOEC, ECx were given for the following endpoints:
- Germination (radicle length);
- Growth inhibition in soil: range-finding test with 17 species (although 'Fig 2' represents results without standard deviations or errors of this exposure);
- Hydroponic culture: 14 day fresh weight as % of the control;
- Hydroponic culture: 6 weeks fresh weight (although 'Fig 5' represents results

without standard deviations or errors of this exposure).

In annex 1 ECx calculations of germination of garden cress and fresh weight (6 weeks hydroponic test) are given, based on Vanewijk & Hoekstra 1993.

CONCLUSIONS

Avena sativa was the most sensitive plant with an EC10 of 80 mg LAS / kg d.w. (fresh weight at % of the control after 14 days exposure).

RELIABILITY

Klimisch score (Klimisch *et al.* 1997	3b (documentation insufficient for assessment): no measured concentrations; test-substrate not fully described, nominal concentrations not measured.

REFERENCES

Günther P., Rahman A., Pestemer W. 1989. Quantitative bioassay for determining residues and availability to plants of sulfonylurea herbicides. Weed Research, 29, 141-146.

Günter P., Pestemer W. 1990. Risk assessment for selected xenobiotics by bioassay methods with higher plants. Risk Management, 14, 381-388.

ISO. 1993a. Soil quality – Determination of the effects of pollutants on soil flora. Part 3: Method for the measurement of germination. ISO 11269-3

ISO. 1993b. Soil quality – Determination of the effects of pollutants on soil flora. Part 2: Method for the measurement of effects of chemicals on the emergence and growth of higher plants.

Vanewijk, P.H., Hoekstra, J.A. 1993. Calculation of the EC50 and its confidence interval when subtoxic stimulus is present. Ecotoxicology and Environmental Safety, 25, 25-32.