

TOXICITY TO AQUATIC PLANTS (SELENASTRUM CAPRICORNUTUM)

TEST SUBSTANCE

Identity: Perfluorooctanoic acid, ammonium salt; may also be referred to as PFOA ammonium salt, Ammonium perfluorooctanoate, PFO, FC-116, FC-126, FC-169, or FC-143. (Octanoic acid, pentadecafluoro-, ammonium salt, CAS # 3825-26-1)

Remarks: The 3M production lot number was 427. The test sample is FC-143, referred to by the test laboratory as N2803-4. The T.R. Wilbury study number is 895-TH. The purity of the sample was not sufficiently characterized, although current information indicates it is a mixture of 96.5 - 100% test substance and 0 – 3.5% C6, C7, and C9 perfluoro analogue compounds.

METHOD

Method: U.S. EPA-TSCA Guideline 797.1050

Test: Acute static

GLP: Yes

Year completed: 1996.

Species: *Selenastrum capricornutum*

Source: Originally from The Culture Collection of Algae at the University of Texas at Austin, maintained in culture medium at T.R. Wilbury, Inc., Marblehead, MA.

Element basis: Algal cell counts (cells/ml), and specific growth rates.

Exposure period: 96-hours

Statistical methods: Cell densities, growth rates and percent inhibition values used to estimate the EC₁₀, EC₅₀, and EC₉₀ values and 95% confidence limits were calculated using the computer software of C.E. Stephan. The no observed effect concentration (NOEC) was calculated using one-way analysis of variance (ANOVA).

Analytical monitoring: pH and temperature

Test Conditions:

Algal nutrient medium: U.S. EPA-recommended sterile enriched medium, prepared by spiking deionized water with nutrient stocks. The pH of the synthetic algal medium at test initiation was 7.5.

Stock and test solutions preparation: A 1,000 mg/L primary stock solution was prepared in sterile enriched media. Appropriate amounts of this stock solution were added directly to dilution water to formulate the test media.

Exposure vessels: 250 mL glass Erlenmeyer flasks containing 50 mL of test solution.

Agitation: Shaken continuously at 100 rpm

Number of replicates: 3

Initial algal cell loading: 1.0×10^4 cells/mL

Number of concentrations: Five plus a negative control

Lighting: ~400 ft-c from continuous cool-white fluorescent lighting

Water chemistry:

pH range: (0 – 96 hours)

7.5 – 9.6 (control exposure)

5.4 – 7.4 (1,000 mg/L exposure)

Test temperature range: (0 – 96 hours)

23.5 – 23.7°C

RESULTS

Nominal concentrations: Bk control, 62, 130, 250, 500, 1,000 mg/L.

Element value and 95% confidence interval:

72-hour EC₁₀ (cell density) = 310 (110 – 440) mg/L

72-hour E_rC₁₀ (growth rate) = 470 (380 - 550) mg/L

72-hour EC₅₀ (cell density) = 520 (250 – 1,000) mg/L

72-hour E_rC₅₀ (growth rate) = >1,000 mg/L (C.I. not calculable)

72-hour EC₉₀ (cell density) = >1,000 mg/L (C.I. not calculable)

72-hour E_rC₉₀ (growth rate) = >1,000 mg/L (C.I. not calculable)

96-hour EC₁₀ (cell density) = 97 (77 – 120) mg/L

96-hour E_rC₁₀ (growth rate) = 220 (160 - 280) mg/L

96-hour EC₅₀ (cell density) = 310 (280 - 350) mg/L

96-hour E_rC₅₀ (growth rate) = >1,000 mg/L (C.I. not calculable)

96-hour EC₉₀ (cell density) = 1,000 (830 - >1,000) mg/L

96-hour E_rC₉₀ (growth rate) = >1,000 mg/L (C.I. not calculable)

96-hour NOEC (cell density): 62 mg/L

96-hour NOEC (growth rate): 500 mg/L

Element values based on nominal concentrations

Biological observations after 96-hours:

Mean Measured Concentration, mg/L	Mean Number of Cells per mL	Percent Inhibition via Density	Percent Inhibition via Growth Rate
Control	1,407,000	-	-
62	1,445,000	-3	0
130	1,129,000	20	6
250	753,000	46	13
500	443,000	69	25
1,000	181,000	87	42

Control response: Satisfactory

Observations: Algal cell counts in each test vessel were determined by means of direct microscope counts with a hemocytometer. After 96 hours of exposure, there were no signs of aggregation, flocculation or adherence of the algae to the flasks in the control or any test treatment group. In addition, there were no noticeable changes in cell size, color or morphology when compared to the control.

Reversibility of Growth Inhibition: Effect of the test substance was determined to be algistatic based on the results of the post-definitive test exposure.

CONCLUSIONS

The test sample 96-hour EC₅₀ and 95% confidence interval for *Selenastrum capricornutum* was determined using two calculation methods. By cell density, it was 310 (280 - 350) mg/L, and by growth rate >1,000 mg/L. The 96-hour NOEC was determined to be 62 mg/L using cell density and 500 mg/L using growth rate. No signs of aggregation, flocculation, or adherence were noted in any of the test solutions. This test substance was determined to be algistatic.

Submitter: 3M Company, Environmental Laboratory, P.O. Box 33331, St. Paul, Minnesota, 55133.

DATA QUALITY

Reliability: Klimisch ranking = 2. The study lacks analytical measurement of test substance concentrations in the test solutions and the sample purity is not sufficiently characterized.

REFERENCES

This study was conducted at T.R. Wilbury Laboratories, Inc., Marblehead, MA, at the request of the 3M Company, Lab Request number N2803-4.

OTHER

Last changed: 4/01/01